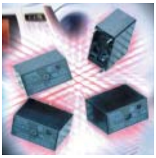
OMRON

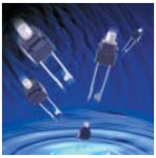
2005 Components Catalogue

OMRON

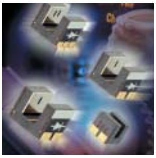
2005 Catalogue



Continued on next page



Continued on next page



The Omron Components catalogue 2005

Welcome to the new Omron Components catalogue, featuring one of the world's most extensive range of solid state and electro mechanical relays, switches and FPC connectors.

Omron Components has led the industry in the elimination of lead from its components. The majority of components in this catalogue, including all the signal relays, microswitches, dip switches and tactile switches as well as most power relays are RoHS compliant now, a full year and a half before the deadline. The balance of the power relays will be compliant by April 2005.

As usual, this new catalogue introduces a great many solutions that raise the bar in terms of performance and miniaturisation in their class. Omron's new G3VM MOSFET series for example brings many of the advantages of mechanical technology in a solid-state devices, allowing design flexibility with either AC or DC load able to be connected in either direction. Our FPC connector range has also been greatly extended, and now includes versions with a 0.3mm pitch.

As a result of Omron's heavy investment in research and development, we will announce innovative new technologies during the life of this catalogue. To keep informed of these developments, check the news area of our website, or ask your regular Omron sales contact.

www.europe.omron.com/ocb

■ Relay Classification

Model	Mounting	Enclosure Ratings	Features
G4W 	Discrete	Unsealed	Designed for manual soldering
G2R 		Flux protection	Design inhibits flux intrusion into the casing fro the terminals during soldering.
G6A 		Fully sealed	Sealed resin casings and covers, limiting damage from corrosive atmospheres.
G6S 	Surface mounting		Surface mounting relays permit automatic reflow soldering.

■ Construction

SEALING

Unsealed Relays

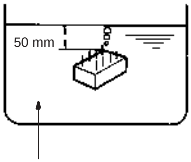
Relays of this type are intended for manual soldering. No measures are taken against penetration of flux and cleaning solvent into the relay. This type of relay cannot be immersion-cleaned.

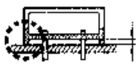
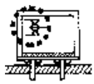
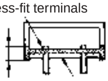
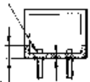
Flux-protection Relays

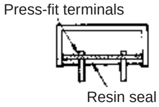
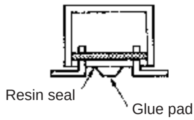
Special design construction prevents flux from penetrating into the relay housing, for example, due to capillary action up the terminals when the relay is soldered onto a PCB. This type of relay also cannot be immersion-cleaned.

Fully Sealed Relays

Fully sealing prevents not only flux, but also cleaning solvent from penetrating into the relay housing. Therefore, this type of relay can be immersion-cleaned. Relays are each tested before being shipped. The relay is immersed in fluorocarbon solution for 1 minute, at a temperature of 70°C +5°C/-0°C, to see if gases escape from the relay. The following figure illustrates the test conditions.



Classification	Unsealed		Flux protection	
Construction				
Features	Terminals are separated from PCB surface when relay is mounted.	Contacts are positioned away from base.	Terminals are pressed into base.	Terminals are inserted into base 0.3 mm min. thick.
Automatic flux application	Poor	Poor	Good	Good
Automatic soldering	Poor	Poor	Good	Good
Automatic cleaning	Poor	Poor	Poor	Poor
Manual soldering	Good	Good	Good	Good
Penetration of dust	Fair		Fair	
Penetration of corrosive gas	Poor		Poor	

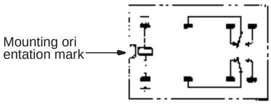
Classification	Fully Sealed	Surface Mounting
Construction		
Features	Terminals are separated from PCB surface when relay is mounted.	Terminal and base, as well as the base and casing, are sealed with adhesive; the L-shaped terminals and adhesive pads allow temporary fixing to the board.
Automatic flux application	Good	Good
Automatic soldering	Good	Good
Automatic cleaning	Good	Good
Manual soldering	Good	Good
Penetration of dust	Good	Good
Penetration of corrosive gas	Good	Good

■ Operation

SINGLE-SIDE STABLE RELAYS (STANDARD)

The contacts of this simple type of relay momentarily turn ON and OFF, depending on the excitement state of the coil.

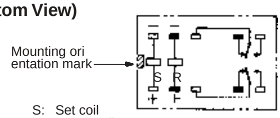
Terminal Arrangement/ Internal Connections (Bottom View)



DOUBLE-WINDING, LATCHING RELAYS

This latching relay has two coils: set and reset. It can retain the ON or OFF states even when a pulsating voltage is supplied, or when the voltage is removed.

Terminal Arrangement/ Internal Connections (Bottom View)

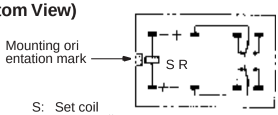


S: Set coil
R: Reset coil

SINGLE-WINDING, LATCHING RELAYS

Unlike the double-winding latching relay, the single-winding latching relay has only one coil. This coil, however, serves as both the set and reset coils, depending on the polarity (direction) of current flow. When current flows through the coil in the forward direction, it functions as a set coil; when current flows through the coil in the reverse direction, it functions as a reset coil.

Terminal Arrangement/ Internal Connections (Bottom View)



S: Set coil
R: Reset coil

BUILT-IN DIODE

A diode is built into some relays, wired in parallel with the coil to absorb the counterelectromotive force (counter emf) generated by the coil.

BUILT-IN OPERATION INDICATOR

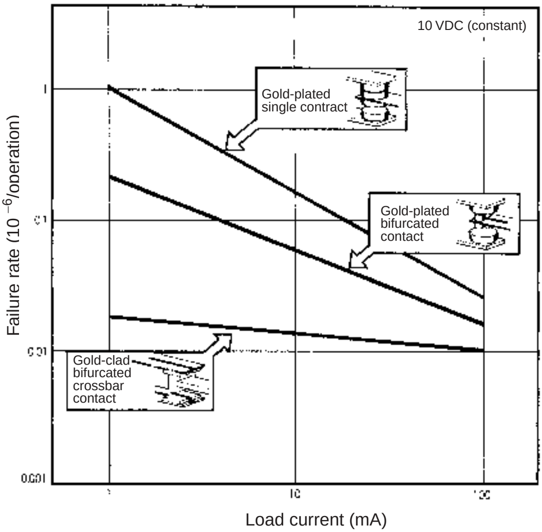
Some relays are provided with a light-emitting diode (LED), wired in parallel with the coil. This permits a fast–check of the relay's operating status.

■ Contacts

Contact ratings are generally indicated according to resistive loads and inductive loads (cosø = 0.4 or L/R = 7 ms). Contact shape and material are also shown to guide the customer in selection of a model suitable for the intended load and required service life.

When used at extremely low loads, the failure rate differs according to the contact material and contact method, as shown in the figure. For example, in comparing a single contact point with a bifurcated contact point, the bifurcated contact model has higher parallel redundancy and will therefore exhibit a lower failure rate.

Failure Rate vs. Load Current



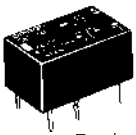
■ Terminals

STRAIGHT PCB TERMINALS

PCB terminals are normally straight.

Self-clinching (S-shaped) PCB Terminals

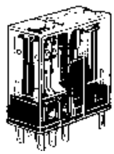
Some relays have terminals that are bent into an “S” shape. This secures the PCB relay to the PCB prior to soldering, helping the terminals stay in their holes and keeping the relay level.



Terminal

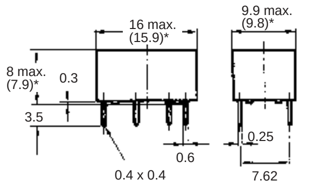
Quick-connect Terminals

Plug-in Terminals



■ Dimensions

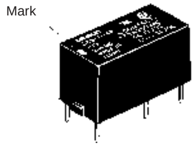
For miniature relays, the maximum dimensions and the average values ( ) marked with an asterisk are provided to aid the customer in designing.



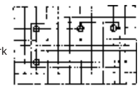
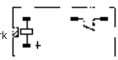
*Average value

MOUNTING ORIENTATION MARK

On the top of all OMRON relays is a mark indicating where the relay coil is located. Knowing the coil location aids in designing PCBs when spacing components. Also, pin orientation is easy to discern when automatic or hand-mounting relays.



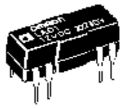
On dimensional drawings in all OMRON literature this mark is left-oriented. Mounting holes, terminal arrangements, and internal connections follow this alignment. The following two symbols are used to represent the orientation mark.

Drawing view	Bottom	Top
Detail	Mounting holes	Terminal arrangement/ internal connections
Symbol		
Example	 (Bottom view)	 (Bottom view)

TERMINAL ARRANGEMENT/INTERNAL CONNECTIONS

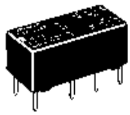
Top View

If the terminal arrangement of a relay can be seen from above the PCB, the top view of the relay is provided in the Dimensions section of the catalog or data sheet.



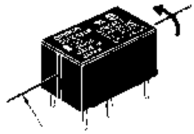
Bottom View

If the relay's terminals cannot be seen from above the PC board, as in this example, a bottom view is shown.



Rotation Direction to Bottom View

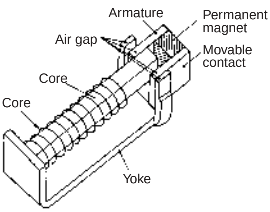
The bottom view shown in the catalog or data sheet is rotated in the direction indicated by the arrow, with the coil always on the left.



■ Moving Loop System

In the U.S.A., the National Association of Relay Manufactures (NARM) in April 1984, awarded OMRON for monumental advances in relay technology, as embodied in the Moving Loop System.

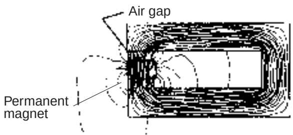
This unique relay construction maximizes electrical and permanent magnet energy. A high-efficiency magnet adds to the magnetic flux of the relay coil, which also allows for tighter packing of relay parts. Relays having such a coil are known as "polarized relays." Details of construction are shown below.



The moving loop design has similarities with polarized relays; however, the following two features make for a large performance distinction.

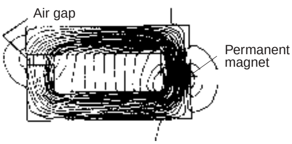
A permanent magnet is placed in the vicinity of the "working gaps." The flux energy of this permanent magnet complements that of the electrical coil. This increased efficiency enables the mechanism holding the contacts closed to ultimately switch larger loads, and at the same time reduces the power consumed by the coil.

The following diagram shows concentric lines of magnetic flux when the permanent magnet is placed near the working gap.



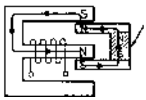
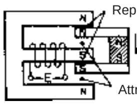
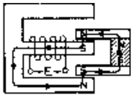
CONVENTIONAL RELAY COIL

The following diagram shows the lines of magnetic flux when the permanent magnet is placed away from the working gap. These lines of flux detract from the total strength of the coil.



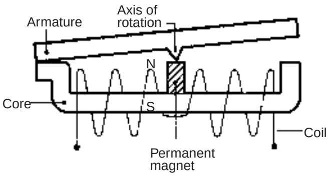
When the switching voltage is removed from the coil, the collapse of the magnetic flux created by the permanent magnet and the electrical coil provides the force to return the relay contacts to the reset position. Note the flux path and magnet polarity in the illustration overleaf.

Operating Principle

Release	
Transition from release to operation (operating voltage supplied)	
Operation	

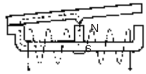
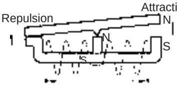
Super Moving Loop System

A very small high-sensitivity magnetic circuit is incorporated to further minimize the conventional moving loop system.



This magnetic circuit has the following features:

1. High-efficiency polarized magnetic circuit utilizes power of both attraction and repulsion.
2. Balanced armature system improves resistance to both vibration and impacts.
3. Ideal mechanism for a low-profile relay.

Release	
Transition from release to operation (operating voltage supplied)	
Operation	

Note: The above applies to a latching relay.

■ Glossary

TERMS RELATED TO CONTACTS

Carry Current

The value of the current which can be continuously applied to the relay contacts without opening or closing them, and which allows the relay to stay within the permissible temperature rise.

Maximum Switching Current

A current which serves as a reference in determining the performance of the relay contacts. This value will never exceed the current flow. When using a relay, do not exceed this value.

Contact Form

OMRON uses the following relay terminology for the various polarity and switch configurations.

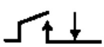
SPST-NO (Single-pole, single-throw, normally open)

SPST-NC (Single-pole, single-throw, normally close)

SPDT (or changeover contact) (single-pole, double-throw)

DPDT (Double-pole, double–throw)

Contact Symbols

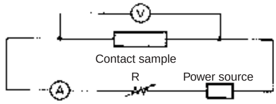
NO	NC	DT (NO/NC)	MBB
			

Make-before-break (MBB) Contact

A contact arrangement in which part of the switching section is shared between both an NO and NC contact. When the relay operates or releases, the contact that closes the circuit operates before the contact that opens the circuit releases. Thus both contacts are closed momentarily at the same time.

Contact Resistance

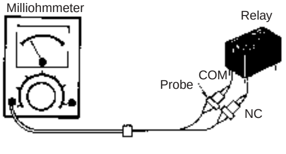
The total resistance of the conductor, as well as specific resistivities such as of the armature and terminal, and the resistance of the contacts. This value is determined by measuring the voltage drop across the contacts by applying test currents as shown in the table below.



Test Current

Rated current or switching current	Test current (mA)
Less than 0.01	1
0.01 or higher but less than 0.1	10
0.1 or higher but less than 1	100
1 or higher	1,000

To measure the contact resistance, a milliohmmeter can also be used, although the accuracy drops slightly.



Maximum Switching Power

The maximum value of the load capacity which can be switched without problem. When using a relay, do not exceed this value.

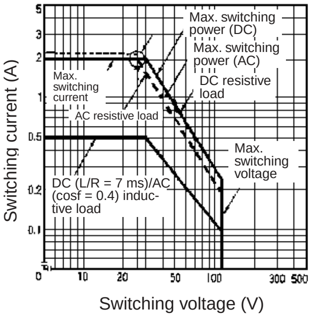
For example, when maximum switching voltage V_1 is known, maximum switching current I_1 can be obtained at the point of intersection on the characteristic curve "Maximum Switching Power" shown below. Conversely, maximum switching voltage V_1 can be obtained if I_1 is known.

$$\text{Maximum switching current } (I_1) = \frac{\text{Max. switching power [W(VA)]}}{\text{Max. switching voltage (V1)}}$$

$$\text{Maximum switching voltage } (V_1) = \frac{\text{Max. switching power [W(VA)]}}{\text{Max. switching current (I1)}}$$

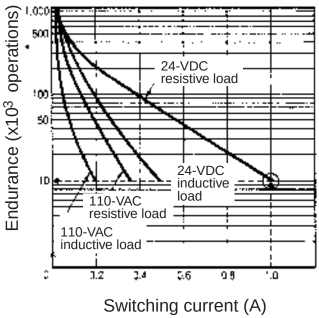
For instance, if the maximum switching voltage = 40 V
Maximum switching current = 2 A (see circled point on graph below.)

Maximum Switching Power



The life expectancy of the relay can be determined from the "Endurance" curve shown below, based on the rated switching current (I_1) obtained above. For instance, the electrical endurance at the obtained maximum switching current of 2 A is slightly over 300,000 operations (see circled point on graph below).

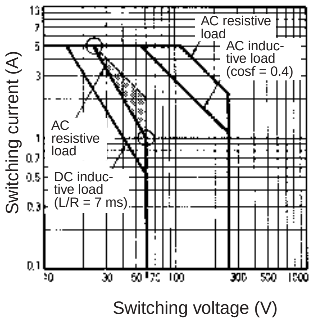
Endurance



However, with a DC load, it may become difficult to break the circuit of 48 V or more due to arcing. Determine the suitability of the relay in actual usage testing.

The correlation between the contact ratings is shown in the following figure:

Maximum Switching Power



Failure Rate

The failure rate indicates the lower limit of switching capability of a relay as the reference value. Such minute load levels are found in microelectronic circuits. This value may vary, depending on operating frequency, operating conditions, expected reliability level of the relay, etc. It is always recommended to double-check relay suitability under actual load conditions.

In this catalog, the failure rate of each relay is indicated as a reference value. It indicates failure level at a reliability level of 60% (λ_{60}).λ_{60}=0.1x 10^{-6}/operation means that one failure is presumed to occur per 10,000,000 (ten million) operations at a reliability level of 60%.

Number of Poles

The number of contact circuits. See Contact Form for reference.

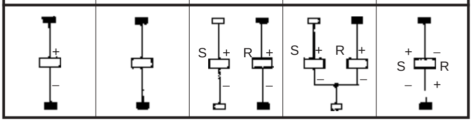
TERMS RELATED TO COILS

Rated Coil Voltage

A reference voltage applied to the coil when the relay is used under normal operating conditions.

Coil Symbols

Single-sided stable		Double-winding Latching		Single-winding latching
Polarised	Non-polarised	w/4 terminals	w/3 terminals	



Coil Resistance (Applicable to DC-switching Relays only)

The resistance of the coil is measured at a temperature of 23°C with a tolerance of ±10% unless otherwise specified. (The coil resistance of an AC-switching type relay may be given for reference when the coil inductance is specified.)

Hot Start

The ratings set forth in the catalog or data sheet are measured at a coil temperature of 23°C.

Maximum Voltage

The maximum value of the pulsating voltage fluctuations in the operating power supply to the relay coil.

Minimum Pulse Width

The minimum value of the pulsating voltage required to set and reset a latching relay at a temperature of 23°C.

Must Operate (Must Set) Voltage

The threshold value of a voltage at which a relay operates when the input voltage applied to the relay coil in the reset state is increased gradually.

Must Release (Must Reset) Voltage

The threshold value of a voltage at which a relay releases when the rated input voltage applied to the relay coil in the operating state is decreased gradually.

Power Consumption

The power (= rated voltage x rated current) consumed by the coil when the rated voltage is applied to it. A frequency of 60 Hz is assumed if the relay is intended for AC operation. The current flows through the coil when the rated voltage is applied to the coil at a temperature of 23°C. The tolerance is $^{+15\%}/_{-20\%}$ unless otherwise specified.

TERMS RELATED TO ELECTRICAL CHARACTERISTICS

Dielectric Strength

The critical value which a dielectric can withstand without rupturing when a high-tension voltage is applied for 1 minute between the following points:

Between coil and contact

Between contacts of different polarity

Between contacts of same polarity

Between set coil and reset coil

Between current-carrying metal parts and ground terminal

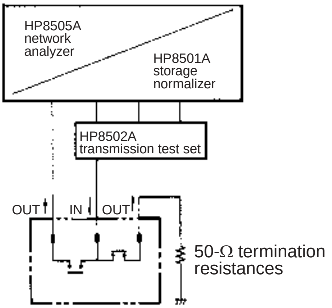
Note that normally a leakage current of 3 mA is detected; however, a leakage current of 1 mA to 10 mA may be detected on occasion.

Electrical Endurance

The life of a relay when it is switched at the rated operating frequency with the rated load applied to its contacts.

High-frequency Isolation (Applicable to High-frequency Relay only)

The degree of isolation of a high-frequency signal, which is equivalent to the insulation resistance of ordinary relays.



G5Y-154P

The following characteristics are measured with contacts unrelated to the measurement terminated at 50Ω, when a signal is applied from input terminal 11 to output terminal 8 or from input terminal 11 to output terminal 14 of the sample.

1. Isolation characteristics
2. Insertion loss characteristics
3. Return loss

The following conversion formula converts from return loss to VSWR.

$$VSWR = \frac{1 + 10^{-\frac{x}{20}}}{1 - 10^{-\frac{x}{20}}}$$

where,
x = return loss

High-frequency Switching Power (Applicable to High-frequency Relays Only)

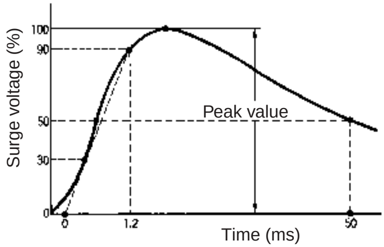
The power of a high-frequency signal that can be switched.

High–frequency Transmitted Power (Applicable to High-frequency Relays Only)

The transmission capacity of a high-frequency signal.

Impulse Withstand Voltage

The critical value which the relay can withstand when the voltage surges momentarily due to lightning, switching an inductive load, etc. The surge waveform which has a pulse width of ±1.2 x 50 μs is shown below:



Insertion Loss (Applicable to High-frequency Relays Only)

The attenuation of a high-frequency signal in a transmission line and is equivalent to the contact resistance of ordinary relays.

Insulation Resistance

The resistance between an electric circuit such as the contacts and coil, and grounded, non-conductive metal parts such as the core, or the resistance between the contacts. The measured values are as follows:

Rated insulation voltage	Measured value
60 V max.	250 V
61 V min.	500 V

Maximum Operating Frequency

The frequency or intervals at which the relay continuously operates and releases, satisfying the rated mechanical and electrical endurance.

Mechanical Endurance

The life of a relay when it is switched at the rated operating frequency without the rated load.

Operate Bounce Time

The bounce time of the normally open (NO) contact of a relay when the rated coil voltage is applied to the relay coil at an ambient temperature of 23°C.

Operate Time

The time that elapses after power is applied to a relay coil until the NO contacts have closed, at an ambient temperature of 23°C. Bounce time is not included. For the relays having an operate time of less than 10 ms, the mean (reference) value of its operate time is specified as follows:

Operate time	5 ms max. (mean value: approx. 2.3 ms)

Release Bounce Time

The bounce time of the normally closed (NC) contact of a relay when the coil is de-energized at an ambient temperature of 23°C.

Release Time

The time that elapses between the moment a relay coil is de-energized until the NC contacts have closed, at an ambient temperature of 23°C. (With a relay having SPST-NO or DPST-NO contacts, this is the time that elapses until the NO contacts have operated under the same condition.) Bounce time is not included. For the relays having an operate time of less than 10 ms, the mean (reference) value of its operate time is specified as follows:

Release time	5 ms max. (mean value: approx. 2.3 ms)

Reset Time (Applicable to Latching Relays Only)

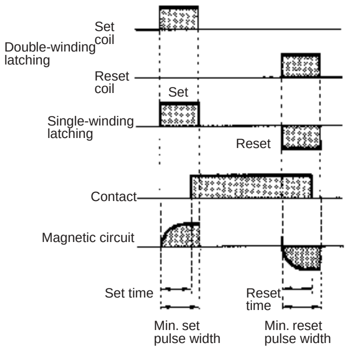
The time that elapses from the moment a relay coil is de-energized until the NC contacts have closed, at an ambient temperature of 23°C. (With a relay having SPST-NO contacts, this is the time that elapses until the NO contacts have operated under the same condition.) Bounce time is not included. For the relays having a reset time of less than 10 ms, the mean (reference) value of its reset time is specified as follows:

Reset time	5 ms max. (mean value: approx. 2.3 ms)

Set Time

The time that elapses after power is applied to a relay coil until the NO contacts have closed, at an ambient temperature of 23°C. Bounce time is not included. For the relays having a set time of less than 10 ms, the mean (reference) value of its set time is specified as follows:

Reset time	5 ms max. (mean value: approx. 2.3 ms)



Shock Resistance

The shock resistance of a relay is divided into two categories: "Destruction" which quantifies the characteristic change of, or damage to, the relay due to considerably large shocks which may develop during the transportation or mounting of the relay, and "Malfunction" which quantifies the malfunction of the relay while it is in operation.

Stray Capacitance

The capacitance measured between terminals at an ambient temperature of 23°C and a frequency of 1 kHz.

VSWR (Applicable to High-frequency Relays Only)

Stands for voltage standing-wave ratio. The degree of reflected wave that is generated in the transmission line.

Vibration Resistance

The vibration resistance of a relay is divided into two categories: "Destruction" which quantifies the characteristic changes of, or damage to, the relay due to considerably large vibrations which may develop during the transportation or mounting of the relay, and "Malfunction" which quantifies the malfunction of the relay due to vibrations while it is in operation.

$a = 0.002f^2A$

where,

a: Acceleration of vibration

f: Frequency

A: Double amplitude

Precautions

■ Basic Information

Before actually committing any component to a mass-production situation, OMRON strongly recommends situational testing, in as close to actual production situations as possible. One reason is to confirm that the product will still perform as expected after surviving the many handling and mounting processes in involved in mass production. Also, even though OMRON relays are individually tested a number of times, and each meets strict requirements, a certain testing tolerance is permissible. When a high-precision product uses many components, each depends upon the rated performance thresholds of the other components. Thus, the overall performance tolerance may accumulate into undesirable levels. To avoid problems, always conduct tests under the actual application conditions.

GENERAL

To maintain the initial characteristics of a relay, exercise care that it is not dropped or mishandled. For the same reason, do not remove the case of the relay; otherwise, the characteristics may degrade. Avoid using the relay in an atmosphere containing sulphuric acid (SO2), hydrogen sulphide (H2S), or other corrosive gases. Do not continuously apply a voltage higher than the rated maximum voltage to the relay. Never try to operate the relay at a voltage and a current other than those rated.

If the relay is intended for DC operation, the coil has polarity. Connect the power source to the coil in the correct direction. Do not use the relay at temperatures higher than that specified in the catalog or data sheet.

The storage for the relay should be in room temperature and humidity.

COIL

1) AC-switching Relays

Generally, the coil temperature of the AC-switching relay rises higher than that of the DC-switching relay. This is because of resistance losses in the shading coil, eddy current losses in the magnetic circuit, and hysteresis losses. Moreover, a phenomenon known as "beat" may take place when the AC-switching relay operates on a voltage lower than that rated. For example, beat may occur if the relay's supply voltage drops. This often happens when a motor (which is to be controlled by the relay) is activated. This results in damage to the relay contacts by burning, contact weld, or disconnection of the self–holding circuit. Therefore, countermeasures must be taken to prevent fluctuation in the supply voltage.

One other point that requires attention is the "inrush current." When the relay operates, and the armature of the relay is released from the magnet, the impedance drops. As a result, a current much higher than that rated flows through the coil. This current is known as the inrush current. (When the armature is attracted to the magnet, however, the impedance rises, decreasing the inrush current to the rated level.) Adequate consideration must be given to the inrush current, along with the power consumption, especially when connecting several relays in parallel.

2) DC-switching Relays

This type of relay is often used as a so-called "marginal" relay that turns ON or OFF when the voltage or current reaches a critical value, as a substitute for a meter. However, if the relay is used in this way, its control output may fail to satisfy the ratings because the current applied to the coil gradually increases or decreases, slowing down the speed at which the contacts move. The coil resistance of the DC-switching relay changes by about 0.4% per degree C change in the ambient temperature. It also changes when the relay generates heat. This means that the must operate and must release voltages may increase as the temperature rises.

Coil switching voltage Source

If the supply voltage fluctuates, the relay will be caused to malfunction regardless of whether the fluctuation lasts for a long time or only for a moment.

For example, assume that a large-capacity solenoid, relay, motor, or heater is connected to the same power source as the relay, or that many relays are used at the same time. If the capacity of the power source is insufficient to operate these devices at the same time, the relay may not operate, because the supply voltage has dropped. Conversely, if a high voltage is applied to the relay (even after taking voltage drop into account), chances are that the full voltage will be applied. As a consequence, the relay's coil will generate heat. Therefore, be sure 1) to use a power source with sufficient capacity and 2) that the supply voltage to the relay is within the rated must operate voltage range of the relay.

Minimum Must Operate Voltage

When the relay is used at a high temperature, or when the relay coil is continuously energized, the coil temperature rises and coil resistance increases. Consequently, the must operate voltage increases. This increase in the must operate voltage requires attention when determining the minimum must operate voltage are given below for reference when designing a power source appropriate for the relay.

Assuming a coil temperature rise of 10˚C, the coil resistance will increase about 4%. The must operate voltage increases as follows:

Rated values of Model LZN2 taken from catalog or data sheet

Rated voltage: 12 VDC

Coil resistance: 500Ω

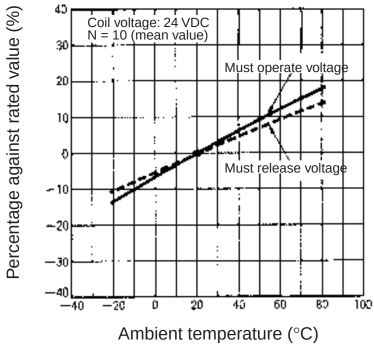
Must operate voltage: 80% max. of rated voltage at 23˚C coil temperature

The rated current that flows through this relay can be obtained by dividing the rated voltage by the coil resistance. Hence,

12 VDC ÷ 500Ω = 24 mA

However, the relay operates at 80% maximum of this rated current, i.e., 19.2 mA (= 24 mA x 0.8). Assuming that the coil temperature rises by 10˚C, the coil resistance increases 4% to 520Ω (= 500Ω x 1.04). The voltage that must be applied to the relay to flow a switching current of 19.2 mA x 520Ω = 9.98 V. This voltage, which is at a coil temperature of 33˚C (= 23˚C + 10˚C), is 83.2% of the rated voltage (= 9.98 V ÷ 12 V). As is evident from this, the must operate voltage increases when the coil temperature rises, in this example, 10˚C from 23˚C.

Coil Temperature vs.
Must Operate/release Voltage (LZN)



The minimum must operate voltage can be determined by this expression.

$$E_T > E \times \frac{Epv + 5}{100} \times \left(\frac{T - Ta}{234.5 + Ta} + 1\right) [V]$$

where,

E (V): Rated coil voltage

Epv (%): Must operate voltage

Ta: Coil temperature for determining Epv (20˚C, unless otherwise specified)

T (˚C): Ambient operating temperature

E_T (V): Minimum must operate voltage

Note: In the above expression, T is taken to be the result of energization of the coil, when the coil temperature is the same as the ambient temperature.

■ Coil Input

To guarantee accurate and stable relay operation, the first and foremost condition to be satisfied is the application of the rated voltage to the relay. Additionally, the rated voltage in light of the type of the power source, voltage fluctuation, and changes in coil resistance due to temperature rise. If a voltage higher than the rated maximum voltage is applied to the coil for a long time, layer short-circuiting and damage to the coil by burning may take place.

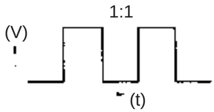
Coil Temperature Rise

When a current flows through the coil, the coil's temperature rises to a measurable level, because of copper loss. If an alternating current flows, the temperature rises even more, due not only to the copper loss, but additionally to the iron loss of the magnetic materials, such as the core. Moreover, when a current is applied to the contact, heat is generated on the contacts, raising the coil temperature even higher (however, with relays whose switching current is rated at 2 A or lower, this rise is insignificant).

Temperature Rise by Pulsating Voltage

When a pulsating voltage having an ON time of less than 2 minutes is applied to the relay, the coil temperature rise varies, and is independent of the duration of the ON time, depending only on the ratio of the ON time to the OFF time. The coil temperature in this case does not rise as high as when a voltage is continuously applied to the relay.

Energization time	Release temperature rise
Continuous energization	100%
ON:OFF = 3:1 approx.	80%
ON:OFF = 1:1 approx.	50%
ON:OFF = 1:3 approx.	35%



Changes in Must Operate Voltage by Coil Temperature Rise

The coil resistance of a DC-switching relay increases (as the coil temperature rises) when the coil has been continuously energized, de-energized once, and then immediately energized again. This increase in the coil resistance raises the voltage value at which the relay operates. Additionally, the coil resistance rises when the relay is used at a high ambient temperature.

Maximum Must Operate Voltage

The maximum voltage applicable to a relay is determined in accordance with the coil temperature rise and the coil insulation materials' heat resistivity, electrical as well as mechanical life, general characteristics, and other factors.

If a voltage exceeding the maximum voltage is applied to the relay, it may cause the insulation materials to degrade, the coil to be burnt, and the relay to not operate at normal levels. Actually, however, there are occasions when the maximum voltage is exceeded to compensate for fluctuation in the supply voltage. In this event, pay attention to the following points.

The coil temperature must not exceed the temperature that the spool and wound wire constituting the coil can withstand. The following table shows the wires often used for a coil. In this table, the coil temperature is measured through calculation of the coil resistance.

Wire material	Maximum coil temperature
Polyurethane (UEW)	120˚C
Polyester (PEW)	130˚C

How to Calculate Coil Temperature

$$t = \frac{R2 - R1}{R1}\,(234.5 + T1) + T1\ [C°]$$

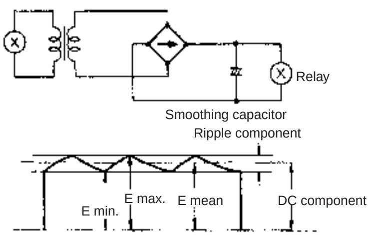
where,

R1 (Ω): coil resistance before energization
R2 (Ω): coil resistance after energization
T1 (˚C): coil temperature (ambient) before energization
t (˚C): coil temperature after energization

Before using the relay confirm that there are no problems.

DC Input Power Source

Pay attention to the coil polarity of the DC-switching relay. Power sources for DC-operated relays are usually a battery or a DC power supply, either with a maximum ripple of 5%. If power is supplied to the relay via a rectifier, the must operate and must release voltages vary with the ripple percentage. Therefore, check the voltages before actually using the relay. If the ripple component is extremely large, beat may occur. If this happens, it is recommended that a smoothing capacitor be inserted as shown in the following diagram.



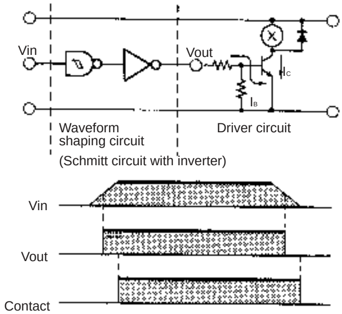
$$\text{Ripple percentage} = \frac{\text{Emax.} - \text{Emin.}}{\text{Emean}}\ 100$$

where,
E max.: maximum value of ripple component
E min.: minimum value of ripple component
E mean: mean value of DC component

If the voltage applied to the DC-operated coil increases or decreases slowly, each contact of a multi-pole contact relay may not operate at the same time. It is also possible for this situation to result in the must operate voltage varying each time the relay operates. Either way, circuit sequencing will not be correct. In critical applications, the use of a Schmitt circuit is recommended to reshape the DC waveform to trigger all contacts of the relay at the same time.

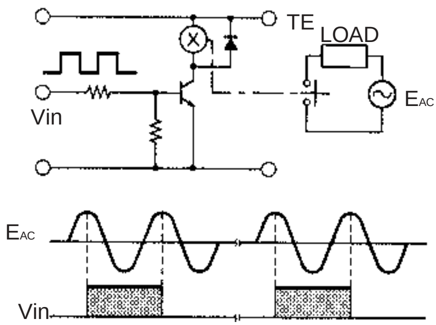
Relay Driving Signal Waveform

A long rise time and/or fall time of the signal driving the relay may prolong the operate time and/or release time of the relay. This situation may shorten the life of the contacts. If this situation cannot be avoided, providing a Schmitt trigger circuit at the circuit stage preceding the relay circuit will shape a waveform with sharp transitions, as shown in the following diagram:



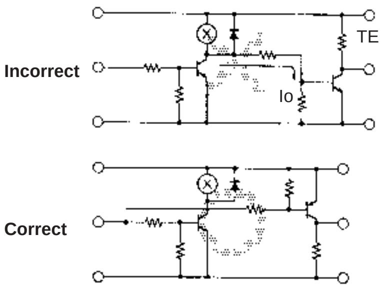
If the Schmitt trigger circuit is configured of transistors, a residual voltage may exist in the output of the circuit. Therefore, confirm that the rated voltage is present across the relay coil, or that the residual voltage drops to zero when the relay releases. When an IC (e.g., TC74HC132P) is used, this value is close to zero.

Cyclic Switching of AC Load



If the relay operates in synchronization with the supply voltage, the life of the relay may be shortened. When designing the control system in which the relay is used, estimate the life of the relay and thus the reliability of the overall system under actual operating conditions. Moreover, construct the circuit so that the relay operates in a random phase or in the vicinity of the zero point.

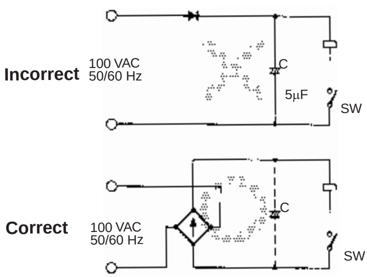
Dark Current in OFF Time



A circuit that produces a control output as soon as the relay operates must be carefully designed. In the example on the left, electrode dark current flows as shown when the relay operates. When dark current flows into the relay coil, the relay's resistivity to shock and vibration may degrade.

Overcoming Beat in DC Relays

When using AC power to generate power for operating a DC relay, the use of half-wave rectification causes the formation of a pulsating current. Therefore, when the capacitance of the smoothing capacitor C is low, the relay generates a beat. However, when a bridge rectification circuit is used, the frequency of the pulsating current doubles, generating no beat even when a smoothing capacitor C is not provided. The bridge rectification circuit can provide a higher rectification efficiency to increase the contact attraction, which is desirable in terms of prolonging the service life of the contact.

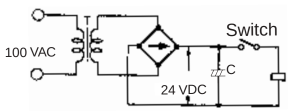


Voltage Considerations for AC Relays

For stable relay operation, a voltage +10% to -20% of the rated voltage should be applied to the relay. The voltage applied to the relay must be a sine wave. When a commercial power source is used, there should be no problem. However, if an AC stabilized power source is used, either beat or abnormal heating may occur, depending on the wave distortion of the power source. A shading coil is used to suppress beat in an AC current coil, but wave distortion defeats this function.

When a motor, solenoid, transformer, or other device is connected to the same power line source as the relay controller, and any of these devices causes a drop in the line voltage, the relay may vibrate, damaging the contact. This commonly occurs when a small transformer is added to the line, when the transformer is too small, when long wiring is used, or when thin wiring is used in the customer's premises. Be aware of this phenomenon, as well as normal voltage fluctuations. Should this problem occur, check the change in voltage with a synchroscope or the like, and take appropriate countermeasures. Effective countermeasures include replacing the relay with a special relay suited to the circumstances, or use of a DC circuit and inclusion of a capacitor to compensate for the voltage change, as shown in the following circuit diagram.

Voltage change compensation circuit incorporating a capacitor



■ Contacts

The contacts are the most important constituent of a relay. Their characteristics are significantly affected by factors such as the material of the contacts, voltage and current values applied to them (especially, the voltage and current waveforms when energizing and de-energizing the contacts), the type of load, operating frequency, atmosphere, contact arrangement, and bounce. If any of these factors fail to satisfy predetermined values, problems such as metal deposition between contacts, contact welding, wear, or rapid increase in the contact resistance may occur.

Switching voltage (AC, DC)

When a relay breaks an inductive load, a fairly high counterelectromotive force (counter emf) is generated in the relay's contact circuit. The higher the counter emf, the greater the damage to the contacts. This may result in a significant decrease in the switching power of DC-switching relays. This is because, unlike the AC-switching relay, the DC-switching relay does not have a zero-cross point. Once arc has been generated, it does not easily diminish, prolonging the arc time. Moreover, the unidirectional flow of the current in a DC circuit may cause metal deposition to occur between contacts and the contacts to wear rapidly (this is discussed later).

Despite the information a catalog or data sheet sets forth as the approximate switching power of the relay, always confirm the actual switching power by performing a test with the actual load.

Switching Current

The quantity of electrical current which flows through the contact directly influences the contact' characteristics. For example, when the relay is used to control an inductive load such as a motor or a lamp, the contacts will wear more quickly, and metal deposition between the mating contacts will occur more often as the inrush current to the contacts increases. Consequently, at some point the contacts may not be able to open.

Contact Materials

Selection of an appropriate contact material according to the load to be opened or closed is important. Several contact materials and their properties are listed below.

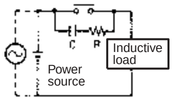
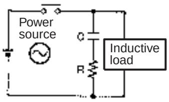
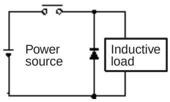
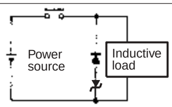
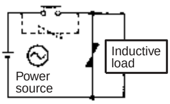
Contact Materials and Feature

P. G. S. Alloy	This material has excellent corrosion resistance and is suitable for very small current circuits. (Au : Ag : Pt = 69 : 25 : 6)
AgPd	This material exhibits good corrosion and sulphur resistance. In a dry circuit, it attracts organic gas to generate a polymer, therefore it is usually plated with gold or other material.
Ag	This material has the highest electric and heat conductivities among all metals. It exhibits low contact resistance, but easily forms sulphide film in a sulphide gas environment. This may result in defective contact performance at a low-voltage small-current operation.
AgCdO	This material exhibits the same high electric conductivity as silver, low contact resistance, and excellent deposition resistance. It easily forms sulphide film in a sulphide gas environment.
AgNi	This material exhibits the same high electric conductivity as silver and excellent arc resistance.
AgSnIn	This material exhibits excellent deposition resistance and exhaustion resistance.
AgW	This material exhibits a high hardness and melting point. It also exhibits excellent arc resistance and superior resistance to deposition and transfer. However, it shows high contact resistance and inferior environmental resistance.

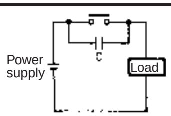
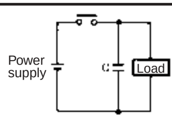
Contact Protection Circuit

A contact protection circuit, designed to prolong the life of the relay, is recommended. This protection will have the additional advantages of suppressing noise, as well as preventing the generation of carbide and nitric acid, which otherwise would be generated at the contact surface when the relay contact is opened. However, unless designed correctly, the protection circuit may produce adverse effects, such as prolonging the release time of the relay.

The following table lists examples of contact protection circuits.

Circuit example		Applicability AC	Applicability DC	Features and remarks	Element selection
CR		Fair	Good	Load impedance must be much smaller than the RC circuit when the relay operates on an AC voltage.	Optimum C and R values are: C: 1 to 0.5 μF for 1–A switching current R: 0.5 to 1Ω for 1–V switching voltage
		Good	Good	The release time of the contacts will be delayed when a relay solenoid is used as a load. This circuit is effective if connected across the load when the supply voltage is 24 to 48 V. When the supply voltage is 100 to 240 V, connect the circuit across the contacts.	These values do not always agree with the optimum values due to the nature of the load and the dispersion in the relay characteristics. Confirm optimum values experimentally. Capacitor C suppresses discharge when the contacts are opened, while resistor R limits the current applied when the contacts are closed the next time. Generally, employ a capacitor C whose dielectric strength is 200 to 300 V. If the circuit is powered by an AC power source, employ an AC capacitor (non–polarized).
Diode		Poor	Good	The energy stored in a coil (inductive load) reaches the coil as current via the diode connected in parallel with the coil, and is dissipated as Joule (measurable) heat by the resistance of the inductive load. This type of circuit delays the release time more than the RC type.	Employ a diode having a reverse breakdown voltage of more than 10 times the circuit voltage and a forward current rating greater than the load current. A diode having a reverse breakdown voltage two to three times that of the supply voltage can be used in an electronic circuit where the circuit voltage is not particularly high.
Diode + Zener Diode		Poor	Good	This circuit effectively shortens release time in applications where the release time of a diode protection circuit proves to be too slow.	The zener diode breakdown voltage should be about the same as the supply voltage.
Varistor		Good	Good	By utilizing the constant-voltage characteristic of a varistor, this circuit prevents high voltages from being applied across the contacts. This circuit also somewhat delays the release time. This circuit, if connected across the load, is effective when the supply voltage is 24 to 48 V. If the supply voltage is 100 to 240 V, connect the circuit across the contacts.	–

Avoid use of a surge suppressor in the manner shown below.

	
This circuit arrangement is very effective for diminishing sparking (arcing) at the contacts, when breaking the circuit. However, since electrical energy is stored in C (capacitor) when the contacts are open, the current from C flows into the contacts when they close. Therefore, metal deposition is likely to occur between mating contacts.	This circuit arrangement is very useful for diminishing sparking (arcing) at the contacts when breaking the circuit. However, since the charging current to C flows into the contacts when they are closed, metal deposition is likely to occur between the mating contacts.

Although it is considered that switching a DC inductive load is more difficult than a resistive load, an appropriate contact protection circuit can achieve almost the same characteristics.

■ Latching Relays

Avoid use in locations subject to excessive magnetic particles or dust.

Avoid use in magnetic fields (over 8,000 A.m).

Take measures to preventing problems caused by vibration or shock. Problems may originate from other relay(s) operating or releasing on the same panel.

Avoid simultaneous energization of the set and reset coils, even though both coils can be continuously energized.

Avoid use under conditions where excessive surge-generating sources exist in the coil power source.

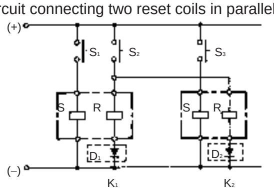
When planning to mount multiple relays together, observe the minimum mounting interval of each type of relay.

Drive Circuit (Double-winding Relays G5AK, G6AK, G6BK, etc.)

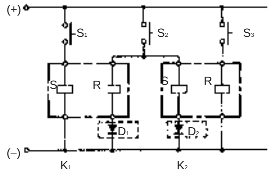
When a DC-switching latching relay is used in one of the circuits shown in the following diagram, the relay contacts may be released from the locked state unless a diode (enclosed in the dotted box in the circuit diagram) is connected to the circuit.

Circuits

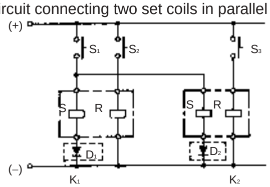
Circuit connecting two reset coils in parallel.



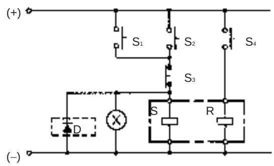
Circuit connecting set coil to reset coil.



Circuit connecting two set coils in parallel



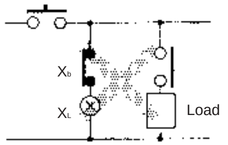
Circuit connecting set coil of latching relay in parallel with another relay coil.



When connecting a diode to the relay circuit, be sure to use a diode with a repetitive peak–inverse voltage, and a DC reverse voltage sufficient to withstand external noise or surge. Also be sure that the diode has an average rectified current greater than the coil current.

If the contact of the relay is used to de-energize the relay, the relay may not operate normally. Avoid using the relay in a circuit like the one shown below:

Incorrect Use:



X_L: Latching relay
X_b: NC contact of relay

■ PCB Design

Soldering

As demands for more compact electronic devices have grown, so have demands declined for the plug-in relays that requires a bulky socket for connection. This trend has lead to the development of relays that can be soldered directly onto the PCB. Smaller relays have made possible great density increases on the PCB, which in turn reduces the size of the product or device. However, unless the relay is fully sealed, when soldered onto a PCB, flux may penetrate into the housing, adversely affecting the internal circuitry.

The following points will help when designing a product which uses relays. This section points out details to be noted when soldering a relay to a PCB.

PCB Selection

In general, relays are directly mounted and soldered onto a PCB. Although seemingly an uninvolved process, soldering and its related processes of flux application, relay mounting, heat application, and washing can be detrimental to a relay's performance. For example, if the PCB were to warp, the internal mechanism of the relay could become distorted, degrading the performance characteristics. Thus it could be said that the relay's characteristics are also affected by the size, thickness, and material of the PCB. Therefore, carefully select a PCB that will not jeopardise the performance of the relay.

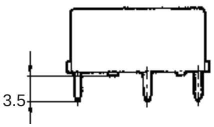
PCB MATERIALS

Generally, the substrate of a PCB is made of glass epoxy (GE), paper epoxy (PE), or paper phenol (PP). Of these, the glass-epoxy or paper-epoxy PCB is recommended for mounting relays. See the following table

Item	Epoxy Based		Phenol-based
	Glass Epoxy (GE)	Paper Epoxy (PE)	Paper Phenol (PP)
Electrical characteristics	High insulation resistance. Insulation resistance hardly affected by humidity.	Fair	Insulation resistance degraded by humidity.
Mechanical characteristics	Little expansions/shrinkage caused by change in temperature or humidity. Suitable for through-hole PCBs and multi-layered PCBs.	Fair	Much expansion/shrinkage caused by changes in temperature or humidity. Not suitable for through-hole PCB.
Cost Effectiveness	Expensive	Fair	Fair

PCB Thickness

PCBs having a thickness of 0.8, 1.2, 1.6, or 2.0 mm are generally used. A PCB that is 1.6 mm thick is best for mounting a PCB relay, considering the weight of the relay and the length of the terminals. (The terminal length of OMRON relays is 3, 3.5, or 4.0 to 5.0 mm.)



Terminal Hole Diameter and Land Diameter

Select the appropriate terminal hole and land diameters from the following table, based on the PCB mounting hole drawing. Land diameters may be reduced to less than those listed below if the through-hole connection process is to be employed.

Terminal Hole and Land Diameters

Terminal Hole Diameter		Minimum Land Diameter
Normal	Tolerance	
0.6 mm	±0.1 mm	1.5 mm
0.8 mm		1.8mm
1.0 mm		2.0mm
1.2 mm		2.5mm
1.3 mm		2.5mm
1.5 mm		3.0mm
1.6 mm		3.0mm
2.0 mm		3.0mm

Shape of Lands

The land section should be on the center line of the copper-foil pattern, so that the soldered fillets become uniform.

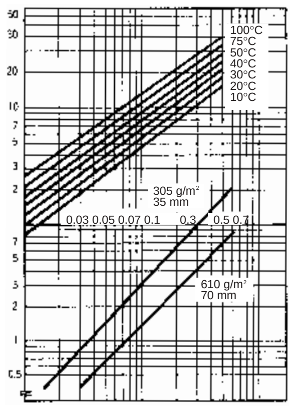
Correct	
Incorrect	

A break in the circular land area will prevent molten solder from filling holes reserved for components which must be soldered manually after the automatic soldering of the PCB is complete.

Conductor Width and Thickness

The following thickness of copper foil are standard: 35 µm and 70 µm. The conductor width is determined by the current flow and allowable temperature rise. Refer to the chart below.

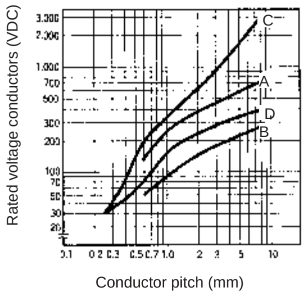
Conductor Width and Carry Current
(according to IEC Pub326-3)



Conductor Pitch

The conductor pitch on a PCB is determined according to the insulation resistance between conductors and the environmental conditions under which the PCB is to be placed. The following graph shows the general relationship between the voltage between conductors and the conductor pitch on a PCB. However, if the PCB must conform to safety organization standards (such as UL, CSA, VDE, etc.), priority must be given to fulfilling their requirements.

Voltage between Conductors vs. Conductor Pitch



A = w/o coating at altitude of 3,000 m max.
B = w/o coating at altitude of 3,000 m or higher but lower than 15,000 m
C = w/coating at altitude of 3,000 m max.
D = w/coating at altitude of 3,000 m or higher

Temperature and Humidity

PCBs expand or contract with changes in temperature. Should expansion occur with a relay mounted on the PCB, the internal components of the relay may be shifted out of operational tolerance. As a result, the relay may not be able to operate with its normal characteristics.

PCB materials have "directionality," which means that a PCB generally has expansion and contraction coefficients 1/10 to 1/2 higher in the vertical direction than in the horizontal direction. Conversely, its warp in the vertical direction is 1/10 to 1/2 less than in the horizontal direction. Therefore, take adequate counter-measures against humidity by coating the PCB. Should heat or humidity be entirely too high, the relay's physical characteristics will likewise be affected. For example, as the heat rises the PCB's insulation resistance degrades. Mechanically, PCB parts will continue to expand as heat is applied, eventually passing the elastic limit, which will permanently warp components.

Moreover, if the relay is used in an extremely humid environment, silver migration may take place.

Gas

Exposure to gases containing substances such as sulphuric acid, nitric acid, or ammonia can cause malfunctions such as faulty contacting in relays. They can also cause the copper film of a PCB to corrode, or prevent positive contacts between the PCB's connectors. Of the gases mentioned, nitric acid is particularly damaging as it tends to accelerate the silver migration. As a counter-measure against gas exposure damage, the following processes on the relay and PCB have proved useful.

Item	Process
Outer Casing, housing	Sealed construction by using packing, etc
Relay	Use of simplified hermetically sealed type relay, DIP relay, reed relay
PCB, Copper Firm	Coating
Connector	Gold-plating, rhodium-plating process

Vibration and Shock

Although the PCB itself is not usually a source of vibration or shock, it may simplify or prolong the vibration by resonate with external vibrations or shocks. Securely fix the PCB, paying attention to the following points.

Mounting Method	Process
Rack Mounting	No gap between rack's guide & PCB
Screw Mounting	Securely tighten screw. Place heavy components such as relays on part of PCB near where screws are to be used. Attach rubber washers to screws when mounting components that are affected by shock (such as audio devices.)

Mounting Position

Depending on where the relay is mounted, the function of the relay (and the performance of the circuit which includes the relay) may be adversely affected.

The relay may malfunction if it is mounted near a transformer or other device that generates a large magnetic field, or much heat. Provide an adequate distance between the relay and such devices.

Also, keep the relay away from semiconductor devices, if they are to be mounted on the same PCB.

Correct

Incorrect

Mounting Direction

To allow a relay to operate to its full capability, adequate consideration must be given to the mounting direction of the relay. Relay characteristics that are considerably influenced by mounting direction are shock resistance, life, and contact reliability.

Shock Resistance

Ideally, the relay must be mounted so that any shock or vibration is applied to the relay at right angles to the operating direction of the armature of the relay. Especially when a relay's coil is not energized, the shock resistance and noise immunity are significantly affected by the mounting direction of the relay.

Life

When switching a heavy load that generates arc (generally, having a greater impedance than that of the relay coil), substances spattered from the contact may accumulate in the vicinity, resulting in degradation of the insulation resistance of the circuit. Mounting the relay in the correct direction is also important in preventing this kind of degradation of the insulation resistance.

Contact Reliability

Switching both a heavy and a minute load with a single relay contact is not recommended. The reason for this is that the substances scattered from the contact when the heavy load is switched degrade the contact when switching the minute load. For example, when using a multi-pole contact relay, avoid the mounting direction or terminal connections in which the minute load switching contact is located below the heavy load switching contact.

Mounting Interval

When mounting multiple relays side by side on a PCB, pay attention to the following points:

When many relays are mounted together, they may generate an abnormally high heat due to the thermal interference between the relays. Therefore, provide an adequate distance between the relays to dissipate the heat. When using a relay, be sure to check the minimum mounting interval.

Also, if multiple PCBs with relays are mounted to a rack, the temperature may rise. In this case, preventive measures must be taken so that the ambient temperature falls within the rated value.

PATTERN LAYOUT

Countermeasures Against Noise

The relay can be a noise source when viewed from a semiconductor circuit. This must be taken into consideration when designing the layout positioning of the relay and other semiconductor components on the PCB.

Keep the relay away from semiconductor components as far away as possible.

Locate the surge suppressor for the relay coil as close to the relay as possible.

Do not route wiring for signals such as audio signals that are likely to be affected by noise below the relay.

Design the shortest possible pattern.

One method for separating the power source and relay from other electronic components is to use shielded patterns.

Coating

As is also the case in humid environments, coating the PCB is recommended to prevent the insulation of its pattern form being degraded by gases containing harmful substances. When coating the PCB, however, care must be exercised not to allow the coating agent to penetrate into the relays mounted on the PCB; otherwise, faulty contact of the relay may occur due to sticking or coating. Moreover, some coating agents may degrade or adversely affect the relay. Select the coating agent carefully.

Type of Coating

Item	Applicability to PCB with relays mounted	Feature
Epoxy	Good	Good insulation. Performing this coating is a little difficult, but has no effect on relay contact.
Urethane	Good	Good insulation and easy to coat. Be careful not to allow the coating on the relay itself, as thinner-based solvents are often used with this coating.
Silicon	Good	Good insulation and easy to coat. However, silicon gas may cause faulty contact of relay.

■ Automatic Mounting of Relay on PCB

THOUGH-HOLE MOUNTING

The following tables list the processes required for mounting a relay onto a PCB and the points to be noted in each process.

Process 1: Placement

Do not bend any terminal of the relay to use it as a self–clinching relay or the relay may malfunction.

It is recommended to use magazine-packaged self–clinching relays for placement onto the PCB.

Possibility of Automatic Placement

Construction	Unsealed	Flux protection	Fully sealed
Magazine-packaged relay **Self-clinching relays**	NO	YES	YES

Process 2: Flux Application

To apply flux to a flux protection or fully sealed relay, a sponge soaked with flux can be used. Place the relay in the holes drilled in the PCB and press the PCB (with the relay still mounted) firmly against the sponge. The flux will be pushed up the relay's contact legs, and through the PCB holes. This method must never be applied with an unsealed relay because the flux will penetrate into the relay.

The flux used with the sponge must be a non-corrosive resin-type flux.

For the flux solvent, use an alcohol–based solvent, which tends to be less chemically reactive.

Apply the flux sparingly and evenly to prevent penetration into the relay. When dipping the relay terminals into liquid flux, be sure to adjust the flux level, so that the upper surface of the PCB is not flooded with flux.

Possibility of Dipping Method

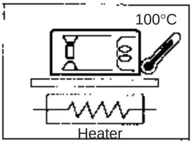
Unsealed	Flux protection	Fully sealed
NO	YES	NO

Process 3: Transportation

When the PCB is transported, the relay mounted on the PCB may be lifted from the board surface due to vibration. This can be prevented if the relay mounted on the PCB has self-clinching terminals.

Process 4: Preheating

Preheat the PCB at a temperature of 100°C maximum within a period of approximately one minute for smooth soldering. The characteristics of the relay may change if it is heated at a high temperature for a long time.



Possibility of Preheating

Unsealed	Flux protection	Fully sealed
NO	YES	NO

Process 5: Soldering

Flow soldering is recommended to assure a uniform solder joint.

- Solder: JIS Z3282, H60, or H63*
- Solder temperature and soldering time: 250°C, 5 s max.
- Adjust the level of the molten solder so that the PCB is not flooded with solder.

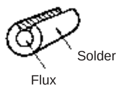
Possibility of Automatic Soldering

Unsealed	Flux protection	Fully sealed
NO	YES	YES

Manual Soldering

Complete the soldering operation quickly. Use the correct wattage of soldering iron. Do not overheat while smoothing the applied solder with the tip of the iron.

- Solder: JIS Z3282, H60, or H63 (containing resin-type flux)
- Soldering iron: rated at 30 to 60 W
- Tip temperature: 280°C to 300°C
- Soldering time: 3 s max.
- The following table contains recommended solders:



Type	Sparkle solder
Applicable solder diameter	0.8 to 1.6 mm
Sn	58.8%
Flux content	1.67%
Impurities	JIS Z3282 Class A
Spread rate	90%
Storage	3 months max.

Possibility of Manual Soldering

Unsealed	Flux protection	Fully sealed
YES	YES	YES

The solder in the illustration shown above is provided with a cut section to prevent the flux from splattering.

Process 6: Cooling

Upon completion of automatic soldering, use a fan or other device to forcibly cool the PCB. This helps prevent the relay and other components from deteriorating from the residual heat of soldering.

Fully sealed relays are washable. Do not, however, put fully sealed relays in a cold cleaning solvent immediately after soldering or the seals may be damaged.

Flux protection	Fully sealed
Necessary	Necessary

Process 7: Cleaning

Avoid cleaning the soldered terminals whenever possible. When a resin-type flux is used, no cleaning is necessary. If cleaning cannot be avoided, exercise care in selecting an appropriate cleaning solvent.

Clensing Method

Unsealed	Flux protection	Fully sealed
Boiling cleaning and immersion cleaning are not possible. Clean only the back of the PCB with a brush.		Boiling cleaning and immersion cleaning are possible. Ultrasonic cleaning will have an adverse effect on the performance of relays not specifically manufactured for ultrasonic cleaning. When cleaning the G2R or any other relay, the ambient temperature must be within the permissible ambient operating temperature range of the relay.

List of Cleaning Solvents

Solvent		Fully Seated
Chlorine-based	Perochlene Chlorosolder Trichloroethylene	Yes
Water-based	Indusco Holys	Yes
Alcohol-based	IPA Ethanol	Yes
Others	Thinner Gasoline	No
Cleaning method		Automatic cleaning Ultrasonic cleaning (see note 4)

Note: 1. Consult your OMRON representative before using any other cleaning solvent. Do not use Freon-TMC-based, thinner-based, or gasoline-based cleaning solvents.

2. Worldwide efforts are being made at discontinuing the use of CFC-113-based (fluorochlorocarbon-based) and trichloroethylene-based cleaning solvents. The user is requested to refrain from using these cleaning solvents

3. It may be difficult to clean the space between the relay and PCB using hydrogen-based or alcohol-based cleaning solvent. It is recommended the stand-off-type be used G6A-□-ST when using hydrogen-based or alcohol-based cleaning solvents.

4. Ultrasonic cleaning may have an adverse effect on the performance of relays not specifically manufactured for ultrasonic cleaning. Please refer to the model number to determine if your relay is intended to be cleaned ultrasonically.

Process 8: Coating

Do not apply a coating agent to any flux-resistant relay or relay with a case because the coating agent will penetrate into the relay and the contacts may be damaged.

Some coating agents may damage the case of the relay. Be sure to use a proper coating agent.

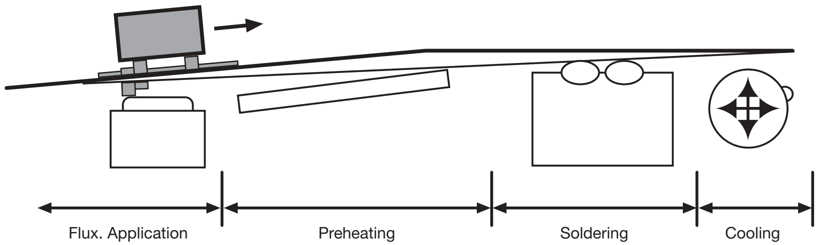
Do not fix the position of relay with resin or the characteristics of the relay will change.

Resin	Fully Sealed
Epoxy	YES
Urethane	YES
Silicone	NO
Fluorine	YES

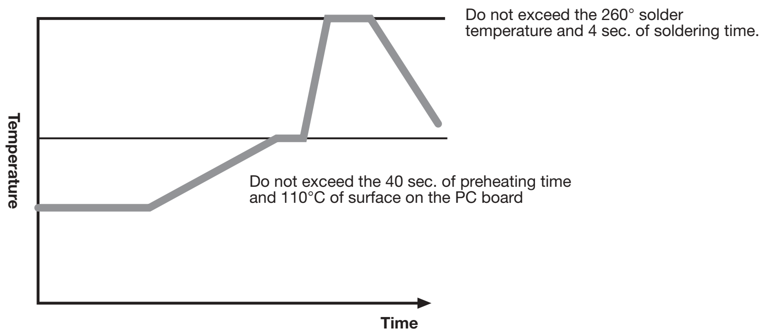
Soldering Profile

PCB RELAY THT TYPE – PROFILE OF SOLDER TEMPERATURE FOR LEAD FREE

Process flow chart



Solder Profile



Soldering Heat Resistance – PCB (THT)

Item	Present (SnPB)	Lead Free Type
Preheating temperature	100°C	110°C
Preheating time	60 sec. max.	40 sec.
Solder temperature	Approx. 250°C	260°C
Soldering time	5 sec. max.	4 sec. max.

We recommend to confirm under the actual soldering condition at the customer before use.

SURFACE MOUNTING

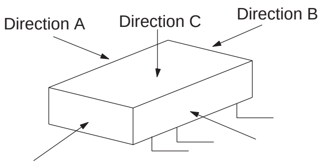
The following tables list the processes required for mounting a relay onto a PCB and the points to be noted in each process.

Process 1: Cream Solder Printing

Do not use a cream solder that contains a flux with a large amount of chlorine or the terminals of the relay may be corroded.

Process 2: Relay Mounting

The holding force of the relay holder must be the same as or more than the minimum holding force value required by the relay.



Direction	G6H	G6S
A	200 g max.	200 g max.
B	500 g max.	500 g max.
C	200 g max.	200 g max.

Process 3: Transportation

The relay may be dismounted by vibration during transportation. To prevent this, it is recommended an adhesive agent be applied to the relay's gluing part (protruding part) to tack the relay.

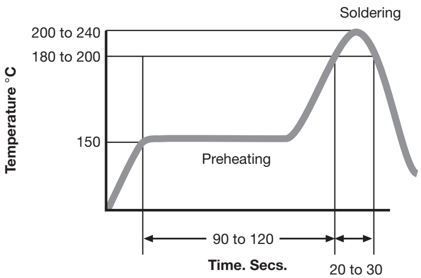
Adhesive Agent Application Methods

Dispenser Method	Screen-printing Method
NO	YES

SIGNAL RELAY SMD TYPE

Mounting temperature for Lead solder mounting

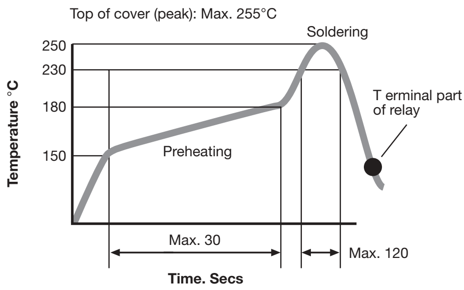
IRS recommended soldering temperature



Temperatures indicate the surface temperatures of the PCB

Mounting temperature for Lead-Free solder mounting

IRS recommended soldering temperature



Temperatures indicate the terminal part of the relay

Cleaning

Boiling cleaning and immersion cleaning are recommended.

Ultrasonic cleaning will have an adverse effect on the performance of relays not specifically manufactured for ultrasonic cleaning.

List of Cleaning Solvent

Solvent		Fully Seated
Chlorine-based	Perochlene Chlorosolder Trichloroethylene	Yes
Water-based	Indusco Holys	Yes
Alcohol-based	IPA Ethanol	Yes
Others	Thinner Gasoline	No
Cleaning method		Automatic cleaning Ultrasonic cleaning (see note 4)

Note: 1. Consult your OMRON representative before using any other cleaning solvent. Do not use Freon-TMC-based, thinner-based, or gasoline-based cleaning solvents.

2. Worldwide efforts are being made at discontinuing the use of CFC-113-based (fluorochlorocarbon-based) and trichloroethylene-based cleaning solvents. The user is requested to refrain from using these cleaning solvents

3. It may be difficult to clean the space between the relay and PCB using hydrogen-based or alcohol–based cleaning solvent. It is recommended the stand-off-type be used G6A-□-ST when using hydrogen-based or alcohol-based cleaning solvents.

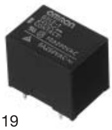
4. Ultrasonic cleaning may have an adverse effect on the performance of relays not specifically manufactured for ultrasonic cleaning. Please refer to the model number to determine if your relay is intended to be cleaned ultrasonically.

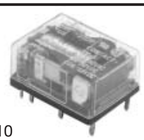
Model		G5B	G5NB-E	G5SB
Features		Miniature relay	Compact single pole 5A high isolation relay CTI: 250 ROHS compliant	Environmentally friendly compact relay ROHS compliant
Appearance **Dimensions (LxWxH)**		 22.4 x 11.9 x 14.4	 20.5 x 7.2 x 15.3	 20.3 x 10.3 x 15.8
Contact Ratings	**Contact Form**	SPST-NO	SPST-NO	SPST
	Contact Type	Single	Single	Single
	Contact Material	Ag	Ag Alloy	Ag
	Resistive Load	3 A at 125 VAC 3 A at 30 VDC	5 A at 250 VAC 5 A at 30 VDC	3 A at 125 VAC 5 A at 30 VDC
	Max. Switching Current	3 A	5 A	5 A
	Min. Permissible load	10 mA at 5 VDC	10 mA at 5 VDC	10 mA at 5 VDC
	Max. Switching Power	750 VA, 90 W	1,250 VA, 90 W	1250 VA, 150 W
	Max. Switching Voltage	250 VAC, 30 VDC	250 VAC, 30 VDC	250 VAC, 30 VDC
Coil ratings	**Rated Voltage**	5 to 24 VDC	5 to 24 VDC	5 to 24 VDC
	Power Consumption (Approx.)	360 mW (200 mW high sensitivity)	200 mW	400 mW (200 mW high sensitivity)
Endura-nce	**Electrical (operations)**	200,000 min	100,000 (5A / 250 VAC) 50,000 (5A / 30 VDC)	50,000 min
	Mechanical (operations)	5,000,000 min	5,000,000	5,000,000 min
Dialec-tric strength	**Between coil and contacts**	2,000 VAC	4,000 VAC	4,000 VAC
	Between contacts of different polarity	–	–	–
	Between contacts of same polarity	750 VAC	750 VAC	1,000 VAC
Ambient temperature (operating)		-40°C to 70°C	-40°C to 85°C	-40°C to 70°C
Variations	**Single Side Stable**	•	•	•
	Single Winding Latching			
	Double Winding Latching			
	PCB Terminal	•	•	•
	Plug-in Terminal			
	Quick Connect Terminal			
	Panel Mount			
	Fully sealed			
	Flux Protection	•	•	
Approved Standards		UL, CSA, IEC (TÜV)	UL, CSA, EN	UL, CSA, EN
Page		41	48	53

Model		G6M	G6D
Features		Slim single in-line miniature relay	Slim miniature relay capable of relaying controller output
Appearance Dimensions (LxWxH)		 20.3 x 5.1 x 17.7	 17.5 x 6.5 x 12.5
Contact Ratings	Contact Form	SPST-NO	SPST-NO
	Contact Type	Single	Single
	Contact Material	AgNi	AgCdO (Cd free planned 1 Apr 05)
	Resistive Load	3 A at 250 VAC 3 A at 30 VDC	5 A at 250 VAC 5 A at 30 VDC
	Max. Switching Current	5 A	5 A
	Min. Permissible load	10 mA at 5 VDC	10 mA at 5 VDC
	Max. Switching Power	750 VA, 90 W	1,250 VA, 150 W
	Max. Switching Voltage	270 VAC, 125 VDC	250 VAC, 30 VDC
Coil ratings	Rated Voltage	5 to 24 VDC	5 to 24 VDC
	Power Consumption (Approx.)	120 mW	200 mW
Endura-nce	Electrical (operations)	100,000 min	100,000 min
	Mechanical (operations)	20,000,000 min	20,000,000 min
Dialec-tric strength	Between coil and contacts	3,000 VAC	3,000 VAC
	Between contacts of different polarity	–	–
	Between contacts of same polarity	750 VAC	750 VAC
Ambient temperature (operating)		-40°C to 85°C	-40°C to 70°C
Variations	Single Side Stable	•	•
	Single Winding Latching		
	Double Winding Latching		
	PCB Terminal	•	•
	Plug-in Terminal		
	Quick Connect Terminal		
	Panel Mount		
	Fully sealed	•	•
	Flux Protection		
Approved Standards		UL, CSA, EN	UL, CSA, IEC, EN
Page		56	60

Model		G6B		G2RG
Features		Sub-miniature relay		Power Relay with 2 x 1.5 mm contact gap. Meets requirements of european UPS standards. ROHS compliant.
Appearance				
Dimensions (LxWxH)		20 x 10 x 10	20 x 11 x 11	29 x 13.5 x 25.5
Contact Ratings	Contact Form	SPST-NO	SPST-NO/NC, DPST-NO DPST-NC	DPST-NO
	Contact Type	Single		Single
	Contact Material	AgCdO (Cd free planned 1 Apr 05)		Ag Alloy
	Resistive Load	5 A at 250 VAC 5 A at 30 VDC		8 A at 250 VAC
	Max. Switching Current	5 A		8 A
	Min. Permissible load	10 mA at 5 VDC		10 mA at 5 VDC
	Max. Switching Power	1,250 VA, 125 W		2,000 VA, 240 W
	Max. Switching Voltage	380 VAC, 125 VDC		380 VAC, 125 VDC
Coil ratings	Rated Voltage	5 to 24 VDC		12 & 24 VDC
	Power Consumption (Approx.)	120 mW	300 mW	800 mW
Endura-nce	Electrical (operations)	100,000 min		10,000 min
	Mechanical (operations)	50,000,000 min		1,000,000 min
Dialec-tric strength	Between coil and contacts	3,000 VAC		5,000 VAC
	Between contacts of different polarity	–	2,000 VAC	3,000 VAC
	Between contacts of same polarity	1,000 VAC		1,000 VAC
Ambient temperature (operating)		-25°C to 70°C		-40°C to 70°C
Variations	Single Side Stable	•		•
	Single Winding Latching	•		
	Double Winding Latching	•		
	PCB Terminal	•		•
	Plug-in Terminal			
	Quick Connect Terminal			
	Panel Mount	•		
	Fully sealed			•
	Flux Protection			•
Approved Standards		UL, CSA, SEV, IEC, (TÜV), EN		UL, CSA, EN
Page		64		71

Model		G5Q-EU		G6RN	
Features		Compact low cost high isolation relay CTI: 250 ROHS compliant		Slim, low profile heavy duty relay ROHS compliant	
Appearance Dimensions (LxWxH)		 20.3 x 10.3 x 15.8		 28.5 x 10 x 15	
Contact Ratings	Contact Form	SPST-NO	SPDT	SPST-NO	SPDT
	Contact Type	Single		Single	
	Contact Material	Ag Alloy		AgNi (Au clad)	
	Resistive Load	10 A at 250 VAC 5 A at 30 VDC (NO)		8 A at 250 VAC 5 A at 30 VDC	
	Max. Switching Current	10 A (NO), 3 A (NC)		8 A	
	Min. Permissible load	10 mA at 5 VDC		10 mA at 5 VDC	
	Max. Switching Power	2,500 VA, 150 W		2,000 VA, 150 W	
	Max. Switching Voltage	277 VAC, 30 VDC		250 VAC, 30 VDC	
Coil ratings	Rated Voltage	5 to 24 VDC		5 to 48 VDC	
	Power Consumption (Approx.)	200 mW	400 mW	220-250 mW	
Endura-nce	Electrical (operations)	25,000 min (10 A / 250 VAC – NO) 100,000 min (3 A / 250 VAC – NC)		100,000 min	
	Mechanical (operations)	10,000,000 min		10,000,000 min	
Dialec-tric strength	Between coil and contacts	4,000 VAC		4,000 VAC	
	Between contacts of different polarity	–		–	
	Between contacts of same polarity	1,000 VAC		1,000 VAC	
Ambient temperature (operating)		-40°C to 85°C		-40°C to 85°C	
Variations	Single Side Stable	•		•	
	Single Winding Latching				
	Double Winding Latching				
	PCB Terminal	•		•	
	Plug-in Terminal				
	Quick Connect Terminal				
	Panel Mount				
	Fully sealed	•		•	
	Flux Protection	•			
Approved Standards		UL, CSA, EN		UL, CSA, SEV, IEC, EN	
Page		75		79	

Model		G5LE	G5LB	G5LC-EU
Features		Sub-miniature 'sugar cube' relay. ROHS compliant.	Low profile 10A sugar cube relay. ROHS compliant.	Sub-miniature 'sugar cube' single pole relay CTI: 250. ROHS compliant.
Appearance Dimensions (LxWxH)		 22.5 x 16.5 x 19	 19.6 x 15.6 x 15.2	 22.5 x 16.5x 19
Contact Ratings	Contact Form	SPST-NO SPST	SPDT, SPST-NO	SPST-NO SPDT
	Contact Type	Single	Single	Single
	Contact Material	AgSnO^{2}, AgSnin	AgSnO^{2}	Ag Alloy
	Resistive Load	10 A at 120 VAC 8 A at 30 VDC	10 A at 250 VAC 8 A at 30 VDC	10 A at 240 VAC 10 A at 24 VDC (NO)
	Max. Switching Current	10 A	10 A	10 A
	Min. Permissible load	100 mA at 5 VDC	100 mA at 5VDC	100 mA at 5VDC
	Max. Switching Power	1,200 VA, 150 W	2,500 VA, 240W	2,400 VA, 240W
	Max. Switching Voltage	250 VAC, 30 VDC	250 VAC, 30 VDC	250 VAC, 30 VDC
Coil ratings	Rated Voltage	5 to 48 VDC	3 to 48 VDC	5 to 24 VDC
	Power Consumption (Approx.)	400 mW	360 mW	360 mW
Endura-nce	Electrical (operations)	100,000 min	100,000 min	100,000
	Mechanical (operations)	10,000,000 min	10,000,000 min	10,000,000
Dialec-tric strength	Between coil and contacts	2,000 VAC	2,000 VAC	2,000 VAC
	Between contacts of different polarity	–	–	–
	Between contacts of same polarity	750 VAC	750 VAC	750 VAC
Ambient temperature (operating)		-40°C to 85°C	-40°C to 85°C	-25°C to 85°C
Variations	Single Side Stable	•	•	•
	Single Winding Latching			
	Double Winding Latching			
	PCB Terminal	•	•	•
	Plug-in Terminal			
	Quick Connect Terminal			
	Panel Mount			
	Fully sealed	•	•	•
	Flux Protection	•	•	•
Approved Standards		UL, CSA, SEV, IEC, EN	UL, CSA, EN	UL, CSA, EN
Page		83	88	92

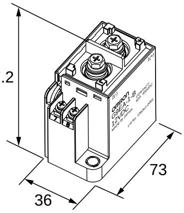
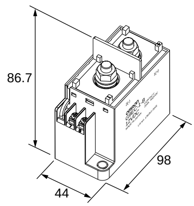
Model		G5CA		G6C	
Features		Flat power relay. ROHS compliant.		General purpose power relays	
Appearance					
Dimensions (LxWxH)		22 x 16 x 11		20 x 15 x 10	
Contact Ratings	Contact Form	SPST-NO		SPST-NO	SPST-NO/NC
	Contact Type	Single		Single	
	Contact Material	$AgSnO^2$		AgCdO (Cd free planned 1 Apr 05)	
	Resistive Load	10 A at 250 VAC 10 A at 30 VDC	10 A at 110 VAC	10 A at 250 VAC 10 A at 30 VDC	8 A at 250 VAC 8 A at 30 VAC
	Max. Switching Current	10 A	15 A	10 A	10 A
	Min. Permissible load	10 mA at 5 VDC		10 mA at 5 VDC	
	Max. Switching Power	2,500 VA, 300 W		2,500 VA, 300 W	2,000 VA, 240 W
	Max. Switching Voltage	250 VAC, 30 VDC		380 VAC, 125 VDC	
Coil ratings	Rated Voltage	5 to 48 VDC		3 to 24 VDC	
	Power Consumption (Approx.)	200 mW (150 mW high sensitivity version)		200 mW	
Endura-nce	Electrical (operations)	300,000 min	100,000 min	100,000 min	
	Mechanical (operations)	20,000,000 min		50,000,000 min	
Dialec-tric strength	Between coil and contacts	2,500 VAC		2,000 VAC	
	Between contacts of different polarity	–		–	2,000 VAC
	Between contacts of same polarity	1,000 VAC		1,000 VAC	
Ambient temperature (operating)		-25°C to 70°C		-25°C to 70°C	
Variations	Single Side Stable	•		•	
	Single Winding Latching			•	
	Double Winding Latching			•	
	PCB Terminal	•		•	
	Plug-in Terminal				
	Quick Connect Terminal	•			
	Panel Mount				
	Fully sealed	•		•	
	Flux Protection	•		•	
Approved Standards		UL, CSA, SEV, SEMKO, IEC (TÜV)		UL, CSA, SEV, IEC (TÜV)	
Page		96		100	

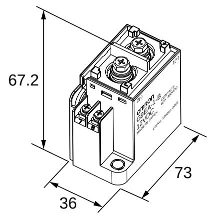
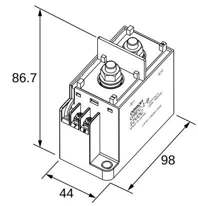
Model		G2R		
Features		General pupose power relays		
Appearance				
Dimensions (LxWxH)		29 x 13 x 25.5		
Contact Ratings	Contact Form	SPST-NO, SPDT	SPST-NO, SPDT	DPST-NO, DPDT
	Contact Type	Single		
	Contact Material	AgCdO (Cd free planned 1 Apr 05)		
	Resistive Load	10 A at 250 VAC 10 A at 30 VDC	16 A at 250 VAC 16 A at 30 VDC	5 A at 250 VAC 5 A at 30 VDC
	Max. Switching Current	10 A	16 A	5 A
	Min. Permissible load	100 mA at 5 VDC	100 mA at 5 VDC	10 mA at 5 VDC
	Max. Switching Power	2,500 VA, 300 W	4,000 VA, 400 W	1,250 VA, 150 W
	Max. Switching Voltage	380 VAC, 125 VDC		
Coil ratings	Rated Voltage	5 to 100 VDC, 12 to 240 VAC		
	Power Consumption (Approx.)	DC: 530mW; 360mW high sensitivity version AC: 900Mva		
Endura-nce	Electrical (operations)	100,000 min		
	Mechanical (operations)	DC: 20,000,000 min AC: 10,000,000 min		
Dialec-tric strength	Between coil and contacts	5,000 VAC		
	Between contacts of different polarity	–	–	3,000 VAC
	Between contacts of same polarity	1,000 VAC		
Ambient temperature (operating)		-40°C to 70°C		
Variations	Single Side Stable	•		
	Single Winding Latching			
	Double Winding Latching	•		
	PCB Terminal	•		
	Plug-in Terminal	•		
	Quick Connect Terminal	•		
	Panel Mount	•		
	Fully sealed	•		
	Flux Protection	•		
Approved Standards		UL, CSA, SEV, SEMKO, IEC (TÜV), EN		
Page		109		

Model		**G2RL**		
Features		Low profile relays with Class F insulation available. ROHS compliant.		
Appearance				
Dimensions (LxWxH)		29 x 12.7 x 15.7		
Contact Ratings	**Contact Form**	SPST-NO, SPDT	SPST-NO, SPDT	DPST-NO, DPDT
	Contact Type	Single		
	Contact Material	$AgSnO_2$	$AgSnO_2$	AgNi
	Resistive Load	12 A at 250 VAC 12 A at 24 VDC	16 A at 250 VAC 16 A at 24 VDC	8 A at 250 VAC 8 A at 24 VDC
	Max. Switching Current	12 A	16 A	8 A
	Min. Permissible load	10 mA at 5 VDC		
	Max. Switching Power	3,000 VA, 280 W	4,000 VA, 380 W	2,000 VA, 240 W
	Max. Switching Voltage	440 VAC, 300 VDC		
Coil ratings	**Rated Voltage**	5 to 48 VDC		
	Power Consumption (Approx.)	400 mW		
Endura-nce	**Electrical (operations)**	50,000 min		
	Mechanical (operations)	20,000,000 min		
Dialec-tric strength	**Between coil and contacts**	5,000 VAC		
	Between contacts of different polarity	–	–	2,500 VAC
	Between contacts of same polarity	1,000 VAC		
Ambient temperature (operating)		-40°C to 85°C		
Variations	**Single Side Stable**	•		
	Single Winding Latching			
	Double Winding Latching			
	PCB Terminal	•		
	Plug-in Terminal			
	Quick Connect Terminal			
	Panel Mount			
	Fully sealed	•		
	Flux Protection	•		
Approved Standards		UL, CSA, EN		
Page		130		

Model		G5RL-AC	G4W	
Features		Single-pole 16A power relay AC coil type	Relay with 10kV impulse and 4kV withstand voltages for power supply switching applications	
Appearance				
Dimensions (LxWxH)		29.0 x 12.7 x 15.7	30.5 x 19.5 x 30.5	
Contact Ratings	Contact Form	SPDT	SPST-NO	DPST-NO
	Contact Type	Single	Single	
	Contact Material	Ag Alloy (AgSnIn)	AgCdO (Cd free planned 1 Apr 05)	
	Resistive Load	AC 250V 16A (NO), DC 24V 16A (NO), AC 250V 5A (NC), DC 24V 5A (NC)	15 A at 250 VAC 15 A at 24 VDC	10 A at 250 VAC 10 A at 24 VDC
	Max. Switching Current	16 A (NO), 15 A (NC)	15 A	10 A
	Min. Permissible load	40 mA at 24 VDC	100 mA at 5 VDC	
	Max. Switching Power	AC 250V, DC24V	3,750 VA, 375 W	2,500 VA, 240 W
	Max. Switching Voltage	250 VAC, 24 VDC	250 VAC, 125 VDC	
Coil ratings	Rated Voltage	24 VAC to 240 VAC	12 to 100 VDC	
	Power Consumption (Approx.)	75 VA	800 mW	
Endura-nce	Electrical (operations)	50,000 min	100,000 min	
	Mechanical (operations)	10,000,000 min	5,000,000 min	
Dialec-tric strength	Between coil and contacts	6,000 VAC	4,000 VAC	
	Between contacts of different polarity	–	–	2,000 VAC
	Between contacts of same polarity	1,000 VAC	1,500 VAC	
Ambient temperature (operating)		-40°C to 70°C	-25°C to 55°C	
Variations	Single Side Stable		•	
	Single Winding Latching			
	Double Winding Latching			
	PCB Terminal	•	•	
	Plug-in Terminal			
	Quick Connect Terminal		•	
	Panel Mount			
	Fully sealed			
	Flux Protection	•		
Approved Standards		UL, VDE	UL, CSA, EN (VDE), SEV, SEMKO, DEMKO	
Page		135	139	

Model		G8P		G4A	
Features		Small, low cost power relays		Relay with 10kV impulse and 4kV withstand voltages for power supply switching applications	
Appearance					
Dimensions (LxWxH)		32.1 x 28.2 x 20.1		30.5 x 16 x 23.5	30.5 x 16 x 26.8
Contact Ratings	Contact Form	SPDT	SPDT	SPST-NO	
	Contact Type	Single		Single	
	Contact Material	AgCdO ((Cd free planned 1 Apr 05)		$AgSnO_2$	
	Resistive Load	30 A at 250 VAC 20 A at 28 VDC	20/10 A at 250 VAC 20/10 A at 30 VAC	20 A at 250 VAC	
	Max. Switching Current	30 A	20/10 A	20 A	
	Min. Permissible load	500 mA at 5 VDC		100 mA at 5 VDC	
	Max. Switching Power	7,500 VA, 560 W	5,000/2,000 VA, 560/2,380 W	5,000 VA	
	Max. Switching Voltage	250 VAC, 28 VDC		250 VAC	
Coil ratings	Rated Voltage	5 to 110 VDC		5 to 24 VDC	
	Power Consumption (Approx.)	900 mW		900 mW	
Endura-nce	Electrical (operations)	100,000 min		100,000 min	
	Mechanical (operations)	10,000,000 min		2,000,000 min	
Dialec-tric strength	Between coil and contacts	2,500 VAC		4,500 VAC	
	Between contacts of different polarity	–		–	
	Between contacts of same polarity	1,500 VAC		1,000 VAC	
Ambient temperature (operating)		-55°C to 105°C		-20°C to 60°C	
Variations	Single Side Stable	•		•	
	Single Winding Latching				
	Double Winding Latching				
	PCB Terminal	•		•	
	Plug-in Terminal			•	
	Quick Connect Terminal	•			
	Panel Mount	•			
	Fully sealed	•			
	Flux Protection			•	
Approved Standards		UL, CSA		UL, CSA, IEC, EN	
Page		144		150	

Model		G9EA		G9EC
		G9EA-1(-B)	G9EA-1(-B)-CA	G9EC-1(-B)
Classification		Switching/current conduction	High-current conduction	Switching/current conduction
Appearance				
Features		**Standard model** Compact, carries/switches 400 V, 60 A loads	**Carries 100 A** Low contact resistance when carrying current	**Largest capacity in series** Carries/switches 400 V, 200 A loads
Contact	Contact Form	SPST-NO		SPST-NO
	Contact structure	Double-break, single		Double-break, single
	Contact resistance	30 mΩ max. (0.6 mΩ typical)	10 mΩ max. (0.3 mΩ typical)	30 mΩ max. (0.2 mΩ typical)
	Switching voltage drop	0.1 V max. (for a carry current of 60 A)	0.1 V max. (for a carry current of 100 A)	0.1 V max. (for a carry current of 200 A)
	Electrical endurance	120 VDC, 100 A, 3,000 operations min.	400 VDC, 30 A, 1,000 operations min.	400 VDC, 200 A, 3,000 operations min.
		400 VDC, 60 A, 3,000 operations min.	120 VDC, 30 A, 2,500 operations min.	–
		400 VDC, 30 A, 30,000 operations min.	–	–
	Maximum switching current	100 A	30 A	200 A
	Rated carry current	60 A	100 A	200 A
	Short-time carry current	100 A (10 min)	150 A (10 min)	300 A (15 min)
	Maximum interruption current	600 A at 300 VDC (5 times)	–	1,000 A at 400 VDC (10 times)
	Overload interruption	180 A at 400 VDC (100 times min.)	100 A at 120 VDC (150 times min.)	700 A at 400 VDC (40 times min.)
	Reverse polarity interruption	-60 A at 200 VDC (1,000 times min.)	–	-200 A at 200 VDC (1,000 times min.)
Coil	Rated voltage	12, 24, 48, 60 & 100 VDC		12, 24, 48, 60 & 100 VDC
	Power consumption	Approx. 5 to 5.4 W		Approx. 11 W
Mechanical endurance		200,000 operations min.		200,000 operations min.

Model		G9EA		G9EC
		G9EA-1(-B)	**G9EA-1(-B)-CA**	**G9EC-1(-B)**
Classification		Switching/current conduction	High-current conduction	Switching/current conduction
Appearance				
Features		**Standard model** Compact, carries/switches 400 V, 60 A loads	**Carries 100 A** Low contact resistance when carrying current	**Largest capacity in series** Carries/switches 400 V, 200 A loads
Insulation resistance (see note 1)	**Between Coil and Contacts**	1,000 MΩ min		1,000 MΩ min
	Between contacts of the same polarity	1,000 MΩ min		1,000 MΩ min
Dielectric strength	**Between Coil and Contacts**	2,500 VAC, 1 min		2,500 VAC, 1 min
	Between contacts of the same polarity	2,500 VAC, 1 min		2,500 VAC, 1 min
Impulse withstand voltage (see note 2)		4,500 V		4,500 V
Ambient operating temperature		-40 to 70°C (with no icing or condensation)		-40 to 50°C (with no icing or condensation)
Ambient operating humidity		5% to 85%		5% to 85%
Terminals	**Screw terminals**	Yes		Yes
	Lead wire output	Yes		Yes
Page		154		161

Note: 1. The insulation resistance was measured with a 500 VDC megohmmeter.
2. The impulse withstand voltage was measured with a JEC-212 (1981) standard impulse voltage waveform (1.2 x 50 μs).

Single-pole 3-A Miniature Relay

- Impulse withstand voltage of 10 kV (between coil and contacts).
- Models available with 200-mW current consumption (High-sensitivity Type).
- High-capacity (8 A) type available.
- UL/CSA/TÜV approved.
- Standard and high capacity types Cd free.

Ordering Information

Classification	Contact form	Enclosure ratings	Model
Standard	SPST-NO	Flux protection	G5B-1
High-sensitivity			G5B-1-H
High-capacity			G5B-1-E

Note: 1. 6 VDC can be also produced.
2. When ordering, add the rated coil voltage to the model number.
Example: G5B-1 12 VDC
Rated coil voltage

G5B - ☐ - ☐ ☐ VDC
1 2 3

1. **Number of Poles**
   1: 1 pole (SPST-NO)
2. **Classification**
   H: High-sensitivity
   E: High-capacity
3. **Rated Coil Voltage**
   5, 12, 24 VDC

Specifications

■ Coil Ratings

Item	Standard type, high-capacity type			High-sensitivity type		
Rated voltage	5 VDC	12 VDC	24 VDC	5 VDC	12 VDC	24 VDC
Rated current	72.0 mA	30.0 mA	15.0 mA	40.0 mA	16.7 mA	8.3 mA
Coil resistance	69.4 Ω	400 Ω	1,600 Ω	125 Ω	720 Ω	2,880 Ω
Must operate voltage	Standard type: 70% max. of rated voltage High–capacity type: 75% max. of rated voltage			75% max. of rated voltage		
Must release voltage	5% min. of rated voltage					
Max. voltage	140% (at 23°C)/110% (at 70°C) of rated voltage			160% (at 23°C)/130% (at 70°C) of rated voltage		
Power consumption	Approx. 360 mW			Approx. 200 mW		

■ Contact Ratings

Item	Standard type, high-capacity type	High-sensitivity type
Load	Resistive load (cosf = 1)	–
Rated load	3 A at 125 VAC, 3 A at 30 VDC	8 A at 125 VAC, 8 A at 30 VDC
Contact material	Ag	AgCdO (Cd free planned 1 Apr 05)
Rated carry current	3 A	8 A
Max. switching voltage	250 VAC, 30 VDC	
Max. switching current	3 A	8 A
Max. switching power	750 VA, 90 W	2,000 VA, 240 W
Failure rate (ref. value)	5 VDC, 10 mA	5 VDC, 100 mA

Note: P level: λ_{60} = 0.1 x 10^{-6}/operation (with an operating frequency of 120 operations/min).

■ Characteristics

Contact resistance	100 mΩ max.
Operate time	10 ms max.
Release time	10 ms max.
Insulation resistance	1,000 MΩ max. (at 500 VDC)
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min between coil and contacts; 750 VAC, 50/60 Hz for 1 min between contacts of same polarity
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 100 m/s^2
Endurance	Mechanical: 5,000,000 operations min. (at 18,000 operations/hr) Electrical: 200,000 operations min. (at 1,800 operations/hr) for standard type, high-sensitivity type 100,000 operations min. (at 1,200 operations/hr) for high-capacity type
Ambient temperature	Operating: -40°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 7 g

Note: The data shown above are initial values.

■ Approved Standards
UL508 (File No. E41643)/CSA C22.2 No.0, No.14 (File No. LR31928)

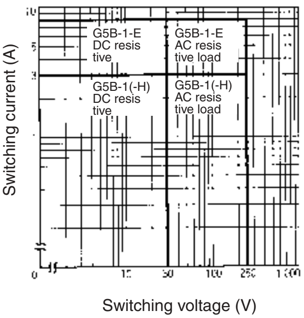
Model	Coil ratings	Contact ratings
G5B-1, G5B-1-H	3 to 24 VDC	3 A, 250 VAC (general use) 3 A, 30 VDC (resistive) 1/8 hp, 125 VAC/1/8 hp, 250 VAC TV-2 125 VAC

TÜV VDE0435 IEC255 (File No. R9251225)

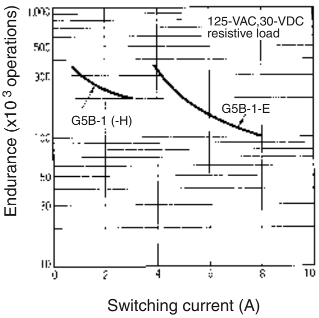
Model	Coil ratings	Contact ratings	Condition
G5B-1, G5B-1-H	3 to 24 VDC	3 A, 250 VAC~ (cosø = 1) 3 A, 30 VDC= (0 ms)	Duty level: class III Operative range: 2 Pick–up class: class a Pollution degree: 2 Overvoltage category: II Material group: IIIa Ambient temperature: -40°C to 70°C
G5B-1-E		8 A, 125 VAC~ (cosø = 1) 8 A, 30 VDC= (0 ms)	

Engineering Data

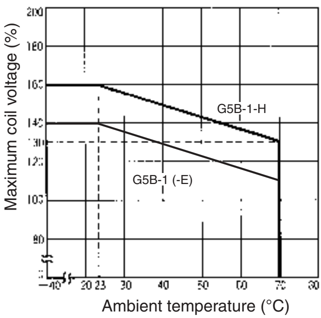
Maximum Switching Power



Endurance



Ambient Temperature vs. Maximum Coil Voltage

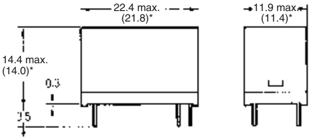


Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

Dimensions

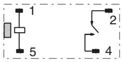
Note: 1. All units are in millimeters unless otherwise indicated.

2. Orientation marks are indicated as follows:

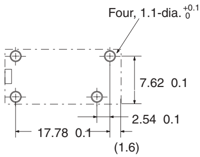


*Average value.

Terminal Arrangement/Internal Connections (Bottom View)



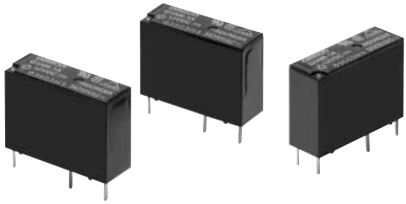
Mounting Holes (Bottom View)



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

A Miniature Relay with 1-pole 5 A Switching Capability and 10 kV Impulse Withstand Voltage

- ROHS compliant.
- Highly efficient magnetic circuit for high sensitivity (200 mW).
- Compact, slim, yet provides 10 kV impulse withstand voltage (between coil and contacts).
- Standard model conforms to UL, CSA and EN standards.
- Tracking resistance: CTI>250



Ordering Information

Classification	Contact form	Enclosure ratings	Model
Standard	SPST-NO	Flux protection	G5NB-1A

Note: When ordering, add the rated coil voltage to the model number.
Example: G5NB-1A-E 12 VDC
Rated coil voltage

Model Number Legend

G5NB-□□-E □VDC
1 2 3

1. Number of Poles

1: 1 pole

2. Contact Form

A: SPST-NO

3. Rated Coil Voltage

5, 12, 18, 24 VDC

Application Examples

Water heaters, refrigerators, air conditioners, and small electric appliances

Specifications

■ Coil Ratings

Rated voltage	5 VDC	12 VDC	18 VDC	24 VDC
Rated current	40.0 mA	16.7 mA	11.1 mA	8.3 mA
Coil resistance	125 Ω	720 Ω	1,620 Ω	2,880 Ω
Must operate voltage	75% max. of rated voltage			
Must release voltage	10% min. of rated voltage			
Max. voltage	170% of rated voltage (at 23°C)			
Power consumption	Approx. 200 mW			

Note: The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
The operating characteristics are measured at a coil temperature of 23°C.
The “Max. voltage” is the maximum voltage that can be applied to the relay coil.

■ Contact Ratings

Load	Resistive load (cosϕ = 1)
Rated load	5 A at 250 VAC, 3 A at 30 VDC
Max. switching voltage	250 VAC, 30 VDC
Max. switching current	5 A
Max. switching power	1250 VA, 90 W
Failure rate (reference value)	10 mA at 5 VDC

Note: P level: λ_{60} = 0.1 x 10^{-6}/operation (with an operating frequency of 120 operations/min)

■ Characteristics

Contact resistance (See note 2.)	100 mΩ max.
Operate time	10 ms max.
Release time	10 ms max.
Insulation resistance (See note 3.)	1,000 MΩ min. (at 500 VDC)
Dielectric strength	4,000 VAC, 50/60 Hz for 1 min between coil and contacts 750 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	10,000 V (1.2 x 50 ms) between coil and contacts
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 100 m/s^2
Endurance	Mechanical: 5,000,000 operations min. Electrical: 100,000 operations min (5 A at 250 VAC), 200,000 operations min. (3 A at 30 VDC)
Failure rate P level (reference value) (See note 4.)	5 VDC, 10 mA
Ambient temperature	Operating: -40°C to 85°C (with no icing or condensation)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 4 g

Note: **1.** The data shown above are initial value.
2. Measurement conditions: 5 VDC, 1 A, voltage drop method.
3. Measurement conditions: Measured at the same points as the dielectric strength using a 500-VDC ohmmeter.
4. This value is for a switching frequency of 120 operations/minute.

■ Approved Standards

UL508 (File No. 41515)

Coil ratings	Contact ratings
5 to 24 VDC	5 A, 30 VDC (resistive) 5 A, 125 VAC (resistive) 5 A, 250 VAC (general use)

CSA C22.2 (No. 0, No. 1, No. 14) (File No. LR31928)

Coil ratings	Contact ratings
5 to 24 VDC	5 A, 30 VDC (resistive) 5 A, 125 VAC (resistive) 5 A, 250 VAC (general use)

EN 61810-1 (VDE Reg No 137575)

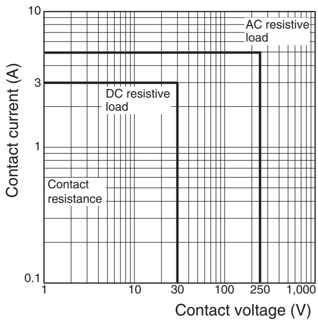
Coil ratings	Contact ratings
5 to 24VDC	5 A, 30 VDC (resistive) 5 A, 250 VAC (general use)

■ Actual Load Life (Reference Values)

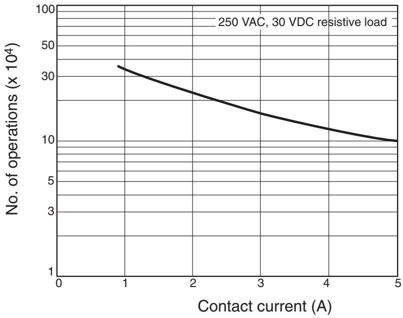
1. 120-VAC motor and lamp load (2.5-A surge and 0.5-A normal): 250,000 operations min.(at 23°C)
2. 160-VDC valve load (with varistor) (0.24-A): 250,000 operations min.(at 23°C)

Engineering Data

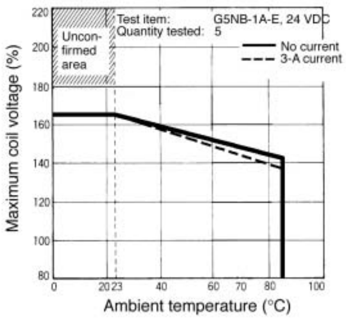
Maximum Switching Capacity



Endurance

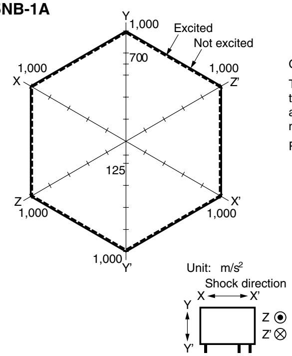


Ambient Temperature vs. Maximum Coil Voltage



Malfunctioning Shock

G5NB-1A



Quantity Tested: 5 units

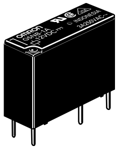
Test Method: Shock was applied 3 times in 6 directions along 3 axes and the level at which shock caused malfunction was measured.

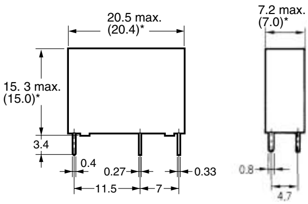
Rating: 100 m/s²

Dimensions

Note: All units are in millimeters unless otherwise indicated.

G5NB-1A-E

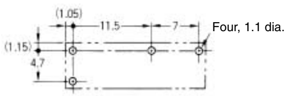




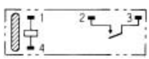
*Average value

PCB Mounting Holes (Bottom View)

Tolerance: 0.1 mm



Terminal Arrangement/ Internal Connections (Bottom View)



(No coil polarity)

Precautions

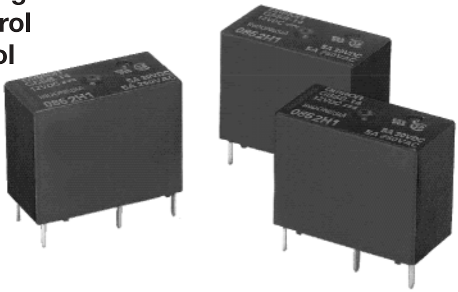
■ Correct Use

HANDLING

The enclosure rating of the G5NB is for flux protection. Do not use immersion-cleaning.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Compact Single-pole Relay for Switching 5 A (Normally Open Contact), Fan Control of Air Conditioners, and Heating Control of Small Appliances.



- ROHS compliant.
- Compact SPDT Relay with high insulation.
- Incorporates a normally open contact that switches 5 A max.
- Ensures a withstand impulse voltage of 8,000 V between the coil and contacts.
- Conforms to UL, CSA and EN.

Ordering Information

Classification	Contact form	Enclosure ratings	Model
Standard	SPDT-NO	Fully sealed	G5SB-14

Note: When ordering, add the rated coil voltage to the model number.

Example: G5SB-14 12 VDC

Rated coil voltage

Model Number Legend

G5SB-□□□ VDC

1 2 3

1. Number of Poles

1: 1 pole (SPDT)

2. Protective Structure

4: Fully sealed

3. Rated Coil Voltage

5, 9, 12, 24 VDC

Specifications

■ Coil Ratings

Rated voltage	5 VDC	9 VDC	12 VDC	24 VDC
Rated current	80 mA	44.4 mA	33.3 mA	16.7 mA
Coil resistance	63 Ω	202 Ω	360 Ω	1,440 Ω
Must operate voltage	75% max. of rated voltage			
Must release voltage	5% min. of rated voltage			
Max. voltage	110% of rated voltage			
Power consumption	Approx. 400 mW			

Contact Ratings

Load	Resistive Load
Rated load	3 A (NO)/3 A (NC) at 125 VAC 5 A (NO)/3 A (NC) at 125 VAC 5 A (NO) at 250 VAC 3 A (NC) at 250 VAC 5 A (NO)/3 A (NC) at 30 VDC
Contact material	Ag alloy
Rated carry current	5 A (NO)/3 A (NC)
Max. switching voltage	250 VAC, 30 VDC
Max. switching current	5 A (NO)/3 A (NC)
Max. switching capacity	1,250 VA, 150 W (NO) 750 VA, 30 W (NC)
Min. permissible load	10 mA at 5 VDC

Note: P level: λ_{60} = 0.1 x 10^{-6}/operation (with an operating frequency of 120 operations/min)

Characteristics

Contact resistance (see note 2)	100 mΩ max.
Operate time (see note 3)	10 ms max.
Release time (see note 3)	5 ms max.
Insulation resistance (see note 4)	1,000 MΩ min.
Dielectric strength	4,000 VAC, 50/60 Hz for 1 min between coil and contacts 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	8 kV (1.2 x 50 µs)
Vibration resistance	Destruction: 10 to 55 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction: 10 to 55 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 (approx. 100 G) Malfunction: Energized: 100 m/s^2 (approx. 10 G) Non-energized: 100 m/s^2 (approx. 10 G)
Endurance (see note 5)	Mechanical: 5,000,000 operations (18,000 operations per hour) Electrical: 200,000 operations: 3 A (NO)/3 A (NC) at 125 VAC resistive load 50,000 operations: 5 A (NO)/3 A (NC) at 125 VAC resistive load 50,000 operations: 5 A (NO) at 250 VAC resistive load 10,000 operations: 3 A (NC) at 250 VAC resistive load 10,000 operations: 5 A (NO)/3 A (NC) at 30 VDC resistive load Switching frequency: 1,800 operations per hour
Ambient temperature	Operating: -40°C to 70°C with no icing or condensation
Ambient humidity	Operating: 5% to 95%
Weight	Approx. 6.5 g

Note: **1.** The data shown above are initial values.
2. The contact resistance is possible with 1 A applied at 5 VDC using a fall-of-potential method.
3. The operating time is possible with the operating voltage imposed with no contact bounce at an ambient temperature of 23°C.
4. The insulation resistance is possible between coil and contacts and between contacts of the same polarity at 500 VDC.
5. The electrical durability data items shown are possible at 23°C.

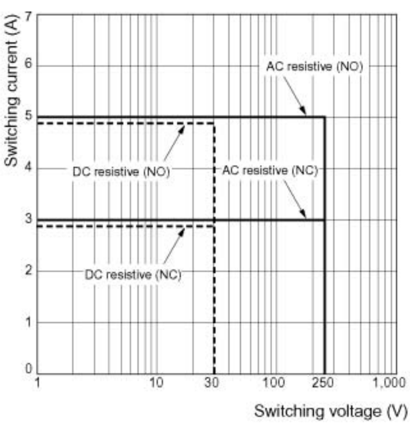
■ Approved Standards
UL508 (File No. E41515)/CSA C22.2 (No.14) (File No. LR31928)
EN 61810-1 (VDE Reg. no 40000957)

Model	Coil ratings	Contact ratings
G5SB	5 to 24 VDC	3 A, 125 VAC (resistive) NC only 2 A, 125 VAC (resistive) NC only 5 A, 250 VAC (resistive) NO only 3 A, 250 VAC (resistive) NO only 5 A, 30 VDC (resistive) NO only

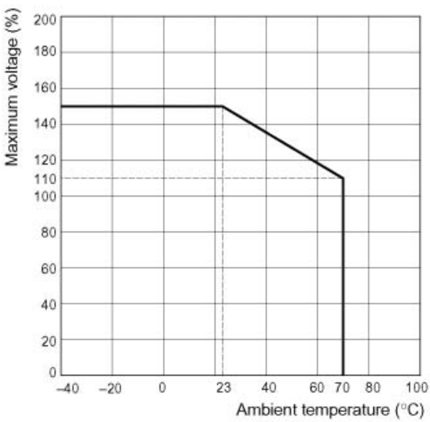
Electrical endurance tests are performed at 70°C.

Engineering Data

Max. Switching Capacity

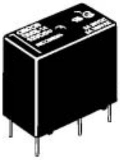


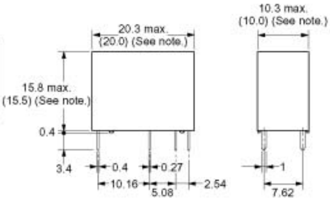
Ambient Temperature vs. Maximum Voltage



Dimensions

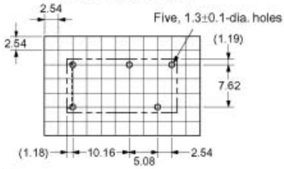
Note: All units are in millimeters unless otherwise indicated.



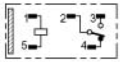


PCB Mounting Holes (Bottom View)

Tolerance: ±0.1 mm



Terminal Arrangement/ Internal Connections (Bottom View)



(No coil polarity)

Note: Values in parentheses are average values.

Application Examples

- Fan Motor
- Refrigerator
- Air Conditioner
- Oven
- Washing Machine
- Others

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Slim, Miniature Relay, Capable of Relaying Programmable Controller and Temperature Controller Outputs

- ROHS compliant.
- Slim 5-mm width, and miniature size.
- Reduced mounting area ideal for high-density mounting.
- Highly efficient magnetic circuit for high sensitivity (40% higher than the G6D, with power consumption of 120 mW).
- Satisfies IEC61131-2 and IEC61010 requirements.
- SIL (single-in-line) terminal pitch.
- UL, CSA and EN approved.

Ordering Information

Classification	Contact form	Enclosure ratings	Model
Standard	SPST-NO	Fully sealed	G6M-1A

Note: When ordering, add the rated coil voltage to the model number.

Example: G6M-1A 12 VDC
Rated coil voltage

Model Number Legend

G6M -□ □ □ VDC
1 2 3

1. Number of Poles

1: 1 pole

2. Contact Form

A: SPST-NO

3. Rated Coil Voltage

5, 12, 24 VDC

Specifications

■ Coil Ratings

Rated voltage	5 VDC	12 VDC	24 VDC
Rated current	24 mA	10 mA	5 mA
Coil resistance	208 Ω	1,200 Ω	4,800 Ω
Must operate voltage	75% max. of rated voltage		
Must release voltage	5% min. of rated voltage		
Max. voltage	160% of rated voltage (at 23°C)		
Power consumption	Approx. 120 mW		

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.
3. The maximum allowable voltage is the maximum possible value of the voltage that can be applied to the relay coil. It is not the maximum voltage that can be applied continuously.
4. The must operate voltage is 72% or less of the rated voltage if the relay is mounted vertically and the terminals are pointed downwards.

■ Contact Ratings

Rated load	3 A at 250 VAC, 3 A at 30 VDC
Rated carry current	5 A
Max. switching voltage	270 VAC, 125 VDC
Max. switching current	5 A
Max. switching power	750 VAC, 90 W
Min. permissable load	10 mA at 5 VDC (at 120 operations/min)

Note: P level: λ_{60} = 0.1 x 10^{-6}/operation

■ Characteristics

Contact resistance	100 mΩ max.
Operate time	10 ms max.
Release time	5 ms max.
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric strength	3,000 VAC, 50/60 Hz for 1 min between coil and contacts 750 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	5,080 V (1.2 x 50 µs) between coil and contacts
Vibration resistance	Destruction: 10 to 55 Hz, 2.5-mm single amplitude (5.0-mm double amplitude) Malfunction: 10 to 55 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 100 m/s^2
Endurance	Mechanical: 20,000,000 operations min. (at 18,000 operations/hr) Electrical: 100,000 operations min. (3 A at 250 VAC/30 VDC, resistive load)
Ambient temperature	Operating: -40°C to 85°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight Approx.	4 g

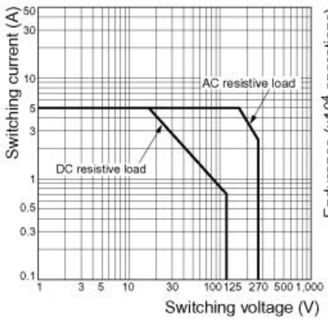
■ Approved Standards

UL508 (File No. E41515)/CSA C22.2 (No.14) (File No. LR31928)
EN 61810-1 (VDE Reg. no 400003429)

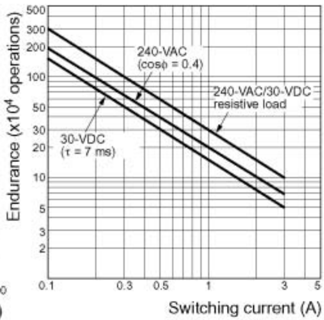
Model	Coil ratings	Contact ratings
G6M-1A	4.5 to 24 VDC	5 A, 250 VAC (resistive load, 6,000 operations) 5 A, 24 VDC (resistive load, 6,000 operations) 3 A, 250 VAC (general use, 100,000 operations) 3A, 24 VDC (general use, 100,000 operations)

Engineering Data

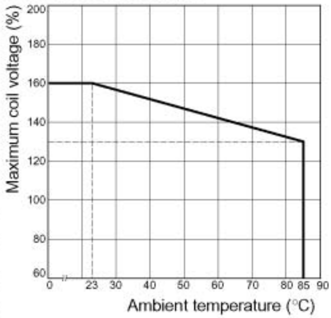
Maximum Switching Power



Endurance



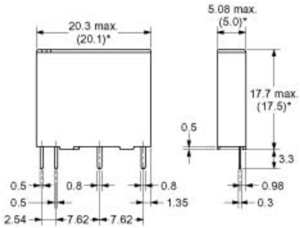
Ambient Temperature vs. Maximum Coil Voltage



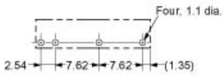
Note: The maximum coil voltage refers to the maxi mum value in a varying range of operating power voltage, not a continuous voltage.

Dimensions

G6M-1A



Terminal Arrangement/ Internal Connections (Bottom View)



Mounting Holes (Bottom View)

Tolerance: ±0.1

*Average value

Precautions

BASIC INFORMATION

Before actually committing any component to a mass-productionsituation, OMRON strongly recommends situational testing, in as close to actual production situations as possible. One reason is to confirm that the product will still perform as expected after surviving the many handling and mounting processes involved in mass production. Also, even though OMRON relays are individually tested a number of times, and each meets strict requirements, a certain testing tolerance is permissible. When a high-precision product uses many components, each depends upon the rated performance thresholds of the other components. Thus, the overall performance tolerance may accumulate into undesirable levels.

To avoid problems, always conduct tests under the actual application conditions.

General

To maintain the initial characteristics of a relay, exercise care that it is not dropped or mishandled. For the same reason, do not remove the case of the relay; otherwise, the characteristics may degrade. Avoid using the relay in an atmosphere containing sulfuric acid (SO_2), hydrogen sulfide (H_2S), or other corrosive gases.

Do not continuously apply a voltage higher than the rated maximum voltage to the relay. Never try to operate the relay at a voltage and a current other than those rated.

Do not use the relay at temperatures higher than that specified in the catalog or data sheet.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Slim, Miniature Relay, Capable of Relaying Programmable Controller and Temperature Controller Outputs

- Slim and miniature: 17.5 x 6.5 x 12.5 mm (L x W x H).
- Reduced bottom area (45% smaller than the G6B's bottom area) ideal for high-density mounting.
- Switches 5 A at 250 VAC/30 VDC.
- Allows 300,000 operations with a 2-A load at 250 VAC or 30 VDC.
- Actual load switching capability equals the G6B's capability.
- Washable construction.

Ordering Information

Classification	Contact form	Enclosure ratings	Model
Standard	SPST-NO	Fully sealed	G6D-1A

Note: When ordering, add the rated coil voltage to the model number.
Example: G6D-1A $\underbrace{\text{12 VDC}}_{}$ Rated coil voltage

Model Number Legend

G6D - □ □ □ VDC
1 2 3

1. **Number of Poles**
   1: 1 pole
2. **Contact Form**
   A: SPST-NO
3. **Rated Coil Voltage**
   5, 12, 24 VDC

Accessories (Order Separately)

Connecting Socket	P6D-04P

Specifications

Coil Ratings

Rated voltage	5 VDC	12 VDC	24 VDC
Rated current	40 mA	16.7 mA	8.3 mA
Coil resistance	125 Ω	720 Ω	2,880 Ω
Must operate voltage	70% max. of rated voltage		
Must release voltage	10% min. of rated voltage		
Max. voltage	160% of rated voltage		
Power consumption	Approx. 200 mW		

Note: The must operate voltage is 75% or less of the rated voltage if the relay is mounted upside down.

Contact Ratings

Rated load	5 A at 250 VAC, 5 A at 30 VDC, resistive load (cosø=1)
Contact material	AgCdO (Cd free planned 1 Apr 05)
Rated carry current	5 A
Max. switching voltage	250 VAC, 30 VDC
Max. switching current	5 A
Max. switching power	1,250 VA, 150 W
Failure rate (reference value)	10 mA at 5 VDC

Note: P level: λ_{60} = 0.1 x 10^{-6}/operation.

Characteristics

Contact resistance (see note 2)	100 mΩ max.
Operate time	10 ms max.
Release time	5 ms max.
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric strength	3,000 VAC, 50/60 Hz for 1 min between coil and contacts 750 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	6,000 V (1.2 x 50 μs) between coil and contacts
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: Energized: 100 m/s^2
Endurance (see note 5)	Mechanical: 20,000,000 operations min. (at 18,000 operations/hr) Electrical: 100,000 operations min. (5 A at 250 VAC/30 VDC, resistive load) 300,000 operations min. (2 A at 250 VAC/30 VDC, resistive load)
Ambient temperature	Operating: -40°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 3 g

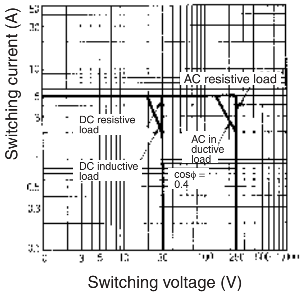
Approved Standards

UL508 (File No. E41515)/CSA C22.2 No.14 (File No. LR31928), DIN EN VDE 0627 (VDE Reg No. 132242)

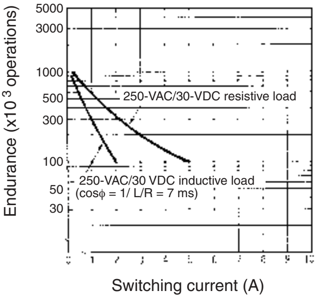
Model	Coil ratings	Contact Ratings
G6D-1A	5 to 24 VDC	5 A, 250 VAC 5 A, 30 VDC

Engineering Data

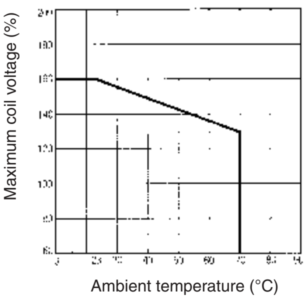
Maximum Switching Power



Endurance



Ambient Temperature vs. Maximum Coil Voltage

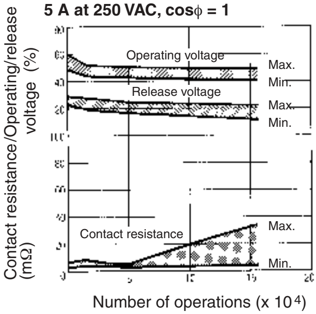


Note: The maximum coil voltage refers to the max mum value in a varying range of operating power voltage, not a continuous voltage.

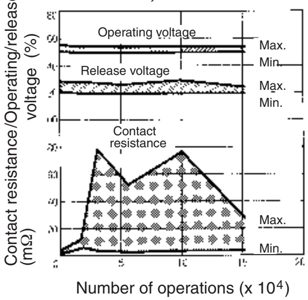
■ Reference Data

Electrical Endurance

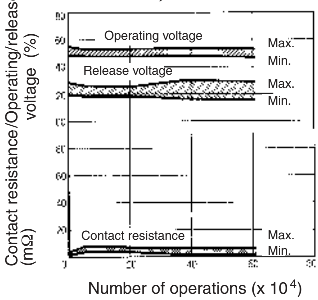
5 A at 250 VAC, cosφ = 1



5 A at 30 VDC, Resistive Load

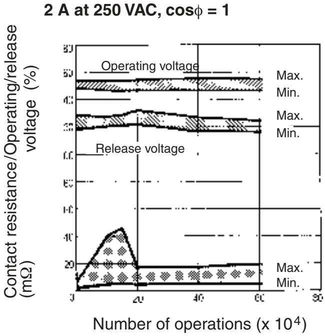


2 A at 30 VDC, Resistive Load



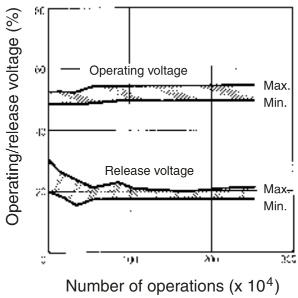
Electrical Endurance

2 A at 250 VAC, cosφ = 1

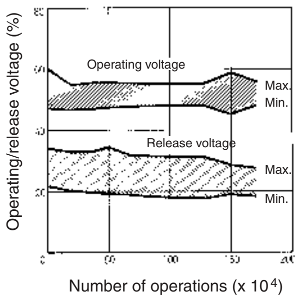


Actual Load Test Data

With OMRON's H3BA Timer (5 mA at 200 VAC)



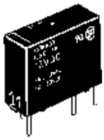
With OMRON's MA415A Contactor (40 mA at 200 VAC)

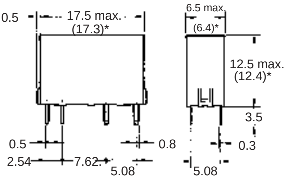


Dimensions

Note: **1.** All units are in millimeters unless otherwise indicated.
2. Orientation marks are indicated as follows:

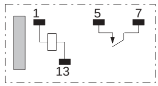
G6D-1A





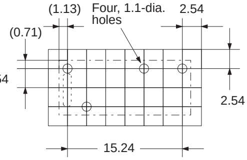
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)

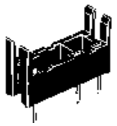


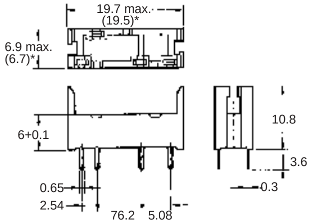
Mounting Holes (Bottom View)

Tolerance: 0.1



P6D-04P Socket

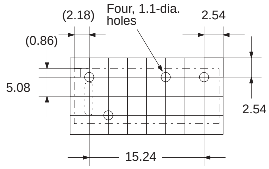




*Average value

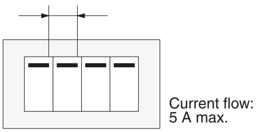
Mounting Holes (Bottom View)

Tolerance: 0.1

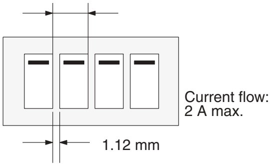


Precautions

More than two relays can be closely mounted right side up as shown in the following illustration.

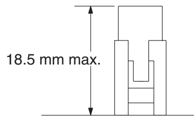


More than two relays can be closely mounted upside down as shown in the following illustration.



Note: The space between each relay required for heat radiation may vary with operating conditions. Contact your OMRON representative for details

SOCKET MOUNTING HEIGHT



When mounting the relay, insert it into the socket as vertically as possible so that the relay terminals contact securely with the contact pins on the socket.

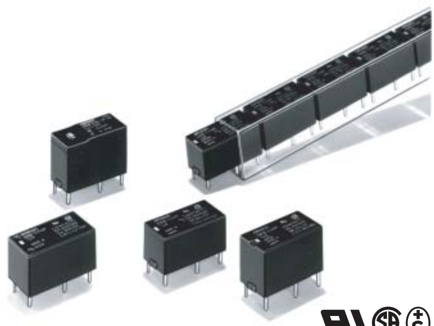
The P6D is flux-resistive. Do not wash the P6D with water.

Dismount the relay from the socket before soldering the socket to a PCB.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Sub-miniature Relay that Switches up to 5 A

- Sub-miniature: 20 x 10 x 10 mm (L x W x H).
- Low power consumption: 200 mW.
- Unique moving loop armature reduces relay size, magnetic interference, and contact bounce time.
- Single- and double-winding latching types also available.



Ordering Information

Classification	Contact form	Straight PCB	Self-clinching PCB
Single-side stable	SPST-NO	G6B-1114P-US	G6B-1114C-US
	SPST-NO+SPST-NC	G6B-2114P-US	G6B-2114C-US
	DPST-NO	G6B-2214P-US	G6B-2214C-US
	DPST-NC	G6B-2014P-US	G6B-2014C-US
Single-winding latching	SPST-NO	G6BU-1114P-US	G6BU-1114C-US
Double-winding latching	SPST-NO	G6BK-1114P-US	G6BK-1114C-US
High-capacity single-side stable	SPST-NO	G6B-1174P-US	G6B-1174C-US

Note: When ordering, add the rated coil voltage to the model number.
Example: G6B-1114P-US 12 VDC

Rated coil voltage

Model Number Legend

G6B □-□ □ □ □ - □ □ VDC

1 2 3 4 5 6 7

1. **Relay Function**
   None: Single-side stable
   U: Single-winding latching
   K: Double-winding latching
2. **Contact Form**
   21: SPST-NO + SPST-NC
   22: DPST-NO
   20: DPST-NC
   11: SPST-NO
3. **Contact Type**
   1: Standard
   7: High-capacity
4. **Enclosure Ratings**
   4: Fully sealed
5. **Terminals**
   P: Straight PCB
   C: Self-clinching PCB
6. **Approved Standards**
   US: UL/CSA certified
7. **Rated Coil Voltage**
   5, 6, 12, 24 VDC

Accessories (Order Separately)

Back Connecting Sockets

Applicable relay	Back connecting socket*
G6B(U)-1114P-US	P6B-04P
G6BK-1114P-US	P6B-06P
G6B-2114P-US	P6B-26P
G6B-1174P-US	P6B-04P

*Not applicable to the self-clinching type.

Removal Tool	P6B-Y1
Hold-down Clips	P6B-C2

Specifications

■ Coil Ratings

Single-side Stable Type

Item		SPST-NO					SPST-NO + SPST-NC, DPST-NO, DPST-NC				
Rated voltage		3 VDC	5 VDC	6 VDC	12 VDC	24 VDC	3 VDC	5 VDC	6 VDC	12 VDC	24 VDC
Rated current		67 mA	40 mA	33.3 mA	16.7 mA	8.3 mA	100 mA	60 mA	50 mA	25 v	12.5 mA
Coil resistance		45 Ω	125 Ω	180 Ω	720 Ω	2,880 Ω	30 Ω	83.3 Ω	120 Ω	480 Ω	1,920 Ω
Coil inductance	Armature OFF	0.20	0.28	0.31	1.2	4.9	–	–	–	–	–
(H) (ref. value)	Armature ON	0.18	0.26	0.28	1.1	4.1	–	–	–	–	–
Must operate voltage		70% max. of rated voltage					80% max. of rated voltage				
Must release voltage		10% min. of rated voltage									
Max. voltage		160% of rated voltage (at 23°C)					140% of rated voltage (at 23°C)				
Power consumption		Approx. 200 mW					Approx. 300 mW				

Single-winding Latching Type

Rated voltage		3 VDC	5 VDC	6 VDC	12 VDC	24 VDC
Rated current		67 mA	40 mA	33.3 mA	16.7 mA	8.3 mA
Coil resistance		45 Ω	125 Ω	180 Ω	720 Ω	2,880 Ω
Coil inductance	Armature OFF	0.20	0.28	0.31	1.2	4.9
(H) (ref. value)	Armature ON	0.18	0.26	0.28	1.1	4.1
Must operate voltage		70% max. of rated voltage				
Must release voltage		70% min. of rated voltage				
Max. voltage		160% of rated voltage (at 23°C)				
Power consumption		Approx. 200 mW				

Double-winding Latching Type

Rated voltage			3 VDC	5 VDC	6 VDC	12 VDC	24 VDC
Set coil	Rated current		93.2 mA	56 mA	46.8 mA	23.3 mA	11.7 mA
	Coil resistance		32.2 Ω	89.2 Ω	128.5 Ω	515 Ω	2,060 Ω
	Coil inductance	Armature OFF	0.11	0.15	0.18	0.52	1.2
	(H) (ref. value)	Armature ON	0.11	0.15	0.18	0.52	1.2
Reset coil	Rated current		93.2 mA	56 mA	46.8 mA	23.3 mA	11.7 mA
	Coil resistance		32.2 Ω	89.2 Ω	128.5 Ω	515 Ω	2,060 Ω
	Coil inductance	Armature OFF	0.11	0.15	0.18	0.52	1.2
	(H) (ref. value)	Armature ON	0.11	0.15	0.18	0.52	1.2
Must set voltage			70% max. of rated voltage				
Must reset voltage			70% min. of rated voltage				
Max. voltage			130% of rated voltage (at 23°C)				
Power consumption			Set coil: Approx. 280 mW Reset coil: Approx. 280 mW				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

■ Contact Ratings

Item	SPST-NO		SPST-NO + SPST-NC, DPST-NO, DPST-NC	
Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)
Rated load	5 A at 250 VAC; 5 A at 30 VDC	2 A at 250 VAC; 2 A at 30 VDC	5 A at 250 VAC; 5 A at 30 VDC	1.5 A at 250 VAC; 1.5 A at 30 VDC
Contact material	AgCdO (Cd free planned 1 Apr 05)			
Rated carry current	5 A			
Max. switching voltage	380 VAC, 125 VDC			
Max. switching current	5 A			
Max. switching power	1,250 VA, 150 W	500 VA, 60 W	1,250 VA, 150 W	375 VA, 80 W
Failure rate (reference value)	10 mA at 5 VDC			

Item	SPST-NO (High-capacity)	
Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)
Rated load	8 A at 250 VAC; 5 A at 30 VDC	2 A at 250 VAC; 2 A at 30 VDC
Contact material	AgCdO	
Rated carry current	8 A	
Max. switching voltage	380 VAC, 125 VDC	
Max. switching current	8 A	
Max. switching power	2,000 VA, 150 W	
Failure rate (reference value)	10 mA at 5 VDC	

Note: P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation

■ Characteristics

Contact resistance	30 mΩ max.
Operate (set) time	10 ms max. (mean value: 1-pole approx. 3 ms, 2-pole approx. 4 ms)
Release (reset) time	Single-side stable types: 10 ms max. (mean value: 1-pole approx. 1 ms, 2-pole approx. 2 ms) Latching types: 10 ms max. (mean value: approx. 3 ms)
Min. set/reset signal width	Latching type: 15 ms min. (at 23°C)
Max. operating frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	1,000 MΩ min. (at 500 VDC, at 250 VDC between set coil and reset coil)
Dielectric strength	3,000 VAC (Latching types: 2,000 VAC), 50/60 Hz for 1 min between coil and contacts 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity 250 VAC, 50/60 Hz for 1 min between set and reset coils 2,000 VAC, 50/60 Hz for 1 min between contacts of different polarity
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: Single-side stable: 100 m/s^2; Latching: 300 m/s^2
Endurance	Mechanical: 50,000,000 operations min. (at 18,000 operations/hr) Electrical: 100,000 operation min. (at 1,800 operations/hr)
Ambient temperature	Operating: -25°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Double-winding latching: Approx. 3.7 g High-capacity: Approx. 4.6 g Double pole: Approx. 4.5 g Other: Approx. 3.5 g

Note: The data shown above are initial values.

■ Approved Standards

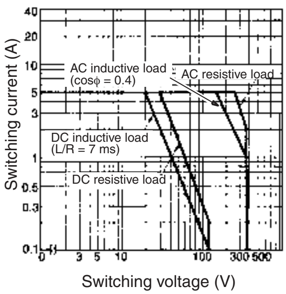
UL508 (File No. E41643)/CSA C22.2 No.14 (File No. LR31928)
EN 61810-1 (VDE Reg No. 5361)/Connector EN 61984 (VDE Reg No. 125603)

Model	Contact form	Coil ratings	Contact ratings
G6B-1114P-US G6B-1114C-US G6BU-1114P-US G6BU-1114C-US G6BK-1114P-US G6BK-1114C-US	SPST-NO	3 to 24 VDC	5 A, 250 VAC (general use) 5 A, 30 VDC (resistive load)
G6B-1174P-US G6B-1174C-US			8 A, 250 VAC (general use) 8 A, 30 VDC (resistive load)
G6B-2114P-US G6B-2114C-US G6B-2214P-US G6B-2214C-US G6B-2014P-US G6B-2014C-US	SPST-NO + SPST-NC DPST-NO DPST-NC		5 A, 250 VAC (general use) 5 A, 30 VDC (resistive load)

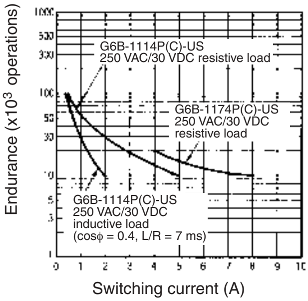
Engineering Data

G6B-1114P-US

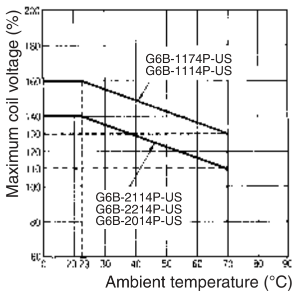
Maximum Switching Power



Endurance



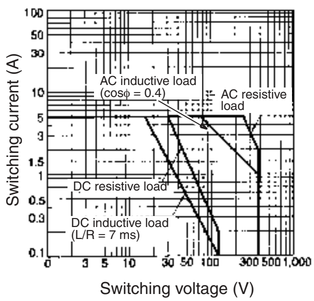
Ambient Temperature vs. Maximum Coil Voltage



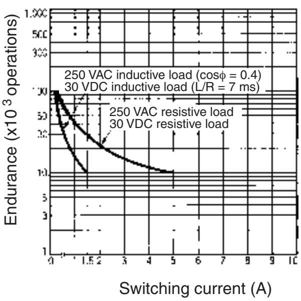
Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

G6B-2114P-US, G6B-2214P-US
G6B-2014P-US

Maximum Switching Power



Endurance

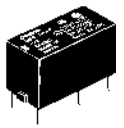


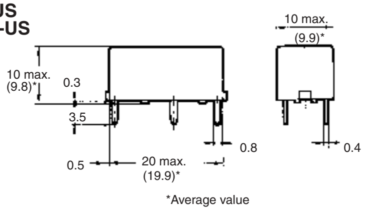
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.

2. Orientation marks are indicated as follows:

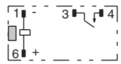
G6B-1114P-US
G6BU-1114P-US



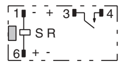


Terminal Arrangement/Internal Connections (Bottom View)

G6B-1114P, -1114C

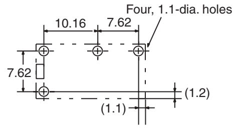


G6BU-1114P, -1114C

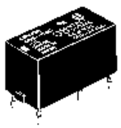


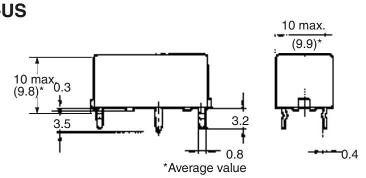
Mounting Holes (Bottom View)

G6B-1114P, -1114C
G6BU-1114P, -1114C

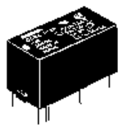


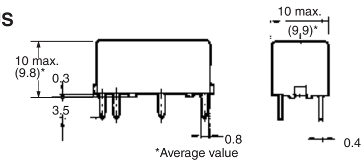
G6B-1114C-US
G6BU-1114C-US





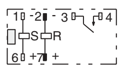
G6BK-1114P-US





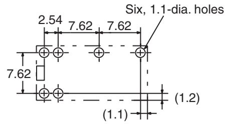
Terminal Arrangement/Internal Connections (Bottom View)

G6BK-1114P, -1114C

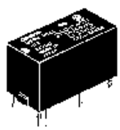


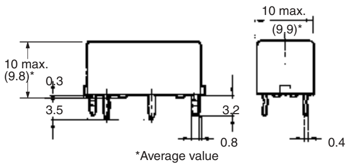
Mounting Holes (Bottom View)

G6BK-1114P, -1114C

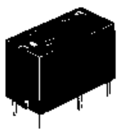


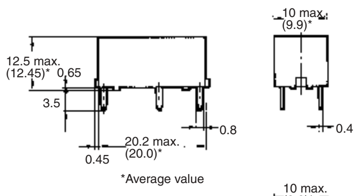
G6BK-1114C-US





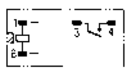
G6B-1174P-US



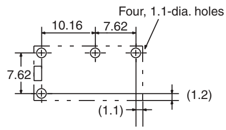


Terminal Arrangement/Internal Connections (Bottom View)

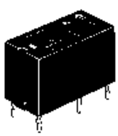
G6B-1174P, -1174C

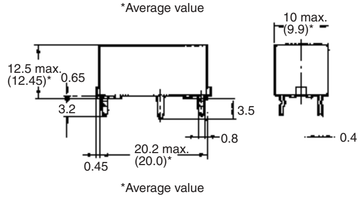


Mounting Holes (Bottom View)

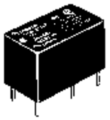


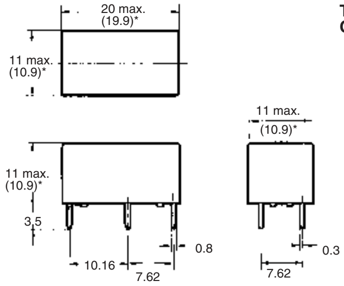
G6B-1174C-US





G6B-2114P-US
G6B-2214P-US
G6B-2014P-US

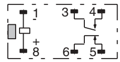




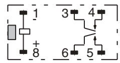
*Average value

Terminal Arrangement/Internal Connections (Bottom View)

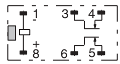
G6B-2114P-US



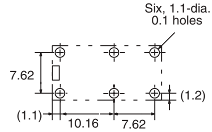
G6B-2214P-US



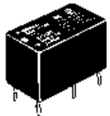
G6B-2014P-US

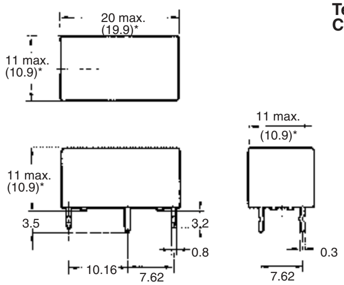


Mounting Holes (Bottom View)
Tolerance: 0.1



G6B-2114C-US
G6B-2214C-US
G6B-2014C-US

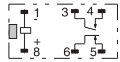




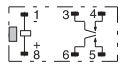
*Average value

Terminal Arrangement/Internal Connections (Bottom View)

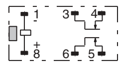
G6B-2114C-US



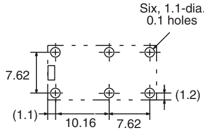
G6B-2214C-US



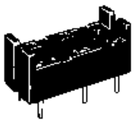
G6B-2014C-US

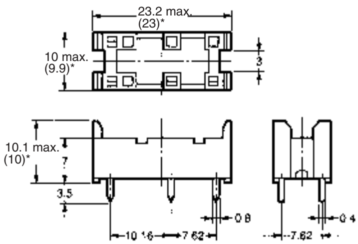


Mounting Holes (Bottom View)
Tolerance: 0.1



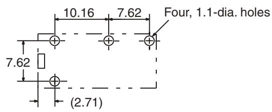
Back Connecting Socket
P6B-04P



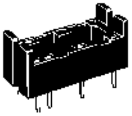


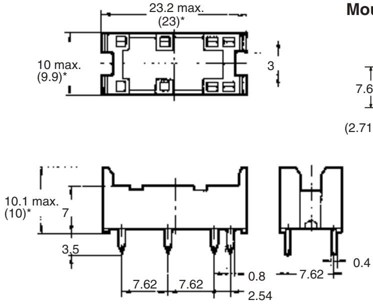
*Average value

Mounting Holes (Bottom View)



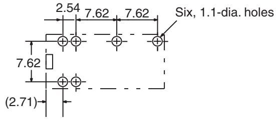
P6B-06P



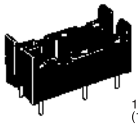


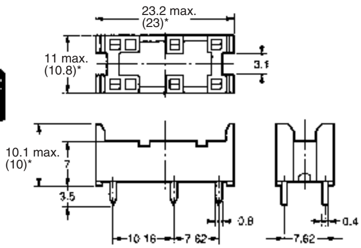
*Average value

Mounting Holes (Bottom View)



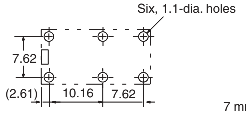
P6B-26P





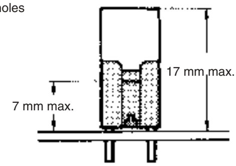
*Average value

Mounting Holes (Bottom View)



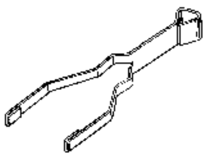
Note: Rated current of socket is 5 A max.

Mounting Height of Relay with Connecting Socket



Note: Height of G6B-1174P-US is 19.5 mm max.

Removal Tool
P6B-Y1



Hold-down Clips
P6B-C2

Note: P6B-C2 Hold-down Clips cannot be used for G6B-1174P-US.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Power Relay with 1.5mm Contact Gap

- ROHS compliant.
- Clearance between contact terminals of the same polarity: 1.5 mm min.
- Meets the requirements of European UPS standards. Note:UPS: Uninterruptible power systems.
- Conforms to EN 61810-1, UL508, CSA22.2.
- Meets VDE0700 requirements for household products according to VDE0110.
- Tracking resistance: CTI > 250 V.

Ordering Information

Contact form	Rated coil voltage	Model number
DPST-NO	12 VDC 24 VDC	G2RG-2A4

Model Number Legend

G2RG-□□□
1 2 3

1. Number of Poles

2: 2 poles

2. Contact Form

A: N.O. contact

3. Protective Structure

4: Plastic sealing

Specifications

■ Coil Ratings

Rated voltage	Rated current	Coil resistance	Must-operate voltage	Must-release Voltage	Maximum allowable voltage	Power consumption
12 VDC	66.6 mA	180 Ω	80% max.	10% min.	140% (at 23°C)	Approx. 800 mW
24 VDC	33.3 mA	720 Ω				

Note: **1.** The rated current and coil resistance are for a coil temperature of 23°C and have a tolerance of ±10%.
2. The operating characteristics given in the above table are for a coil temperature of 23°C.
3. The maximum allowable voltage is the maximum possible value of the voltage that can be applied to the relay coil.

Contact Ratings

Load	Resistive load
Contact mechanism	Single
Contact material	Ag alloy
Rated load	250 VAC, 8 A
Rated carry current	8 A
Maximum switching voltage	380 VAC, 125 VDC
Maximum switching current	8 A
Failure rate (P level, reference value) (See note.)	5 VDC, 10 mA

Note: This value is for a switching frequency of 120 operations/min.

Characteristics

Contact resistance (See note 1.)		100 mΩ max.
Operate time		15 ms max.
Release time		5 ms max.
Maximum switching frequency	**Mechanical**	18,000 operations/hr
	Electrical	1,800 operations/hr (under rated load)
Insulation resistance (See note 2.)		1,000 MΩ min. (at 500 VDC)
Dielectric strength		5,000 VAC, 50/60 Hz for 1 min between coil and contacts 3,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 1,000 VAC, 50/60 Hz for 1 min between contacts of the same polarity
Impulse withstand voltage		10 kV (1.2 × 50 μs)
Vibration resistance	**Destruction**	10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
	Malfunction	10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
Shock resistance	**Destruction**	1,000 m/s^2
	Malfunction	200 m/s^2 when energized
Endurance	**Mechanical**	1,000,000 operations min. (at 18,000 operations/hr)
	Electrical	10,000 operations min. (at 1,800 operations/hr under rated load)
Ambient operating temperature		–40 to 70 °C (with no icing or condensation)
Ambient operating humidity		5% to 85%
Weight		Approx. 17.2 g

Note 1. The above values are initial values (at an ambient temperature of 23°C.)

2. Measurement conditions: 5 VDC, 1 A, voltage-drop method.

3. Measurement conditions: Measured with a 500-VDC megohmmeter at the same places as the dielectric strength.

Approved Standards

The approved rated values for international standards are different to the individually specified characteristic values. Be sure to confirm that required standards are satisfied before actual use.

UL508 (File No. E41643)

Model	Contact form	Coil rating	Contact rating
G2RG-2A4	DPST-NO	12 to 24 VDC	8 A, 250 VAC (general use)

CSA C22.2 No. 14 (File No. LR31928)

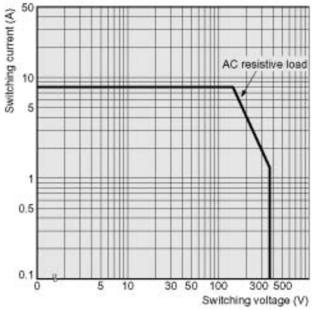
Model	Contact form	Coil rating	Contact rating
G2RG-2A4	DPST-NO	12 to 24 VDC	8 A, 250 VAC (general use)

EN 61810-1 (VDE Reg No. 6166)

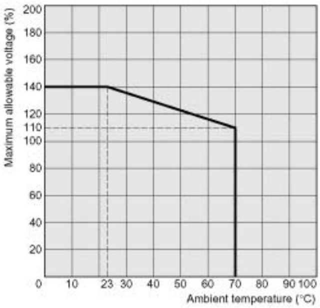
Model	Contact form	Coil rating	Contact rating
G2RG-2A4	DPST-NO	12, 24 VDC	8 A, 250 VAC (cosϕ = 1)

Engineering Data

Maximum Switching Capacity



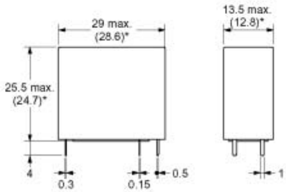
Ambient Temperature vs Maximum Allowable Voltage



Note: The maximum allowable voltage is the maximum possible value of the voltage that can be applied to the relay coil.

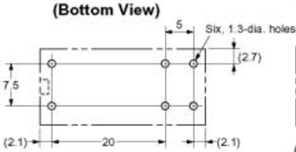
Dimensions

G2RG-2A4



*Figures in parentheses indicate average values.

PCB Mounting Holes (Bottom View)



Terminal Arrangement/ Internal Connections (Bottom View)

(The coil has no polarity.)

Precautions

■ Correct Use

Differences with the G2R

The G2RG-2A4 has the same terminal arrangement as the G2R-2A4 but the switching capacity and electrical endurance are different. Confirm that correct operation is possible in the actual operating conditions before using in applications.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Compact, High Isolation Relay

- ROHS compliant.
- Compact single pole relay with high isolation between coil and contacts.
- Up to 10 A 250 VAC switching on the NO contacts.
- Ensures a withstand impulse voltage of 8,000 V between the coil and contacts.
- Low coil power consumption (SPST-NO: 200 mW, SPDT: 400 mW.
- UL class F coil insulation.
- UL, CSA and EN approvals.
- Ideal for appliance and HVAC controls.
- Tracking resistance: CTI > 250.

Ordering Information

To Order: Select the part number and add the desired coil voltage rating (e.g. G5Q-14-EU-DC12)

Classification		Enclosure rating	Part number
Single contact, Class F coil	SPST-NO	Vented	G5Q-1A-EU
		Sealed	G5Q-1A4-EU
	SPDT	Vented	G5Q-1-EU
		Sealed	G5Q-14-EU

Specifications

Coil Ratings

Rated voltage (V)		Rated current	Coil resistance (Ω)	Pick-up voltage	Drop-out Voltage	Maximum voltage	Power consumption (mW)
SPDT	DC5	80	63	75% of max.	5% of max.	190% at 23°C	400
	DC12	33.3	360				
	DC24	16.7	1440				
SPST-NO	DC5	40	125				200
	DC12	16.7	720				
	DC24	8.3	2880				

Note: Rated current and coil resistance are measured at 23C with a tolerance of 10%.

■ Contact Ratings

Load	SPDT	SPDT-NO
Rated load (resistive)	10A at 250 VAC (NO) 3A at 250 VAC (NO) 3A at 125 VAC (NO) 5A at 30 VDC (NO) 3A at 250 VDC (NC) 3A at 125 VDC (NC) 3A at 30 VDC (NC)	10A at 250 VAC 3A at 250 VAC 3A at 125 VAC 5A at 30 VDC
Contact material	Ag Alloy	
Rated carry current	AC 10 A – DC 5A (NO)/ AC 3A – DC 3A (NC)	
Max. switching voltage	277 VAC, 30 VDC	
Max. switching current	AC: 10 A (NO)/3 A (NC) DC: 5 A (NO)/3 A (NC)	
Max. switching capacity	2500 VA, 150 W (NO) 750 VA, 90 W (NC)	
Min. permissible load	10 mA at 5 VDC (P level: $\lambda 60 = 0.1 \times 10^{-6}$ operation)	

■ Characteristics

Contact resistance (see note 2)	100 mΩ max.
Operate time	10 ms max.
Release time	5 ms max.
Insulation resistance (see note 3)	1,000 MΩ min.
Dielectric strength	4,000 VAC, 50/60 Hz for 1 min between coil and contacts 1000 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	8 kV (1.2 x 50 ms) between coil and contacts
Vibration resistance	Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours Malfunction: 10 to 55 Hz, 1.5-mm double amplitude for 5 minutes
Shock resistance	Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: 100 m/s^2 (approximately 10G)
Life expectancy (see note 4)	Mechanical 10,000,000 operations (18,000 operations per hour)
	Electrical 200,000 operations: 3 A (NO)/3 A (NC) at 125 VAC resistive load 100,000 operations: 3 A (NO)/3 A (NC) at 250 VAC 5 A (NO)/3 A (NC) at 30 VDC resistive load 25,000 operations: 10A (NO) at 250 VAC (900 operations per hour: 1 sec ON/3 sec OFF)
	Switching frequency: 1,800 operations per hour: 1 sec ON/1 SEC OFF
Ambient temperature	Operating & storage: -40°C to 85°C (with no icing)
Ambient humidity	Operating & storage: 5% to 85%

Note: 1. The data shown above are initial value.
2. The contact resistance is possible with 1 A applied at 5 VDC using a fall-of-potential method.
3. The insulation resistance is possible between coil and contacts and between contacts of the same polarity at 500 VDC.
4. The electrical life data items shown are possible at 23°C.

■ UL508 (File No. E41515) CSA C22.2 No. 14 (File No. LR31928)

Model	Coil ratings	Contact ratings	
		NO contacts	NO contacts
G5Q-EU	5-48 VDC	10 A, 250 VAC resistive 10 A, 30 VDC resistive 4 A, 120 VAC resistive, 100,000 ops. 4 FLA, 4 LRA 120 VAC, definite purpose, 100,000 operations.	3 A, 250 VAC resistive 3 A, 30 VDC resistive 4 LRA, 2 FLA, 120 VAC definite purpose, 100,000 operations.

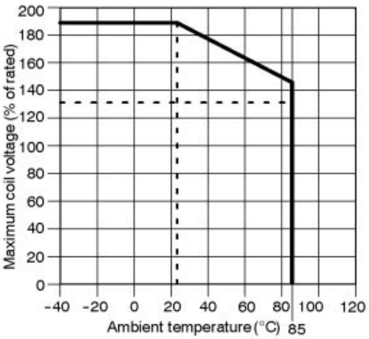
Note: Ratings for both NO contacts and NC contacts are given at 105°C (221°F).

EN 61810-1 (VDE Reg. no 125314)

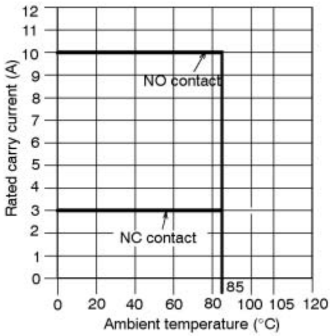
Model	Coil ratings	Contact ratings
G5Q-EU	5,12, 24 VDC	10 A, 250 VAC 5 A, 30 VDC (NO) 3 A, 250 VDC (NC)

Engineering Data

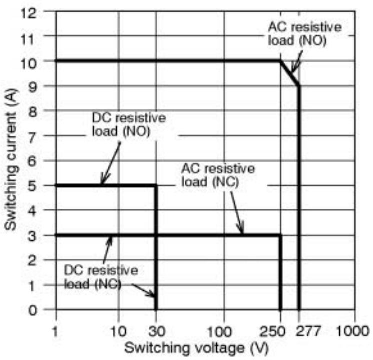
■ AMBIENT TEMPERATURE VS. MAXIMUM VOLTAGE



■ AMBIENT TEMPERATURE VS. RATED CARRY CURRENT



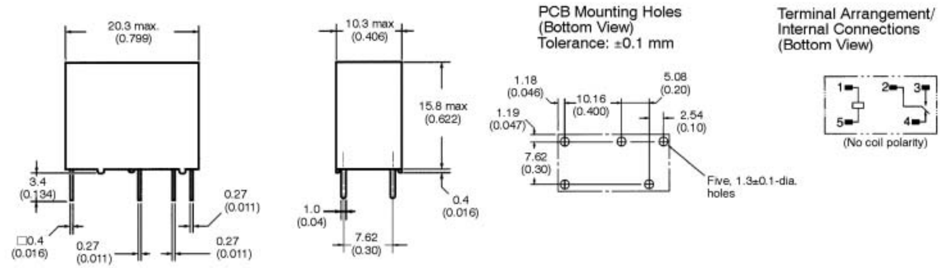
■ MAX. SWITCHING CAPACITY



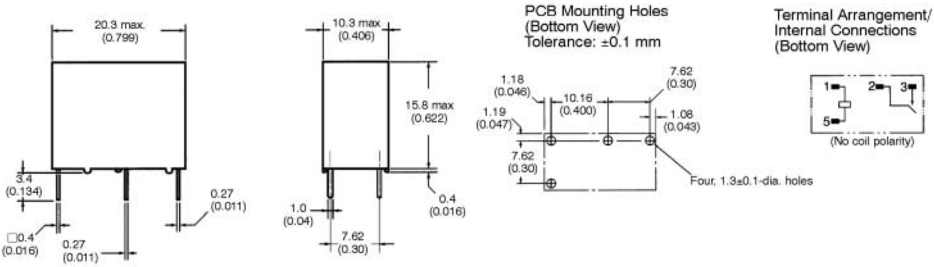
Dimensions

Note: All units are in millimeters unless otherwise indicated.

■ G5Q-EU SPDT



■ SPST-NO



Precautions

CAUTION

Do not touch the terminals of the relay or the charted part of the socket when power is supplied to the Relay. Otherwise, an electric shock may occur,

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Heavy-duty Miniature Relay

- ROHS compliant.
- Incorporates environment-friendly, cadmium-free contacts.
- Variety of contact forms: SPDT or SPST-NO (continuous current rating: 8 A)
- Dielectric strength of 4 kV at a distance of 8 mm.
- Tracking resistance: CTI>250
- Conforms to EN 61810-1.

Ordering Information

Classification	Enclosure ratings	Contact material	Contact form	
			SPST-NO	SPDT
Standard	Fully sealed	AgNi + gold plating (0.35 μ)	G6RN-1A	G6RN-1
		AgNi + gold plating (4 μ)	G6RN-1A-AP4	G6RN-1-AP4

Note: When ordering, add the rated coil voltage to the model number.
Example: G6RN-1A 24 VDC
Rated coil voltage

Model Number Legend

G6RN-□□-□ □ VDC
1 2 3 4

1. Number of Poles

1: 1 pole

2. Contact Form

None: SPDT
A: SPST-NO

3. Contact Material

None: AgNi + gold plating (0.35 μ)
ANI: AgNi
AP4: AgNi + gold plating (4 μ)

4. Rated Coil Voltage

5, 12, 24, 48 VDC

Specifications

Coil Ratings

Rated voltage	5 VDC	12 VDC	24 VDC	48 VDC
Rated current	44 mA	18.3 mA	9.2 mA	5.2 mA
Coil resistance	114 Ω	655 Ω	2,620 Ω	9,210 Ω
Must operate voltage	70% max. of rated voltage			
Must release voltage	10% min. of rated voltage			
Max. voltage	110% of rated voltage at max. temperature (at 85°C)			
Power consumption	Approx. 220 mW		Approx. 250 mW	

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C..

Contact Ratings

Load	Resistance load (cosø = 1)
Rated load	8 A at 250 VAC: 5 A at 30 VDC
Rated carry current	8 A
Max. switching voltage	250 VAC; 30 VDC, (400 VAC) (see note)
Max. switching current	AC 8 A; DC 5 A
Max. switching power	2,000 VA; 150 W
Failure rate (reference value)	5 VDC 10 mA (for gold plating 0.35 μ min.)

Note: Electrical life expectancy is reduced.

Characteristics

Operate time	Approx. 6 ms
Release time	Approx. 3 ms
Max. operating frequency	Mechanical: 36,000 operations/hr Electrical: 360 operations/hr (under rated load)
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric strength	4,000 VAC between coil and contacts 1,000 VAC between contacts
Creepage/clearance	8 mm min. between coil and contacts
Vibration resistance	Malfunction: NO: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude) NC: 10 to 55 to 10 Hz, 0.4mm single amplitude (0.8mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2
Endurance	Mechanical: 10,000,000 operations min. Electrical: Approx. 100,000 operations
Ambient temperature	Operating: -40°C to 85°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 9 g
Protection class	II according to VDE0106 Part 1
Insulation class	C/250, B/380 according to VDE0110

■ Approved Standards

EC255 (Includes Reinforced Insulation and Spacing Requirements According to IEC65, 335-1, 950, EN60335-1, 60950)

Standard	Contact form	Coil ratings	Contact rating	Conditions
IEC255-1-00 IEC255-0-20	SPDT SPST-NO	5, 6, 12, 18, 24 36, 48 VDC	8A at 250 VAC (cosø = 1) (see note)	Pollution: degree: 3 Overvoltage category: II Operating range: class 1 Pick-up class: class C Ambient temperature: -40°C to 85°C

■ EN 61810-1 (VDE Reg. no 0435 part no 201 & 102/Reg. no 6135)

Standard	Contact form	Coil ratings	Contact rating	Conditions
VDE0435 Part201 VDE0435 Part120 EN 61810	SPDT SPST-NO	5, 6, 12, 18, 24 36, 48 VDC	8 A at 250 VAC (cosø = 1)	Insulation group according to VDE0110 C/250, B/380 Operating range: class 1 Pick-up class: class C Ambient temperature: -40°C to 85°C

■ UL508 (File No. E41515)

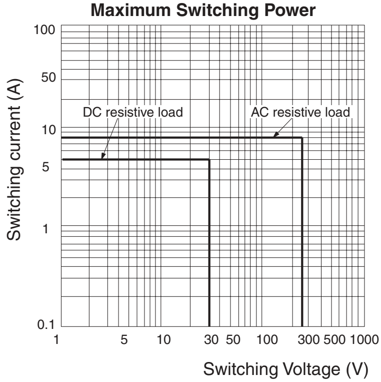
Coil ratings	Contact ratings
5 to 48 VDC	10 A at 250 VAC (resistive) 5 A at 30 VDC (resistive) 8 A at 250 VAC (resistive) (ambient temperature: 85°C)

■ CSA C22.2 (File No. LR31928-543)

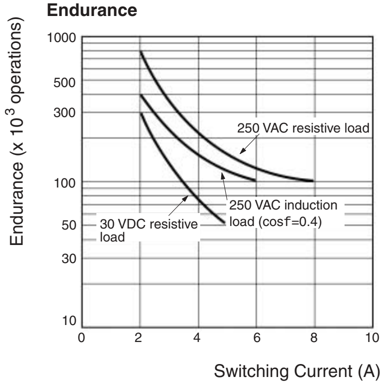
Coil ratings	Contact ratings
5 to 48 VDC	10 A at 250 VAC (resistive) 5 A at 30 VDC (resistive) 8 A at 250 VAC (resistive) (ambient temperature: 85°C)

Engineering Data

Maximum Switching Power

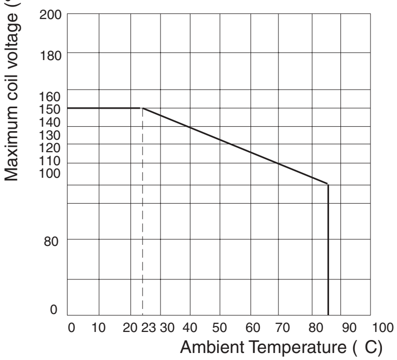


Endurance



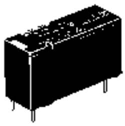
Engineering Data

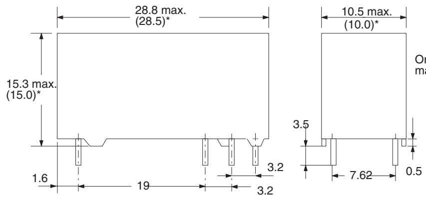
Ambient Temperature vs Maximum Coil Voltage



Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

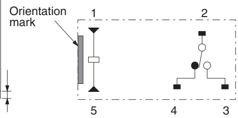
SPDT Type





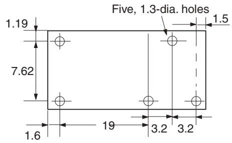
*Average value.

Terminal Arrangement/ Internal Connections (Bottom View)

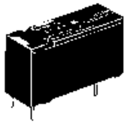


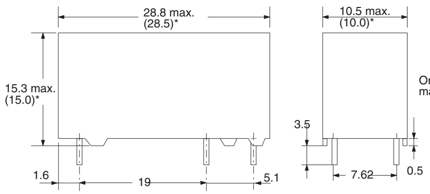
Mounting Holes (Bottom View)

Tolerance: ±0.1



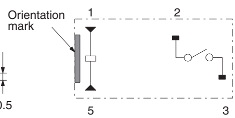
SPST-NO Type





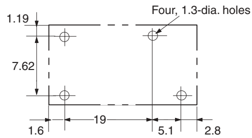
*Average value.

Terminal Arrangement/ Internal Connections (Bottom View)



Mounting Holes (Bottom View)

Tolerance: ±0.1



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

A Cubic, Single-pole 10-A Power Relay

- ROHS compliant.
- Sub-miniature ‘sugar cube’ relay with universal terminal footprint.
- Conforms to EN 61810-1, UL508, CSA22.2.
- Tracking resistance: CTI>250 (-VD type).
- UL class-F coil insulation model available (UL class-B coil insulation for standard model).
- High switching power: 10 A.
- Two types of seal available; flux protection and fully sealed.
- Withstands impulse of up to 4,500 V.
- 400-mW and 360-mW coil power consumption types available.
- Pre-soldered terminals.

Ordering Information

Enclosure Rating	Contact Form	Contact Material	
		$AgSnO_2$	AgSnIn
Flux protection	SPDT	G5LE-1 G5LE-1-VD G5LE-1-CF	G5LE-1-ASI G5LE-1-ASI-VD G5LE-1-ASI-CF
	SPST-NO	G5LE-1A G5LE-1A-VD G5LE-1A-CF	G5LE-1A-ASI G5LE-1A-ASI-VD G5LE-1A-ASI-CF
Fully sealed	SPDT	G5LE-14 G5LE-14-VD G5LE-14-CF	G5LE-14-ASI G5LE-14-ASI-VD G5LE-14-ASI-CF
	SPST-NO	G5LE-1A4 G5LE-1A4-VD G5LE-1A4-CF	G5LE-1A4-ASI G5LE-1A4-ASI-VD G5LE-1A4-ASI-CF

Note: When ordering, add the rated coil voltage to the model number.
Example: G5LE-1 12 VDC
Rated coil voltage

Model Number Legend

G5LE - □ □ □ - □ - □ - □ - □ □ VDC
1 2 3 4 5 6 7 8

1. Number of Poles

1: 1 pole

2. Contact Form

None: SPDT
A: SPST-NO

3. Enclosure ratings

None: Flux protection
4: Fully sealed

4. Contact Material

None: $AgSnO_2$
ASI: AgSnIn

5. Insulation System

None: Class B
CF: Class F (UL and CSA only)

6. Coil Power Consumption/Coil Characteristic

None: Approx. 400 mW
36: Approx. 360 mW

7. Approved Standards

None: UL, CSA, TÜV
VD: UL, CSA, TÜV and VDE
(Not applicable with “-CF.”)

8. Rated Coil Voltage

5, 9, 12, 24, 48 VDC

Specifications

■ Coil Ratings

400-mW Type

Rated voltage	5 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current	79.4 mA	45 mA	33.3 mA	16.7 mA	8.33 mA
Coil resistance	63 Ω	200 Ω	360 Ω	1,440 Ω	5,760 Ω
Must operate voltage	75% max. of rated voltage				
Must release voltage	10% min. of rated voltage				
Max. voltage	130% of rated voltage at 85°C, 170% of rated voltage at 23°C				
Power consumption	Approx. 400 mW				

Note: The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

360-mW Type

Rated voltage	5 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current	72 mA	40 mA	30 mA	15 mA	7.5 mA
Coil resistance	70 Ω	225 Ω	400 Ω	1,600 Ω	6,400 Ω
Must operate voltage	75% max. of rated voltage				
Must release voltage	10% min. of rated voltage				
Max. voltage	130% of rated voltage (at 85°C), 170% of rated voltage (at 23°C)				
Power consumption	Approx. 360 mW				

Note: The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

■ Contact Ratings

Load	Resistive load (cosø = 1)
Rated Load	10 A at 120 VAC; 8 A at 30 VDC; 10 A at 250 VAC (12 + 24 VDC)
Rated Carry Current	10 A
Max. switching voltage	250 VAC, 125 VDC (30 VDC when UL/CSA standard is applied)
Max. switching current	AC: 10 A; DC: 8 A
Max. switching power	1,200 VA, 240 W
Failure rate (reference value)	100 mA at 5 VDC

Characteristics

Contact resistance	100 mΩ max.
Operate time	10 ms max.
Release time	5 ms max.
Bounce Time	Operate: Approx. 0.6 ms Release: Approx. 7.2 ms
Max. switching frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr at rated load
Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min between coil and contacts 750 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	4,500 V (1.2 50 µs) between coil and contacts
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 100 m/s^2
Endurance	Mechanical: 10,000,000 operations min. (at 18,000 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr) 36,000 operations min. (10 A at 250 VAC)
Ambient temperature	Operating: -40°C to 85°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 12 g

Approved Standards

UL508, UL114, UL478, UL325, UL873, UL1409, UL1950 (File No. E41643)/CSA C22.2 No. 14, No. 1 (File No. LR34815)

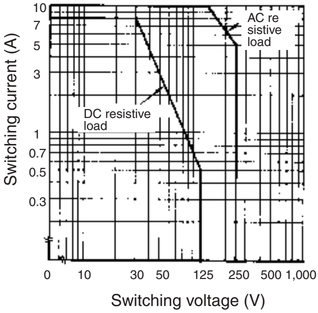
Model	Coil ratings	Contact ratings
G5LE	3 to 48 VDC	12 A, 120 VAC (resistive load 30,000 cycles) 10 A, 250 VAC (general use) 10 A, 125 VAC (general use 100,000 cycles) 8 A, 30 VDC (resistive load) 6 A, 277 VAC (general use) NO: 1/6 hp, 120 VAC (50,000 cycles) 1/3 hp, 125 VAC, 70°C 30K with Class 130B system 65°C 30K with Class 105 Coil insulation system TV-3, 120 VAC TV-5, 120 VAC (For ASI only) NC: 1/8 hp, 120 VAC (50,000 cycles) 1/10 hp, 120 VAC (50,000 cycles))

EN 61810-1, EN 60255, IEC (VDE TUV Reg No. R9151267, VDE Reg No. 6850UG)

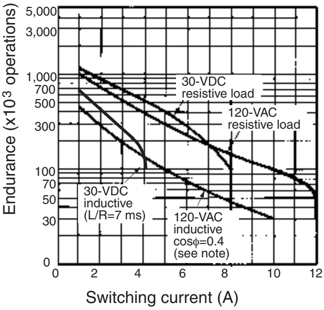
Model	Coil ratings	Contact ratings
G5LE	Approx. 400 mW 3, 5, 6, 9, 12, 24, 48 VDC Approx. 360 mW 5, 6, 12, 24, 48 VDC	10A, 250 VAC (resistive load 50,000 cycles at 85°C) 5A, 30VDC 2.5A, 250VAC (cos = 0.4)

Engineering Data

Maximum Switching Power
G5LE

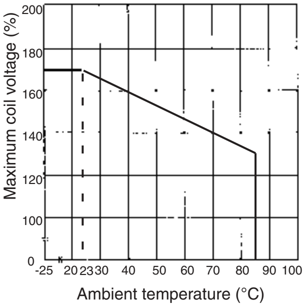


Endurance
G5LE



Note: Same curve as for 250-VAC resistive load

Ambient Temperature vs. Maximum Coil Voltage



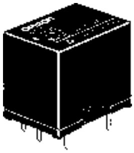
Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

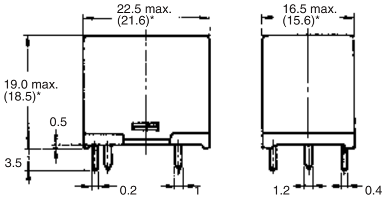
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.

2. Orientation marks are indicated as follows:

G5LE-1
G5LE-1A

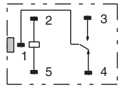




*Average value

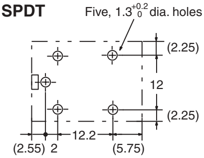
Terminal Arrangement/Internal Connections (Bottom View)

SPDT

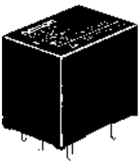


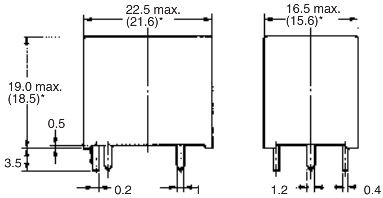
Mounting Holes (Bottom View)
Tolerance: 0.1 mm unless specified

SPDT



G5LE-14
G5LE-1A4

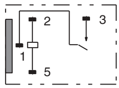




*Average value

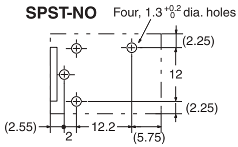
Terminal Arrangement/Internal Connections (Bottom View)

SPST-NO



Mounting Holes (Bottom View)
Tolerance: 0.1 mm unless specified

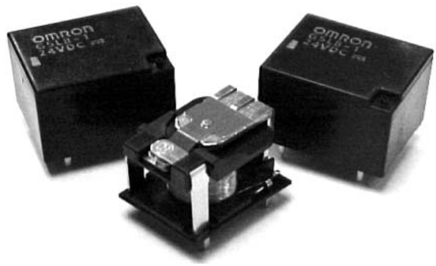
SPST-NO



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

A Cubic, Single-pole 10-A Power Relay

- ROHS compliant.
- L 19.6 x W 15.6 x H 15.2 (mm)
- Subminiature 'Sugar Cube' relays.
- Standard 360mW – Lower Coil power consumption.
- Standard Class B insulation, (Class F available).
- Standard CTI 175, (CTI 250 available).
- Withstands impulse of up to 4,500V.
- Approved to EN 61810-1



Ordering Information

Sealing	Contact Form	Contact Material
		$AgSn0_2$
Unsealed (vent hole)	SPDT	G5LB-1
	SPST-NO	G5LB-1A
Plastic-sealed	SPDT	G5LB-14
	SPST-NO	G5LB-1A4

Note: When ordering, add the rated coil voltage to the number.
Examples : G5LB-1 12 VDC
Rated Coil Voltage

Model Number Legend

G5LB □ □ □ □ □ □ □ □ VDC
1 2 3 4 5 6 7 8

1. **Number of Poles**
   1: 1 pole

2. **Contact Form/Contact Construction**
   None: SPDT
   A: SPST-NO

3. **Sealing/Protective Construction**
   None: Unsealed (vent hole)
   4: Sealed

4. **Contact Type**
   None: Standard (Silver Tin Oxide)

5. **Coil Power Consumption**
   None: 360mW
   40: 400mW
   60: 600mW (UL and CSA only)

6. **6. Tracking Index and Insulation**
   None: CTI >175 – Class B Insulation
   25: CTI >250 – Class F Insulation

7. **Optional Suffix(es)**
   None: Standards
   May include additional numbers(s) and / or letter(s) for sales purposes

8. **Rated Coil Value**

■ Coil Ratings

Rated voltage	3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	36 VDC	48 VDC
Rated current	123.3 mA	72.0 mA	60.8 mA	40.8 mA	30.7 mA	15.2 mA	10.2 mA	7.6 mA
Coil resistance	24.3 Ω	69.4 Ω	98.7 Ω	220.4 Ω	390.6 Ω	1575.4 Ω	3533.7 Ω	6287.4 Ω
Must operate voltage	75% of rated voltage (max.)							
Must release voltage	10% of rated voltage (min.)							
Max. voltage	130% of rated voltage at 85°C, 170% of rated voltage at 23°C							
Power consumption	Approx. 360 mW							

Note: The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

Rated voltage	3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	36 VDC	48 VDC
Rated current	136.4 mA	80.0 mA	67.8 mA	45.7 mA	32.8 mA	17.0 mA	11.3 mA	8.5 mA
Coil resistance	22.0 Ω	62.5 Ω	88.5 Ω	196.9 Ω	366.0 Ω	1,407.7 Ω	3,196.8 Ω	5,638.0 Ω
Must operate voltage	75% of rated voltage (max.)							
Must release voltage	10% of rated voltage (min.)							
Max. voltage	130% of rated voltage at 85°C, 170% of rated voltage at 23°C							
Power consumption	Approx. 400 mW							

Note: The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

Rated voltage	3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	36 VDC	48 VDC
Rated current	200.2 mA	120.0 mA	100.7 mA	66.8 mA	50.4 mA	25.3 mA	16.6 mA	12.6 mA
Coil resistance	15.0Ω	41.7 Ω	59.6 Ω	134.8 Ω	237.9 Ω	947.6 Ω	2164.8 Ω	3800.0 Ω
Must operate voltage	75% of rated voltage (max.)							
Must release voltage	10% of rated voltage (min.)							
Max. voltage	130% of rated voltage at 85°C, 170% of rated voltage at 23°C							
Power consumption	Approx. 600 mW							

Note: The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

■ Contact Ratings

Load	Resistive load (cos Ø=1)
Rated load	10A at 120 VAC, 8A at 30 VDC & 10A at 250 VAC
Rated carry current	10A
Max. switching voltage	250 VAC, 125 VDC (30 VDC when UL/CSA standard is applied)
Max. switching current	AC: 10A; DC: 8A
Max. switching capacity	1,200 VA, 240 W & 2,500 VA
Min. permissible load	100 mA at 5 VDC

■ Approved Standards

UL 325, UL 873 (File No. E41643)/CSA 22.2 No. 14 (File No. LR34815)
EN 61810-1 (VDE Reg. no A662)

Model	Coil Ratings	Contact Ratings
G5LB	3 - 48 VDC	10A 250 VAC 10A 30 VDC

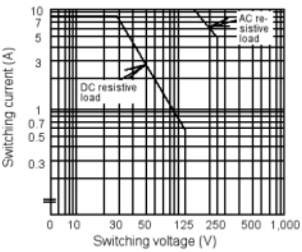
■ Characteristics

Contact resistance	100 mΩ max.
Operate time	10 ms max.
Release time	5 ms max.
Max. switching frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	100MΩ min. (at 500 VDC)
Dielectric strength	750 VAC, 50/60 Hz for 1 min. between contacts of same polarity 2,000 VAC, 50/60 Hz for 1 min. between coil and contacts
Impulse withstand voltage	4,500V between coil and contacts, 1.2 x 5 μsec
Vibration resistance	Destruction: 10 to 55Hz, 1.5mm double amplitude Malfunction: 10 to 55Hz, 1.5mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: 100 m/s^2 (approx. 10G)
Life expectancy	Mechanical: 10,000,000 operations min. (at 18,000 operations/hr) Electrical: *100,000 operations min. (at 1,800 operations/hr, 10A 120VAC)
Ambient temperature	Operating: -40°C to 85°C
Ambient humidity	Operating: 35% to 85°C
Weight	Approx. 10g*

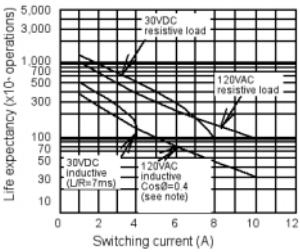
*G5LB-1

Engineering Data

Max. Switching Capacity G5LB-1

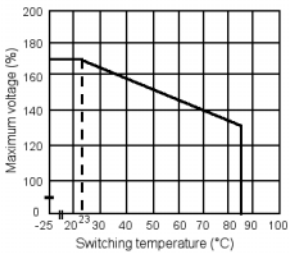


Life Expectancy G5LB-1



Note: Curve 120VAC inductive CosØ=0.4 is same for 250VAC resistive load.

Ambient Temp. Vs Max. Voltage



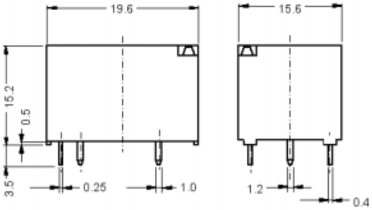
Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

Dimensions

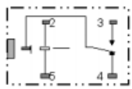
Note: 1. All units are milimeters unless otherwise indiated
2. Orientation marks are indicated as follow:

■ SPDT Types

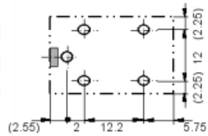
G5LB-1



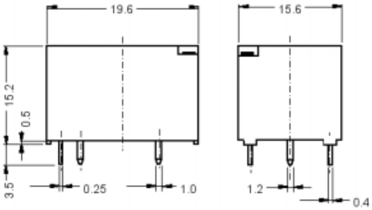
Terminal Arrangemment/ Internal Connections (Bottom View)



Mounting Holes (Bottom View) Tolerance: ±0.1mm

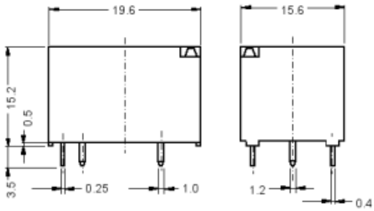


G5LB-14

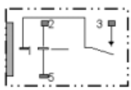


■ SPST Types

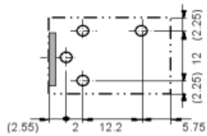
G5LB-1A



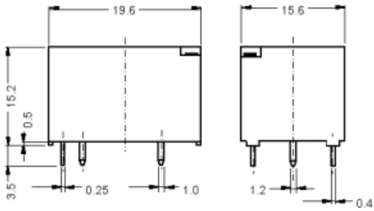
Terminal Arrangemment/ Internal Connections (Bottom View)



Mounting Holes (Bottom View) Tolerance: ±0.1mm



G5LB-1A4



A Cubic, Single-pole 10-A Power Relay

- ROHS compliant.
- Subminiature ‘sugar cube’ relay with universal terminal footprint.
- Conforms to EN 61810-1, UL508, CSA22.2.
- High switching power: 10 A. 250 VAC
- Two types of seal available; flux protection and fully sealed.
- Withstands impulse of up to 4,500 V.
- Coil power consumption: 360 mW
- Tracking resistance: CTI >250

Ordering Information

Enclosure ratings	Contact form	Model
Flux protection	SPDT	G5LC-1-EU
	SPST-NO	G5LC-1A-EU
Fully sealed	SPDT	G5LC-14-EU
	SPST-NO	G5LC-1A4-EU

Note: When ordering, add the rated coil voltage to the model number.
Example: G5LC-1-EU 12 VDC
Rated coil voltage

Model Number Legend

G5LC - □ □ □ - EU □ VDC
1 2 3 4

1. Number of Poles

1: 1 pole

2. Contact Form

None: SPDT
A: SPST-NO

3. Enclosure Ratings

None: Flux protection
4: Fully sealed

4. Rated Coil Voltage

5, 12, 24 VDC

■ Coil Ratings

Rated voltage	5 VDC	12 VDC	24 VDC
Rated current	71.5mA	30 mA	15.1 mA
Coil resistance	69.9 Ω	390 Ω	1.585 Ω
Must operate voltage	75% max. of rated voltage		
Must release voltage	10% min. of rated voltage		
Max. voltage	110% of rated voltage at 85°C		
Power consumption	Approx. 360 mW		

Note: The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

■ Contact Ratings

Load	Resistive load (cosφ = 1)
Rated Load	10 A at 250 VAC (NO), 12 A at 120 VAC (NO), 5 A at 120 VAC (NO/NC) 10 A at 24 VDC (NO), 5 A at 24 VDC (NO/NC)
Rated Carry Current	12 A
Max. switching voltage	250 VAC, 125 VDC (30 VDC when UL/CSA standard is applied)
Max. switching current	AC: 12 A; DC: 12 A
Max. switching power	1,200 VA, 240 W
Failure rate (reference value)	100 mA at 5 VDC (P level: $\lambda 60 = 0.1 \times 10^{-6}$ operation)

■ Characteristics

Contact resistance	100 mΩ max.
Operate time	10 ms max.
Release time	5 ms max.
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min between coil and contacts 750 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	4,500 V (1.2 x 50 ms) between coil and contacts
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 100 m/s^2
Endurance	Mechanical: 10,000,000 operations min. (at 36,000 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr)
Ambient temperature	Operating: -25°C to 85°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 12 g

■ Approved Standards

UL508, UL873 (File No. E41643)/CSA C22.2 No. 14, No. 0 (File No. LR31928)

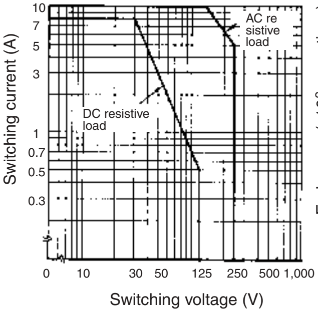
Model	Coil ratings	Contact ratings
G5LC-EU	5 to 24 VDC	NO: 10 A, 250 VAC (general use) 10 A, 24 VDC (resistive load) 1/8 hp, 120 VAC (50,000 cycles) 12 A, 120 VAC (resistive load) NC: 1/8 hp, 120 VAC (50,000 cycles)

EN 61810-1 (VDE Reg. no 40002435)

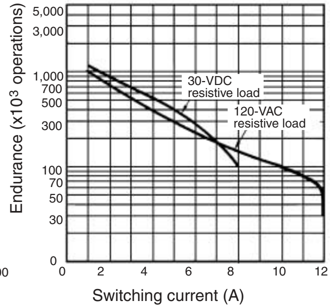
Model	Coil ratings	Contact ratings
G5LC-EU	Approx. 360 mW 5, 12, 24 VDC	5 A, 250 VAC (NC) 10 A, 250 VAC (NO)

Engineering Data

Maximum Switching Power
G5LC

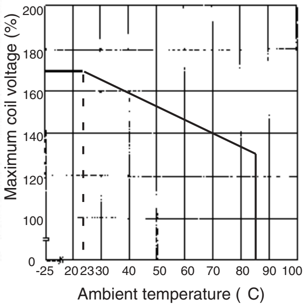


Endurance
G5LC



Note: Same curve as for 250-VAC resistive load

Ambient Temperature vs. Maximum Coil Voltage

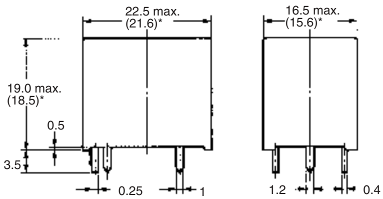


Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Orientation marks are indicated as follows:

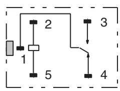
G5LC-EU



*Average value

Terminal Arrangement/Internal Connections (Bottom View)

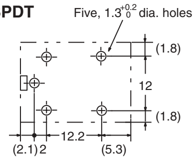
SPDT



Mounting Holes (Bottom View)

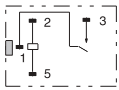
Tolerance: 0.1 mm unless specified

SPDT



Terminal Arrangement/Internal Connections (Bottom View)

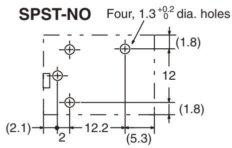
SPST-NO



Mounting Holes (Bottom View)

Tolerance: 0.1 mm unless specified

SPST-NO



Precautions

Basic Information

Before actually committing any component to a mass-production situation, OMRON strongly recommends situational testing, in as close to actual production situations as possible. One reason is to confirm that the product will still perform as expected after surviving the many handling and mounting processes involved in mass production. Also, even though OMRON relays are individually tested a number of times, and each meets strict requirements, a certain testing tolerance is permissible. When a high-precision product uses many components, each depends upon the rated performance thresholds of the other components. Thus, the overall performance tolerance may accumulate into undesirable levels. To avoid problems, always conduct tests under the actual application conditions.

General

To maintain the initial characteristics of a relay, exercise care that it is not dropped or mishandled. For the same reason, do not remove the case of the relay; otherwise, the characteristics may degrade. Avoid using the relay in an atmosphere containing sulfuric acid (SO2), hydrogen sulfide (H2S), or other corrosive gases. Do not continuously apply a voltage higher than the rated maximum voltage to the relay. Never try to operate the relay at a voltage and a current other than those rated.

Do not use the relay at temperatures higher than that specified in the catalog or data sheet.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Flat Relays that Switch 10-A/15-A Loads with New Quick-connect Terminals

- ROHS compliant.
- Ideal for switching power in household appliances or for outputs from industrial devices.
- Sub-miniature dimensions: 22 x 16 x 11 mm (L x W x H).
- High-sensitivity models available with low power consumption (150 mW).
- UL and CSA approved.
- Fully sealed models and quick-connect terminal models available (#187 load contact

Ordering Information

Contact form	Enclosure ratings	General purpose	High-sensitivity	High-capacity	Quick-connect terminals
SPST-NO	Flux protection	G5CA-1A	G5CA-1AH	G5CA-1AE	G5CA-1AE-TP-E
–	Fully sealed	G5CA-1A4	G5CA-1A4H	–	–

Note: 1. When ordering, add the rated coil voltage to the model number.
Example: G5C-1 12 VDC
Rated coil voltage
2. High-capacity models with a Fully sealed structure are not available.
3. Standard or high-sensitivity models with quick-connect terminals are not available.

Model Number Legend

G5CA-1A – □–□–□–□–□ VDC
1 2 3 4 5 6

1. **Number of Poles**
   1A: 1 pole (SPST-NO)

2. **2. Enclosure Ratings**
   None: Flux protection
   4: Fully sealed

3. **3. Terminal Form**
   None: PCB Terminal
   TP: Quick-connect terminal (#187)

4. **Special functions**
   None: Standard
   E: High capacity

5. **Coil Consumption**
   None: Standard
   H: High sensitivity

6. **6. Rated coil voltage**
   5, 12, 24 VDC

Standard Specifications
Contact configuration: SPST-NO
Enclosure ratings: Flux protection
Terminal form: PCB terminal

Coil Ratings

Item	Standard, high-capacity, or quick-connect terminals			High-sensitivity		
	5 VDC	12 VDC	24 VDC	5 VDC	12 VDC	24 VDC
Rated current	40 mA	16.7 mA	8.3 mA	30 mA	12.5 mA	6.25 mA
Coil resistance	125 Ω	720 Ω	2,880 Ω	167 Ω	960 Ω	3,840 Ω
Must operate voltage	75% max. of rated voltage			80% max. of rated voltage		
Must release voltage	10% min. of rated voltage					
Max. voltage	150% (standard)/130% (high-capacity, quick-connect terminals) of rated voltage (at 23°C)			150% (at 23°C)		
Power consumption	Approx. 200 mW			Approx. 150 mW		

Contact Ratings

Item	Standard		High-sensitivity		High-capacity, or quick-connect terminals	
	Resistive load (cosø = 1)	Inductive load (cosø = 0.4, L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4, L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4, L/R = 7 ms)
Contact Material	Silver Alloy (cadmium free)		Silver Alloy (cadmium free)		Silver Alloy (cadmium free)	
Rated load	10 A at 250 VAC; 10 A at 30 VDC	3 A at 250 VAC; 3 A at 30 VDC	10 A at 250 VAC; 10 A at 30 VDC	3 A at 250 VAC; 3 A at 30 VDC	15 A at 110 VAC; 10 A at 30 VDC	5 A at 110 VAC; 3 A at 30 VDC
Rated carry current	10 A		10 A		15 A	
Max. switching voltage	250 VAC, 125 VDC		250 VAC, 125 VDC		250 VAC, 125 VDC	
Max. switching current	10 A		10 A		15 A	
Max. switching	2,500 VA, 300 W	750 VA, 90 W	2,500 VA, 300 W	750 VA, 90 W	2,500 VA, 300 W	750 VA, 90 W

Characteristics

Contact resistance	30 mΩ max. (Quick-connect terminals type: 100 mΩ max.)
Operate time	10 ms max. (High-sensitivity type: 15 ms max.)
Release time	10 ms max.
Insulation resistance	1,000 MΩ min.
Dielectric strength	2,500 VAC, 50/60 Hz for 1 min between contacts of same polarity 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	4,500 V (1.2 x 50 µs) between coil and contacts
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 200 m/s^2
Endurance	Mechanical: 20,000,000 operations min. at 18,000 operations/hr Electrical: 300,000 operations min. (100,000 operations min. for Fully sealed Type) at 1,200 operations/hr under rated load of 10 A at 250 VAC; 100,000 operations min. under load of 15 A at 110 VAC for high-capacity models 100,000 operations min. at 1,200 operations/hr under rated load of 10 A at 30 VDC
Ambient temperature	Operating: -25°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 8 g (for TP model: Approx. 9.6 g)

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

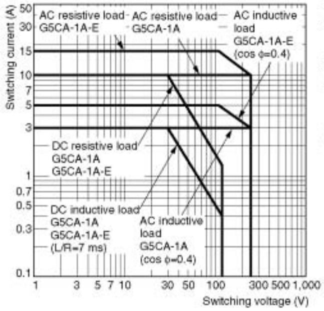
■ Approved Standards

UL508 (File No. E41515)/CSA C22.2 No.14 (File No. LR31928)
IEC/VDE standard/TUV Certified: IEC255/VDE0435 (Certification No.R9351138)

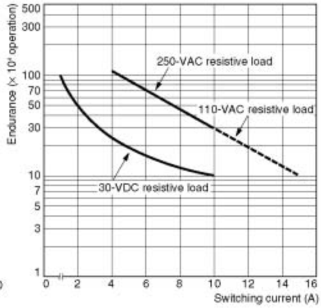
Model	Coil ratings
3 to 100 VDC	15 A, 125 VAC 10 A, 250 VAC 10 A, 30 VDC (resistive load only)

■ Engineering Data

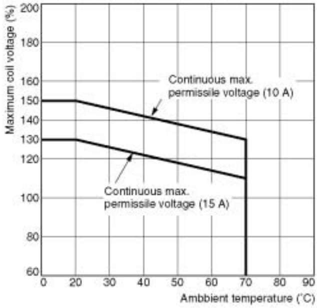
Maximum Switching Power



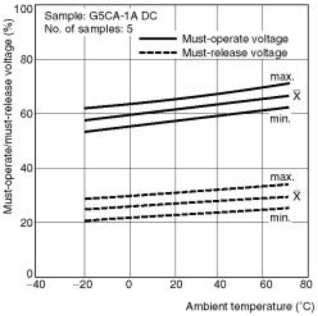
Endurance



Ambient Temperature vs. Maximum Coil Voltage

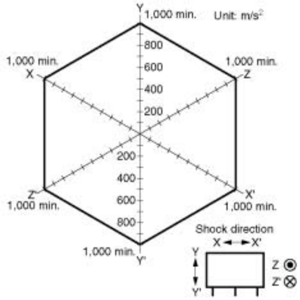


Operating Temperature vs. Must-operate/Must-release Voltage



Note: The "maximum voltage" is the maximum voltage that can be applied to the relay coil.

Malfunction Shock

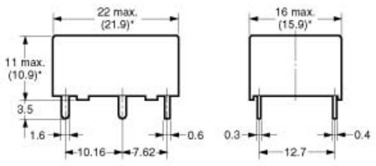


No. of samples: 10
Measured value: The value at which malfunction occurs in the contact when the contact is subjected to shock three times each in six directions for three axes.
Standard: 200 m/s²

Dimensions

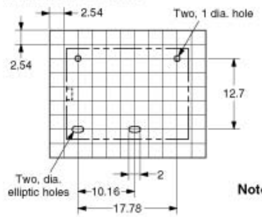
Note: 1. All units are in millimeters unless otherwise indicated.
2. Orientation marks are indicated as follows: 

G5CA-1A(-E)
G5CA-1A4(-H)

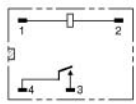


* Average value

Mounting Holes (PCB)
(BOTTOM VIEW)
Tolerance: ±0.1 mm



Terminal Arrangement/ Internal Connections
(BOTTOM VIEW)

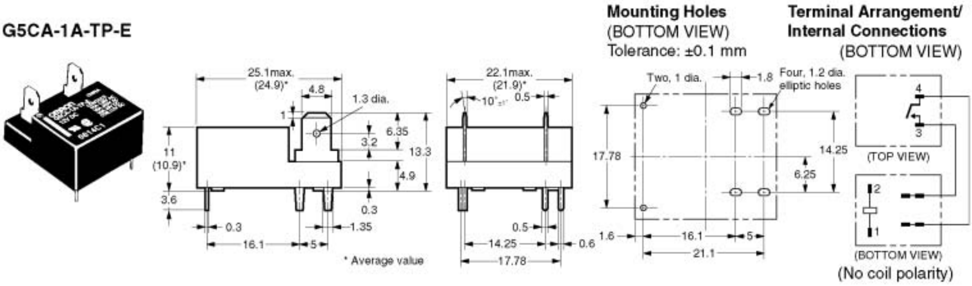


(No coil polarity)

Note: Orientation marks are indicated as follows:

Dimensions (cont)

G5CA-1A-TP-E

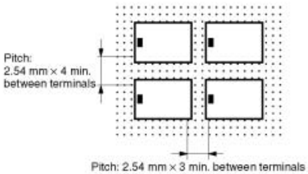


Precautions

■ Precautions for Correct Use

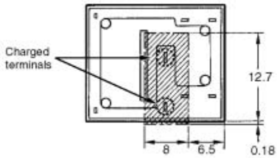
Installation

Make sure that sufficient space is provided between relays when installing two or more relays side by side to facilitate heat dissipation. Insufficient heat dissipation may result in the relay malfunctioning.



Charged Terminals

The section marked with dotted circles (indicated by arrows) in the following diagram includes the charged terminals of the relay. When the relay is mounted on a PCB, make sure that there are no metal patterns on the section of the PCB facing the portion of the relay shaded in the following diagram.



Quick-connect Terminal Connections

- Do not pass current through the PCB of the load contactterminals (quick-connect terminals).
- The terminals are compatible with Faston receptacle #187 and are suitable for positive-lock mounting.

  Use only Faston terminals with the specified numbers. Select leads for connecting Faston receptacles with wire diameters that are within the allowable range for the load current. Do not apply excessive force to the terminals when mounting or dismounting the Faston receptacle.

  Insert and remove terminals carefully one at a time. Do not insert terminals on an angle, or insert/remove multiple terminals at the same time.

  The following positive-lock connectors made by AMP are recommended. Contact the manufacturer directly for details on connectors including availability.

Other Precautions

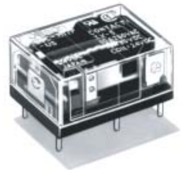
- The G5CA is a power relay designed for applications switching power loads such as heaters in electric household appliances. Do not use the G5CA to switch micro loads less than 100 mA, such as in signal applications.
- Use fully sealed models if the relays will require washing. Fluxprotection models may malfunction or the relay's performance may be otherwise adversely affected if cleaning fluid enters the relay.

Type	Type Receptacle terminals (See note.)	Positive housing
#187 terminals (width: 4.75 mm)	AMP 170330-1 (170324-1) AMP 170331-1 (170325-1) AMP 170332-1 (170326-1)	AMP 172074-1 (natural color) AMP 172074-4 (yellow) AMP 172074-5 (green) AMP 172074-6 (blue)

Note: The numbers shown in parentheses are for air-feeding

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

SPST-NO Type Breaks 10-A Loads; SPST-NO + SPST-NC Type Breaks 8-A Load

- Compact: 20 x 15 x 10 mm (L x W x H).
- Low power consumption: 200 mW.
- Flux protection or fully sealed construction available.
- Unique moving loop armature reduces relay size, magnetic interference, and contact bounce.
- Single- and double-winding latching types also available

Ordering Information

Classification	Contact form	Straight PCB		Self-clinching PCB	
		Flux protection	Fully sealed	Flux protection	Fully sealed
Single-side stable	SPST-NO	G6C-1117P-US	G6C-1114P-US	G6C-1117C-US	G6C-1114C-US
	SPST-NO + SPST-NC	G6C-2117P-US	G6C-2114P-US	G6C-2117C-US	G6C-2114C-US
Single-winding latching	SPST-NO	G6CU-1117P-US	G6CU-1114P-US	G6CU-1117C-US	G6CU-1114C-US
	SPST-NO + SPST-NC	G6CU-2117P-US	G6CU-2114P-US	G6CU-2117C-US	G6CU-2114C-US
Double-winding latching	SPST-NO	G6CK-1117P-US	G6CK-1114P-US	G6CK-1117C-US	G6CK-1114C-US
	SPST-NO + SPST-NC	G6CK-2117P-US	G6CK-2114P-US	G6CK-2117C-US	G6CK-2114C-US

Note: When ordering, add the rated coil voltage to the model number.
Example: G6C-1117P-US 12 VDC
Rated coil voltage

Model Number Legend

G6C □ - □ □ □ □ - □ □ VDC
1 2 3 4 5 6 7

1. **Relay Function**
   None: Single-side stable
   U: Single-winding latching
   K: Double-winding latching
2. **Contact Form**
   11: SPST-NO
   21: SPST-NO + SPST-NC
3. **Contact Type**
   1: Standard
4. **Enclosure Ratings**
   7: Flux protection
   4: Fully sealed
5. **Terminals**
   P: Straight PCB
   C: Self-clinching PCB
6. **Approved Standards**
   US: UL/CSA certified
7. **Rated Coil Voltage**
   3, 5, 6, 12, 24 VDC

Accessories (Order Separately)

Back Connecting Sockets

Applicable relay	Back connecting socket*
G6C(U)-1114P-US G6C(U)-1117P-US G6C(U)-2114P-US G6C(U)-2117P-US	P6C-06P
G6CK-1114P-US G6CK-1117P-US G6CK-2114P-US G6CK-2117P-US	P6C-08P

*Not applicable to the self-clinching type.
The operating current for the socket is 5 A max

Removal Tool	P6B-Y1
Hold-down Clips	P6B-C2

Specifications

Coil Rating

Single-side Stable Type

Rated voltage		3 VDC	5 VDC	6 VDC	12 VDC	24 VDC
Rated current		67 mA	40 mA	33.3 mA	16.7 mA	8.3 mA
Coil resistance		45 Ω	125 Ω	180 Ω	720 Ω	2,880 Ω
Coil inductance	**Armature OFF**	0.078	0.22	0.36	1.32	4.96
(H) (ref. value)	**Armature OFF**	0.067	0.18	0.29	1.13	4.19
Must operate voltage		70% max. of rated voltage				
Must release voltage		70% min. of rated voltage				
Max. voltage		160% of rated voltage (at 23°C)				
Power consumption		Approx. 200 mW				

Single-side Latching Type

Rated voltage		3 VDC	5 VDC	6 VDC	12 VDC	24 VDC
Rated current		67 mA	40 mA	33.3 mA	16.7 mA	8.3 mA
Coil resistance		45 Ω	125 Ω	180 Ω	720 Ω	2,880 Ω
Coil inductance	**Armature OFF**	0.09	0.25	0.36	1.75	5.83
(H) (ref. value)	**Armature OFF**	0.06	0.20	0.24	1.17	3.84
Must operate voltage		70% max. of rated voltage				
Must release voltage		70% min. of rated voltage				
Max. voltage		160% of rated voltage (at 23°C)				
Power consumption		Approx. 200 mW				

Double-winding Latching Type

Rated voltage			3 VDC	5 VDC	6 VDC	12 VDC	24 VDC
Set coil	Rated current		93.5 mA	56.0 mA	46.7 mA	23.3 mA	11.7 mA
	Coil resistance		32.1 Ω	89.3 Ω	129 Ω	514 Ω	2,056 Ω
	Coil inductance	Armature OFF	0.03	0.07	0.10	0.37	1.56
	(H) (ref. value)	Armature OFF	0.02	0.06	0.08	0.32	1.18
Reset coil	Rated current		93.5 mA	56.0 mA	46.7 mA	23.3 mA	11.7 mA
	Coil resistance		32.1 Ω	89.3 Ω	129 Ω	514 Ω	2,056 Ω
	Coil inductance	Armature OFF	0.03	0.08	0.12	0.47	1.46
	(H) (ref. value)	Armature OFF	0.02	0.07	0.10	0.38	1.13
Must set voltage			70% max. of rated voltage				
Must reset voltage			70% min. of rated voltage				
Max. voltage			130% of rated voltage (at 23°C)				
Power consumption			Set coil: Approx. 280 mW Reset coil: Approx. 280 mW				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.
3. The minimum pulse width of the set and reset voltage is 20 ms.

■ Contact Ratings

Item	SPST-NO		SPST-NO+SPST-NC	
Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load cosø = 0.4; L/R = 7 ms)
Rated load	10 A at 250 VAC; 10A at 30 VDC	5 A at 30 VAC; 5 A at 30 VDC	8A at 30 VAC; 8A at 30 VDC;	3.5 A at 250 VAC; 3.5 A at 30 VDC
Contact material	AgCdO (Cd free planned 1 Apr 05)			
Rated carry current	10 A		8 A	
Max. switching voltage	380 VAC, 125 VDC (the case of latching 250 VAC, 125 VDC)			
Max. switching current	10 A		8 A	
Max. switching power	2,500 VA, 300 W	1,250 VA, 220 W	2,000 VA, 240 W	875 VA, 170 W
Failure rate (reference value)	10 mA at 5 VDC			

Characteristics

Contact resistance	30 mΩ max.
Operate (set) time	10 ms max. (mean value: approx. 5 ms)
Release (reset) time	10 ms max. (mean value: approx. 2 ms; latching types: mean value: approx. 5 ms)
Bounce Time	Operate: 5 ms max. Release: 5 ms max.
Min. set/reset signal width	Latching type: 20 ms (at 23°C)
Max. switching frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	1,000 MΩ min. (at 500 VDC, at 250 VDC between set coil and reset coil)
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min between coil and contacts 2,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity 250 VAC, 50/60 Hz for 1 min between set and reset coils
Impulse withstand voltage	6.000 V (1.2 x 50 μs) between coil and contacts (latching types: 4,500 V, 1.2 50 μs)
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 100 m/s^2
Ambient temperature	Operating: -25°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Endurance	Mechanical: 50,000,000 operations min. (at 18,000 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr)
Weight	Approx. 5.6 g

Approved Standards
UL508 (File No. E41643)

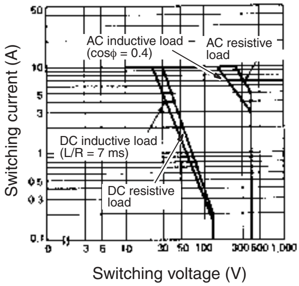
Model	Contact form	Coil rating	Contact rating
G6C-1114P-US G6C-1114C-US G6C-1117P-US G6C-1117C-US	SPST-NO	3 to 60 VDC	10 A, 250 VAC (general use) 10 A, 30 VDC (resistive load) 1/6 hp, 125 VAC 1/4 hp, 125 VAC 1/4 hp, 250 VAC 1/3 hp, 250 VAC TV-5 600 W, 120 VAC (tungsten) 530 VA, 20 to 265 VAC, 2 A max. (pilot duty) 43.2 VA, 30 VDC (pilot duty) 12LRA, 2.2FLA, 30 VDC (30,000 cycle)
G6C-2114P-US G6C-2114C–US G6C-2117P-US G6C-2117C-US	SPST-NO + SPST-NC		8 A, 250 VAC (general use) 8 A, 30 VDC (resistive load) 1/6 hp, 125 VAC 1/4 hp, 125 VAC 1/4 hp, 250 VAC TV-5 600 W, 120 VAC (tungsten)

■ Approved Standards (continued)
CSA C22.2 No.14 (File No. LR31928)
EN 61810-1 (VDE Reg. no 2413)

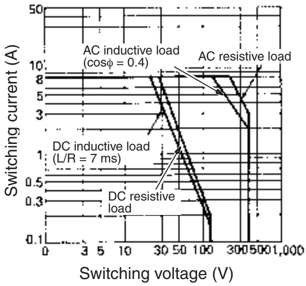
Model	Contact form	Coil rating	Contact rating
G6C-1114P-US G6C-1114C-US G6C-1117P-US G6C-1117C-US	SPST-NO	3 to 60 VDC	10 A, 250 VAC (general use) 10 A, 30 VDC (resistive load) 1/6 hp, 125 VAC 1/4 hp, 125 VAC 1/4 hp, 250 VAC 1/3 hp, 250 VAC TV-5 600 W, 120 VAC (tungsten)
G6C-2114P-US G6C-2114C-US G6C-2117P-US G6C-2117C-US	SPST-NO + SPST-NC	3 to 60 VDC	8 A, 250 VAC (general use) 8 A, 30 VDC (resistive load) 1/6 hp, 125 VAC 1/4 hp, 125 VAC 1/4 hp, 250 VAC TV-5 600 W, 120 VAC (tungsten)

■ Engineering Data

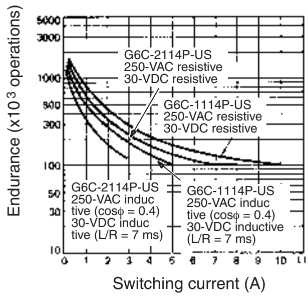
Maximum Switching Power
SPST-NO



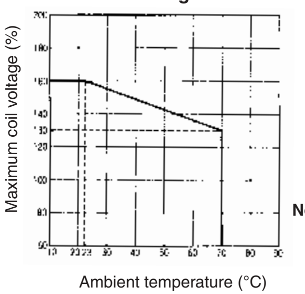
SPST-NO + SPST-NC



Endurance



Ambient Temperature vs. Maximum Coil Voltage



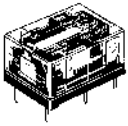
Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

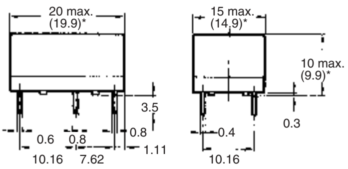
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.

2. Orientation marks are indicated as follows:

G6C-□117P-US

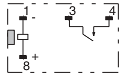




*Average value

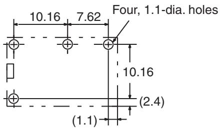
G6C-1117P-US, G6C-1117C-US
G6C-1114P-US, G6C-1114C-US

Terminal Arrangement/Internal Connections (Bottom View)

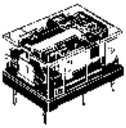


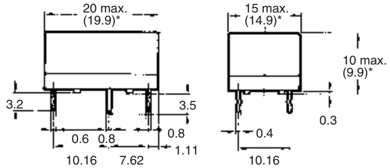
Mounting Holes (Bottom View)

Tolerance: 0.1



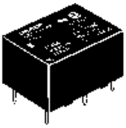
G6C-□117C-US

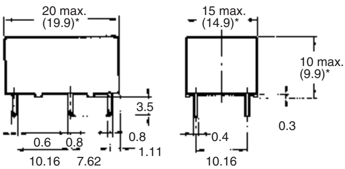




*Average value

G6C-□114P-US

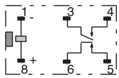




*Average value

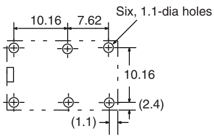
G6C-2117P-US, G6C-2117C-US
G6C-2114P-US, G6C-2114C-US

Terminal Arrangement/Internal Connections (Bottom View)

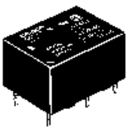


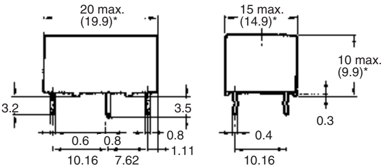
Mounting Holes (Bottom View)

Tolerance: 0.1



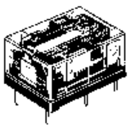
G6C-□114C-US

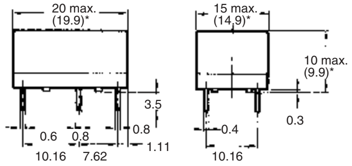




*Average value

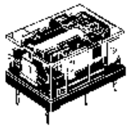
G6C-□117P-US

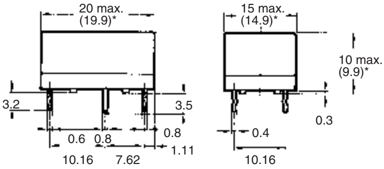




*Average value

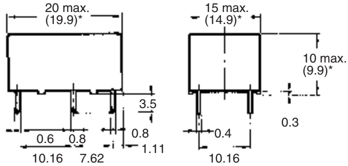
G6C-□117C-US





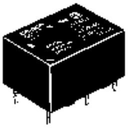
*Average value

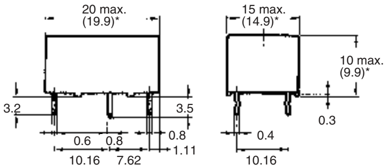
G6C-□114P-US



*Average value

G6C-□114C-US

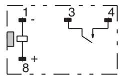




*Average value

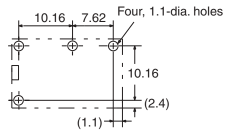
G6C-1117P-US, G6C-1117C-US
G6C-1114P-US, G6C-1114C-US

Terminal Arrangement/Internal Connections (Bottom View)



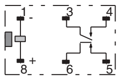
Mounting Holes (Bottom View)

Tolerance: 0.1



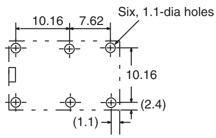
G6C-2117P-US, G6C-2117C-US
G6C-2114P-US, G6C-2114C-US

Terminal Arrangement/Internal Connections (Bottom View)

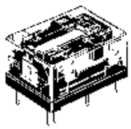


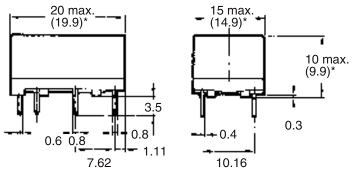
Mounting Holes (Bottom View)

Tolerance: 0.1



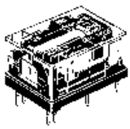
G6CK-□117P-US

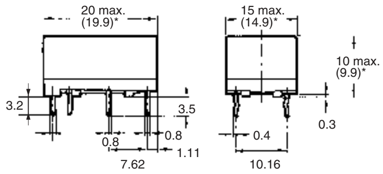




*Average value

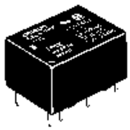
G6CK-□117C-US

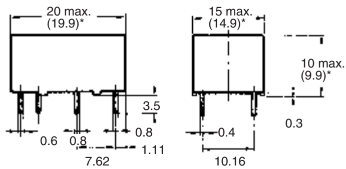




*Average value

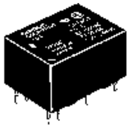
G6CK-□114P-US

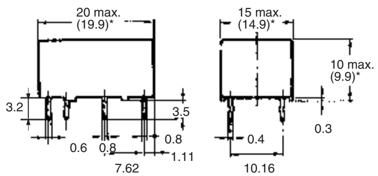




*Average value

G6CK-□114C-US

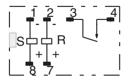




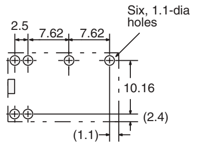
*Average value

G6CK-1117P-US, G6CK-1117C-US
G6CK-1114P-US, G6CK-1114C-US

Terminal Arrangement/Internal Connections (Bottom View)

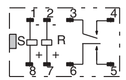


Mounting Holes (Bottom View)

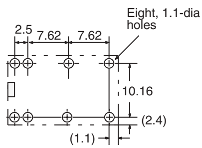


G6CK-2117P-US, G6CK-2117C-US
G6CK-2114P-US, G6CK-2114C-US

Terminal Arrangement/Internal Connections (Bottom View)

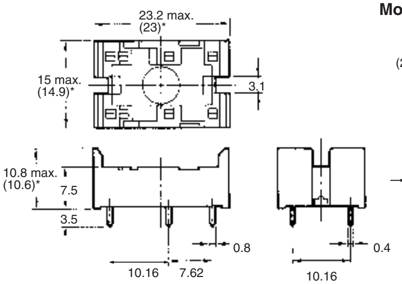


Mounting Holes (Bottom View)



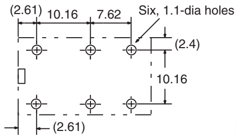
Back Connecting Sockets

P6C-06P

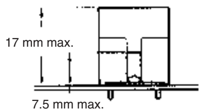


*Average value

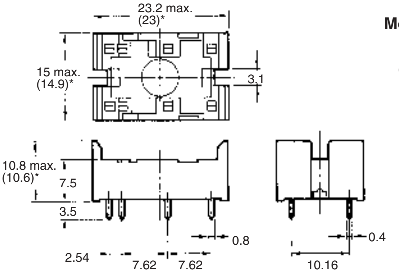
Mounting Holes (Bottom View)



Mounting Height of Relay with Connecting Socket

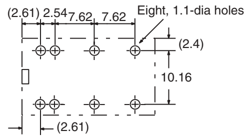


P6C-08P



*Average value

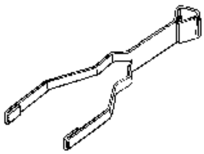
Mounting Holes (Bottom View)



Note: Rated current of socket max. 5 A

Removal Tool

P6B-Y1



Hold-down Clips

P6B-C2

A Power Relay for a Variety of Purposes with Various Models

- Conforms to EN 61810-1, UL508, CSA22.2, SEV, SEMKO.
- Meets VDE0700 requirements for household products according to VDE0110.
- Clearance and creepage distance: 8 mm/8 m.
- Models with CTI250 material available.
- High-sensitivity (360 mW) and high-capacity (16 A) types available.
- Double-winding latching type available.
- Plug-in with test button and quick-connect terminals available.
- Highly functional socket available.

Ordering Information

Classification		Enclosure Ratings	Coil Ratings	Contact Form			
				SPST-NO	SPDT	DPST-NO	DPDT
PCB terminal	General-purpose	Flux protection	AC/DC	G2R-1A	G2R-1	G2R-2A	G2R-2
		Fully sealed		G2R-1A4	G2R-14	G2R-2A4	G2R-24
	Bifurcated contact	Flux protection	DC	G2R-1AZ	G2R-1Z	–	–
		Fully sealed		G2R-1AZ4	G2R-1Z4	–	–
	High-capacity	Flux protection	AC/DC	G2R-1A-E	G2R-1-E	–	–
	High-sensitivity	Flux protection	DC	G2R-1A-H	G2R-1-H	G2R-2A-H	G2R-2-H
	Double-winding latching	Flux protection		G2RK-1A	G2RK-1	G2RK-2A	G2RK-2
Plug-in terminal	General-purpose	Unsealed	AC/DC	–	G2R-1-S	–	G2R-2-S
	LED indicator			–	G2R-1-SN	–	G2R-2-SN
	LED indicator with test button			–	G2R-1-SNI	–	G2R-2-SNI
	Diode		DC	–	G2R-1-SD	–	G2R-2-SD
	LED indicator and diode			–	G2R-1-SND	–	G2R-2-SND
	LED indicator and diode with test button			–	G2R-1-SNDI	–	G2R-2-SNDI
Plug-in terminal (Bifurcated crossbar contact)	General-purpose		AC/DC	G2R-1A3-S	G2R-13-S	–	–
	LED indicator			G2R-1A3-SN	G2R-13-SN	–	–
	LED indicator and diode		DC	G2R-1A3-SND	G2R-13-SND	–	–

Note:
1. When ordering, add the rated coil voltage to the model number.
   Example: G2R-1A 12 VDC
   Rated coil voltage
2. OMRON has also prepared the above relays with AgSnIn contacts, which are more tolerant of large inrush currents and physical movement compared with relays with standard contacts. When ordering, add "-ASI" to the model number.
   Example: G2R-1A-ASI
3. Standard, NO contact type relays are TV-3 class products in accordance with the TV standards of the UL/CSA. Models with AgSnIn contacts are TV-5 class products.
   Example: G2R-1A-ASI
   When ordering a TV-8 class model, insert "-TV8" into the model number as follows:
   Example: G2R-1A-TV8-ASI
4. Models with CTI250 material are also available.
   Contact your OMRON representative for more details.

Model Number Legend

G2R □ -□ □ □ □- □ □ □ -□ □ VDC

1 2 3 4 5 6 7 8 9 10

1. Relay Function
- None: Single-side stable
- K: Double-winding latching

2. Number of Poles
- 1: 1 pole
- 2: 2 poles

3. Contact Form
- None: PDT
- A: PST-NO

4. Contact Type
- None: Single
- Z: Bifurcated
- 3: Bifurcated crossbar

5. Enclosure Ratings
- None: Flux protection
- 4: Fully sealed

6. Terminals
- None: Straight PCB
- S: Plug-in
- T: Quick-connect (upper bracket mounting)

7. Classification
- None: General-purpose
- E: High-capacity
- H: High-sensitivity
- N: LED indicator
- D: Diode
- ND: LED indicator and diode

8. Test button
- I: Test button
- Note: Applied for only SN and SND type

9. Contact Material
- None: AgCdO (Cd free planned 1 Apr 05)
- ASI: AgSnIn

10. Rated Coil Voltage
- Refer to Coil Ratings

■ Accessories (Order Separately)

Connecting Sockets

Number of Poles	Applicable Relay Model	Track/surface-mounting Socket	Back-mounting Socket	
			Terminals	Model
1 pole	G2R-1-S(N)(D)(ND)(NI)(NDI)G2R-13-S (G2R-1A3-S)	P2RF-05-E P2RF-05	PCB terminals	P2R-05P, P2R-057P
			Solder terminals	P2R-05A
2 Poles	G2R-2-S(N)(D)(ND)(NI)(NDI)	P2RF-08-E P2RF-08	PCB terminals	P2R-08P, P2R-087P
			Solder terminals	P2R-08A

Note: See Dimensions for details on socket size.

Mounting Track

Applicable socket	Description	Model
Track connecting socket	Mounting track	50 cm (l) x 7.3 mm (t): PFP-50N 1 m (l) x 7.3 mm (t): PFP-100N 1 m (l) x 16 mm (t): PFP-100N2
	End plate	PFP-M
	Spacer	PFP-S
Back connecting socket	Mounting plate	P2R-P*

*Used to mount several P2R-05A and P2R-08A connecting sockets side by side.

Specifications

■ Coil Ratings

Rated voltage		12 VAC	24 VAC	100/(110) VAC	120 VAC	200/(220)VAC	220 VAC	230 VAC	240 VAC
Rated Current	50Hz	93 mA	46.5 mA	11 mA	9.3 mA	5.5 (4.0) mA	5.1 mA	4.7 (3.7) mA	4.7 mA
	60Hz	75 mA	37.5 mA	9/(10.6) mA	7.5 mA	4.5 (5.3) mA	4.1 mA	3.8 (3.1) mA	3.8 mA
Coil resistance		65 Ω	260 Ω	4,600 Ω	6,500 Ω	20,200 (25,000) Ω	25,000 Ω	26,850 (30,000) Ω	30,000 Ω
Coil inductance	Armature OFF	0.19	0.81	13.34	21	51.3	57.5	62	65.5
(H) (ref. value)	Armature ON	0.39	1.55	26.84	42	102	117	124	131
Must operate voltage		80% max. of rated voltage							
Must release voltage		30% min. of rated voltage							
Max. voltage		140% of rated voltage (at 23°C)							
Power consumption		Approx. 0.9 VA at 60 Hz (approx. 0.7 VA at 60 Hz)							

Note: 1. Rated voltage of bifurcated crossbar contact type: 100/(110) VAC, 200/(220) VAC, 230 VAC (Approx. 0.7 VA at 60 Hz).
2. Depending on the type of Relay, some Relays do not have coil specifications. Contact your OMRON representative for more details.

Rated voltage		5 VDC	6 VDC	12 VDC	24 VDC	48 VDC	100 VDC
Rated current (50/60Hz)		106 mA	88.2 mA	43.6 mA	21.8 mA	11.5 mA	5.3 mA
Coil resistance		47 Ω	68 Ω	275 Ω	1,100 Ω	4,170 Ω	18,860 Ω
Coil inductance	Armature OFF	0.20	0.28	1.15	4.27	13.86	67.2
(H) (ref. value)	Armature ON	0.39	0.55	2.29	8.55	27.71	93.2
Must operate voltage		70% max. of rated voltage					
Must release voltage		15% min. of rated voltage					
Max. voltage		170% of rated voltage (at 23°C)					
Power consumption		Approx. 0.53 W					

Note: Rated voltage of bifurcated crossbar contact type: 12 VDC, 24 VDC

High-sensitivity Relays

Rated voltage		5 VDC	6 VDC	12 VDC	24 VDC	48 VDC
Rated current (50/60Hz) (see Note. 1)		71.4 mA	60 mA	30 mA	15 mA	7.5 mA
Coil resistance (see Note. 1)		70 Ω	100 Ω	400 Ω	1,600 Ω	6,400 Ω
Coil inductance	Armature OFF	0.37	0.53	2.14	7.80	31.20
(H) (ref. value)	Armature ON	0.75	1.07	4.27	15.60	62.40
Must operate voltage		70% max. of rated voltage				
Must release voltage		15% min. of rated voltage				
Max. voltage		170% of rated voltage (at 23°C)				
Power consumption		Approx. 0.36 W				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of $^{+15\%}/_{-20\%}$ (AC rated current) or ±10% (DC coil resistance)
2. LEDs are used for the built-in operation indicator. For models equipped with these indications, the VAC rated current must be increased by approximately 1 mA; the VDC rated current, by approximately 4 mA.
3. Operating characteristics are measured at a coil temperature of 23°C.

Double-winding Latching Relays

Rated voltage			5 VDC	6 VDC	12 VDC	24 VDC
Set Coil	Rated current (see note 1.)		167 mA	138 mA	70.6 mA	34.6 mA
	Coil resistance (see note 1.)		30 Ω	43.5 Ω	170 Ω	694 Ω
	Coil inductance (H) (ref. value)	Armature OFF	0.073	0.104	0.42	1.74
		Armature ON	0.146	0.208	0.83	3.43
Reset Coil	Rated current		119 mA	100 mA	50 mA	25 mA
	Coil resistance		42 Ω	60 Ω	240 Ω	960 Ω
	Coil inductance (H) (ref. value)	Armature OFF	0.003	0.005	0.018	0.079
		Armature ON	0.006	0.009	0.036	0.148
Must set voltage			70% max. of rated voltage			
Must reset voltage			70% max. of rated voltage			
Max. voltage			140% of rated voltage (at 23°C)			
Power consumption			Set coil: Approx. 850 mW; Reset coil: Approx. 600 mW			

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

■ Contact Ratings

PCB/Flux Protection, Plug-in, Quick-connect Terminal Relays

Item	General-purpose, quick-connect terminal				High-capacity	
Number of poles	1 pole		2 poles		1 pole	
Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)
Rated Load	10 (1) A at 250 VAC; 10 (1) A at 30 VDC	7.5 A at 250 VAC; 5 A at 30 VDC	5 A at 250 VAC; 5 A at 30 VDC	2 A at 250 VAC; 3 A at 30 VDC	16 A at 250 VAC; 16 A at 30 VDC	8 A at 250 VAC; 8 A at 30 VDC
Rated carry current	10 (1) A		5 A		16 A	
Max. switching voltage	380 VAC, 125 VDC		380 VAC, 125 VDC		380 VAC, 125 VDC	
Max. switching current	10 (1) A		5 A		16 A	
Max. switching power	2,500 (250) VA, 300 (30) W	1,875 VA, 150 W	1,250 VA, 150 W	500 VA, 90 W	4,000 VA, 480 W	2,000 VA, 240 W
Failure rate (reference value)	100 mA at 5 VDC (1 mA at 5 VDC)		10 mA at 5 VDC		100 mA at 5 VDC	

Note: 1. P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation.
2. ( ): Bifurcated crossbar contact type.

PCB/Flux Protection Relays

Item	Bifurcated contacts		High-sensitivity			
Number of poles	1 pole		1 pole		2 poles	
Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)
Rated Load	5 A at 250 VAC; 5 A at 30 VDC	2 A at 250 VAC; 3 A at 30 VDC	5 A at 250 VAC; 5 A at 30 VDC	2 A at 250 VAC; 3 A at 30 VDC	3 A at 250 VAC; 3 A at 30 VDC	1 A at 250 VAC; 1.5 A at 30 VDC
Rated carry current	5 A		5 A		3 A	
Max. switching voltage	380 VAC, 125 VDC		380 VAC, 125 VDC		380 VAC, 125 VDC	
Max. switching current	5 A		5 A		3 A	
Max. switching power	1,250 VA, 150 W	500 VA, 90 W	1,250 VA, 150 W	500 VA, 90 W	750 VA, 90 W	250 VA, 45 W
Failure rate (reference value)	1 mA at 5 VDC		100 mA at 5 VDC		10 mA at 5 VDC	

Note: P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation.

PCB/Fully Sealed Relays

Item	General-purpose (single contact)				Bifurcated contact	
Number of poles	1 pole		2 poles		1 pole	
Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)
Rated Load	8 A at 250 VAC; 8 A at 30 VDC	6 A at 250 VAC; 4 A at 30 VDC	4 A at 250 VAC; 4 A at 30 VDC	1.5 A at 250 VAC; 2.5 A at 30 VDC	5 A at 250 VAC; 5 A at 30 VDC	2 A at 250 VAC; 3 A at 30 VDC
Rated carry current	8 A		4 A		5 A	
Max. switching voltage	380 VAC, 125 VDC		380 VAC, 125 VDC		380 VAC, 125 VDC	
Max. switching current	8 A		4 A		5 A	
Max. switching power	2,000 VA, 240 W	1,500 VA, 120 W	1,000 VA, 120 W	375 VA, 75 W	1,250 VA, 150 W	500 VA, 90 W
Failure rate (reference value)	100 mA at 5 VDC		10 mA at 5 VDC		1 mA at 5 VDC	

Note: P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation.

Latching Relays

Number of poles	1 pole		2 poles	
Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4;; L/R = 7 ms)
Rated Load	5 A at 250 VAC; 5 A at 30 VDC	3.5 A at 250 VAC; 2.5 A at 30 VDC	3 A at 250 VAC; 3 A at 30 VDC	1.5 A at 250 VAC; 2 A at 30 VDC
Rated carry current	5 A		3 A	
Max. switching voltage	380 VAC, 125 VDC		380 VAC, 125 VDC	
Max. switching current	5 A		3 A	
Max. switching power	1,250 VA, 150 W	875 VA, 75 W	750 VA, 90 W	375 VA, 60 W
Failure rate (reference value)	100 mA at 5 VDC		10 mA at 5 VDC	

Note: P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation.

■ Characteristics

Standard Relays

Item	1 Pole	2 Poles
Contact resistance	30 mΩ max. (high-capacity type: 100 mΩ max.)	50 mΩ max.
Operate (set) time	15 ms max	
Release (reset) time	AC: 10 ms max.; DC: 5 ms max. (w/built-in diode: 20 ms max.)	
Max. operating frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)	
Insulation resistance	1,000 MΩ min. (at 500 VDC)	
Dielectric strength	5,000 VAC, 50/60 Hz for 1 min between coil and contacts*; 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity	5,000 VAC, 50/60 Hz for 1 min between coil and contacts*; 3,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude)	
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 200 m/s^2 when energized; 100 m/s^2 when not energized	
Endurance	Mechanical: AC coil: 10,000,000 operations min.; DC coil: 20,000,000 operations min. (at 18,000 operations/hr) Electrical:100,000 operations min. (at 1,800 operations/hr under rated load)	
Ambient temperature	Operating: -40°C to 70°C (with no icing)	
Ambient humidity	Operating: 5% to 85%	
Weight	Approx. 17 g (plug-in terminal: approx. 20 g)	

Note: Values in the above table are the initial values.
*2,000 VAC, 50/60 Hz for 1 minute when the P2R-05A or P2R-08A socket is mounted.

Double-winding Latching Relays

Item	1 Pole	2 Poles
Contact resistance	30 mΩ max.	50 mΩ max.
Set time	20 ms max	
Reset time	20 ms max.	
Min. set/reset signal width	30 ms max.	
Max. operating frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)	
Insulation resistance	1,000 MΩ min. (at 500 VDC)	
Dielectric strength	5,000 VAC, 50/60 Hz for 1 min between coil and contacts*; 1,000 VAC, 50/60 Hz for 1 min between contacts of same pole; 1,000 VAC, 50/60 Hz for 1 min between set and reset coil	5,000 VAC, 50/60 Hz for 1 min between coil and contacts*; 3,000 VAC, 50/60 Hz for 1 min between contacts of different poles 1,000 VAC, 50/60 Hz for 1 min between contacts of same pole 1,000 VAC, 50/60 Hz for 1 min between set and reset coil
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude)	
Shock resistance	Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: Set: 500 m/s^2 (approx. 50G); 200 m/s^2 (approx. 20G) Reset: 100 m/s^2 (approx. 10G)	
Endurance	Mechanical: 10,000,000 operations min (at 18,000 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr under rated load)	
Ambient temperature	Operating: -40°C to 70°C (with no icing)	
Ambient humidity	Operating: 5% to 85%	
Weight	Approx. 17 g	

Note: Values in the above table are the initial values.
*2,000 VAC, 50/60 Hz for 1 minute when the P2R-05A or P2R-08A socket is mounted.

■ Approved Standards
UL 508 (File No. E41643)

Model	Contact form	Coil ratings	Contact ratings
G2R-1 G2R-14 G2R-1-H G2R-1-S G2R-1-T	SPDT	3 to 110 VDC 3 to 240 VAC	10 A, 30 VDC (resistive) 10 A, 250 VAC (general use) TV-3 (NO contact only)
G2R-1A G2R-1A4 G2R-1A-H G2R-1A-S G2R-1A-T	SPST-NO		
G2R-1-E	SPDT		16 A, 30 VDC (resistive, NO contact only) 16 A, 250 VAC (general use, NO contact only) TV-3 (NO contact only); 1/3 hp, 120 VAC
G2R-1A-E	SPST-NO		
G2R-2 G2R-24 G2R-2-H G2R-2-S	DPDT		5 A, 30 VDC (resistive) 5 A, 250 VAC (general use) TV-3 (NO contact only)
G2R-2A G2R-2A4 G2R-2A-H G2R-2A-S	DPST-NO		
G2R-1A-ASI	SPST-NO		10 A, 30 VDC (resistive) 10 A, 250 VAC (general use) TV-5/TV-8 (NO contact only)

CSA 22.2 No.0, No.14 (File No. LR31928)

Model	Contact form	Coil ratings	Contact ratings
G2R-1 G2R-14 G2R-1-H G2R-1-S G2R-1-T	SPDT	3 to 110 VDC 3 to 240 VAC	10 A, 30 VDC (resistive) 10 A, 250 VAC (general use) TV-3 (NO contact only)
G2R-1A G2R-1A4 G2R-1A-H G2R-1A-S G2R-1A-T	SPST-NO		
G2R-1-E	SPDT		16 A, 30 VDC (resistive, NO contact only) 16 A, 250 VAC (general use, NO contact only) TV-3 (NO contact only)
G2R-1A-E	SPST-NO		
G2R-2 G2R-24 G2R-2-H G2R-2-S	DPDT		5 A, 30 VDC (resistive) 5 A, 250 VAC (general use) TV-3 (NO contact only)
G2R-2A G2R-2A4 G2R-2A-H G2R-2A-S	DPST-NO		
G2R-1A-ASI	SPST-NO		10 A, 30 VDC (resistive) 10 A, 250 VAC (general use) TV-8 (NO contact only); 1/4 hp, 125 VAC

SEV

Contact form	Coil ratings	Contact ratings
1 pole	3 to 110 VDC 3 to 240 VAC	16 A, 250 VAC1 (AgSnIn contact) 16 A, 30 VDC1 (AgSnIn contact) 10 A, 250 VAC1 5 A, 250 VAC3 10 A, 30 VDC1
2 poles	3 to 110 VDC 3 to 240 VAC	5 A, 250 VAC1 2 A, 380 VAC1 5 A, 30 VDC1

SEMKO

Contact form	Coil ratings	Contact ratings
1 pole	3 to 110 VDC 3 to 240 VAC	10/80 A, 250 VAC 3/100 A, 250 VAC 16/128 A, 250 VAC (AgSnIn contact)
2 poles		5/40 A, 250 VAC

TÜV (IEC 255)

Contact form	Coil ratings	Contact ratings
1 pole	3 to 110 VDC, 6 VAC to 240 VAC (for Standard coil) 3 to 48 VDC (for K, U coil) 3 to 70 VDC (for H coil)	10 A, 250 VAC (cosø = 1.0) 10 A, 30 VDC (0 ms) 16 A, 250 VAC (cosø = 1.0) (AgSnIn contact)
2 poles		8 A, 250 VAC (cosø = 0.4) 5 A, 250 VAC (cosø =1.0) 5 A, 30 VDC (0 ms) 2.5 A, 250 VAC (cosø = 0.4)

EN 61810-1 (VDE IEC 255, VDE 0435 IMQ - VDE Reg No. 6166)

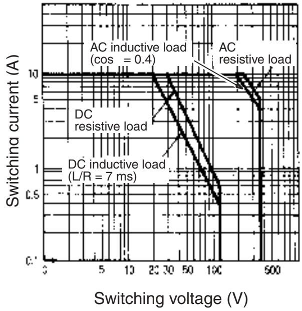
Contact form	Coil ratings	Contact ratings
1 pole	5, 6, 9, 12, 18, 24, 48, 60, 100, 110 VDC 12, 18, 24, 48, 50, 100/(110), 110, 120, 200/(220), 220, 230, 240 VAC	10 A, 250 VAC (cosø = 1.0) 10 A, 30 VDC (0 ms) 16 A, 250 VAC (cosø = 1.0)
2 poles	5, 6, 9, 12, 18, 24, 48, 60, 100, 110 VDC 12, 18, 24, 48, 50, 100/(110), 110, 120, 200/(220), 220, 230, 240 VAC	5 A, 250 VAC (cosø =1.0) 5 A, 30 VDC (0 ms)

Engineering Data

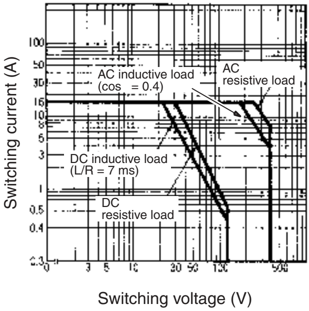
Maximum Switching Power

Flux Protection/Plug-in Relays

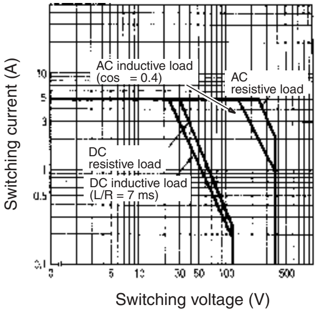
G2R-1, G2R-1A, G2R-1-S, G2R-1-T, G2R-1A-T



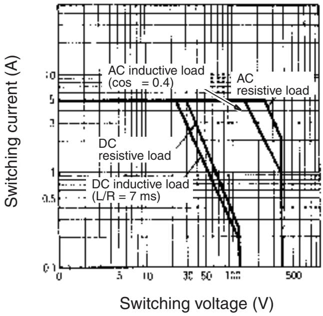
G2R-1-E, G2R-1A-E



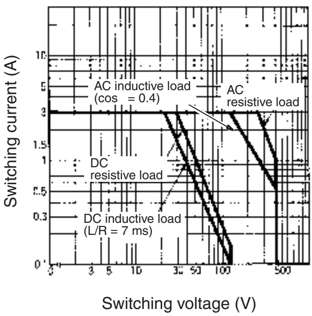
G2R-1Z, G2R-1AZ



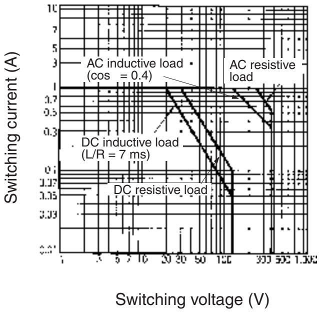
G2R-1-H, G2R-1A-H, G2R-2 G2R-2A, G2R-2-S



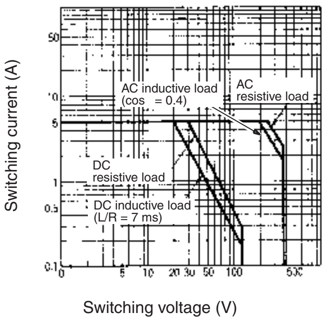
G2R-2-H, G2R-2A-H



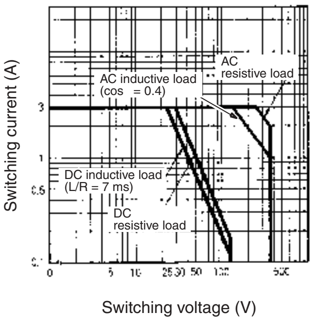
G2R-13-S, G2R-1A3-S



G2RK-1A, G2RK-1



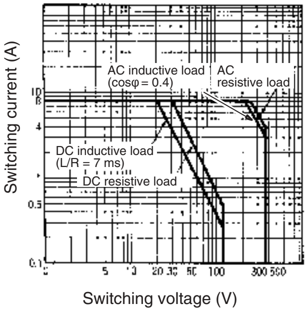
G2RK-2A, G2RK-2



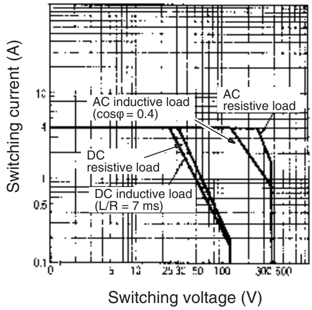
Engineering Data (cont.)

Fully Sealed Relays

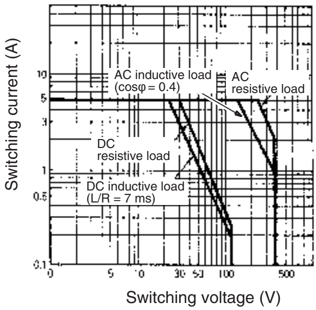
G2R-14, G2R-1A4



G2R-24, G2R-2A4



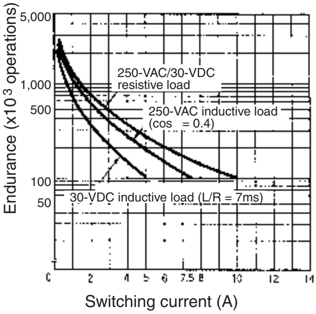
G2R-1Z4, G2R-1AZ4



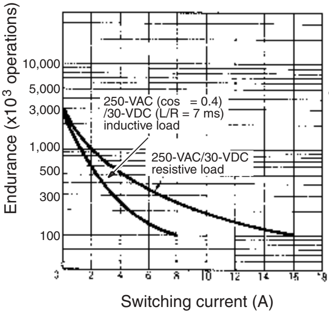
Endurance

Flux Protection/Plug-in Relays

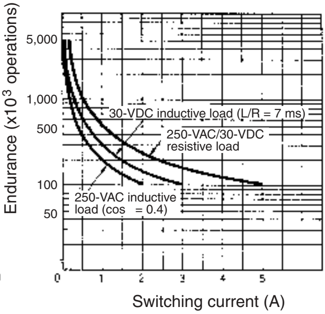
G2R-1, G2R-1A, G2R-1-S, G2R-1-T, G2R-1A-T



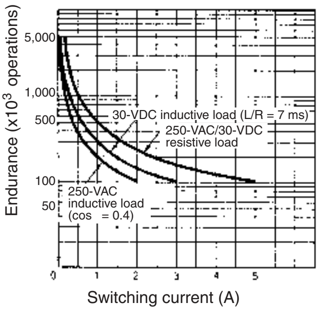
G2R-1-E, G2R-1A-E



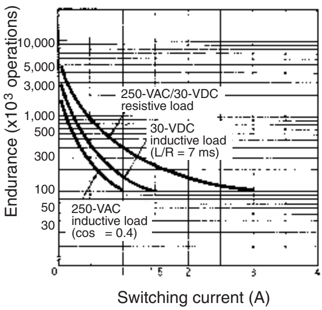
G2R-1Z, G2R-1AZ



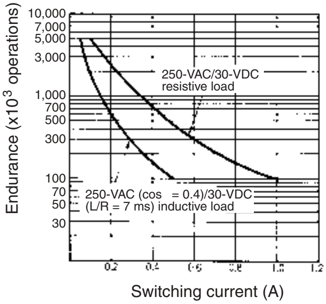
G2R-1-H, G2R-1A-H, G2R-2 G2R-2A, G2R-2-S



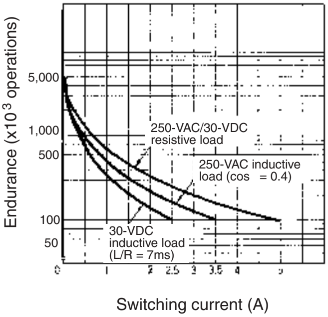
G2R-2-H, G2R-2A-H



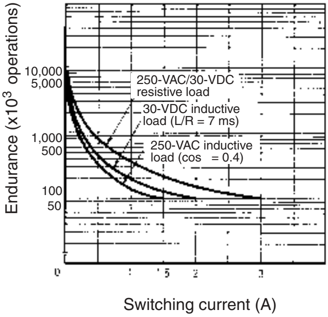
G2R-13-S, G2R-1A3-S



G2RK-1A, G2RK-1

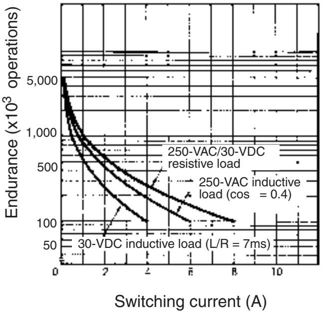


G2RK-2A, G2RK-2

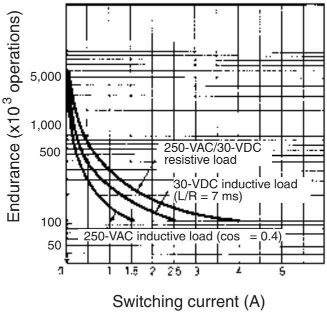


Fully sealed Relays

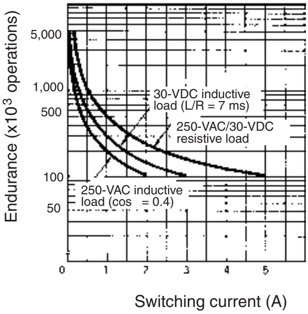
G2R-14, G2R-1A4



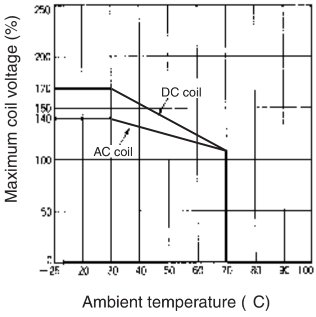
G2R-24, G2R-2A4



G2R-1Z4, G2R-1AZ4



Ambient Temperature vs Maximum Coil Voltage



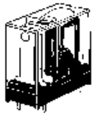
Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

Dimensions

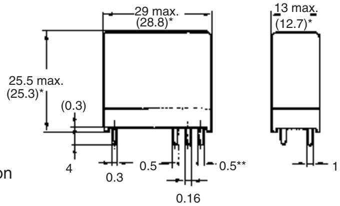
Note: 1. All units are in millimeters unless otherwise indicated.
2. Orientation marks are indicated as follows:

Relays with PCB Terminals

SPDT Relays
G2R-1, G2R-1Z, G2R-1-H

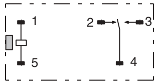


The illustration shows the G2R-1.



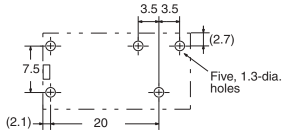
*Average value
**0.3 (-H Type)

Terminal Arrangement/ Internal Connections (Bottom View)



Mounting Holes (Bottom View)

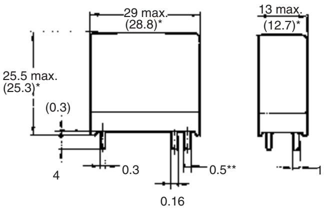
Tolerance: 0.1



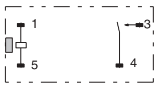
(No coil polarity)

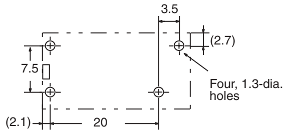
SPST-NO Relays
G2R-1A, G2R-1AZ, G2R-1A-H

The illustration shows the G2R-1A.



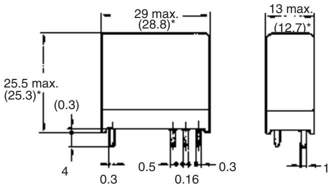
*Average value
**0.3 (-H Type)



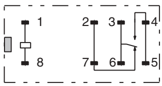


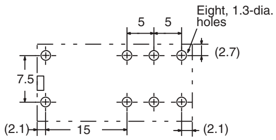
(No coil polarity)

SPDT/High-capacity Relays
G2R-1-E



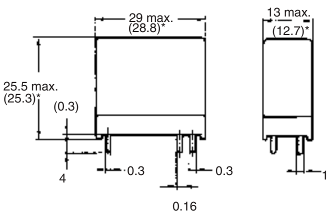
*Average value



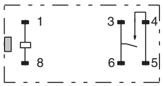


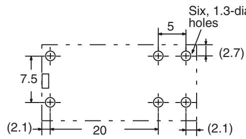
(No coil polarity)

SPST-NO/High-capacity Relays
G2R-1A-E



*Average value

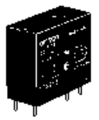


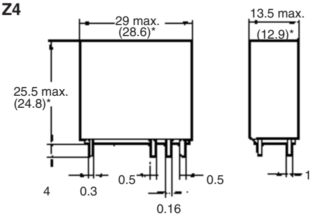


(No coil polarity)

Relays with PCB Terminals

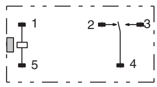
SPDT Relays
G2R-14, G2R-1Z4





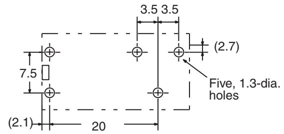
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)



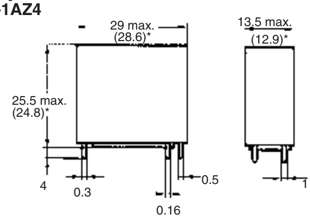
Mounting Holes (Bottom View)

Tolerance: ±0.1

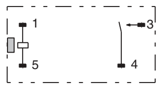


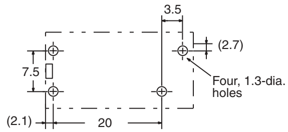
(No coil polarity)

SPST-NO Relays
G2R-1A4, G2R-1AZ4



*Average value

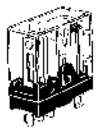


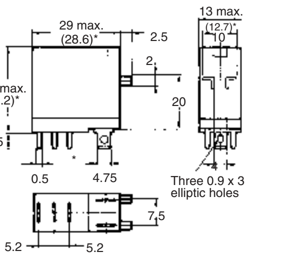


(No coil polarity)

Relays with Plug-in Terminals

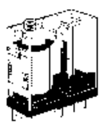
SPDT Relays
G2R-1-S, G2R-1-SD, G2R-1-SN, G2R-1-SND, G2R-1-SNI, G2R-1-SNDI
G2R-13-S, G2R-13-SD, G2R-13-SN, G2R-13-SND

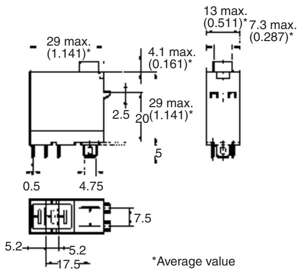




*This terminal is SPDT only.

*Average value

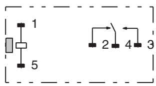




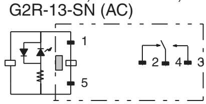
*Average value

Terminal Arrangement/Internal Connections (Bottom View)

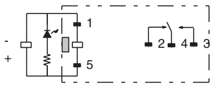
G2R-1-S, G2R-13-S



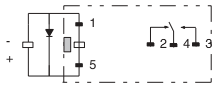
G2R-1-SN, G2R-1-SNI, G2R-13-SN (AC)



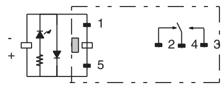
G2R-1-SN, G2R-1-SNI, G2R-13-SN (DC)



G2R-1-SD, G2R-13-SD (DC)



G2R-1-SND, G2R-1-SNDI, G2R-13-SND (DC)

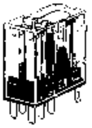


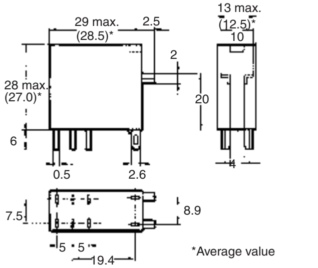
(After confirming coil polarity, wire correctly.) (Except G2R-1-S, G2R-13-S)

Dimensions

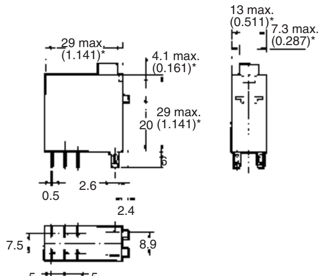
DPDT Relays

G2R-2-S, G2R-2-SD, G2R-2-SN, G2R-2-SNI, G2R-2-SNDI
G2R-2-SND





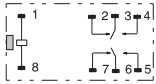
*Average value



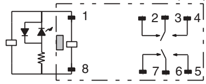
*Average value

Terminal Arrangement/Internal Connections (Bottom View)

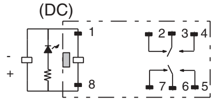
G2R-2-S



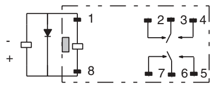
G2R-2-SN G2R-2-SNI (AC)



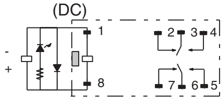
G2R-2-SN G2R-2-SNI (DC)



G2R-2-SD (DC)



G2R-2-SND G2R-2-SNDI (DC)



(After confirming coil polarity, wire correctly.)

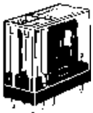
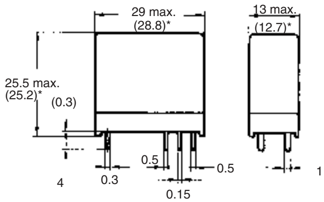
Relays with PCB Terminals

Terminal Arrangement/ Internal Connections (Bottom View)

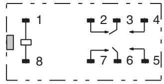
Mounting Holes (Bottom View)

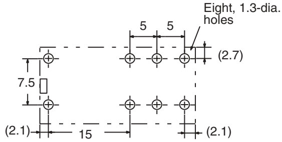
Tolerance: 0.1

DPDT Relays
G2R-2, G2R-2-H

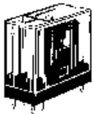
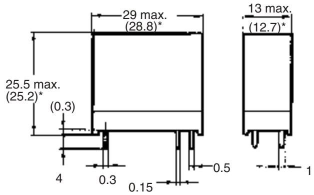
*Average value



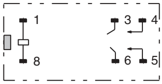


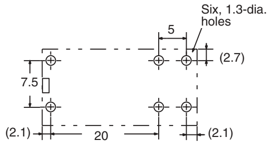
(No coil polarity)

DPST-NO Relays
G2R-2A, G2R-2A-H

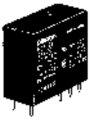
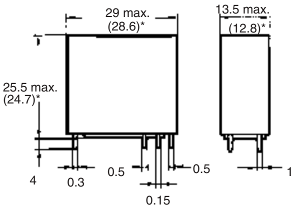
*Average value



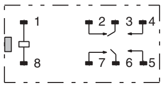


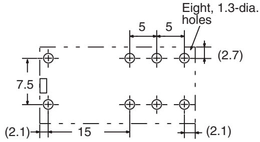
(No coil polarity)

DPDT Relays
G2R-24

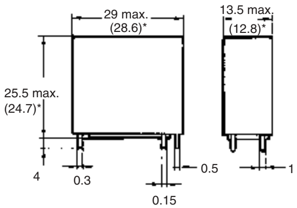
*Average value



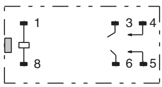


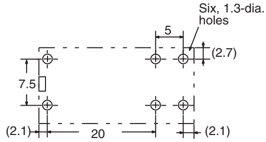
(No coil polarity)

DPST-NO Relays
G2R-2A4

*Average value

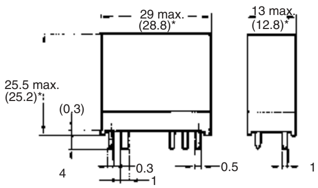




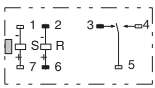
(No coil polarity)

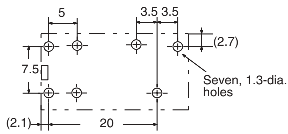
Double-winding Latching Relays with PCB Terminals

SPDT Relays
G2RK-1

*Average value

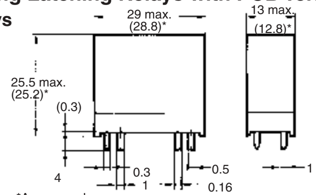




(After confirming coil polarity, wire correctly.)

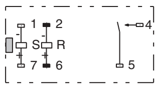
Double-winding Latching Relays with PCB Terminals

SPST-NO Relays
G2RK-1A

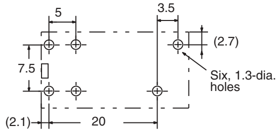


*Average value

Terminal Arrangement/ Internal Connections (Bottom View)

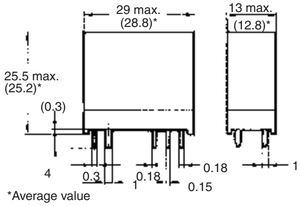


Mounting Holes (Bottom View)
Tolerance: 0.1

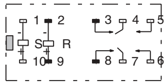


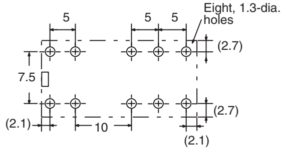
(After confirming coil polarity, wire correctly.)

DPDT Relays
G2RK-2



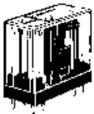
*Average value

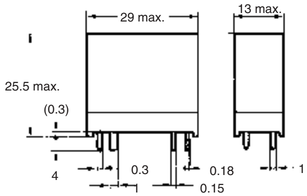


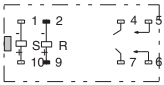


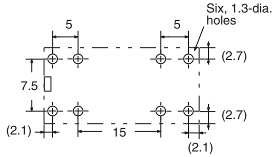
(After confirming coil polarity, wire correctly.)

DPST-NO Relays
G2RK-2A





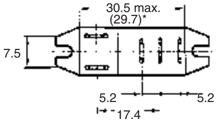


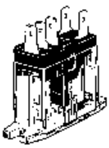


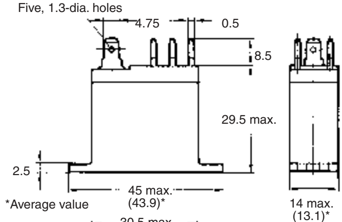
(After confirming coil polarity, wire correctly.)

Relays with Quick-connect Terminals

SPDT Relays
G2R-1-T

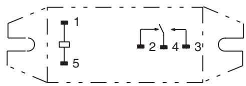






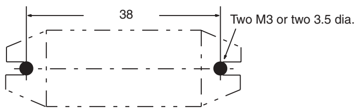
*Average value

Terminal Arrangement/Internal Connections (Bottom View)

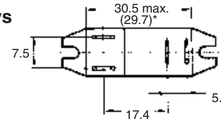


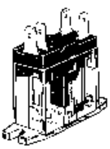
(No coil polarity)

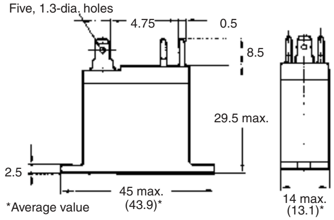
Mounting Holes (Bottom View)
Tolerance: 0.1



SPST-NO Relays
G2R-1A-T

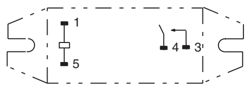






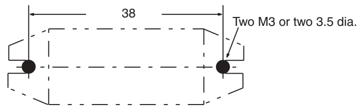
*Average value

Terminal Arrangement/Internal Connections (Bottom View)



(No coil polarity)

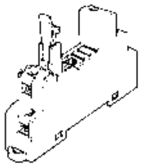
Mounting Holes (Bottom View)

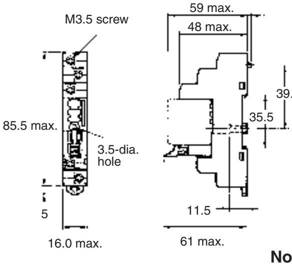


Note: Model number of quick-connect terminal is 187.

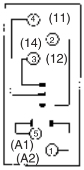
Track/Surface Mounting Sockets

P2RF-05-E

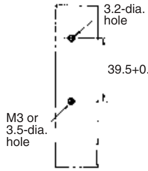




Terminal Arrangement (Top View)

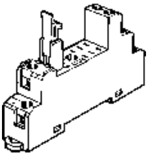


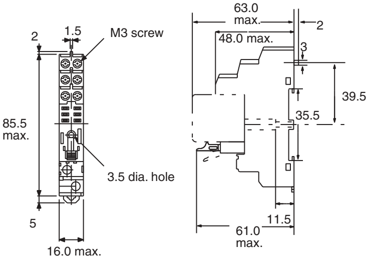
Mounting Holes (for Surface Mounting)



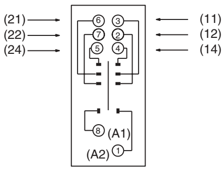
Note: Pin numbers in parentheses apply to DIN standard.

P2RF-08-E

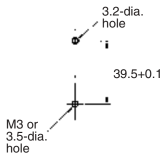




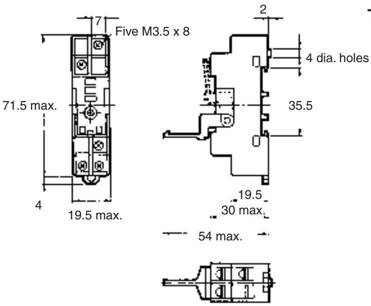
Terminal Arrangement (Top View)



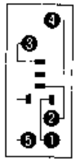
Mounting Holes (for Surface Mounting)



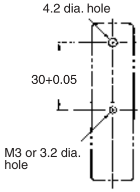
P2RF-05



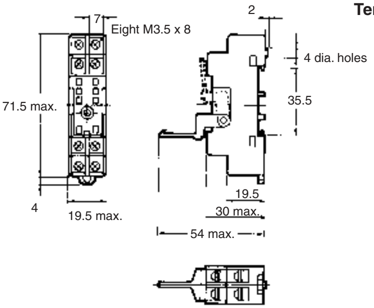
Terminal Arrangement



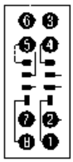
Mounting Holes (for Surface Mounting)



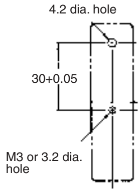
P2RF-08



Terminal Arrangement

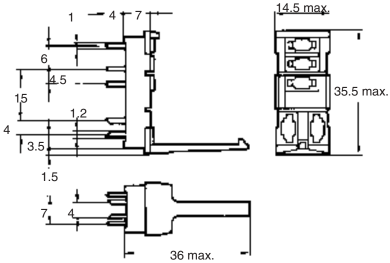


Mounting Holes (for Surface Mounting)

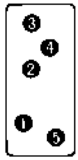


Back Connecting Sockets

P2R-05P (1-pole)

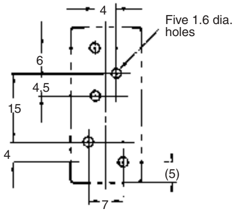


Terminal Arrangement

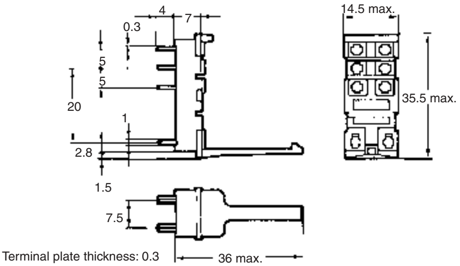


Mounting Holes

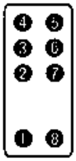
Tolerance: 0.1



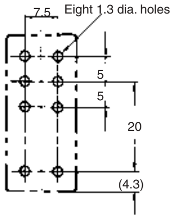
P2R-08P (2-pole)



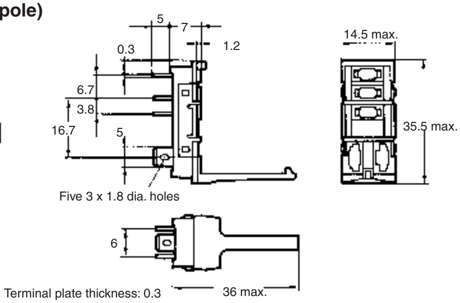
Terminal Arrangement



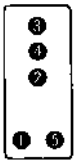
Mounting Holes



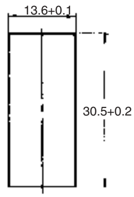
P2R-05A (1-pole)



Terminal Arrangement

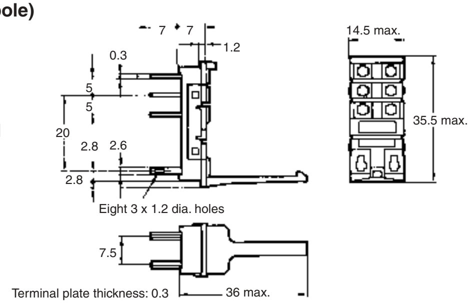


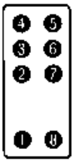
Panel Cutout



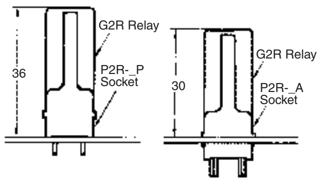
Recommended thickness of the panel is 1.6 to 2.0 mm

P2R-08A (2-pole)



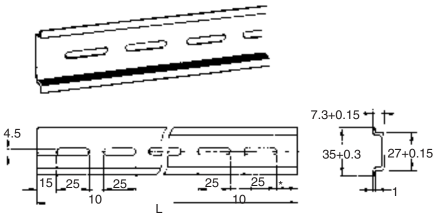


Mounting Height of Relay with Socket

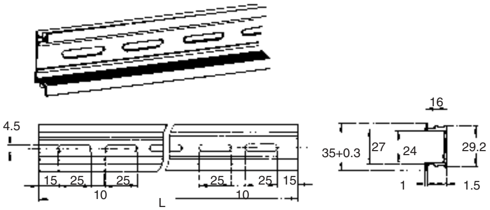


Mounting Track

PFP-100N, PFP-50N



PFP-100N2



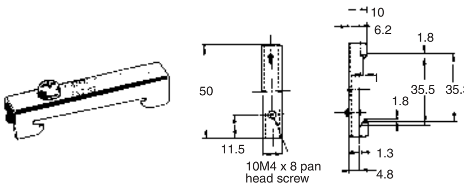
It is recommended to use a panel 1.6 to 2.0 mm thick.

L: Length

1 m	PFP-100N
50 cm	PFP-50N
1 m	PFP-100N2

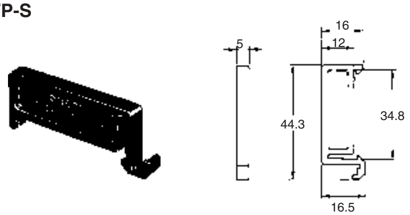
End Plates

PFP-M



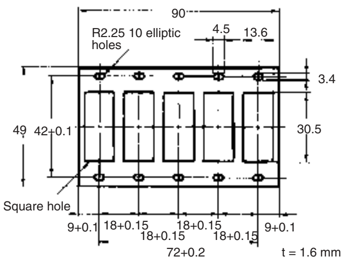
Spacers

PFP-S



Mounting Plates

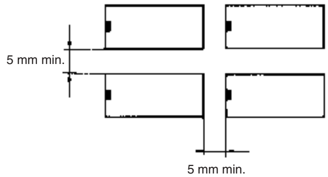
P2R-P



Precautions

■ Mounting

When mounting a number of relays on a PCB, be sure to provide a minimum mounting space of 5 mm between the two juxtaposed relays as shown below.



The above minimum mounting space is necessary due to mutual thermal interference generated by the relays. This restriction may be ignored, however, depending on the operating conditions of the relays. Consult OMRON for details.

There is no restriction on the mounting direction of each relay on the PCB.

When using this circuit, confirm the set and reset states and then take into account the circuit constant.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Next-generation PCB Relay Available in 24 Models

- ROHS compliant.
- Low profile: 15.7 mm max. in height.
- Conforms to EN 61810-1, UL508 and CSA22.2.
- Meets VDE0700 requirements for household products according to VDE0110.
- Clearance and creepage distance: 10mm/10mm.
- Tracking distance: CT>250 (Both standard and class F type).
- UL 1446 Class F Coil Insulation system available.
- High sensitivity: 400 mW

Ordering Information

Classification		Enclosure ratings	Contact form			
			SPST-NO	SPDT	DPST-NO	DPDT
Standard	General-purpose	Flux protection	G2RL-1A	G2RL-1	G2RL-2A	G2RL-2
		Fully sealed	G2RL-1A4	G2RL-14	G2RL-2A4	G2RL-24
	High-capacity	Flux protection	G2RL-1A-E	G2RL-1-E	---	---
		Fully sealed	G2RL-1A4-E	G2RL-14-E	---	---
Class-F	General-purpose	Flux protection	G2RL-1A-CF	G2RL-1-CF	G2RL-2A-CF	G2RL-2-CF
		Fully sealed	G2RL-1A4-CF	G2RL-14-CF	G2RL-2A4-CF	G2RL-24-CF
	High-capacity	Flux protection	G2RL-1A-E-CF	G2RL-1-E-CF	---	---
		Fully sealed	G2RL-1A4-E-CF	G2RL-14-E-CF	---	---

Note: When ordering, add the rated coil voltage to the model number.
Example: G2RL-1A 12 VDC
Rated coil voltage

Model Number Legend

G2RL-□□□-□-□
1 2 3 4 5

1. **Number of Poles**
   1: 1 pole
   2: 2 poles
2. **Contact Form**
   None: □PDT
   A: □PST-NO
3. **Enclosure Ratings**
   None: Flux protection
   4: Fully sealed
4. **Classification**
   None: General purpose
   E: High capacity (1 pole)
5. **Approved Standards**
   None: UL, CSA, VDE, UL Class B Insulation
   CF: UL, CSA, VDE, UL Class F Insulation

Specifications

■ Coil Ratings

Rated voltage	5 VDC	12 VDC	24 VDC	48 VDC
Rated current	80.0 mA	33.3 mA	16.7 mA	8.96 mA
Coil resistance	62.5 Ω	360 Ω	1,440 Ω	5,358 Ω
Must operate voltage	70% max. of the rated voltage			
Must release voltage	10% min. of the rated voltage			
Max. voltage	130% at 85°C of the rated voltage			
Power consumption	Approx. 400 mW			Approx. 430 mW

Note: The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

■ Contact Ratings

Number of poles	1 pole	2 poles
Contact material	$AgSnO_2$	AgNi
Load	Resistive load (cosϕ=1)	Resistive load (cosϕ=1)
Rated load	12 A (16 A) at 250 VAC 12 A (16 A) at 24 VDC (See note 2.)	8 A at 250 VAC 8 A at 30 VDC (See note 2.)
Rated carry current	12 A (16 A) (See note 2.)	8 A (70°C)/5 A (85°C) (See note 2.)
Max. switching voltage	440 VAC, 300 VDC	
Max. switching current	12 A (16 A)	8 A
Max. switching power	3,000 VA (4,000 VA)	2,000 VA

Note: 1. Values in parentheses are those for the high-capacity model.

2. Contact your OMRON representative for the ratings on fully sealed models.

■ Characteristics

Item	1 pole	2 poles
Contact resistance	100 mΩ max.	
Operate (set) time	15 ms max. (Approx. 7 ms typical)	
Release (reset) time	5 ms max. (Approx. 2 ms typical)	
Max. operating frequency	Mechanical: 18,000 operation/hr Electrical: 1,800 operation/hr at rated load	
Insulation resistance	1,000 MΩ min. (at 500 VDC)	
Dielectric strength	5,000 VAC, 1 min between coil and contacts 1,000 VAC, 1 min between contacts of same polarity	5,000 VAC, 1 min between coil and contacts 2,500 VAC, 1 min between contacts of different polarity 1,000 VAC, 1 min between contacts of same polarity
Impulse withstand voltage	10 kV (1.2 × 50 µs) between coil and contact	
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude)	
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: Energized: 100 m/s^2 Not energized: 100 m/s^2	
Endurance (Mechanical)	20,000,000 operations (at 18,000 operations/hr)	
Ambient temperature	Operating: –40°C to 85°C (with no icing) Storage: –40°C to 85°C (with no icing)	
Ambient humidity	5% to 85%	
Weight	Approx. 12 g	
Packaging	Standard: 20 relays/stick	

Note: Values in the above table are the initial values.

■ Approved Standards

UL508 (File No. E41643)

Model	Contact form	Coil ratings	Contact ratings
G2RL-1A	SPST-NO	3 to 48 VDC	12 A at 250 VAC (General use) 12 A at 24 VDC (Resistive)
G2RL-1	SPDT		
G2RL-1A-E	SPST-NO (High capacity)		16 A at 250 VAC (General use) 16 A at 24 VDC (Resistive)
G2RL-1-E	SPDT (High capacity)		
G2RL-2A	DPST-NO		8 A at 277 VAC (General use) 8 A at 30 VDC (Resistive)
G2RL-2	DPDT		

CSA C22.2 (No. 14) (File No. LR31928)

Model	Contact form	Coil ratings	Contact ratings
G2RL-1A	SPST-NO	3 to 48 VDC	12 A at 250 VAC (General use) 12 A at 24 VDC (Resistive)
G2RL-1	SPDT		
G2RL-1A-E	SPST-NO (High capacity)		16 A at 250 VAC (General use) 16 A at 24 VDC (Resistive)
G2RL-1-E	SPDT (High capacity)		
G2RL-2A	DPST-NO		8 A at 277 VAC (General use) 8 A at 30 VDC (Resistive)
G2RL-2	DPDT		

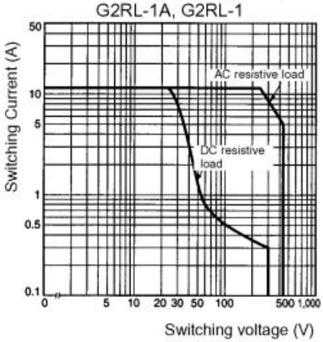
EN 61810-1 (VDE 0435) (Licence No. 119650)

Model	Contact form	Coil ratings	Contact ratings
G2RL	1 pole	5, 12, 18, 22, 24, 48 VDC	12 A at 250 VAC (cosϕ=1) 12 A at 24 VDC (L/R=0 ms) AC15: 3 A at 240 VAC DC13: 2.5 A at 24 VDC, 50 ms
	1 pole (High capacity)		16 A at 250 VAC (cosϕ=1) 16 A at 24 VDC (L/R=0 ms) AC15: 3 A at 240 VAC (NO) 1.5 A at 240 VAC (NC) DC13: 2.5 A at 24 VDC (NO), 50 ms
	2 poles		8 A at 250 VAC (cosϕ=1) 8 A at 24 VDC (L/R=0 ms) AC15: 1.5 A at 240 VAC DC13: 2 A at 30 VDC, 50 ms

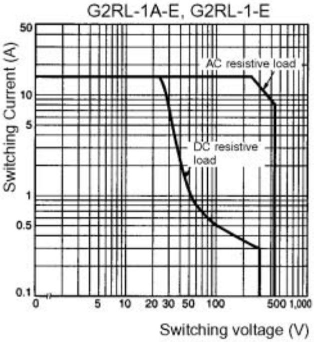
Engineering Data

Maximum Switching Capacity

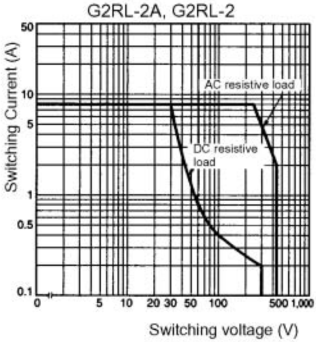
G2RL-1A, G2RL-1



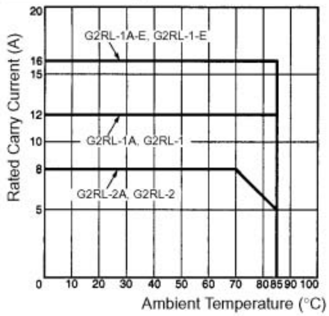
G2RL-1A-E, G2RL-1-E



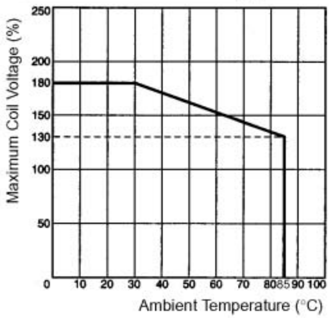
G2RL-2A, G2RL-2



Ambient Temperature vs Rated Carry Current



Ambient Temperature vs Maximum Coil Voltage



Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

Note: Contact your OMRON representative for the data on fully sealed models.

Electrical Endurance Data

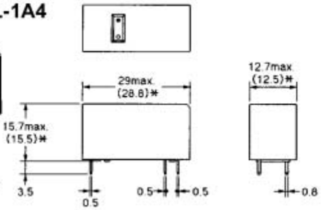
G2RL-1-E	16 A at 250 VAC (cosϕ=1) 16 A at 24 VDC 8 A at 250 VAC (cosϕ=0.4) 8 A at 30 VDC (L/R=7 ms)	30,000 operations min. 30,000 operations min. 200,000 operation min. (Normally open side operation) 10,000 operation min. (Normally open side operation)
G2RL-1	12 A at 250 VAC (cosϕ=1) 12 A at 24 VDC 5 A at 250 VAC (cosϕ=0.4) 5 A at 30 VDC (L/R=7 ms)	50,000 operations min. 30,000 operations min. 150,000 operation min. (Normally open side operation) 20,000 operation min. (Normally open side operation)
G2RL-2	8 A at 250 VAC (cosϕ=1) 8 A at 30 VDC	30,000 operations min. 30,000 operations min.
G2RL-1A-E	Pilot duty (A300), 250 VAC Pilot duty (A300), 125 VAC	250,000 operations min. 150,000 operations min.

Note: The results shown reflect values measured using very severe test conditions i.e., Duty: 1 sec ON/1 sec OFF. Electrical endurance will vary depending on the test conditions. Contact your OMRON representative if you require more detailed information for the electrical endurance under your test conditions.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

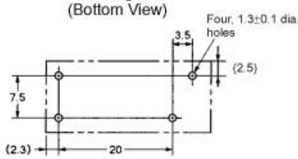
G2RL-1A, G2RL-1A4



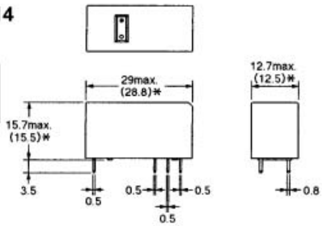
* Indicates average dimensions.

Terminal Arrangement/
Internal Connection
(Bottom View)

Mounting Holes
(Bottom View)

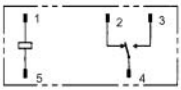


G2RL-1, G2RL-14

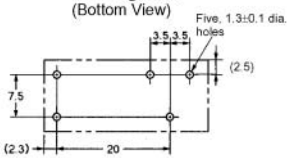


* Indicates average dimensions.

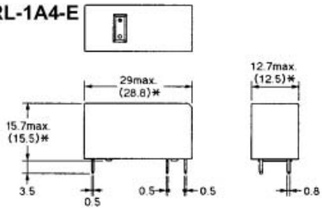
Terminal Arrangement/
Internal Connection
(Bottom View)



Mounting Holes
(Bottom View)



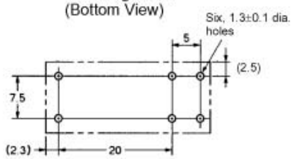
G2RL-1A-E, G2RL-1A4-E



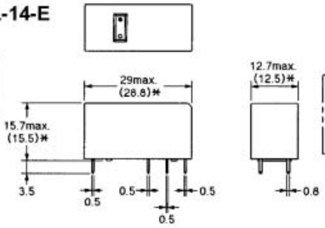
* Indicates average dimensions.

Terminal Arrangement/
Internal Connection
(Bottom View)

Mounting Holes
(Bottom View)

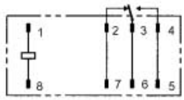


G2RL-1-E, G2RL-14-E

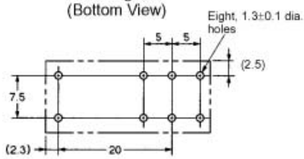


* Indicates average dimensions.

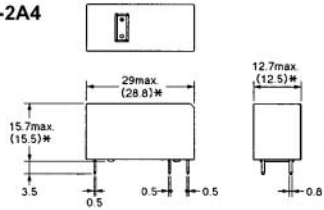
Terminal Arrangement/
Internal Connection
(Bottom View)



Mounting Holes
(Bottom View)



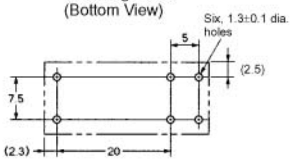
G2RL-2A, G2RL-2A4



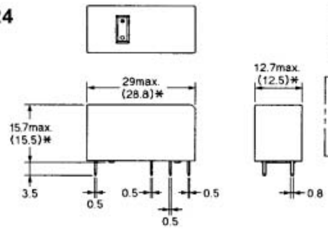
* Indicates average dimensions.

Terminal Arrangement/
Internal Connection
(Bottom View)

Mounting Holes
(Bottom View)



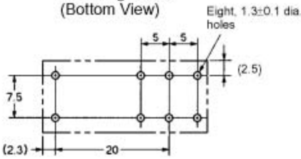
G2RL-2, G2RL-24



* Indicates average dimensions.

Terminal Arrangement/
Internal Connection
(Bottom View)

Mounting Holes
(Bottom View)



Precautions

Basic Information

Before actually committing any component to a mass-production situation, OMRON strongly recommends situational testing, in as close to actual production situations as possible. One reason is to confirm that the product will still perform as expected after surviving the many handling and mounting processes involved in mass production. Also, even though OMRON relays are individually tested a number of times, and each meets strict requirements, a certain testing tolerance is permissible. When a high-precision product uses many components, each depends upon the rated performance thresholds of the other components. Thus, the overall performance tolerance may accumulate into undesirable levels. To avoid problems, always conduct tests under the actual application conditions.

General

To maintain the initial characteristics of a relay, exercise care that it is not dropped or mishandled. For the same reason, do not remove the case of the relay; otherwise, the characteristics may degrade. Avoid using the relay in an atmosphere containing sulfuric acid (SO_2), hydrogen sulfide (H_2S), or other corrosive gases. Do not continuously apply a voltage higher than the rated maximum voltage to the relay. Never try to operate the relay at a voltage and a current other than those rated.
Do not use the relay at temperatures higher than that specified in the catalog or data sheet.

A Single-pole 16A Power Relay AC-coil Type

- L 29.0 x W 12.7 x H 15.7 (mm)
  Low profile: 15.7mm in height.
- Standards class F insulation available.
- Clearance and creepage distance between coil and contact: 8mm / 8mm, betrween the same pole 3mm / 4mm.
- An environmentally friendly product – Cd, Pb and Chromium free.

VDE

Ordering Information

Classification		Enclosure ratings	Contact form	
			SPST-NO	SPDT
Class F	High-capacity	Flux protection	–	G5RL-1-E

Note: When ordering, add the rated coil voltage to the number.
Example: G5RL-1-E 100 VAC
Rated coil voltage

■ Model Number Legend

G5RL-□□□–□
1 2 3 4

1. **Number of Poles**
   1: 1 pole
2. **Contact Form / Contact Construction**
   None: 1c / SPDT
3. **Enclosure Ratings**
   None: Flux protection
4. **Classfication**
   E: High capacity

Specifications

■ Coil Ratings

Rated voltage	24 VAC	100 VAC	115 VAC / 120 VAC		200 VAC	230 VAC / 240 VAC	
Rated current 50Hz (mA)	31.30	7.50	5.85	6.25	3.75	3.00	3.13
Rated current 60Hz (mA)	28.30	6.88	5.35	5.70	3.45	2.76	2.88
Coil resistance Ω	443.00	8220.00	11600.00		33000.00	47600.00	
Must operate voltage	75% max. of rated voltage						
Must release voltage	15% min. of rated voltage						
Max. voltage	90% ~ 110% of rated voltage						
Power consumption	Approx. 75 VA						

Note: 1. The above items are measured at a coil temperature of 23.
2. The tolerance of rated current is +15% / -20%.
3. Power consumption drop was measured at 50Hz.
4. Coil resistance is provided as reference values.

■ Contact Ratings

Load	Resistive load (cos Ø=1)
Rated load	AC250V 16A (N.O.), DC 24V 16A (N.O.), AC 250V 5A (N.C.), DC24V 5A (N.C.)
Rated carry current	16A (N.O.), 5A (N.C.)
Max. switching voltage	AC 250V, DC24V
Max. switching current	16A (N.O.), 5A (N.C.)
Max. switching capacity	AC 4000 VA (N.O.), AC 1250 VA (N.C.), DC384 W(N.O.), DC120 W (N.C.)
Min. permisable load	DC 24V 40mA

■ Approved Standards

UL 508 (File No. E41643 Vol.4 Sec.38) / CSA C22.2 No.1,C22.2 No.14 (Certificate No:1419093)

Model	Coil ratings	Contact ratings
G5RL-1-E	24VAC to 240 VAC	16 A, 277 VAC General, 50,000 c - NO 16 A, 250 VAC General, 50,000 c - NO TV-5, 25,000 c - NO A 300 Pilot Duty, 720 VA, 240 VAC, 30,000 c- NO ½Hp, 120 VAC, 6,000 c - NO 60 LRA/ 10 FLA, 250 VAC, 6,000 c - NO 5 A, 250 VAC General, 50,000 c - NC 5 A, 24 VDC Resistive, 50,000 c - NC

DIN EN 61810-1/EN 60255-23 (VDE Reg. No. A282)

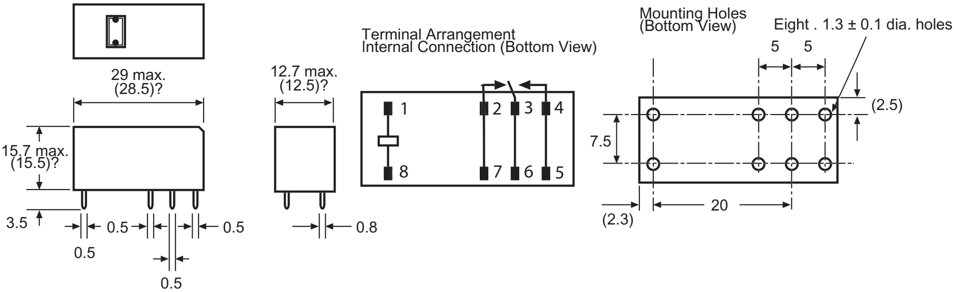
Model	Coil ratings	Contact ratings
G5RL-1-E	24,100,115/120, 200, 230/240 VAC (50Hz)	16A, 250 VAC, 16A 24 VDC

■ Characteristics

Contact resistance	100 mΩ max.
Operate time	15 ms max.
Release time	5 ms max.
Max. switching frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	1,000MΩ min. (at 500VDC)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min. between contacts of same polarity 6,000 VAC, 50/60 Hz for 1 min. between coil and contacts
Impulse withstand voltage	10,000V between coil and contacts, 1.2 X 50 µsec
Vibration resistance	Destruction: 10 to 55 to 10Hz, 1.5 mm double amplitude Malfunction: 10 to 55 to 10Hz, 1.5 mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: 100 m/s^2 (approx. 10G)
Life expectancy	Mechanical: 10,000,000 operations min. (at 18,000 operations/hr) Electrical: 50,000 operations min. (at 1,800 operations/hr, Resistive load 16A 250VAC N.O.) (at 1,800 operations/hr, Resistive load 16A 24VDC N.O.) (at 1,800 operations/hr, Resistive load 5A 250VAC N.C.) (at 1,800 operations/hr, Resistive load 5A 24VDC N.C.) 100,000 operations min. (at 1,800 operations/hr, Resistive load 12A 24VDC N.O.)
Ambient temperature	Operating: -40°C to 70°C
Ambient humidity	Operating: 5% to 85% RH
Weight Approx.	10 g

Dimensions

Note: All units are in millimeters unless otherwise indicated.



Packaging

Note: All units are in millimeters unless otherwise indicated.

Polystyrene Trays Packing

1 Polystyrene: 100 pcs relay

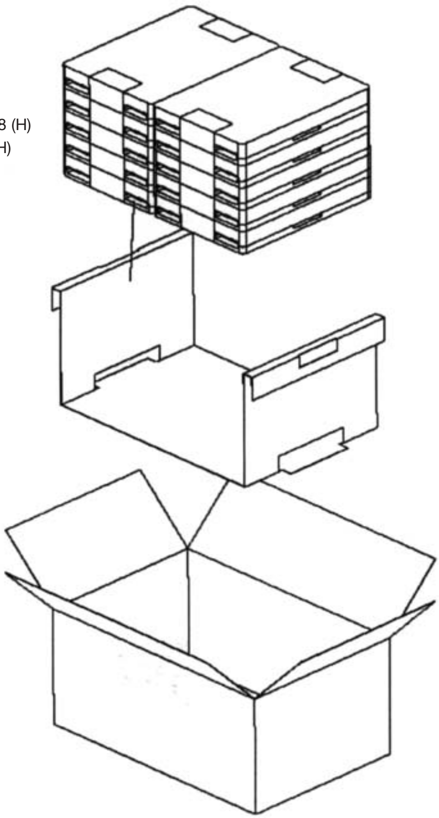
1 Sleeve Packing: 5 polystyrene tray

1 Carton: 2 sleeve packing –1000 pcs relay

Weight: Approx. 12 Kg per carton

Size of polystyrene tray is approximately:340 (L) x 120 (W) x 48 (H)

Size of Carton box is approximately: 535 (L) x 355 (W) x 250 (H)



Impulse Withstand Voltage as High as 10 kV with 4kV Dielectric Strength: Ideal for Power Supply Switching

- Creepage distance of 8 mm min.
- Dielectric strength of 4,000 VAC min.
- SPST-NO types conform to TV-8 rating.
- DPST-NO types conform to TV-5 rating.
- International 2.54mm terminal pitch.

Ordering Information

Contacts		SPST-NO	DPST-NO
Mounting style	**Terminals**		
General purpose	PCB (straight)	G4W-1112P-US-TV8	G4W-2212P-US-TV5
Upper mounting	Solder	G4W-11123A-US-TV8	G4W-22123A-US-TV5
	Quick-connect	G4W-11123T-US-TV8	G4W-22123T-US-TV5

Note: When ordering, add the rated coil voltage to the model number.
Example: G4W-11123A-US-TV8 12 VDC
Rated coil voltage

Model Number Legend

G4W - □ □ □ □ □ - □ - □ - □ □ VDC
1 2 3 4 5 6 7 8 9

1. **Contact Form**
   11: SPST-NO
   22: DPST-NO
2. **Contact Type**
   1: Single button
3. **Enclosure Ratings**
   2: Unsealed
4. **Mounting Style**
   None: Standard
   3: Upper mounting bracket
5. **Terminals**
   P: Straight PCB
   A: Solder
   T: Quick connect
6. **Approved Standards**
   US: UL, CSA certified
7. **TV Ratings**
   TV5: TV-5
   TV8: TV-8
8. **Special Function**
   None: General-purpose
   Z: Full-wave rectifier
9. **Rated Coil Voltage**
   12, 24, 100 VDC

Specifications

Coil Ratings

Single-side Stable Type

Rated voltage		12 VDC	24 VDC	100 VDC
Rated current		66.7 mA	33.3 mA	8 mA
Coil resistance		180 Ω	720 Ω	12,500 Ω
Coil inductance (H) (ref. value)	**Armature OFF**	0.93	3.7	61.8
	Armature ON	1.65	6.4	106
Must operate voltage		80% max. of rated voltage		
Must release voltage		10% min. of rated voltage		
Max. voltage		130% of rated voltage (at 23°C)		
Power consumption		Approx. 800 mW		

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±15%.
2. Operating characteristics are measured at a coil temperature of 23°C.

Contact Ratings

Item	SPST-NO		DPST-NO	
Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load cosø = 0.4; L/R = 7 ms)
Rated load	15A at 250 VAC; 15A at 24 VDC	10A at 250 VAC; 7.5A at 24 VDC	10A at 250 VAC; 10A at 24 VDC;	7.5A at 250 VAC; 5A at 24 VDC
Contact material	AgCdO (Cd free planned 1 Apr 05)			
Rated carry current	15A		10A	
Max. switching voltage	250 VAC, 125 VDC			
Max. switching current	15A		10A	
Max. switching power	3,750 VA, 375 W	2,500 VA, 255 W	2,500 VA, 240 W	1,850 VA, 120 W
Failure rate (reference value)	100 mA at 5 VDC			

Characteristics

Contact resistance	30 mΩ max.
Operate time	20 ms max. (mean value: approx. 13 ms)
Release time	5 ms max. (mean value: approx. 2.5 ms)
Bounce time	Operate: approx. 3 ms
Max. Operating Frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	100 MΩ max. (at 500 VDC)
Dielectric strength	4,000 VAC, 50/60 Hz for 1 min between coil and contacts 2,000 VAC, 50/60 Hz for 1 min between contacts of different polarities (DPST-NO) 1,500 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	10,000 V (1.2 x 50 μs) between coil and contacts
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 150 m/s^2
Endurance	Mechanical: 5,000,000 operations min. (at 18,000 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr)
Ambient temperature	Operating: -25°C to 55°C (with no icing)
Ambient humidity	Operating: 5% to 85% RH
Weight	Approx. 29 g

■ Approved Standards

UL508 (File No. E41643)/CSA C22.2 No.14 (File No.LR31928)

Model	Contact Form	Coil ratings	Contact ratings
G4W-1112P-US-TV8 G4W-11123A-US-TV8 G4W-11123T-US-TV8	SPST-NO	6 to 120 VDC	15 A, 250 VAC (general use) 15 A, 24 VDC TV-8 1/2 hp, 125 VAC 1 hp, 250 VAC 3/4 hp, 240 VAC
G4W-2212P-US-TV5 G4W-22123A-US-TV5 G4W-22123T-US-TV5	DPST-NO		15 A, 250 VAC (general use) 10 A, 250 VAC (general use) 15 A, 24 VDC TV-5 1/2 hp, 250 VAC 1/3 hp, 125/250 VAC

SEMKO (File No. 9346122, 9223128)

Contact form	Coil ratings	Contact ratings
SPST-NO	6-100 VDC	15/120 A, 250 VAC
DPST	6-120 VDC	10/80 A, 250 VAC

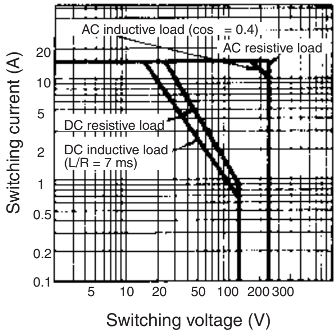
EN 61810-1 (VDE0435 (File No. 1906, No. 1907)

Contact form	Coil ratings	Contact ratings
SPST-NO	6, 12, 24, 48, 100 VDC	15 A, 250 VAC (cosø = 1.0) 10 A, 250 VAC (cosø = 0.4) 15 A, 24 VDC (0 ms) 7.5 A, 24 VDC (40 ms)
DPST-NO		10 A, 250 VAC (cosø = 1.0) 7.5 A, 250 VAC (cosø = 0.4) 10 A, 24 VDC (0 ms) 5 A, 24 VDC (40 ms)

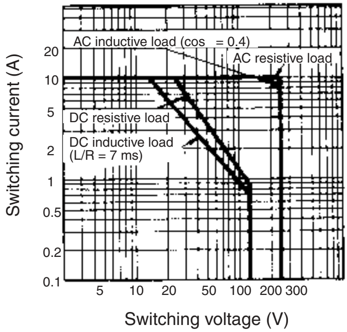
Engineering Data

Maximum Switching Power

G4W-1112P-US-TV8/-11123A-US-TV8/-11123T-US-TV8

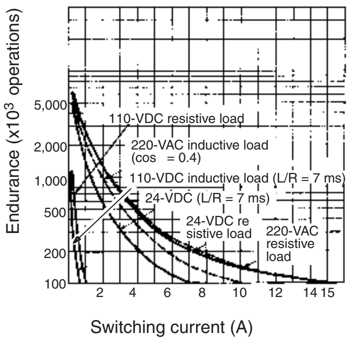


G4W-2212P-US-TV5/-22123A-US-TV5/-22123T-US-TV5

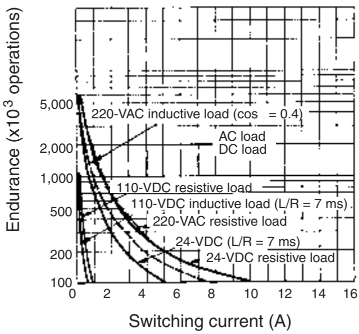


Endurance

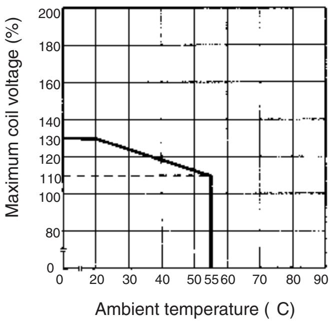
G4W-1112P-US-TV8/-11123A-US-TV8/-1123T-US-TV8



G4W-2212P-US-TV5/-22123A-US-TV5/-22123T-US-TV5



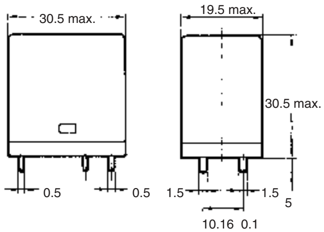
Ambient Temperature vs. Maximum Coil Voltage



Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

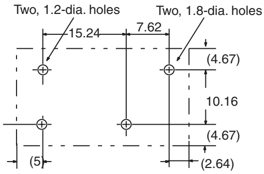
Dimensions

G4W-□12P-US-TV

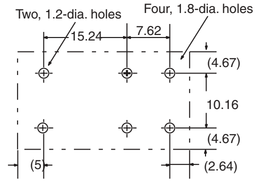


Mounting Holes (Bottom View)

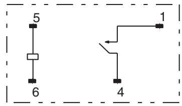
G4W-1112P-US-TV-8

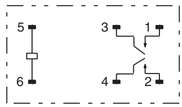


G4W-2212P-US-TV-5

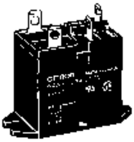


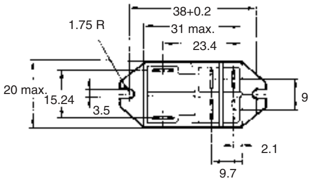
Terminal Arrangement/Internal Connections (Bottom View)

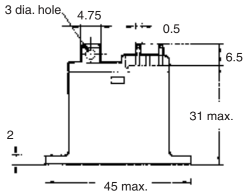




G4W-□123A-US-TV

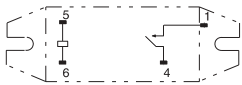




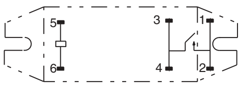


Terminal Arrangement/Internal Connections (Bottom View)

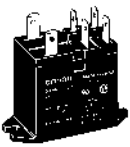
G4W-11123A-US-TV8

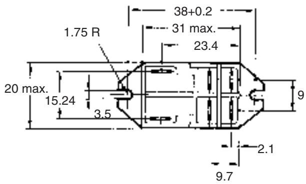


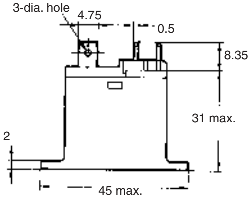
G4W-11123T-US-TV-8



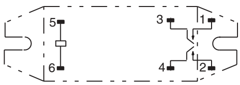
G4W-□123T-US-TV





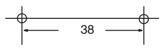


G4W-22123A-US-TV5
G4W-22123T-US-TV5



Mounting Holes (Bottom View)

Tolerance: 0.2



Compact, Low-cost 30-A Power Relay for PC Board or Panel-mounted Applications

- Compact, yet capable of switching up to 30-A loads.
- Complies with UL873 and UL508 column A spacings (⅛" through air, ¼" over surface).
- UL Class F insulation standard.
- Withstands of up to 6,000 V under 1.250 μs impulse wave or ring wave.
- A selection of contact forms: SPDT and SPST-NO.
- Quick-connect terminals versions ideal for PC board and panel mounting.
- Flanged mounting available.
- Ideal for home and industrial appliances, HVAC (heating, ventilating, and air conditioning), and many other applications.

Ordering Information

Classification		Contact Form	Enclosure Rating		
Mounting style	Terminals		Opem	Unsealed	Fully Sealed
PCB mounting	PCB	SPST-NO	G8P-1AP	G8P-1A2P	G8P-1A4P
		SPDT	G8P-1CP	G8P-1C2P	G8P-1C4P
		SPST-NO	G8P-1ATP	G8P-1A2TP	G8P-1A4TP
		SPDT	G8P-1CTP	G8P-1C2TP	G8P-1C4TP
Flanged mounting	Quick-connect	SPST-NO	–	G8P-1A2T-F	–
		SPDT	–	G8P-1C2T-F	–

Note: 1. The contacts described above are AgCdO.

2. When ordering, add the rated coil voltage to the model number
Example: G8P-1AP 12 VDC

Rated coil voltage

Model Number Legend

G8P - □ □ □ □ - □ □ VDC

1 2 3 4 5 6

1. **Number of Poles**
   1: 1 pole
2. **Contact Form**
   A: SPST-NO
   C: SPDT
3. **Enclosure Ratings**
   None: Open
   2: Unsealed
   4: Fully-Sealed
4. **Terminals**
   P: Straight PCB for contacts and coil
   T: Quick-connect (#250 terminals for contacts and #187 terminals for coil)
   TP: Quick-connect (#250 terminals) and straight PCB for contacts, and straight PCB for coil
5. **Mounting**
   None: PCB mounting
   F: Flanged mounting
6. **Rated Coil Voltage**
   5, 9, 12, 24, 48, 110
   Other rated coil voltages available.

Specifications

■ Coil Ratings

Rated voltage	5 VDC	9 VDC	12 VDC	24 VDC	48 VDC	110 VDC
Rated current	185 mA	93 mA	77 mA	36 mA	19 mA	9 mA
Coil resistance	27 Ω	97 Ω	155 Ω	660 Ω	2,480 Ω	12,400 Ω
Must operate voltage	75% max. of rated voltage					
Must release voltage	10% min. of rated voltage					
Max. voltage	120% of rated voltage					
Power consumption	Approx. 900 mW					

Note: The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of ±10%.

■ Contact Ratings

Item	SPST-NO	SPDT
Load	Resistive load (cosø = 1)	
Rated load	30 A at 250 VAC; 20 A at 28 VDC	20 A/10 A* at 250 VAC; 20 A/10 A* at 28 VDC
Contact material	AgCdO (Cd free planned 1 Apr 05)	
Rated carry current	30 A	20 A/10 A*
Max. switching voltage	250 VAC, 28 VDC	
Max. switching current	AC: 30 A, DC: 20 A	AC: 20 A/10 A, DC: 20 A/10 A*
Max. switching capacity	7,500 VA, 560 W	5,000/2,500 VA, 560/280 W*

Note: *NO contact/NC contact.

■ Characteristics

100 mΩ max.	
Operate time	15 ms max.
Release time	10 ms max.
Max. Operating Frequency	Mechanical: 18,000 operations/hr Electrical: 360 operations/hr (under rated load)
Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength	2,500 VAC, 50/60 Hz for 1 min between coil and contacts 1,500 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	6,000 V (1.2/50 μs) between coil and contacts
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.825-mm single amplitude (1.65-mm double amplitude) for 2 hours Malfunction: 10 to 55 to 10 Hz, 0.825-mm single amplitude (1.65-mm double amplitude) for 5 minutes
Shock resistance	Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: 100 m/s^2 (approx. 10G)
Endurance	Mechanical: 10,000,000 operation min. (at 18,000 operations/hr) Electrical: 100,000 operations min. (at rated load)
Ambient temperature	Operating: -55°C to 105°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	G8P-1CP: Approx. 21 g, G8P-1CTP: Approx. 24 g G8P-1C4P: Approx. 28 g, G8P-1C4TP: Approx. 31 g

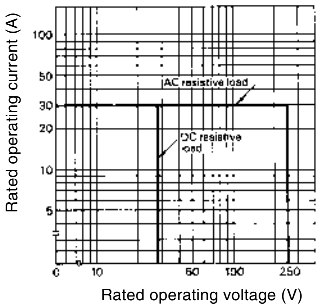
■ Approved Standards
UL (File No. E41643)/CSA (File No. LR34815-101)
EN 61810-1 (VDE Reg No. 40004714)

Type	Contact form	Coil ratings	Contact ratings
G8P-1A	SPST-NO	5 to 110 VDC	30 A, 277 VAC (G.P./Res.) 30 A, 250 VAC, 100 k ops. (Res.) 20 A, 120-240 VAC, 70°C, 100 k ops. (G.P./Res.) 20 A, 28 VDC (Res.) 20 A, 240 VAC, 105°C, 100 k ops. (Res.) 1 hp, 125-250 VAC 2 hp, 250 VAC A300 Pilot Duty 12FLA/72LRA, 250 VAC, 100 k ops. 20 FLA/96 LRA, 125 VAC, 100 k ops. 5 A, 250 VAC (Tungsten) 20 A, 120-277 VAC (Ballast) 25A, 250VAC
G8P-1C	SPDT	5 to 110 VDC	30 A/30 A, 250 VAC (Res.) 30 A/30 A, 277 VAC, 40°C, 100 k opns (NO) and 50 k opns (NC) 20 A/15 A, 120-240 VAC, 105°C, 100 k ops. (Res.) 20 A/10 A, 120-240 VAC, 70°C, 100 k ops. (G.P./Res.) 20 A/10 A, 28 VDC (Res.) 1/2 hp/ 1/2 hp, 125 VAC, 100 k ops. 2 hp/ 1/2 hp, 250 VAC 1 hp/ 1/4 hp, 125 VAC B150 Pilot Duty 5 A/3 A, 250 VAC (Tungsten) 6 A/3 A, 277 VAC (Ballast)

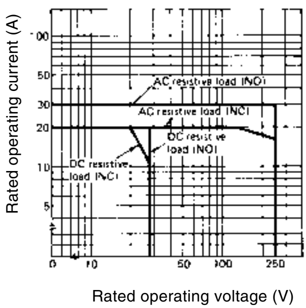
Engineering Data

Maximum Switching capacity

SPST-NO

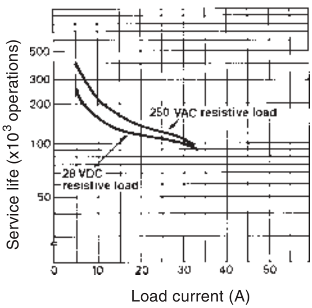


SPDT

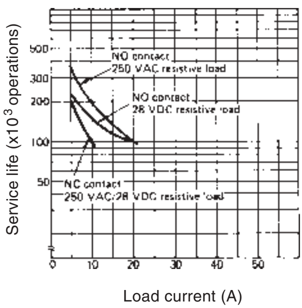


Endurance

SPST-NO



SPDT

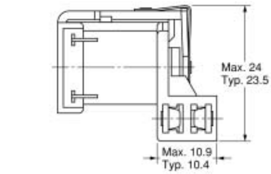


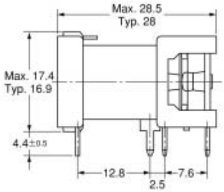
Dimensions

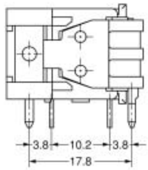
Note: All units are in millimeters unless otherwise indicated.

■ Open Types

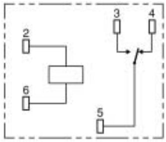
G8P-1CP/1AP



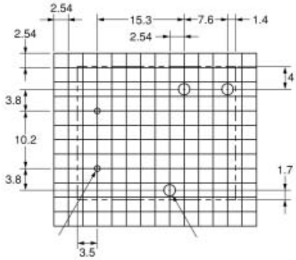




Terminal Arrangement/Internal Connections (Bottom View)

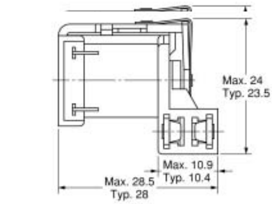


Mounting Holes (Bottom View)

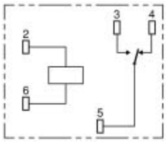


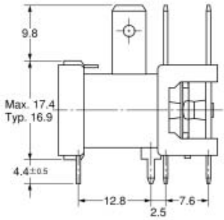
Note: Pin #4 is omitted on G8P-1AP.

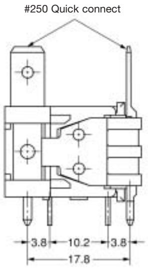
G8P-1CTP/1ATP



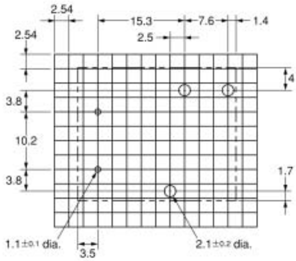
Terminal Arrangement/Internal Connections (Bottom View)







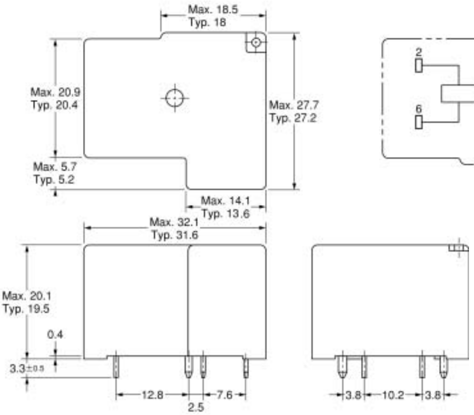
Mounting Holes (Bottom View)



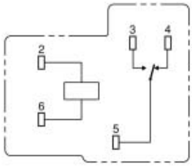
Note: Pin #4 is omitted on G8P-1ATP

■ Fully-Sealed Types/Unsealed Types

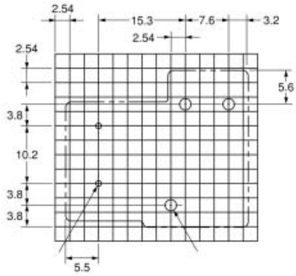
G8P-1C4P/1A4P/1C2P/1A2P



Terminal Arrangement/Internal Connections (Bottom View)

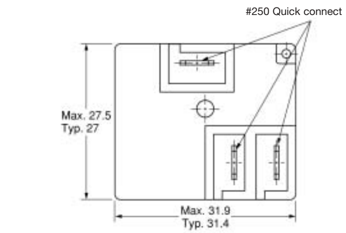


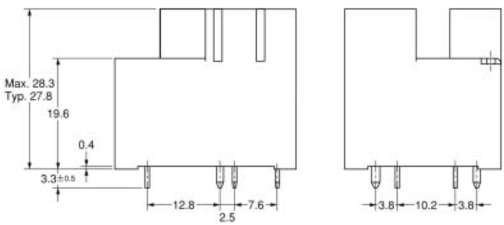
Mounting Holes (Bottom View)



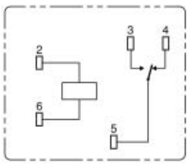
Note: Pin #4 is omitted on G8P-1A4P/1A2P

G8P-1C4TP/1A4TP/1C2TP/1A2TP

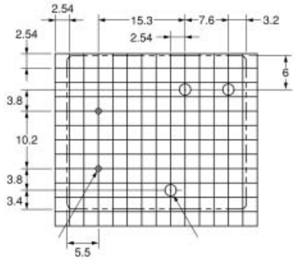




Terminal Arrangement/Internal Connections (Bottom View)



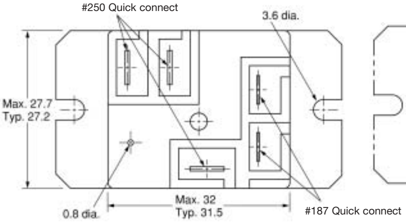
Mounting Holes (Bottom View)



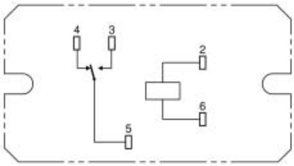
Note: Pin #4 is omitted on G8P-1A4TP/1A2TP

■ Flange Mounting Types

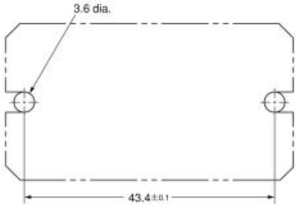
G8P-1C2T-F/1A2T-F



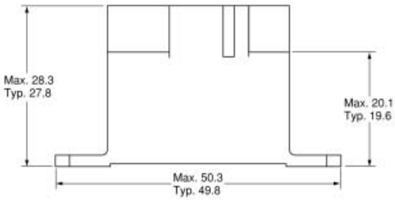
Terminal Arrangement/Internal Connections (Bottom View)

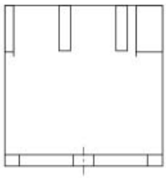


Mounting Holes (Bottom View)



Note: Pin #4 is omitted on G8P-1A2T-F





Note: Allow air circulation within the sealed type G8P by removing the knock off nib from the cover after soldering and cleaning is complete.

Precautions

Sealed Relays

Remove the vent hole tape seal from the cover after all soldering and cleaning have been completed to allow air circulation within sealed G8P Relays.

Miniature Single-pole Relay with 80-A Surge Current and 20-A Switching Current

- ROHS compliant.
- Ideal for motor switching.
- Miniature, relay with high switching power and long endurance.
- Creepage distance conforms to UL, CSA and EN standards.
- Highly noise-resistive insulation materials employed.
- Standard model available with flux protection construction.

Ordering Information

Classification	Contact Form	Model
#250 tab terminals/PCB coil terminals	SPST-NO	G4A-1A-E
PCB terminals/PCB coil terminals		G4A-1A-PE

Note: When ordering, add the rated coil voltage to the model number.
Example: G4A-1A-E 12 VDC
Rated coil voltage

Model Number Legend

G4A-□□-□□ □VDC
1 2 3 4 5

1. **Number of Poles**
   1: 1 pole
2. **Contact Form**
   A: SPST-NO
3. **Terminals**
   None: #250 tab/PCB coil terminals
   P: Straight PCB/PCB terminals
4. **Special Function**
   E: For long endurance
5. **Rated Coil Voltage**
   5, 12, 24 VDC

Specifications

Coil Rating

Rated voltage		5 VDC	12 VDC	24 VDC
Rated current		180 mA	75 mA	37.5 mA
Coil resistance		27.8Ω	160Ω	640Ω
Coil inductance (ref. value)	**Armature OFF**	–	0.8 H	3.5 H
	Armature ON	–	1.1 H	4.8 H
Must operate voltage		70% of rated voltage max.		
Must release voltage		10% of rated voltage min.		
Max. permissible voltage		160% of rated voltage at (23°)		
Power consumption		Approx. 0.9 W		

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.
3. Max. permissible voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

Contact Ratings

Rated load	20 A at 250 VAC
Rated carry current	20 A
Max. switching voltage	250 VAC
Max. switching current	20 A
Max. switching power	5,000 VA
Failure rate (ref. value)	100 mA at 5 VDC

Note: P level: λ_{60} = 0.1 x 10^{-6}/operation (with an operating frequency of 120 operations/min).

Endurance

with Motor Load

Load conditions	Switching frequency	Electrical endurance
250 VAC: Inrush current: 80 A, 0.3 s (cosø= 0.7) Break current: 20 A (cosø = 0.9)	ON: 1.5 s OFF: 1.5 s	200,000 operations

With Overload

Load conditions	Switching frequency	Electrical endurance
250 VAC: Inrush current: 80 A (cosø= 0.7) Break current: 80 A (cosfø= 0.7)	ON: 1.5 s OFF: 99 s	1,500 operations

With Inverter Load

Load conditions	Switching frequency	Electrical endurance
100 VAC: Inrush current: 200 A (0-P) Break current: 20 A	ON: 3 s OFF: 5 s	30,000 operations

Characteristics

Contact resistance	100 mΩ max.
Operate time	20 ms max.
Release time	10 ms max.
Max. Operating Frequency	Mechanical: 18,000 operations/hr
Insulation resistance	1000 MΩ max. (at 500 VDC)
Insulation resistance	100 MΩ max. (at 500 VDC)
Dielectric strength	4,500 VAC 50/60 Hz for 1 min between coil and contacts 1,000 VAC 50/60 Hz for 1 min between contacts of same polarity
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 200 m/s^2
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
Endurance	Mechanical: 2,000,000 operations min. (at 18,000 operations/hr) Motor load: 100,000 operations min. (ON/OFF: 1.5 s) Inverter load: 30,000 operations min. (ON: 3 s, OFF: 5 s)
Ambient temperature	Operating: -20°C to 60°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 25 g

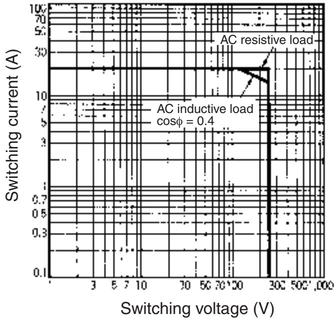
Note: The data shown above are initial values.

DIN EN 61810-1/EN 60255-23 (VDE Reg. No. 6673)

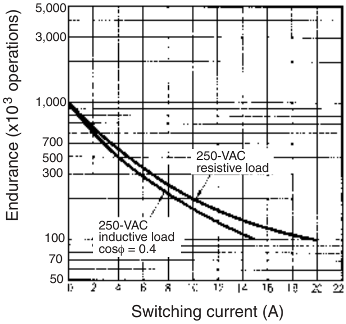
Model	Coil ratings	Contact ratings
G4A-1A	5 to 48 VDC	20A, 250VAC

Engineering Data

Maximum Switching Power



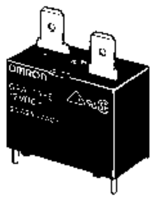
Endurance

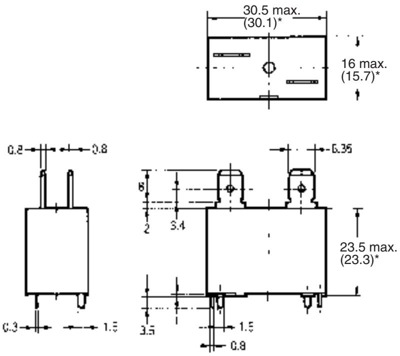


Dimensions

Note: All units are in millimeters unless otherwise indicated; dimensions shown in parentheses are in inches.

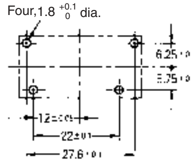
G4A-1A-E





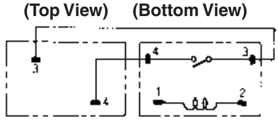
*Average value

Mounting Holes (Bottom View)



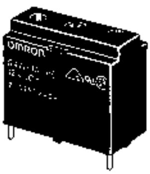
Terminal Arrangement /Internal Connections

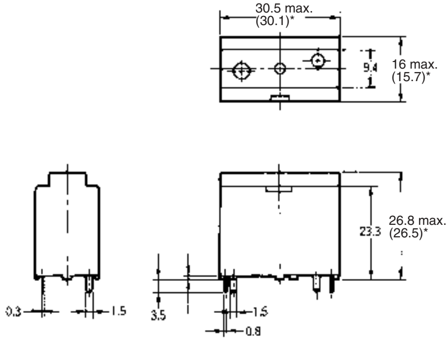
(Top View) **(Bottom View)**



Tab Terminal **PCB Terminal**

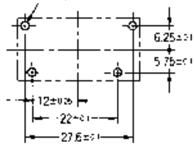
G4A-1A-PE



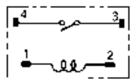


*Average value

Mounting Holes (Bottom View)



Terminal Arrangement /Internal Connections (Bottom View)



Precautions

Mounting

When mounting two or more relays side by side, provide a minimum space of 3 mm between relays.

Terminal Connection

The terminals fit FASTON receptacle 250 and are suitable for positive-lock mounting.
Do not apply excessive force on the terminals when mounting or dismounting the relay.
The following positive-lock connectors made by AMP are recommended.

Type	Receptacle terminals	Positive housing
#250 terminals (width: 6.35 mm)	AMP 170333-1 (170327-1) AMP 170334-1 (170328-1) AMP 170335-1 (170329-1)	AMP 172076-1 natural color AMP 172076-4 yellow AMP 172076-5 green AMP 172076-6 blue

Note: The numbers shown in parentheses are for air-feeding.

DC Power Relays Capable of Interrupting High-voltage, High-current Loads

- A compact relay (73 x 36 x 67.2 mm (L x W x H)) capable of switching 400-V 60-A/100-A DC loads. (Capable of interrupting 600 A at 300 VDC max.)
- The switching section and driving section are gas-injected and hermetically sealed, allowing these compact relays to interrupt high-capacity loads. The sealed construction also requires no arc space, saves space, and helps ensure safe applications.
- Downsizing and optimum design allow no restrictions on the mounting direction.
- Terminal Cover and DIN Track Adapters are also available for industrial applications.
- UL/CSA approval pending.

Model Number Structure

■ Model Number Legend

G9EA-□-□-□-□
1 2 3 4

1. Number of Poles
1: 1 pole

2. Contact Form
Blank: SPST-NO

3. Coil Terminals
B: M3.5 screw terminals
Blank: Lead Wire Output

4. Special Functions
CA: High-current conduction (100 A)

Note: Power-saving Models (with auxiliary contacts function) are scheduled to be added to the lineup as special function models.

Specifications

■ List of Models

Models	Terminals		Contact form	Rated coil voltage	Model
	Coil terminals	Contact terminals			
Switching / current conduction models	Screw terminals	Screw terminals	SPST-NO	12 VDC 24 VDC 48 VDC 60 VDC 100 VDC	G9EA-1-B
	Lead wires				G9EA-1
High-current conduction models	Screw terminals				G9EA-1-B-CA
	Lead wires				G9EA-1-CA

Note: 1. Relays come with two M5 screws for the main terminals (contacts).
2. Relays with coil terminals and screw terminals come with two M3.5 screws.

■ Ratings

Coil

Rated voltage	Rated current	Coil resistance	Must-operate voltage	Must-release voltage	Max. Voltage (see note 3)	Power consumption
12 VDC	417 mA	28.8 Ω	75% max. of rated voltage	8% min. of rated voltage	130% of rated voltage	Approx. 5 W
24 VDC	208 mA	115.2 Ω				
48 VDC	102 mA	469.3 Ω				
60 VDC	86.2 mA	695.7 Ω				Approx. 5.2 W
100 VDC	53.6 mA	1,864 Ω				Approx. 5.4 W

Note: 1. The figures for the rated current and coil resistance are for a coil temperature of 23°C and have a tolerance of ±10%.
2. The figures for the operating characteristics are for a coil temperature of 23°C.
3. The figure for the maximum voltage is the maximum voltage that can be applied to the relay coil for period of 10 minutes at an ambient temperature of 23°C. It does not apply to continuous operation.

Contacts

Item	Rated current	
	G9EA-1(-B)	**G9EA-1(-B)-CA**
Rated load	60 A at 400 VDC, 100 A at 120 VDC	30 A at 400 VDC
Rated carry current	60 A	100 A
Maximum switching voltage	400 V	400 V
Maximum switching current	100 A	30 A

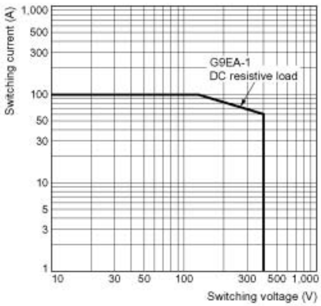
■ Characteristics

Item		G9EA-1(-B)	G9EA-1(-B)-CA
Contact resistance (see note 2)		30 mΩ max. (0.6 mΩ typical)	10 mΩ max. (0.3 mΩ typical)
Contact voltage drop		0.1 V max. (for a carry current of 60 A)	0.1 V max. (for a carry current of 100 A)
Operate time		50 ms max.	
Release time		30 ms max.	
Insulation resistance (see note 3.)	**Between coil & contacts**	1,000 MΩ min.	
	Between contacts of the same polarity	1,000 MΩ min.	
Dielectric strength	**Between coil & contacts**	2,500 VAC, 1 min	
	Between contacts of the same polarity	2,500 VAC, 1 min	
Impulse withstand voltage (See note 4.)		4,500 V	
Vibration resistance	**Destruction**	10 to 55 to 10 Hz, 0.75-mm single amplitude (Acceleration: 2.94 to 88.9 m/s^2)	
	Malfunction	10 to 55 to 10 Hz, 0.75-mm single amplitude (Acceleration: 2.94 to 88.9 m/s^2)	
Shock resistance	**Destruction**	490 m/s^2	
	Malfunction	196 m/s^2	
Mechanical endurance (See note 5.)		200,000 ops. min.	
Electrical endurance (See note 6.)		120 VDC, 100 A, 3,000 ops. min.	400 VDC, 30 A, 1,000 ops. min.
		400 VDC, 60 A, 3,000 ops. min.	120 VDC, 30 A, 2,500 ops. min.
		400 VDC, 30 A, 30,000 ops. min.	–
Short-time carry current		100 A (10 min)	150 A (10 min)
Maximum interruption current		600 A at 300 VDC (5 times)	–
Overload interruption		180 A at 400 VDC (100 times min.)	100 A at 120 VDC (150 times min.)
Reverse polarity interruption		-60 A at 200 VDC (1,000 times min.)	–
Ambient operating temperature		-40 to 70°C (with no icing or condensation)	
Ambient operating humidity		5% to 85%	
Weight Approx.		310 g	

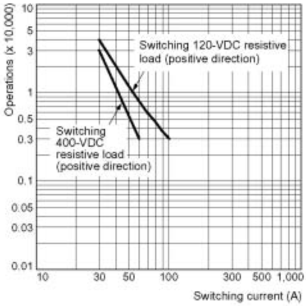
Note: **1.** The above values are initial values at an ambient temperature of 23°C unless otherwise specified.
2. The contact resistance was measured with 1 A at 5 VDC using the voltage drop method.
3. The insulation resistance was measured with a 500-VDC megohmmeter.
4. The impulse withstand voltage was measured with a JEC-212 (1981) standard impulse voltage waveform (1.2 x 50 µs).
5. The mechanical endurance was measured at a switching frequency of 3,600 operations/hr.
6. The electrical endurance was measured at a switching frequency of 60 operations/hr.

■ G9EA-1(-B) Switching/Current Conduction Models

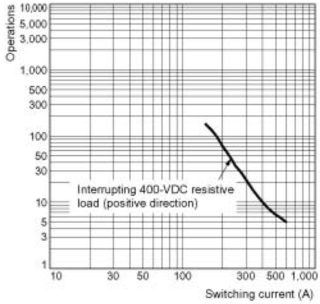
Maximum Switching Capacity



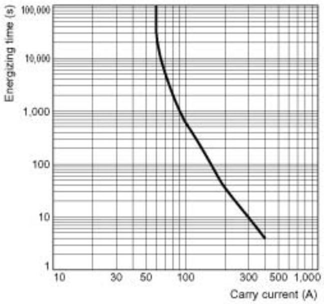
Electrical Endurance (Switching Performance)



Electrical Endurance (Interruption Performance)

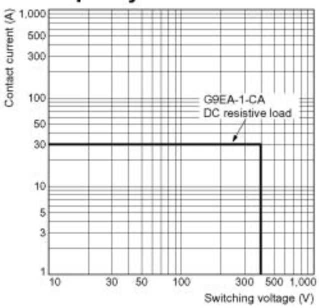


Carry Current vs Energizing Time

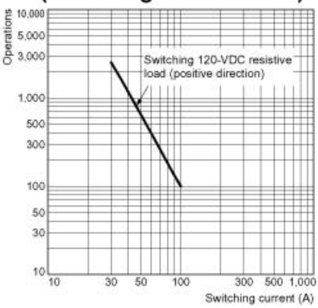


■ G9EA-1(-B)-CA High-current Conduction Models

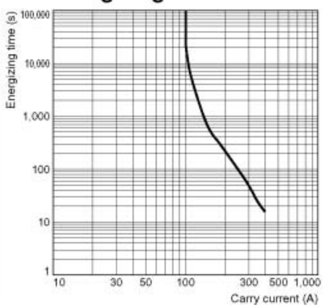
Maximum Switching Capacity



Electrical Endurance (Switching Performance)

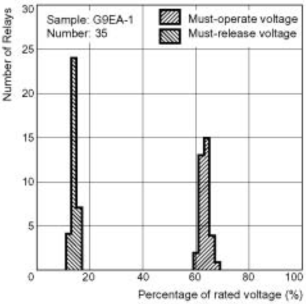


Carry Current vs Energizing Time

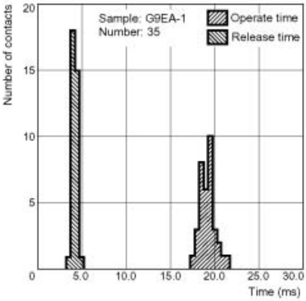


■ All G9EA-1 Models

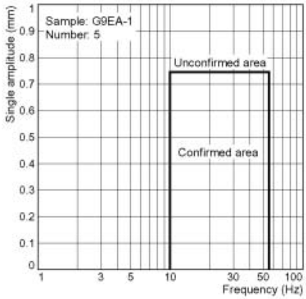
Must-operate Voltage and Must-release Voltage Distributions



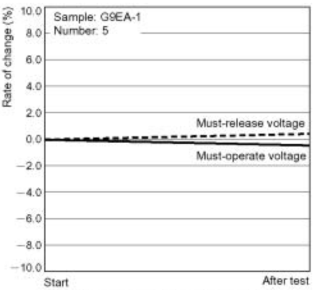
Time Characteristic Distributions



Vibration Malfunction

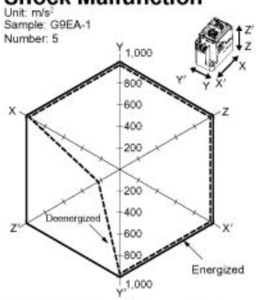


Vibration Resistance



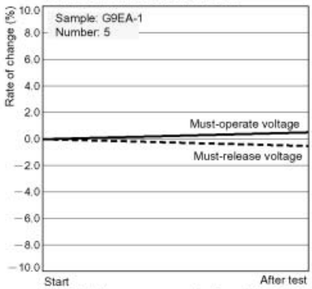
Characteristics were measured after applying vibration at a frequency of 10 to 55 Hz (single amplitude of 0.75 mm) to the test piece (not energized) for 2 hours each in 3 directions. The percentage rate of change is the average value for all of the samples

Shock Malfunction



The value at which malfunction occurred was measured after applying shock to the test piece 3 times each in 6 directions along 3 axes.

Shock Resistance



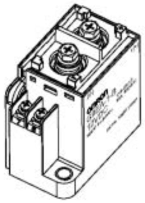
Characteristics were measured after applying a shock of 490 m^2/s to the test piece 3 times each in 6 directions along 3 axes. The percentage rate of change is the average value for all of the samples.

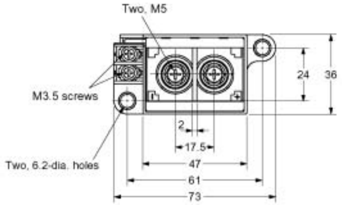
Dimensions

Note: All units are in millimeters unless otherwise indicated.

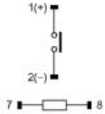
■ Models with Screw Terminals

G9EA-1-B(-CA)



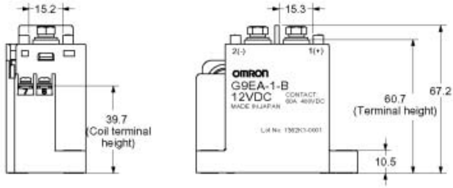


Terminal Arrangement/ Internal Connections (TOP VIEW)

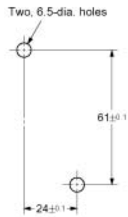


Note: Be sure to connect terminals with the correct polarity. Coils do not have polarity.

Dimension (mm)	Tolerance (mm)
10 or lower	±0.3
10 to 50	±0.5
50 or higher	±1

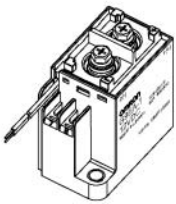


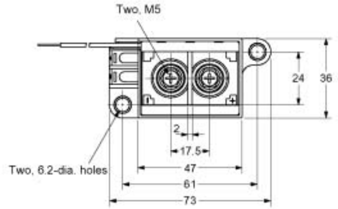
Mounting Hole Dimensions (TOP VIEW)



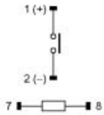
■ Models with Lead Wires

G9EA-1(-CA)



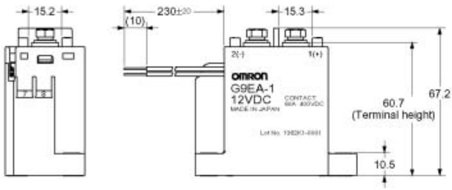


Terminal Arrangement/ Internal Connections (TOP VIEW)

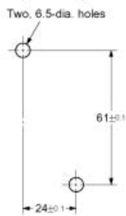


Note: Be sure to connect terminals with the correct polarity. Coils do not have polarity.

Dimension (mm)	Tolerance (mm)
10 or lower	±0.3
10 to 50	±0.5
50 or higher	±1



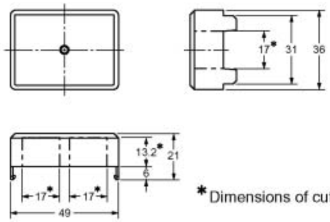
Mounting Hole Dimensions (TOP VIEW)



Options

■ Terminal Cover

P9EA-C

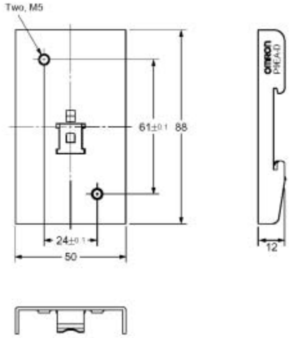


*Dimensions of cutouts for wiring.

Dimension (mm)	Tolerance (mm)
10 or lower	±0.3
10 to 50	±0.5
50 or higher	±1

■ DIN Track Adaptor

P9EA-D



Dimension (mm)	Tolerance (mm)
10 or lower	±0.3
10 to 50	±0.5
50 or higher	±1

DC Power Relays Capable of Interrupting High-voltage, High-current Loads

- A compact relay (98 x 44 x 86.7 mm (L x W x H)) capable of switching 400V, 200 A DC loads. (Capable of interrupting 1,000 A at 400 VDC max.)
- The switching section and driving section are gas-injected and hermetically sealed, allowing these compact relays to interrupt high-capacity loads. The sealed construction also requires no arc space, saves space, and helps ensure safe applications.
- Downsizing and optimum design allow no restrictions on the mounting direction.
- Terminal Cover is also available for industrial applications.
- UL/CSA approval pending.

Model Number Structure

Model Number Legend

G9EC-□-□-□-□
1 2 3 4

1. Number of Poles
1: 1 pole

2. Contact Form
Blank: SPST-NO

3. Coil Terminals
B: M3.5 screw terminals (standard)
Blank: Lead wire output

4. Special Functions

Note: Power-saving Models (with auxiliary contacts function) are scheduled to be added to the line-up as special function models.

Specifications

List of Models

Models	Terminals		Contact form	Rated coil voltage	Model
	Coil terminals	Contact terminals			
Switching / current conduction models	Screw terminals	Screw terminals	SPST-NO	12 VDC 24 VDC 48 VDC 60 VDC 100 VDC	G9EC-1-B
	Lead wires				G9EC-1

Note: 1. Relays come with two M8 nuts for the main terminals (contacts).
2. Relays with coil terminals and screw terminals come with two M3.5 screws.

■ Ratings

Coil

Rated voltage	Rated current	Coil resistance	Must-operate voltage	Must-release voltage	Max. Voltage (see note 3)	Power consumption
12 VDC	938 mA	12.8 Ω	75% max. of rated voltage	8% min. of rated voltage	110% of rated voltage	Approx. 11 W
24 VDC	469 mA	51.2 Ω				
48 VDC	234 mA	204.8 Ω				
60 VDC	188 mA	320.0 Ω				
100 VDC	113 mA	888.9 Ω				

Note: 1. The figures for the rated current and coil resistance are for a coil temperature of 23°C and have a tolerance of ±10%.
2. The figures for the operating characteristics are for a coil temperature of 23°C.
3. The figure for the maximum voltage is the maximum voltage that can be applied to the relay coil for period of 10 minutes at an ambient temperature of 23°C. It does not apply to continuous operation.

Contacts

Item	Rated current
	G9EC-1(-B)
Rated load	200 A at 400 VDC
Rated carry current	200 A
Maximum switching voltage	400 V
Maximum switching current	200 A

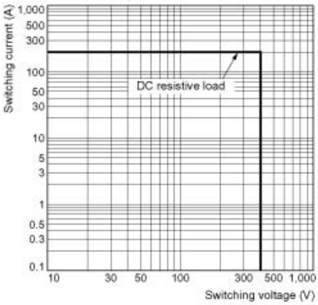
■ Characteristics

Item		G9EC-1(-B)
Contact resistance (see note 2)		30 mΩ max. (0.2 mΩ typical)
Contact voltage drop		0.1 V max. (for a carry current of 200 A)
Operate time		50 ms max.
Release time		30 ms max.
Insulation resistance (see note 3.)	**Between coil & contacts**	1,000 MΩ min.
	Between contacts of the same polarity	1,000 MΩ min.
Dielectric strength	**Between coil & contacts**	2,500 VAC, 1 min
	Between contacts of the same polarity	2,500 VAC, 1 min
Impulse withstand voltage (See note 4.)		4,500 V
Vibration resistance	**Destruction**	10 to 55 to 10 Hz, 0.75-mm single amplitude (Acceleration: 2.94 to 88.9 m/s^2)
	Malfunction	10 to 55 to 10 Hz, 0.75-mm single amplitude (Acceleration: 2.94 to 88.9 m/s^2)
Shock resistance	**Destruction**	490 m/s^2
	Malfunction	196 m/s^2
Mechanical endurance (See note 5.)		200,000 ops. min.
Electrical endurance (resistive load) (See note 6.)		400 VDC, 200 A, 3,000 ops. min.
Short-time carry current		300 A (15 min)
Maximum interruption current		1.000 A at 400 VDC (10 times)
Overload interruption		700 A at 400 VDC (40 times min.)
Reverse polarity interruption		-200 A at 200 VDC (1,000 times min.)
Ambient operating temperature		-40 to 50°C (with no icing or condensation)
Ambient operating humidity		5% to 85%
Weight Approx.		570 g

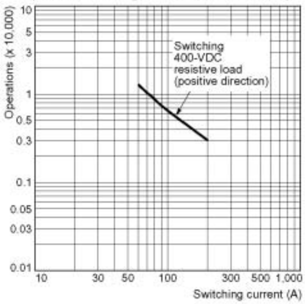
Note: 1. The above values are initial values at an ambient temperature of 23°C unless otherwise specified.
2. The contact resistance was measured with 1 A at 5 VDC using the voltage drop method.
3. The insulation resistance was measured with a 500 VDC megohmmeter.
4. The impulse withstand voltage was measured with a JEC-212 (1981) standard impulse voltage waveform (1.2 x 50 μs).
5. The mechanical endurance was measured at a switching frequency of 3,600 operations/hr.
6. The electrical endurance was measured at a switching frequency of 60 operations/hr.

■ G9EC-1 Switching / Current Conduction Models

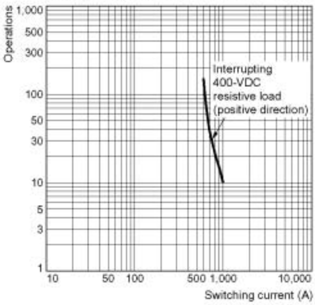
Maximum Switching Capacity



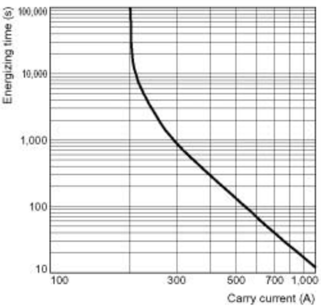
Electrical Endurance (Switching Performance)



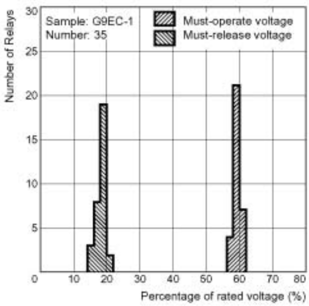
Electrical Endurance (Interruption Performance)



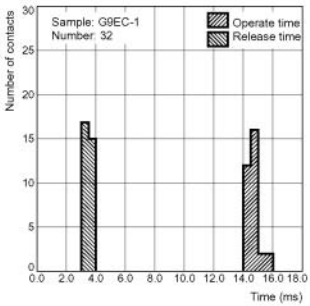
Carry Current vs Energizing Time



Must-operate Voltage and Must-release Voltage Distributions

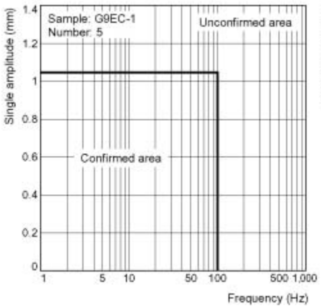


Time Characteristic Distributions

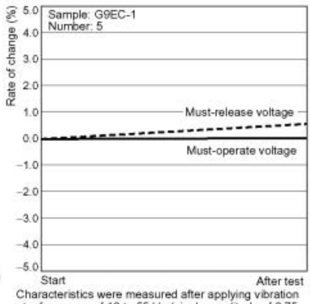


■ G9EC-1 Switching / Current Conduction Models

Vibration Malfunction

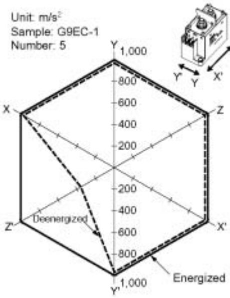


Vibration Resistance



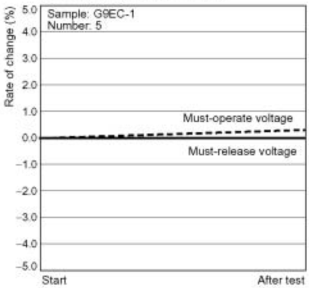
Characteristics were measured after applying vibration at a frequency of 10 to 55 Hz (single amplitude of 0.75 mm) to the test piece (not energized) for 2 hours each in 3 directions. The percentage rate of change is the average value for all of the samples.

Shock Malfunction



The value at which malfunction occurred was measured after applying shock to the test piece 3 times each in 6 directions along 3 axes.

Shock Resistance



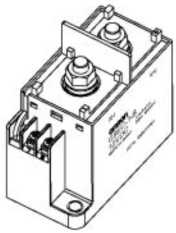
Characteristics were measured after applying a shock of 490 m^2/s to the test piece 3 times each in 6 directions along 3 axes. The percentage rate of change is the average value for all of the samples.

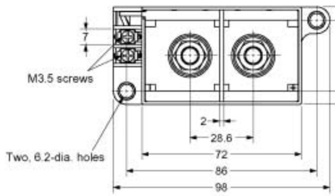
Dimensions

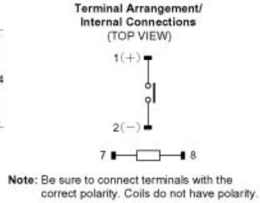
Note: All units are in millimeters unless otherwise indicated.

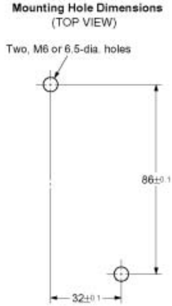
Models with Screw Threads

G9EC-1-B

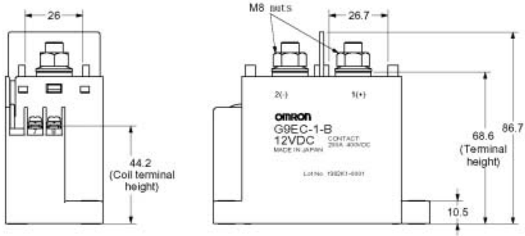






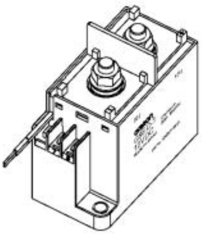


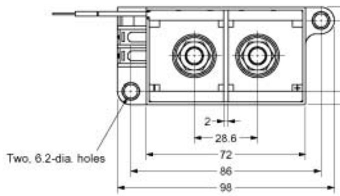
Dimension (mm)	Tolerance (mm)
10 or lower	±0.3
10 to 50	±0.5
50 or higher	±1

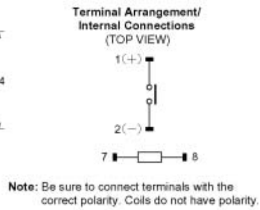


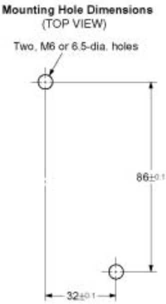
Models with Lead Wires

G9EC-1

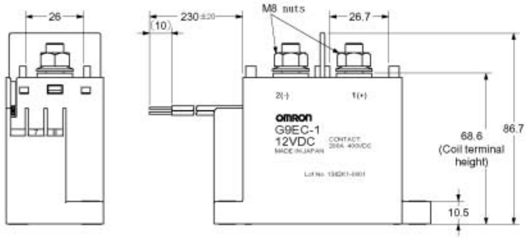








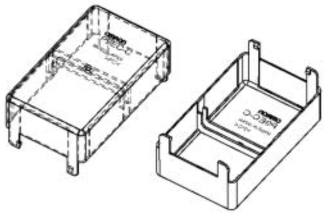
Dimension (mm)	Tolerance (mm)
10 or lower	±0.3
10 to 50	±0.5
50 or higher	±1

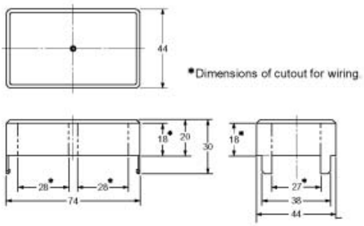


Options

Terminal Cover

P9EC-C





Dimension (mm)	Tolerance (mm)
10 or lower	±0.3
10 to 50	±0.5
50 or higher	±1

Precautions

WARNING
Take measures to prevent contact with charged parts when using the Relay for high voltages.

■ Correct Use

Refer to the relevant catalog for common precautions.

1. Be sure to tighten all screws to the appropriate torque given below. Loose screws may result in burning due to abnormal heat generation during energization.
   - M8 screws: 8.82 to 9.80 N·m
   - M6 screws: 3.92 to 4.90 N·m
   - M5 screws: 1.57 to 2.35 N·m
   - M4 screws: 0.98 to 1.37 N·m
   - M3.5 screws: 0.75 to 1.18 N·m
2. The G9EA and G9EC Relays' contacts have polarity. Be sure to perform connections with the correct polarity. If the contacts are connected with the reverse polarity, the switching characteristics specified in this document cannot be assured.
3. Do not drop or disassemble this Relay. Not only may the Relay fail to meet the performance specifications, it may also result in damage, electric shock, or burning.
4. Do not use these Relays in strong magnetic fields of 800 A/m or higher (e.g., near transformers or magnets). The arc discharge that occurs during switching may be bent by the magnetic field, resulting in flashover or insulation faults.
5. This Relay is a device for switching high DC voltages. If it is used for voltages exceeding the specified range, it may not be possible to interrupt the load and burning may result. In order to prevent fire spreading, use a configuration in which the current load can be interrupted in the event of emergencies.

   In order to ensure safety of the system, replace the Relay on a regular basis.
6. If the Relay is used for no-load switching, the contact resistance may increase and so confirm correct operation under the actual operating conditions.
7. These Relays contain pressurized gas. Even in applications with low switching frequencies, the ambient temperature and heat caused by arc discharge in the contacts may allow permeation of the sealed gas, resulting in arc interruption failure.

   In order to ensure safety of the system, replace Relays on a regular basis.
8. Do not use or store the Relay in a vacuum. Doing so will accelerate deterioration of the sealing.
9. With this Relay, if the rated voltage (or current) is continuously applied to the coil and contacts, and then turned OFF and immediately ON again, the coil temperature, and consequently the coil resistance, will be higher than usual. This means that the mustoperate voltage will also be higher than usual, exceeding the rated value ("hot start"). In this case, take the appropriate countermeasures, such as reducing the load current or restricting the energizing time or ambient operating temperature.
10. The ripple percentage for DC relays can cause fluctuations in the must-operate voltage or humming. For this reason, reduce the ripple percentage in full-wave rectified power supply circuits by adding a smoothing capacitor. Ensure that the ripple percentage is less than 5%.
11. Ensure that a voltage exceeding the specified maximum voltage is not continuously applied to the coil. Abnormal heating in the coil may shorten the lifetime of the insulation coating.
12. Do not use the Relay at a switching voltage or current greater than the specified maximum values. Doing so may result in arc discharge interruption failure or burning due to abnormal heating in the contacts.
13. The contact ratings are for resistive loads. The electrical endurance with inductive loads is inferior to that of resistive loads. Confirm correct operation under the actual operating conditions.
14. Do not use the Relay in locations where water, solvents, chemicals, or oil may come in contact with the case or terminals. Doing so may result in deterioration of the case resin or abnormal heating due to corrosion or contamination of the terminals. Also, if electrolyte adheres to the output terminals, electrolysis may occur between the output terminals, resulting in corrosion of the terminals or wiring disconnections.
15. Be sure to turn OFF the power and confirm that there is no residual voltage before replacing the Relay or performing wiring.
16. The distance between crimp terminals or other conductive parts will be reduced and insulation properties will be lowered if wires are laid in the same direction from the contact terminals. Use insulating coverings, do not wire in the same direction, and take other measures as required to maintain insulation properties.
17. Do not tighten the screws to a torque exceeding 11 N·m for the M8 screws and 5 N·m for the M5 screws.

    Overtightening the contact terminals will reduce the switching performance and damage the product.

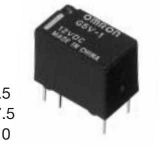
The coil's power consumption can be reduced by using in combination with a semiconductor circuit. Consult your OMRON representative for details.

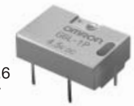
Recommended Wire Size

Model	Size
G9EA-1(-B)	14 to 22 mm^2
G9EA-1(-B)-CA	22 to 38 mm^2
G9EC-1(-B)	38 to 60 mm^2
G9EB-1-B	Consult your OMRON representative

Note: Use flexible leads.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Model		G5V-1	G2E		G6E
Features		Slim single in-line miniature relay	Miniature, low-cost relay		Sub-miniature, sensitive relay
Appearance					
Dimensions (LxWxH)		12.5 x 7.5 x 10	15.5 x 10.5 x 11.5		16 x 10 x 8
Contact Ratings	Contact Form	SPDT	SPDT		SPDT
	Contact Type	Single Crossbar	Single Crossbar	Bifurcated Crossbar	Bifurcated Crossbar
	Contact Material	Ag (Au-clad)	AgPg (Au-clad)		Ag (Au-clad)
	Resistive Load	0.5 A at 125 VAC 1 A at 24 VDC	0.5 A at 110 VAC 1 A at 24 VDC		0.4 A at 125 VAC 12 A at 30 VDC
	Max. Switching Current	1 A	1 A		3 A
	Min. Permissible load	1 mA at 5 VDC	1 mA at 5 VDC	10 μA at 10 mVDC	10 μA at 10 mVDC
	Max. Switching Power	125 VA, 90 W	120 VA, 30 W		50 VA, 60 W
	Max. Switching Voltage	270 VAC, 60 VDC	125 VAC, 60 VDC		250 VAC, 220 VDC
Coil ratings	Rated Voltage	3 to 24 VDC	1.5 to 24 VDC		3 to 48 VDC
	Power Consumption (Approx.)	150 mW	450 mW (200 mW high sensitivity version)		200 to 400 mW
Endura-nce	Electrical (operations)	100,000 min	200,000 min		100,000 min
	Mechanical (operations)	5,000,000 min	10,000,000 min		100,000,000 min
Dialec-tric strength	Between coil and contacts	1,000 VAC	500 VAC		1,500 VAC
	Between contacts of different polarity	–	–		–
	Between contacts of same polarity	400 VAC	500 VAC		1,000 VAC
Ambient temperature (operating)		-40°C to 70°C	-40°C to 70°C		-40°C to 70°C
Variations	Single Side Stable	•	•		•
	Single Winding Latching				•
	Double Winding Latching				•
	Through Hole	•	•		•
	Surface Mount				
	Fully Sealed	•	•		•
Approved Standards		UL, CSA	UL, CSA		UL, CSA
Page		178	181		184

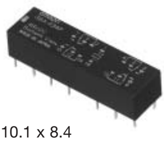
Model		G6L	G6H
Features		Ultra-thin flat relay	Ultra-small relay with 5mm height
Appearance Dimensions (LxWxH)		G6L-1P  10.6 x 7 x 3.8 G6L-1F  10.6 x 7 x 4.2	G6H-2F  14.3 x 9.3 x 5.4 G6H-2  14.3 x 9.3 x 6.6
Contact Ratings	Contact Form	SPST-NO	SPST-NO
	Contact Type	Single Crossbar	Single Crossbar
	Contact Material	Ag (Au-clad)	Ag (Au-clad)
	Resistive Load	0.3 A at 125 VAC 1 A at 24 VDC	0.5 A at 125 VAC 1 A at 30 VDC
	Max. Switching Current	1 A	1 A
	Min. Permissible load	1 mA at 5 VDC	10 µA at 10 mVDC
	Max. Switching Power	37.5 VA, 24 W	62.5 VA, 33 W
	Max. Switching Voltage	125 VAC, 60 VDC	125 VAC, 110 VDC
Coil ratings	Rated Voltage	3 to 24 VDC	3 to 48 VDC
	Power Consumption (Approx.)	180 to 230 mW	140 to 280 mW
Endura-nce	Electrical (operations)	100,000 min	200,000 min
	Mechanical (operations)	5,000,000 min	100,000,000 min
Dialec-tric strength	Between coil and contacts	1,000 VAC	1,000 VAC
	Between contacts of different polarity	–	1,000 VAC
	Between contacts of same polarity	750 VAC	750 VAC
Ambient temperature (operating)		-40°C to 70°C	-40°C to 70°C
Variations	Single Side Stable	•	•
	Single Winding Latching		•
	Double Winding Latching		•
	Through Hole	•	•
	Surface Mount	•	•
	Fully Sealed	•	•
Approved Standards		UL, CSA	UL, CSA
Page		189	198

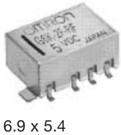
Model		G6J-Y		
Features		Ultra compact and slim relay		
Appearance Dimensions (LxWxH)		G6J-2FS-Y  10.6 x 5.7 x 10.0	G6J-2FL-Y  10.6 x 5.7 x 10.0	G6J-2P-Y  10.6 x 5.7 x 9.0
Contact Ratings	Contact Form	DPDT		
	Contact Type	Bifurcated Crossbar		
	Contact Material	Ag (Au alloy contact)		
	Resistive Load	0.3 A at 125 VAC 1 A at 30 VDC		
	Max. Switching Current	1 A		
	Min. Permissible load	1 µA at 10 mVDC		
	Max. Switching Power	37.5 VA, 30 W		
	Max. Switching Voltage	125 VAC, 110 VDC		
Coil ratings	Rated Voltage	3 to 24 VDC		
	Power Consumption (Approx.)	140 to 230 mW		
Endura-nce	Electrical (operations)	100,000 min		
	Mechanical (operations)	50,000,000 min		
Dialec-tric strength	Between coil and contacts	1,500 VAC		
	Between contacts of different polarity	1,000 VAC		
	Between contacts of same polarity	750 VAC		
Ambient temperature (operating)		-40°C to 85°C		
Variations	Single Side Stable	•		
	Single Winding Latching	•		
	Double Winding Latching			
	Through Hole	•		
	Surface Mount	•		
	Fully Sealed	•		
Approved Standards		UL, CSA		
Page		204		

Model		G6K		
Features		Sub-miniature surface mounting relay		
Appearance		G6K-2F 	G6K-2G 	G6K-2P 
Dimensions (LxWxH)		10 x 6.5 x 5.4	10 x 6.5 x 5.4	10 x 6.5 x 5
Contact Ratings	Contact Form	DPDT		
	Contact Type	Bifurcated Crossbar		
	Contact Material	Ag (Au alloy)		
	Resistive Load	0.3 A at 125 VAC, 1 A at 30 VDC		
	Max. Switching Current	1 A		
	Min. Permissible load	10 µA at 10 mVDC		
	Max. Switching Power	37.5 VA, 30 W		
	Max. Switching Voltage	125 VAC, 60 VDC		
Coil ratings	Rated Voltage	3 to 24 VDC		
	Power Consumption (Approx.)	100 mW		
Endura-nce	Electrical (operations)	100,000 min		
	Mechanical (operations)	50,000,000 min		
Dialec-tric strength	Between coil and contacts	1,500 VAC		
	Between contacts of different polarity	1,000 VAC		
	Between contacts of same polarity	750 VAC		
Ambient temperature (operating)		-40°C to 70°C		
Variations	Single Side Stable	•		
	Single Winding Latching	•		
	Double Winding Latching			
	Through Hole	•		
	Surface Mount	•		
	Fully Sealed	•		
Approved Standards		UL, CSA		
Page		214		

Model		G6S
Features		Surface mounting relay with 2.5kV surge voltage
Appearance Dimensions (LxWxH)		G6S-2F  15 x 7.5 x 9.4 G6S-2  15 x 7.5 x 9.4 G6S-2G  15 x 7.5 x 9.4
Contact Ratings	Contact Form	DPDT
	Contact Type	Bifurcated Crossbar
	Contact Material	Ag (Au alloy contact)
	Resistive Load	0.5 A at 125 VAC, 1 A at 30 VDC
	Max. Switching Current	2 A
	Min. Permissible load	10 µA at 10 mVDC
	Max. Switching Power	62.5 VA, 60 W
	Max. Switching Voltage	250 VAC, 220 VDC
Coil ratings	Rated Voltage	4.5 to 24 VDC
	Power Consumption (Approx.)	140 to 200 mW
Endura-nce	Electrical (operations)	100,000 min
	Mechanical (operations)	100,000,000 min
Dialec-tric strength	Between coil and contacts	2,000 VAC
	Between contacts of different polarity	1,500 VAC
	Between contacts of same polarity	1,000 VAC
Ambient temperature (operating)		-40°C to 85°C
Variations	Single Side Stable	•
	Single Winding Latching	•
	Double Winding Latching	•
	Through Hole	•
	Surface Mount	•
	Fully Sealed	•
Approved Standards		UL, CSA
Page		224

Model		G5A	G5V-2
Features		Sub-miniature relay	Miniature relay for signal circuits
Appearance Dimensions (LxWxH)		 16 x 9.9 x 8.4	 20.5 x 10.1 x 11.5
Contact Ratings	Contact Form	DPDT	DPDT
	Contact Type	Bifurcated Crossbar	Bifurcated Crossbar
	Contact Material	Ag (Au-clad)	Ag (Au-clad)
	Resistive Load	0.5 A at 30 VAC 1 A at 30 VDC	0.5 A at 125 VAC 2 A at 30 VDC
	Max. Switching Current	1 A	2 A
	Min. Permissible load	10 µA at 10 mVDC	10 µA at 10 mVDC
	Max. Switching Power	37.5 VA, 33 W	62.5 VA, 60 W
	Max. Switching Voltage	125 VAC, 60 VDC	125 VAC, 125 VDC
Coil ratings	Rated Voltage	3 to 48 VDC	3 to 48 VDC
	Power Consumption (Approx.)	200 to 280 mW	500 to 580 mW (150 mW high sensitivity version)
Endura-nce	Electrical (operations)	100,000 min	100,000 min
	Mechanical (operations)	50,000,000 min	15,000,000 min
Dialec-tric strength	Between coil and contacts	1,000 VAC	1,000 VAC
	Between contacts of different polarity	1,000 VAC	1,000 VAC
	Between contacts of same polarity	500 VAC	750 VAC
Ambient temperature (operating)		-40°C to 70°C	-25°C to 65°C
Variations	Single Side Stable	•	•
	Single Winding Latching	•	
	Double Winding Latching	•	
	Through Hole	•	•
	Surface Mount		
	Fully Sealed	•	•
Approved Standards		UL, CSA	UL, CSA
Page		233	237

Model		G6A				G6Y
Features		Fully sealed relay with high surge dielectric for use in telecommunications equipment				High frequency relay with high isolation and low insertion loss
Appearance Dimensions (LxWxH)		G6A-2  20.2 x 10.1 x 8.4		G6A-4  35.4 x 10.1 x 8.4		 20.7 x 11.7 x 9.2
Contact Ratings	Contact Form	DPDT		4PDT		SPDT
	Contact Type	Bifurcated Crossbar				Double-braking contact
	Contact Material	Ag (Au-clad)	AgPg (Au-clad)	Ag (Au-clad)	AgPg (Au-clad)	Au
	Resistive Load	0.5 A at 125 VAC 2 A at 30 VDC	0.3 A at 125 VAC 1 A at 30 VDC	0.5 A at 125 VAC 2 A at 30 VDC	0.3 A at 125 VAC 1 A at 30 VDC	10 mA at 30 VAC 10 mA at 30 VDC
	Max. Switching Current	2 A				0.5 A
	Min. Permissible load	10 μA at 10 mVDC				10 μA at 10 mVDC
	Max. Switching Power	125 VA, 60 W				10 VA (AC) 10 W (DC)
	Max. Switching Voltage	250 VAC, 220 VDC				30 VAC, 30 VDC
Coil ratings	Rated Voltage	3 to 48 VDC				3 to 24 VDC
	Power Consumption (Approx.)	200 to 235 mW		360 mW		200 mW
Endura-nce	Electrical (operations)	500,000 min				300,000 min
	Mechanical (operations)	100,000,000 min				50,000,000 min
Dialec-tric strength	Between coil and contacts	1,000 VAC				1,000 VAC
	Between contacts of different polarity	1,000 VAC				1,000 VAC
	Between contacts of same polarity	1,000 VAC				1,000 VAC
Ambient temperature (operating)		-40°C to 70°C				-40°C to 70°C
Variations	Single Side Stable	•				•
	Single Winding Latching	•				
	Double Winding Latching	•				
	Through Hole	•				•
	Surface Mount					
	Fully Sealed	•				•
Approved Standards		UL, CSA				–
Page		242				251

Model		G6K(U)-2F-RF	G6Z
Features		Surface mounting 1GHz band high frequency relay	Surface mountable 2.6GHz band miniature relay
Appearance Dimensions (LxWxH)		 10.3 x 6.9 x 5.4	G6Z-1FE  20 x 8.6 x 9.3 G6Z-1PE  20 x 8.6 x 8.9
Contact Ratings	Contact Form	DPDT	SPDT
	Contact Type	Bifurcated Crossbar	Double-braking contact
	Contact Material	Ag (Au-alloy)	Au-clad (Cu alloy)
	Resistive Load	0.3 A at 125 VAC 1 A at 30 VDC	10 mA at 30 VAC 10 mA at 30 VDC
	Max. Switching Current	1 A	0.5 A
	Min. Permissible load	10 µA at 10 mVDC	10 µA at 10 mVDC
	Max. Switching Power	1 W	10 VA (AC) 10 W (DC)
	Max. Switching Voltage	125 VAC, 60 VDC	30 VAC, 30 VDC
Coil ratings	Rated Voltage	3 to 24 VDC	3 to 24 VDC
	Power Consumption (Approx.)	100 mW	200 mW
Endura-nce	Electrical (operations)	100,000 min	300,000 min
	Mechanical (operations)	50,000,000 min	1,000,000 min
Dialec-tric strength	Between coil and contacts	750 VAC	1,000 VAC
	Between contacts of different polarity	750 VAC	500 VAC
	Between contacts of same polarity	750 VAC	500 VAC
Ambient temperature (operating)		-40°C to 70°C	-40°C to 70°C
Variations	Single Side Stable	•	•
	Single Winding Latching	•	•
	Double Winding Latching		•
	Through Hole		•
	Surface Mount	•	•
	Fully Sealed		•
Approved Standards		–	–
Page		257	261

Model		**G6W**	
Features		Surface mountable 2.5GHz band miniature high-frequency relay	
Appearance		**G6W-1F** 	**G6W-1P** 
Dimensions (LxWxH)		20 x 9.4 x 9.3	20 x 9.4 x 9.3
Contact Ratings	**Contact Form**	SPDT	
	Contact Type	Double-braking single contact	
	Contact Material	Au	
	Resistive Load	10 mA at 30 VAC 10 mA at 30 VDC	
	Max. Switching Current	0.5 A	
	Min. Permissible load	10 μA at 10 mVDC	
	Max. Switching Power	10 VA (AC), 10 W (DC)	
	Max. Switching Voltage	230 VAC, 30 VDC	
Coil ratings	**Rated Voltage**	3 to 48 VDC	
	Power Consumption (Approx.)	200 to 360 mW	360 mW
Endura-nce	**Electrical (operations)**	300,000 min	
	Mechanical (operations)	1,000,000 min	
Dialec-tric strength	**Between coil and contacts**	1,000 VAC	
	Between contacts of different polarity	–	
	Between contacts of same polarity	500 VAC	
Ambient temperature (operating)		-40°C to 70°C	
Variations	**Single Side Stable**	•	
	Single Winding Latching	•	
	Double Winding Latching	•	
	Through Hole	•	
	Surface Mount	•	
	Fully Sealed	•	
Approved Standards		–	
Page		277	

Signal Relays

Ultra-miniature, Highly Sensitive SPDT Relay for Signal Circuits

- ROHS compliant.
- Ultra-miniature at 12.5 x 7.5 x 10 mm (L x W x H).
- Wide switching power of 1 mA to 1 A.
- High sensitivity: 150mW nominal coil power.
- Fully sealed construction.
- International 2.54mm terminal pitch.
- Conforms to FCC Part 68 requirements for coil to contacts.

Ordering Information

Classification				Model
Contact form	**Contact type**	**Contact material**	**Structure**	
SPDT	Single crossbar	Ag + Au-clad	Fully sealed	G5V-1

Note: When ordering, add the rated coil voltage to the model number.
Example: G5V-1 12 VDC
Rated coil voltage

Model Number Legend

G5V - □ □ VDC
1 2

1. **Contact Form**
   1: SPDT
2. **Rated Coil Voltage**
   3, 5, 6, 9, 12, 24 VDC

Specifications

■ Coil Ratings

Rated voltage		3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC
Rated current		50 mA	30 mA	25 mA	16.7 mA	12.5 mA	6.25 mA
Coil resistance		60 Ω	167 Ω	240 Ω	540 Ω	960 Ω	3,840 Ω
Coil inductance	**Armature OFF**	0.05	0.15	0.20	0.45	0.85	3.48
(H) (ref. value)	**Armature ON**	0.11	0.29	0.41	0.93	1.63	6.61
Must operate voltage		80% max. of rated voltage					
Must release voltage		10% min. of rated voltage					
Max. voltage		200% of rated voltage at 23°C					
Power consumption		Approx. 150 mW					

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

Contact Ratings

Load	Resistive load (cosø = 1)
Rated Load	0.5 A at 125 VAC; 1 A at 24 VDC
Contact Material	Ag + Au-clad
Rated Carry Current	2 A
Max. switching voltage	125 VAC, 60 VDC
Max. switching current	1 A
Max. switching power	62.5 VA, 30 W
Failure rate (reference value)	1 mA at 5 VDC

Note: P level: λ_{60} = 0.1 x 10^{-6}/operation.

Characteristics

Contact resistance	100 mΩ max.
Operate time	5 ms max. (mean value: approx. 2.5 ms)
Release time	5 ms max. (mean value: approx. 0.9 ms)
Bounce Time	Operate: Approx. 0.2 ms Release: Approx. 5 ms
Max. operating frequency	Mechanical: 36,000 operations/hr Electrical: 1,800 operations/hr at rated load
Insulation resistance	1,000 MΩ min. (at 500 VDC between coil and contacts, at 250 VDC between contacts of same polarity.)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between coil and contacts 400 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	1,500 V (10 x 160 μs) between coil and contacts (conforms to FCC Part 68)
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 1.65mm single amplitude (3.3mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 1.65mm single amplitude (3.3mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 100 m/s^2
Endurance	Mechanical: 5,000,000 operations min. (at 18,000 operations/hr) Electrical: 100,000 operations min. (under rated load, at 1,800 operations/hr)
Ambient temperature	Operating: -40°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 2 g

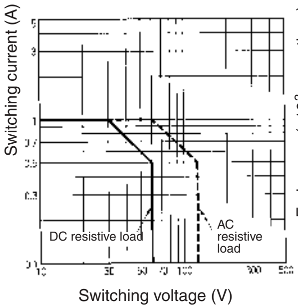
Approved Standards

UL1950 (File No. E41515)/CSA C22.2 No.0, No.14 (File No. LR31928)

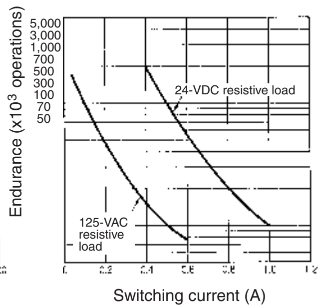
Model	Contact form	Coil ratings	Contact ratings
G5V-1	SPDT	3 to 24 VDC	0.5 A, 125 VAC (general use) 0.3 A, 110 VDC (resistive load) 1 A, 30 VDC (resistive load)

Engineering Data

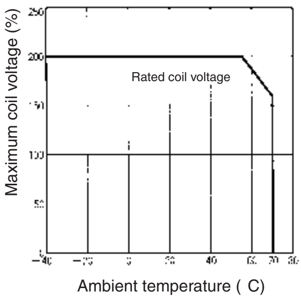
Maximum Switching Power



Endurance



Ambient Temperature vs. Maximum Coil Voltage



Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

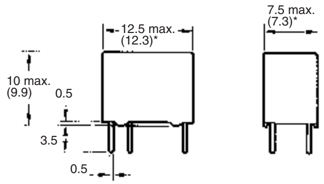
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.

2. Numbers in parentheses are reference values.

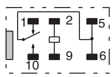
3. Tolerance: ±0.1

4. Orientation marks are indicated as follows:

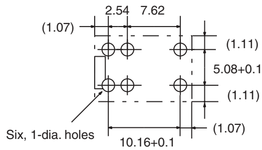


* Average value

Terminal Arrangement/ Internal Connections (Bottom View)



Mounting Holes (Bottom View)



Miniature, Low-cost, Single-pole PCB Relay

- ROHS compliant.
- Miniature: 15.5 x 10.5 x 11.5 mm (L x W x H).
- Low power consumption: 200 mW.
- Bifurcated crossbar contacts.
- Gold-clad contacts.
- Fully sealed type available.
- Ideal for telecommunications equipment and security systems.

Ordering Information

Contact		General-purpose	High-sensitivity
		Fully sealed	Fully sealed
SPDT	Single crossbar	G2E-184P-M-US	G2E-184P-H-M-US
	Bifurcated crossbar	G2E-134P-M-US	G2E-134P-H-M-US

Note: When ordering, add the rated coil voltage to the model number.
Example: G2E-184P-M-US 12 VDC
Rated coil voltage (12 VDC)

Model Number Legend

G2E - □ □ □ □ - □ - □ - □ □ VDC
1 2 3 4 5 6 7 8

1. **Contact Form**
   1: SPDT
2. **Contact Type**
   3: Bifurcated crossbar
   8: Single crossbar
3. **Enclosure Ratings**
   4: Fully sealed
4. **Terminals**
   P: Straight PCB
5. **Power Consumption**
   None: General-purpose (450 mW)
   H: High-sensitivity (200 mW)
6. **Classification**
   M: General-purpose
7. **Approved Standards**
   US: UL, CSA certified
8. **Rated Coil Voltage**
   1.5, 3, 5, 6, 9, 12, 24 VDC

Specifications

■ Coil Rating

General-purpose Relays

Rated voltage		1.5 VDC	3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC
Rated current		300 mA	150 mA	89.3 mA	75 mA	50 mA	37.5 mA	18.8 mA
Coil resistance		5 Ω	20 Ω	56 Ω	80 Ω	180 Ω	320 Ω	1,280 Ω
Coil inductance (H) (ref. value)	Armature OFF	0.005	0.017	0.044	0.067	0.137	0.229	0.94
	Armature ON	0.009	0.034	0.091	0.136	0.297	0.496	2.1
Must operate voltage		70% max. of rated voltage						
Must release voltage		10% min. of rated voltage						
Max. voltage		120% of rated voltage at 23°C, 110% at 60°C						
Power consumption		Approx. 450 mW						

High-sensitivity Relays

Rated voltage		1.5 VDC	3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC
Rated current		125 mA	66.7 mA	41.7 mA	33.3 mA	22.5 mA	17.1 mA	8.6 mA
Coil resistance		12 Ω	45 Ω	120 Ω	180 Ω	400 Ω	700 Ω	2,800 Ω
Coil inductance	**Armature OFF**	0.005	0.022	0.055	0.083	0.165	0.228	1.465
(H) (ref. value)	**Armature ON**	0.009	0.035	0.092	0.129	0.303	0.504	2.287
Must operate voltage		80% max. of rated voltage						
Must release voltage		10% min. of rated voltage						
Max. voltage		140% of rated voltage at 23°C, 130% at 65°C						
Power consumption		Approx. 200 mW						

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

■ Contact Ratings

Item	Single crossbar	Bifurcated crossbar
Load	Resistive load (cosø = 1)	Resistive load (cosø = 1)
Rated Load	0.5 A at 110 VAC; 1 A at 24 VDC	0.5 A at 110 VAC; 1 A at 24 VDC
Contact Material	AgPd (Au-clad)	
Rated Carry Current	2 A	
Max. switching voltage	125 VAC, 60 VDC	
Max. switching current	1 A	
Max. switching power	120 VA, 30 W	120 VA, 30 W
Failure rate (reference value)	1 mA at 5 VDC	0.1 mA at 0.1 VDC

Note: P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation.

■ Characteristics

Contact resistance	50 mΩ max.
Operate time	General-purpose type: 5 ms max. (mean value: approx. 2.5 ms) High-sensitivity type: 7 ms max. (mean value: approx. 3.5 ms)
Release time	3 ms max. (mean value: approx. 0.8 ms)
Max. switching frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr at rated load
Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric withstand voltage	500 VAC, 50/60 Hz for 1 min between coil and contacts 500 VAC, 50/60 Hz for 1 min between contacts of same polarity
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 1.65mm single amplitude (3.3mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 1.65mm single amplitude (3.3mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: 200 m/s^2 (approx. 20G)
Endurance	Mechanical: 10,000,000 operations min. (at 18,000 operations/hr) Electrical: DC: 500,000 operations min. (1 A at 24 VDC resistive load) AC: 200,000 operations min. (0.5 A at 110 VAC resistive load) (at 1,800 operations/hr)
Ambient temperature	Operating: -25°C to 60°C (with no icing) (high-sensitivity type: -25°C to 65°C)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 3.7 g

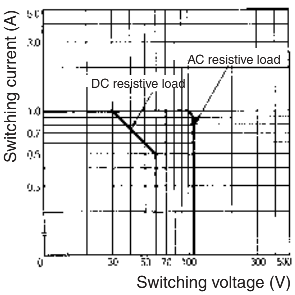
■ Approved Standards

UL114, UL478, UL1950 (File No. E41515)/CSA C22.2 No.0, No.14 (File No. LR34815-97)

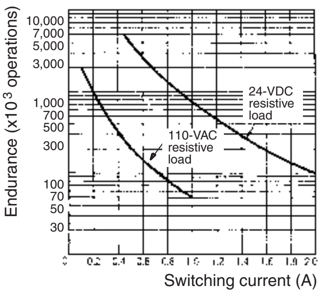
Model	Contact form	Coil ratings	Contact ratings
G2E-184P-M-US G2E-184P-H-M-US G2E-134P-M-US G2E-134P-H-M-US	SPDT	1.5 to 24 VDC	0.5 A, 125 VAC (general use) 1 A, 28 VDC (resistive)

Engineering Data

Maximum Switching Power
G2E-184P-M-US



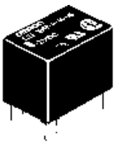
Endurance
G2E-184P-M-US

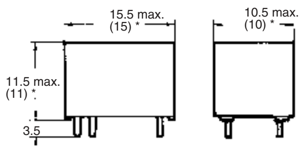


Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.

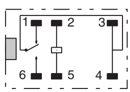
2. Orientation marks are indicated as follows:





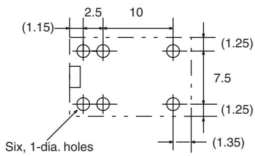
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)

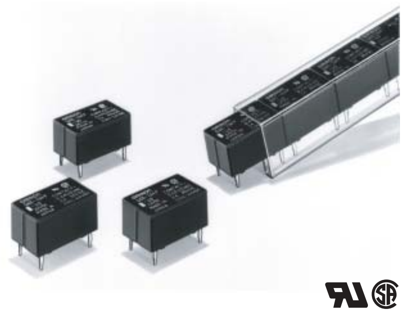


Mounting Holes (Bottom View)

Tolerance: 0.1



Sub-miniature, Sensitive SPDT Signal Switching Relay



- ROHS compliant.
- High sensitivity: 98mW pickup coil power.
- Impulse withstand voltage meets FCC Part 68 requirements.
- Fully sealed construction.
- Unique moving loop armature reduces relay size, magnetic interference, and contact bounce time.
- Single- and double-winding latching types also available.

Ordering Information

Contact form		Terminal	Single-side stable	Single-winding latching	Double-winding latching
SPDT	Bifurcated crossbar	Straight terminal	G6E-134P-US	G6EU-134P-US	G6EK-134P-US
		Self-clinching terminal	G6E-134C-US	G6EU-134C-US	G6EK-134C-US

Note: When ordering, add the rated coil voltage to the model number.
Example: G6E-134P-US 12 VDC
Rated coil voltage

Model Number Legend

G6E □ - □ □ □ □ □-□-□ □ VDC
1 2 3 4 5 6 7 8 9

1. **Relay Function**
   None: Single-side stable
   U: Single-winding latching
   K: Double-winding latching
2. **Contact Form**
   1: SPDT
3. **Contact Type**
   3: Bifurcated crossbar Ag (Au-clad) contact
   9: Bifurcated crossbar AgNi (Au-clad) contact
4. **Enclosure Ratings**
   4: Fully sealed
5. **Terminals**
   P: Straight PCB
   C: Curved tail
6. **Special Function**
   L: Low sensitivity coil (400 mW)
7. **Approved Standards**
   US: UL, CSA certified
8. **Special Function**
   U: For ultrasonically cleanable
9. **Rated Coil Voltage**
   3, 5, 6, 9, 12, 24, 48 VDC

Specifications

■ Coil Ratings

Single-side Stable, Bifurcated Crossbar Contact Type

Rated voltage		3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current		66.7 mA	40 mA	33.3 mA	22.2 mA	16.7 mA	8.3 mA	8.3 mA
Coil resistance		45 Ω	125 Ω	180 Ω	405 Ω	720 Ω	2,880 Ω	5,760 Ω
Coil inductance (H) (ref. value)	Armature OFF	0.08	0.18	0.31	0.62	1.20	4.70	5.35
	Armature ON	0.06	0.17	0.24	0.50	0.99	3.90	5.12
Must operate voltage		70% max. of rated voltage						
Must release voltage		10% min. of rated voltage						
Max. voltage		190% of rated voltage at 23°C						170% of rated voltage at 23°C
Power consumption		Approx. 200 mW						Approx 400 mW

Single-winding Latching, Bifurcated Crossbar Contact Type

Rated voltage		3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC
Rated current		66.7 mA	40 mA	33.3 mA	22.2 mA	16.7 mA	8.3 mA
Coil resistance		45 Ω	125 Ω	180 Ω	405 Ω	720 Ω	2,880 Ω
Coil inductance (H) (ref. value)	Armature OFF	0.05	0.13	0.19	0.45	0.84	3.56
	Armature ON	0.04	0.12	0.17	0.40	0.79	3.10
Must set voltage		70% max. of rated voltage					
Must reset voltage		70% max. of rated voltage					
Max. voltage		190% of rated voltage at 23°C					
Power consumption		Approx. 200 mW					

Double-winding Latching, Bifurcated Crossbar Contact Type

Rated voltage			3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC
Set Coil	Rated current		66.7 mA	40 mA	33.3 mA	22.2 mA	16.7 mA	8.3 mA
	Coil resistance		45 Ω	125 Ω	180 Ω	405 Ω	720 Ω	2,880 Ω
	Coil inductance (H) (ref. value)	Armature OFF	0.03	0.09	0.12	0.25	0.44	1.66
		Armature ON	0.03	0.08	0.11	0.22	0.41	1.62
Reset Coil	Rated current		66.7 mA	40 mA	33.3 mA	22.2 mA	16.7 mA	8.3 mA
	Coil resistance		45 Ω	125 Ω	180 Ω	405 Ω	720 Ω	2,880 Ω
	Coil inductance (H) (ref. value)	Armature OFF	0.03	0.09	0.12	0.25	0.44	1.66
		Armature ON	0.03	0.08	0.11	0.22	0.41	1.62
Must set voltage			70% max. of rated voltage					
Must reset voltage			70% max. of rated voltage					
Max. voltage			190% of rated voltage (at 23°C)					
Power consumption			Set coil: Approx. 200 mW Reset coil: Approx. 200 mW					

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

Contact Ratings

Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)
Rated Load	0.4 A at 125 VAC; 2 A at 30 VDC	0.2 A at 125 VAC; 1 A at 30 VDC
Contact Material	Ag (Au–clad)	
Rated Carry Current	3 A	
Max. switching voltage	250 VAC, 220 VDC	
Max. switching current	3 A	3 A
Max. switching power	50 VA, 60 W	25 VA, 30 W
Failure rate (reference value)	10µ A at 10m VDC	

Note: P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation.

Characteristics

Contact resistance	50 mΩ max.
Operate (set*) time	5 ms max. (mean value: approx. 2.9 ms; 48 VDC type: approx. 2.4 ms)
Release (reset*) time	5 ms max. (mean value: approx. 1.3 ms)
Bounce time	Operate: 3 ms max. (mean value: 0.37 ms) Release: 3 ms max. (mean value: 1.12 ms)
Max. operating frequency	Mechanical: 36,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric withstand voltage	1,500 VAC, 50/60 Hz for 1 min between coil and contacts 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	1,500 V (10 x 160 µs) (conforms to FCC Part 68)
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 2.5mm single amplitude (5mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 1.65mm single amplitude (3.3mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 300 m/s^2
Endurance	Mechanical: 100,000,000 operations min. (at 36,000 operations/hr) Electrical: 100,000 operations min. (0.4 A at 125 VAC resistive load; 0.2 A at 125 VAC inductive load) 500,000 operations min. (2 A at 30 VDC resistive load; 1 A at 30 VDC inductive load) 200,000 operations min. (3 A at 30 VDC resistive load)
Ambient temperature	Operating: -40°C to 70°C (with no icing)
Ambient humidity	5% to 85%
Weight	Approx. 2.7 g

*Minimum set and reset signals width is 7 ms min.

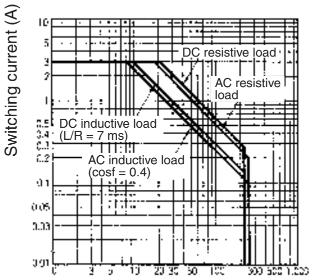
Approved Standards

UL508 (File No. E41515)/CSA C22.2, No.14 (File No. LR31928)

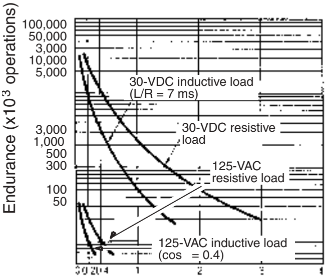
Contact form	Coil ratings	Contact ratings
SPDT	3 to 48 VDC	0.2 A, 250 VAC (general use) 0.6 A, 125 VAC (general use) 2 A, 30 VDC (resistive) 0.6 A, 125 VDC (resistive, Ag contact only)

Engineering Data

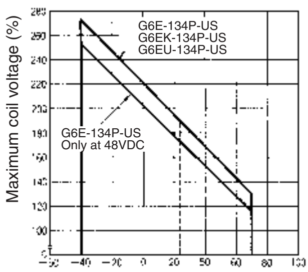
Maximum Switching Power



Endurance



Ambient Temperature vs. Maximum Coil Voltage

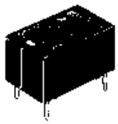


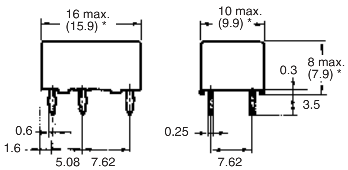
Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Orientation marks are indicated as follows:

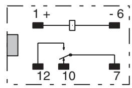
G6E-134P-US
G6E-194P-US



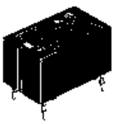


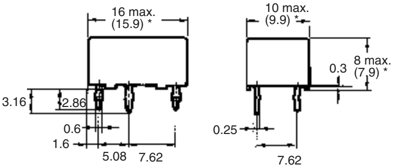
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)



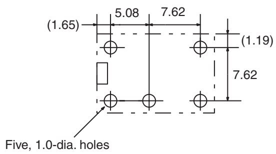
G6E-134C-US
G6E-194C-US



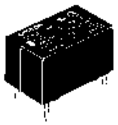


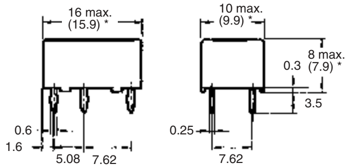
*Average value

Mounting Holes (Bottom View)
Tolerance: 0.1



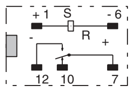
G6EU-134P-US
G6EU-194P-US





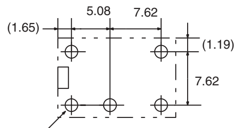
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)



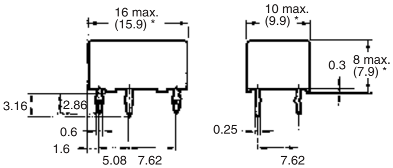
Mounting Holes (Bottom View)

Tolerance: 0.1



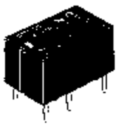
Five, 1.0-dia. holes

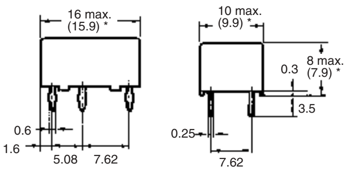
G6EU-134C-US
G6EU-194C-US



*Average value

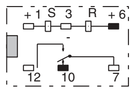
G6EK-134P-US
G6EK-194P-US





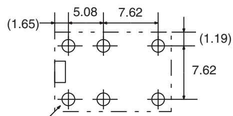
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)



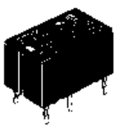
Mounting Holes (Bottom View)

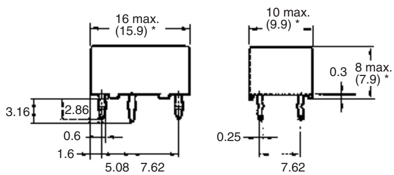
Tolerance: 0.1



Six, 1.0-dia. holes

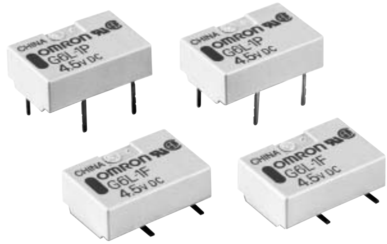
G6EK-134C-US
G6EK-194C-US





*Average value

Extremely Thin SPST-NO Flat Relay, One of the Thinnest Relays in the World



- ROHS compliant.
- Dimensions of 7.0(W) x 10.6(L) x 4.2(H) (SMD) or 3.8 mm(H) (TH) represent a reduction of approximately 20% in mounting area and approximately 67% in volume compared with the OMRON G5V-1, for higher-density mounting.
- Ensures a dielectric strength between coil and contacts (1,000), and conforms to FCC Part 68 (i.e., withstanding an impulse withstand voltage of 1.5 kW for 10 x160 μs).
- High dielectric strength between contacts of same polarity (750 VAC).
- Surface-Mounting relays are also available.
- Conforms to to UL60950 (File No. E41515 / CSA C222 No. 60950 (File No. LR31928).
- Use of lead completely eliminated.

Ordering Information

Classification			Single-side stable
SPST-NO	Fully sealed	Through-hole terminal	G6L-1P
		Surface-mounting terminal	G6L-1F

Note: **1.** When ordering, add the rated coil voltage to the model number.
Example: G6L-1P 12 VDC
Rated coil voltage

2. When ordering tape packing, add “-TR” to the model number.
Example: G6L-1F-TR 12 VDC
Tape packing

Be sure since “-TR” is not part of the relay model number, it is not marked on the relay case.

Model Number Legend

G6L □ – 1 □ –□
1 2 3 4

1. **Relay Function**
   None: Single-side stable relay
2. **Number of contact poles/ Contact form**
   1: SPST-NO
3. **Terminal shape**
   P: PCB terminals
   F: Surface-mounting terminals, short
4. **Packing state**
   None: Stick packing
   TR: Tape packing

Application Examples

Peripherals of MODEM/PC, telephones, office automation machines, audio-visual products, communications equipment, measurement devices, amusement equipment, or security equipment.

Specifications

Contact Ratings

Item/Load	Resistive load
Contact mechanism	Single crossbar
Rated load	0.3 A at 125 VAC, 1 A at 24 VDC
Rated carry current	1 A
Max. switching voltage	125 VAC, 60 VDC
Max. switching current	1 A

Coil Ratings

Single-side Stable Relays (G6L-1P, G6L-1F)

Rated voltage	3 VDC	4.5 VDC	5 VDC	12 VDC	24 VDC
Rated current	60.0 mA	40.0 mA	36.0 mA	15.0 mA	9.6 mA
Coil resistance	50.0 Ω	112.5 Ω	139.0 Ω	800.0 Ω	2,504.0 Ω
Must operate voltage	75% max. of rated voltage				
Must release voltage	10% min. of rated voltage				
Max. voltage	150% of rated voltage				130% of rated voltage
Power consumption	Approx. 180 mW				Approx. 230 mW

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.
3. The maximum voltage is the highest voltage that can be imposed on the Relay coil.

■ Characteristics

Classification		Single-side Stable Relays
Item/Model		G6L-1P, G6L-1F
Contact resistance (See note 1.)		100 mΩ max.
Operating time (See note 2.)		5 ms max. (approx. 1.1 ms)
Release time (See note 2.)		5 ms max. (approx. 0.4 ms)
Insulation resistance (See note 3.)		1,000 MΩ min. (at 500 VDC)
Dielectric strength	**Coils & contacts**	1,000 VAC, 50/60 Hz for 1 min
	Contacts of same polarity	750 VAC, 50/60 Hz for 1 min
Impulse with-stand voltage	**Coil & contacts**	1,500 VAC, 10 x 160 µs
Vibration resistance	**Destruction**	10 to 55 Hz, 1.65-mm single amplitude (3.3mm double amplitude)
	Malfunction	10 to 55 Hz, 1.65-mm single amplitude (3.3mm double amplitude)
Shock resistance	**Destruction**	1,000 m/s^2
	Malfunction	100 m/s^2
Endurance	**Mechanical**	5,000,000 operations min. (at 36,000 operations/hour)
	Electrical	100,000 operations min. (with a rated load at 1,800 operations/hour)
Failure rate (P level) (See note 4.)		1 mA at 5 VDC
Ambient temperature		Operating: -40°C to 70°C (with no icing or condensation)
Ambient humidity		Operating: 5% to 85%
Weight		Approx. 0.6 g

Note: 1. The contact resistance was measured with 10 mA at 1 VDC with a fall-of-potential method.

2. Values in parentheses are actual values.

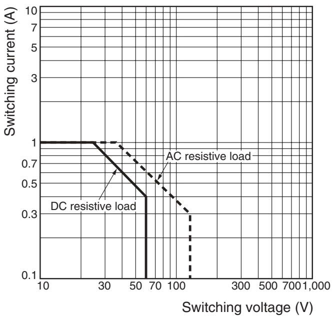
3. The insulation resistance was measured with a 500-VDC Megger Tester applied to the same parts as those for checking the dielectric strength.

4. This value was measured at a switching frequency of 120 operations/min. This value may vary, depending on switching frequency, operating conditions, expected reliability level of the relay, etc. It is always recommended to double-check relay suitability under actual load conditions.

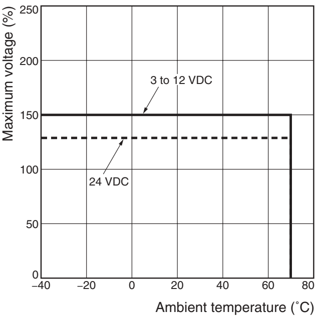
5. The above values are initial values.

Engineering Data

Maximum Switching Capacity

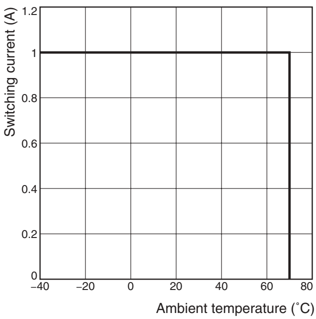


Ambient Temperature vs. Maximum Voltage

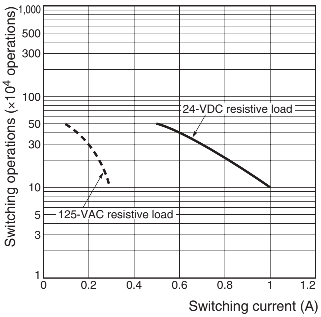


Note: "Maximum voltage" is the maximum voltage that can be applied to the Relay coil.

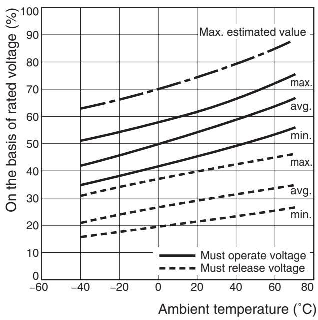
Ambient Temperature vs. Switching Current



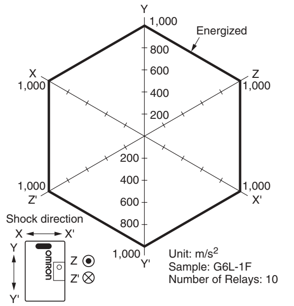
Endurance



Ambient Temperature vs. Must Operate or Must Release Voltage

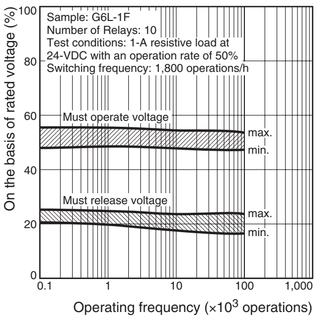


Shock Malfunction

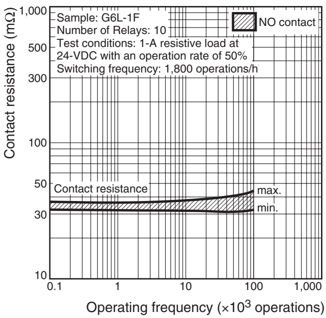


Conditions: Shock is applied in ±X, ±Y, and ±Z directions three times each with and without energizing the Relays to check the number of contact malfunctions.

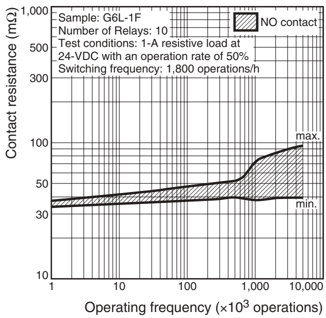
Electrical Endurance (with Must Operate and Must Release Voltage) (See note.)



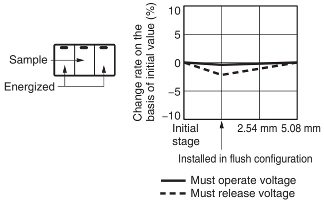
Electrical Endurance (Contact Resistance) (See note.)



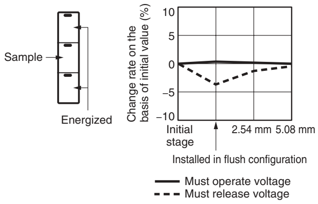
Contact Reliability Test (Contact Resistance) (See note.)



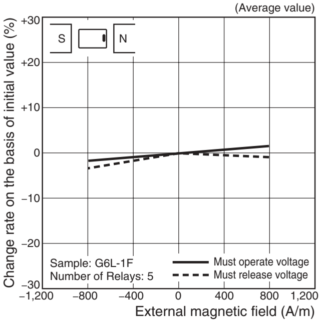
Mutual Magnetic Interference

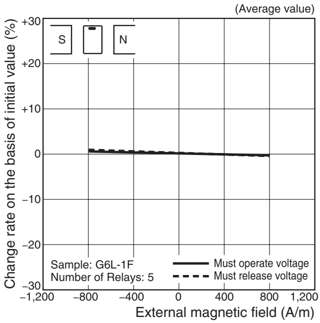


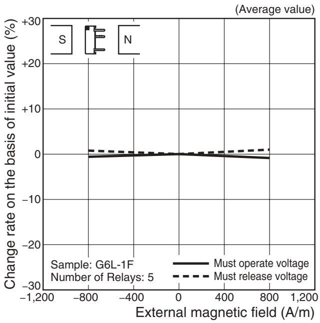
Mutual Magnetic Interference



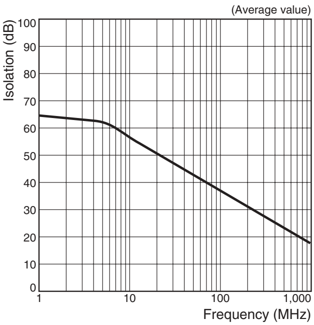
External Magnetic Interference



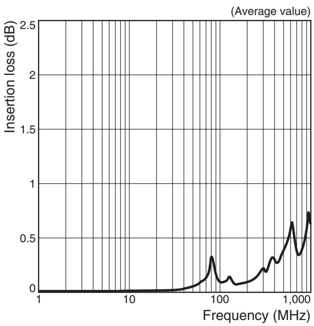




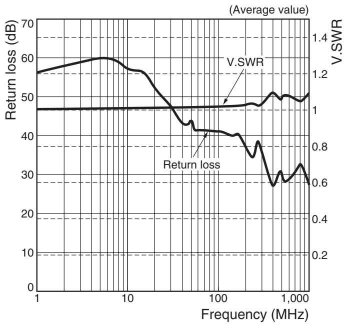
High-frequency Characteristics (Isolation)



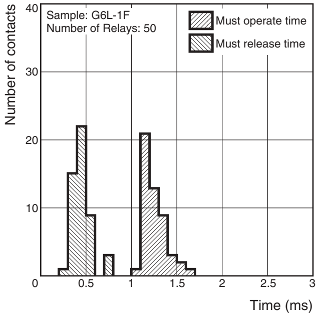
High-frequency Characteristics (Insertion Loss)



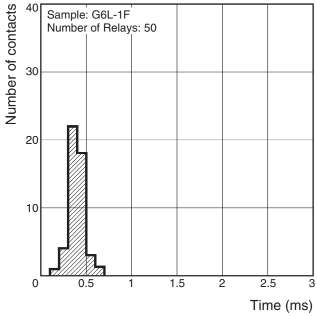
High-frequency Characteristics (Return Loss, V.SWR)



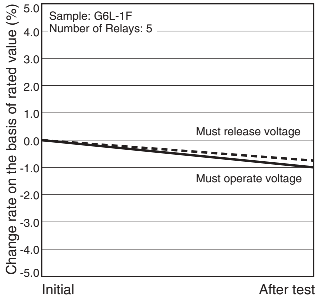
Must Operate and Must Release Time Distribution (See note.)



Distribution of Bounce Time (See note.)



Vibration Resistance

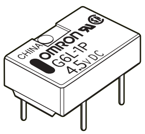


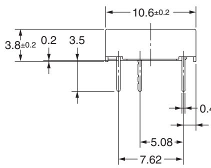
Note: The tests were conducted at an ambient temperature of 23°C.

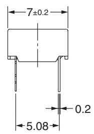
Dimensions

Note: All units are in millimeters unless otherwise indicated.

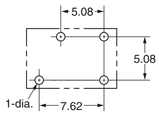
G6L-1P



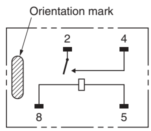




PCB Mounting Holes (Bottom View)
Tolerance: ±0.1 mm

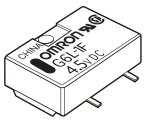


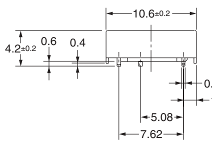
Terminal Arrangement/ Internal Connections (Bottom View)

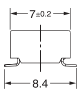


Note: Each value has a tolerance of ±0.3 mm.

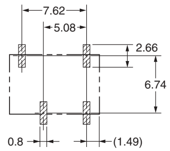
G6L-1F



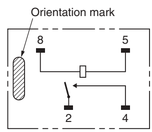




PCB Mounting Holes (Top View)
Tolerance: ±0.1 mm



Terminal Arrangement/ Internal Connections (Top View)



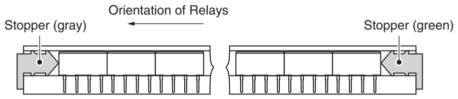
Note: Each value has a tolerance of ±0.3 mm.

Stick Packing and Tape Packing

1. STICK PACKING

Relays in stick packing are arranged so that the orientation mark of each Relay is on the left side.

Always confirm that the Relays are in the correct orientation when mounting the Relays to the PCBs.



Stick length: 552 mm (stopper not included)

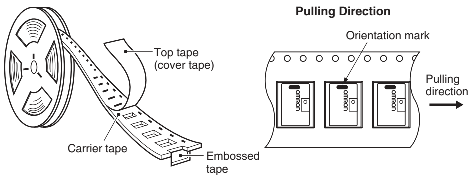
No. of Relays per stick: 50

2. TAPE PACKING (SURFACE-MOUNTING TERMINAL RELAYS)

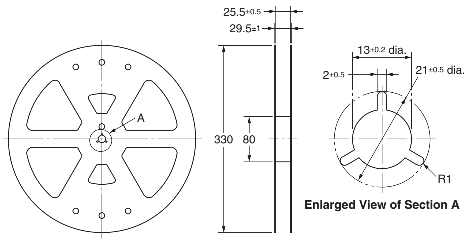
When ordering Relays in tape packing, add the suffix "-TR" to the model number, otherwise the Relays in stick packing will be provided.

Tape type:	TB2412R (Refer to EIAJ (Electronic Industries Association of Japan))
Reel type:	R24D (Refer to EIAJ (Electronic Industries Association of Japan))
Relays per reel:	1,000

Direction of Relay Insertion

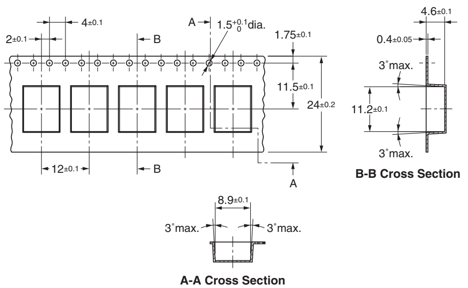


Reel Dimensions



Carrier Tape Dimensions

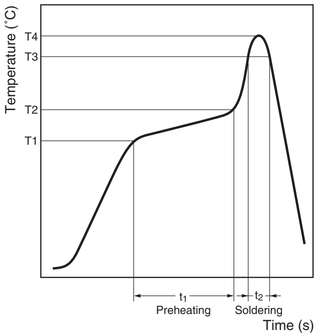
G6L-1F



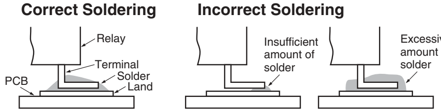
Recommended Soldering Method

TEMPERATURE PROFILE ACCORDING TO IRS

- When performing reflow-soldering, check the profile on an actual device after setting the temperature condition so that the temperatures at the relay terminals and the upper surface of the case do not exceed the limits specified in the following table.



- The thickness of cream solder to be applied should be within a range between 150 and 200 µm on OMRON's recommended PCB pattern.



Visually check that the Relay is properly soldered.

Item/ Measuring position	Preheating (T1 to T2, t1)	Soldering (T3, t_1)	NPeak value (T_2)
Terminal	150°C to 180°C, 120 s max.	180°C to 200°C, 20 to 30 s	245°C max.
Upper surface of case	–	–	250°C max.

■ Approved Standards

UL approval: UL60950 (File No. E41515)

CSA approval: C22.2 No.60950 (File No. LR31928)

Contact form	Coil ratings	Contact ratings	Number of test operations
SPST-NO	G6L-1P and G6L-1F: 3 to 24 VDC	1A at 30 VDC 0.5A at 60 VDC 0.3A at 125 VAC	6,000

Precautions

CORRECT USE

Handling

Leave the Relays packed until just prior to mounting them.

Soldering

Solder: JIS Z3282, H63A

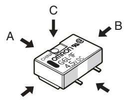
Soldering temperature: Approx. 250ºC (At 260ºC if the DWS method is used.)

Soldering time: Approx. 5 s max. (approx. 2 s for the first time and approx. 3 s for the second time if the DWS method is used.)

Be sure to adjust the level of the molten solder so that the solder will not overflow onto the PCB.

Claw Securing Force During Automatic Insertion

During automatic insertion of Relays, make sure to set the securing force of the claws to the following values so that the Relay characteristics will be maintained.



Direction A: 5.0 N max.
Direction B: 5.0 N max.
Direction C: 5.0 N max.

Secure the claws to the area indicated by shading. Do not attach them to the center area or to only part of the Relay.

Environmental Conditions During Operation, Storage, and Transportation

Protect the Relays from direct sunlight and keep the Relays under normal temperature, humidity, and pressure.

MAXIMUM VOLTAGE

The maximum voltage of the coil can be obtained from the coil temperature increase and the heat-resisting temperature of coil insulating sheath material. (Exceeding the heat-resisting temperature may result in burning or short-circuiting.) The maximum voltage also involves important restrictions which include the following:

- Must not cause thermal changes in or deterioration of the insulating material.
- Must not cause damage to other control devices.
- Must not cause any harmful effect on people.
- Must not cause fire.

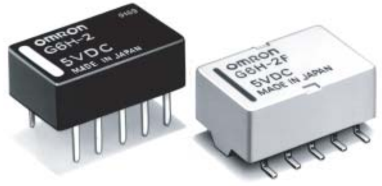
Therefore, be sure not to exceed the maximum voltage specified in the catalog.

As a rule, the rated voltage must be applied to the coil. A voltage exceeding the rated value, however, can be applied to the coil provided that the voltage is less than the maximum voltage. It must be noted that continuous voltage application to the coil will cause a coil temperature increase thus affecting characteristics such as electrical life and resulting in the deterioration of coil insulation.

Coating

Relays mounted on PCBs may be coated or washed. Do not apply silicone coating or detergent containing silicone, otherwise the silicone coating or detergent may remain on the surface of the Relays.

Ultracompact, Ultrasensitive DPDT Relay



- ROHS compliant.
- Compact size and low 5mm profile.
- Low power consumption (140 mW for single-side stable, 100 to 300 mW for latching type) and high sensitivity.
- Low thermoelectromotive force.
- Low magnetic interference enables high-density mounting.
- Single- and double-winding latching types also available.

Ordering Information

Classification			Single-side stable	Single-winding latching	Double-winding latching
DPDT	Fully Sealed	PCB terminal	G6H-2	G6HU-2	G6HK-2
		Surface mount terminal	G6H-2F	–	–

Note: When ordering, add the rated coil voltage to the model number.
Example: G6HK-2 12 VDC
Rated coil voltage (12 VDC)

Model Number Legend

G6H ☐ - ☐ ☐ - ☐ ☐ VDC
1 2 3 4 5

1. **Relay Function**
   None: Single-side stable
   U: Single-winding latching
   K: Double-winding latching
2. **Contact Form**
   2: DPDT
3. **Terminal Shape**
   None: PCB terminal
   F: Surface mount terminal
4. **Classification**
   U: Ultrasonically cleanable
5. **Rated Coil Voltage**
   3, 5, 6, 9, 12, 24 VDC

Specifications

■ Coil Ratings

Single-side Stable Type (G6H-2, G6H-2F)

Rated voltage		3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC
Rated current		46.7 mA	28.1 mA	23.3 mA	15.5 mA	11.7 mA	8.3 mA
Coil resistance		64.3 Ω	178 Ω	257 Ω	579 Ω	1,028 Ω	2,880 Ω
Coil inductance (H) (ref. value)	**Armature OFF**	0.025	0.065	0.11	0.24	0.43	1.2
	Armature ON	0.022	0.058	0.09	0.20	0.37	1.0
Must operate voltage		75% max. of rated voltage					
Must release voltage		10% min. of rated voltage					
Max. voltage		200% of rated voltage at 23°C					170% of rated voltage at 23°C
Power consumption		Approx. 140 mW					Approx. 200 mW

Note: 48 VDC (single-side stable) model is also available. Consult OMRON for details.

Single-winding Latching Type (G6HU-2)

Rated voltage		3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC
Rated current		33.3 mA	20 mA	16.7 mA	11.1 mA	8.3 mA	6.25 mA
Coil resistance		90 Ω	250 Ω	360 Ω	810 Ω	1,440 Ω	3,840 Ω
Coil inductance	**Armature OFF**	0.034	0.11	0.14	0.33	0.60	1.6
(H) (ref. value)	**Armature ON**	0.029	0.09	0.12	0.28	0.50	1.3
Must operate voltage		75% max. of rated voltage					
Must release voltage		75% min. of rated voltage					
Max. voltage		180% of rated voltage at 23°C					
Power consumption		Approx. 100 mW					Approx. 150 mW

Double-winding Latching Type (G6HK-2)

Rated voltage		3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC
Rated current		66.7 mA	40 mA	33.3 mA	22.2 mA	16.7 mA	12.5 mA
Coil resistance		45 Ω	125 Ω	180 Ω	405 Ω	720 Ω	1,920 Ω
Coil inductance	**Armature OFF**	0.014	0.042	0.065	0.16	0.3	0.63
(H) (ref. value)	**Armature ON**	0.0075	0.023	0.035	0.086	0.16	0.33
Must operate voltage		75% max. of rated voltage					
Must release voltage		75% min. of rated voltage					
Max. voltage		160% of rated voltage at 23°C					130% of rated voltage at 23°C
Power consumption		Approx. 200 mW					Approx. 300 mW

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

■ Contact Ratings

Load	Resistive load (cosø = 1)
Rated load	0.5 A at 125 VAC; 1 A at 30 VDC
Contact material	Ag (Au-clad)
Rated carry current	1 A
Max. switching voltage	125 VAC, 110 VDC
Max. switching current	1 A
Max. switching power	62.5 VA, 33 W
Failure rate (reference value)	10 µA at 10 mVDC

Note: P level: λ_{60} = 0.1 x 10^{-6}/operation

■ Characteristics

Contact resistance	50 mΩ max. (G6H-2-U: 100 mΩ max.; G6H-2F: 60 mΩ max.)
Operate (set) time	Single-side stable types: 3 ms max. (mean value: approx. 2 ms) Latching types: 3 ms max. (mean value: approx. 1.5 ms)
Release (reset) time	Single-side stable types: 2 ms max. (mean value: approx. 1 ms) Latching types: 3 ms max. (mean value: approx. 1.5 ms)
Bounce time	Operate: Approx. 0.5 ms Release: Approx. 0.5 ms Set/reset: Approx. 0.5 ms
Min. set/reset signal width	Latching type: 5 ms min. (at 23°C)
Max. operating frequency	Mechanical: 36,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric withstand voltage	1,000 VAC, 50/60 Hz for 1 min between coil and contacts 1,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 750 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	1,500 V (10 x 160 μs) between contacts of same polarity (conforms to FCC Part 68)
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 2.5mm single amplitude (5mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 1.65mm single amplitude (3mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 500 m/s^2
Endurance	Mechanical: 100,000,000 operations min. (at 36,000 operations/hr) Electrical: 200,000 operations min. (at 1,800 operations/hr)
Ambient temperature	Operating: -40°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 1.5 g

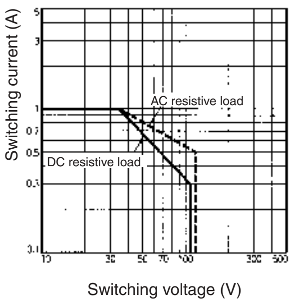
■ Approved Standards

UL114, UL478 (File No. E41515)/CSA C22.2 No.0, No.14 (File No. LR31928)

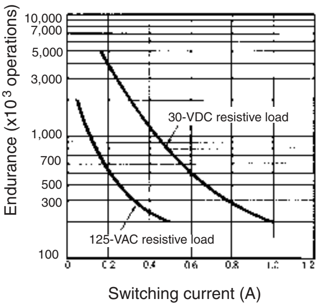
Model	Contact form	Coil ratings	Contact ratings
G6H-2 G6HU-2 G6HK-2 G6H(U/K)-2-U G6H(U/K)-2-100	DPDT	1.5 to 48 VDC	2 A, 30 VDC 0.3 A, 110 VDC 0.5 A, 125 VAC

Engineering Data

Maximum Switching Power

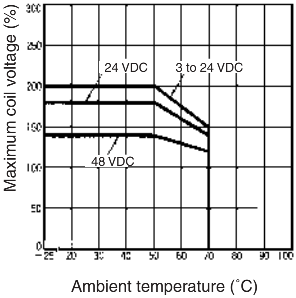


Endurance

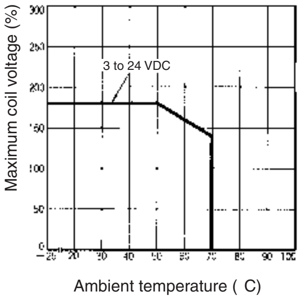


Ambient Temperature vs. Maximum Coil Voltage

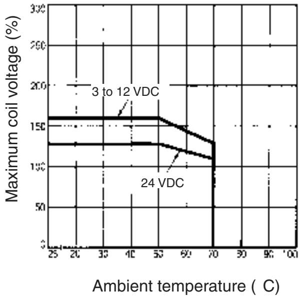
Single-side Stable (G6H-2)



Single-winding Latching (G6HU-2)



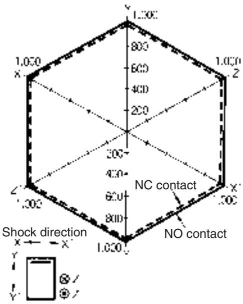
Double-winding Latching (G6HK-2)



Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

Malfunctioning Shock Resistance (G6H-2)

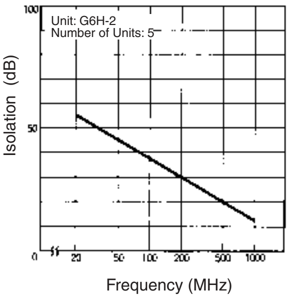
5 VDC
Number of Units: 10



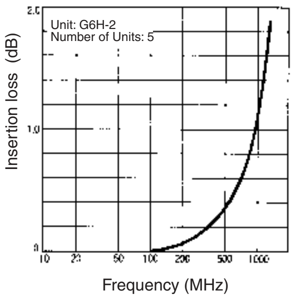
Condition: The Units were shocked at the rate of 500 m/s^2 three times each in the X, Y, and Z directions with and without voltage imposed on the Units until the Units malfunctioned.

High-frequency Characteristics

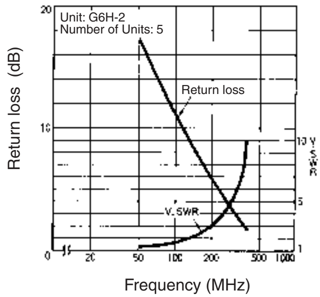
Frequency vs. Isolation



Frequency vs. Insertion Loss

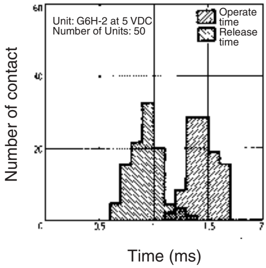


Frequency vs. Return Loss, V.SWR

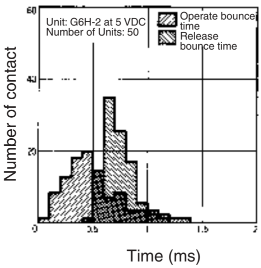


Note: The above characteristics were obtained from the Units inserted into test sockets. The characteristics of G6H-2 Units in actual operation may be different from the above characteristics. Check the characteristics of G6H-2 Units under the actual conditions before use.

Distribution of Operate and Release Time



Distribution of Bounce Time



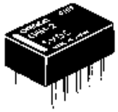
Dimensions

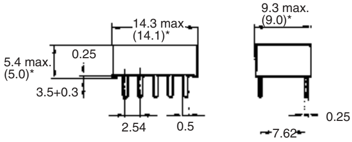
Note: 1. All units are in millimeters unless otherwise indicated.

2. Orientation marks are indicated as follows:

Single-side Stable Type

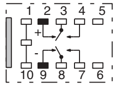
G6H-2(-U)





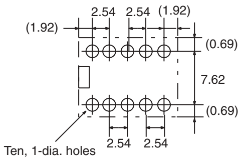
* Average value

Terminal Arrangement/ Internal Connections (Bottom View)



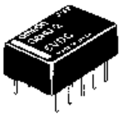
Mounting Holes (Bottom View)

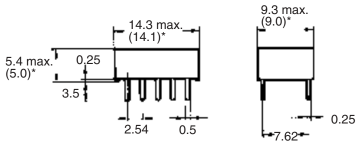
Tolerance: 0.1



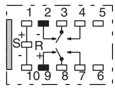
Single-winding Latching Type

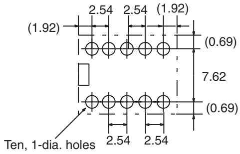
G6HU-2(-U)





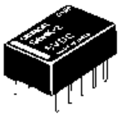
* Average value

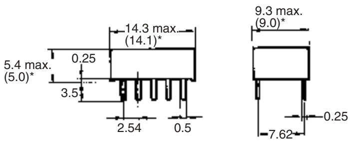




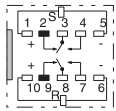
Double-winding Latching Type

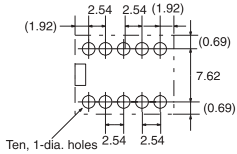
G6HK-2(-U)





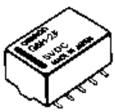
* Average value

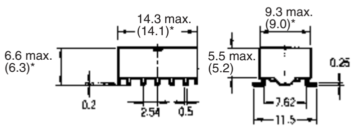




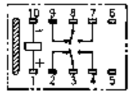
Single-side Stable Type

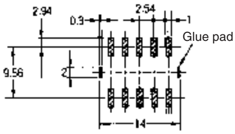
G6H-2F





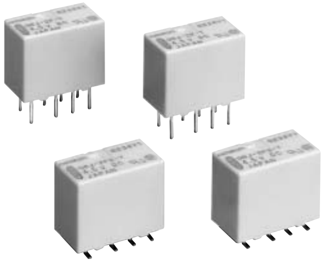
* Average value





Ultra-compact and Slim DPDT Relay

- ROHS compliant.
- Dimensions of 5.7 x 10.6 x 9 mm (W x L x H) represent a reduction of approximately 56% in mounting area compared with the OMRON G6S, for higher-density mounting.
- Dielectric strength of 1,500 VAC and an impulse withstand voltage of 2,500 V for 2 x 10 μs (conforms to North American Telcordia specifications (formerly Bellcore)).
- Conforms to FCC Part 68 (i.e., impulse withstand voltage of 1,500 V for 10 x 160 μs between coil and contacts and between contacts of the same polarity).
- Single-winding latching models to save energy.
- Conforms to UL60950 (File No. E41515)/CSA C22.2 No. 60950 (File No. LR31928).



NEW

Ordering Information

Classification				Single-side stable	Single-winding latching
DPDT	Plastic sealed	Through-hole terminal		G6J-2P-Y	G6JU-2P-Y
		Surface mount terminal	Short	G6J-2FS-Y	G6JU-2FS-Y
			Long	G6J-2FL-Y	G6JU-2FL-Y

Note: 1. When ordering, add the rated coil voltage to the model number.
Example: G6J-2P-Y 12 VDC
Rated coil voltage

2. When ordering tape packing, add "-TR" to the model number.
Example: G6J-2P-Y-TR 12 VDC
Tape packing

Be sure since "-TR" is not part of the relay model number, it is not marked on the relay case.

G6J □ – □ □ – □
1 2 3 4

1. **Relay Function**
   None: Single-side stable relay
   U: Single-winding latching relay

2. **Contact form**
   2: DPDT

3. **Terminal shape**
   P: PCB terminals
   FS: Surface-mounting terminals, short
   FL: Surface-mounting terminals, long

4. **Special function**
   Y: Improved product for soldering heat resistance

Application Examples

Telephones, communications equipment, measurement devices, office automation machines, audio-visual products.

Standard Specifications

Contact mechanism: Crossbar twin Ag (Au-alloy contact)

Enclosure rating: Plastic-sealed

■ Coil Rating

Single-side Stable Relays (G6J-2P-Y, G6J-2FS-Y, G6J-2FL-Y)

Rated voltage	3 VDC	4.5 VDC	5 VDC	12 VDC	24 VDC
Rated current	48.0 mA	32.6 mA	28.9 mA	12.3 mA	9.2 mA
Coil resistance	62.5 Ω	137.9 Ω	173.1 Ω	976.8 Ω	2,600.5 Ω
Must operate voltage	75% max. of rated voltage				
Must release voltage	10% min. of rated voltage				
Max. voltage	150% of rated voltage				
Power consumption	Approx. 140 mW				Approx. 230 mW

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.
3. The maximum voltage is the highest voltage that can be imposed on the Relay coil instantaneously.

Single-winding Latching Relays (G6JU-2P-Y, G6JU-2FS-Y, G6JU-2FL-Y)

Rated voltage	3 VDC	4.5 VDC	5 VDC	12 VDC
Rated current	33.7 mA	22.0 mA	20.4 mA	9.0 mA
Coil resistance	89.0 Ω	204.3 Ω	245.5 Ω	1,329.2 Ω
Must set voltage	75% max. of rated voltage			
Must reset voltage	75% max. of rated voltage			
Max. voltage	150% of rated voltage			
Power consumption	Approx. 100 mW			

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.
3. The maximum voltage is the highest voltage that can be imposed on the Relay coil instantaneously.

■ Contact Ratings

Load	Resistive load
Rated load	0.3 A at 125 VAC; 1 A at 30 VDC
Rated carry current	1 A
Max. switching voltage	125 VAC, 110 VDC
Max. switching current	1 A

■ Characteristics

Item		Single-side Stable Relays	Single-winding Latching Relays
		G6J-2P-Y, G6J-2FS-Y, G6J-2FL-Y	G6JU-2P-Y, G6JU-2FS-Y, G6JU-2FL-Y
Contact resistance (See note 1.)		100 mΩ max.	
Operating (set) time (See note 2.)		3 ms max. (approx. 1.6 ms)	
Release (reset) time (See note 2.)		3 ms max. (approx. 1.0 ms)	3 ms max. (approx. 0.9 ms)
Minimum set/reset signal width		–	10 ms
Insulation resistance (See note 3.)		1,000 MΩ min. (at 500 VDC)	
Dielectric strength	**Coil & contacts**	1,500 VAC, 50/60 Hz for 1 min	
	Contacts of different polarity	1,000 VAC, 50/60 Hz for 1 min	
	Contacts of same polarity	750 VAC, 50/60 Hz for 1 min	
Impulse with stand voltage	**Coil & contacts**	2,500 VAC, 2 x 10 µs	
	Contacts of different polarity	1,500 VAC, 10 x 160 µs	
	Contacts of same polarity		
Vibration resistance		Destruction: 10 to 55 Hz 2.5mm single amplitude (5mm double amplitude) Malfunction: 10 to 55 Hz 1.65mm single amplitude (3.3mm double amplitude)	
Shock resistance		Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: 750 m/s^2 (approx. 75G)	
Life expectancy		Mechanical: 50,000,000 operations min. (at 36,000 operations/hour) Electrical: 100,000 operations min. (with a rated load at 1,800 operations/hour)	
Failure rate (P level) (See note 4.)		10 µA at 10 mVDC	
Ambient temperature		-40 to 85°C (with no icing or condensation)	
Ambient humidity		5% to 85%	
Weight		Approx. 1 g	

Note: 1. The contact resistance was measured with 10 mA at 1 VDC with a fall-of-potential method.

2. Values in parentheses are actual values.

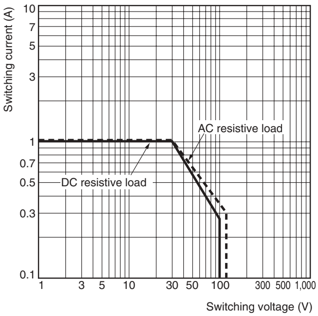
3. The insulation resistance was measured with a 500-VDC Megger Tester applied to the same parts as those for checking the dielectric strength.

4. This value was measured at a switching frequency of 120 operations/min and the criterion of contact resistance is 5% of the load impedance. This value may vary depending on the operating frequency, operating conditions, expected reliability level of the relay, etc. Always double-check relay suitability under actual load conditions.

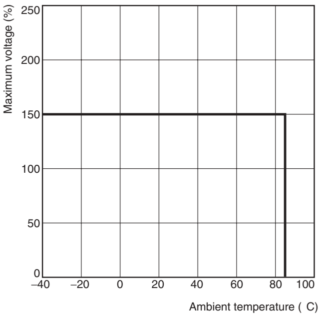
5. The above values are initial values.

Engineering Data

Maximum Switching Capacity

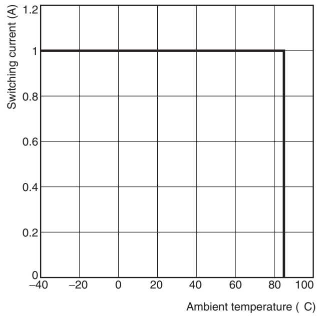


Ambient Temperature vs. Maximum Coil Voltage

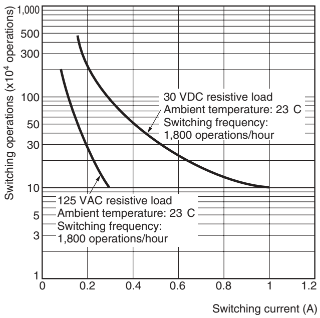


Note: "Maximum voltage" is the maximum voltage that can be applied to the Relay coil.

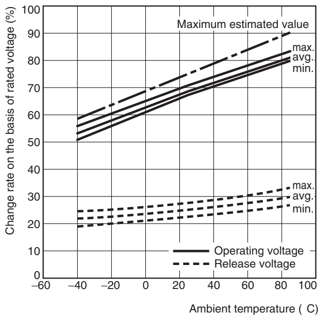
Ambient Temperature vs. Switching Current



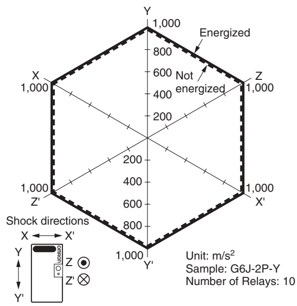
Electrical Endurance



Ambient Temperature vs. Must Operate or Must Release Voltage

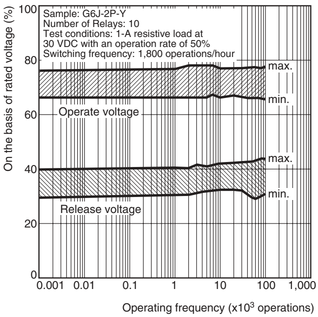


Shock Malfunction

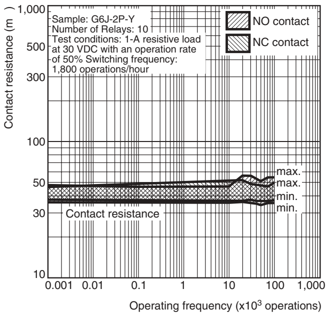


Conditions: Shock is applied in ±x, ±y, ±z directions three times each with and without energizing the relays to check the number of contact malfunctions.

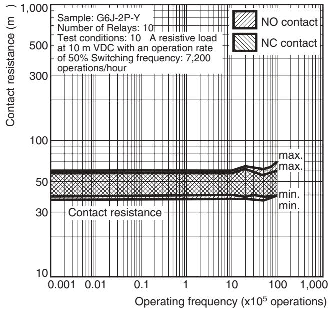
Electrical Endurance (with Operate and Release Voltage) (See note.)



Electrical Endurance (Contact Resistance) (See note.)

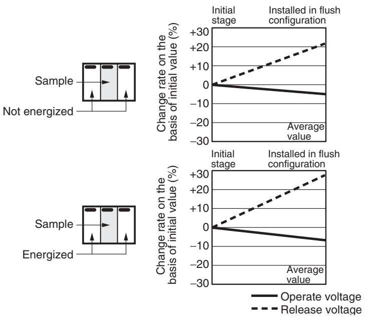


Contact Reliability Test (See note.)

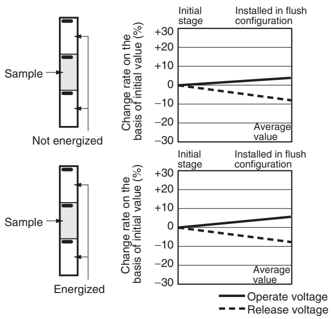


Note: These tests were conducted at an ambient temperature of 23°C.

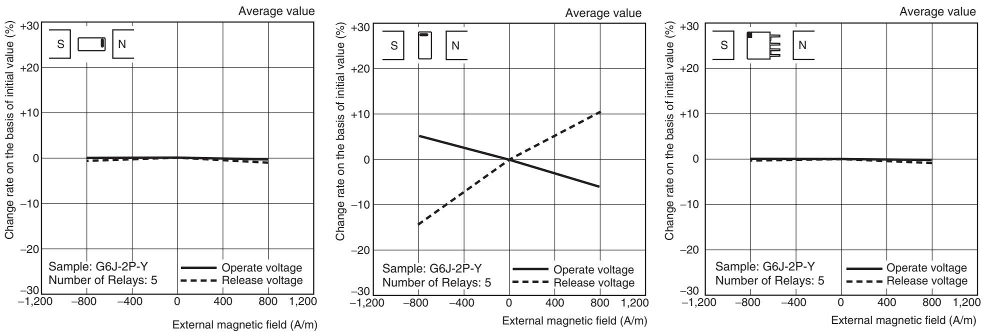
Mutual Magnetic Interference



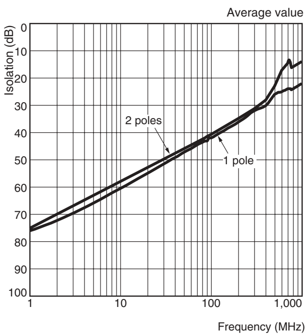
Mutual Magnetic Interference



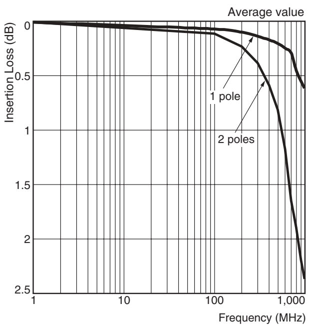
External Magnetic Interference



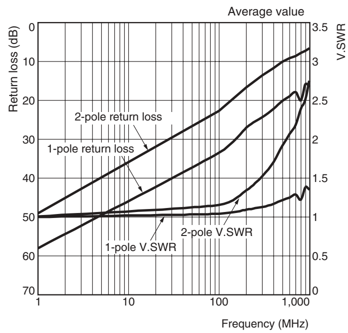
High-frequency Characteristics (Isolation)



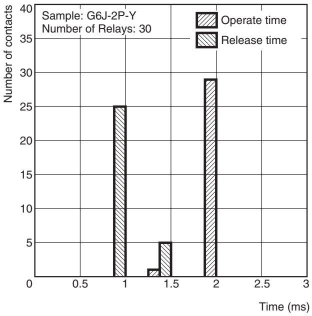
High-frequency Characteristics (Insertion Loss)



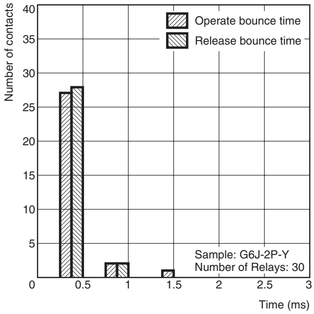
High-frequency Characteristics (Return Loss, V.SWR)



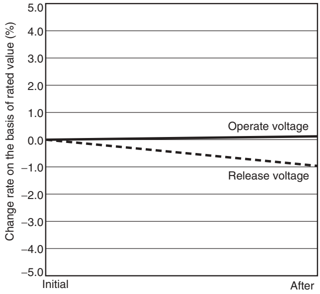
Operate and Release Time Distribution (See note.)



Operate and Release Bounce Time Distribution (See note.)



Vibration Resistance

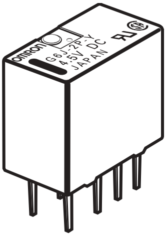


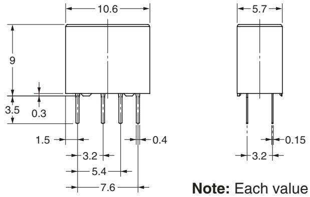
Note: These tests were conducted at an ambient temperature of 23°C.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

G6J-2P-Y
G6JU-2P-Y

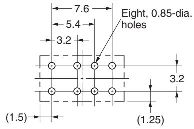




Note: Each value has a tolerance of ±0.3 mm.

Mounting Dimensions (Bottom View)

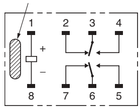
Tolerance ±0.1 mm



Terminal Arrangment/ Internal Connections (Bottom View)

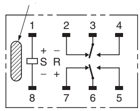
G6J-2P

Orientation mark

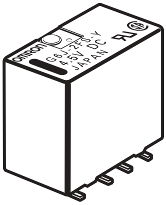


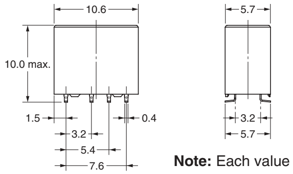
G6U-2P

Orientation mark



G6J-2FS-Y
G6JU-2FS-Y

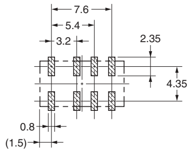




Note: Each value has a tolerance of ±0.3 mm.

Mounting Dimensions (Top View)

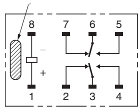
Tolerance ±0.1 mm



Terminal Arrangement/ Internal Connections (Top View)

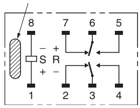
G6J-2FS

Orientation mark

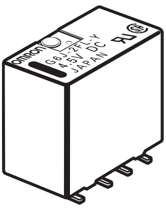


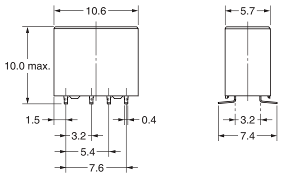
G6JU-2FS

Orientation mark



G6J-2FL-Y
G6JU-2FL-Y

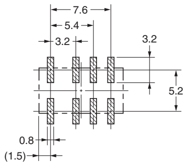




Note: Each value has a tolerance of ±0.3 mm.

Mounting Dimensions (Bottom View)

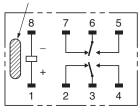
Tolerance ±0.1 mm



Terminal Arrangement/ Internal Connections (Top View)

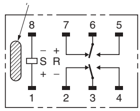
G6J-2FL

Orientation mark



G6JU-2FL

Orientation mark

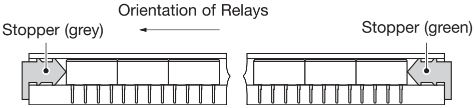


Stick Packing and Tape Packing

1. Stick Packing

Relays in stick packing are arranged so that the orientation mark of each Relay is on the left side.

Always confirm that the Relays are in the correct orientation when mounting the Relays to the PCBs.



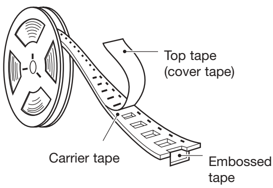
Stick length: 555 mm (stopper not included)
No. of Relays per stick: 50

2. Tape Packing (Surface-mounting Terminal Relays)

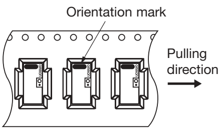
When ordering Relays in tape packing, add the prefix "-TR" to the model number, otherwise the Relays in stick packing will be provided.

Tape type	TB2412R (EIAJ (Electronic Industrial Association of Japan))
Reel type:	R24D (EIAJ (Electronic Industrial Association of Japan))
Relays per reel:	400

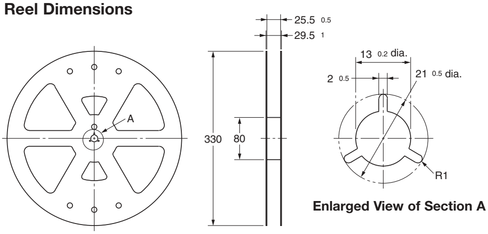
Direction of Relay Insertion



Pulling direction



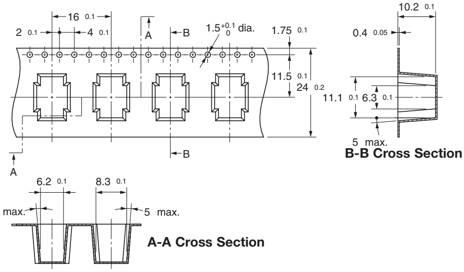
Reel Dimensions



Enlarged View of Section A

Carrier Tape Dimensions

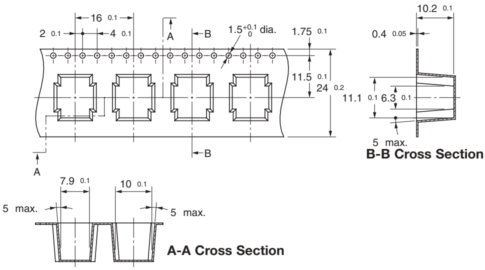
G6J-2FS-Y, G6JU-2FS-Y



B-B Cross Section

A-A Cross Section

G6J-2FL-Y, G6JU-2FL-Y



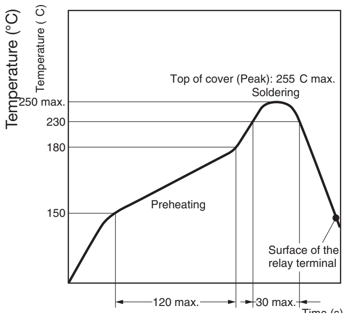
B-B Cross Section

A-A Cross Section

Signal Relays

Recommended Soldering Method

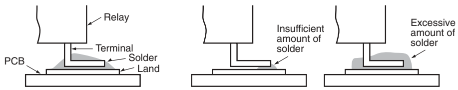
IRS Method (for Surface-Mounting Terminal Relays)



Note: Temperatures are given for the surface of the terminal.

- The thickness of cream solder to be applied should be between 150 and 200 μm on OMRON's recommended PCB pattern.
- In order to perform correct soldering, it is recommended that the correct soldering conditions be maintained as shown below on the left-hand side.

Correct Soldering **Incorrect Soldering**



Visually check that the Relay is properly soldered.

■ Approved Standards

UL approval: UL60950 (File No. E41515)
CSA approval: C22.2 No. 60950 (File No. LR31928)

Contact form	Coil ratings	Contact ratings	Number of test operations
DPDT	G6J-2P-Y, 2FS-Y, 2FL-Y: 3 to 24 VDC G6JU-2P-Y, 2FS-Y, 2FL-Y: 3 to 24 VDC	1 A at 30 VDC 0.5 A at 60 VDC 0.3 A at 125 VAC	6,000

Precautions

CORRECT USE

Long Term Current Carrying

Under a long-term current carrying without switching, the insulation resistance of the coil goes down gradually due to the heat generated by the coil itself. Furthermore, the contact resistance of the Relay will gradually become unstable due to the generation of film on the contact surfaces. A Latching Relay can be used to prevent these problems. When using a single-side stable relay, the design of the fail-safe circuit provides protection against contact failure and open coils.

Handling of Surface-mounting Relays

Use the Relay as soon as possible after opening the moisture-proof package. If the Relay is left for a long time after opening the moisture-proof package, the appearance may suffer and seal failure may occur after the solder mounting process. To store the Relay after opening the moisture-proof package, place it into the original package and sealed the package with adhesive tape.

When washing the product after soldering the Relay to a PCB, use a water-based solvent or alcohol-based solvent, and keep the solvent temperature to less than 40°C. Do not put the relay in a cold cleaning bath immediately after soldering.

Soldering

Solder: JIS Z3282, H63A

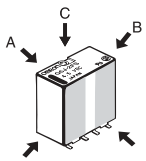
Soldering temperature: Approx. 250˚C (At 260˚C if the DWS method is used.)

Soldering time: Approx. 5s max. (Approx. 2s for the first time and approx. 3s for the second time if the DWS method is used.)

Be sure to adjust the level of the molten solder so that the solder will not overflow onto the PCB.

Claw Securing Force During Automatic Mounting

During automatic insertion of Relays, make sure to set the securing force of the claws to the following values so that the Relay characteristics will be maintained.



Direction A: 4.90 N max.
Direction B: 9.80 N max.
Direction C: 9.80 N max.

Secure the claws to the area indicated by shading.

Do not attach them to the center area or to only part of the Relay.

Environmental Conditions During Operation, Storage, and Transportation

Protect the Relays from direct sunlight and keep the Relays under normal temperature, humidity, and pressure.

Mounting Latching Relays

Make sure that the vibration or shock that is generated from other devices, such as Relays in operation, on the same panel and imposed on the Latching Relays does not exceed the rated value, otherwise the Latching Relays that have been set may be reset or vice versa. The Latching Relays are reset before shipping. If excessive vibration or shock is imposed, however, the Latching Relays may be set accidentally. Be sure to apply a reset signal before use.

Maximum Voltage

The maximum voltage of the coil can be obtained from the coil temperature increase and the heat-resisting temperature of coil insulating sheath material. (Exceeding the heat-resisting temperature may result in burning or short-circuiting.) The maximum voltage also involves important restrictions which include the following:

- Must not cause thermal changes or deterioration of the insulating material.
- Must not cause damage to other control devices.
- Must not cause any harmful effect on people.
- Must not cause fire.

Therefore, be sure not to exceed the maximum voltage specified in the catalog.

As a rule, the rated voltage must be applied to the coil. A voltage exceeding the rated value, however, can be applied to the coil provided that the voltage is less than the maximum voltage. It must be noted that continuous voltage application to the coil will cause a coil temperature increase thus affecting characteristics such as electrical life and resulting in the deterioration of coil insulation.

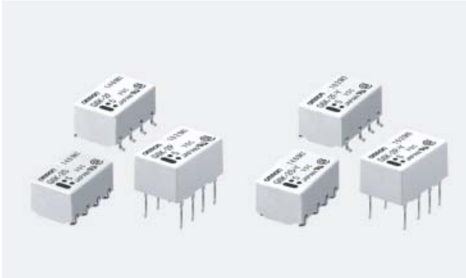
Coating

Relays mounted on PCBs may be coated or washed. Do not apply silicone coating or detergent containing silicone, otherwise the silicone coating or detergent may remain on the surface of the Relays.

Other Handling

Please don't use the relay if it has been dropped. There is a possibility of damage.

Surface-Mounting Relay with the World's Smallest Mounting Area and a Height of Only 5.2 mm



- ROHS compliant.
- Sub-miniature model as small as 5.2 (H) x 6.5 (W) x 10 (L) mm is ideal for high-density mounting.
- Low profile of 5.2 mm and weight of only 0.7 g combine to improve mounting efficiency.
- Models with inside-L surface mounting terminals are available.
- Consumes approximately 70% the power of a conventional OMRON model and operates at a current that is as low as 100 mW.
- Surface mounting terminal models incorporate a unique terminal structure with high infrared irradiation efficiency which allows the terminal temperature to rise easily when mounting the IRS, thus ensuring excellent soldering.
- Ensures a dielectric strength of 1,500 VAC and conforms to FCC Part 68 (i.e., withstanding an impulse withstand voltage of 1,500 V for 10 x 160 µs).
- New-Y models offer an impulse withstandvoltage of 2,500 V for 2 x 10 µs (conforms to Bellcore specifications) by optimizing the distance between coil and contacts.
- Conforms to UL1950 (File No. E41515)/CSA C22.2 No. 950 (File No. LR24825)

The above specifications are ensured as of August 1999.

Ordering Information

Classification				Single-side stable	Single-winding latching	Single-side stable Bellcore: 2,500 V for 2x10 µs
DPDT	Fully sealed	Through-hole terminal		G6K-2P	G6KU-2P-Y	G6K-2P-Y
		Surface Mounting terminal	Inside-L	G6K-2G	G6KU-2G-Y	G6K-2G-Y
			Outside-L	G6K-2F	G6KU-2F-Y	G6K-2F-Y

Note: 1. When ordering, add the rated coil voltage to the model number.
Example: G6K-2F 12 VDC
Rated coil voltage
2. When ordering tape packing, add -TR" to the model number.
Example: G6K-2F-TR 12 VDC
Tape packing
Be sure since -TR" is not part of the relay model number, it is not marked on the relay case.

Model Number Legend

G6K□-□□-□ □VDC
1 2 3 4 5

1. **Relay function**
   None: Single-side stable model
   U: Single-winding latching model
2. **Contact Form**
   2: DPDT
3. **Terminal shape**
   F: Outside-L surface-mounting terminal
   G: Inside-L surface-mounting terminal
   P: PCB terminal
4. **Approved standards**
   None: UL, CSA
   Does not conform to Bellcore specifications
   Y: UL, CSA
   Conforms to Bellcore specifications:
   2,500 V for 2 x 10 µs
5. **Rated Coil Voltage**
   3, 4.5, 5, 12, 24 VDC

Application Examples

Telephones, communications equipment, measurement devices, office automation machines, and audio–visual products.

Specifications

Contact mechanism: Bifurcated crossbar Ag (Au-alloy contact)
Enclosure ratings: Fully sealed

■ Coil Ratings

Single-side Stable Models – G6K-2F, G6K-2G, G6K-2P

Rated voltage	3 VDC	4.5 VDC	5 VDC	12 VDC
Rated current	33.0 mA	23.2 mA	21.1 mA	9.1 mA
Coil resistance	91 Ω	194 Ω	237 Ω	1,315 Ω
Must operate voltage	80% max. of rated voltage			
Must release voltage	10% min. of rated voltage			
Max. voltage	150% of rated voltage at 23°C to 70°C			
Power consumption	Approx. 100 mW			

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. The operating characteristics are measured at a coil temperature of 23°C.
3. The maximum voltage is the highest voltage that can be imposed on the relay coil instantaneously.

Single-side Stable Models (Bellcore Version) – G6K-2F-Y, G6K-2G-Y, G6K-2P-Y

Rated voltage	3 VDC	4.5 VDC	5 VDC	12 VDC	24 VDC
Rated current	33.0 mA	23.2 mA	21.1 mA	9.1 mA	4.6 mA
Coil resistance	91 Ω	194 Ω	237 Ω	1,315 Ω	5,220 Ω
Must operate voltage	80% max. of rated voltage				
Must release voltage	10% min. of rated voltage				
Max. voltage	150% of rated voltage at 23°C to 70°C				
Power consumption	Approx. 100 mW				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. The operating characteristics are measured at a coil temperature of 23°C.
3. The maximum voltage is the highest voltage that can be imposed on the relay coil instantaneously.

Single-winding Latching Models (Bellcore Version) – G6KU-2F-Y, G6KU-2G-Y, G6KU-2P-Y

Rated voltage	3 VDC	4.5 VDC	5 VDC	12 VDC	24 VDC
Rated current	33.0 mA	23.2 mA	21.1 mA	9.1 mA	4.6 mA
Coil resistance	91 Ω	194 Ω	237 Ω	1,315 Ω	5,220 Ω
Must Set voltage	75% max. of rated voltage				
Must reset voltage	75% max. of rated voltage				
Max. voltage	150% of rated voltage at 23°C to 70°C				
Power consumption	Approx. 100 mW				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. The operating characteristics are measured at a coil temperature of 23°C.
3. The maximum voltage is the highest voltage that can be imposed on the relay coil instantaneously.

■ Contact Ratings

Load	Resistive load
Rated load	0.3 A at 125 VAC; 1 A at 30 VDC
Rated carry current	1 A
Max. switching voltage	125 VAC, 60 VDC
Max. switching current	1 A

■ Characteristics

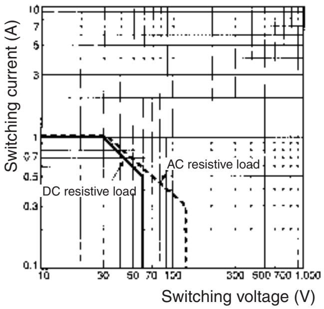
Item		Single-side stable models (double-pole)		Single-winding latching model
		G6K-2F, G6K-2G, G6K-2P	G6K-2F-Y, G6K-2G-Y, G6K-2P-Y	G6KU-2F-Y, G6KU-2G-Y, G6KU-2P-Y
Contact resistance (see note 1)		100 mΩ max.		
Operating (set) time (see note 2)		3 ms max. (approx. 1.4 ms)		3 ms max. (approx. 1.2 ms)
Release (reset) time (see note 2)		3 ms max. (approx. 1.3 ms)		3 ms max. (approx. 1.2 ms)
Insulation resistance (see note 3)		1,000 MΩ min. (at 500 VDC)		
Dielectric strength	**Coil & contacts**	1,500 VAC, 50/60 Hz for 1 min		
	Contacts of different polarity	1,000 VAC, 50/60 Hz for 1 min		
	Contacts of same polarity	750 VAC, 50/60 Hz for 1 min		
Impulse withstand voltage	**Coil & contacts**	1,500 V (10 x 160 µs)	2,500 V (2 x 10 µs), 1,500 V (10 x 160 µs)	
	Contacts of different polarity	1,500 V (10 x 160 µs)		
	Contacts of same polarity	–		
Vibration resistance		Destruction: 10 to 55 Hz, 2.5-mm single amplitude (5-mm double amplitude) and 55 to 500 Hz, 300 m/s^2 (approx. 30G) Malfunction: 10 to 55 Hz, 1.65-mm single amplitude (3.3-mm double amplitude) and 55 to 500 Hz, 200 m/s^2 (approx. 20G)		
Shock resistance		Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: 750 m/s^2 (approx. 75G)		
Endurance		Mechanical: 50,000,000 operations min. (at 36,000 operations/hour) Electrical: 100,000 operations min. (with a rated load at 1,800 operations/hour)		
Failure rate (P level) (see note 4)		10 µA at 10 mVDC		
Ambient temperature		Operating: -40°C to 70°C (with no icing or condensation)		
Ambient humidity		Operating: 5% to 85%		
Weight		Approx. 0.7 g		

Note: The above values are initial values.

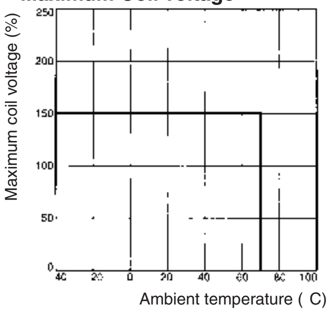
Note: 1. The contact resistance was measured with 10 mA at 1 VDC with a fall-of-potential method.
2. Values in parentheses are actual values.
3. The insulation resistance was measured with a 500-VDC Megger Tester applied to the same parts as those used for checking the dielectric strength.
4. This value was measured at a switching frequency of 120 operations/min.

Engineering Data

Maximum Switching Power

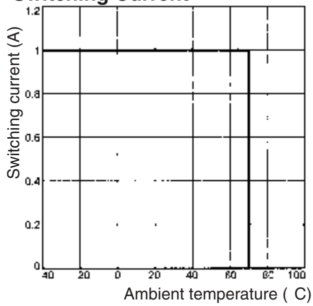


Ambient Temperature vs. Maximum Coil Voltage

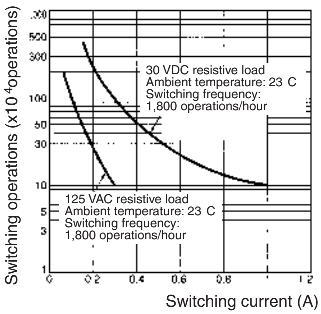


Note: The maximum coil voltage refers to the maxi mum value in a varying range of operating power voltage, not a continuous voltage.

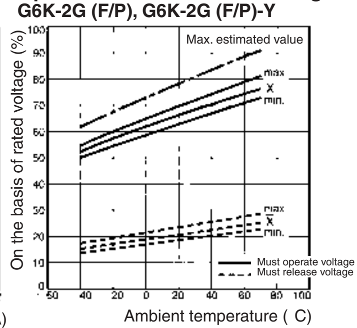
Ambient Temperature vs. Switching Current



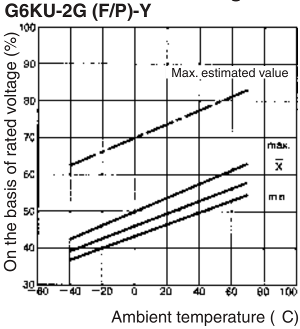
Endurance



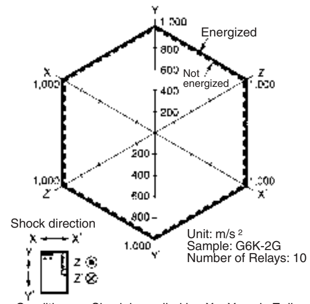
Ambient Temperature vs. Must Operate or Must Release Voltage
G6K-2G (F/P), G6K-2G (F/P)-Y



Ambient Temperature vs. Must Set or Must Reset Voltage
G6KU-2G (F/P)-Y

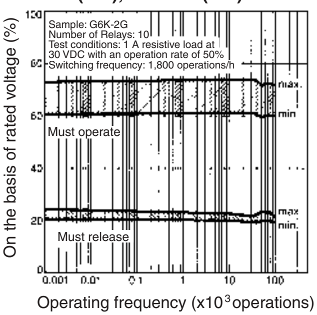


Shock Malfunction

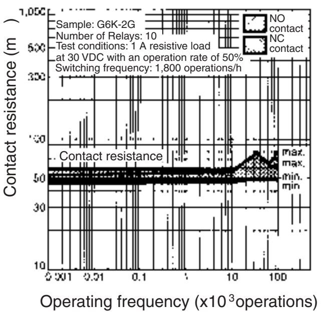


Conditions: Shock is applied in X, Y, and Z di rections three times each with and with out energizing the Relays to check the number of contact malfunctions.

Electrical Endurance (with Must Operate and Must Re lease Voltage) (see note)
G6K-2G (F/P), G6K-2G (F/P)-Y

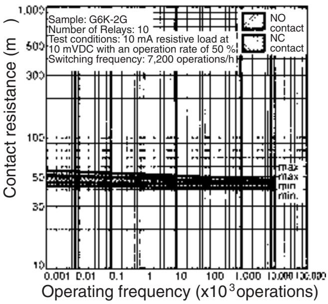


Electrical Endurance (Contact Resistance) (see note)
G6K-2G (F/P), G6K-2G (F/P)-Y



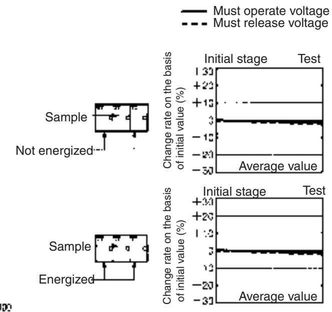
Signal Relays

Contact Reliability Test (see note)
G6K-2G (F/P), G6K-2G (F/P)-Y

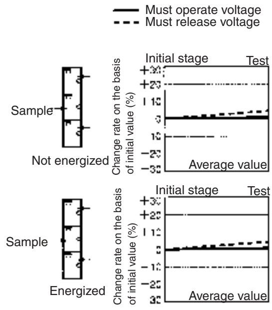


Note: The test was conducted at an ambient temperature of 23 C.

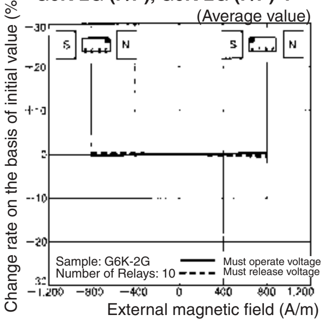
Mutual Magnetic Interference
G6K-2G (F/P), G6K-2G (F/P)-Y

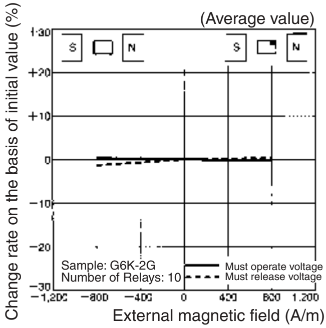


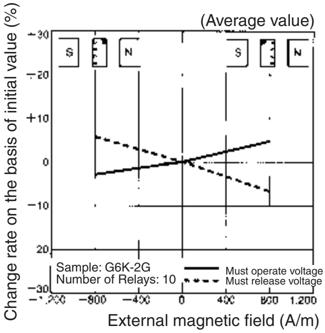
Mutual Magnetic Interference
G6K-2G (F/P), G6K-2G (F/P)-Y



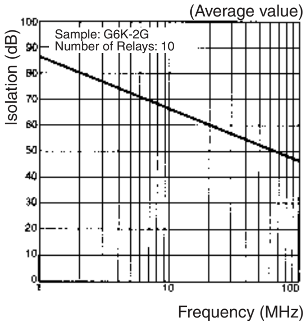
External Magnetic Interference
G6K-2G (F/P), G6K-2G (F/P)-Y



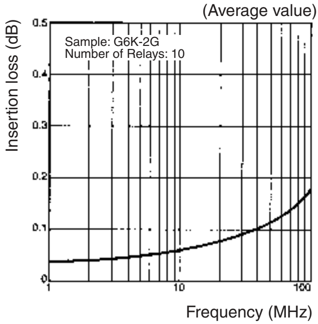




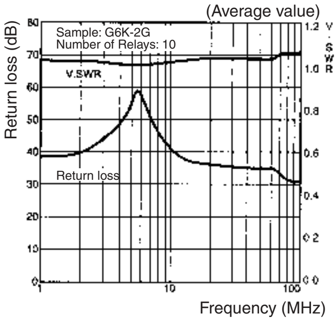
High-frequency Characteristics (Isolation)
G6K-2G (F/P), G6K-2G (F/P)-Y



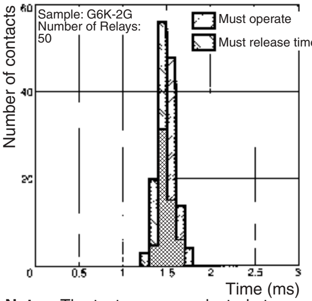
High-frequency Characteristics (Insertion Loss)
G6K-2G (F/P), G6K-2G (F/P)-Y



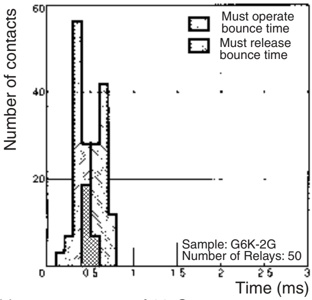
High-frequency Characteristics (Return Loss)
G6K-2G (F/P),G6K-2G (F/P)-Y



Must Operate and Must Release Time Distribution (see note)
G6K-2G (F/P), G6K-2G (F/P)-Y

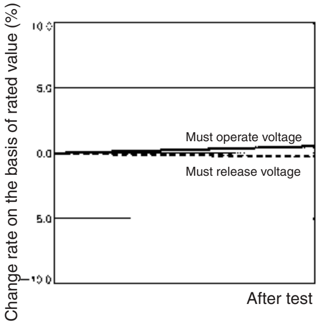


Must Operate and Must Release Bounce Time Distribution (see note)
G6K-2G (F/P) , G6K-2G (F/P)-Y



Note: The tests were conducted at an ambient temperature of 23 C.

Vibration Resistance
G6K-2G (F/P), G6K-2G (F/P)-Y

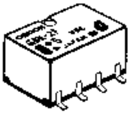


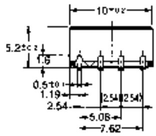
Dimensions

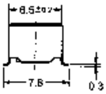
Note: 1. All units are in millimeters unless otherwise indicated.

■ DPDT

G6K-2F

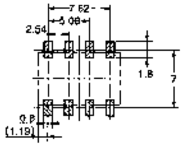




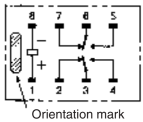


Note: Each value has a tolerance of 0.3 mm.

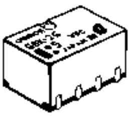
Mounting Dimensions (Top View)
Tolerance: 0.1 mm

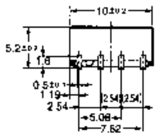


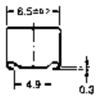
Terminal Arrangement/ Internal Connections (Top View)



G6K-2G

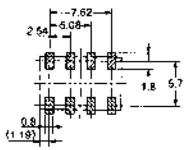




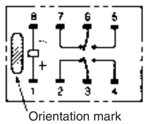


Note: Each value has a tolerance of 0.3 mm.

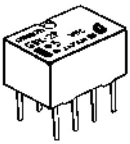
Mounting Dimensions (Top View)
Tolerance: 0.1 mm

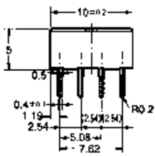


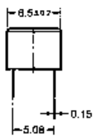
Terminal Arrangement/ Internal Connections (Top View)



G6K-2P

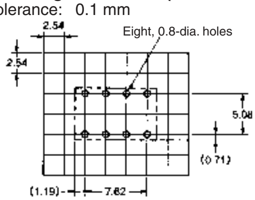




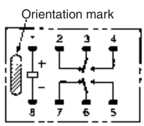


Note: Each value has a tolerance of 0.3 mm.

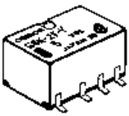
Mounting Dimensions (Bottom View)
Tolerance: 0.1 mm

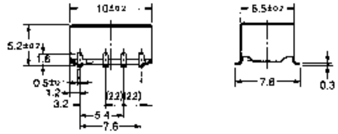


Terminal Arrangement/ Internal Connections (Bottom View)



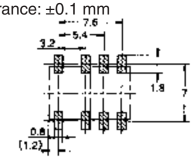
G6K-2F-Y



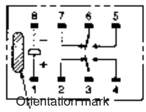


Note: Each value has a tolerance of ±0.3 mm.

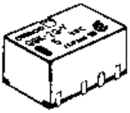
Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

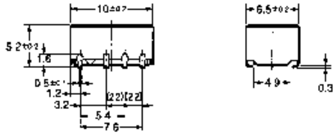


Terminal Arrangement/ Internal Connections (Top View)



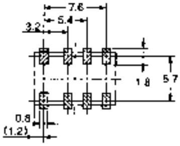
G6K-2G-Y



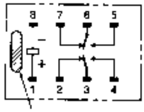


Note: Each value has a tolerance of ±0.3 mm.

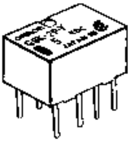
Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

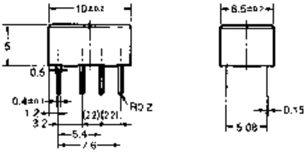


Terminal Arrangement/ Internal Connections (Top View)



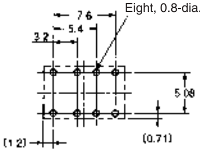
G6K-2P-Y



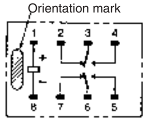


Note: Each value has a tolerance of ±0.3 mm.

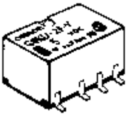
Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

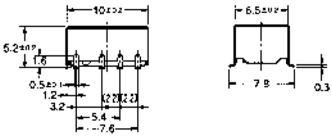


Terminal Arrangement/ Internal Connections (Bottom View)



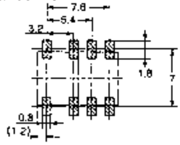
G6KU-2F-Y



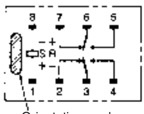


Note: Each value has a tolerance of 0.3 mm.

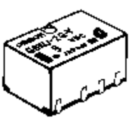
Mounting Dimensions (Top View)
Tolerance: 0.1 mm

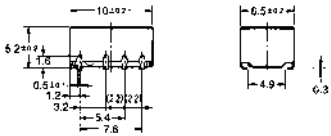


Terminal Arrangement/ Internal Connections (Top View)



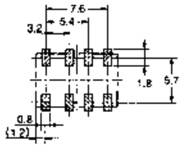
G6KU-2G-Y



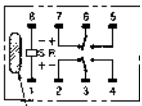


Note: Each value has a tolerance of 0.3 mm.

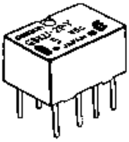
Mounting Dimensions (Top View)
Tolerance: 0.1 mm

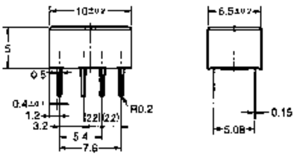


Terminal Arrangement/ Internal Connections (Top View)



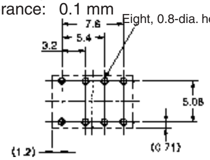
G6KU-2P-Y



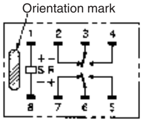


Note: Each value has a tolerance of 0.3 mm.

Mounting Dimensions (Bottom View)
Tolerance: 0.1 mm



Terminal Arrangement/ Internal Connections (Bottom View)

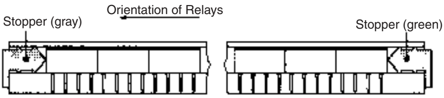


Stick Packing and Tape Packing

Stick Packing

Relays in stick packing are arranged so that the orientation mark of each Relay is on the left side. Fifty Relays are packed on one stick.

Be sure not to make mistakes in Relay orientation when mounting the Relay to the FPCB.



Stick length: 520 mm (stopper not included)

No. of Relays per stick: 50

Tape Packing (Surface-Mounting Terminal Models)

When ordering Relays in tape packing, add the prefix “-TR” to the model number, otherwise the Relays in stick packing will be provided.

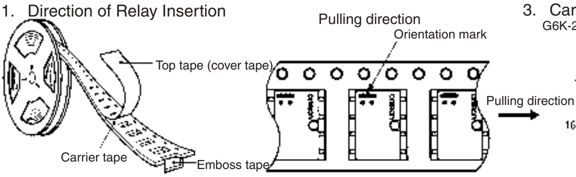
Tape Type: ETX7200

(EIAJ (Electronic Industrial Association of Japan))

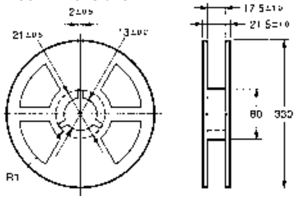
Reel type: RPM-16D (EIAJ)

Relays per Reel: 900

1. Direction of Relay Insertion

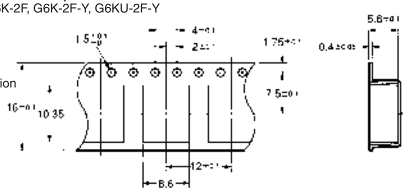


2. Reel Dimensions

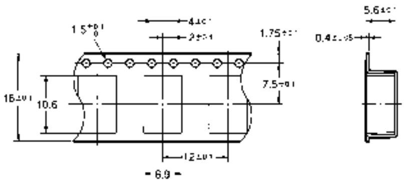


3. Carrier Tape Dimensions

G6K-2F, G6K-2F-Y, G6KU-2F-Y

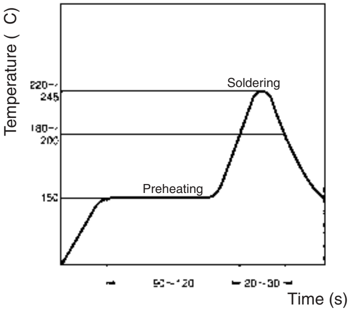


G6K-2G, G6K-2G-Y, G6KU-2G-Y



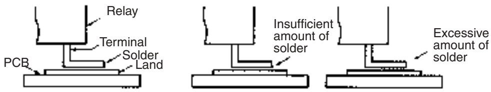
Recommended Soldering Method

Temperatures indicate the surface temperatures of the PCB.
IRS Method (for surface-mounting terminal models)



- The thickness of cream solder to be applied should be within a range between 150 and 200 μm on OMRON's recommended PCB pattern.
- In order to perform correct soldering, it is recommended that the correct soldering conditions be maintained as shown below on the left side.

Correct Soldering **Incorrect Soldering**



Visually check that the Relay is properly soldered.

■ Approved Standards

UL approval: UL1950 (File No. E41515)
CSA approval: C22.2 No. 950 (File No. LR24825)

Model	Coil ratings	Contact ratings	Number of test operations
DPDT	G6K-2G(F/P): 3 to 12 VDC G6K(U)-2G(F/P)-Y: 3 to 24 VDC	1 A at 30 VDC 0.5 A at 60 VDC 0.3 A at 125 VAC	6,000

Precautions

CORRECT USE

Handling

Leave the Relay unpacked until mounting it.

Soldering

Solder: JIS Z3282, H63A

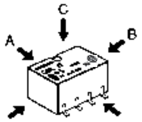
Soldering temperature: Approx. 250˚C (260˚C if the DWS method is used)

Soldering time: Approx. 5 s max. (approx. 2 s for the first time and approx. 3 s for the second time if the DWS method is used)

Be sure to make a molten solder level adjustment so that the solder will not overflow on the PCB.

Claw Securing Force During Automatic Mounting

During automatic insertion of Relays, make sure to set the securing force of each claw to the following so that the Relays characteristics are maintained.



Direction A: 1.96 N
Direction B: 4.90 N
Direction C: 1.96 N

Environmental Conditions During Operation, Storage, and Transportation

Protect the Relay from direct sunlight and keep the Relay under normal temperature, humidity, and pressure.

If the Relay is stored for a long time in an adverse environment with high temperature, high humidity, organic gases, or sulphide gases, sulphide or oxide films will form on the contact surfaces. These films may result in unstable contact, contact problems, or functional problems. Therefore, operate, store, or transport the product under specified environmental conditions.

Latching Relay Mounting

Make sure that the vibration or shock that is generated from other devices, such as relays in operation, on the same panel and imposed on the Latching Relay does not exceed the rated value, otherwise the Latching Relay that has been set may be reset or vice versa. The Latching Relay is reset before shipping. If excessive vibration or shock is imposed, however, the Latching Relay may be set accidentally. Be sure to apply a reset signal before use.

Maximum Allowable Voltage

The maximum allowable voltage of the coil can be obtained from the coil temperature increase and the heat-resisting temperature of coil insulating sheath material. (Exceeding the heat-resisting temperature may result in burning or short-circuiting.) The maximum allowable voltage also involves important restrictions which include the following:

- Must not cause thermal changes in or deterioration of the insulating material.
- Must not cause damage to other control devices.
- Must not cause any harmful effect on people.
- Must not cause fire.

Therefore, be sure to use the maximum allowable voltage beyond the value specified in the catalog.

As a rule, the rated voltage must be applied to the coil. A voltage exceeding the rated value, however, can be applied to the coil provided that the voltage is less than the maximum allowable voltage. It must be noted that continuous voltage application to the coil will cause a coil temperature increase thus affecting characteristics such as electrical life and resulting in the deterioration of coil insulation.

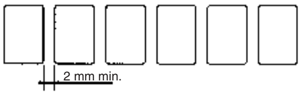
Coating

The Relay mounted on the PCB may be coated or washed but do not apply silicone coating or detergent containing silicone, otherwise the silicone coating or detergent may remain on the surface of the Relay.

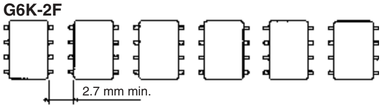
PCB Mounting

If two or more Relays are closely mounted with the long sides of the Relays facing each other and soldering is performed with infrared radiation, the solder may not be properly exposed to the infrared rays. Be sure to keep the proper distance between adjacent Relays as shown below.

G6K-2G



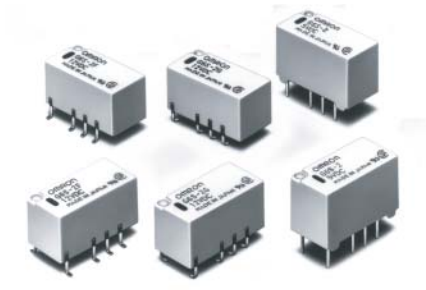
G6K-2F



Two or more Relays may be closely mounted with the short sides of the Relays facing each other.

Surface-Mounting DPDT Relay

- ROHS compliant.
- Long terminals ideal for soldering and mounting reliability.
- Space-saving inside-L terminal.
- High dielectric strength between coil and contacts (2,000 VAC), and between contacts of different polarity (1,500 VAC).
- High impulse withstand voltages between coil and contacts, and between contacts of different polarity (2,500 V, 2 10 μs: Bellcore requirements).
- Low power consumption (140 mW).
- Bifurcated crossbar contact (Au-clad) and Fully sealed construction for high reliability.
- Applicable to IRS.
- High sealability after IRS.



- Ultra-miniature at 15 x 7.5 x 9.4 mm (L x W x H).
- Through-hole terminal is available
- EN60950/EN41003 Supplementary Insulation-certified type is available.

Ordering Information

Classification				Single-side Stable	Single-winding latching	Double-winding latching	Single-side stable EN60950/EN41003
DPDT	Fully sealed	Through-hole terminal		G6S-2	G6SU-2	G6SK-2	G6S-2-Y
		Surface mounting terminal	Inside-L	G6S-2G	G6SU-2G	G6SK-2G	G6S-2G-Y
			Outside-L	G6S-2F	G6SU-2F	G6SK-2F	G6S-2F-Y

Note: 1. When ordering, add the rated coil voltage to the model number.
Example: G6S-2F 12 VDC
Rated coil voltage
2. When ordering tape packing, add -TR" to the model number.
Example: G6S-2F-TR 12 VDC
Tape packing
Be sure since -TR" is not part of the relay model number, it is not marked on the relay case.

Model Number Legend

G6S□-□□-□ □VDC
1 2 3 4 5

1. Relay Function

None: Single-side stable
U: Single-winding latching
K: Double-winding latching

2. Contact Form

2: DPDT

3. Terminal Shape

None: Through-hole terminal
G: Inside-L surface mounting terminal
F: Outside-L surface mounting terminal

4. Approved Standards

None: UL/CSA
Y: EN60950/EN41003

5. Rated Coil Voltage

4.5, 5, 12, 24 VDC

Specifications

■ Coil Ratings

Single-side Stable Type (G6S-2, G6S-2F, G6S-2G)

Rated voltage	4.5 VDC	5 VDC	12 VDC	24 VDC
Rated current	31.0 mA	28.1 mA	11.7 mA	8.3 mA
Coil resistance	145 Ω	178 Ω	1,028 Ω	2,880 Ω
Must operate voltage	75% max. of rated voltage			
Must release voltage	10% min. of rated voltage			
Max. voltage	200% of rated voltage at 23°C			170% of rated voltage at 23°C
Power consumption	Approx. 140 mW			Approx. 200 mW

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

Single-winding Latching Type (G6SU-2, G6SU-2F, G6SU-2G)

Rated voltage		4.5 VDC	5 VDC	12 VDC	24 VDC
Rated current		22.2 mA	20 mA	8.3 mA	6.3 mA
Coil resistance		203 Ω	250 Ω	1,440 Ω	3,840 Ω
Coil inductance (H) (ref. value)	**Armature OFF**	0.27	0.36	2.12	5.80
	Armature ON	0.14	0.18	1.14	3.79
Must set voltage		75% max. of rated voltage			
Must reset voltage		75% min. of rated voltage			
Max. voltage		180% of rated voltage at 23°C			
Power consumption		Approx. 100 mW			Approx. 150 mW

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

Double-winding Latching Type (G6SK-2, G6SK-2F, G6SK-2G)

Rated voltage			4.5 VDC	5 VDC	12 VDC	24 VDC
Rated current			44.4 mA	40 mA	16.7 mA	12.5 mA
Coil resistance			101 Ω	125 Ω	720 Ω	1,920 Ω
Coil inductance (H) (ref. value)	**Set**	**Armature OFF**	0.12	0.14	0.60	1.98
		Armature ON	0.074	0.088	0.41	1.23
	Reset	**Armature OFF**	0.082	0.098	0.46	1.34
		Armature ON	0.14	0.16	0.54	2.23
Must set voltage			75% max. of rated voltage			
Must reset voltage			75% min. of rated voltage			
Max. voltage			170% of rated voltage at 23°C			140% of rated voltage at 23°C
Power consumption			Approx. 200 mW			Approx. 300 mW

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

Single-side Stable EN60950/EN41003 Approved Type (G6S-2-Y, G6S-2F-Y, G6S-2G-Y)

Rated voltage	5 VDC	12 VDC	24 VDC
Rated current	40 mA	16.7 mA	9.6 mA
Coil resistance	125 Ω	720 Ω	2,504 Ω
Must operate voltage	75% max. of rated voltage		
Must release voltage	10% min. of rated voltage		
Max. voltage	170% of rated voltage at 23°C		170% of rated voltage at 23°C
Power consumption	Approx. 200 mW		Approx. 230 mW

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

■ Contact Ratings

Load	Resistive load (cosø = 1)
Rated Load	0.5 A at 125 VAC; 2 A at 30 VDC
Contact material	Ag (Au-clad)
Rated Carry Current	2 A
Max. switching voltage	250 VAC, 220 VDC
Max. switching current	2 A
Max. switching power	62.5 VA, 60 W
Failure rate (reference value)	10 µA at 10 mVDC

Note: P level: λ_{60} = 0.1 x 10^{-6}/operation

■ Characteristics

Contact resistance	75 mΩ max.
Operate (set) time	4 ms max. (mean value: approx. 2.5 ms; latching type: approx. 2 ms)
Release (reset) time	4 ms max. (mean value: approx. 1.5 ms; latching type: approx. 2 ms)
Bounce Time	Operate: Approx. 0.5 ms Release: Approx. 0.5 ms Set/Reset: Approx. 0.5 ms
Max. operating frequency	Mechanical: 36,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min between coil and contacts 1,000 VAC, 50/60 Hz for 1 min between coil and contacts (double-winding latching) 1,500 VAC, 50/60 Hz for 1 min between contacts of different polarity 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity 500 VAC, 50/60 Hz for 1 min between set and reset coil (double-winding latching)
Impulse withstand voltage	2,500 V (2 x 10 µs) between coil and contacts 1,500 V (10 x 160 µs) between coil and contacts (double-winding latching) 2,500 V (2 x 10 µs) between contacts of different polarity 1,500 V (10 x 160 µs) between contacts of same polarity (conforms to FCC Part 68)
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 2.5mm single amplitude (5mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 1.65mm single amplitude (3.3mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: 750 m/s^2 (approx. 175G)
Endurance	Mechanical: 100,000,000 operations min. (at 36,000 operations/hr) Electrical: 100,000 operations min. (2 A at 30 VDC, resistive load: 1,200 operations/hr) 100,000 operations min. (0.5 A at 125 VAC, resistive load)
Ambient temperature	Operating: -40°C to 85°C (with no icing), -40°C to 70°C (double-winding latching, 24 VDC)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 2 g

■ Approved Standards

UL1950 (File No. E41515)/CSA C22.2 No.950 (File No. LR24825)

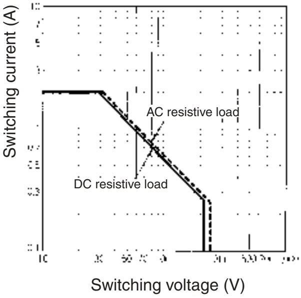
Model	Contact form	Coil ratings	Contact ratings
G6S-2, G6S-2F, G6S-2G	DPDT	1.5 to 48 VDC	2 A, 30 VDC 0.3 A, 110 VDC 0.5 A, 125 VAC
G6SU2, G6SK-2, G6SU-2F G6SU2G, G6SK-2F, G6SK-2G		1.5 to 24 VDC	

EN60950/EN41003

Model	Contact form	Isolation category	Voltage
G6S-2-Y, G6S-2G-Y, G6S-2F-Y	DPDT	Suppleme ntary Isolation	250 VAC

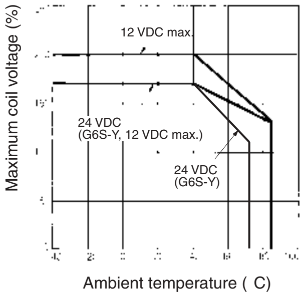
Engineering Data

Maximum Switching Power

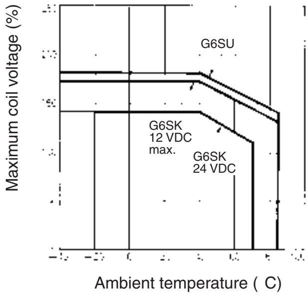


Ambient Temperature vs. Maximum Coil Voltage

Single-side Stable



Single-winding Latching
Double-winding Latching

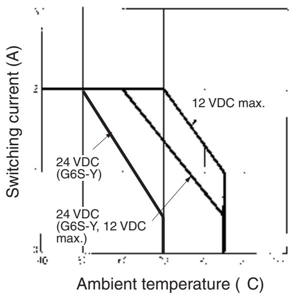


Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

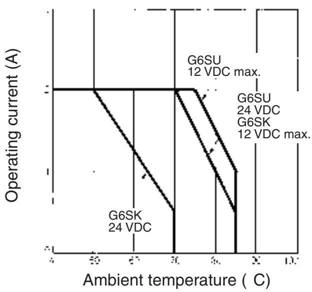
Reference Data

Ambient Temperature vs. Switching Current

Single-side Stable



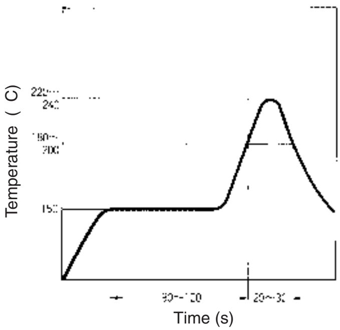
Single-winding Latching
Double-winding Latching



Recommended Soldering Time vs. Surface PCB Temperature

(The temperature profile indicates the temperature on the surface of the PCB.)

IRS



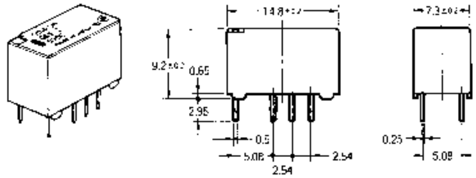
Dimensions

Note: All units are in millimeters unless otherwise indicated.

Single-side Stable

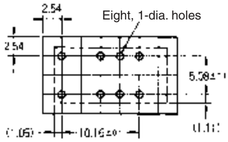
G6S-2, G6S-2-Y

Tolerance: 0.3

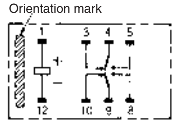


Footprint (Bottom View)

Tolerance: 0.1

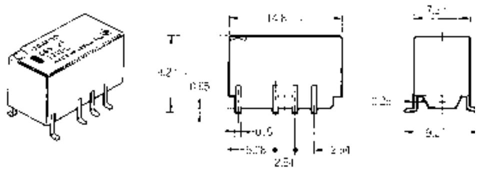


Terminal Arrangement/ Internal Connections (Bottom View)



G6S-2F, G6S-2F-Y

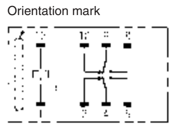
Tolerance: 0.3



Footprint (Top View)

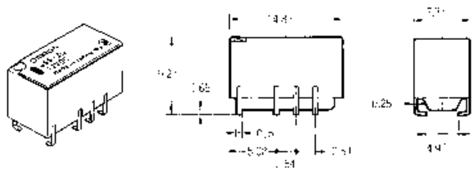
Tolerance: 0.1

Terminal Arrangement/ Internal Connections (Top View)



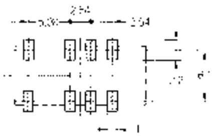
G6S-2G, G6S-2G-Y

Tolerance: 0.3

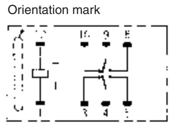


Footprint (Top View)

Tolerance: 0.1



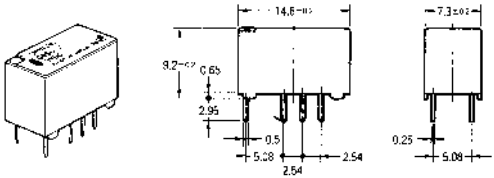
Terminal Arrangement/ Internal Connections (Top View)



Single-winding Latching

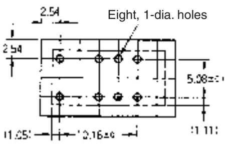
G6SU-2

Tolerance: 0.3

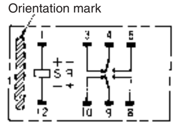


Footprint (Bottom View)

Tolerance: 0.1

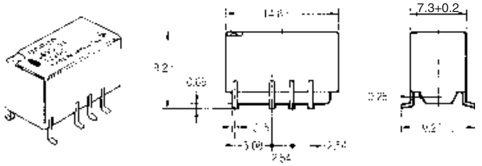


Terminal Arrangement/ Internal Connections (Bottom View)



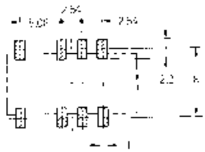
G6SU-2F

Tolerance: 0.3

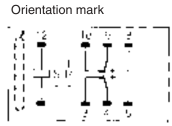


Footprint (Top View)

Tolerance: 0.1

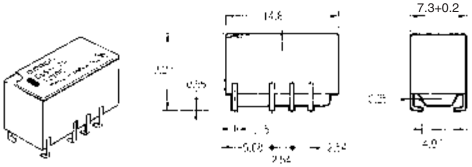


Terminal Arrangement/ Internal Connections (Top View)



G6SU-2G

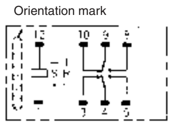
Tolerance: 0.3



Footprint (Top View)

Tolerance: 0.1

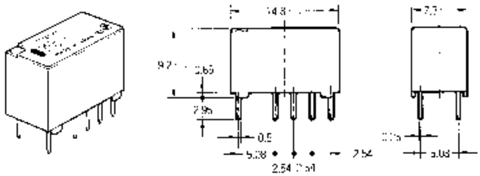
Terminal Arrangement/ Internal Connections (Top View)



Double-winding Latching

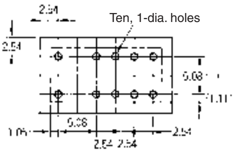
G6SK-2

Tolerance: 0.3

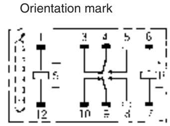


Footprint
(Bottom View)

Tolerance: 0.1

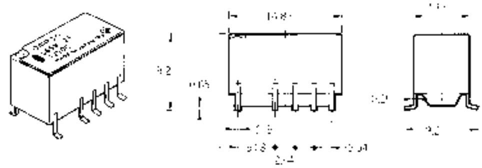


Terminal Arrangement/
Internal Connections
(Bottom View)



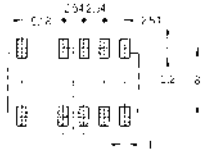
G6SK-2F

Tolerance: 0.3

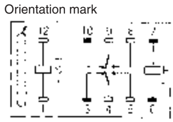


Footprint
(Top View)

Tolerance: 0.1

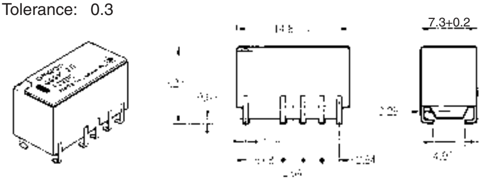


Terminal Arrangement/
Internal Connections
(Top View)



G6SK-2G

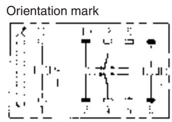
Tolerance: 0.3



Footprint
(Top View)

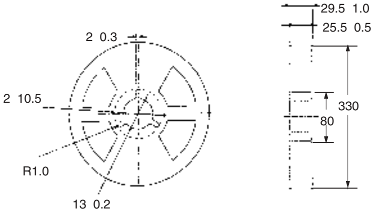
Tolerance: 0.1

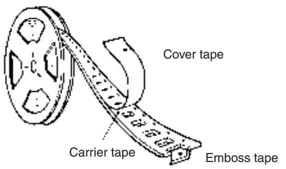
Terminal Arrangement/
Internal Connections
(Top View)

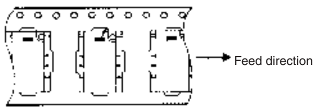


■ Tape Packing

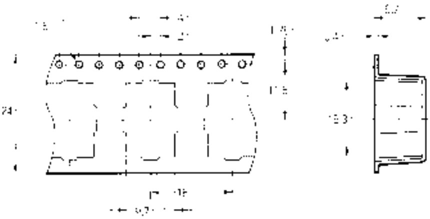
When ordering, add “-TR” before the rated coil voltage for tape packing.
Tape type: TE2416R (Refer to EIAJ)
Reel type: R24E (Refer to EIAJ)
Relays per reel: 400



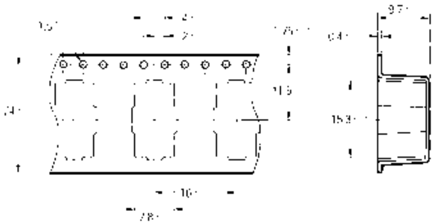




G6S-2F, G6SU-2F, G6SK-2F, G6S-2F-Y



G6S-2G, G6SU-2G, G6SK-2G, G6S-2G-Y



Precautions

Use a DC power supply with 5% or less ripple factor to operate the coil.

Do not use the G6S where subject to strong external magnetic fields.

Do not use the G6S where subject to magnetic particles or excessive amounts of dust.

Do not reverse the polarity of the coil (+, -).

Latching types are delivered in the reset position. We recommend that a reset voltage be applied in advance to start operation.

Do not drop the G6S or otherwise subject it to excessive shock.

Remove the relay from the packing immediately prior to usage.

Sub-miniature Relay (16 x 9.9 x 8.4 mm (L x W x H)) with DPDT Contact

- ROHS compliant.
- Unique moving-loop armature reduces relay size, magnetic interference and contact bounce time.
- Miniature permissible load: 0.01 mA 10 mVDC.
- Bifurcated gold-clad crossbar contact.
- International 2.54mm terminal pitch.
- Special models available for FCC Part 68 compliance.

Ordering Information

Classification		Single-side stable	Single-winding latching	Double-winding latching
DPDT	Fully sealed	G5A-234P	G5AU-234P	G5AK-234P

Note: When ordering, add the rated coil voltage to the model number.
Example: G5A-234P 12 VDC
Rated coil voltage

Model Number Legend

G5A □ - □ □ □ □ - □ □ VDC
1 2 3 4 5 6 7

1. **Relay Function**
   None: Single-side stable
   U: Single-winding latching
   K: Double-winding latching
2. **Contact Form**
   2: DPDT
3. **Contact Type**
   3: Bifurcated crossbar Ag (Au-clad)
4. **Enclosure Ratings**
   4: Fully sealed
5. **Terminals**
   P: Straight PCB
   C: Self-clinching PCB
6. **Special Function**
   None: General-purpose
   FC: FCC part 68 compliance
   U: For ultrasonically cleanable
7. **Rated Coil Voltage**
   3, 5, 6, 9, 12, 24, 48 VDC

Specifications

■ Coil Ratings

Single-side Stable Types

Rated voltage		3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current		66.7 mA	40 mA	33.3 mA	22.2 mA	16.7 mA	8.3 mA	5.8 mA
Coil resistance		45 Ω	125 Ω	180 Ω	405 Ω	720 Ω	2,880 Ω	8,230 Ω
Coil inductance (H) (ref. value)	**Armature OFF**	0.048	0.13	0.17	0.43	0.71	2.76	7.44
	Armature ON	0.043	0.12	0.16	0.4	0.68	2.70	7.25
Must operate voltage		70% max. of rated voltage						
Must release voltage		10% min. of rated voltage						
Max. voltage		200% of rated voltage at 23°C						170% of rated voltage at 23°C
Power consumption		Approx. 200 mW						Approx. 280 mW

Single/Double–winding Latching Types

Rated voltage		3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC
Rated current		66.7 mA	40 mA	33.3 mA	22.2 mA	16.7 mA	8.3 mA
Coil resistance		45 Ω	125 Ω	180 Ω	405 Ω	720 Ω	2,880 Ω
Coil inductance (H) (ref. value)	**Armature OFF**	0.02	0.06	0.08	0.17	0.29	1.1
	Armature ON	0.02	0.05	0.07	0.14	0.24	0.85
Must operate voltage		80% max. of rated voltage					
Must release voltage		80% min. of rated voltage					
Max. voltage		200% of rated voltage at 23°C					
Power consumption		Approx. 200 mW					

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

■ Contact Ratings

Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4) (L/R = 7 ms)
Rated Load	0.5 A at 30 VAC; 1 A at 30 VDC	0.1 A at 30 VAC; 0.2 A at 30 VDC
Contact Material	Ag (Au-clad)	
Rated Carry Current	1 A	
Max. switching voltage	125 VAC, 125 VDC	
Max. switching current	1 A	0.5 A
Max. switching power	37.5 VA, 33 W	12.5 VA, 11 W
Failure rate (reference value)	0.01 mA at 10 mVDC	

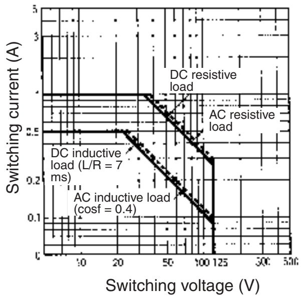
Note: P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation.

■ Characteristics

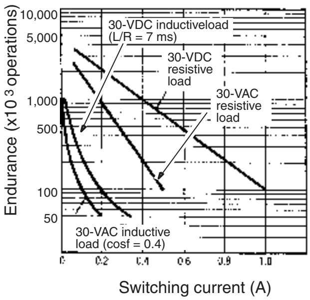
Contact resistance	50 mΩ max.
Operate (set) time	Single-side stable types: 5 ms max. (mean value: approx. 2.4 ms) Latching types: 5 ms max. (mean value: approx. 2 ms)
Release (reset) time	Single-side stable types: 5 ms max. (mean value: approx. 1.1 ms) Latching types: 5 ms max. (mean value: approx. 1.8 ms)
Bounce Time	Operate: Approx. 0.5 ms Release: Approx. 0.5 ms
Min. set/reset signal width	Latching type: 7 ms
Max. operating frequency	Mechanical: 36,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between coil and contacts 1,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 500 VAC, 50/60 Hz for 1 min between contacts of same polarity 100 VAC, 50/60 Hz for 1 min between set and reset coils (double-winding type only)
Impulse withstand voltage	1,500 V (10 x 160 μs) between contacts of same polarity (conforms to FCC Part 68)
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: 300 m/s^2 (approx. 30G)
Endurance	Mechanical: 50,000,000 operations min. (at 36,000 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr)
Ambient temperature	Operating: -40°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 3 g

Engineering Data

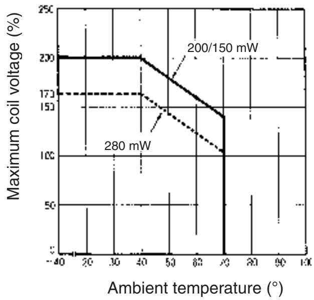
Maximum Switching Power



Endurance



Ambient Temperature vs. Maximum Coil Voltage



Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

■ Approved Standards

UL114, UL478 (File No.E41515)/CSA C22.2 No.0, No.14 (File No.LR24825)

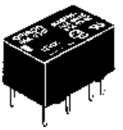
Model	Contact form	Coil ratings	Contact ratings
G5A-234P	DPDT	3 to 48 VDC	0.5 A, 60 VAC 0.5 A, 60 VDC 1 A, 30 VDC
G5AU-234P G5AK-234P		3 to 24 VDC	

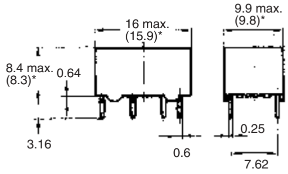
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.

2. Orientation marks are indicated as follows:

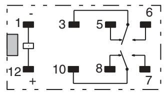
G5A-234P





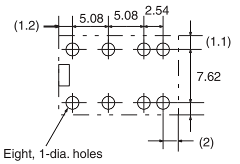
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)

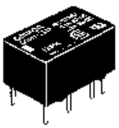


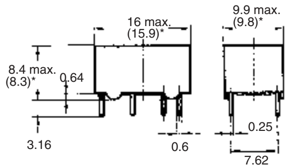
Mounting Holes (Bottom View)

Tolerance: 0.1

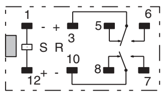


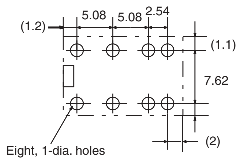
G5AU-234P



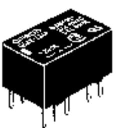


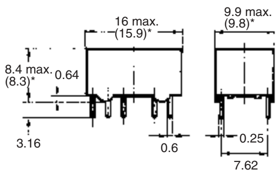
*Average value



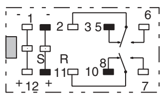


G5AK-234P

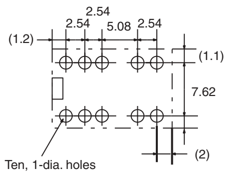




*Average value



S: Set coil
R: Reset coil



Miniature Relay for Signal Circuits

- ROHS compliant.
- Wide switching power of 10 µA to 2 A.
- High dielectric strength coil-contacts:1,000 VAC; open contacts: 750 VAC.
- Conforms to FCC Part 68 requirements.
- Ag + Au clad bifurcated crossbar contacts and fully sealed for high contact reliability.
- New 150-mW relays with high-sensitivity.

Ordering Information

Classification	Contact form	Contact type	Contact material	Enclosure Rating	Model
Standard	DPDT	Bifurcated crossbar	Ag + Au-clad	Fully sealed	G5V-2
High-sensitivity					G5V-2-H1

Note: When ordering, add the rated coil voltage to the model number.
Example: G5V-2 12 VDC
Rated coil voltage

Model Number Legend

G5V -□ -□ □ VDC
1 2 3

1. **Contact Form**
   2: DPDT
2. **Classification**
   H1: High-sensitivity
3. **Rated Coil Voltage**
   3, 5, 6, 9, 12, 24, 48 VDC

Specifications

■ Coil Rating

Standard Models

Rated voltage	3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current	166.7 mA	100 mA	83.3 mA	55.6 mA	41.7 mA	20.8 mA	12 mA
Coil resistance (W)	18 Ω	50 Ω	72 Ω	162 Ω	288 Ω	1,152 Ω	4,000 Ω
Coil inductance (H) (ref. value) Armature OFF	0.04	0.09	0.16	0.31	0.47	1.98	7.23
Coil inductance (H) (ref. value) Armature ON	0.05	0.11	0.19	0.49	0.74	2.63	10.00
Must operate voltage	70% max. of rated voltage						
Must release voltage	5% min. of rated voltage						
Max. voltage	120% of rated voltage at 23°C						
Power consumption	Approx. 500 mW						Approx. 580 mW

High Sensitivity Models

Rated voltage		3 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current		50 mA	30 mA	25 mA	16.7 mA	12.5 mA	8.33 mA	6.25 mA
Coil resistance		60 Ω	166.7 Ω	240 Ω	540 Ω	960 Ω	2,880 Ω	7,680 Ω
Coil inductance	**Armature OFF**	0.18	0.46	0.70	1.67	2.90	6.72	20.1
(H) (ref. value)	**Armature OFF**	0.57	0.71	0.97	2.33	3.99	9.27	26.7
Must operate voltage		75% max. of rated voltage						
Must release voltage		5% min. of rated voltage						
Max. voltage		180% of rated voltage at 23°C						150% of rated voltage (at 23°C)
Power consumption		Approx. 150 mW					Approx. 200 mW	Approx. 580 mW

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

■ Contact Ratings

Item	Standard models	High sensitivity models
Load	Resistive load (cosø = 1)	
Rated load	0.5 A at 125 VAC; 2 A at 30 VDC	0.5 A at 125 VAC; 1 A at 24 VDC
Contact material	Ag + Au-clad	
Rated carry current	2 A	
Max. switching voltage	125 VAC, 125 VDC	
Max. switching current	2 A	1 A
Max. switching power	62.5 VA, 60 W	62.5 VA, 24 W
Failure rate (reference value)	0.01 mA at 10 mVDC	

Note: P level: λ_{60} = 0.1 x 10^{-6}/operation

■ Characteristics

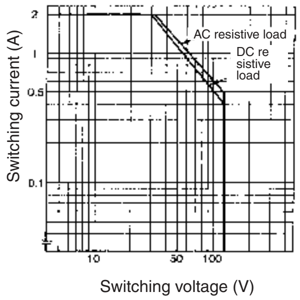
Item	Standard models	High sensitivity models
Contact resistance	50 mΩ max.	100 mΩ max.
Operate time	7 ms max.	
Release time	3 ms max.	
Bounce Time	Operate: approx. 0.3 ms Release: approx. 1.5 ms	
Max. operating frequency	Mechanical: 36,000 operations/hr Electrical: 1,800 operations/hr (under rated load)	
Insulation resistance	1,000 MΩ min. (at 500 VDC)	
Dielectric strength	1,500 VAC, 50/60 Hz for 1 min between coil and contacts 1,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 750 VAC, 50/60 Hz for 1 min between contacts of same polarity	1,000 VAC, 50/60 Hz for 1 min between coil and contacts 1,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 500 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	1,500 V (10 x 160 μs) between coil and contacts (conforms to FCC part 68)	
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)	
Shock resistance	Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: 200 m/s^2 (approx. 20G)	Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: 100 m/s^2 (approx. 10G)
Endurance	Mechanical: 15,000,000 operations min. (at 36,000 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr)	
Ambient temperature	Operating: -25°C to 65°C (with no icing)	Operating: -25°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%	
Weight	Approx. 5 g	

■ Approved Standards
UL478, UL1950, UL508 (File No. E41515)/CSA C22.2 No.0, No.14 (File No. LR24825)

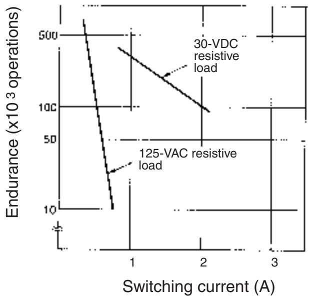
Contact form	Coil rating	Contact rating	
		G5V-2	G5V-2-H1
DPDT	3 to 48 VDC	0.6 A, 125 VAC (general use) 0.6 A, 110 VDC (resistive load) 2 A, 30 VDC (resistive load)	0.5 A, 125 VAC (general use) 0.2 A, 110 VDC (resistive load) 1 A, 24 VDC (resistive load)

Engineering Data

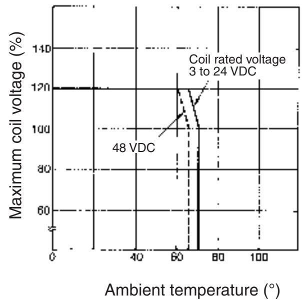
Maximum Switching Power
G5V-2



Endurance
G5V-2

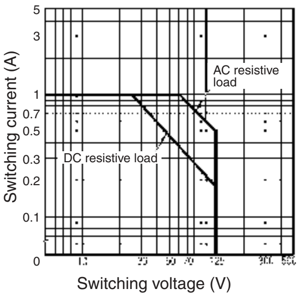


Ambient Temperature vs. Maximum Coil Voltage
G5V-2

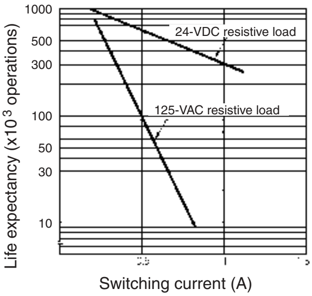


Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

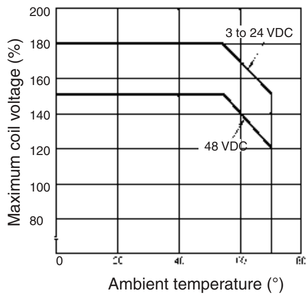
G5V-2-H1



G5V-2-H1



G5V-2-H1

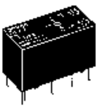


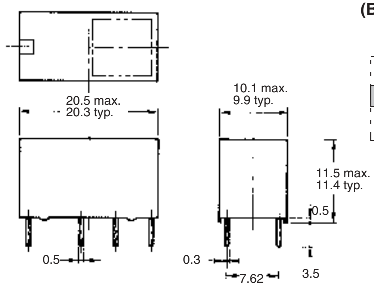
Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

Dimensions

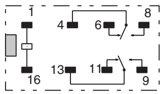
Note: 1. All units are in millimeters unless otherwise indicated.

2. Orientation marks are indicated as follows:



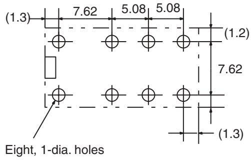


Terminal Arrangement/ Internal Connections (Bottom View)



Mounting Holes (Bottom View)

Tolerance: 0.1



Fully sealed Relay with High Impulse Dielectric for Use in Telecommunications Equipment

- ROHS compliant.
- High sensitivity can be driven by digital circuits.
- Horizontal design allows use in 1/2-inch PCB racks.
- Impulse withstand voltage meets FCC Part 68 requirements.
- Relays can be mounted side-by-side due to low magnetic leakage.
- Single- and double-winding latching relays also available.
- Special models available for low thermoelectromotive force.

Ordering Information

Single-side Stable Type

Contact		Ag + Au-clad	AgPd + Au-clad
General purpose	DPDT	G6A-274P-ST-US	G6A-234P-ST-US
	4PDT	G6A-474P-ST-US	G6A-434P-ST-US
Low-sensitivity	DPDT	G6A-274P-ST40-US	G6A-234P-ST40-US
	4PDT	G6A-474P-ST40-US	G6A-434P-ST40-US

Single-winding Latching Type

Contact		Ag + Au-clad	AgPd + Au-clad
General purpose	DPDT	G6AU-274P-ST-US	G6AU-234P-ST-US
	4PDT	G6AU-474P-ST-US	G6AU-434P-ST-US

Double-winding Latching Type

Contact		Ag + Au-clad	AgPd + Au-clad
General purpose	DPDT	G6AK-274P-ST-US	G6AK-234P-ST-US
	4PDT	G6AK-474P-ST-US	G6AK-434P-ST-US
Low-sensitivity	DPDT	G6AK-274P-ST40-US	G6AK-234P-ST40-US
	4PDT	G6AK-474P-ST40-US	G6AK-434P-ST40-US

Note: When ordering, add the rated coil voltage to the model number.
Example: G6A-274P-ST-US $\underbrace{\text{12 VDC}}_{\text{Rated coil voltage}}$

Model Number Legend

G6A □ - □ □ □ □ - □ □ - □ □ VDC
1 2 3 4 5 6 7 8 9

1. **Relay Function**
   None: Single-side stable
   U: Single-winding latching
   K: Double-winding latching
2. **Contact Form**
   2: DPDT
   4: 4PDT
3. **Contact Type**
   7: Bifurcated crossbar Ag (Au-clad) contact
   3: Bifurcated crossbar AgPd (Au-clad) contact
4. **Enclosure Ratings**
   4: Fully sealed
5. **Terminals**
   P: Straight PCB
6. **Stand-off**
   ST: Stand-off 0.64 mm
7. **Special Function**
   40: Low-sensitivity (400 mW)
   LT: Low thermoelectromotive force
8. **Approved Standards**
   US: UL, CSA certified
9. **Rated Coil Voltage**
   3, 4.5, 5, 6, 9, 12, 24, 48 VDC

Specifications

■ Coil Ratings

General-purpose, DPDT Relays

Rated voltage		3 VDC	4.5 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current		66.7 mA	44.6 mA	40 mA	33.3 mA	22.2 mA	16.7 mA	8.3 mA	4.9 mA
Coil resistance		45 Ω	101 Ω	125 Ω	180 Ω	405 Ω	720 Ω	2,880 Ω	9,750 Ω
Coil inductance	Armature OFF	0.07	0.16	0.2	0.29	0.63	1.1	4.5	13.7
(H) (ref. value)	Armature ON	0.065	0.14	0.18	0.26	0.57	1.06	4.1	12.5
Must operate voltage		70% max. of rated voltage							
Must release voltage		10% min. of rated voltage							
Max. voltage		200% of rated voltage at 23°C							
Power consumption		Approx. 200 mW							Approx. 235 mW

General-purpose, 4PDT Relays

Rated voltage		3 VDC	4.5 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current		120 mA	79.9 mA	72.5 mA	60 mA	40 mA	30 mA	15 mA	7.5 mA
Coil resistance		25 Ω	56.3 Ω	69 Ω	100 Ω	225 Ω	400 Ω	1,600 Ω	6,400 Ω
Coil inductance	Armature OFF	0.05	0.11	0.14	0.2	0.45	0.8	3.2	12.8
(H) (ref. value)	Armature ON	0.045	0.095	0.12	0.17	0.38	0.68	2.7	10.9
Must operate voltage		70% max. of rated voltage							
Must release voltage		10% min. of rated voltage							
Max. voltage		150% of rated voltage at 23°C							
Power consumption		Approx. 360 mW							

Low-sensitivity DPDT Relays

Rated voltage		3 VDC	4.5 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current		133.3 mA	88.9 mA	80 mA	66.7 mA	44.3 mA	33.3 mA	16.7 mA	8.3 mA
Coil resistance		22.5 Ω	50.6 Ω	62.5 Ω	90 Ω	203 Ω	360 Ω	1,440 Ω	5,760 Ω
Coil inductance	Armature OFF	0.03	0.065	0.08	0.11	0.27	0.52	2.1	7.5
(H) (ref. value)	Armature ON	0.02	0.06	0.07	0.1	0.23	0.43	1.8	6.4
Must operate voltage		70% max. of rated voltage							
Must release voltage		10% min. of rated voltage							
Max. voltage		150% of rated voltage at 23°C							
Power consumption		Approx. 400 mW							

Low-sensitivity 4PDT Relays

Rated voltage		3 VDC	4.5 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current		133.3 mA	88.9 mA	80 mA	66.7 mA	44.3 mA	33.3 mA	16.7 mA	8.3 mA
Coil resistance		22.5 Ω	50.6 Ω	62.5 Ω	90 Ω	203 Ω	360 Ω	1,440 Ω	5,760 Ω
Coil inductance	Armature OFF	0.035	0.1	0.12	0.17	0.42	0.7	2.8	10.2
(H) (ref. value)	Armature ON	0.02	0.07	0.09	0.13	0.3	0.52	2.2	8.6
Must operate voltage		70% max. of rated voltage							
Must release voltage		10% min. of rated voltage							
Max. voltage		150% of rated voltage at 23°C							
Power consumption		Approx. 400 mW							

Single-winding Latching, DPDT Relays

Rated voltage		3 VDC	4.5 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current		33.7 mA	22.2 mA	20 mA	16.7 mA	11.1 mA	8.3 mA	4.2 mA	2.5 mA
Coil resistance		89 Ω	202 Ω	250 Ω	360 Ω	810 Ω	1,440 Ω	5,760 Ω	19,000 Ω
Coil inductance (H) (ref. value)	**Armature OFF**	0.15	0.34	0.44	0.64	1.38	2.5	9.2	28.5
	Armature ON	0.11	0.25	0.35	0.48	1.07	2	7.2	22
Must operate voltage		70% max. of rated voltage							
Must release voltage		70% max. of rated voltage							
Max. voltage		200% of rated voltage at 23°C							
Power consumption		Approx. 100 mW							Approx. 125 mW

Single-winding Latching, 4PDT Relays

Rated voltage		3 VDC	4.5 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current		106.8 mA	71.2 mA	64 mA	53.3 mA	35.6 mA	26.7 mA	13.3 mA	6.7 mA
Coil resistance		28.1 Ω	63.2 Ω	78.1 Ω	112.5 Ω	253 Ω	450 Ω	1,800 Ω	7,200 Ω
Coil inductance (H) (ref. value)	**Armature OFF**	0.03	0.06	0.08	0.11	0.25	0.45	1.8	7
	Armature ON	0.02	0.04	0.06	0.08	0.18	0.32	1.3	5.2
Must operate voltage		70% max. of rated voltage							
Must release voltage		70% max. of rated voltage							
Max. voltage		150% of rated voltage at 23°C							
Power consumption		Approx. 320 mW							

Double-winding Latching, DPDT Relays

Rated voltage			3 VDC	4.5 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current			66.7 mA	40.2 mA	36 mA	30 mA	20 mA	15 mA	7.5 mA	4.2 mA
Coil resistance			45 Ω	112 Ω	139 Ω	200 Ω	450 Ω	800 Ω	3,200 Ω	11,520 Ω
Coil inductance (H) (ref. value)	**Set**	**Armature OFF**	0.037	0.09	0.11	0.16	0.38	0.6	2.1	8.5
		Armature ON	0.027	0.065	0.08	0.12	0.28	0.45	1.5	6.3
	Reset	**Armature OFF**	0.027	0.065	0.08	0.12	0.28	0.45	1.5	6.3
		Armature On	0.037	0.09	0.11	0.16	0.38	0.6	2.1	8.5
Must operate voltage			70% max. of rated voltage							
Must release voltage			70% max. of rated voltage							
Max. voltage			200% of rated voltage at 23°C							
Power consumption			Approx. 200 mW	Approx. 180 mW						Approx. 200 mW

Double-winding Latching, 4PDT Relays

Rated voltage			3 VDC	4.5 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current			106.8 mA	71.2 mA	64 mA	53.3 mA	35.6 mA	26.7 mA	13.3 mA	6.7 mA
Coil resistance			28.1 Ω	63.2 Ω	78.1 Ω	112.5 Ω	253 Ω	450 Ω	1,800 Ω	7,200 Ω
Coil inductance (H) (ref. value)	**Set**	**Armature OFF**	0.03	0.06	0.08	0.11	0.25	0.45	1.8	7
		Armature ON	0.02	0.04	0.06	0.08	0.18	0.32	1.3	5.2
	Reset	**Armature OFF**	0.02	0.04	0.06	0.08	0.18	0.32	1.3	5.2
		Armature ON	0.03	0.06	0.08	0.11	0.25	0.45	1.8	7
Must operate voltage			70% max. of rated voltage							
Must release voltage			70% max. of rated voltage							
Max. voltage			150% of rated voltage at 23°C							
Power consumption			Approx. 320 mW							

Double-winding Latching, Low-sensitivity DPDT Relays

			3 VDC	4.5 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated voltage			3 VDC	4.5 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current			120 mA	79.9 mA	72.5 mA	60 mA	40 mA	30 mA	15 mA	7.5 mA
Coil resistance			25 Ω	56.3 Ω	69 Ω	100 Ω	225 Ω	400 Ω	1,600 Ω	6,400 Ω
Coil inductance (H) (ref. value)	**Set**	**Armature OFF**	0.015	0.04	0.05	0.07	0.16	0.28	1.1	4
		Armature ON	0.01	0.025	0.035	0.05	0.12	0.2	0.75	2.9
	Reset	**Armature OFF**	0.01	0.025	0.035	0.05	0.12	0.2	0.75	2.9
		Armature ON	0.015	0.04	0.05	0.07	0.16	0.28	1.1	4
Must operate voltage			70% max. of rated voltage							
Must release voltage			70% max. of rated voltage							
Max. voltage			150% of rated voltage at 23°C							
Power consumption			Approx. 360 mW							

Double-winding Latching, Low-sensitivity 4PDT Relays

Rated voltage			3 VDC	4.5 VDC	5 VDC	6 VDC	9 VDC	12 VDC	24 VDC	48 VDC
Rated current			120 mA	79.9 mA	72.5 mA	60 mA	40 mA	30 mA	15 mA	7.5 mA
Coil resistance			25 Ω	56.3 Ω	69 Ω	100 Ω	225 Ω	400 Ω	1,600 Ω	6,400 Ω
Coil inductance (H) (ref. value)	**Set**	**Armature OFF**	0.02	0.045	0.065	0.09	0.18	0.3	1.2	4.4
		Armature ON	0.015	0.035	0.05	0.075	0.14	0.23	0.82	3.2
	Reset	**Armature OFF**	0.015	0.035	0.05	0.075	0.14	0.23	0.82	3.2
		Armature ON	0.02	0.045	0.065	0.09	0.18	0.3	1.2	4.4
Must operate voltage			70% max. of rated voltage							
Must release voltage			70% max. of rated voltage							
Max. voltage			150% of rated voltage at 23°C							
Power consumption			Approx. 360 mW							

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. Operating characteristics are measured at a coil temperature of 23°C.

■ Contact Ratings

Item	G6A-234P-ST(40)-US/434P-ST(40)-US		G6A-274P-ST(40)-US/474P-ST(40)-US	
Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)
Rated Load	0.3 A at 125 VAC; 1 A at 30 VDC	0.2 A at 125 VAC; 0.5 A at 30 VDC	0.5 A at 125 VAC; 2 A at 30 VDC	0.3 A at 125 VAC; 1 A at 30 VDC
Contact Material	AgPd (Au-clad)		Ag (Au-clad)	
Rated Carry Current	3 A			
Max. switching voltage	250 VAC, 220 VDC			
Max. switching current	2 A	1 A	2 A	1 A
Max. switching power	125 VA, 60 W	62.5 VA, 30 W	125 VA, 60 W	62.5 VA, 30 W
Failure rate (reference value)	0.01 mA at 10 mVDC			

Item	G6AK-234P-ST(40)-US/G6AK-434P-ST(40)-US G6AU-234P–ST-US/G6AU-434P-ST-US		GG6AK-274P-ST(40)-US/G6AK-474P-ST(40)-U G6AU-274P-ST-US/G6AU-474P-ST-US	
Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4; L/R = 7 ms)
Rated Load	0.3 A at 125 VAC; 1 A at 30 VDC	0.2 A at 125 VAC; 0.5 A at 30 VDC	0.5 A at 125 VAC; 2 A at 30 VDC	0.25 A at 125 VAC; 1 A at 30 VDC
Contact Material	AgPd (Au-clad)		Ag (Au-clad)	
Rated Carry Current	3 A		3 A	
Max. switching voltage	250 VAC, 220 VDC		250 VAC, 220 VDC	
Max. switching current	2 A	1 A	2 A	1 A
Max. switching power	125 VA, 60 W	62.5 VA, 30 W	125 VA, 60 W	62.5 VA, 30 W
Failure rate (reference value)	0.01 mA at 10 mVDC		0.01 mA at 10 mVDC	

Note: P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation.

■ Characteristics

Contact resistance	50 mΩ max.
Operate (set) time	**Single-side stable types:** DPDT: 5 ms max. (mean value: approx. 3 ms) 4PDT: 7 ms max. (mean value: approx. 3.8 ms) **Latching types:** DPDT: 5 ms max. (mean value: approx. 2.5 ms) 4PDT: 7 ms max. (mean value: approx. 3.3 ms)
Release (reset) time	**Single-side stable types:** DPDT: 3 ms max. (mean value: approx. 1.2 ms) 4PDT: 5 ms max. (mean value: approx. 1.3 ms) **Latching types:** DPDT: 5 ms max. (mean value: approx. 2.5 ms) 4PDT: 7 ms max. (mean value: approx. 2.7 ms)
Bounce Time	Operate: mean value: approx. 0.5 ms Release: mean value: approx. 0.5 ms
Min. set/reset signal width	DPDT: 7 ms min. 4PDT: 15 ms min.
Max. operating frequency	Mechanical: 36,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	1,000 MΩ min. (at 500 VDC); except for set-reset
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between coil and contacts 1,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity 250 VAC, 50/60 Hz for 1 min between set and reset coils
Impulse withstand voltage	1,500 V (10 x 160 μs) (conforms to FCC Part 68)
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 2.5-mm single amplitude (5-mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 1.65-mm single amplitude (3.3-mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 (approx. 100G) Malfunction: DPDT: 500 m/s^2 (approx. 50G) 4PDT, Latching type: 300 m/s^2 (approx. 30G)
Endurance	Mechanical: 100,000,000 operations min. (at 36,000 operations/hr) Electrical: 500,000 operations min. (at 1,800 operations/hr)
Ambient temperature	Operating: -40°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	DPDT: Approx. 3.5 g 4PDT: Approx. 6 g

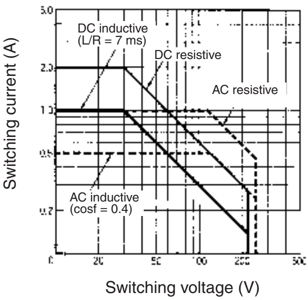
■ Approved Standards

UL114, UL478 (File No. E41515)/CSA C22.2 No.0, No.14 (File No. LR24825

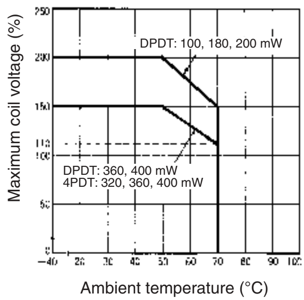
Model	Contact form	Coil ratings	Contact ratings
G6A-234P-ST(40)-US G6AK-234P-ST(40)-US G6AU-234P-ST-US	DPDT	3 to 48 VDC	0.6 A, 125 VAC 1 A, 30 VDC 0.6 A, 110 VDC
G6A-274P-ST(40)-US G6AK-274P-ST(40)-US G6AU-274P-ST-US	DPDT		0.6 A, 125 VAC 2 A, 30 VDC 0.6 A, 110 VDC
G6A-434P-ST(40)-US G6AK-434P-ST(40)-US G6AU-434P-ST-US	4PDT		0.6 A, 125 VAC 1 A, 30 VDC 0.6 A, 110 VDC
G6A-474P-ST(40)-US G6AK-474P-ST(40)-US G6AU-474P-ST-US	4PDT		0.6 A, 125 VAC 2 A, 30 VDC 0.6 A, 110 VDC

Engineering Data

Maximum Switching Power DPDT, 4PDT

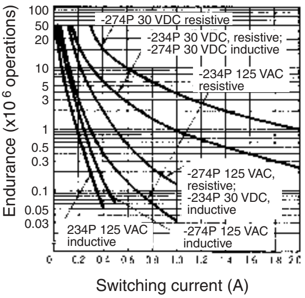


Ambient Temperature vs. Maximum Coil Voltage

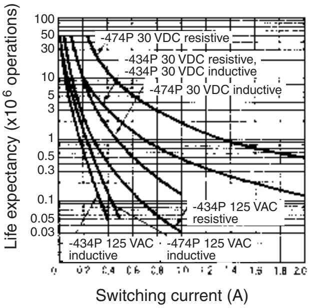


Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

Endurance DPDT



4PDT

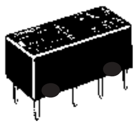


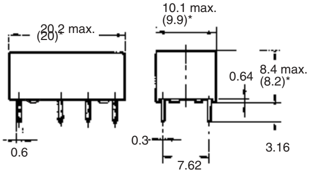
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.

2. Orientation marks are indicated as follows:

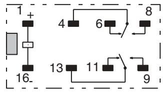
G6A-234P-ST(40)-US, G6A-274P-ST(40)-US





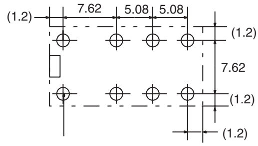
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)



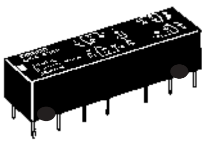
Mounting Holes (Bottom View)

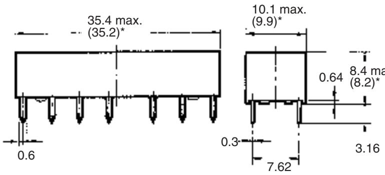
Tolerance: ±0.1



Eight, 1.0-dia. holes

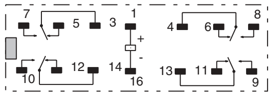
G6A-434P-ST(40)-US, G6A-474P-ST-US





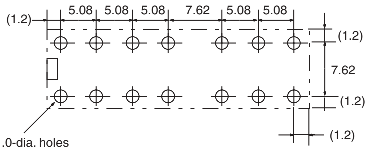
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)



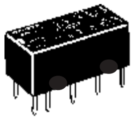
Mounting Holes (Bottom View)

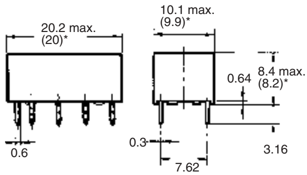
Tolerance: ±0.1



Fourteen, 1.0-dia. holes

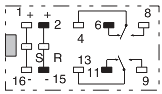
G6AK-234P-ST(40)-US, G6AK-274P-ST(40)-US





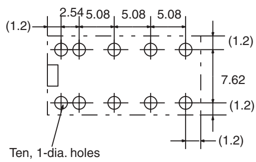
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)



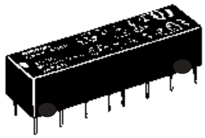
Mounting Holes (Bottom View)

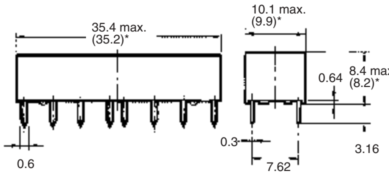
Tolerance: ±0.1



Ten, 1-dia. holes

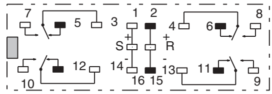
G6AK-434P-ST(40)-US, G6AK-474P-ST(40)-US





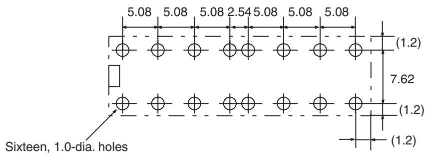
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)

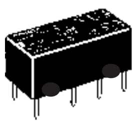


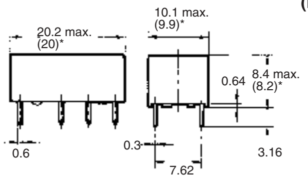
Mounting Holes (Bottom View)

Tolerance: ±0.1



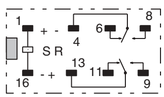
G6AU-234P-ST-US, G6AU-274P-ST-US





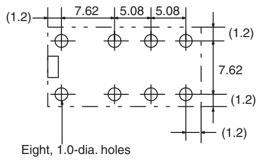
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)

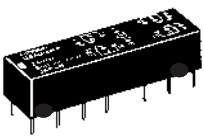


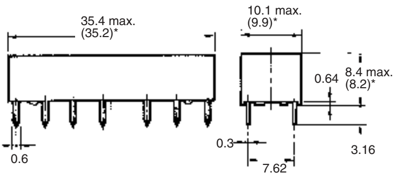
Mounting Holes (Bottom View)

Tolerance: ±0.1



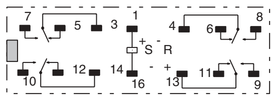
G6AU-434P-US, G6AU-474P-ST-US





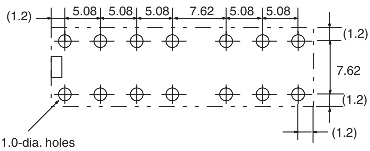
*Average value

Terminal Arrangement/ Internal Connections (Bottom View)

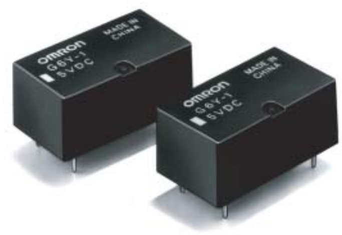


Mounting Holes (Bottom View)

Tolerance: ±0.1



Switching Structure Based on the Micro Strip Line is Used to Combine High Performance and Cost-effectiveness



- ROHS compliant.
- Isolation characteristics of 65 dB or better at 900 MHz.
- Effective insertion loss characteristics of 0.2 dB or better at 900 MHz (half the loss of earlier models).
- Fully sealed construction provides excellent environmental resistance.
- Improved shock-resistance (double the resistance of earlier models).

Ordering Information

Class	Sealing	Fully sealed	
	Contact configuration	Rated coil voltage	Model
Basic Type	SPDT	4.5 VDC	G6Y-1
		5 VDC	
		9 VDC	
		12 VDC	
		24 VDC	

Model Number Legend

G6Y-□□ VDC
1 2

1. Number of contact poles

1: Single pole (SPDT contact)

2. Rated Coil Voltage

4.5, 5, 9, 12, 24 VDC

■ Basic Specifications

- Contact Mechanism: Double-braking bifurcated contact
- Contact Material: Gold alloy
- Sealing: Fully sealed
- Terminal Configuration: Printed circuit board terminal configuration

Application Examples

Signal Switching in Various Communications Equipment

- Wired Communications: Cable TV, captain systems, and video response systems (VRS)
- Wireless Communications: Transceivers, ham radio, car telephones, high-level TV, fax machines, satellite broadcasting, text multiplex broadcasting, and pay TV
- Public Equipment: VCRs, TVs, video disk players, and TV games
- Industrial Equipment: Measuring equipment, test equipment, and multiplex transmission devices

■ Ratings

Operational Coil

Class		Item Rated voltage (V)	Rated current (mA)	Coil resistance (Ω)	Operating voltage (V)	Release voltage (V)	Max. allowed voltage (V)	Power consumption (mW)
Basic Type	DC	4.5	44.4	101	75% max.	10% min.	150% of rated voltage at 23°C	Approx. 200
		5	40.0	125				
		9	22.2	405				
		12	16.7	720				
		24	8.3	2,880				

Note: The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
The operating characteristics are measured at a coil temperature of 23°C.
The “Max. allowed voltage” is the maximum voltage that can be applied to the relay coil. It is not the maximum voltage that can be applied continuously.

Contact Ratings

Load	Resistive load
Rated voltage	0.01 A at 30 VAC 0.01 A at 30 VDC 900 MHz, 1 W (see note)
Rated carry current	0.5 A
Max. switching voltage	30 VAC 30 VDC
Max. switching current	0.5 A
Max. switching power (reference value)	AC10VA DC10W

Note: This value is for a load with V.SWR x 1.2.

High-frequency Characteristics

Item	250 MHz	900 MHz	2.5 GHz
Isolation	80 db min.	65 dB min.	30 dB min.
Insertion loss	0.5 dB max.	0.5 dB max.	–
V.SWR	1.5 max.	1.5 max.	–
Max. carry power	10 W		–
Max. switching power	10 W (see note 3)		–

Note: 1. The impedance of the measuring system is 50 Ω.
2. The table above shows preliminary values.
3. This value is for a load with V.SWR x 1.2

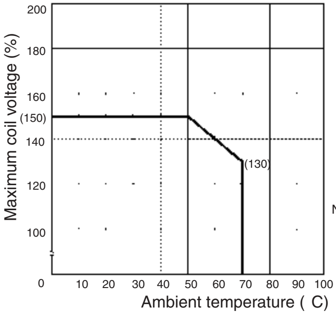
■ Characteristics

Contact resistance (see note 1)	100 mΩ max.
Operating time	10 ms max. (approx. 5 ms)
Release time	5 ms max. (approx. 1 ms)
Insulation resistance (see note 2)	100 mΩ min.
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between coil and contacts 500 VAC, 50/60 Hz for 1 min between contacts of same polarity 500 VAC, 50/60 Hz for 1 min between coil and ground and between contacts and ground
Vibration resistance	Destruction: 10 Hz to 55 to 10 Hz, 0.75-mm single amplitude (1.5 mm double amplitude) Malfunction: 10 Hz to 55 to 10 Hz, 0.75-mm single amplitude (1.5 mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 500 m/s^2
Endurance	Mechanical: 1,000,000 operations min. (at 1,800 operations/hr) Electrical: 300,000 operations min. (under rated load at 1,800 operations/hr)
Failure rate (reference value (see note 3))	10 mVDC, 10 µA
Ambient temperature	Operating: -40°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 5 g

Note: The table above shows preliminary values.
1. Measurement Conditions: 5 VDC, 100 mA, voltage drop method
2. Measurement Conditions: Measured at the same points as the dielectric strength using a 500-VDC ohmmeter.
3. This value is for a switching frequency of 120 operations/minute.

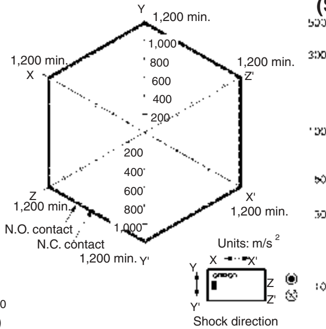
Engineering Data

Ambient Temperature vs. Maximum Coil Voltage



Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

Malfunctioning Shock

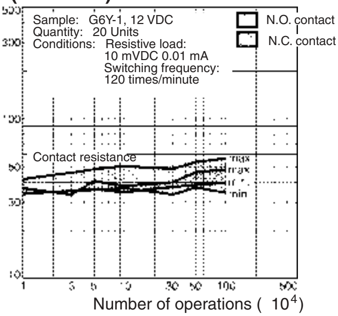


Quantity Tested: 10 Units

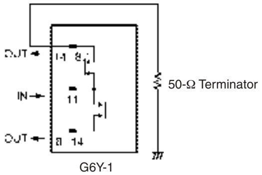
Test Method: Shock was applied 3 times in each direction with and with out excitation and the level at which the shock caused mal function was measured.

Rating: 500 m/s 2

Contact Reliability Test (See Note)



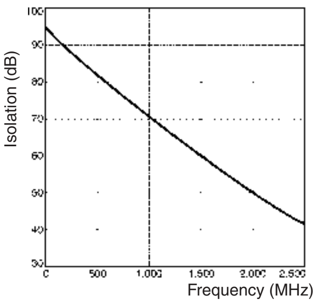
Note: Ambient temperature of 23 C



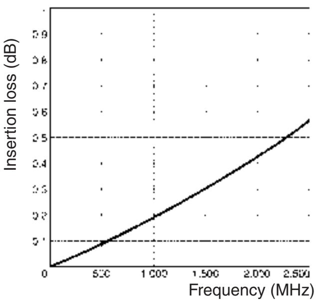
Terminals which were not being measured were terminated with 50 Ω.

Note: The high-frequency characteristics data were measured using a dedicated circuit board and actual values will vary depending on the usage conditions. Check the characteristics of the actual equipment being used.

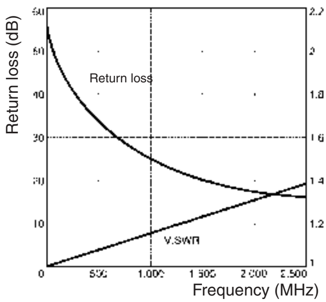
Isolation Characteristics (Average Values)



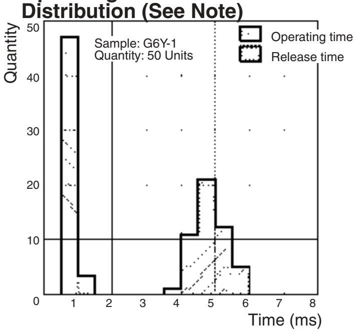
Insertion Loss Characteristics (Average Values)



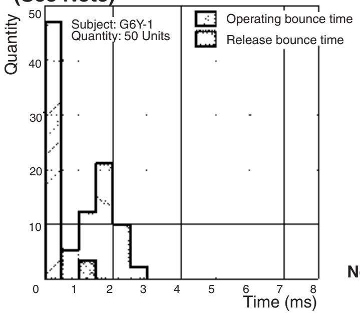
V.SWR, Return Loss Characteristics (Average Values)



Operating/Release Time Distribution (See Note)



Bounce Time Distribution (See Note)

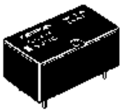


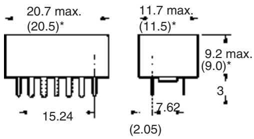
Note: Ambient temperature: 23 C

Dimensions

Note: All units are in millimeters unless otherwise indicated.

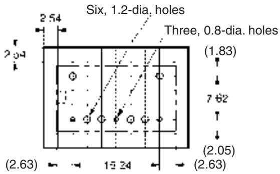
G6Y-1





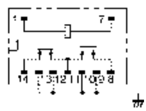
* Average value

PCB Dimensions (Bottom View)
Tolerances: ±0.1 mm.



(Holes for the coil terminals may also be 1.0.)

Terminal Arrangement/ Internal Connections (Bottom View)



(There is no polarity to the coil.)

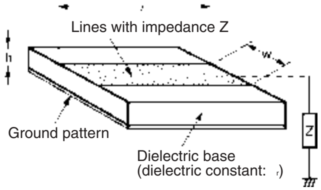
Note: The shaded and unshaded parts indicate the product's directional marks.

■ Correct Use

Airtightness when cleaning will last 1 minute at 70°C. Complete cleaning within these conditions.

MICRO STRIP LINE DESIGN

- It is advantageous to use the Micro Strip Line in high–frequency transmission circuits because a low-loss transmission can be constructed with this method. By etching the dielectric base which has copper foil attached to both sides, the Micro Strip Line will have a concentrated electric field between the lines and ground as shown in the following diagram.

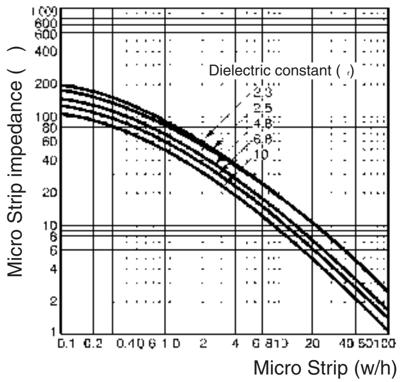


- The characteristic impedance of the lines Z_O is determined by the kind of base (dielectric constant), the base's thickness, and the width of the lines, as expressed in the following equation.

$$Z_O = \frac{377}{\sqrt{\varepsilon_r}\;\frac{W}{H}\left\{1+\frac{2H}{W}\left[1+\ln\frac{W}{H}\right]\right\}}$$

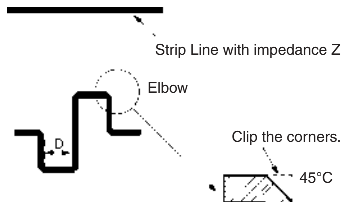
W: Line width
ε_r: Effective dielectric constant
H: Dielectric base thickness
The copper foil thickness must be less than H.

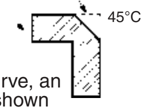
- The following graph shows this relationship.



- For example, when creating 50 Ω lines using a glass epoxy base with a thickness of 1.6 mm, the above graph will yield a w/h ratio of 1.7 for a dielectric constant of 4.8. Since the base thickness is 1.6 mm, the width will be h ∞ 1.7 ≈ 2.7 mm.
- The thickness of the copper foil "t" is ignored in this design method, but it must be considered because large errors will occur in extreme cases such as a foil thickness of t ≈ w. Furthermore, with the Micro Strip Line design, the lines are too short for the G6Y's intended frequency bandwidths, so we can ignore conductive losses and the line's attenuation constant.
- The spacing of the Strip Lines and ground pattern should be comparable to the width of the Strip Lines.
- Design the pattern with the shortest possible distances. Excessive distances will adversely effect the high-frequency characteristics.
- Spread the ground patterns as widely as possible so that potential differences are unlikely to develop between the ground patterns.
- To avoid potential short-circuits, do not place the pattern's leads near the point where the bottom of the Relay attaches to the board.

BENDING THE MICRO STRIP LINE





When the lines must curve, an elbow can be used as shown in the diagram. A distance (D) between the lines of approximately twice the line width is sufficient.

Signal Relays

EXAMPLES OF MOUNTING DESIGNS

Since this example emphasizes reducing mounting costs, expensive mounting methods such as through-hole boards are not shown. If such methods are to be used, the characteristics must be studied carefully using the actual board configuration.

Using a Double-sided Paper Epoxy Board

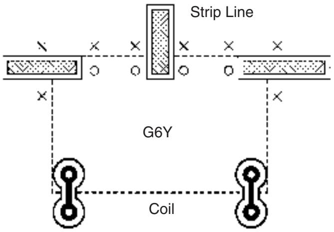
When double-sided paper epoxy boards are used, the dielectric constant will be approximately the same as that of glass epoxy boards (ε_r = 4.8).

The width of the Strip Lines for a board with t=1.6 mm is 2.7 mm for 50 Ω and 1.3 mm for 75 Ω. For a board with t=1.0 mm the width is 1.7 mm for 50 Ω and 0.8 mm for 75 Ω.

The following diagram shows an example pattern and the Micro Strip Lines connected to the contact terminals are formed with pattern widths derived from the description above. The width between the Micro Strip Lines and ground patterns are comparable to the Micro Strip Line width.

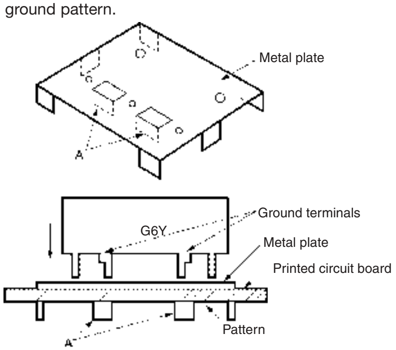
There are jumpers between the upper and lower patterns at the points marked with Xs in the diagram. Improved characteristics can be obtained with more jumper locations. This method yields isolation characteristics of 65 dB to 75 dB at 500 MHz and 50 dB at 900 MHz.

At this point in the diagram the component side is the entire ground pattern side, but set aside approximately 2.0 mm ∞ 2.0 mm of the pattern for the contact terminals and coil terminals.



Using a Single-sided Board

When a single-sided board is used, isolation characteristics of only 60 dB to 70 dB at 200 MHz can be obtained. When high frequency bands are to be used with a single-sided board, a metal plate can be placed between the base and Relay and connected to the ground pattern.



With this method a metal plate is placed between the Relay and base and connected to the pattern, as shown in the above diagram. The important point here is that 3 locations (the G6Y's ground terminal, the metal plate's bent tabs (A), and the ground pattern) are soldered together at the same time. This method combines an inexpensive single-sided board and inexpensive metal plate to yield the same characteristics as a double-sided board and good characteristics are obtained by grounding the G6Y's ground terminal and metal plate in the same place.

The metal plate must be attached to the base as described here. From this point, the methods used for Strip Line design are the same as for the double-sided board.

Mounting Precautions

Be sure to securely attach the Relay's base surface to the board during installation. The isolation characteristics will be affected if the Relay lifts off the board.

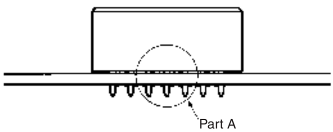
As shown in the enlarged illustration of the cross-section of part A, the G6Y is designed to ensure better high-frequency characteristics if the stand-off part of the G6Y is in contact with the ground pattern of the PCB. Therefore, the ground terminal and stand-off part are electrically connected internally.

Should the through hole electrically connected to the contact terminal come in contact with the stand-off part, the contact will be short-circuited with the ground, which may cause an accident.

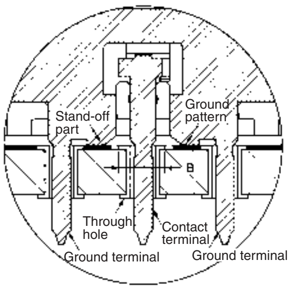
As a preventive measure, keep at least a distance of 0.3 mm between the stand-off part and the through hole or land.

For example, if the terminal hole on the PCB is 1 mm in diameter and the length B shown in the illustration is 1.4 mm, a distance of 0.3 mm or more will be provided between the through hole and stand-off part.

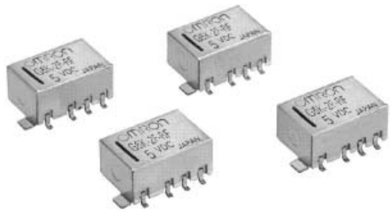
PCB Mounting



Cross-section of Part A



Surface-mounting, 1-GHz-Band, Miniature, DPDT, High-frequency Relay



- ROHS compliant.
- Superior high-frequency characteristics (at 1 GHz), such as an isolation of 20 dB min. between contacts of the same polarity or 30 dB min. between contacts of different polarity with an insertion loss of 0.2 dB max.
- Miniaturized to 10.3 x 6.9 x 5.4 mm (L x W x H).
- Rated power consumption of 100 mW with high sensitivity.
- Single-side stable and single-winding latching

Ordering Information

Model Number Legend

G6K□-□□-□
1 2 3 4

1. Relay Function

None: Single-side stable
U: Single-winding latching

2. Classification

2: DPDT

3. Terminal Shape

F: Surface-mounting terminals

4. Special Function

RF: High-frequency compatible

List of Models

Standard Models with Surface-mounting Terminals

Classification	Structure	Contact form	Rated coil voltage	Model
Single-side stable	Plastic sealed	DPDT	3, 4.5, 5, 12, and 24 VDC	G6K-2F-RF
Single-winding latching			3, 4.5, 5, 12, and 24 VDC	G6KU-2F-RF

Application Examples

- Measurement devices
- Communications devices
- Broadcasting and audio-visual devices

Specifications

■ Contact Ratings

Load	Resistive load
Rated load	125 VAC, 0.3 A 30 VDC, 1 A 1 GHz, 1 W (See note.)
Rated carry current	1 A
Max. switching voltage	125 VAC or 60 VDC
Max. switching current	1 A

Note: This value is for a V.SWR of 1.2 max. at the load.

■ High-frequency Characteristics

Item / Frequency		1 GHz
Isolation	Between contacts of the same polarity	20 dB min.
	Between contacts of different polarity	30 dB min.
Insertion loss		0.2 dB max.
V.SWR		1.2 max.
Maximum carry power		3 W (See note 3.)
Maximum switching power		1 W (See note 3.)

Note:
1. The impedance of the measurement system is 50 Ω.
2. The above values are initial values.
3. These values are for a V.SWR of 1.2 max. at the load.

■ Coil Ratings

Single-side Stable Models

G6K-2F-RF

Rated voltage (VDC)	3	4.5	5	12	24
Rated current (mA)	33.0	23.2	21.1	9.1	4.6
Coil resistance (Ω)	91	194	237	1,315	5,220
Must operate voltage (V)	80% max. of rated voltage				
Must release voltage (V)	10% min. of rated voltage				
Maximum voltage (V)	150% of rated voltage				
Power consumption (mW)	Approx. 100 mW				

Single-winding Latching Models

G6KU-2F-RF

Rated voltage (VDC)	3	4.5	5	12	24
Rated current (mA)	33.0	23.2	21.1	9.1	4.6
Coil resistance (Ω)	91	194	237	1,315	5,220
Must operate voltage (V)	75% max. of rated voltage				
Must release voltage (V)	75% max. of rated voltage				
Maximum voltage (V)	150% of rated voltage				
Power consumption (mW)	Approx. 100 mW				

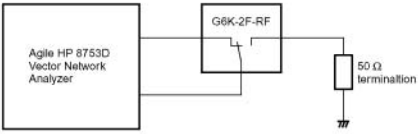
Note:
1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. The operating characteristics are measured at a coil temperature of 23°C.
3. The maximum voltage is the highest voltage that can be imposed on the Relay coil instantaneously.

■ Characteristics

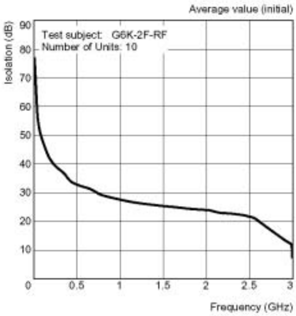
Item		Single-side stable models	Single-winding latching models
		G6KU-2F-RF	G6KU-2F-RF
Contact resistance (See note 2.)		100 mΩ max.	
Operating (set) time (See note 3.)		3 ms max. (approx. 1.4 ms)	3 ms max. (approx. 1.2 ms)
Release (reset) time (See note 3.)		3 ms max. (approx. 1.3 ms)	3 ms max. (approx. 1.2 ms)
Minimum set/reset pulse time		---	10 ms
Insulation resistance (See note 4.)		1,000 MΩ min. (at 500 VDC)	
Dielectric strength	Between coil and contacts	750 VAC, 50/60 Hz for 1 min	
	Between contacts of different polarity	750 VAC, 50/60 Hz for 1 min	
	Between contacts of the same polarity	750 VAC, 50/60 Hz for 1 min	
	Between ground and coil/contacts	500 VAC, 50/60 Hz for 1 min	
Vibration resistance		Destruction: 10 to 55 to 10 Hz, 2.5-mm single amplitude (5-mm double amplitude) and 55 to 500 to 55 Hz, 300 m/s^2 Malfunction: 10 to 55 to 10 Hz, 1.65-mm single amplitude (3.3-mm double amplitude) and 55 to 500 to 55 Hz, 200 m/s^2	
Shock resistance		Destruction: 1,000 m/s^2 Malfunction: 750 m/s^2	
Endurance		Mechanical: 50,000,000 operations min. (at a switching frequency of 36,000 operations/hour) Electrical: 100,000 operations min. (at a switching frequency of 1,800 operations/hour)	
Ambient temperature		Operating: –40°C to 70°C (with no icing or condensation)	
Ambient humidity		Operating: 5% to 85%	
Weight		Approx. 0.95 g	

Note:
1. The above values are initial values.
2. The contact resistance was measured with 10 mA at 1 VDC with a voltage drop method.
3. Values in parentheses are actual values.
4. The insulation resistance was measured with a 500-VDC megohmmeter applied to the same parts as those used for checking the dielectric strength.

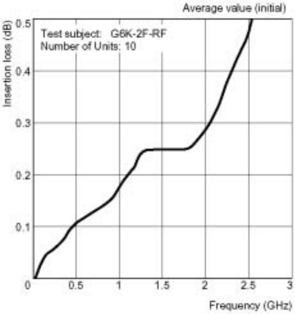
Engineering Data



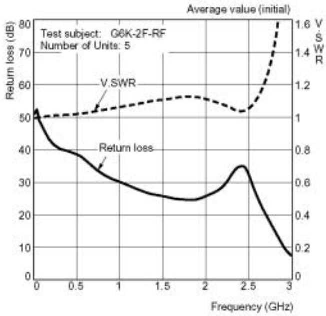
High-frequency Characteristics (Isolation)



High-frequency Characteristics (Insertion Loss)



High-frequency Characteristics (Return Loss, V.SWR)

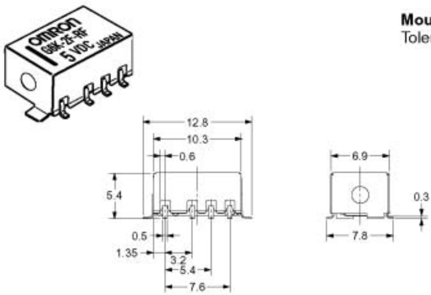


Note: Refer to the G6K specifications for basic specifications not shown above.

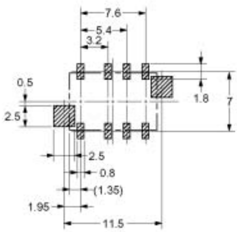
Dimensions

Note: All units are in millimeters unless otherwise indicated.

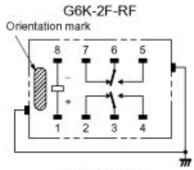
G6K-2F-RF
G6KU-2F-RF

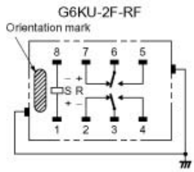


Mounting Dimensions (Top View)
Tolerance: ±0.1 mm



Terminal Arrangement/Internal Connections (Top View)

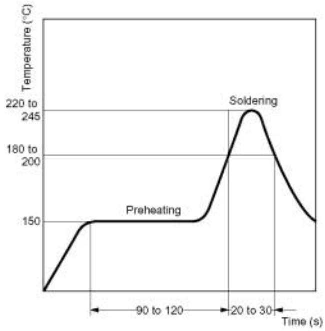




Note:
1. Each value has a tolerance of ±0.3 mm.
2. The coplanarity of the terminals is 0.15 mm max.

Recommended Soldering Method

Recommended Conditions for IRS Method (Surface-mounting Terminals)

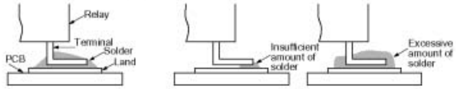


Note: The temperature profile indicates the temperature on the circuit board surface.

The thickness of cream solder to be applied should be between 200 and 250 µm and the land pattern should be based on OMRON's recommended PCB pattern.

To maintain the correct soldering joint shown in the following diagram, we recommend applying solder with the soldering conditions shown on the left.

Correct Soldering **Incorrect Soldering**



Check the soldering in the actual mounting conditions before use.

Safety Precautions

■ Precautions for Correct Use

Handling

Remove the Relay from its packaging just before installation.

Environmental Conditions for Usage, Storage, and Transport

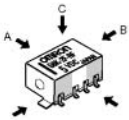
Avoid direct sunlight when using, storing, or transporting the Relay and maintain normal temperature, humidity, and pressure conditions.

Long-term, Continuous ON Contacts

Using the Relay in a circuit where the Relay will be ON continuously for long periods (rather than switching) can lead to unstable contacts because the heat generated by the coil itself will affect the insulation and can cause a film to develop on the contact surfaces. We recommend using a latching relay (magnetic-holding relay) in this kind of circuit. If a single-side stable model must be used in this kind of circuit, we recommend adding fail-safe circuits in case the contact fails or the coil burns out.

Claw Securing Force During Automatic Mounting

During automatic insertion of Relays, be sure to set the securing force of each claw to the following so that the Relay's characteristics will be maintained.



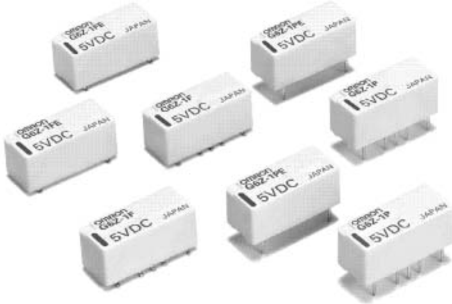
Direction A: 1.96 N max.
Direction B: 4.90 N max.
Direction C: 1.96 N max.

Secure the claws to the shaded area.
Do not attach them to the center of the Relay or just one part of the Relay.

Coating

Do not use silicone coating to coat the Relay when it is mounted to the PCB. Do not wash the PCB after the Relay is mounted using detergent containing silicone. Otherwise, the detergent may remain on the surface of the Relay.

Surface-mounting, 2.6-GHz-Band, Miniature, SPDT, High-frequency Relay



- ROHS compliant.
- Superior high-frequency characteristics, such as an isolation of 30 dB min., insertion loss of 0.5 dB max., and V.SWR of 1.5 max. at 2.6 GHz.
- Surface-mounting terminals and superior high frequency characteristics combined using semi triplate strip transmission lines.
- Miniature dimensions of 20 x 8.6 x 8.9 mm (L x W x H).
- Choose from a lineup that includes single-winding latching models (200 mW), double-winding latching models (360 mW), and models with a reverse contact arrangement.
- Series includes models with an E-shape terminal structure (same as existing models), and models with a Y-shape terminal structure, allowing greater freedom with PCB design.
- Models with 75-Ω impedance and models with 50-Ω impedance are available.

Ordering Information

Model Number Legend

G6Z-□-□□□-□□
1 2 3 4 5 6

1. Relay Function

None: Single-side stable
U: Single-winding latching
K: Double-winding latching

2. Contact Form

1: SPDT

3. Terminal Shape

F: Surface-mounting terminals
P: PCB terminals

4. Terminal Structure

None: Y-shape terminal structure
E: E-shape terminal structure

5. Characteristic Impedance

None: 75 Ω
A: 50 Ω

6. Contact Arrangement

None: Standard contact arrangement
R: Reverse contact arrangement

■ List of Models

Standard Models with PCB Terminals

Classification	Structure	Contact form	Terminal arrangement	Characteristic impedance	Rated coil voltage	Model
Single-side stable	Plastic sealed	SPDT	E-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6Z-1PE
				50 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6Z-1PE-A
			Y-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6Z-1P
				50 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6Z-1P-A
Single-winding latching			E-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZU-1PE
				50 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZU-1PE-A
			Y-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZU-1P
				50 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZU-1P-A
Double-winding latching			E-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZK-1PE
				50 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZK-1PE-A
			Y-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZK-1P
				50 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZK-1P-A

Standard Models with Surface-mounting Terminals

Classification	Structure	Contact form	Terminal arrangement	Characteristic impedance	Rated coil voltage	Model
Single-side stable	Plastic sealed	SPDT	E-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6Z-1FE
				50 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6Z-1FE-A
			Y-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6Z-1F
				50 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6Z-1F-A
Single-winding latching			E-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZU-1FE
				50 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZU-1FE-A
			Y-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZU-1F
				50 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZU-1F-A
Double-winding latching			E-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZK-1FE
				50 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZK-1FE-A
			Y-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZK-1F
				50 Ω	3, 4.5, 5, 9, 12, and 24 VDC	G6ZK-1F-A

Note: When ordering tape packing (surface-mounting models), add "-TR" to the model number. "-TR" does not appear on the Relay itself.

Application Examples

These Relays can be used for switching signals in media equipment.

- **Wire communications:**
  Cable TV (STB and broadcasting infrastructure), cable modems, and VRS (video response systems)
- **Wireless communications:**
  Transceivers, ham radios, car telephones, ETC, ITS, high-level TV, satellite broadcasting, text multiplex broadcasting, pay TV, mobile phone stations, TV broadcasting facilities, and community antenna systems
- **Public equipment:**
  TVs, TV games, satellite radio units, car navigation systems
- **Industrial equipment:**
  Measuring equipment, test equipment, and multiplex transmission devices

Specifications

■ Contact Ratings

Load	Resistive load
Rated load	10 mA at 30 VAC; 10 mA at 30 VDC; 10 W at 900 MHz (See note.)
Rated carry current	0.5 A
Max. switching voltage	30 VAC, 30 VDC
Max. switching current	0.5 A

Note: This value is for an impedance of 50 Ω or 75 Ω with a V.SWR of 1.2 max.

■ High-frequency Characteristics

Frequency		**900 MHz**				**2.6 GHz**			
		TH		**SMD**		**TH**		**SMD**	
Item		**E-shape**	**Y-shape**	**E-shape**	**Y-shape**	**E-shape**	**Y-shape**	**E-shape**	**Y-shape**
Isolation	75 Ω	65 dB min.		60 dB min.		35 dB min.	45 dB min.	30 dB min.	40 dB min.
	50 Ω	60 dB min.							
Insertion loss (not including substrate loss)	75 Ω	0.2 dB max.				0.5 dB max.			
	50 Ω	0.1 dB max.				0.3 dB max.			
V.SWR	75 Ω	1.2 max.				1.5 max.			
	50 Ω	1.1 max.				1.3 max.			
Return loss	75 Ω	20.8 dB max.				14.0 dB max.			
	50 Ω	26.4 dB max.				17.7 dB max.			
Maximum carry power		10 W (See note 2.)							
Maximum switching power		10 W (See note 2.)							

Note: **1.** The above values are initial values.

2. These values are for an impedance of 50 Ω or 75 Ω with a V.SWR of 1.2 max.

■ Coil Ratings

Single-side Stable Models

G6Z-1P(E), G6Z-1F(E)

Raged voltage	3 VDC	4.5 VDC	5 VDC	9 VDC	12 VDC	24 VDC
Rated current	66.7 mA	44.4 mA	40.0 mA	22.2 mA	16.7 mA	8.3 mA
Coil resistance	45 Ω	101 Ω	125 Ω	405 Ω	720 Ω	2,880 Ω
Must operate voltage	75% max. of rated voltage					
Must release voltage	10% min. of rated voltage					
Maximum voltage	150% of rated voltage					
Power consumption	Approx. 200 mW					

Single-winding Latching Models

G6ZU-1P(E), G6ZU-1F(E)

Raged voltage	3 VDC	4.5 VDC	5 VDC	9 VDC	12 VDC	24 VDC
Rated current	66.7 mA	44.4 mA	40.0 mA	22.2 mA	16.7 mA	8.3 mA
Coil resistance	45 Ω	101 Ω	125 Ω	405 Ω	720 Ω	2,880 Ω
Must operate voltage	75% max. of rated voltage					
Must release voltage	75% max. of rated voltage					
Maximum voltage	150% of rated voltage					
Power consumption	Approx. 200 mW					

Double-winding Latching Models

G6ZK-1P(E), G6ZK-1F(E)

Raged voltage	3 VDC	4.5 VDC	5 VDC	9 VDC	12 VDC	24 VDC
Rated current	120 mA	80 mA	72 mA	40 mA	30 mA	15 mA
Coil resistance	25 Ω	56 Ω	69 Ω	225 Ω	400 Ω	1,600 Ω
Must operate voltage	75% max. of rated voltage					
Must release voltage	75% max. of rated voltage					
Maximum voltage	150% of rated voltage					
Power consumption	Approx. 360 mW					

Note: **1.** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

2. The operating characteristics are measured at a coil temperature of 23°C.

3. The maximum voltage is the highest voltage that can be imposed on the Relay coil instantaneously.

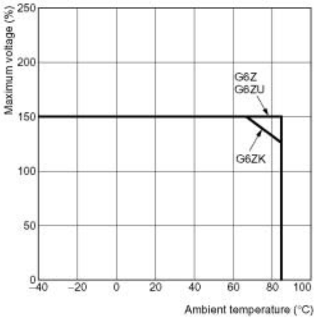
■ Characteristics

Item		Single-side stable models	Single-winding latching models	Double-winding latching models
		G6Z-1P(E), G6Z-1F(E)	G6ZU-1P(E), G6ZU-1F(E)	G6ZK-1P(E), G6ZK-1F(E)
Contact resistance (See note 2.)		100 mΩ max.		
Operating (set) time (See note 3.)		10 ms max. (approx. 3.5 ms)	10 ms max. (approx. 2.5 ms)	
Release (reset) time (See note 3.)		10 ms max. (approx. 2.5 ms)		
Minimum set/reset pulse time		---	12 ms	
Insulation resistance (See note 4.)		100 MΩ min. (at 500 VDC)		
Dielectric strength	**Coil and contacts**	1,000 VAC, 50/60 Hz for 1 min		
	Coil and ground, contacts and ground	500 VAC, 50/60 Hz for 1 min		
	Contacts of same polarity	500 VAC, 50/60 Hz for 1 min		
Vibration resistance		Destruction:10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction:10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)		
Shock resistance		Destruction:1,000 m/s^2 Malfunction:500 m/s^2		
Endurance		Mechanical:1,000,000 operations min. (at 36,000 operations/hour) Electrical: 300,000 operations min. (30 VAC, 10 mA/30 VDC, 10 mA), 100,000 operations min. (900 MHz, 10 W) at a switching frequency of 1,800 operations/hour		
Ambient temperature		Operating: –40°C to 70°C (with no icing or condensation)		
Ambient humidity		Operating: 5% to 85%		
Weight		Approx. 2.8 g		

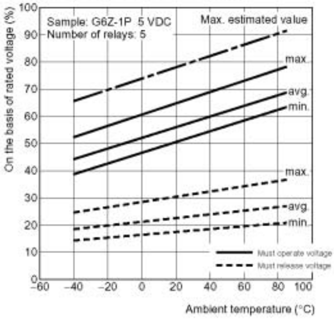
Note:
1. The above values are initial values.
2. The contact resistance was measured with 10 mA at 1 VDC with a voltage drop method.
3. Values in parentheses are actual values.
4. The insulation resistance was measured with a 500-VDC megohmmeter applied to the same parts as those used for checking the dielectric strength.

Engineering Data

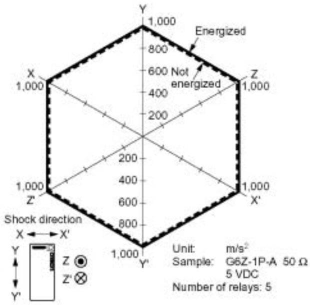
Ambient Temperature vs. Maximum Voltage



Ambient Temperature vs. Must Operate or Must Release Voltage

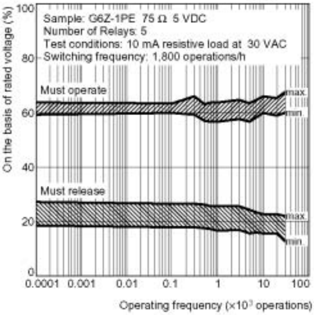


Shock Malfunction

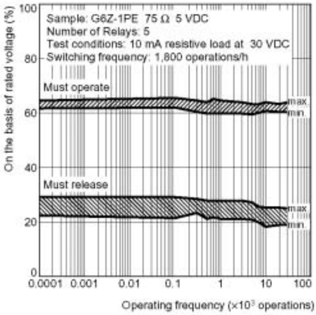


Conditions: Shock is applied in ±X, ±Y, and ±Z directions three times each with and without energizing the Relays to check for contact malfunctions.

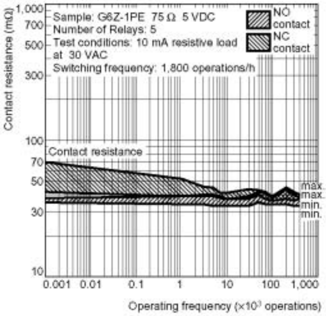
Electrical Endurance (with Must Operate and Must Release Voltage)



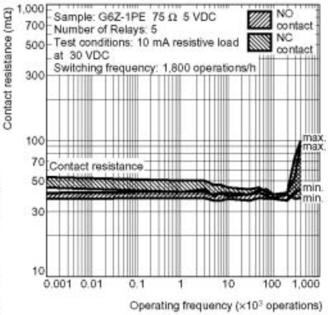
Electrical Endurance (with Must Operate and Must Release Voltage)



Electrical Endurance (Contact Resistance)

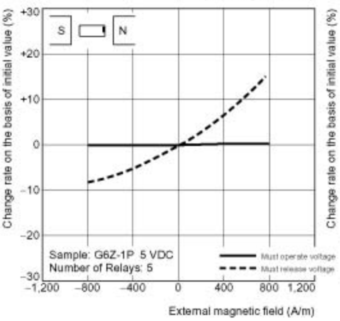


Electrical Endurance (Contact Resistance)

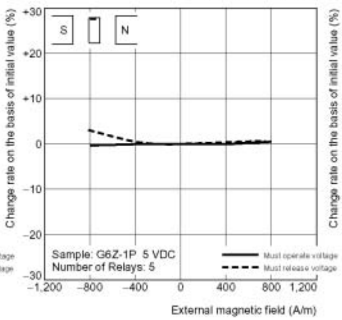


External Magnetic Interference

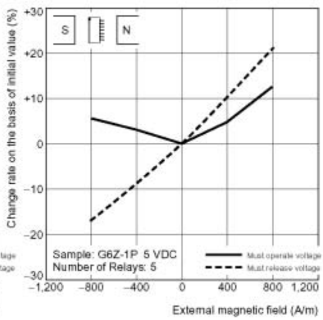
(Average value)



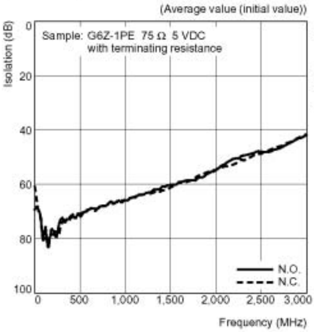
(Average value)



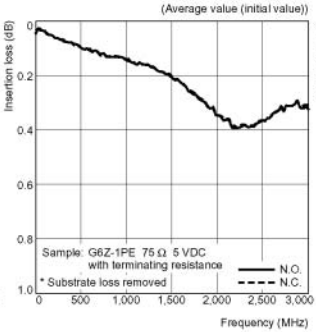
(Average value)



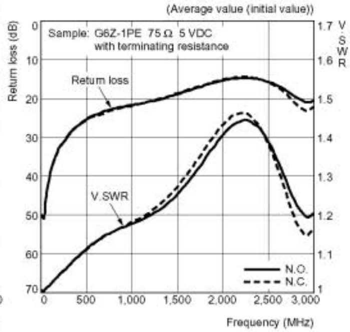
High-frequency Characteristics at 75 Ω (Isolation)



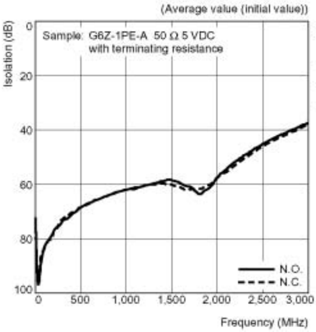
High-frequency Characteristics at 75 Ω (Insertion Loss)



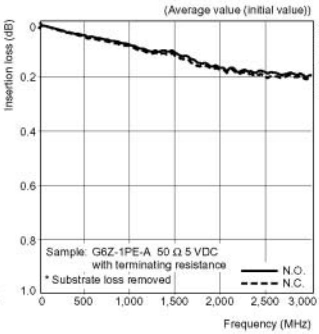
High-frequency Characteristics at 75 Ω (Return Loss, V.SWR)



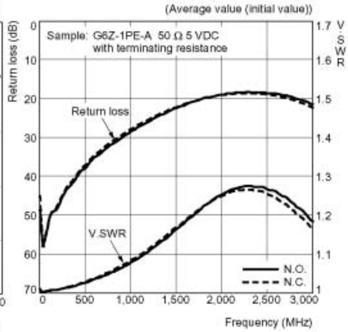
High-frequency Characteristics at 50 Ω (Isolation)



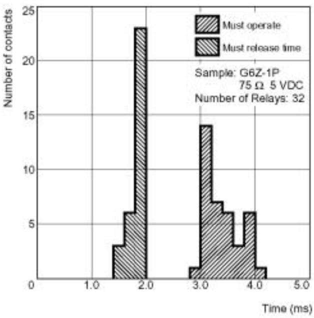
High-frequency Characteristics at 50 Ω (Insertion Loss)



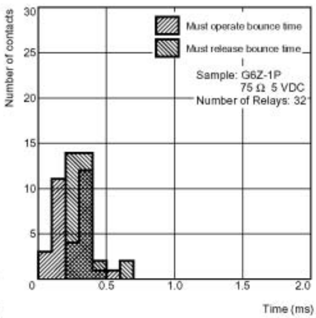
High-frequency Characteristics at 50 Ω (Return Loss, V.SWR)



Must Operate and Must Release Time Distribution (See note.)



Must Operate and Must Release Bounce Time Distribution (See note.)



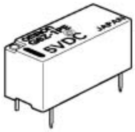
Note: The tests were conducted at an ambient temperature of 23°C.

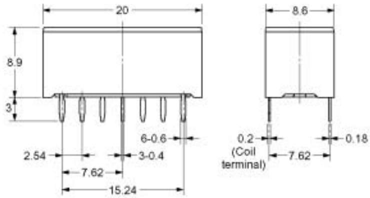
Dimensions

Note: All units are in millimeters unless otherwise indicated.

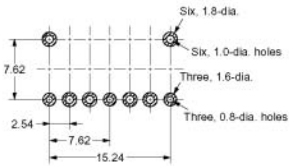
■ Models with PCB Terminals

G6Z-1PE
G6ZU-1PE
G6Z-1PE-R





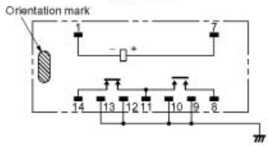
Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm



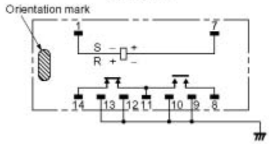
Note: Each value has a tolerance of ±0.3 mm.

Terminal Arrangement/Internal Connections (Bottom View)

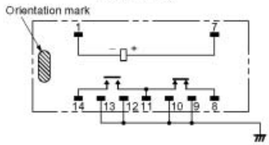
G6Z-1PE



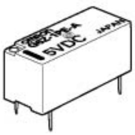
G6ZU-1PE

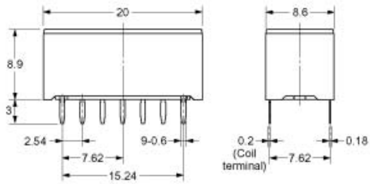


G6Z-1PE-R

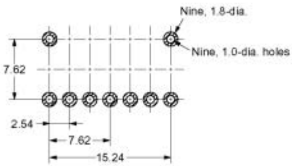


G6Z-1PE-A
G6ZU-1PE-A





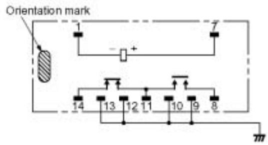
Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm



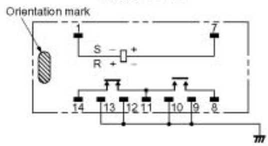
Note: Each value has a tolerance of ±0.3 mm.

Terminal Arrangement/Internal Connections (Bottom View)

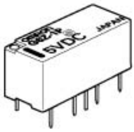
G6Z-1PE-A

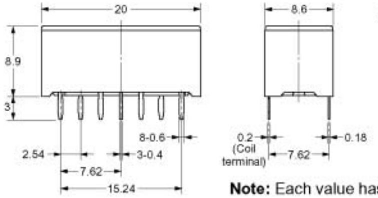


G6ZU-1PE-A



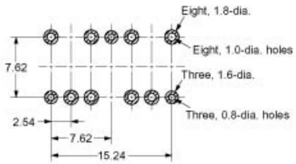
G6Z-1P
G6ZU-1P





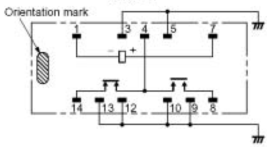
Note: Each value has a tolerance of ±0.3 mm.

Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

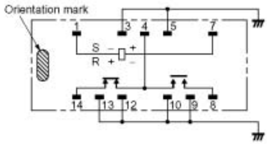


Terminal Arrangement/Internal Connections (Bottom View)

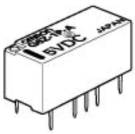
G6Z-1P

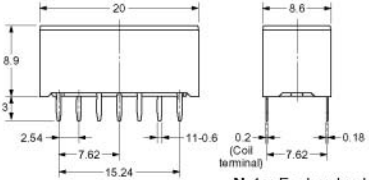


G6ZU-1P



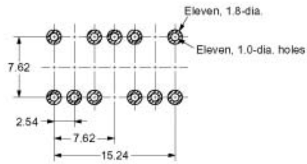
G6Z-1P-A
G6ZU-1P-A





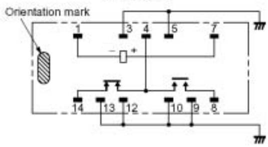
Note: Each value has a tolerance of ±0.3 mm.

Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

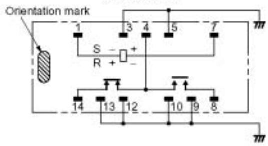


Terminal Arrangement/Internal Connections (Bottom View)

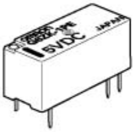
G6Z-1P-A

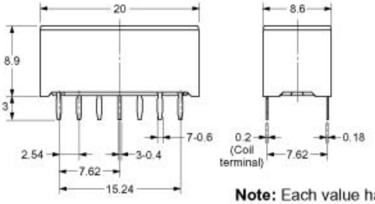


G6ZU-1P-A



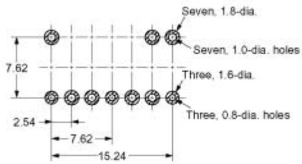
G6ZK-1PE



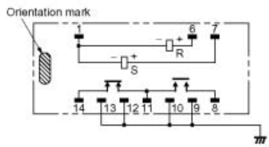


Note: Each value has a tolerance of ±0.3 mm.

Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

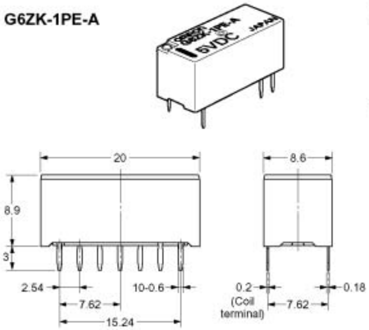


Terminal Arrangement/Internal Connections (Bottom View)

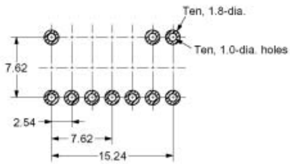


Signal Relays

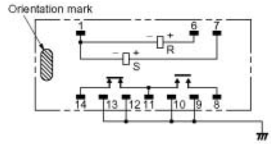
G6ZK-1PE-A



Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

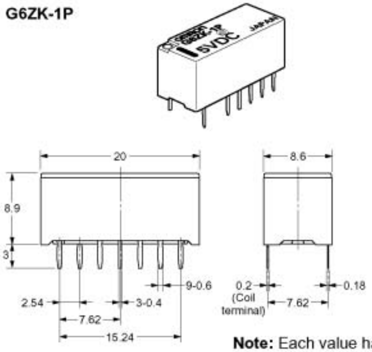


Terminal Arrangement/Internal Connections (Bottom View)

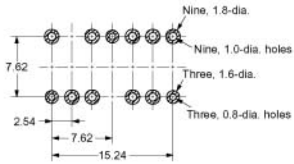


Note: Each value has a tolerance of ±0.3 mm.

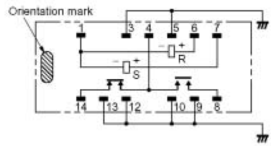
G6ZK-1P



Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

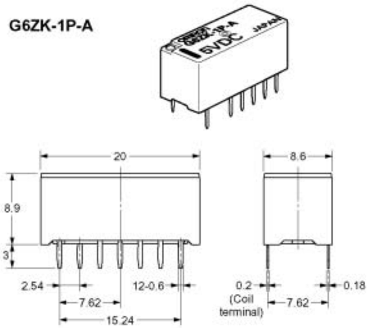


Terminal Arrangement/Internal Connections (Bottom View)

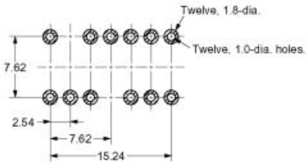


Note: Each value has a tolerance of ±0.3 mm.

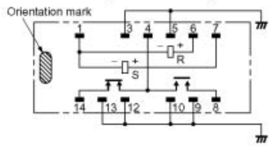
G6ZK-1P-A



Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm



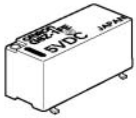
Terminal Arrangement/Internal Connections (Bottom View)

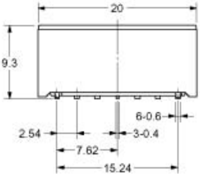


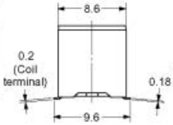
Note: Each value has a tolerance of ±0.3 mm.

■ Models with Surface-mounting Terminals

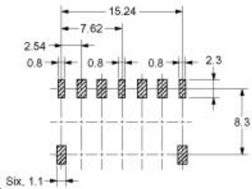
G6Z-1FE
G6ZU-1FE







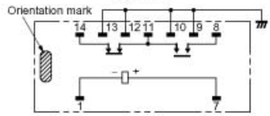
Mounting Dimensions (Top View)
Tolerance: ±0.1 mm



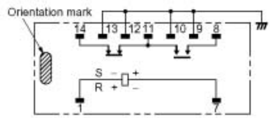
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

Terminal Arrangement/Internal Connections (Top View)

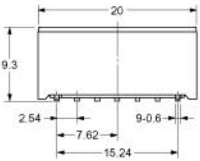
G6Z-1FE

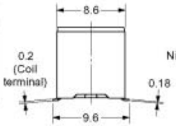


G6ZU-1FE

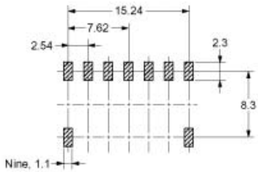


G6Z-1FE-A
G6ZU-1FE-A





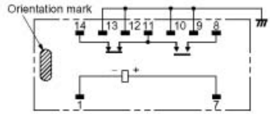
Mounting Dimensions (Top View)
Tolerance: ±0.1 mm



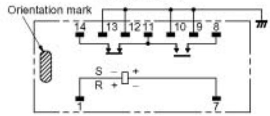
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

Terminal Arrangement/Internal Connections (Top View)

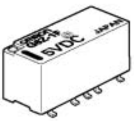
G6Z-1FE-A

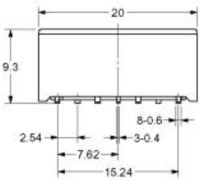


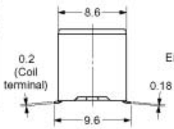
G6ZU-1FE-A



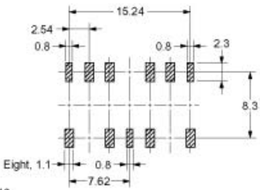
G6Z-1F
G6ZU-1F







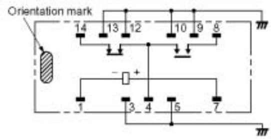
Mounting Dimensions (Top View)
Tolerance: ±0.1 mm



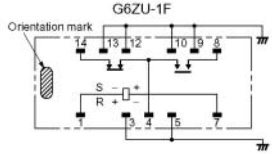
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

Terminal Arrangement/Internal Connections (Top View)

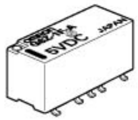
G6Z-1F

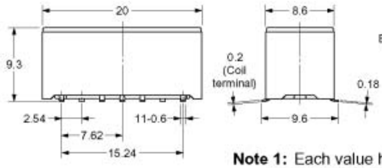


G6ZU-1F



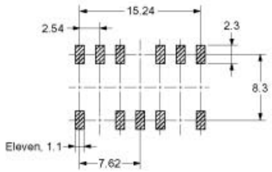
G6Z-1F-A
G6ZU-1F-A





Mounting Dimensions (Top View)

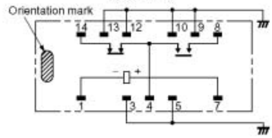
Tolerance: ±0.1 mm



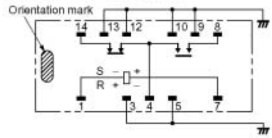
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

Terminal Arrangement/Internal Connections (Top View)

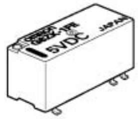
G6Z-1F-A

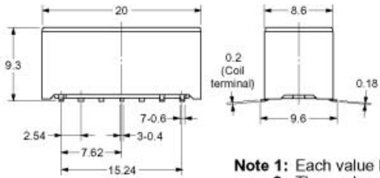


G6ZU-1F-A



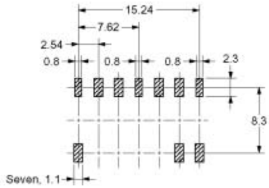
G6ZK-1FE





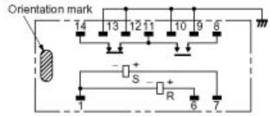
Mounting Dimensions (Top View)

Tolerance: ±0.1 mm

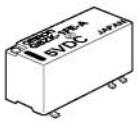


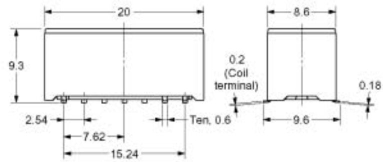
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

Terminal Arrangement/Internal Connections (Top View)



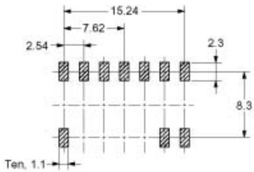
G6ZK-1FE-A





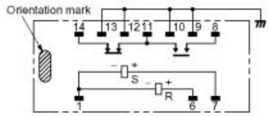
Mounting Dimensions (Top View)

Tolerance: ±0.1 mm

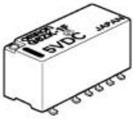


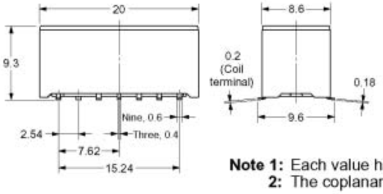
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

Terminal Arrangement/Internal Connections (Top View)

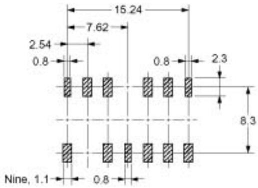


G6ZK-1F

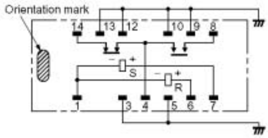




Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

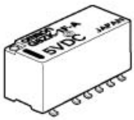


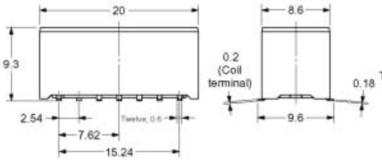
Terminal Arrangement/Internal Connections (Top View)



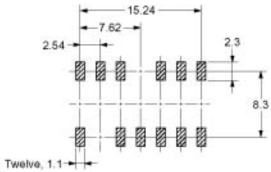
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

G6ZK-1F-A

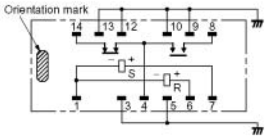




Mounting Dimensions (Top View)
Tolerance: ±0.1 mm



Terminal Arrangement/Internal Connections (Top View)



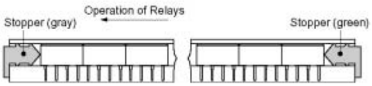
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

Stick Packing and Tape Packing

Stick Packing

Relays in stick packing are arranged so that the orientation mark of each Relay in on the left side.

Be sure not to make mistakes in Relay orientation when mounting the Relay to the PCB.



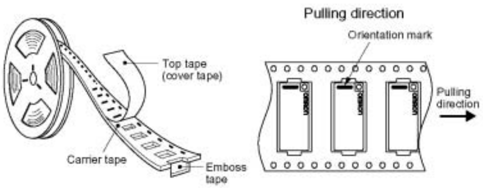
Stick length: 530 mm (stopper not included)
No. of Relays per stick: 25

Tape Packing (Surface-mounting Terminal Models)

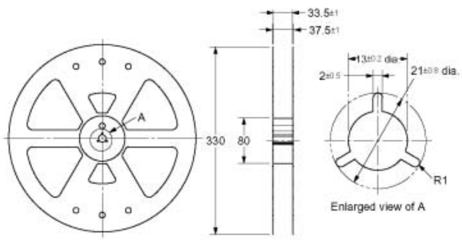
When ordering Relays in tape packing, add the prefix "-TR" to the model number, otherwise the Relays in stick packing will be provided.

Relays per Reel: 300

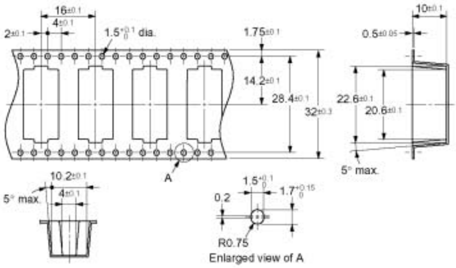
Direction of Relay Insertion



Reel Dimensions



Carrier Tape Dimensions

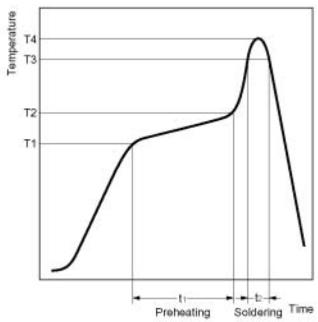


Note: The radius of the unmarked corner is 0.3 mm.

Recommended Soldering Method

Temperature Conditions for IRS Method

When using reflow soldering, ensure that the Relay terminals and the top of the case stay below the following curve. Check that these conditions are actually satisfied before soldering the terminals.

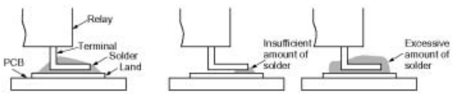


Measured part	Preheating (T1 → T2, t1)	Soldering (T3, t2)	Maximum peak (T4)
Terminals	150 → 180°C, 120 s max.	230°C min, 30 s max.	250°C max.
Top of case	---	---	255°C max.

Do not quench the terminals after mounting. Clean the Relay using alcohol or water no hotter than 40°C max.

The thickness of cream solder to be applied should be between 150 and 200 µm on OMRON's recommended PCB pattern.

Correct Soldering **Incorrect Soldering**



Check the soldering in the actual mounting conditions before use.

Safety Precautions

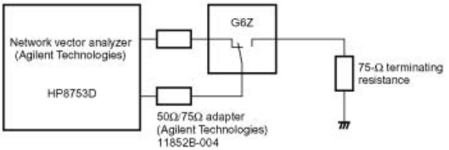
■ Precautions for Correct Use

Please observe the following precautions to prevent failure to operate, malfunction, or undesirable effect on product performance.

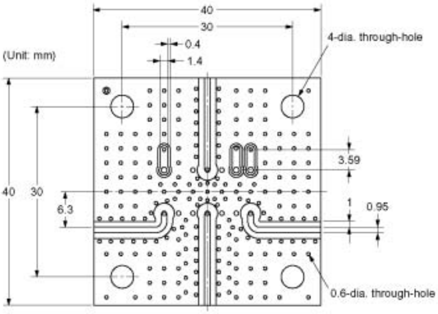
High-frequency Characteristics Measurement Method and Measurement Substrate

High-frequency characteristics for the G6Z are measured in the way shown below. Consult your OMRON representative for details on 50-Ω models.

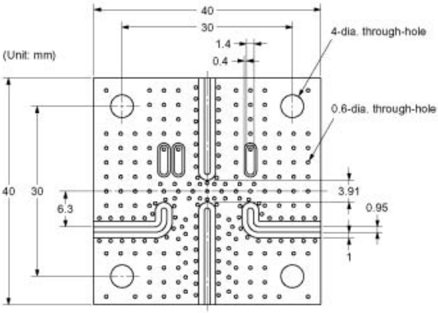
Measurement Method for 75-Ω Models



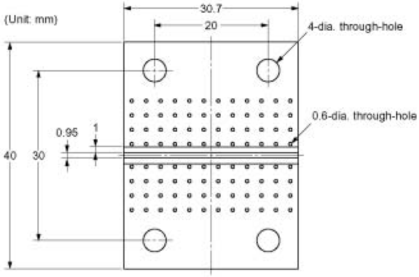
Through-hole Substrate (75-Ω Models, E-shape or Y-shape)



SMD-type Substrate (75-Ω Models, E-shape or Y-shape)



Substrate for High-frequency Characteristic Compensation (75-Ω Models, E-shape or Y-shape)



Substrate Types

Material: FR-4 glass epoxy (glass cloth impregnated with epoxy resin and copper laminated to its outer surface)

Thickness: 1.6 mm

Thickness of copper plating:18 µm

Note:
1. The compensation substrate is used when measuring the Relay's insertion loss. The insertion loss is obtained by subtracting the measured value for the compensation substrate from the measured value with the Relay mounted to the high-frequency measurement substrate.
2. For convenience, the diagrams of the high-frequency measurement substrates given here apply both to models with an E-shape terminal structure and to models with a Y-shape terminal structure.
3. Be sure to mount a standoff tightly to the through-hole substrate.
4. Use measuring devices, connectors, and substrates that are appropriate for 50 Ω and 75 Ω respectively.
5. Ensure that there is no pattern under the Relay. Otherwise, the impedance may be adversely affected and the Relay may not be able to attain its full characteristics.

Handling

Do not use the Relay if it has been dropped. Dropping the Relay may adversely affect its functionality.

Protect the Relay from direct sunlight and keep the Relay under normal temperature, humidity, and pressure.

Flow Soldering

Solder: JIS Z3282, H63A

Soldering temperature: Approx. 250°C (260°C if the DWS method is used)

Soldering time: Approx. 5 s max. (approx. 2 s for the first time and approx. 3 s for the second time if the DWS method is used)

Be sure to make a molten solder level adjustment so that the solder will not overflow on the PCB.

Claw Securing Force During Automatic Mounting

During automatic insertion of Relays, be sure to set the securing force of each claw to the following so that the Relay's characteristics will be maintained.

Direction A: 4.90 N max.
Direction B: 4.90 N max.
Direction C: 4.90 N max.

Secure the claws to the shaded area. Do not attach them to the center area or to only part of the Relay.

Latching Relay Mounting

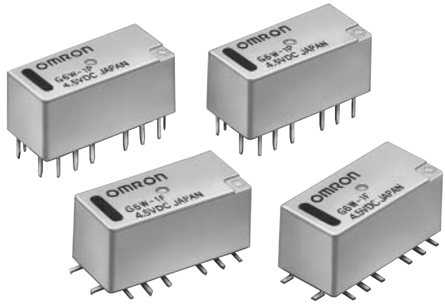
Make sure that the vibration or shock that is generated from other devices, such as Relays, on the same panel or substrate and imposed on the Latching Relay does not exceed the rated value, otherwise the set/reset status of the Latching Relay may be changed. The Latching Relay is reset before shipping. If excessive vibration or shock is imposed, however, the Latching Relay may be set accidentally. Be sure to apply a reset signal before use.

Coating

Do not use silicone coating to coat the Relay when it is mounted to the PCB. Do not wash the PCB after the Relay is mounted using detergent containing silicone. Otherwise, the detergent may remain on the surface of the Relay.

Surface-Mountable 2.5GHz Band Miniature SPDT High-frequency Relay

- ROHS compliant.
- Superior high-frequency characteristics, such as an isolation of 60 dB min., insertion loss of 0.2 dB max., and V.S.W.R. of 1.2 max. at 2.5 GHz (50 Ω).
- Surface-mounting terminals and superior high-frequency characteristics combined through adoption of tri-plate micro strip type transmission lines.
- Ultra-miniature at 20 x 9.4 x 8.9 mm (L x W x H).
- Serialised relay lineup consisting of single-winding latching type (200 mW), double-winding latching type (360 mW), and reverse-arrangement contact type.
- Y-shape terminal arrangement that simplifies wiring to PCBs.



Ordering Information

Classification				Single-side stable	Single-winding latching	Double-winding latching
SPDT	Fully Sealed	Through-hole terminal	Y-shape terminal	G6W-1P	G6WU-1P	G6WK-1P
		Surface-mounting terminal	Y-shape terminal	G6W-1F	G6WU-1F	G6WK-1F

Note: When ordering, add the rated coil voltage to the model number.
Example: G6W-1P 12 VDC
Rated coil voltage

Model Number Legend

G6W □-□□□-□
1 2 3 4 5

1. Relay Function

None: Single-side stable
U: Single-winding latching
K: Double-winding latching

2. Contact Form

2: SPDT

3. Terminal Shape

F: Surface-mounting terminals
P: PCB terminals

4. Terminal Arrangement

None: Y-shape terminal arrangement (standard)

5. Classification

None: Standard contact arrangement
R: Reverse contact arrangement

Application Examples

Mobile phone base station (W-Cdma, UMTS, Cdma-2000, PCS), wireless LAN, and measurement devices.

Specifications

■ Contact Ratings

Item Load	Resistive load
Rated load	10 mA at 30 VAC 10 mA at 30 VDC 2.5 GHz, 50 Ω, 10 W (See note 2.)
Rated carry current	0.5 A
Max. switching voltage	30 VDC, 30 VAC
Max. switching current	0.5 A

■ High-frequency Characteristics

Item Frequency	2.0 GHz	2.5 GHz
Isolation	65 dB min.	60 dB min.
Insertion loss	0.2 dB max.	
V.SWR	1.2 max.	
Max. carry power	20 W (See note 2.)	
Max. switching power	10 W (See note 2.)	

Note: 1. The above values are initial values.
2. This values is for a load with V.SWR ≤ 1.2 at the impedance of 50 Ω.

■ Coil Ratings

Single-side Stable Relays (G6W-1F, G6W-1P)

Rated voltage	3 VDC	4.5 VDC	9 VDC	12 VDC	24 VDC
Rated current	66.7 mA	44.4 mA	22.2 mA	16.7 mA	8.3 mA
Coil resistance	45 Ω	101 Ω	405 Ω	720 Ω	2,880 Ω
Must operate voltage	80% max. of rated voltage				
Must release voltage	10% min. of rated voltage				
Max. voltage	150% of rated voltage				
Power consumption	Approx. 200 mW				

Single-winding Latching Relays (G6WU-1F, G6WU-1P)

Rated voltage	9 VDC	12 VDC
Rated current	22.2 mA	16.7 mA
Coil resistance	405 Ω	720 Ω
Must operate voltage	80% max. of rated voltage	
Must reset voltage	80% max. of rated voltage	
Max. voltage	150% of rated voltage	
Power consumption	Approx. 200 mW	

Double-winding Latching Relays (G6WK-1F, G6WK-1P)

Rated voltage	3 VDC	4.5 VDC	9 VDC	12 VDC	24 VDC
Rated current	120 mA	80 mA	40 mA	30 mA	15 mA
Coil resistance	25 Ω	56 Ω	225 Ω	400 Ω	1,600 Ω
Must set voltage	80% max. of rated voltage				
Must reset voltage	80% max. of rated voltage				
Max. voltage	150% of rated voltage				
Power consumption	Approx. 360 mW				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. The operating characteristics are measured at a coil temperature of 23°C.
3. The maximum voltage is the highest voltage that can be imposed on the Relay coil.

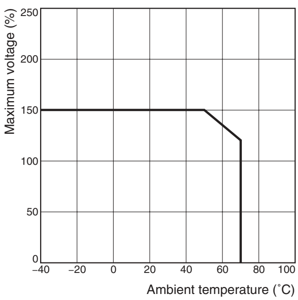
■ Characteristics

Classification		Single-side Stable	Single-winding Latching	Double-winding Latching
Model		G6W-1F, G6W-1P	G6WU-1F, G6WU-1P	G6WK-1F, G6WK-1P
Contact resistance (See note 1.)		100 mΩ max.		
Operate (set) time (See note 2.)		10 ms max. (Approx. 3.5 ms)	10 ms max. (Approx. 2.5 ms)	
Release (reset) time (See note 2.)		10 ms max. (Approx. 2.5 ms)		
Minimum set/reset signal width		–	12 ms	
Insulation resistance (See note 3.)		100 MΩ min. (at 500 VDC)		
Dielectric strength	Coil and contacts	1,000 VAC, 50/60 Hz for 1 min		
	Coil and ground, contacts and ground	500 VAC, 50/60 Hz for 1 min		
	Contacts of same polarity	500 VAC, 50/60 Hz for 1 min		
Vibration resistance	Destruction	10 to 55 Hz, 2-mm double amplitude		
	Malfunction	10 to 55 Hz, 1.5-mm double amplitude		
Shock resistance	Destruction	1,000 m/s^2		
	Malfunction	500 m/s^2		
Endurance	Mechanical	1,000,000 operations min. (at 36,000 operations/hour)		
	Electrical	300,000 operations min. (30 VAC 10 mA/ 30 VDC 10 mA), 100,000 operations min. (2.5 GHz, 50Ω, 10 W)		
Ambient temperature		Operating: -40°C to 70°C (with no icing or condensation)		
Ambient humidity		Operating: 5% to 85%		
Weight		Approx. 3 g		

Note: 1. The contact resistance was measured with 10 mA at 1 VDC with a fall-of-potential method.
2. Values in parentheses are actual values.
3. The insulation resistance was measured with a 500-VDC Megger Tester applied to the same parts as those used for checking the dielectric strength.
4. The above values are initial values.

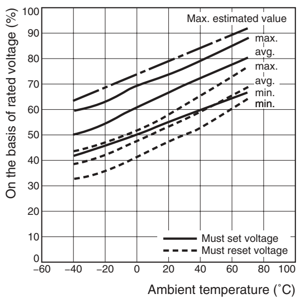
Engineering Data

Ambient Temperature vs. Maximum Voltage

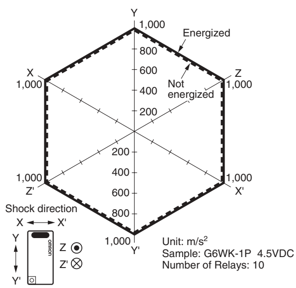


Note: "Maximum voltage" is the maximum voltage that can be applied to the Relay coil.

Ambient Temperature vs. Must Set or Must Reset Voltage

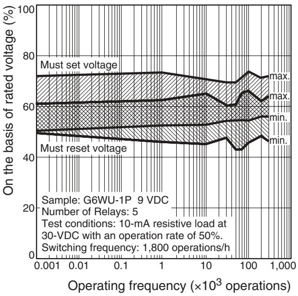


Shock Malfunction

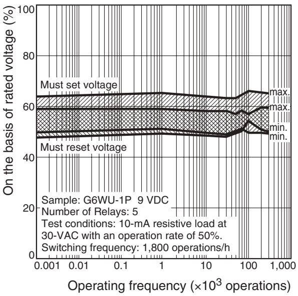


Conditions: Shock is applied in ±X, ±Y, and ±Z directions three times each with and without energizing the Relays to check the number of contact malfunctions.

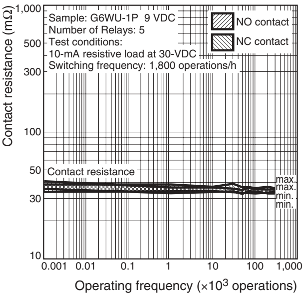
Electrical Endurance (With Must Set and Must Reset Voltage)



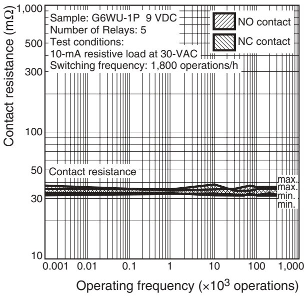
Electrical Endurance (With Must Set and Must Reset Voltage)



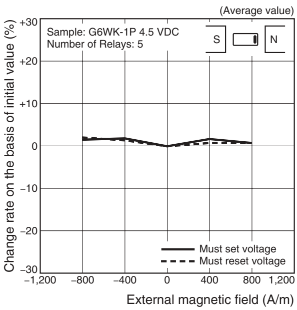
Electrical Endurance (Contact Resistance)

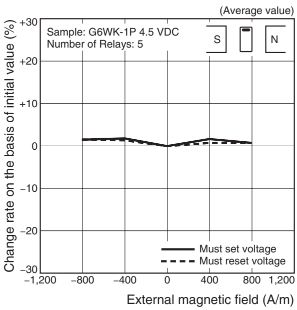


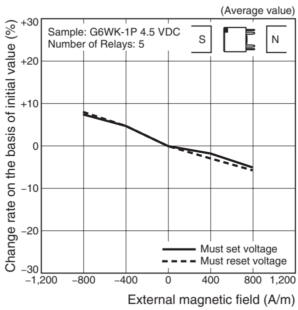
Electrical Endurance (Contact Resistance)



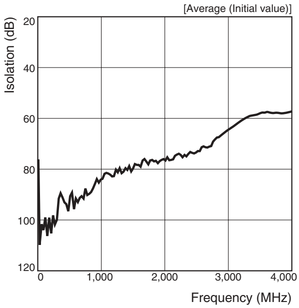
External Magnetic Interference



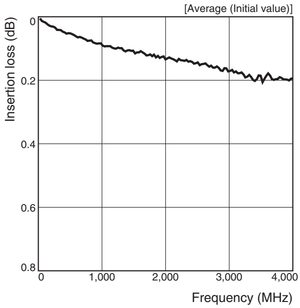




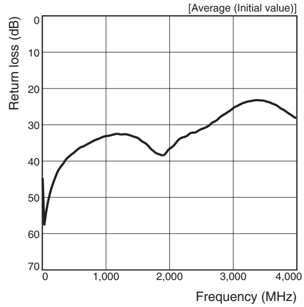
High-frequency Characteristics (Isolation)



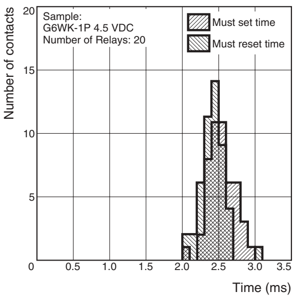
High-frequency Characteristics (Insertion Loss)



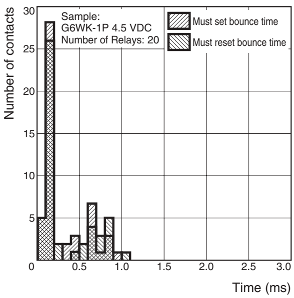
High-frequency Characteristics (Return Loss)



Must Set and Must Reset Time Distribution (See note.)



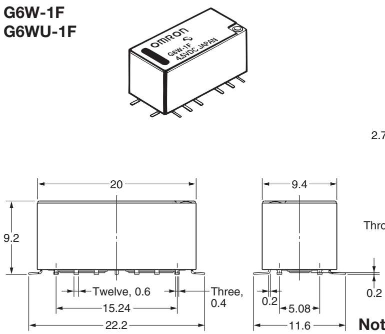
Must Set and Must Reset Bounce Time Distribution (See note.)



Dimensions

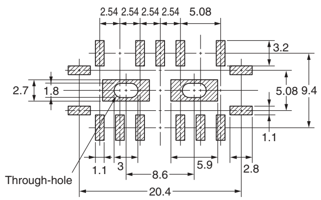
Note: All units are in millimeters unless otherwise indicated.

G6W-1F
G6WU-1F



PCB Mounting Holes (Top View)

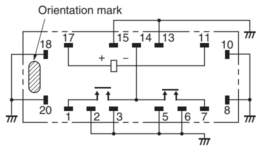
Tolerance: ±0.1 mm



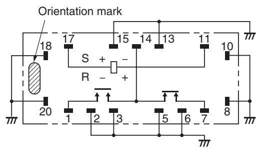
Note: Each value has a tolerance of ±0.3 mm.

Terminal Arrangement/Internal Connections (Top View)

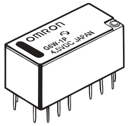
G6W-1F

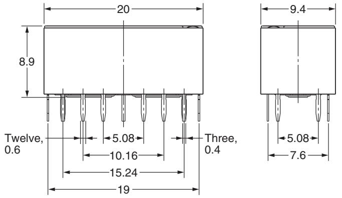


G6WU-1F



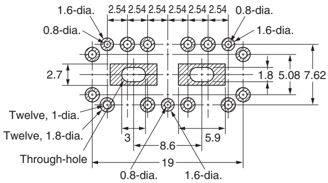
G6W-1P
G6WU-1P





PCB Mounting Holes (Bottom View)

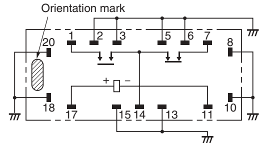
Tolerance: ±0.1 mm



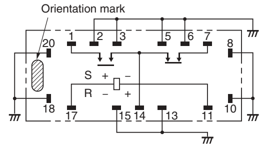
Tolerance: ±0.3 mm unless specified.

Terminal Arrangement/Internal Connections (Bottom View)

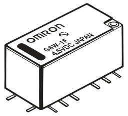
G6W-1P

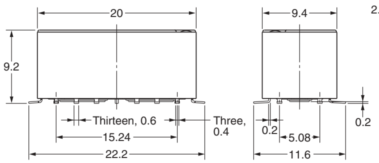


G6WU-1P



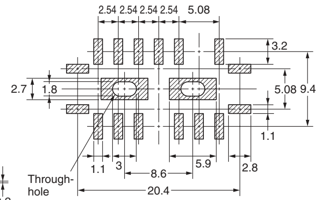
G6WK-1F





PCB Mounting Holes (Top View)

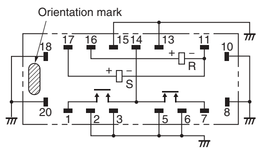
Tolerance: ±0.1 mm



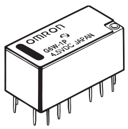
Note: Each value has a tolerance of ±0.3 mm.

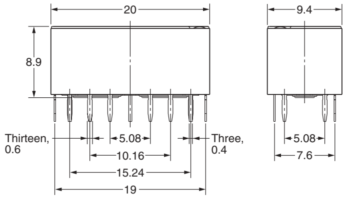
Terminal Arrangement/Internal Connections (Top View)

G6WK-1F



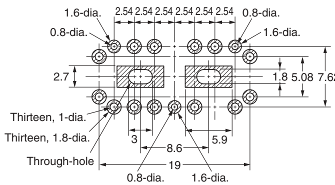
G6WK-1P





PCB Mounting Holes (Bottom View)

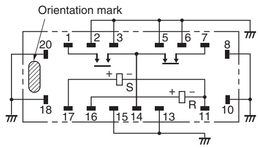
Tolerance: ±0.1 mm



Tolerance: ±0.3 mm unless specified.

Terminal Arrangement/Internal Connections (Bottom View)

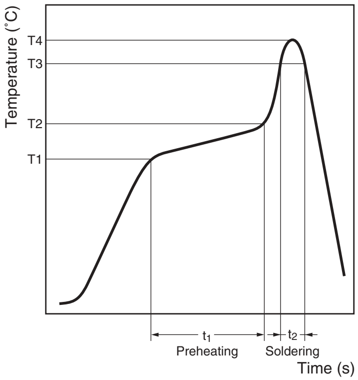
G6WK-1P



Recommended Soldering Method

TEMPERATURE PROFILE ACCORDING TO IRS METHOD

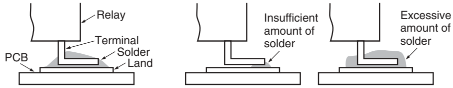
- When performing reflow-soldering, check the profile on an actual device after setting the temperature condition so that the temperatures at the relay terminals and the upper surface of the case do not exceed the limits specified in the following table.



Item Measuring position	Preheating (T1 to T2, t_1)	Soldering (T3, t_2)	Peak value (T4)
Terminal	150°C to 180°C, 120 s max.	230°C min., 30 s max.	250°C max.
Upper surface of case	–	–	255°C max.

- The thickness of cream solder to be applied should be within a range between 150 and 200 mm on OMRON's recommended PCB pattern.

Correct Soldering **Incorrect Soldering**



Visually check that the Relay is properly soldered.

BOTTOM GROUND SOLDERING CONDITIONS

Soldering iron: 50 W

Iron temperature: 380°C to 400°C

Soldering time: 10 s max.

Note: The above conditions are given for reference only; it is recommended to double-check the suitability under actual conditions.

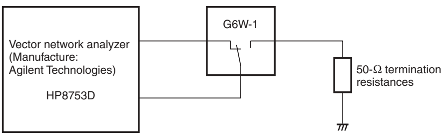
Signal Relays

Precautions

CORRECT USE

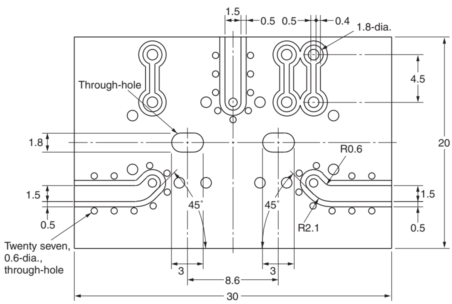
High-frequency Characteristics Measurement Method and Substrate to be Measured

High-frequency Characteristics for G6W are measured as shown below.

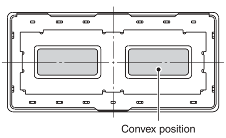


Through-hole substrate

Substrate: t-0.8 BT resin (Dielectric constant at 2 GHz: 3.37)

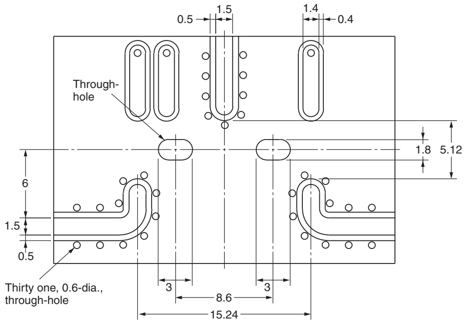


Undersurface of relay

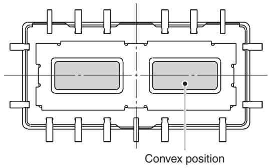


SMD-type substrate

Substrate: t-0.8 BT resin (Dielectric constant at 2 GHz: 3.37

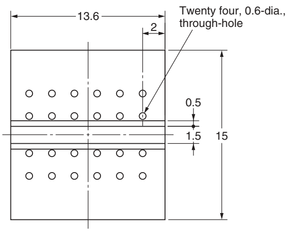


Undersurface of relay



Note: To obtain high-frequency characteristics close to the charts shown on page ?, solder the convex point on the undersurface of the relay to the ground pattern of the substrate..

Base plate for high-frequency characteristic compensation



Note: The above compensation plate is used to measure the loss by the relay.

The relay loss is determined by subtracting the data measured for a compensation base plate from those for a high-frequency characteristics measuring substrate mounted with a relay.

Handling

Leave the Relays packed until just prior to mounting them.

Dropping the relay may cause damage to its functional capability. Never use the relay if it is dropped.

Protect the relays from direct sunlight during operation, storage, and transportation and keep the relays under normal temperature, humidity, and pressure.

Soldering

Solder: JIS Z3282, H63A

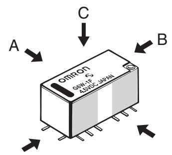
Soldering temperature: Approx. 250ºC (At 260ºC if the DWS method is used.)

Soldering time: Approx. 5 s max. (approx. 2 s for the first time and approx. 3 s for the second time if the DWS method is used.)

Be sure to adjust the level of the molten solder so that the solder will not overflow onto the PCB.

Claw Securing Force During Automatic Insertion

During automatic insertion of Relays, make sure to set the securing force of the claws to the following values so that the Relay characteristics will be maintained.



Direction A: 4.90 N max.
Direction B: 9.80 N max.
Direction C: 9.80 N max.

Secure the claws to the area indicated by shading.
Do not attach them to the center area or to only part of the Relay.

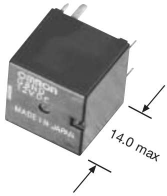
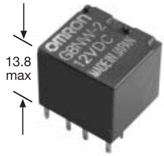
Latching Relay Mounting

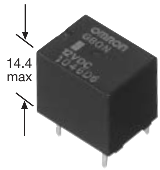
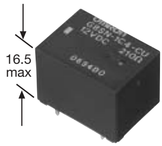
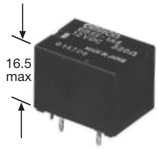
Make sure that the vibration or shock that is generated from other devices, such as relays in operation, on the same panel and imposed on the Latching Relay does not exceed the rated value, otherwise the Latching Relay that has been set may be reset or vice versa. The Latching Relay is reset before shipping. If excessive vibration or shock is imposed, however, the Latching Relay may be set accidentally. Be sure to apply a reset signal before use.

Coating

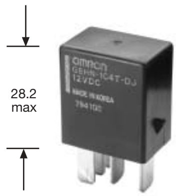
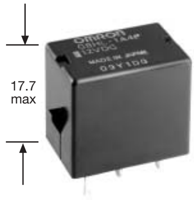
Relays mounted on PCBs may be coated or washed. Do not apply silicone coating or detergent containing silicone, otherwise the silicone coating or detergent may remain on the surface of the Relays.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

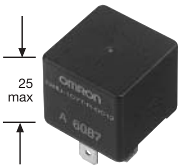
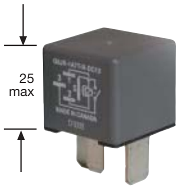
Classification		Ultra-Miniature PCB Relay		
Model		G8N1	G8ND2	G8NW
Features		Fully sealed construction Fully automated assembly 25A motor lock load		Twin automotive relay suitable for polarity reversal control
Appearance				
Dimensions (LxW)		14.3 x 7.5 max	14.5 x 14.1 max	15.7 x 14.3 max
Contact Ratings	Contact Form	SPDT	Dual Contact	SPDT x 2
	Contact Type	Single	Single	Twin Contact
	Max switching current (motor lock condition)	30 A	30 A	30 A
	Max switching current (under resistive load)	–	–	–
Coil ratings	Rated Voltage	12VDC	12VDC	12VDC
Endura-nce	Electrical (under rated load)	100,000 operations		
	Mechanical	1,000,000 operations		
Ambient temperature (operating)		-40˚C to 85˚C		-40°C to 85°C
Variations		• High sensitivity • High temperature	• Suppression resistor • Suppression diode • Mounting bracket with resistor • Weatherproof with Resistor	• High sensitivity • High temperature
Magazine Packaging		80	40	36
Weight		4.1g	7.5g	8.0g
Page		290	295	300

Classification		Sub-miniature Automotive PCB Relay		
Model		**G8QN**	**G8SN**	**G8SE**
Features		Fully sealed construction Fully automated assembly		High capacity, high heat resistance relay
Appearance				
Dimensions (LxW)		16 x 12.5 max	22.5 x 16.5 max	22.5 x 16.5 max
Contact Ratings	**Contact Form**	SPDT	SPDT	SPST
	Contact Type	Single	Single	Single
	Max Switching Current (A) (under resistive load)	5A	10A	20A
Coil ratings	**Rated Voltage**	12VDC	12VDC	12VDC
Endura-nce	**Electrical (under rated load)**	100,000 operations (14V; continuous carry current)		
	Mechanical	10,000,000 operations (at frequency of 18,000 operations/hour)		
Ambient temperature (operating)		-40˚C to 85˚C		-40˚C to 110˚C
Variations		–	–	–
Magazine Packaging		100	100	25
Weight		5.5 g	13 g	16
Page		305	307	309

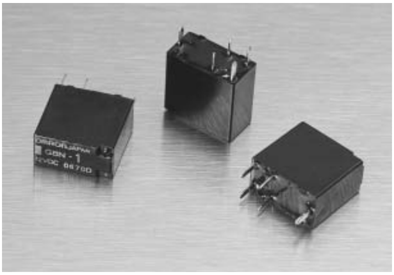
Classification		High Current Automotive PCB Relay
Model		**G8PE**
Features		40A, fully sealed, PCB power relay
Appearance		
Dimensions (WxLxH)		21 x 22.6 x 21.2
Contact Ratings	**Contact Form**	SPST/SPDT
	Contact Type	Silver Tin Alloy
	Max switching current (motor lock condition)	40A
	Max switching current (under resistive load)	–
Coil ratings	**Rated Voltage**	12VDC
Endura-nce	**Electrical (under rated load)**	100K
	Mechanical	1,000,000 operations
Ambient temperature (operating)		-40˚C to 85˚C
Variations		Normally open and normally closed
Magazine Packaging		100
Weight		20g
Page		311

Classification		Micro ISO Automotive PCB relay	
Model		**G8HN-J**	**G8HL**
Features		Sealed and unsealed 20 A / 35 A relay Handles heavy loads Micro ISO	Low height micro ISO 20 A relay
Appearance			
Dimensions (LxW)		23 x 15.5 max	22.5 x 15
Contact Ratings	**Contact Form**	SPST / SPDT	SPST
	Contact Type	Single	Single
	Max switching current (motor lock condition)	–	–
	Max switching current (under resistive load)	20 A (35 A version available)	20 A
Coil ratings	**Rated Voltage**	12 & 24 VDC	12 VDC
Endura-nce	**Electrical (under rated load)**	100,000 operations	
	Mechanical	1,000,000 operations	
Ambient temperature (operating)		-40°C to 125°C	-40°C to 100°C
Variations		• Sealed & unsealed	• PCB terminals • Solder terminals
Magazine Packaging		100	20
Weight		20g	13g
Page		314	320

Selection Guide – Automotive Relays

Classification		General Purpose	Special Purpose
Model		G8JN	G8JR
Features		Standard ISO terminal footprint Handles heavy load High current path Fully welded	Standard ISO terminal footprint. High power (70A)
Appearance			
Dimensions (LxW)		25 x 25 max	25 x 25 max
Contact Ratings	Contact Form	SPDT	SPST
	Contact Type	Single	Single
	Max switching current (motor lock condition)	–	–
	Max switching current (under resistive load)	35A	70A
Coil ratings	Rated Voltage	12VDC	12VDC
Endura-nce	Electrical (under rated load)	100,000 operations	
	Mechanical	1,000,000 operations	
Ambient temperature (operating)		-40°C to 125°C-	-40°C to 135°C
Variations		• Suppression resistor • Suppression diode • Mounting bracket with resistor • Weatherproof with resistor	• Suppression resistor • Mounting bracket with resistor
Magazine Packaging		48	48
Weight		40g	40g
Page		325	327

Features



- Compact size
- High performance PCB relay
- 25A motor lock load
- Fully sealed construction
- Fully automated assembly
- SPDT contracts
- Pre-solder as for all terminal
- PWB pattern design is easy
- ISO9001/QS9000 series approval

■ Available Types

	Type
G8N-1 12VDC	Standard
G8N-1S 12VDC	High Sensitivity
G8N-1L 12VDC	High Temperature (105°C)
G8N-1H 12VDC	High Temperature/High Sensitivity

■ Contact Data

Max Switching Current	30A
Rated Current	25A Motor load
Max Switching Voltage	16V
Contact Material	Silver tin alloy (Cadmium Free)

■ Coil Ratings

Type	Coil Resistance	Pull in Voltage
G8N-1 12VDC	225Ω	<7.2
G8N-1S 12VDC	180Ω	<6.5
G8N-1L 12VDC	225Ω	<7.2
G8N-1H 12VDC	180Ω	<6.5

■ Specifications

Temperature Range	-40 to +85°C (-1L, -1H: -40 to +105°C)
Mechanical Life	1,000,000 Operations
Electrical Life	100,000 Operations
Weight	4.1g

Application Examples

- Power windows
- Power door lock
- Seat adjustment
- Sunroof
- Wiper controls

LIFE TEST I (Power window motor: G8N-1 12VDC)

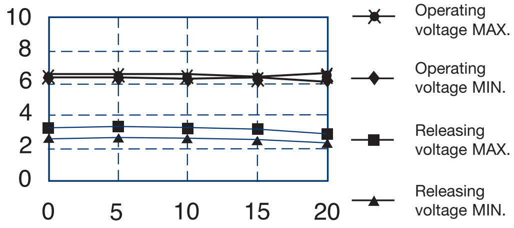
- Test item

  14VDC-26A

  Motor Lock 200,000

  Operations minimum

- Shift of pick-up drop-out voltage



Characteristics		Specification		Before the Test	After the Test
Contact Resistance	N.O. Contact	100(mΩ) or lower	MAX	4.1	7.2
			MIN	2.8	3.5
			AVE	3.36	5.00
	N.C. Contact	100(mΩ) or lower	MAX	5.6	11.8
			MIN	3.9	5.0
			AVE	4.44	8.00
Insulation Resistance		100(mΩ) or higher		1000 or higher	1000 or higher
Structure		No abnormal condition		Good	Good

LIFE TEST II (Door lock motor: G8N-1 12VDC)

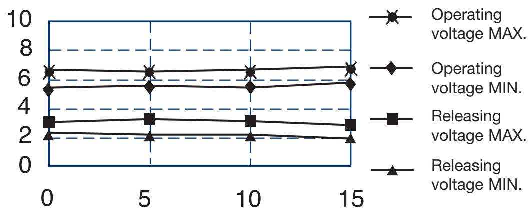
- Test item

  16VDC-22A

  200,000

  Operations minimum

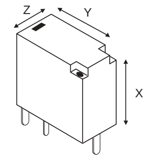
- Shift of pick-up drop-out voltage

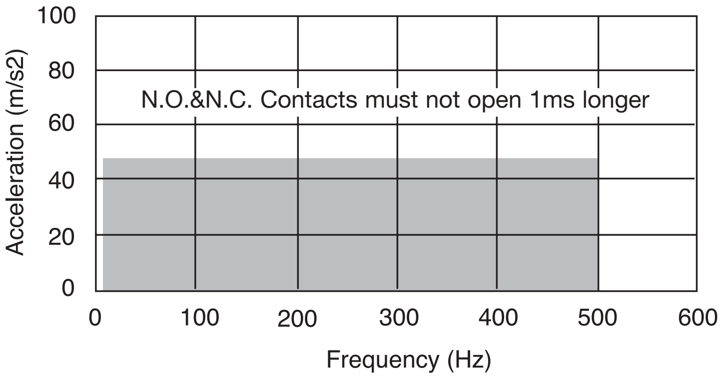


Characteristics		Specification		Before the Test	After the Test
Contact Resistance	N.O. Contact	100(mΩ) or lower	MAX	4.7	6.8
			MIN	3.2	3.5
			AVE	3.89	4.50
	N.C. Contact	100(mΩ) or lower	MAX	5.3	7.2
			MIN	3.7	4.0
			AVE	4.46	6.20
Insulation Resistance		100(mΩ) or higher		1000 or higher	1000 or higher
Structure		No abnormal condition		Good	Good

VIBRATION RESISTANCE CHARACTERISTICS

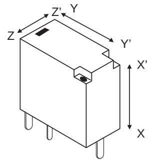
• Test condition
  Frequency: 10Hz-500Hz-10Hz
  Acceleration: 43.1m/s2
  Direction of vibration: see right diagram
  Detection level: Contacts must not open 1ms or longer

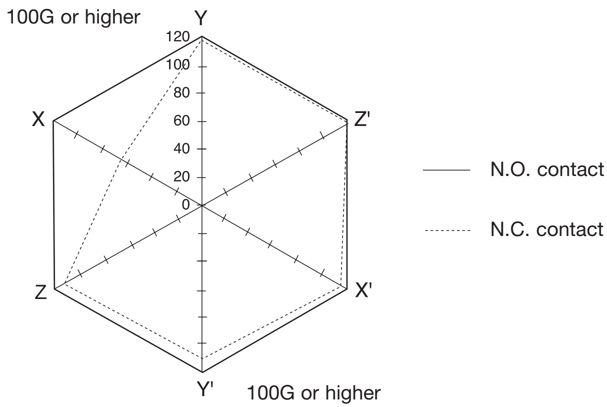




SHOCK RESISTANCE CHARACTERISTICS

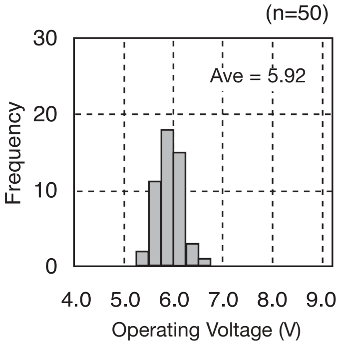
• Test condition
  Shock application time: 11ms, half-sine wave
  Shock direction: see right diagram
  Detection level: Contacts must not open 1ms or longer



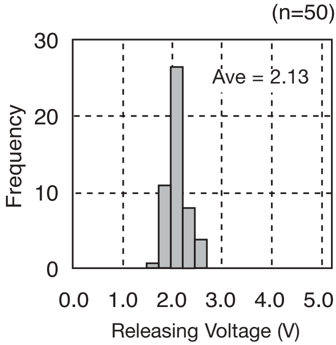


REFERENCE DATA (G8N-1 12VDC)

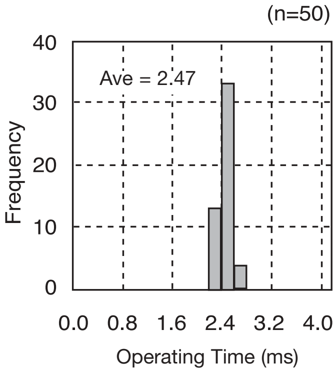
Distribution of operating voltage



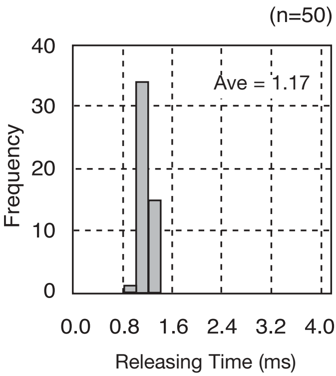
Distribution of releasing voltage



Distribution of operating time

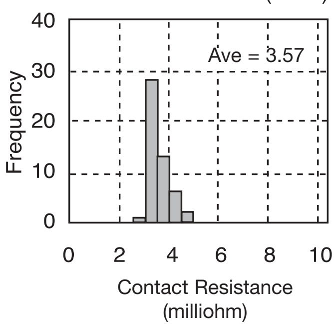


Distribution of releasing time



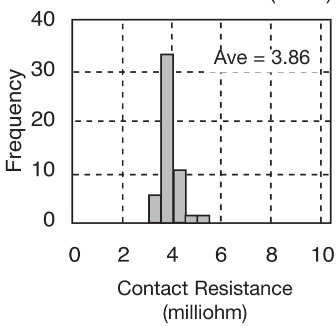
N.O. contact – Distribution of contact resistance

(n=50)

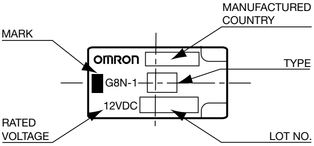


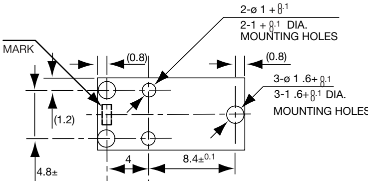
N.O. contact – Distribution of contact resistance

(n=50)

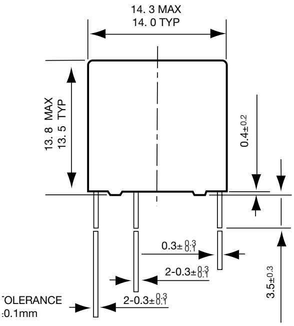


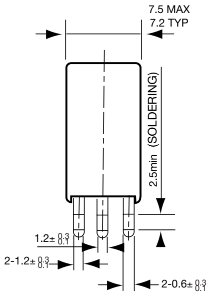
Dimensions

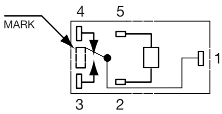




MOUNTING HOLES
(BOTTOM VIEW)



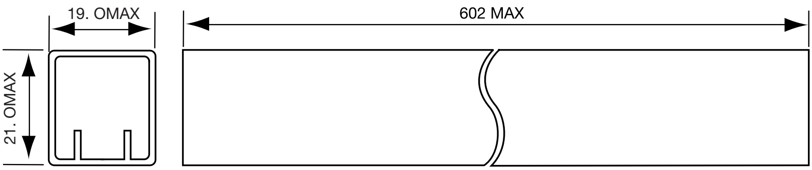




TERMINAL ARRANGEMENT/
INTERNAL CONNECTIONS
(BOTTOM VIEW)

- Omron PCB relays may be mounted in any convient location that is dry and not exposed to excessive dust, SO_2, H_2S or organic gases.
- Omron PCB relays may be oriented in any desired direction. Whenever possible, however, care should be taken that they are not subjected to vibration along the direction of contact movement.

Tube Carrier



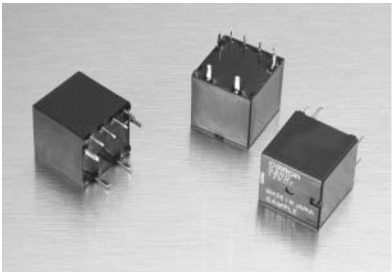
- **Remarks**

For use on any of the products, please contact your sales representative and confirm with spec sheet and actual usage condition.

We constantly endeavor to enhance the quality of our products and update our product offering; therefore, specifications and product availability are subject to change without notice.

Features

- Compact size
- High performance PCB relay
- 25A motor lock load
- Fully sealed construction
- Fully automated assembly
- DPDT (“H” Bridge) contracts
- Pre-solder as for all terminal
- PWB pattern design is easy
- ISO9001/QS9000 series approval



Specifications

Available Types

	Type
G8ND-2 12VDC	Standard
G8ND-2S 12VDC	High Sensitivity

Contact Data

Max Switching Current	30A
Rated Current	25A Motor load
Max Switching Voltage	16V
Contact Material	Silver tin alloy (Cadmium Free)

Coil Ratings

Type	Coil Resistance	Pull in Voltage
G8ND-2 12VDC	225Ω	<7.2
G8ND-2S 12VDC	180Ω	<6.5

Specifications

Temperature Range	-40 to +85°C
Mechanical Life	1,000,000 Operations
Electrical Life	100,000 Operations
Weight	7.5g

Application Examples

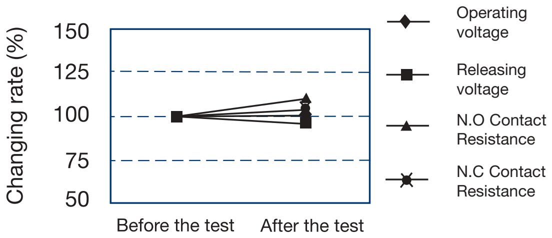
- Power windows
- Power door lock
- Seat adjustment
- Sunroof
- Wiper controls

LIFE TEST I (Power window motor: G8ND-2 12VDC)

- Test item

14VDC-24A/2.6A
130,000
Operations minimum

- Shift of pick-up drop-out voltage



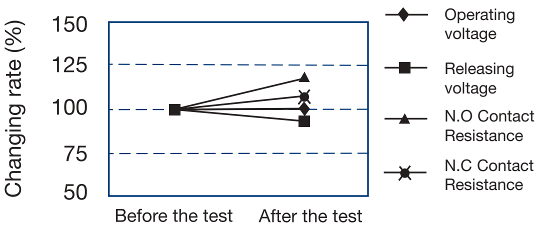
Characteristics		Specification		Before the Test	After the Test
Contact Resistance (milliohm)	N.O. Contact	100 or lower	MAX	4.20	5.62
			MIN	3.30	3.80
			AVE	3.850	4.230
	N.C. Contact	100 or lower	MAX	5.00	5.10
			MIN	3.20	4.10
			AVE	4.320	4.490
Structure		No abnormal condition		Good	Good

LIFE TEST II (Door lock motor: G8ND-2 12VDC)

- Test item

14VDC-27A
130,000
Operations minimum

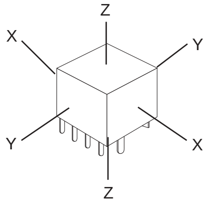
- Shift of pick-up drop-out voltage

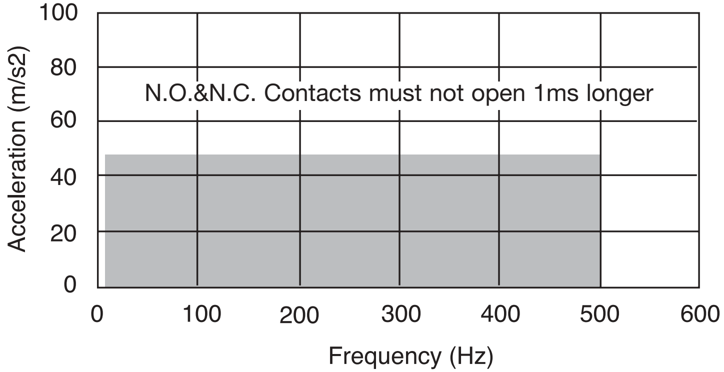


Characteristics		Specification		Before the Test	After the Test
Contact Resistance (milliohm)	N.O. Contact	100 or lower	MAX	4.20	5.60
			MIN	3.50	3.60
			AVE	3.669	4.290
	N.C. Contact	100 or lower	MAX	4.30	5.90
			MIN	3.90	4.10
			AVE	4.120	4.360
Structure		No abnormal condition		Good	Good

VIBRATION RESISTANCE CHARACTERISTICS

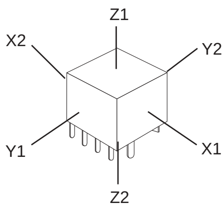
- Test condition
  Frequency: 10Hz-500Hz-10Hz
  Acceleration: 45m/s2
  Direction of vibration: see right diagram
  Detection level: Contacts must not open 1ms or longer

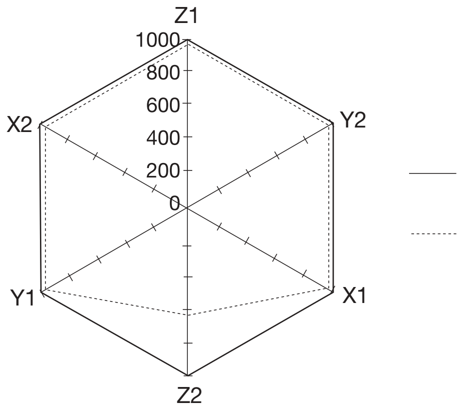




SHOCK RESISTANCE CHARACTERISTICS

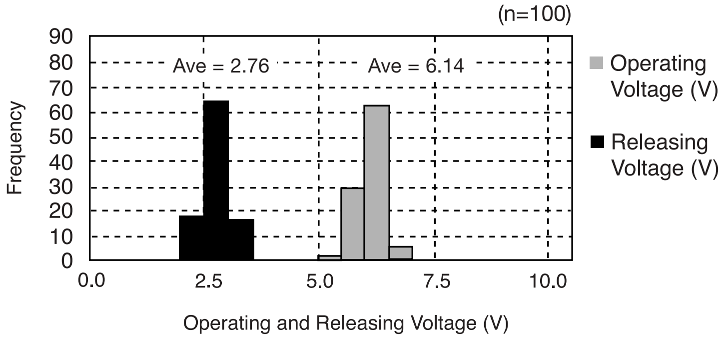
- Test condition
  Shock application time: 11ms, half-sine wave
  Shock direction: see right diagram
  Detection level: Contacts must not open 1ms or longer



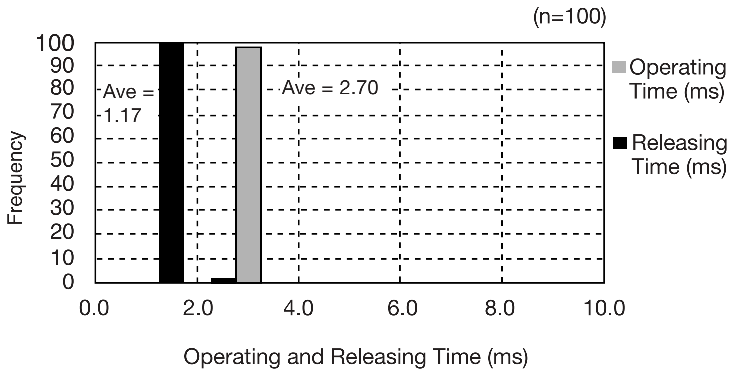


REFERENCE DATA (G8ND-2 12VDC)

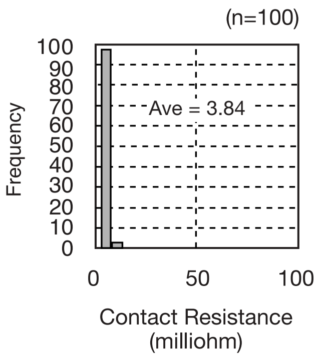
Distribution of operating voltage and releasing voltage



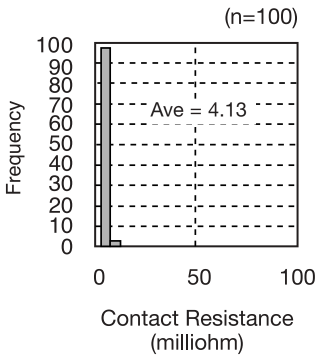
Distribution of operating time



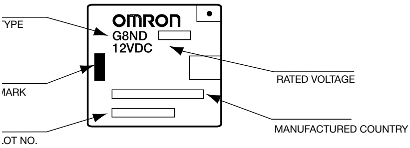
N.O. contact – Distribution of contact resistance

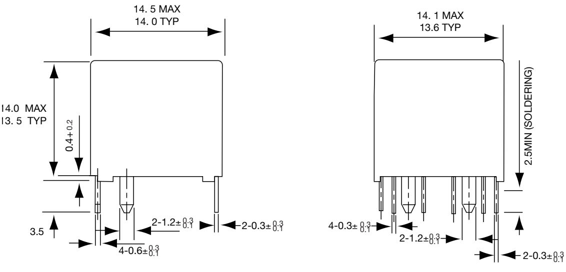


N.C. contact – Distribution of contact resistance

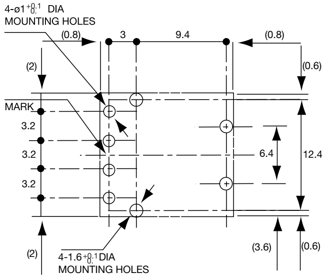


Dimensions

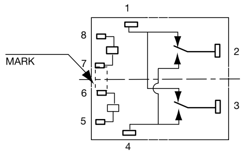




TOLERANCE: ±0.1mm



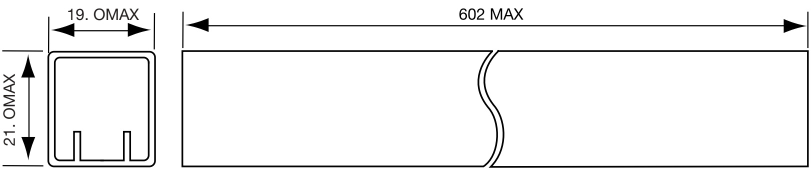
MOUNTING HOLES
(BOTTOM VIEW)



TERMINAL ARRANGEMENT/
INTERNAL CONNECTIONS
(BOTTOM VIEW)

- Omron PCB relays may be mounted in any convient location that is dry and not exposed to excessive dust, $S0_2$, H_2S or organic gases.
- Omron PCB relays may be oriented in any desired direction. Whenever possible, however, care should be taken that they are not subjected to vibration along the direction of contact movement.

Tube Carrier



- **Remarks**

For use on any of the products, please contact your sales representative and confirm with spec sheet and actual usage condition.

We constantly endeavor to enhance the quality of our products and update our product offering; therefore, specifications and product availability are subject to change without notice.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Features

- Compact size
- High performance PCB relay
- 25A motor lock load
- Fully sealed construction
- Fully automated assembly
- DPDT (separate) contacts
- Pre-solder as for all terminal
- ISO9001/QS9000 series approval

Specifications

Available Types

G8NW-2 12VDC	Standard
G8NW-2S 12VDC	High Sensitivity
G8NW-2L 12VDC	High Temperature (105°C)
G8NW-2H 12VDC	High Temper

Contact Data

Max Switching Current	30A
Rated Current	25A Motor load
Max Switching Voltage	16V
Contact Material	Silver tin alloy (Cadmium Free)

Coil Ratings

Type	Coil Resistance	Pull in Voltage
G8NW-2 12VDC	225Ω	<7.2
G8NW-2S 12VDC	180Ω	<6.5
G8NW-2L 12VDC	225Ω	<7.2
G8NW-2H 12VDC	180Ω	<6.5

Specifications

Temperature Range	-40 to +85°C (-2L, -2H: -40 to +105°C)
Mechanical Life	1,000,000 Operations
Electrical Life	100,000 Operations
Weight	7.8g

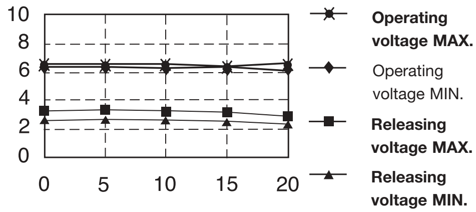
Application Examples

- Power windows
- Power door lock
- Seat adjustment
- Sunroof
- Wiper controls

■ LIFE TEST I (Power window motor: G8NW-2 12VDC)

- **Test item**
  14VDC-26A
  Motor Lock 200,000
  Operations minimum

- **Shift of pick-up drop-out voltage**

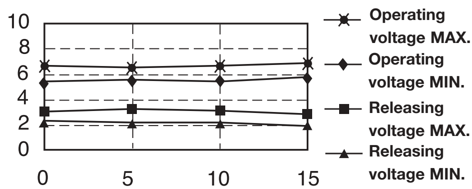


Characteristics		Specification		Before the test	After the test
Contact Resistance	N.O. Contact	100(mΩ) or lower	MAX.	4.1	7.2
			MIN.	2.8	3.5
			AVE.	3.36	5.00
	N.C. Contact	100(mΩ) or lower	MAX.	5.6	11.8
			MIN.	3.9	5.0
			AVE.	4.44	8.00
Insulation Resistance		100(mΩ) or higher		More than 1000	More than 1000
Structure		No abnormal condition		Good	Good

■ LIFE TEST II (Power window motor: G8NW-2 12VDC)

- **Test item**
  16VDC-22A
  200,000
  Operations minimum

- **Shift of pick-up drop-out voltage**



Characteristics		Specification		Before the test	After the test
Contact Resistance	N.O. Contact	100(mΩ) or lower	MAX.	4.7	6.8
			MIN.	3.2	3.5
			AVE.	3.89	4.50
	N.C. Contact	100(mΩ) or lower	MAX.	5.3	7.2
			MIN.	3.7	4.0
			AVE.	4.46	6.20
Insulation Resistance		100(mΩ) or higher		More than 1000	More than 1000
Structure		No abnormal condition		Good	Good

VIBRATION RESISTANCE CHARACTERISTICS

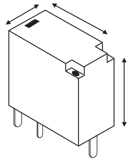
Test condition:

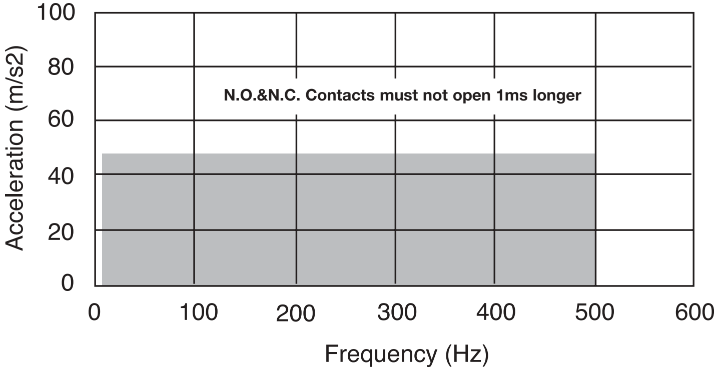
Frequency: 10Hz-500Hz-10Hz

Acceleration: 43.1m/s^2

Direction of vibration:see right diagram

Detection level: Contacts must not open 1ms or longer





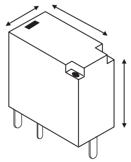
SHOCK RESISTANCE CHARACTERISTICS

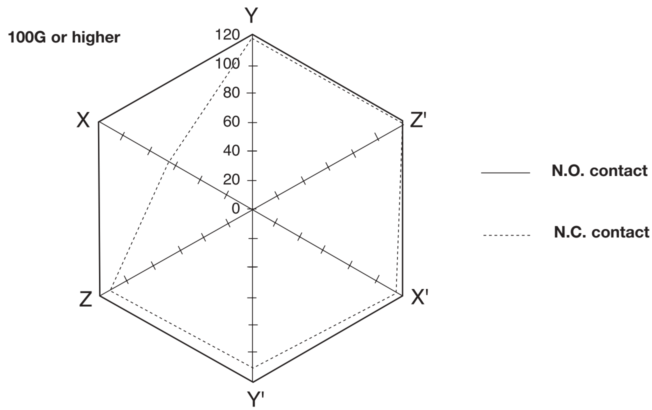
Test condition:

Shock acceleration: 11ms, half-sine wave

Shock direction: see right diagram

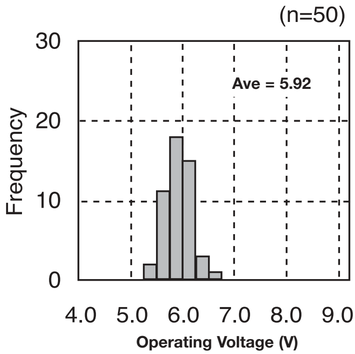
Detection level: Contacts must not open 1ms or longer



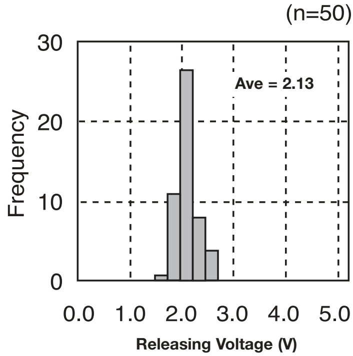


■ Reference Data (G8NW-2 12VDC)

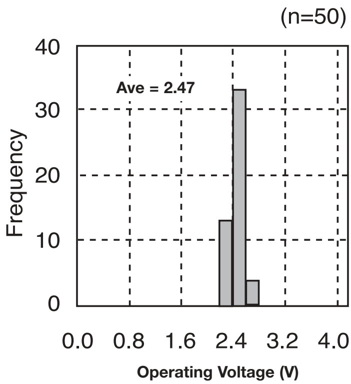
Distribution of operating voltage



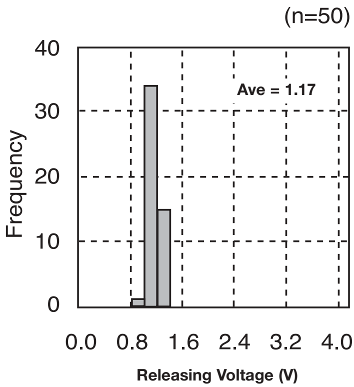
Distribution of releasing voltage



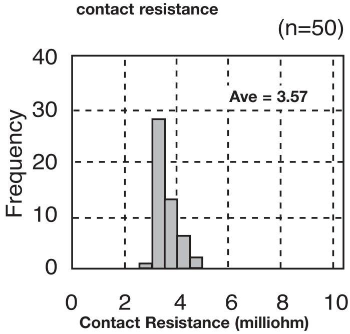
Distribution of operating voltage



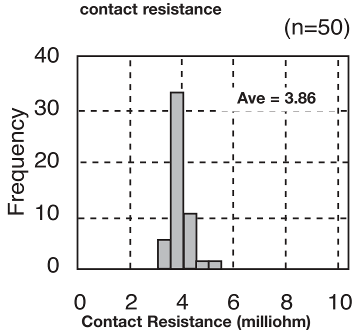
Distribution of releasing voltage



N.O. contact – Distribution of contact resistance

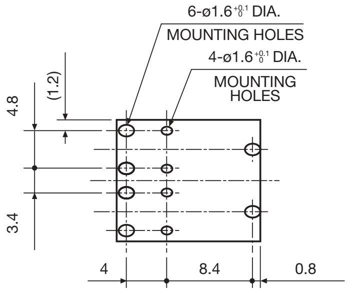


N.O. contact – Distribution of contact resistance

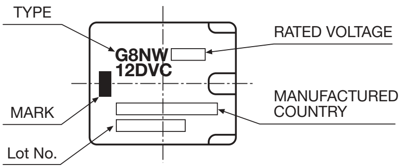


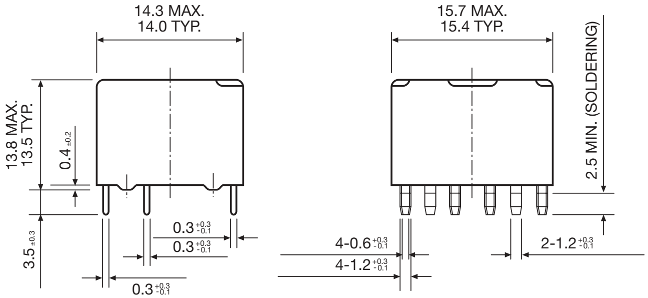
Dimensions

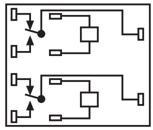
Tolerances: ±0.1mm



MOUNTING HOLES
(Bottom View)



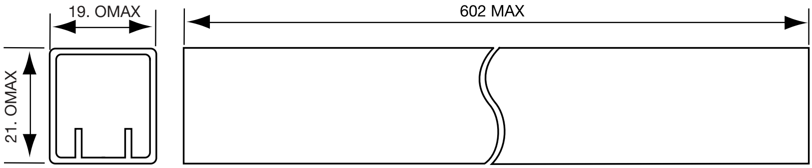




TERMINAL ARRANGEMENT/
INTERNAL CONNECTIONS
(Bottom View)

- Omron PCB relays may be mounted in any convient location that is dry and not exposed to excessive dust, S02, H2S or organic gases.
- Omron PCB relays may be oriented in any desired direction. Whenever possible, however, care should be taken that they are not subjected to vibration along the direction of contact movement.

■ Tube Carrier



• Remarks

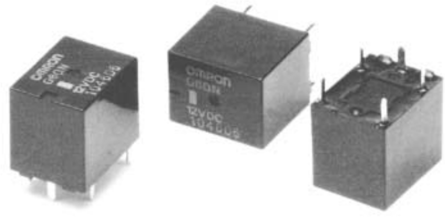
For use on any of the products, please contact your sales representative and confirm with spec sheet and actual usage condition.

We constantly endeavour to enhance the quality of our products and update our product offering; therefore, specifications and product availability are subject to change without notice.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Features

- Compact size
- High performance PCB relay
- Fully sealed construction
- Next generation general purpose automotive PCB relay
- Fully automated assembly



Specifications

Available Types

Type	Contact Form	Recommended Loads
G8QN-1C4 12DC	SPDT	Motor, Resistive

Contact Type

Continuous carry current (max.)	5A
Inrush current (L/R=7ms; 15ms max.)	20A
Contact voltage drop (Initial value at 23°C) (max.)	100mΩ

Ratings/Specifications

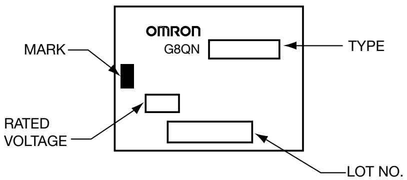
Rated voltage		12VDC
Operating voltage (max)		16VDC
Coil Resistance		210Ω ± 10%
Pull in voltage (cold start)	**at +20°C (max)**	7.3VDC
	at +80°C (max)	9.0VDC
Drop±out voltage at +20°C (min)		0.9VDC
Max. Continuous carry current flow time (16V at 80°C) (max.)		15 min
Operating time (max)		10 ms
Release time (max)		5 ms
Operating ambient temperature		-40°C to +85°C
Mechanical life (min)		10,000,000 cycles (at frequency of 18,000 operations/hour)
Electrical life (resistive load) (min)		100,000 cycles (14V; Continuous carry current)
Weight		5.5g

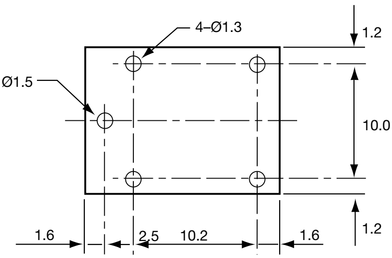
Application Examples

- Power window
- Electric sunroof
- Intermittent Windshield wiper
- Power door lock
- Power seat
- Electric wing mirror
- Power radio aerial
- Washer pump

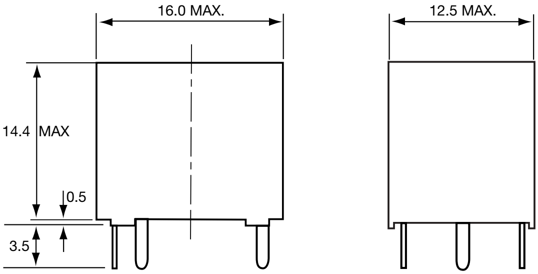
Dimensions

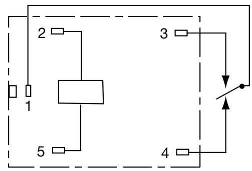
(All dimensions in mm.)





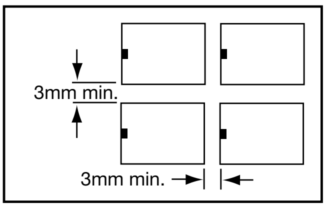
MOUNTING HOLES
(BOTTOM VIEW)





TERMINAL ARRANGEMENT/
INTERNAL CONNECTIONS
(BOTTOM VIEW)

- Omron PCB relays may be mounted in any convenient location that is dry and not exposed to excessive dust, $S0_2$, H_2S or organic gases.
- Omron PCB relays may be oriented in any desired direction. Whenever possible, however, care should be taken that they are not subjected to vibration along the direction of contact movement.
- If several relays are to be mounted on a single printed circuit board, they should be given at least 3mm clearance on all sides as shown in the diagram below.

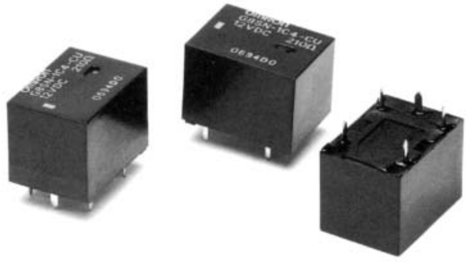


Note: Proper spacing is neccessary to dissapate heat build-up from individual relays. Other than this, there are normally no restrictions depending on application. Please contact Omron for details.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Features

- General purpose automotive PCB relay
- Compact size
- Fully sealed construction
- Fully automated process



Specifications

■ Available Types

Type	Contact Form	Note
G8SN-1C7-CUK 12DC (320Ω)	SPDT	Motor, Resistive
G8SN-1C4-CU 12DC (210Ω)	SPDT	Lamp, Capacitive

■ Contact Type

Continuous carry current (max.)	10A
Inrush current (L/R=7ms; 15ms max.)	30A
Contact voltage drop (Initial value)	100 mV

■ Ratings/Specifications

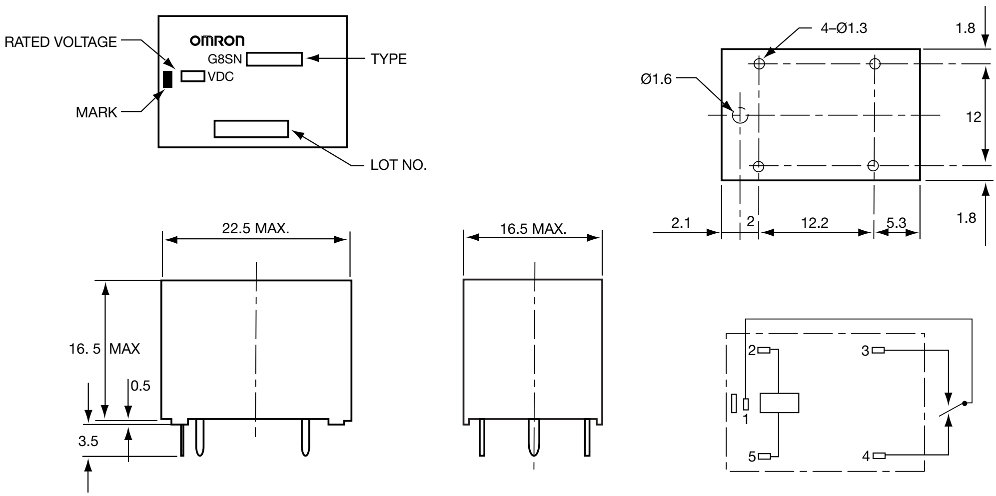
Rated voltage		12VDC	
Operating voltage (max)		16VDC	
Coil Resistance		320Ω	210Ω
Pull in voltage (cold start)	**at +20°C (max)**	7.3VDC	6.5VDC
	at +80°C (max)	9.0VDC	8.0VDC
Drop-out voltage at +20°C (min)		1.0VDC	0.9VDC
Max. Continuous carry current flow time (16VDC at 80°C) (max.)		Unlimited	15 min.
Operating time (max)		10 ms	
Release time (max)		5 ms	
Operating ambient temperature		-40°C to +85°C	
Mechanical life (min)		10,000,000 cycles (at frequency of 18,000 operations/hour)	
Electrical life (resistive load) (min)		100,000 cycles (14V; Continuous carry current)	
Weight		13g	

Application Examples

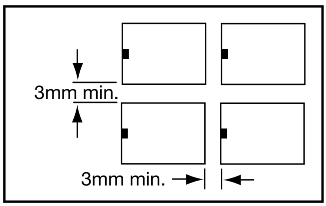
- Electric wing mirror
- Car audio
- Power radio aerial
- Air-conditioning
- Courtesy lamp
- Power window
- Electric sunroof
- Intermittent windshield wiper
- Passive restraint seatbelt
- Power door lock
- Power seat

Dimensions

(All dimensions in mm.)



- Omron PCB relays may be mounted in any convenient location that is dry and not exposed to excessive dust, SO_2, H_2S or organic gases.
- All Omron PCB relays may be oriented in any desired direction. Whenever possible, however, care should be taken that they are not subjected to vibration along the direction of contact movement.
- If several relays are mounted on a single printed circuit board, they should be given at least 3mm clearance on all sides as shown in the diagram below.

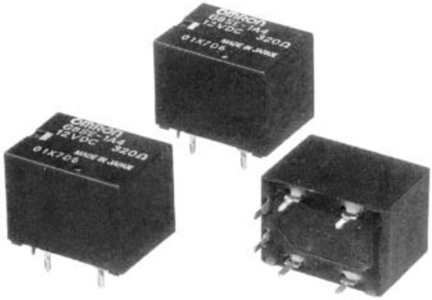


Note: Proper spacing is necessary to dissipate heat build-up from individual relays. Other than this, there are normally no restrictions depending on application. Please contact Omron for details.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Features

- High capacity PCB relay (40A at 20°C)
- Wide range usage
- SPST and SPDT arrangements.



Specifications

Available Types

Type	Contact Form	Recommended Loads
G8SE-1A4-SK 12DC (320Ω)	SPST	Motor, Resistive

Contact Type

Continuous carry current (max.)	20A
Inrush current (L/R = 7ms; 15ms max.)	60A
Contact value drop (Initial value)	50 mΩ

Ratings/Specifications

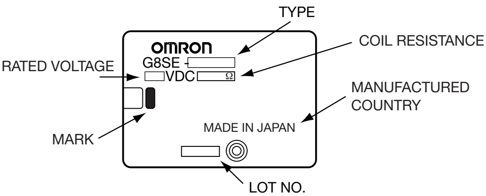
Rated voltage	12VDC
Operating voltage (max)	16VDC
Coil Resistance	320Ω
Pull in voltage (cold start) at 20°C (max)	7.3VDC
Drop-out voltage at +20°C (min)	1.2VDC
Max. Continuous carry current flow time (16VDC at 80°C max.)	Unlimited
Operate time (max)	10 ms
Release time (max)	5 ms
Operating ambient temperature	-40°C to +110°C
Mechanical life (min)	10,000,000 cycles (at frequency of 18,000 operations/hour)
Electrical life (resistive load) (max)	100,000 cycles
Weight	16.0g

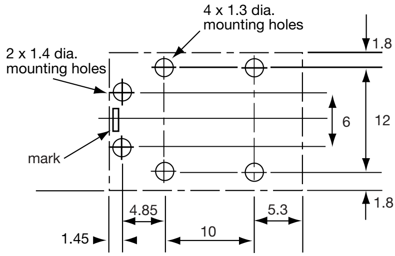
Application Examples

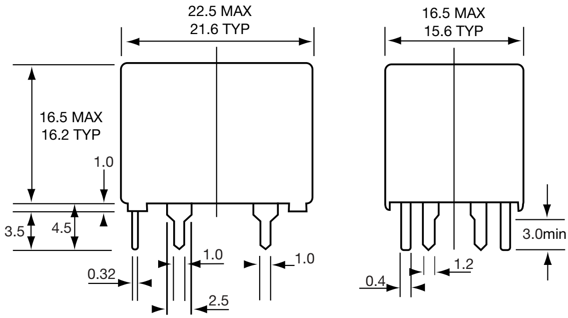
- Electric wing mirror
- Car audio
- Power radio aerial
- Air-conditioning
- Courtesy lamp
- Power window
- Electric sunroof
- Intermittent windshield wiper
- Passive restraint seatbelt
- Power door lock
- Power seat

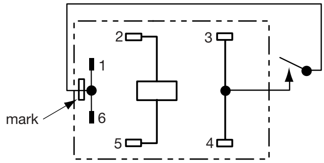
Dimensions

(All dimensions in mm.)

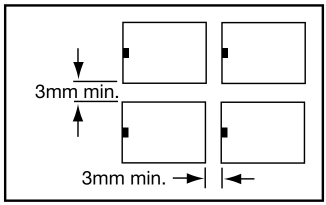








- Omron PCB relays may be mounted in any convenient location that is dry and not exposed to excessive dust, $S0_2$, H_2S or organic gases.
- Omron PCB relays may be oriented in any desired direction. Whenever possible, however, care should be taken that they are not subjected to vibration along the direction of contact movement.
- If several relays are to be mounted on a single printed circuit board, they should be given at least 3mm clearance on all sides as shown in the diagram below.



Note: Proper spacing is neccessary to dissapate heat build-up from individual relays. Other than this, there are normally no restrictions depending on application. Please contact Omron for details.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Features

- General purpose automotive PCB relay.
- High capacity relay.
- High heat resistance.

Application Examples

For Blower fan, defogger and power supply

Specifications

Available Types

Type	Package	Style
G8PE-1A4 (DC12V)	Sealed type	SPST Standard
G8PE-1C4 (DC12V)	Sealed type	SPDT Standard
G8PE-1A4-U (DC12V)	Sealed type	SPST High sensitivity
G8PE-1C4-U (DC12V)	Sealed type	SPDT High sensitivity

Contact Data

Arrangement	SPST, SPDT
Contact material	Silver tin oxide (cadmium free)
Contact resistance	Max. 5m Ω (Initial) Max.10m Ω (After end of life)

Characteristics	Measurement condition	Contact side	Value	Units
Maximum switching current (On)	At +20 °C	NO NC	180 60	A A
Maximum switching current (Off)	At +20 °C	NO NC	60 30	A A
Maximum rated current	At +20 °C	NO NC	40 25	A A
	At +20 °C	NO NC	30 20	A A

Coil Data

Part Number	G8PE-1A4	G8PE-1C4	G8PE-1A4-U	G8PE-1C4-U
	12 VDC	12 VDC	12VDC	12VDC
Rated coil resistance at 20°C	135+/-10%Ω	135+/-10%Ω	100+/-10%Ω	100+/-10%Ω
Maximum coil temperature	180 °C at 20,000h	180 °C at 20,000h	180 °C at 20,000h	180 °C at 20,000h

Characteristics

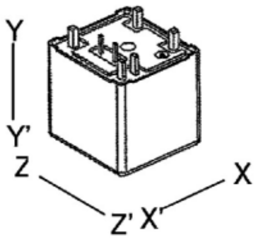
Par Number		G8PE-1A4	G8PE-1C4	G8PE-1A4-U	G8PE-1C4-U
		12 VDC	12 VDC	12 VDC	12 VDC
Pick-up voltage at 20°C		6.8 V	6.8 V	6.0 V	6.0 V
Dropout voltage at 20°C		1.0 V	1.0 V	0.85 V	0.85 V
Operation time		10ms max.			
Release time		10ms max.			
Insulation resistance		10MΩ min (at 500 VDC)			
Dielectric strength		500 VAC, 50 / 60 Hz for 1 minute between coil and contacts 500 VAC, 50 / 60 Hz for 1 minute between contacts of different poles			
Vibration	**Mechanical durability**	5 to 400 Hz, 44.1m/s² mm double amplitude			
	Malfunction durability	5 to 100 Hz,44.1m/s²			
Shock	**Mechanical durability**	1000 m/s²min			
	Malfunction durability	100 m/s²min			
Ambient temperature		-40 to 105° C			
Humidity		35 to 85% RH			
Service Life	**Mechanical**	1,000,000 operations (Frequency: 18,000operations/hour)			
	Electrical	100,000 operations			
Weight		Approx. max. 20 g			

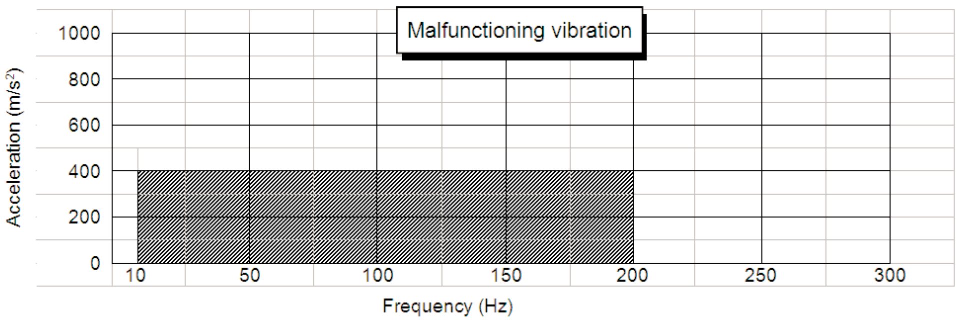
Engineering Data

Malfunctioning Vibration

TEST CONDITION

Frequency: 10Hz-200Hz-10Hz
Acceleration: 392m/s2
Direction of vibration: See right diagram
Detection level: Contacts must not open 1ms or longer





■ Malfunctioning Shock

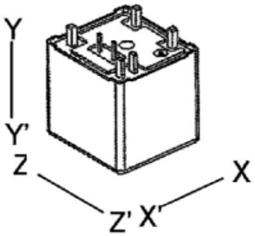
Test Condition

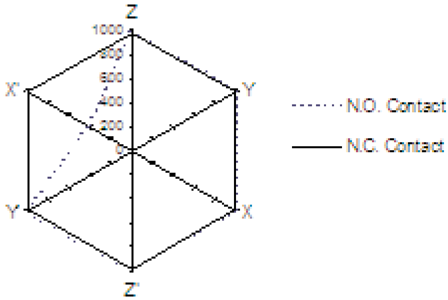
Shock acceleration 1000 m/s²

Detection level: Non operational error of 10µ s min.

N.O. Contact: must not open with rated coil voltage

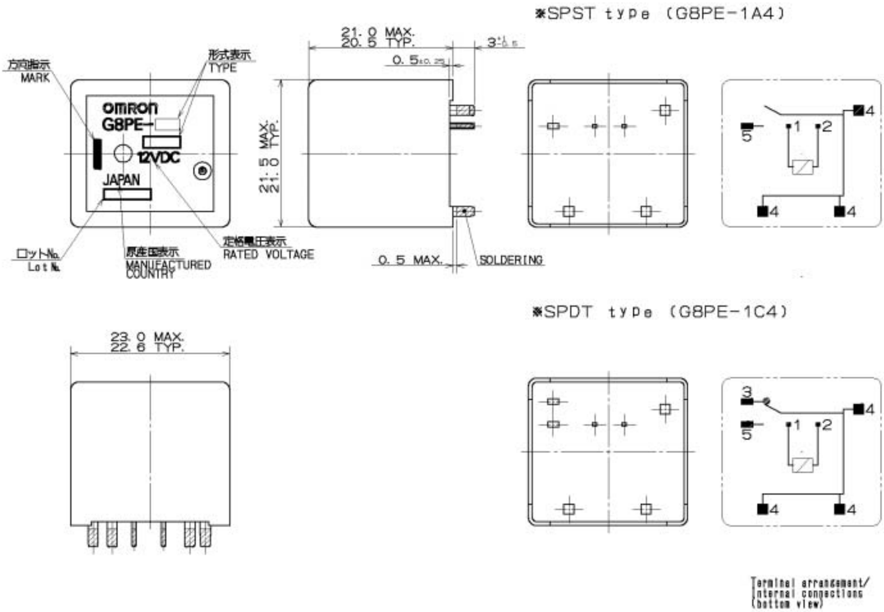
N.C. Contact: must not open without energising





Dimensions

Note: All units are in millimeters unless otherwise indicated.
All tolerance are ±0.1 mm unless otherwise stated.



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Features

- DC 24V specification.
- High capacity specification (35A).
- Covered MINI ISO by high capacity type.
- Achieve low heat generation and improve connection confidence to the connector.
- SPST and SPDT arrangements.

Specifications

Type

Part Number		Contact Type
Unsealed	Sealed	
G8HN-1A2T-RJ/DJ (DC12V/DC24V)	G8HN-1A4T-RJ/DJ (DC12V/DC24V)	SPST Standard
G8HN-1C2T-RJ/DJ (DC12V/DC24V)	G8HN-1C4T-RJ/DJ (DC12V/DC24V)	SPDT Standard
G8HN-1A2T-RH/DH (DC12V)	G8HN-1A4T-RH/DH (DC12V)	SPST High capacity
G8HN-1C2T-RH/DH (DC12V)	G8HN-1C4T-RH/DH (DC12V)	SPDT High capacity

Contact Data

Arrangement			SPST,SPDT
Contact material			Silver tin oxide (cadmium free)
Contact voltage drop	Standard		Less than 200 mV at 20A
	High capacity		Less than 200 mV at 35A
Max. Switching Current	Standard	12VDC	N.O. side: Inrush 100A, Steady 20A N.C. side: Inrush 50A, Steady 10A
		24VDC	N.O. side: Inrush 30A, Steady 10A N.C. side: Inrush 15A, Steady 5A
	High capacity	12VDC	N.O. side : Inrush 120A, Steady 35A N.C. side : Inrush 40A, Steady 20A

■ Coil Data

With Surge Absorber Resistor

Part Number	G8HN-1A2T-RJ G8HN-1C2T-RJ		G8HN-1A2T-RH G8HN-1C2T-RH
	G8HN-1A4T-RJ G8HN-1C4T-RJ		G8HN-1A4T-RH G8HN-1C4T-RH
	12VDC	24VDC	12VDC
Rated coil resistance at 20°C	95.9+/-10%Ω	315.1+/-10%Ω	124.2+/-10%Ω
Rated coil current at 20°C	125.1mA+/-10%	76.2mA+/-10%	96.6mA+/-10%

With Surge Absorber Diode

Part Number	G8HN-1A2T-DJ G8HN-1C2T-DJ		G8HN-1A2T-DH G8HN-1C2T-DH
	G8HN-1A4T-DJ G8HN-1C4T-DJ		G8HN-1A4T-DH G8HN-1C4T-DH
	12VDC	24VDC	12VDC
Rated coil resistance at 20°C	105.0±10%Ω	340.0+/-10%Ω	140.0+/-10%Ω
Rated coil current at 20°C	114.3mA+/-10%	70.6mA+/-10%	85.7mA+/-10%

■ Characteristics

Part Number		G8HN-1A2T-DJ/RJ G8HN-1C2T-DJ/RJ		G8HN-1A2T-DH/RH G8HN-1C2T-DH/RH
		G8HN-1A4T-DJ/RJ G8HN-1C4T-DJ/RJ		G8HN-1A4T-DH/RH G8HN-1C4T-DH/RH
		12VDC	24VDC	12VDC
Pull-in voltage at 20°C		8V max.	16V max.	8.0V max.
Drop-out voltage at 20°C		1.2V min.	2.4V min.	1.2V min.
Operating time		10ms max.		
Releasing time		10ms max.		
Insulation resistance		10MΩ min (at 500 VDC)		
Dielectric strength		500VAC, 50 / 60 Hz for 1 minute between coil and contacts 500VAC, 50 / 60 Hz for 1 minute between contacts of different polarity 500VAC, 50 / 60 Hz for 1 minute between contacts of same polarity		
Vibration	**Mechanical durability**	10 ~ 500 Hz, 44.1 m/s^2mm double amplitude		
	Malfunction durability	10 ~ 2,000 Hz,44.1 m/s^2		
Shock	**Mechanical durability**	100 m/s^2 min		
	Malfunction durability	1000 m/s^2 min		
Ambient temp.	**Operating/storage**	-40 to 125°C		
Humidity		5 to 85%RH		
Service life	**Mechanical**	1,000,000 operations (Frequency: 18,000 operations/hour)		
	Electrical	100,000 operations (Frequency: 1,800 operations/hour)		
Weight		Approx. 20.0g		

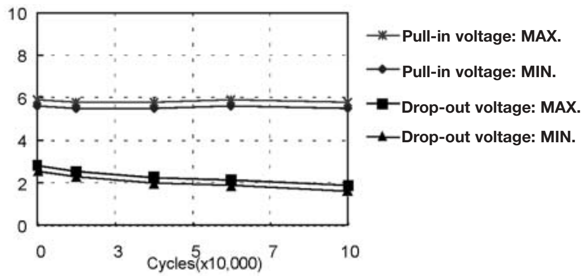
Application Example

- Head-light lamp
- Blower fan
- Defogger

LIFE TEST I (Blower motor: G8HN-1C2T-DJ 12VDC)

Test item
14VDC
Inrush 64A Steady 22A
Frequency: 1sec ON/ 4sec OFF
Cycle: 500,000

Shift of pull-in and drop-out voltage

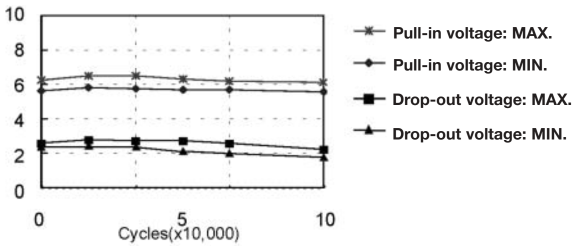


Characteristics	Specification		Before the test	After the test
N.O. Voltage drop between terminals	50mV at 20A MAX.	MAX.	37.0	65.2
		MIN.	31.0	35.1
		AVE.	33.06	45.84
Insulation Resistance	10MΩ MIN.		1000 MIN.	1000 MIN.
Structure	No abnormal condition		Good	Good

LIFE TEST II (Halogen lamp: G8HN-1C2T-DJ 12VDC

Test item
164VDC
Inrush 135A Steady 21A
Frequency: 2sec ON/ 13sec OFF
Cycle: 200,000

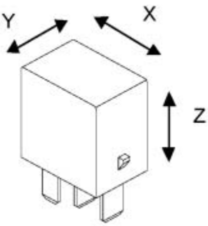
Shift of pull-in and drop-out voltage

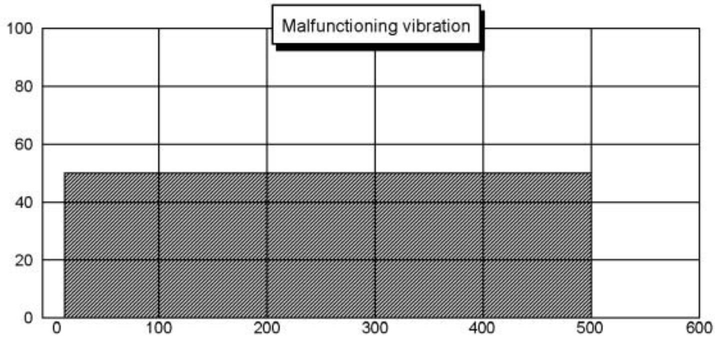


Characteristics	Specification		Before the test	After the test
N.O. Voltage drop between terminals	50mV at 20A MAX.	MAX.	34.5	54.2
		MIN.	27.5	35.7
		AVE.	32.06	44.38
Insulation Resistance	10MΩ MIN.		1000 MIN.	1000 MIN.
Structure	No abnormal condition		Good	Good

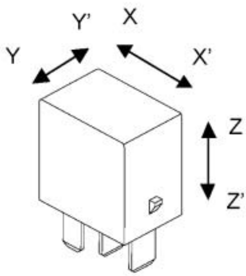
Engineering Data

Malfunctioning vibration
Test condition
Frequency: 10Hz-500Hz-10Hz
Acceleration: 43.1m/s^2
Direction of vibration: see right diagram
Detection level: Contacts must not open 1ms or longer

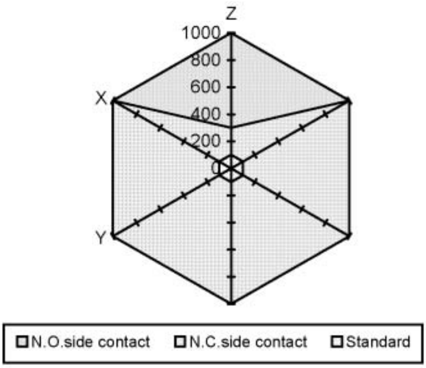




Malfunctioning Shock
Test condition
Shock acceleration: 100m/s^2 to 1000 m/s^2
Detection level: Contact must not open 1ms or more with 100m/s^2
N.O. Contact – must not open with rated coil voltage
N.C. Contact – must not open without energizing



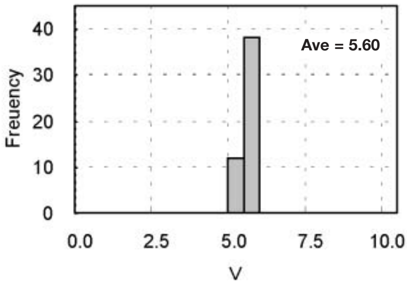
MALFUNCTIONING SHOCK



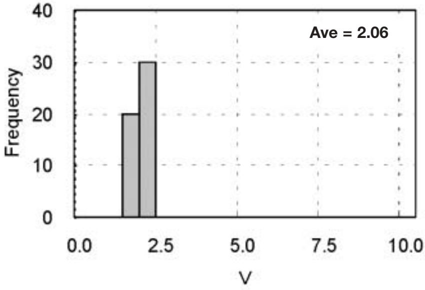
General Characteristic Data

Sample: G8HN-1C2T-DJ 50pcs.

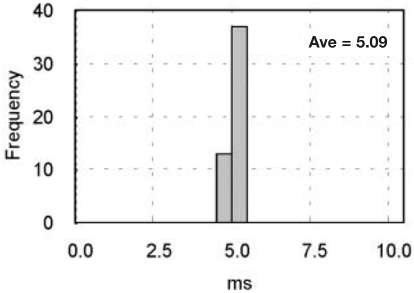
Distribution of pull-in voltage



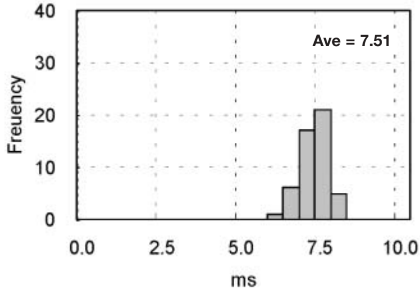
Distribution of drop-out voltage



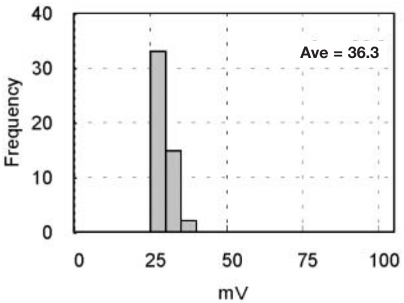
Distribution of operating time



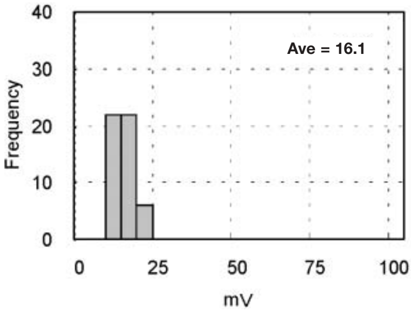
Distribution of releasing time



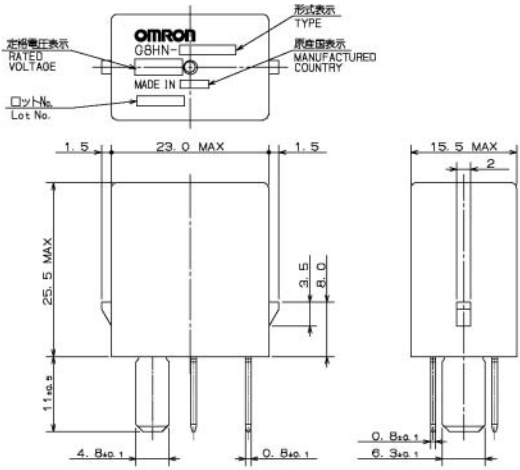
Distribution of N.O. voltage drop between terminals

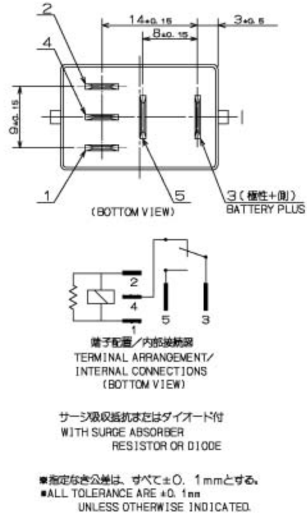


Distribution of N.C. voltage drop between terminals



Dimensions





ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Features

- Low height PCB relay based on Micro ISO
- Height: MAX 17mm
- Environment-friendly by light weight and space saving
- Low heat generation and high capacity switching
- Fully sealed construction
- SPST contacts
- All terminals pre-soldered
- ISO9001/QS9000 series approval

Available Types

Part Number	Contact Form
G8HL-1A4P 12VDC	Standard

Contact Data

Max Switching Current	Inrush 100A Steady 20A
Rated Current	20A
Max Switching Voltage	16VDC
Contact Material	Silver tin alloy (Cadmium Free)

Characteristics

Type		G8HL-1A4P
Rated coil resistance at 20°C		135ohm ± 10%
Rated coil current at 20°C		88.9mA
Pull-in voltage at 20°C		7.0V MAX.
Drop-out voltage at 20°C		0.7 to 4.0V
Operating time		10ms max.
Releasing time		10ms max.
Insulation resistance		10MΩ min (at 500 VDC)
Dielectric strength		500VAC, 50 / 60 Hz for 1 minute between coil and contacts 500VAC, 50 / 60 Hz for 1 minute between contacts of different polarity 500VAC, 50 / 60 Hzfor 1 minute between contacts of same polarity
Vibration	**Mechanical durability**	20~500 Hz, 45m/s^2 mm
	Malfunction durability	20~500 Hz, 45m/s^2 mm
Shock	**Mechanical durability**	1000 m/s^2 min
	Malfunction durability	100 m/s^2 min
Ambient temp.	**Operating/storage**	-40 to 100°C
Humidity		5 to 85%RH
Service life	**Mechanical**	1,000,000 operations
	Electrical	100,000 operations
Weight		Approx. 13.0g

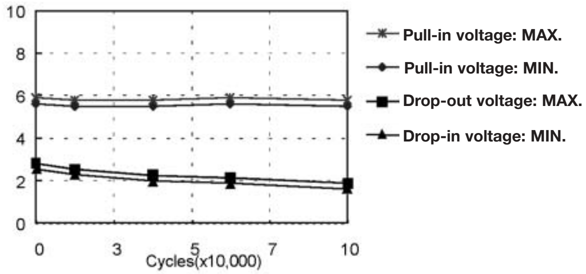
Application Example

- Head light lamp
- Blower fan
- Defogger
- Electrical power steering assist system

■ LIFE TEST I (Head Lamp 240W)

Test item
14VDC
In-rush current 120A,Rated current 20A
Frequency; 1sec ON/29s OFF
Cycle; 100,000

Shift of pull-in and drop-out voltage

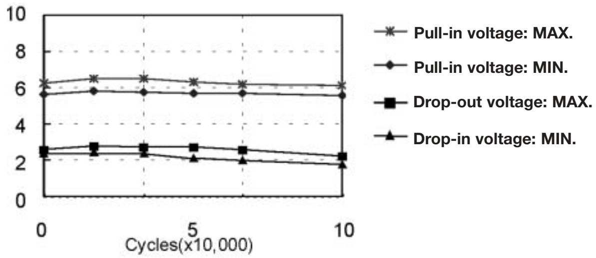


Characteristics	Specification		Before the test	After the test
Voltage Drop (mV) at 20 A	200 Max.	MAX.	40	48
		MIN.	24	30
		AVE.	30.0	36
Insulation Resistance (Mega ohm)	10 Min.		More than 1000	More than 1000
Structure	No abnormal condition		Good	Good

■ LIFE TEST I (Head Lamp 240W)

Test item
14VDC
Frequency; 1sec ON/5s OFF
Cycle; 100,000

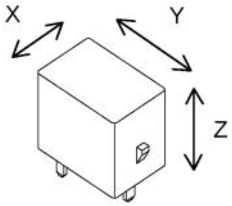
Shift of pull-in and drop-out voltage



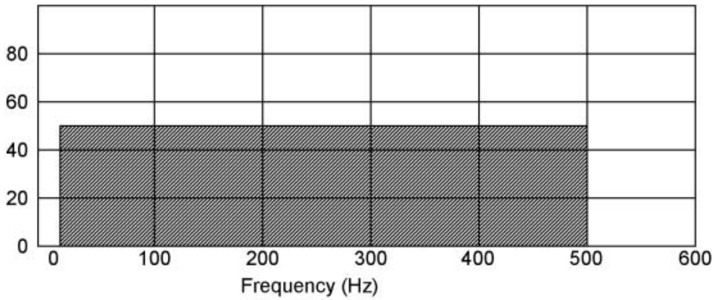
Characteristics	Specification		Before the test	After the test
Voltage Drop (mV) at 20 A	200 Max.	MAX.	24	44
		MIN.	18	29
		AVE.	20.0	38
Insulation Resistance (Mega ohm)	10 Min.		More than 1000	More than 1000
Structure	No abnormal condition		Good	Good

Engineering Data

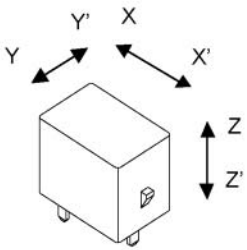
Malfunctioning vibration
Test condition
Frequency: 10Hz-500Hz-10Hz
Acceleration: 43.1m/s^2
Direction of vibration: see right diagram
Detection level: Contacts must not open 1ms or longer



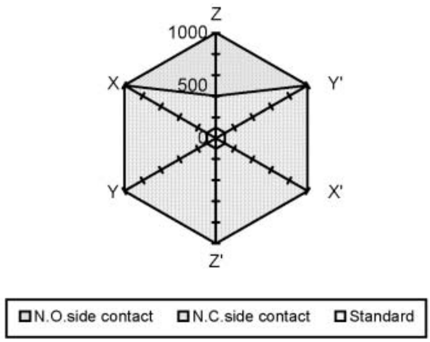
MALFUNCTIONING VIBRATION



Malfunctioning Shock
Test condition
Shock acceleration: 100m/s^2 to 1000 m/s^2
Detection level: Contact must not open 1ms or more with 100m/s^2
N.O. Contact – must not open with rated coil voltage
N.C. Contact – must not open without energizing

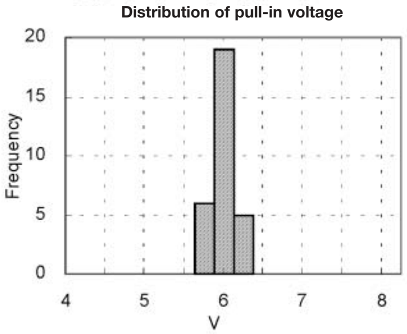


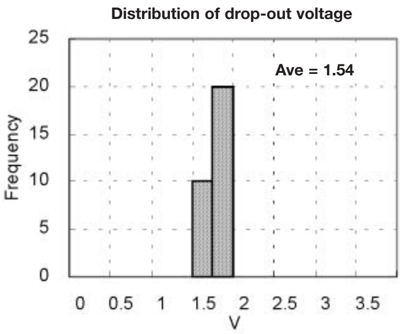
MALFUNCTIONING SHOCK

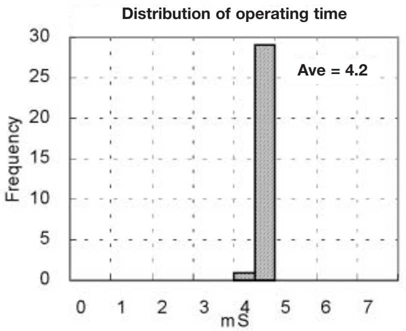


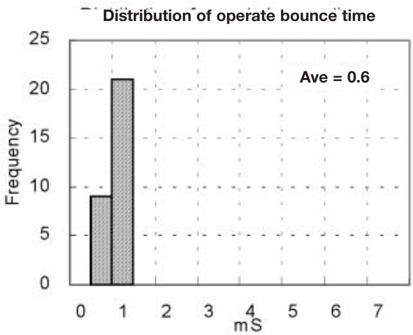
General Characteristic Data

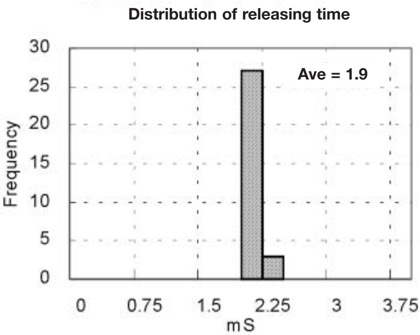
Sample: G8HL-1A4P 50pcs.

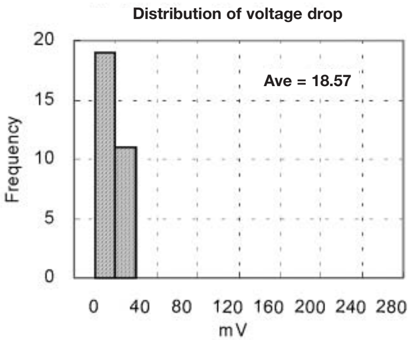




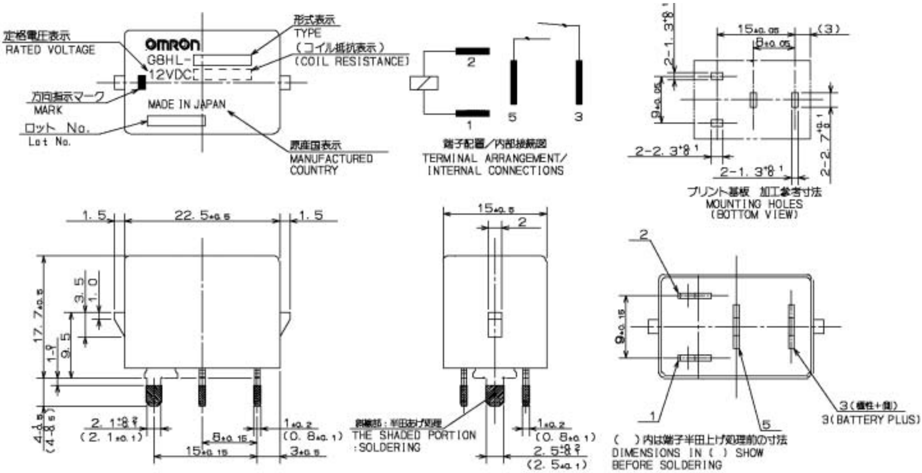








Dimensions



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Features

- General purpose automotive relay.
- Wide temperature range -40°C to +125°C.
- Standard ISO terminal foot print.
- Handle heavy automotive load:
  Inrush current 100A
- High current path fully welded – Reduces heat build up at full load.
- Made in North America.

Available Types

Type	Contact Form	Note
G8JN 1C7T R 12DC	SPDT	With Supression Resistor
G8JN 1C7T D 12DC	SPDT	With Supression Diode
G8JN 1C7T MF R 12DC	SPDT	With Mounting Bracket and Resistor
G8JN 1C7T F R 12DC	SPDT	Weatherproof with Resistor

Contact Data

Resistive load (max.)	35A(NO)/20A(NC)
Inrush current (max.)	100A
Contact resistance	5 m Ohm

Ratings/Specifications

Rated voltage		12VDC
Operating voltage (max)		16VDC
Coil Resistance		72Ω± 15%
Pull in voltage (cold start)	**at +23°C (max)**	8.0 VDC
	at +125°C (max)	11.0 VDC
Drop-out voltage at +23°C (min)		1.0 VDC
Duty cycle at rated load (16V at 80°C)		Up to 100%
Operate time (at 23°C)(max)		10 ms
Release time (at 23°C)(max)		4.0 ms
Operating ambient temperature		-40°C to +125°C
Mechanical life (min)		1,000,000 cycles
Electrical life (resistive load) (min)		100,000 cycles
Weight		40g

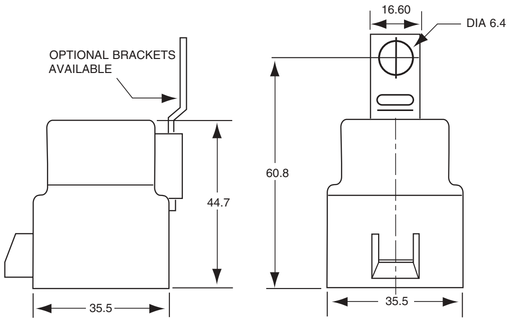
Application Examples

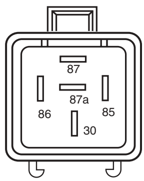
- Heated rear window
- ABS
- Head lamp
- Cooling fan
- HVAC blower motor
- Compressor coil
- Fuel pump
- Starter solenoid
- Horn

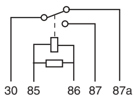
Dimensions

(All dimensions in mm.)

WEATHERPROOF

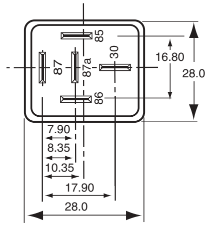


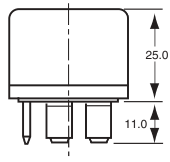




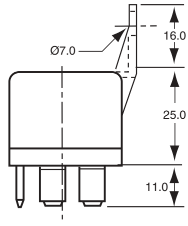
CIRCUIT DIAGRAM

STANDARD





STANDARD PACKAGE



BRACKET COVER OPTIONAL

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Features

- Special purpose high power automotive relay. (70 Amp)
- Wide temperature range -40°C to +135°C.
- High current path fully welded – Reduces heat built up at full load.
- Insert moulded terminals – mechanical stability.
- Standard ISO terminal foot print.
- Made in North America.

Available Types

Type	Contact Form	Note
G8JR 1A7T R 12DC	SPST	With Supression Resistor
G8JR 1A5T R 12DC	SPST	Mounting Bracket with Resistor

Contact Data

Resistive load (max.)	70A
Inrush current (max.)	150A
Contact resistance	5 m Ohm

Ratings/Specifications

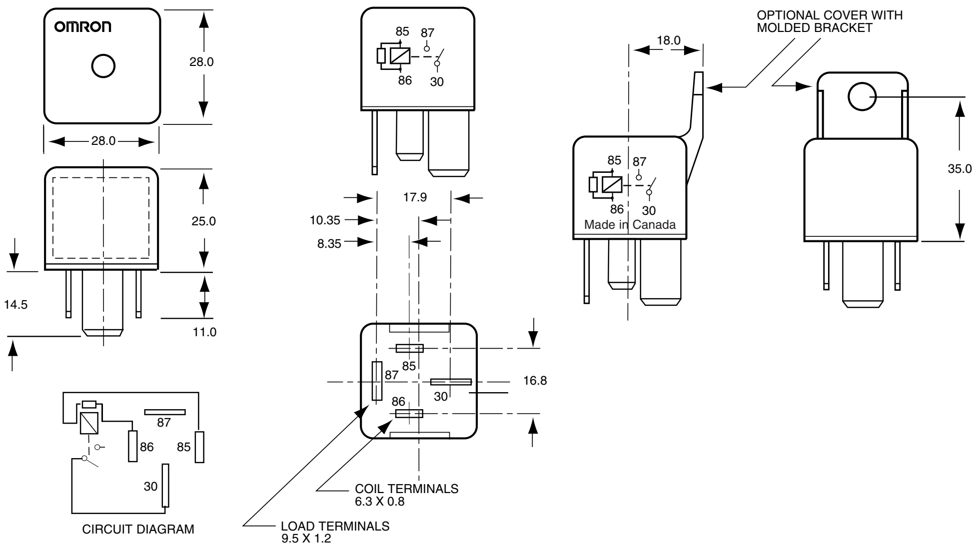
Rated voltage		12VDC
Operating voltage (max)		16VDC
Coil Resistance		65 Ohm ± 15%
Pull in voltage	**at +23°C (max)**	9.0 VDC
	at +125°C (max)	11.0 VDC
Drop-out voltage at +23°C (min)		1.0 VDC
Duty cycle at rated load (16VDC at 25°C)		100%
Operate time (at 23°C)(max)		8.0 ms
Release time (at 23°C)(max)		4.0 ms
Operating ambient temperature		-40°C to +135°C
Mechanical life (min)		1,000,000 cycles
Electrical life (resistive load) (min)		100,000 cycles
Weight		40g

Application Examples

- Engine cooling fan(s)
- Starter motor
- Glow plug

Dimensions

(All dimensions in mm.)



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Glossary

Terms		Meaning
Circuit functions	**Photocoupler Photoctriac coupler**	Transfers the input signal and insulates inputs and outputs as well.
	Zero cross circuit	A circuit which starts operation with the AC load voltage at close to zero-phase.
	Trigger circuit	A circuit for controlling the triac trigger signal, which turns the load current ON and OFF.
	Snubber circuit	A circuit consisting of a resistor R and capacitor C, which prevents faulty ignition from occurring in the SSR triac by suppressing a sudden rise in the voltage applied to the triac.
Input	**Input impedance**	The impedance of the input circuit and the resistance of current-limiting resistors used. Impedance varies with the input signal voltage in case of the constant current input method.
	Operating voltage	Minimum input voltage when the output status changes from OFF to ON.
	Reset voltage	Maximum input voltage when the output status changes from ON to OFF.
	Operating voltage	The permissible voltage range within which the voltage of an input signal voltage may fluctuate.
	Rated voltage	The voltage that serves as the standard value of an input signal voltage.
	Input current	The current value when the rated voltage is applied.
Output	**Leakage current**	The effective value of the current that can flow into the output terminals when a specified load voltage is applied to the SSR with the output turned OFF.
	Load voltage	The effective supply voltage at which the SSR can be continuously energized with the output terminals connected to a load and power supply in series.
	Maximum load current	The effective value of the maximum current that can continuously flow into the output terminals under specified cooling conditions (i.e., the size, materials, thickness of the heat sink, and an ambient temperature radiating condition).
	Minimum load current	The minimum load current at which the SSR can operate normally.
	Output ON voltage drop	The effective value of the AC voltage that appears across the output terminals when the maximum load current flows through the SSR under specified cooling conditions (such as the size, material, and thickness of heat sink, ambient temperature radiation conditions, etc.)
Characteristics	**Dielectric strength**	The effective AC voltage that the SSR can withstand when it is applied between the input terminals and output terminals or I/O terminals and metal housing (heat sink) for more than 1 minute.
	Insulation resistance	The resistance between the input and output terminals or I/O terminals and metal housing (heat sink) when DC voltage is imposed.
	Operating time	A time lag between the moment a specified signal voltage is imposed to the input terminals and the output is turned ON
	Release time	A time lag between the moment the imposed signal input is turned OFF and the output is turned OFF.
	Ambient temperature and humidity (operating)	The ranges of temperature and humidity in which the SSR can operate normally under specified cooling, input/output voltage, and current conditions.
	Storage temperature	The temperature range in which the SSR can be stored without voltage imposition.
Others	**Inrush current resistance**	A current which can be applied for short periods of time to the electrical element.
	Counter-electromotive force	Extremely steep voltage rise which occurs when the load is turned ON or OFF.
	Recommended applicable load	The recommended load capacity which takes into account the safety factors of ambient temperature and inrush current.
	Bleeder resistance	The resistance connected in parallel to the load in order to increase apparently small load currents, so that the ON/OFF of minute currents functions normally.

LIFE EXPECTANCY (MTTF)

The mean time to failure (MTTF) of SSRs is 100,000 hours, which varies with the operating conditions. To ensure long life and stable operation, take proper countermeasures against extremely high or low operating temperature, heavy fluctuations of ambient temperature, and/or long-time, continuous energization.

Precautions

⚠ WARNING

Do not touch the SSR terminal section (charged section) when the power supply is ON. Touching the charged section may cause electric shock.

Do not touch the SSR LOAD terminal immediately after the power is turned OFF.

- Do not apply excessive voltage or current to the SSR input or output circuits. Otherwise SSR malfunction or fire damage may result.
- Do not obstruct the air flow to the SSR. Otherwise, heat generated from an SSR error may cause the output element to short, or cause fire damage.
- Be sure to conduct wiring with the power supply turned OFF. Otherwise electric shock may result.
- Follow the Correct Use section when conducting wiring and soldering. If the product is used before wiring or soldering are complete, heat generated from a power supply error may cause fire damage.

■ Correct Use

Before Using the SSR

1. Unexpected events may occur before the SSR is used. For this reason it is important to test the SSR in all possible environments. For example, the features of the SSR will vary according to the product being used.
2. All rated performance values listed in this catalog, unless otherwise stated, are all under the JIS C5442 standard test environment (15° to 30°C, 25% to 85% relative humidity, and 86 to 106 kPa atmosphere). When checking these values on the actual devices, it is important to ensure that not only the load conditions, but also the operating environmental conditions are adhered to.

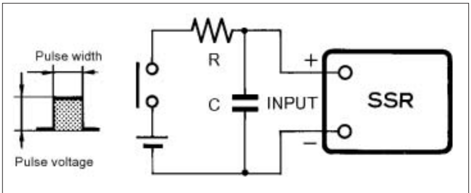
INPUT CIRCUIT

Input Noise

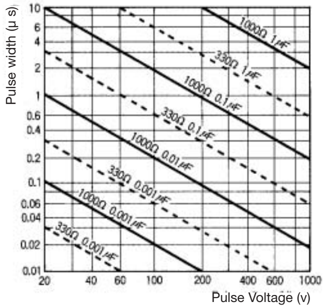
SSRs need only a small amount of power to operate. This is why the input terminals must shut out electrical noise as much as possible. Noise applied to the input terminals may result in malfunction. The following describe measures to be taken against pulse noise and inductive noise.

1. Pulse Noise

A combination of capacitor and resistor can absorb pulse noise effectively. The following is an example of a noise absorption circuit with capacitor C and resistor R connected to an SSR incorporating a photocoupler.



The value of R and C must be decided carefully. The value of R must not be too large or the supply voltage (E) will not be able to satisfy the required input voltage value. The larger the value of C is, the longer the release time will be, due to the time required for C to discharge electricity.



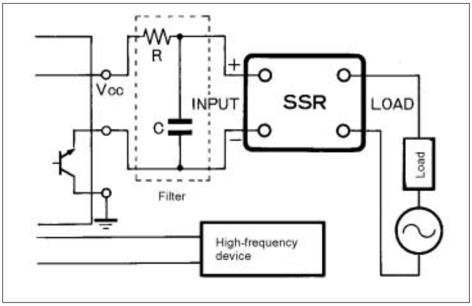
Note: For low-voltage models, sufficient voltage may not be applied to the SSR because of the relationship between C, R, and the internal impedance. When deciding on a value for R, check the input impedance for the SSR.

2. Inductive Noise

Do not wire power lines alongside the input lines. Inductive noise may cause the SSR to malfunction. If inductive noise is imposed on the input terminals of the SSR, use the following cables according to the type of inductive noise, and reduce the noise level to less than the reset voltage of the SSR.

Twisted-pair wire: For electromagnetic noise
Shielded cable: For static noise

A filter consisting of a combination of capacitor and resistor will effectively reduce noise generated from high-frequency equipment.



Note: R: 20 to 100 Ω
C: 0.01 to 1 μF

INPUT CONDITIONS

1. Input Voltage Ripples

When there is a ripple in the input voltage, set so that the peak voltage is lower than the maximum operating voltage and the root voltage is above the minimum operating voltage.

OPERATION AND STORAGE ENVIRONMENT PRECAUTIONS

Operation and Storage Locations

Do not operate or store the Relay in locations subject to direct sunlight or ultraviolet rays. Otherwise the resin to deteriorate, thereby causing cracks and other damage to the case. Do not operate or store the Relay in locations subject to exposure to water or chemicals. Otherwise rust, corrosion, and deterioration of the resin will occur.

Extended Storage of the SSR

If the SSR is stored for an extended period of time, the terminal will be exposed to the air, reducing its solderability due to such effects as oxidation. Therefore, when installing a Relay onto a board after a long time in storage, check the state of the solder before use. Also, take preventive measures so that the terminals will not be exposed to water, oil, or solvents while they are stored.

Vibration and Shock

Do not subject the SSR to excessive vibration or shock. Otherwise the SSR will malfunction and may cause damage to the internal components. To prevent the SSR from abnormal vibration, do not install the Unit in locations or by means that will subject it to the vibrations from other devices, such as motors.

Solvents

Do not allow the SSR to come in contact with solvents such as thinners or gasoline. Doing so will dissolve the markings on the SSR.

Oil

Do not allow the SSR terminal cover to come in contact with oil. Doing so will cause the cover to crack and become cloudy.

PCB SSR Soldering

1. SSRs must be soldered at 260°C within five seconds. For models, however, that conform to separate conditions, perform soldering according to the specified requirements.
2. Use a rosin-based non-corrosive flux that is compatible with the material of the SSR.

Ultrasonic Cleaning

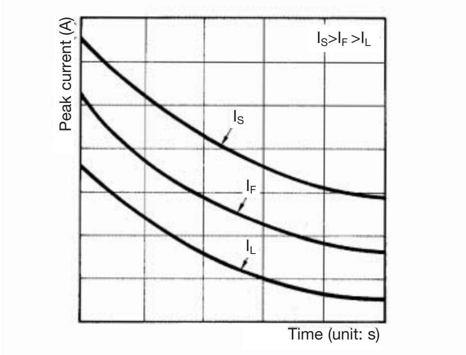
Do not perform ultrasonic cleaning. Performing ultrasonic cleaning after the SSR base has been installed will cause ultrasonic waves to resonate throughout the SSR internal structure, thereby damaging the internal components.

FAIL-SAFE CONCEPT

Overcurrent Protection

A short-circuit current or an overcurrent flowing through the load of the SSR will damage the output element of the SSR. Connect a quick-break fuse in series with the load as an overcurrent protection measure.

Design a circuit so that the protection coordination conditions for the quick-break fuse satisfy the relationship between the SSR surge resistance (I_S), quick-break fuse current-limiting feature (I_F), and the load inrush current (I_L), shown in the following chart.



SSR Life Expectancy

The SSR is not subject to mechanical wear. Therefore, the life expectancy of the SSR depends on the rate of internal component malfunction. See Omron for further details.

The effects of heat on the solder also need to be considered in estimating the total life expectancy of the SSR. The solder deteriorates due to heat-stress from a number of causes. OMRON estimates that the SSR begins to malfunction due to solder deterioration approximately 10 years after it is first installed.

HANDLING THE SSR

Do Not Drop

The SSR is a high-precision component. Do not drop the SSR or subject it to excessive vibration or shock regardless of whether the SSR is mounted or not.

The maximum vibration and shock that an SSR can withstand varies with the model. Refer to the relevant datasheet.

The SSR cannot maintain its full performance capability if the SSR is dropped or subjected to excessive vibration or shock resulting in possible damage to its internal components.

The impact of shock given to the SSR that is dropped varies upon the case, and depends on the floor material, the angle of collision with the floor, and the dropping height. For example, if a single SSR is dropped on a plastic tile from a height of 10 cm, the SSR may receive a shock of 1,000 m/s^2 or more.

Handle the SSR models in in-line packages with the same care and keep them free from excessive vibration or shock.

PCB-MOUNTING SSR

Suitable PCB

1. PCB Material

PCBs are classified into epoxy PCBs and phenol PCBs. The following table lists the characteristics of these PCBs. Select one taking into account the application and cost. Epoxy PCBs are recommended for SSR mounting in order to prevent the solder from cracking.

Item	Epoxy		Phenol
	Glass epoxy	Paper epoxy	Paper phenol
Electrical characteristics	High insulation resistance. Highly resistive to moisture absorption.	Inferior to glass epoxy but superior to paper phenol PCBs.	New PCBs are highly insulation-resistive but easily affected by moisture absorption and cannot maintain good insulation performance over a long time.
Mechanical characteristics	The dimensions are not easily affected by temperature or humidity. Ideal for through-hole or multi-layer PCBs.	Inferior to glass epoxy but superior to paper phenol PCBs.	The dimensions are easily affected by temperature or humidity. Not suitable for through-hole PCBs.
Economical efficiency	Expensive	Rather expensive	Inexpensive
Application	Applications that require high reliability.	Applications that may require less reliability than those for glass epoxy PCBs but require more reliability than those of paper phenol PCBs.	Applications in comparatively good environments with long-density wiring.

2. PCB Thickness

The PCB may warp due to the size, mounting method, or ambient operating temperature of the PCB or the weight of parts mounted to the PCB. Should warping occur, the internal mechanism of the SSR on the PCB will be deformed and the SSR may not provide its full capability. Determine the thickness of the PCB by taking the material of the PCB into consideration.

3. Terminal Hole and Land Diameters

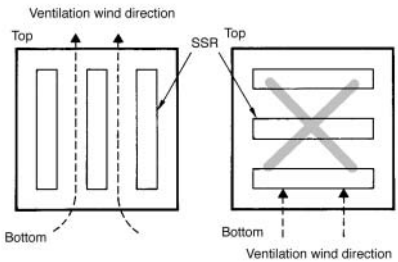
Refer to the following table to select the terminal hole and land diameters based on the SSR mounting dimensions. The land diameter may be smaller if the land is processed with through-hole plating.

Hole Dia. (mm)		Minimum land dia. (mm)
Nominal value	Tolerance	
0.6	±0.1	1.5
0.8		1.8
1.0		2.0
1.2		2.5
1.3		2.5
1.5		3.0
1.6		3.0
2.0		3.0

MOUNTING SPACE

The ambient temperature around the sections where the SSR is mounted must be within the permissible ambient operating temperature. If two or more SSRs are mounted closely together, the SSRs may radiate excessive heat. Therefore, make sure that the SSRs are separated from one another at the specified distance provided in the datasheet. If there is no such provision, maintain a space that is as wide as a single SSR.

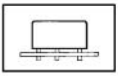
Provide adequate ventilation to the SSRs as shown in the following



Mounting SSR to PCB

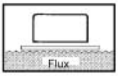
Read the precautions for each model and fully familiarize yourself with the following when mounting the SSR to the PCB.

Step 1
SSR mounting



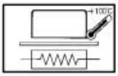
1. Do not bend the terminals to make the SSR self-standing, otherwise the full performance of the SSR may not be possible.
2. Process the PCB properly in accordance with the mounting dimensions.

Step 2
Flux coating



1. The flux applied must be non-corrosive rosin flux, which is suitable to the materialof the SSR. Apply alcohol solvent to dissolve the flux.
2. Make sure that all parts of the SSR other than the terminals are free of the flux. The insulation resistance of the SSR may be degraded if the flux is on the bottom of the SSR.

Step 3
Preheating

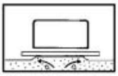


1. Be sure to preheat the SSR to allow better soldering.
2. Preheat the SSR under the following conditions.

Temperature	150° C max.
Time	60-90 secs.

3. Do not use the SSR if it is left at high temperature over a long time. This may change the characteristics of the SSR.

Step 4
Soldering



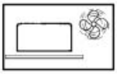
Automatic Soldering

1. Reflow soldering is recommended for maintaining a uniform soldering quality.
   - Solder: JIS Z3282 or H63A
   - Soldering lead temperature: Approx. 210°C max 10 secs
   - Soldering time: Approx. 5 s max. (Approx. 2 s for first time and approx. 3 s for second time for DWS)
   - Perform solder level adjustments so that the solder will not overflow on the PCB.

Manual Soldering – see recommended Temperature Profile

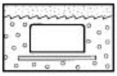
1. After smoothing the tip of the soldering iron, solder the SSR under the following conditions.
   - Solder: JIS Z3282, 1160A, or H63A with rosin-flux-cored solder
   - Soldering iron: 30 to 60 W
   - Soldering temperature: 260°C max.
   - Soldering time: Approx. 5 s max.

Step 5
Cooling



1. After soldering the SSR, be sure to cool down the SSR so that the soldering heat will not deteriorate the SSR or any other component.
2. Do not dip the SSR into cold liquid, such as a detergent, immediately after soldering the SSR.

Step 6
Cleaning



1. Refer to the following table for the selection of the cleaning method and detergent.

Detergent

Boiling cleaning or dip cleaning is available to the SSR. Do not cut the terminals, otherwise the internal parts of the SSR may be damaged. Make sure that the temperature of the detergent is within the permissible ambient operating temperature of the SSR.

2. Availability of Detergents

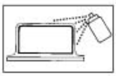
Detergent		Availability
Chlorine detergent	Perochine Chlorosolder Trichloroethylene	OK
Aqueous detergent	Indusco Holys Pure water (pure hot water)	OK
Alcohol	IPA Ethanol	OK
Others	Paint thinner Gasoline	NG

Note: 1. Contact your OMRON representatives before using any other detergent. Do not apply Freon TMC, paint thinner, or gasoline to any SSR.

2. The space between the SSR and PCB may be not be adequately cleaned with a hydrocarbon or alcohol detergent.

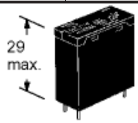
Actions are being taken worldwide to stop the use of CFC-113 (chlorofluorocarbon) and 1.1.1 trichloroethane. Your understanding and cooperation are highly appreciated.

Step 7
Coating



1. Do not fix the whole SSR with resin, otherwise the characteristics of the SSR may change.
2. The temperature of the coating material must be within the permissible ambient operating temperature range.

Detergent	Availability
Epoxy	OK
Urethane	OK
Silicone	OK

Classification		PCB Mounting Type					
Model		G3R/G3RD					
		G3R-102PN	G3R-102PLN	G3R-202PN	G3R-202PLN	G3RD-101PN	G3RDX02PN
Appearance & Dimensions (W x H x D) (mm)		 29 x 13 max.					
Features		• Compatible with OMRON's G2R					
Output	Insulation	Phototriac				Photocoupler	
	Load voltage	75 to 132 VAC		75 to 264 VAC		3 to 125 VDC	3 to 52.8 VDC
	Maximum switching current	2 A				1.5 A	2 A
	Leakage current	2 mA max. at 100 VAC		2 mA max. at 100 VAC 5 mA max. at 200 VAC		0.1 mA max. at 125 VDC	0.1 mA max. at 50 VDC
	V_{DRM}, V_{CEO} (V)	400		600		180	80
	di/dt (A/μs)	30				–	
	dv/dt (V/μs)	300				–	
	I^2t (A^2s)	10.4				–	
	Tj (°C) max.	125				150	
Rated input voltage		5, 12, 24 VDC					
Dielectric strength (between input and output terminals)		2,500 VAC, 50/60 Hz for 1 min					
Ambient temperature (operating)		-30° to 80°C (with no icing or condensation)					
Function	Zero cross	Yes	No	Yes	No		
	Operation indicator	Yes					
	Built-in varistor	No					
Terminal type	Plug-in	No					
	Screw	No					
	Tab	No					
	PCB	Yes					
	Mounting method	PCB mounting					
Magnet relay with compatible terminals		G2R 					
Approved standards		UL, CSA					
Socket		–					
Weight Approx.		Approx.18 g					
Page		339					

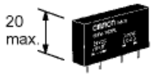
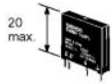
Note: 1. V_{CEO}: Collector-emitter voltage

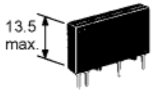
2. The above values are engineering data (reference values) for each output semiconductor incorporated by the respective SSRs.

Classification		Socket Mounting Type						
Model		G3R I/O						
		G3R-IAZR1SN	G3R-IDZR1SN	G3R-IDZR1SN-1	G3R-OA202SZN	G3R-OA202SLN	G3R-ODX02SN	G3R-OD201SN
Appearance & Dimensions (W x H x D) (mm)		I/O SSR Input Module			I/O SSR Output Module			
		 29 x 13 max.						
Features		• Compatible with OMRON's G2R • For mounting G70A-AOC16 Relay Terminal Socket. • For mounting G730-R or G730-Z Remote I/O Terminal.						
Output	Insulation	Photocoupler			Phototriac		Photocoupler	
	Load voltage	4 to 32 VDC			75 to 264 VAC		4 to 60 VDC	40 to 200 VDC
	Maximum switching current	100 mA			2 A		2 A	1 A
	Leakage current	5 µA max. at 32 VDC			1.5 mA max. at 200 VAC		1 mA max. at 50 VDC	1 mA max. at 200 VAC
	V_{DRM}, V_{CEO} (V)	80 V (reference value)			600 V (reference value)		80 V (reference value)	400 V (reference value)
	di/dt (A/µs)	–			30		–	
	dv/dt (V/µs)	–			300		–	
	I^2t (A^2s)	–			10.4		–	
	Tj (°C) max.	150			125		150	
Rated input voltage		100 to 240 VAC	5, 12, 24 VDC		5 to 24 VDC			
Dielectric strength (between input and output terminals)		4,000 VAC, 50/60 Hz for 1 min						
Ambient temperature (operating)		-30° to 80°C (with no icing or condensation)						
Function	Zero cross	No			Yes	No		
	Operation indicator	Yes			Yes	Yes		
	Built-in varistor	No						
Terminal type	Plug-in	Yes			Yes	Yes		
	Screw	No						
	Tab	No						
	PCB	No						
	Mounting method	Socket mounting						
Magnet relay with compatible terminals		G2R-1-S 						
Approved standards		UL, CSA, TÜV (with -UTU version)						
Socket		P2RF-05, P2RF-05-E, P2R-05P, P2R-05A, P2R-057P			P2RF-05, P2R-05P, P2R-05A, P2R-057P, P2RF-05-E			
Weight Approx.		Approx.18 g						
Page		339						

Note: 1. V_{CEO}: Collector-emitter voltage

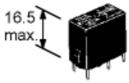
2. The above values are engineering data (reference values) for each output semiconductor incorporated by the respective SSRs.

Classification		PCB Mounting Type							PCB Mounting Type		
Model		G3M							G3MB		
		G3M-102PL	G3M-202PL	G3M-202P	G3M-203P	G3M-203PL	G3M-205P	G3M-205PL	G3MB-102PL	G3MB-202PL	G3MB-202P
Appearance & Dimensions (W x H x D) (mm)		 40 x 9 max.					 40 x 7.6		 24.5 x 5.5 max.		
Features		• Miniature, low-cost SSR							• Miniature, low-cost SSR		
Output	Insulation	Phototriac							Phototriac		
	Load voltage	75 to 132 VAC	75 to 264 VAC						75 to 132 VAC	75 to 264 VAC	
	Maximum switching current	2 A			3 A		5 A		2 A (at 25°C)		
	Leakage current	2 mA max. at 100 VAC	2 mA max. at 100 VAC 5 mAmax. at 200 VAC		1.5 mA at 200 VAC				1 mA max. at 100 VAC	1.5 mA max. at 200 VAC	
	V_{DRM}, V_{CEO} (V)	400	600						400	600	
	di/dt (A/µs)	30					–		40		
	dv/dt (V/µs)	300					–		100		
	I^2t (A^2s)	10.4					–		4		
	Tj (°C) max.	125					–		125		
Rated input voltage		5, 12, 24 VDC							5, 12, 24 VDC		
Dielectric strength (between input and output terminals)		2,000 VAC, 50/60 Hz for 1 min			2,500 VAC, 50/60 Hz for 1 min				2,500 VAC, 50/60 Hz for 1 min		
Ambient temperature (operating)		-30° to 80°C (with no icing or condensation)							-30° to 80°C (with no icing or condensation)		
Function	Zero cross	No		Yes		No	Yes	No	No		Yes
	Operation indicator	No					No		No		
	Built-in varistor	No					No		No		
Terminal type	Plug-in	No					No		No		
	Screw	No					No		No		
	Tab	No					No		No		
	PCB	Yes							Yes		
	Mounting method	PCB mounting							PCB mounting		
Magnet relay with compatible terminals		–							–		
Approved standards		UL, CSA, TÜV					UL, CSA EN, IEC, VDE: approval pending for UTU models		UL, CSA, TÜV		
Socket		–							–		
Weight Approx.		Approx. 15 g					Approx. 25 g		Approx. 5 g		
Page		343							347		

Classification		PCB Mounting Type					
Model		G3MC					
		G3MC-101P	G3MC-101PL	G3MC-201P	G3MC-201PL	G3MC-202P	G3MC-202PL
Appearance & Dimensions (W x H x D) (mm)		 24.5 x 4.5 max.				 24.5 x 4.5 max.	
Features		• Miniature, low-cost SSR					
Output	Insulation	Phototriac					
	Load voltage	75 to 132 VAC		75 to 264 VAC		75 to 264 VAC	
	Maximum switching current	1 A				2 A	
	Leakage current	1 mA max. at 100 VAC		1.5 mA max. at 200 VAC		1.5 mA max. at 200 VAC	
	V_{DRM}, V_{CEO} (V)	400		600		600	
	di/dt (A/μs)	50				40	
	dv/dt (V/μs)	300				100	
	I^2t (A^2s)	4				4	
	Tj (°C) max.	125					
Rated input voltage		5, 12, 24 VDC					
Dielectric strength (between input and output terminals)		2,500 VAC, 50/60 Hz for 1 min					
Ambient temperature (operating)		-30° to 80°C (with no icing or condensation)					
Function	Zero cross	Yes	No	Yes	No	Yes	No
	Operation indicator	No					
	Built-in varistor	No					
Terminal type	Plug-in	No					
	Screw	No					
	Tab	No					
	PCB	Yes					
	Mounting method	PCB mounting					
Magnet relay with compatible terminals		–					
Approved standards		UL, CSA, TÜV					
Socket		–					
Weight Approx.		Approx. 2.5 g				Approx. 5 g	
Page		350					

Note: 1. V_{CEO}: Collector-emitter voltage

2. The above values are engineering data (reference values) for each output semiconductor incorporated by the respective SSRs.

Classification		PCB Mounting Type				
Model		G3S/G3SD				G3DZ
		G3S-201PL	G3S-201PL-PD	G3SD-Z01P	G3SD-Z01P-PD	G3DZ-2R6PL
Appearance & Dimensions (W x H x D) (mm)		 20 x 10 max.		PD types each separated by heat sink		
Features		• Compatible with OMRON's G6B				• AC/DC SSR • 10-μA leakage current max. • Same shape as G6D • Input resistor and varistor incorporated
Output	Insulation	Phototriac		Photocoupler		Photodiode array
	Load voltage	75 to 264 VAC		3 to 26 VDC		3 to 264 VAC, 3 to 125 VDC
	Maximum switching current	1 A	1.2 A	1 A	1.1 A	0.6 A
	Leakage current	2 mA max. at 200 VAC		0.1 mA max. at 26 VDC		10 μA max. at 125 VDC
	V_{DRM}, V_{CEO} (V)	600		32		VDSS 600
	di/dt (A/μs)	30		–		
	dv/dt (V/μs)	300		–		
	I^2t (A^2s)	10.4		–		
	Tj (°C) max.	125		150		
Rated input voltage		5, 12, 24 VDC				
Dielectric strength (between input and output terminals)		2,500 VAC, 50/60 Hz for 1 min				
Ambient temperature (operating)		-30° to 80°C (with no icing or condensation)				-30° to 80°C (with no icing or condensation)
Function	Zero cross	No				
	Operation indicator	No				
	Built-in varistor	Yes				
Terminal type	Plug-in	No				
	Screw	No				
	Tab	No				
	PCB	Yes				
	Mounting method	Socket mounting				Socket mounting /PCB mounting
Magnet relay with compatible terminals		G6B 				G6D 
Approved standards		UL, CSA				–
Socket		P6BF-4BND (with operating indicator, with counterelectromotive voltage absorption diode), P6B-04P				P6D-04P
Weight Approx.		Approx. 13 g				Approx. 3.1 g
Page		355				359

Note: 1. V_{CEO}: Collector-emitter voltage

2. The above values are engineering data (reference values) for each output semiconductor incorporated by the respective SSRs.

Compact SSRs Ideal for Built-in Applications

- Vertical, compact SSRs with an operation indicator offered in versatile variations.
- High dielectric strength of 2,500 VAC for 2-A models.
- High-voltage DC version also available.
- Approved by UL and CSA.

Ordering Information

Terminals	Isolation	Zero cross function	Indicator	Rated output load (Applicable output load)	Rated input voltage	Model
PCB	Phototriac	Yes		2 A at 100 to 120 VDC (2 A at 75 to 132 VDC) (see note 1)		G3R-102PN-US
		No				G3R-102PLN-US
		Yes		2 A at 100 to 240 VAC (2 A at 75 to 264 VAC) (see note 2)		G3R-202PN-US
		No				G3R-202PLN-US
	Photocoupler	---	Yes	1.5 A at 5 to 110 VDC (1.5 A at 3 to 125 VDC)		G3RD-101PN-US
				2 A at 4 to 48 VDC (2 A at 3 to 52.8 VDC) (see note 3)		G3RD-X02PN-US

Note:
1. Product is labelled "125 VAC".
2. Product is labelled "250 VAC".
3. Product is labelled "50 VDC".

Specifications

■ Ratings

Input (AC Output With Zero Cross Function)

Model	Rated voltage	Operating voltage	Impedance	Voltage level	
				Must operate voltage	Must release voltage
G3R-102PN G3R-202PN	5 VDC	4 to 6 VDC	250 Ω±20%	3.5 VDC max.	0.375 VDC min.
	12 VDC	9.6 to 14.4 VDC	600 Ω±20%	8.4 VDC max.	0.9 VDC min.
	24 VDC	19.2 to 28.8 VDC	1.5 kΩ±20%	16.8 VDC max.	1.8 VDC min.

Input (AC Output Without Zero Cross Function, DC Output)

Model	Rated voltage	Operating voltage	Impedance	Voltage level	
				Must operate voltage	Must release voltage
G3R-102PLN G3R-202PLN G3RD-X02PN G3RD-101PN	5 VDC	4 to 6 VDC	300 Ω±20%	3.5 VDC max.	0.375 VDC min.
	12 VDC	9.6 to 14.4 VDC	750 Ω±20%	8.4 VDC max.	0.9 VDC min.
	24 VDC	19.2 to 28.8 VDC	1.5 kΩ±20%	16.8 VDC max.	1.8 VDC min.

Output

Model	Rated load voltage	Applicable load		
		Load voltage range	Load current	Inrush current
G3R-102PN G3R-102PLN	100 to 120 VAC	75 to 132 VAC	0.1 to 2 A	30 A (60 Hz, 1 cycle)
G3R-202PN G3R-202PLN	100 to 240 VAC	75 to 264 VAC	0.1 to 2 A	
G3RD-X02PN	4 to 48 VDC	3 to 52.8 VDC	0.01 to 2 A	8 A (10 ms)
G3RD-101PN	5 to 110 VDC	3 to 125 VDC	0.01 to 1.5 A	2.5 A (10 ms)

■ Characteristics

Item	G3R-102PLN	G3R-102PN	G3R-202PLN	G3R-202PN	G3RD-X02PN/-101PN
Operate time	1 ms max.	1/2 of load power source cycle + 1 ms max.	1 ms max.	1/2 of load power source cycle + 1 ms max.	1 ms max.
Release time	1/2 of load power source cycle + 1 ms max.				1 ms max.
Output ON voltage drop	1.6 V (RMS) max.				1.5 V max.
Leakage current	2 mA max. (at 100 VAC)		2 mA max. (at 100 VAC) 5 mA max. (at 200 VAC)		0.1 mA max. (at 125 VDC) 0.1 mA max. (at 50 VDC)
Insulation resistance	100 MΩ min. (at 500 VDC)				
Dielectric strength	2,500 VAC, 50/60 Hz for 1 min				2,500 VAC, 50/60 Hz for 1 min
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude				
Shock resistance	Malfunction: 1,000 m/s^2				
Ambient temperature	Operating: −30°C to 80°C (with no icing or condensation) Storage: −30°C to 100°C (with no icing or condensation)				
Approved standards	UL508 File No. E64562, CSA C22.2 (No. 14) File No. 35535				
Ambient humidity	Operating: 45% to 85%				
Weight	Approx. 18 g				

■ Approved Standards

UL508 File No.E64562/CSA C22.2 (No.0, No.14) File No. LR35535

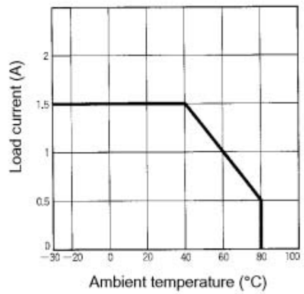
Model	Ratings
G3R-102P(L)(N)-US	2 A at 125 VAC
G3R-202P(L)(N)-US	2 A at 250 VAC
G3RD-X02P(N)-US	2 A at 50 VDC

Engineering Data

Load Current vs. Ambient Temperature Characteristics

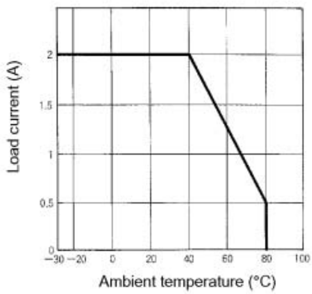
1-A Load Model

G3RD-101PN



2-A Load Model

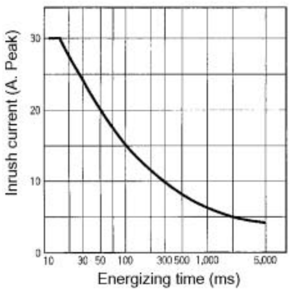
G3R-102□, G3RD-X02□, G3R-202□



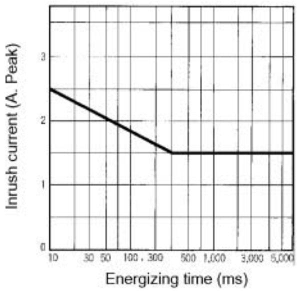
Inrush Current Resistivity

Non-repetitive (Keep the inrush current to half the rated value if it occurs repetitively.)

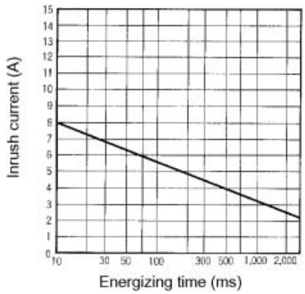
G3R-102□/-202□



G3RD-101PN



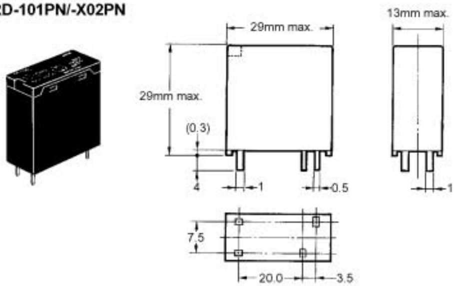
G3RD-X02□



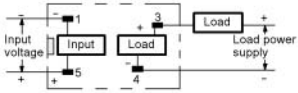
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3R-102P□/-202P□
G3RD-101PN/-X02PN

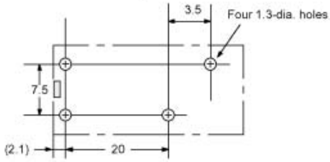


Terminal Arrangement/ Internal Connections (Bottom View)



Note: The plus and minus symbols shown in the parentheses are for DC loads.

Mounting Holes



Precautions

Connection

The SSR for DC switching a surge can connect to a load regardless of the polarity of the positive and negative output terminals.

Protective Terminal

For AC inductive loads, connect the load terminals of the SSR to a surge absorber (varistor).

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Zero Cross Models Added to Compact, Low-cost G3M Series

- This design for high-density PCB applications.
- DC input-AC output for up to 5-A load.
- Approved by UL and CSA.

Ordering Information

Isolation	Input terminal pitch	Zero cross function	Indicator	Rated output load (Applicable output load)	Rated input voltage	Model
Phototriac	7.62 mm	Yes	No	2 A at 100 to 240 VAC (2 A at 75 to 264 VAC)	5 VDC	G3M-202P-US
					12 VDC	
					24 VDC	
				3 A at 100 to 240 VAC (3 A at 75 to 264 VAC)	5 VDC	G3M-203P
					12 VDC	
					24 VDC	
		No		2 A at 100 to 120 VAC (2 A at 75 to 132 VAC)	5 VDC	G3M-102PL-US
					12 VDC	
					24 VDC	
				2 A at 100 to 240 VAC (2 A at 75 to 264 VAC)	5 VDC	G3M-202PL-US
					12 VDC	
					24 VDC	
				3 A at 100 to 240 VAC (3 A at 75 to 264 VAC)	5 VDC	G3M-203PL
					12 VDC	
					24 VDC	
				5 A at 100 to 240 VAC (5 A at 75 to 264 VAC)	5 VDC	G3M-205PL (New)
					12 VDC	
					24 VDC	

Note: 1. TÜV marking is available with "-UTU" in place of "-US" on the part number.

2. UL, CSA and VDE approval of G3M-205PL is pending.

Isolation	Input terminal pitch	Zero cross function	Indicator	Rated output load (Applicable output load)	Rated input voltage	Model
Phototriac	5.08 mm	Yes	No	2 A at 100 to 240 VAC (2 A at 75 to 132 VAC)	5 VDC	G3M-202P-US-4
					12 VDC	
					24 VDC	
				3 A at 100 to 240 VAC (3 A at 75 to 264 VAC)	5 VDC	G3M-203P-4
					12 VDC	
					24 VDC	
		No		2 A at 100 to 120 VAC (3 A at 75 to 264 VAC)	5 VDC	G3M-102PL-US-4
					12 VDC	
					24 VDC	
				2 A at 100 to 240 VAC (2 A at 75 to 264 VAC)	5 VDC	G3M-202PL-US-4
					12 VDC	
					24 VDC	
				3 A at 100 to 240 VAC (3 A at 75 to 264 VAC)	5 VDC	G3M-203PL-4
					24 VDC	
				5 A at 100 to 240 VAC (5 A at 75 to 264 VAC)	5 VDC	G3M-205PL-4 (New)
					12 VDC	
					24 VDC	

Note: TÜV marking is available with "-UTU" in place of "-US" on the part number.

Specifications

■ Ratings

Input

Rated voltage	Operating voltage	Impedance	Voltage levels	
			Must operate voltage	Must release voltage
5 VDC	4 to 6 VDC	300 Ω ±20%	4 VDC max.	1 VDC min.
12 VDC	9.6 to 14.4 VDC	800 Ω ±20%	9.6 VDC max.	
24 VDC	19.2 to 28.8 VDC	1.6 kΩ ±20%	19.2 VDC max.	

Note: Each model has 5-VDC, 12-VDC, and 24-VDC input versions.

Output

Model	Rated voltage	Applicable load		
		Load voltage	Load current	Inrush current
G3M-102PL-US (-4)	100 to 120 VAC	75 to 132 VAC	0.1 to 2 A	30 A (60 Hz, 1 cycle)
G3M-202P(L)-US (-4)	100 to 240 VAC	75 to 264 VAC		
G3M-203P(L) (-4)			0.1 to 3 A	45 A (60 Hz, 1 cycle)
G3M-205P(L) (-4)			0.1 to 5 A	

■ Characteristics

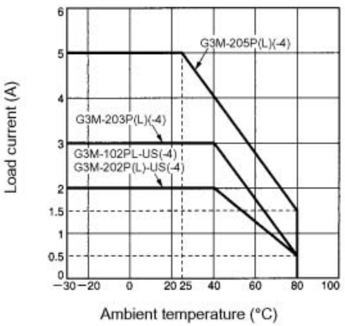
Item	G3M-102PL-US (-4)	G3M-202P(L)-US (-4)	G3M-203P (L) (-4)	G3M-205P (L) (-4)
Operate time	1 ms max. (1/2 of load power source cycle + 1 ms max. for G3M-202P, G3M-203P, G3M-205P)			
Release time	1/2 of load power source cycle + 1 ms max.			
Output ON voltage drop	1.6 V (RMS) max.			
Leakage current	2 mA max. (at 100 VAC)	2 mA max. (at 100 VAC) 5 mA max. (at 200 VAC)	1.5 mA (at 200 VAC)	
Insulation resistance	1,000 MΩ min. (at 500 VDC)			
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min		2,500 VAC, 50/60 Hz for 1 min	
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude			
Shock resistance	Malfunction: 1,000 m/s^2			
Ambient temperature	Operating: −30°C to 80°C (with no icing or condensation) Storage: −30°C to 100°C (with no icing or condensation)			
Ambient humidity	Operating: 45% to 85%			
Weight	Approx. 15 g			Approx. 25 g

■ Approved Standards

Approved by UL (Report No. E64562)	Approved by CSA (Report No. LR35535)	Approved by TÜV
G3M-202P(L)-US(-4) G3M-203P(L)(-4)	G3M-202P(L)-US(-4) G3M-203P(L)(-4)	G3M-202P(L)-UTU(-4) G3M-203P(L)-UTU(-4)

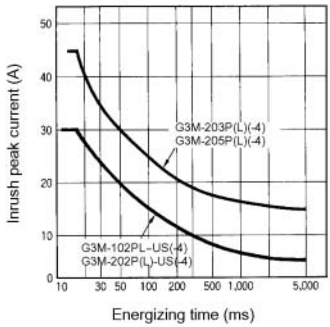
Engineering Data

Load Current vs. Ambient Temperature



Inrush Current Immunity

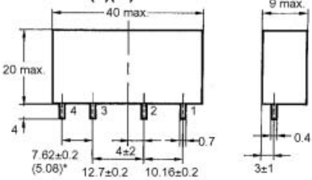
Non-repetitive
Reduce the current to 1/2 or less if the G3M is in repetitive operation.



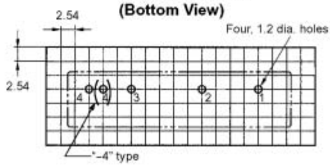
Dimensions

Note: All units are in millimeters unless otherwise indicated.

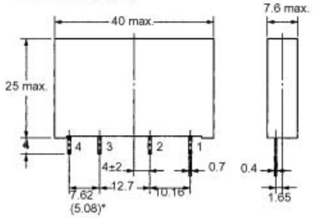
G3M-102P-US(-4), G3M-202P(L)-US(-4)
G3M-203P(L)(-4)



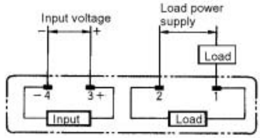
PCB Dimensions
(Bottom View)



G3M-205P(L)(-4)



Terminal Arrangement
(Bottom View)



*Input terminal pitch of 5.08 mm is also available.

Precautions

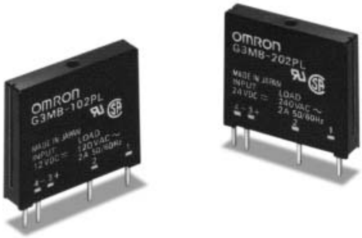
Protective Element

No overvoltage absorption element is built in. Therefore, if the G3M is connected to an inductive load, be sure to connect the overvoltage absorption element.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Low-cost, Subminiature PCB-mounting SSR Switching 2 A

- Bottom is approximately three times as small as that of the G3M and ideal for high-density PCB applications.
- DC input-AC output for 2-A load at 25°C.
- Mono-block lead frame incorporating terminals, heat sink, and a PCB directly mounted with bare chips made it possible to miniaturize the relay.
- Standard models approved by UL, CSA and -UTU models by VDE (TÜV).



Ordering Information

Isolation	Zero cross function	Indicator	Input resister	Snubber circuit	Applicable output load	Rated input voltage	Model
Phototriac	No	No	Yes	Yes	2 A at 100 to 120 VAC (rated load voltage)	5 VDC	G3MB-102PL (-UTU)
						12 VDC	
						24 VDC	
	Yes				2 A at 100 to 240 VAC (rated load voltage)	5 VDC	G3MB-202P (-UTU) G3MB-202P-4 (-UTU)
						12 VDC	
						24 VDC	
	No					5 VDC	G3MB-202PL (-UTU) G3MB-202PL-4 (-UTU)
						12 VDC	
						24 VDC	
	Yes		No	No		*1	G3MB-202PEG-4 (-UTU)
	No						G3MB-202PLEG-4(-UTU)

Note: When ordering models conforming to VDE (TÜV), add "-UTU" to the model number.

* Recommended Operating Conditions

Item	Min.	Standard	Max.
Forward current	5 mA	10 mA	20 mA
Must release voltage	0	---	1 V

Specifications

■ Ratings

Input Resistor Contact

Rated voltage	Operating voltage	Impedance	Voltage levels	
			Must operate voltage	Must release voltage
5 VDC	4 to 6 VDC	440 Ω ±20%	4 VDC max.	1 VDC min.
12 VDC	9.6 to 14.4 VDC	1 kΩ ±20%	9.6 VDC max.	
24 VDC	19.2 to 28.8 VDC	2.2 kΩ ±20%	19.2 VDC max.	

Note: Each model has 5-VDC, 12-VDC, and 24-VDC input versions.

No Input Resistor

Item	Max.
LED forward current	50 mA
Repetitive peak LED forward current	1 A
LED reverse voltage	5 V

Output

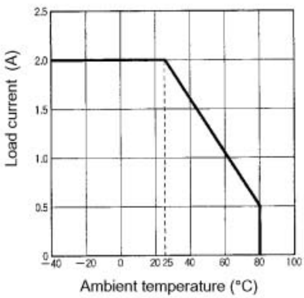
Model	Applicable load			
	Rated load voltage	Load voltage range	Load current	Inrush curret
G3MB-102PL	100 to 120 VAC, 50/60 Hz	75 to 132 VAC, 50/60 Hz	0.1 to 2 A	30 A (60 Hz, 1 cycle)
G3MB-202P G3MB-202PL	100 to 240 VAC, 50/60 Hz	75 to 264 VAC, 50/60 Hz		
G3MB-202PEG-4 G3MB-202PLEG-4				

■ Characteristics

Item	G3MB-102PL	G3MB-202P, -202P-4, -202PEG-4	G3MB-202PL, -202PL-4, -202PLEG-4
Operate time	1 ms max.	1/2 of load power source cycle + 1 ms max.	1 ms max.
Release time	1/2 of load power source cycle + 1 ms max.		
Output ON voltage drop	1.6 V (RMS) max.		
Leakage current	1 mA max. (at 100 VAC)	1.5 mA max. (at 200 VAC)	
Insulation resistance	1,000 MΩ min. (at 500 VDC)		
Dielectric strength	2,500 VAC, 50/60 Hz for 1 min		
Vibration resistance	Malfunction: 10 to 55 Hz, 0.75-mm double amplitude		
Shock resistance	Malfunction: 1,000 m/s^2		
Ambient temperature	Operating: −30°C to 80°C (with no icing or condensation) Storage: −30°C to 100°C (with no icing or condensation)		
Ambient humidity	Operating: 45% to 85%		
Approved standards	UL508 File No. E64562 CSA C22.2 (No.14) File No. LR35535 TÜV R9351062 (EN60950) ("-UTU" type)		
Weight	Approx. 5 g		

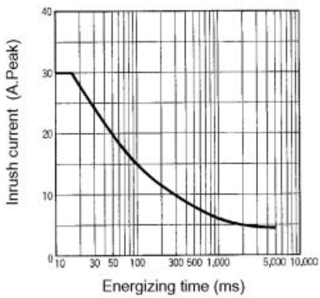
Engineering Data

Load Current vs. Ambient Temperature Characteristics



Inrush Current Resistivity

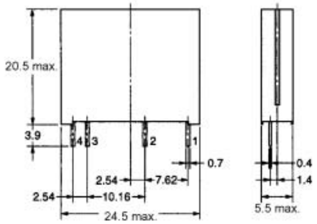
Non-repetitive (Keep the inrush current to half the rated value if it occurs repetitively.)



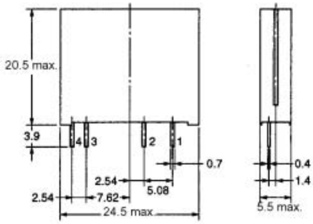
Dimensions

Note: All units are in millimeters unless otherwise indicated.

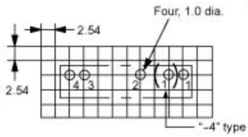
G3MB-□02P□



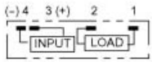
G3MB-202P□□□-4



PCB Dimensions (Bottom View)



Terminal Arrangement/ Internal Connections (Bottom View)



Precautions

Soldering must be completed within 10 seconds at 260°C or less.

Make sure that the space between the bottom of the relay and the PCB is 0.1 mm or less. When making holes on the PCB for the relay's edge terminals, the hole diameters should be slightly smaller than the actual diameters of the edge terminals. This will reduce unnecessary space between the bottom of the relay and the PCB.

To use the SSR output for phase control, select a model that does not incorporate a zero-cross function.

The SSR case serves to dissipate heat. When mounting more than three SSRs as a group, pay attention to the ambient temperature rise and install the Relays so that they are adequately ventilated. If poor ventilation is unavoidable, reduce the load current by half.

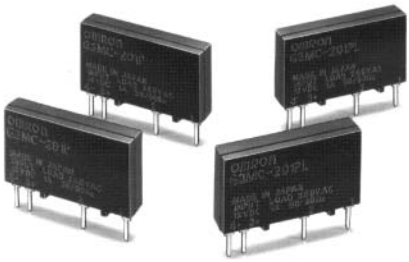
Protective Component

The input circuitry does not incorporate a circuit protecting the SSR from being damaged due to a reversed connection. Make sure that the polarity is correct when connecting the input lines.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Compact, Thin-profile, Low-cost SSR Switching 1 A (PCB-mounting)

- Small bottom surface area (approx. 80% of the conventional G3MB's) and ideal for close PCB mounting.
- DC input and AC output for an applicable load of 1 A at 40°C.
- Compact, thin-profile SSR of monoblock construction with an all-in-one frame incorporates a PCB, terminals, and heat sink.
- Approved by UL and CSA.
- Conforms to VDE.



Ordering Information

Isolation	Zero-cross function	Indicator	Snubber circuit	Applicable output load	Rated input voltage	Model
Phototriac	Yes	No	Yes	1 A at 100 to 120 VAC	5 VDC	G3MC-101P(-VD)
					12 VDC	
					24 VDC	
	No				5 VDC	G3MC-101PL(-VD)
					12 VDC	
					24 VDC	
	Yes			1 A at 100 to 240 VAC	5 VDC	G3MC-201P(-VD)
					12 VDC	
					24 VDC	
	No				5 VDC	G3MC-201PL(-VD)
					12 VDC	
					24 VDC	
	Yes			2 A at 100 to 240 VAC	5 VDC	G3MC-202P(-VD)
					12 VDC	
					24 VDC	
	No				5 VDC	G3MC-202PL(-VD)
					12 VDC	
					24 VDC	

Note: When ordering models conforming to VDE(basic insulation), add "-VD" to the model number. Reinforced insulation models are also available. For details, contact your OMRON representative.

Specifications

■ Ratings (Ambient Temperature 25°C)

Input

Rated voltage	Operating voltage	Impedance	Voltage levels	
			Must operate voltage	Must dropout voltage
5 VDC	4 to 6 VDC	300 Ω ±20%	4 VDC max.	1 VDC min.
12 VDC	9.6 to 14.4 VDC	800 Ω ±20%	9.6 VDC max.	
24 VDC	19.2 to 28.8 VDC	1.6 kΩ ±20%	19.2 VDC max.	

Note: Each model has 5-VDC, 12-VDC, and 24-VDC input versions.

Output

Model	Applicable load			
	Rated load voltage	Load voltage	Load current	Inrush current
G3MC-101P G3MC-101PL	100 to 120 VAC 50/60 Hz	75 to 132 VAC 50/60 Hz	0.1 to 1 A	8 A (60 Hz, 1 cycle)
G3MC-201P G3MC-201PL	100 to 240 VAC 50/60 Hz	75 to 264 VAC 50/60 Hz		
G3MC-202P(-VD) G3MC-202PL(-VD)	100 to 240 VAC 50/60 Hz	75 to 264 VAC 50/60 Hz	0.1 to 2 A	30 A (60 Hz, 1 cycle)

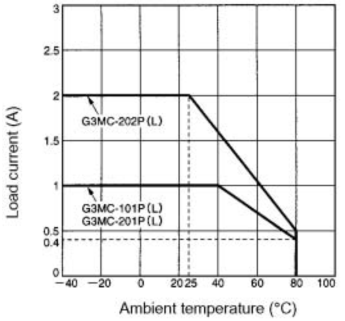
■ Characteristics

Item	G3MC-101P (-VD)	G3MC-101PL (-VD)	G3MC-201P (-VD)	G3MC-201PL (-VD)	G3MC-202P (-VD)	G3MC-202PL (-VD)
Operate time	1/2 of load power source cycle + 1 ms	1 ms max.	1/2 of load power source cycle + 1 ms	1 ms max.	1/2 of load power source cycle + 1 ms	1 ms max.
Release time	1/2 of load power source cycle + 1 ms)					
Output ON voltage drop	1.6 V (RMS) max.					
Leakage current	1 mA max. (at 100 VAC)		1.5 mA max. (at 200 VAC)			
Insulation resistance	1,000 MΩ min. (at 500 VDC)				---	
Dielectric strength	2,500 VAC, 50/60 Hz for 1 min					
Vibration resistance	Malfunction: 10 to 55 Hz, 0.75-mm double amplitude					
Shock resistance	Malfunction: 1,000 m/s^2				---	
Ambient temperature	Operating: −30°C to 80°C (with no icing or condensation) Storage: −30°C to 100°C (with no icing or condensation)					
Approved standards	UL508 File No. E64562, CSA C22.2 (No. 14, No. 950) File No. LR35535, EN60950 File No. 5925UG ("-VD" type)				---	
Ambient humidity	Operating: 45% to 85%					
Weight	Approx. 2.5 g				Approx. 5 g	

Solid State Relays

Engineering Data

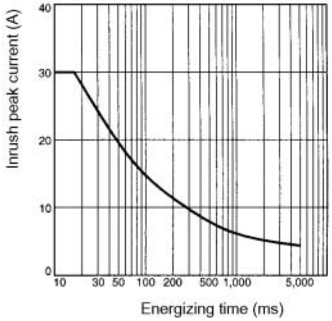
Load Current vs. Ambient Temperature Characteristics



Inrush Current Resistivity

Non-repetitive (Keep the inrush current to half the read value if it occurs repeatedly.)

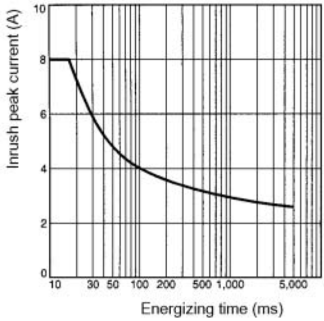
G3MC-202P(L)



Inrush Current Resistivity

Non-repetitive (Keep the inrush current to half the read value if it occurs repeatedly.)

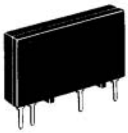
G3MC-101P(L), G3MC-201P(L)

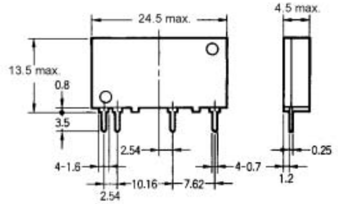


Dimensions

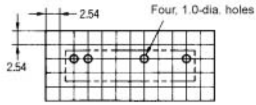
Note: All units are in millimeters unless otherwise indicated.

G3MC-101P(L)(-VD),
G3MC-201P(L)(-VD)

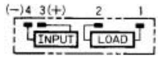




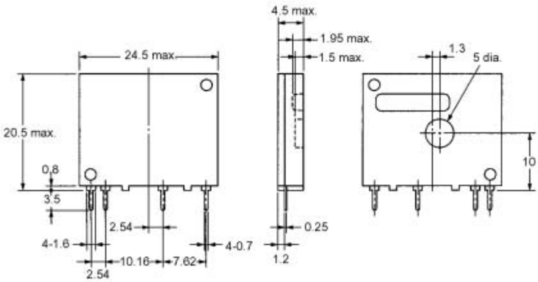
PCB Dimensions
(Bottom View)



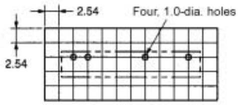
Terminal Arrangement
(Bottom View)



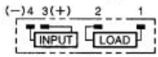
G3MC-202P(L)(-VD)



PCB Dimensions
(Bottom View)



Terminal Arrangement
(Bottom View)



Precautions

General Precautions

Be sure to turn off power to the SSR before wiring the SSR, otherwise an electric shock may be received.

Do not touch the terminals of the SSR while power is being supplied to the SSR. The terminals are charged with the power, and an electric shock may be received by touching the terminals.

The built-in capacitor may have a residual voltage after the SSR is turned off. Be sure to discharge the residual voltage before touching the terminals of the SSR, otherwise an electric shock may be received.

Mounting

1. Make sure that no excessive voltage or current is imposed on or flows to the input or output circuit of the SSR, otherwise the SSR may malfunction or burn.
2. Solder the terminals of the SSR properly under the required soldering conditions. The SSR may be abnormally heated and burn if power is supplied to the terminals soldered incorrectly.
3. Do not short-circuit the load of the SSR while power is supplied to the SSR. Do not short-circuit the power supply through the SSR. The SSR may be damaged, malfunction, or burn if the load or power supply is short-circuited.

Correct Use

The terminals of the SSR are highly heat-conductive. Each terminal must be soldered within 10 s at 260°C or within 5 s at 350°C.

The SSR is of a thin-profile construction. To maintain the vibration resistance of the SSR, make sure that the space between the SSR and PCB is 0.1 mm maximum. Lifting of the PCB can be prevented by setting the hole diameter of the PCBs on both sides slightly smaller than the actual terminal dimension.

Select the model without the zero-cross function when using the Unit for phase control output.

The casing works as a heat sink. When mounting two or more Units closely, make sure that the Units are properly ventilated by taking ambient temperature rises into consideration. If Units are closely mounted and used in places with no ventilation, the load current of each Unit must be 1/2 of the rated load current.

Fusing characteristics

The G3MC has a function that forces an open mode failure when an overcurrent exceeds the rated value. The fusing characteristics of the G3MC, however, are not the same as those of a general-use glass fuse. Machines that use the G3MC must be provided with a safety device, such as a fuse or breaker, and ON-OFF tests or short-circuit tests must be implemented to confirm the following items and detailed influences. Users must determine test conditions and implement tests on reliability as required by the machine.

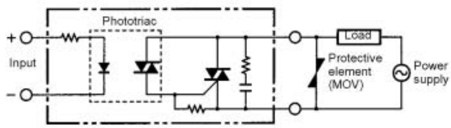
1. Life test under continuous electric current
2. On-off cycle test
3. Influence by ambient temperature
4. Influence by power source frequency
5. Influence by power source voltage fluctuation

Note: Contact your local OMRON sales office for more detailed information.

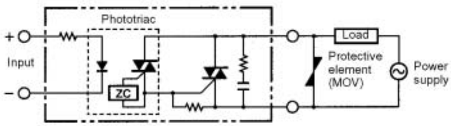
Protective Element

No overvoltage absorption element is built in. Therefore, if the G3MC is connected to an inductive load, be sure to connect the overvoltage absorption element.

G3MC-□□□PL (without Zero cross function)

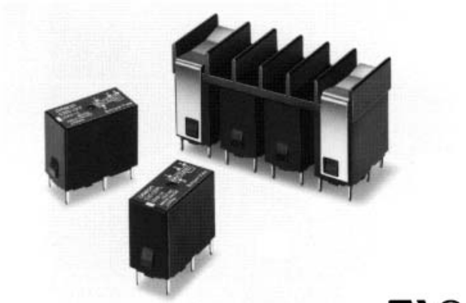


G3MC-□□□P (with Zero cross function)



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Ultra-small Relay Breaks up to 1 A



- Ultra-small, dual in-line package (DIP) SSR.
- Terminals compatible with G6B Electromagnetic Relay's. Mix with G6Bs as the application requires.
- Close side-by-side mounting possible. In addition, heat sink dedicated to this mounting style also available.
- Both AC- and DC-load versions available.
- High isolation of 2,500 VAC between input and output freeing inputs from noise surge generated in the load.
- Built-in varistor effectively absorbs external surges. (In case of SSR for AC switching.)
- Approved by UL and CSA.

Ordering Information

Isolation	Zero cross function	Indicator	Rated output load (applicable output load)	Rated input voltage	Model
Phototriac	No	No	1 A at 100 to 240 VAC (1 A at 75 to 264 VAC) (see note 1)	5 VDC	G3S-201PL-US
				12 VDC	
				24 VDC	
			1.2 A at 100 to 240 VAC (1.2 A at 75 to 264 VAC) (see note 1)	5 VDC	G3S-201PL-PD-US
				12 VDC	
				24 VDC	
Photocoupler			1 A at 4 to 24 VDC (1 A at 3 to 26 VDC) (see note 2)	5 VDC	G3SD-Z01P-US
				12 VDC	
				24 VDC	
			1.1 A at 4 to 24 VDC (1.1 A at 3 to 26 VDC) (see note 2)	5 VDC	G3SD-Z01P-PD-US
				12 VDC	
				24 VDC	

Note: 1. Product is labelled "250 VAC".

2. Product is labelled "24 VDC".

Accessories (Order Separately)

Heat Sink

Heat Sink	Y92B-S08N

See *Dimensions* for details.

Connecting Socket

Connecting Socket	P6B-04P

See *Dimensions* for details.

■ Ratings

Input

Rated voltage	Operating voltage	Impedance		Voltage level	
		G3S-201PL/201PL-PD	G3S-Z01P/Z01P-PD	Must operate voltage	Must release voltage
5 VDC	4 to 6 VDC	450 Ω±20%	630 Ω±20%	4 VDC max.	1 VDC min.
12 VDC	9.6 to 14.4 VDC	1.1 kΩ±20%	1.5 kΩ±20%	9.6 VDC max.	
24 VDC	19.2 to 28.8 VDC	2.2 kΩ±20%	2.8 kΩ±20%	19.2 VDC max.	

Note: Each models has 5-VDC, 12-VDC, and 24-VDC input versions.

Output

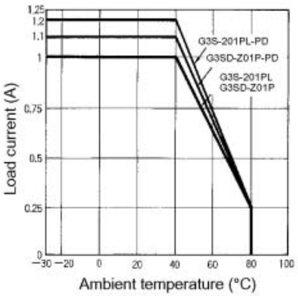
Model	Applicable load			
	Rated load voltage	Rated load voltage range	Load current	Inrush current
G3S-201PL	100 to 240 VAC	75 to 264 VAC	0.1 to 1 A	15 A (60 Hz, 1 cycle)
G3S-201PL-PD			0.1 to 1.2 A	
G3SD-Z01P	4 to 24 VDC	3 to 26 VDC	0.01 to 1 A	3 A (10 ms)
G3SD-Z01P-PD			0.01 to 1.1 A	

■ Characteristics

Item	G3S-201PL/201PL-PD	G3SD-Z01P/Z01P-PD
Operate time	1 ms max.	
Release time	1/2 of load power source cycle + 1 ms max.	1 ms max.
Output ON voltage drop	1.6 V (RMS) max.	1.5 V max.
Leakage current	2 mA max.	0.1 mA max. (at 26 VDC)
Insulation resistance	100 MΩ min. (at 500 VDC)	
Dielectric strength	2,500 VAC, 50/60 Hz for 1 min	
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude	
Shock resistance	Malfunction: 1,000 m/s^2	
Ambient temperature	Operating: −30°C to 80°C (with no icing or condensation) Storage: −30°C to 100°C (with no icing or condensation)	
Ambient humidity	Operating: 45% to 85%	
Approved standards	UL508 File No. E64562/CSA C22.2 (No.0, No.14) File No. LR35535	
Weight	Approx. 13 g	

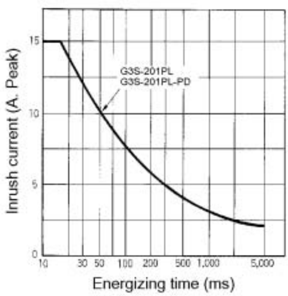
Engineering Data

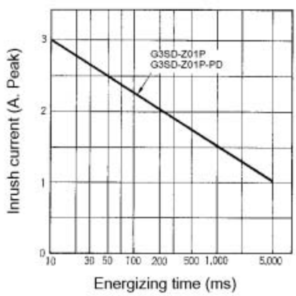
Load Current vs. Ambient Temperature Characteristics



Inrush Current Resistivity

Non-repetitive (Keep the inrush current to half the rated value if it occurs repetitively.)

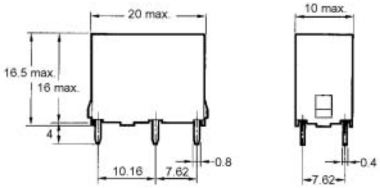




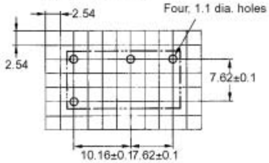
Dimensions

Note: All units are in millimeters unless otherwise indicated.

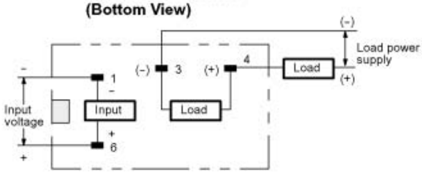
G3S/G3SD



PCB Dimensions (Bottom View)

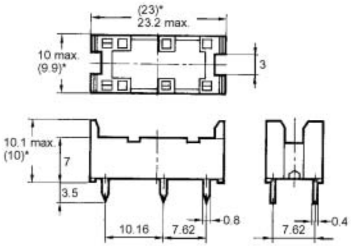


Terminal Arrangement/ Internal Connections (Bottom View)

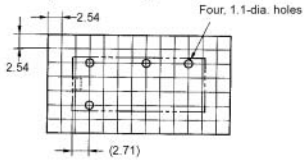


Note: Values in parentheses apply to the DC-load versions.

Connecting Socket P6B-04P

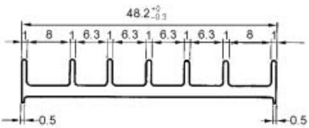


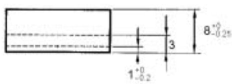
PCB Dimensions (Bottom View)



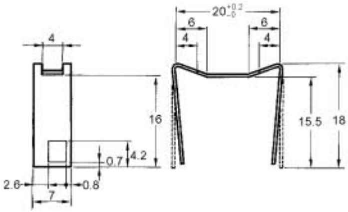
*Average value

Heat Sink Y92B-S08N

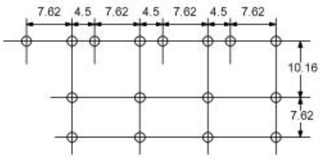




Mounting Bracket



PCB Dimensions (Bottom View)

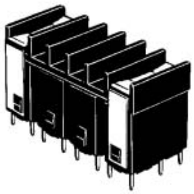


Solid State Relays

Precautions

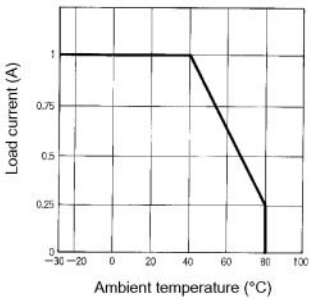
Close Mounting

G3S-201PL-PD and G3SD-Z01-PD SSRs can be closely mounted side by side. Attach the Y92B-S08N Heat Sink to the SSRs mounted closely side by side. When these SSRs are mounted side by side, the load current vs. ambient temperature characteristic declines as shown on the right.



Load Current vs. Ambient Temperature Characteristics

(When four SSRs are mounted side by side and each of them is switched to the same load current.)



Connection

With the SSR for DC switching, the load can be connected to either positive or negative output terminal of the SSR.

Protective Component

Since the SSR does not incorporate an overvoltage absorption component, be sure to connect an overvoltage absorption component when using the SSR under an inductive load.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

SSR Identical to the G6D in Size with a Maximum AC/DC Switching Current of 0.6 A

- Switching 0.6 A at 240 VAC or 100 VDC.
- 10-µA current leakage max. between open output terminals.
- 2,500-VAC dielectric strength ensured between input and output terminals.
- Input resistor and varistor incorporated models available.
- Switching full- and half-wave rectified alternating currents.
- Approved by UL and CSA.

Ordering Information

Contact form	Insulation	Zero cross function	Indicator	Applicable output load	Rated input voltage	Model
SPST-NO	Photo-voltage coupler	No	No	0.6 A at	5 VDC	G3DZ-2R6PL
				3 to 264 VAC	12 VDC	
				3 to 125 VDC	24 VDC	

Accessories (Order Separately)

See *Dimensions* for details.

Connecting socket	P6D-04P

Specifications

■ Ratings

Input

Rated voltage	Operating voltage	Input impedance	Voltage level	
			Must operate	Must release
5 VDC	4 to 6 VDC	830 Ω±20%	4 VDC max.	1 VDC min.
12 VDC	9.6 to 14.4 VDC	2 kΩ±20%	9.6 VDC max.	
24 VDC	19.2 to 28.8 VDC	4 kΩ±20%	19.2 VDC max.	

Output

Rated voltage	Load voltage	Load current	Inrush current
5 to 240 VAC, 5 to 100 VDC	3 to 264 VAC, 3 to 125 VDC	100 µA to 0.6 A	6 A (10 ms)

■ Characteristics

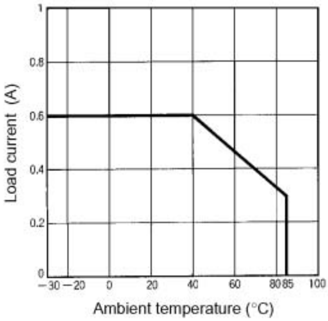
Operate time (see note)	6 ms max.
Release time (see note)	10 ms max.
Output ON-resistance (see note)	2.4 Ω max.
Leakage current	10 µA max. (at 125 VDC)
Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength	2,500 VAC, 50/60 Hz for 1 min between input and output
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Malfunction: 1,000 m/s^2
Ambient temperature	Operating: –30°C to 85°C (with no icing or condensation) Storage: –30°C to 100°C (with no icing or condensation)
Approved standards	UL508 File No. E64562 CSA C22.2 (No.14) File No. LR35535
Ambient humidity	Operating: 45% to 85%
Weight	Approx. 3.1 g

Note: These values are under the measurement conditions whereby rated voltages are applied to the input.

Engineering Data

Load Current vs. Ambient Temperature Characteristics

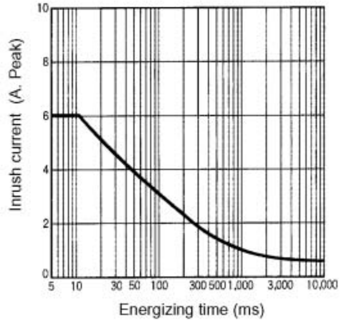
G3DZ-2R6PL



Inrush Current Resistivity

Non-repetitive (Keep the inrush current to half the rated value if it occurs repetitively.)

G3DZ-2R6PL

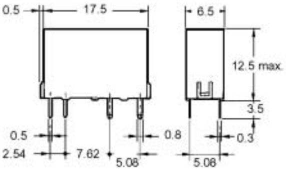


Dimensions

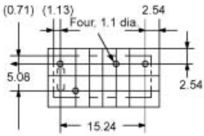
Note: 1. All units are in millimeters unless otherwise indicated.

2. Orientation marks are indicated as follows:

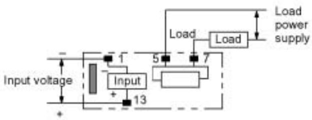
G3DZ-2R6PL



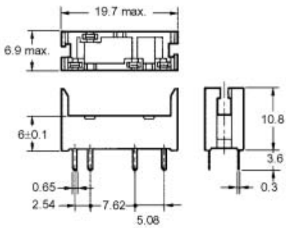
Mounting Holes (Bottom View)



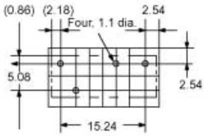
Terminal Arrangement/ Internal Connections (Bottom View)



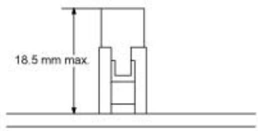
P6D-04P Connecting Socket



Mounting Holes (Bottom View)



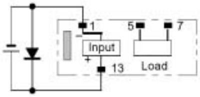
Socket Mounting Height



Solid State Relays

Precautions

If any reversed surge voltage is imposed on the input terminals, insert a diode in parallel to the input terminals as shown in the following circuit diagram and do not impose a reversed voltage value of 3 V or more.



Terminals

Since terminals are made of materials with high heat conduction, complete soldering (automatic or manual) within 10 seconds at a temperature of 260°C.

When fitting with a Socket, match properly and push straight down vertically.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

■ Introduction

New models and a wider range provide an array of solutions, meeting the needs of today's high performance applications.

Our new range of MOSFET relays, Type G3VM, set the benchmark in Solid State Relays (SSRs). Products are manufactured using the latest advances in automated production and include a variety of improved construction technologies within the areas of the input LED, PDA (Photo Diode Array used as a photocoupler) and MOSFET chips used in the load switching circuit. As a result, further reductions in package size and power requirements have been achieved.

Combining the advantages of mechanical and solid state technology, the new G3VM range gives you unprecedented capability to design. All models featured include a double MOSFET load circuit, enabling the designer complete versatility since it makes no difference whether an AC or DC load in either direction is connected (Connection A). Thus, the MOSFET relay is a fully functional alternative to an electromechanical relay with minimal additional drive circuitry.

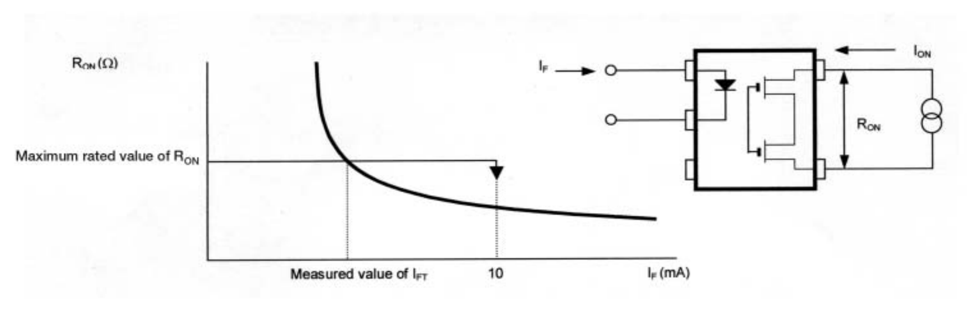
The built-in Current Limit Function (CLR models) has many uses. Traditionally used to clamp excessive over current fault conditions in telecom equipment, this feature can also be used to good effect to resist transient and short circuit conditions.

MOSFET relays are the ideal data and telecommunication solution for line seizing, line switching, hook switching, Data Access Arrangement (DAA) function, line transformer circuit control and other feature phone functions. Central office applications require high reliability and long life. Here G3VM is ideal for use in the areas of Subscriber Line Interfaces (SLICs) Multiplexers and Routers. In addition, Local Area Networks (LANs) and Network Termination Units (NTUs) including Set-Top Boxes (STBs) and Remote Metering Systems (RMS) can take advantage of the G3VMs' small size and low ON resistance.

Advances in performance and cost reduction enable MOSFET relays to be considered as good alternatives to Reed Relays in application areas such as security motion detectors (standard and anti-mask PIRs), other surveillance alarm equipment and associated systems.

■ Glossary

Term	Symbol	Description
LED forward current	I_F	Rated current that can flow continuously in the forward direction of the LED
Repetitive peak LED forward current	I_{FP}	Rated current that can flow momentarily in the forward direction of the LED
LED forward current reduction rate	$<I_{ON}$/°C	Rated change of forward current flowing through the LED relative to ambient temperature above 25 °C
LED reverse voltage	V_R	Rated reverse voltage that can be applied between the anode and the cathode
Connection temperature	T_J	Rated temperature that can be allowed in the junction of the LED, Photodetector or MOSFET(s)
Output dielectric strength	V_{OFF}	Rated voltage that can be applied between the MOSFET's output terminals in the OFF state
Continuous load current	I_O	Rated current that can flow between the MOSFET's output terminals in the ON state
ON current reduction rate	$<I_{ON}$/°C	Rated change of load current flowing between MOSFET(s) output terminals relative to ambient temperature above 25 °C
Dielectric strength between input and output	V_{I-O}	Isolation voltage between input and output terminals for a specified time
Operating temperature	T_a	Ambient temperature range in which the relay may be operated without impairment
Storage temperature	T_{stg}	Ambient temperature range in which the relay may be stored while not operating
LED forward voltage	V_F	Voltage drop between the LED's anode and cathode at a certain forward current
LED reverse current	I_R	Leakage current flowing in the LED's reverse direction (between cathode and anode)
Capacity between LED terminals	C_T	Electrostatic capacitance between the anode and the cathode terminals of the LED
Trigger LED forward current	I_{FT}	Minimum value of input current necessary to put the output MOSFET(s) in to the ON state
Maximum resistance with output ON	R_{ON}	Resistance between the MOSFET's output terminals specified with reference to ON state current
Current leakage when the relay is open	I_{LEAK}	Leakage current flowing between the MOSFET's output terminals in the OFF state
Capacity between I/O terminals	C_{I-O}	Electrostatic capacitance between the input and output terminals of the relay
Insulation resistance	R_{I-O}	Resistance between the input and output terminals at the specified voltage value
Turn-ON time	tON	Time required for the output waveform to change from 0(100%) to 90(10%) after input goes from OFF to ON state
Turn-OFF time	tOFF	Time required for the output waveform to change from 0(100%) to 90(10%) after input goes from ON to OFF state
Output dielectric strength	V_{DD}	Rated load voltage that can be applied between the MOSFET's output terminals



Relationship between R_{ON} and I_{FT}

PRECAUTIONS WHEN MOUNTING DEVICES ON PCBS

Soldering

As far as it is possible, avoid raising the temperature of the device by observing the following restrictions.

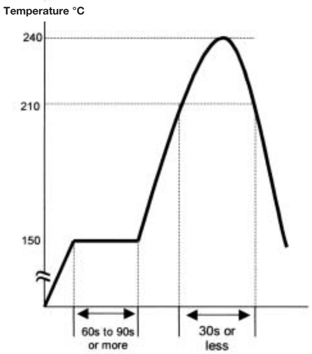
Soldering leads directly

260°C max, 10 seconds max

Reflow soldering

a) Lead temperature: 210°C max, 30 seconds max
Atmospheric temperature close of mold body surface: 240°C max, 10 seconds max

b) Recommended temperature profile



c) Precautions when heating

The soldering time (as shown above) must be kept as short as possible.

When using a halogen lamp of infrared heater, please do not irradiate the mold body surface directly.

Dip soldering (flow soldering)

Reflow soldering is recommended because the thermal stress involved is much less than that inherent in other soldering methods.

If you plan to use dip soldering, please contact OMRON first.

Cleaning

When ions in the flux enter into the product during soldering, fluctuation in device performance or corrosion may occur. Be sure to wash away any flux residue which contains C or Na ions.

The following types of solvents are recommended for cleaning the flux

Asahi Clean AK-225AES
Kao Cleanthru 750H
Pine-Alpha ST-100S

Cleaning Conditions

Cleaning conditions and precautions may vary according to product specifications.

a) **General precautions for dip cleaning**

Dipping time varies according to the solvent used.

However, as a general guideline, it is recommended that the dip time be limited to three minutes.

b) **General precautions for ultrasoni cleaning**

When ultrasonic cleaning is conducted for an excessively long time, contact between the product resin and the metal leads may lessen. Also, excessive ultrasonic stress may cause cracks in the pellet.

It is recommended that the applied stress be minimized.

Recommended conditions for standard ultrasonic cleaning

Frequency:	27kHz to 29kHz
Output:	0.25 W/cm² or less
Time:	30 seconds or less
Temperature:	50°C (may vary according to the type of solvent used)

Cleaning must be conducted with the printed circuit board or device floating on the solvent, so as to avoid direct contact between the PCB or device and the ultrasonic vibrator.

Handling Precautions

Do not touch the device's mark-bearing surface with your hand or with a brush while cleaning or applying cleaning liquid to the device. This may erase device markings. It is important to confirm that neither the solvent used for cleaning nor the cleaning conditions will damage the device package.

Precautions

> **⚠ WARNING**
> Be sure to turn OFF the power when wiring the relay, otherwise an electric shock may be received.

> **⚠ WARNING**
> Do not touch the charged terminals of the SSR, otherwise an electric shock may be received.

> **⚠ CAUTION**
> Do not apply overvoltage or overcurrent to the I/O circuits of the SSR, otherwise the SSR may malfunction or burn.

> **⚠ CAUTION**
> Be sure to wire and solder the Relay under the proper soldering conditions, otherwise the Relay in operation may generate excessive heat and the Relay may burn.

> **⚠ CAUTION**
> Electrostatic sensitive devices. Keep in original packaging until required to use. Avoid touching device terminals. Take static handling precautions during processing.

Appearence Examples

DIP (Dual In-line Package)

Omron Logo

Model name
LOT No.

SOP (Small Outline Package)

Omron Logo

Model name
LOT No.

SSOP (Shrink Small Outline Package)

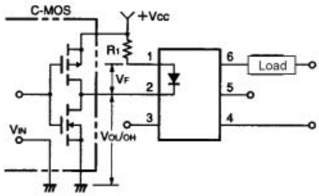
Omron mark

Model name
LOT No.

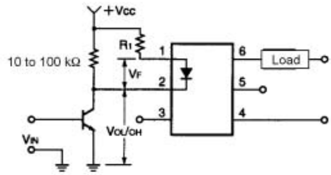
Note 'G3VM' is not printed on the actual product

Typical Relay Driving Circuit Examples

C-MOS



Transistor



Use the following formula to obtain the LED current limiting resistance value to assure that the relay operates accurately.

$$R_1 = \frac{V_{CC} - V_{OL} - V_F\,(ON)}{5 \text{ to } 20 \text{ mA}}$$

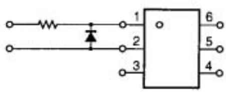
Use the following formula to obtain the LED forward voltage value to assure that the relay releases accurately.

$$V_{F\,(OFF)} = V_{CC} - V_{OH} < 0.8 \text{ V}$$

PROTECTION FROM SURGE VOLTAGE ON THE INPUT TERMINALS

If any reversed surge voltage is imposed on the input terminals, insert a diode in parallel to the input terminals as shown in the following circuit diagram and do not impose a reversed voltage value of 3 V or more.

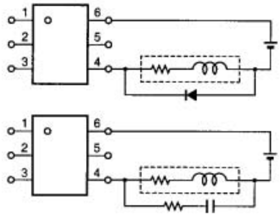
Surge Voltage Protection Circuit Example



PROTECTION FROM SPIKE VOLTAGE ON THE OUTPUT TERMINALS

If a spike voltage exceeding the absolute maximum rated value is generated between the output terminals, insert a C-R snubber or clamping diode in parallel to the load as shown in the following circuit diagram to limit the spike voltage.

Spike Voltage Protection Circuit Example



UNUSED TERMINALS (6-PIN MODELS ONLY)

Terminal 3 is connected to thr internal circuit. Do not connect anything to terminal 3 externally.

PIN STRENGTH FOR AUTOMATIC MOUNTING

In order to maintain the characteristics of the relay, the force imposed on any pin of a relay for automatic mounting must not exceed the following.

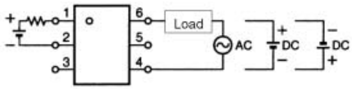
In direction A: 1.96 N

In direction B: 1.96 N

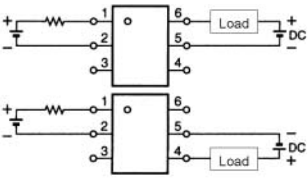
LOAD CONNECTION

Do not short-circuit the input and output terminals while the relay is operating or the relay may malfunction.

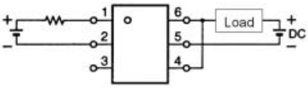
AC Connection



DC Single Connection



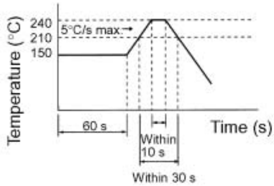
DC Parallel Connection



SOLDER MOUNTING

Maintain the following conditions during manual or reflow soldering of the relays in order to prevent the temperature of the relays from rising.

1. Pin Soldering
   Solder each pin at a maximum temperature of 260°C within 10 s.
2. Reflow Soldering
   a. Solder each pin at a maximum temperature of 260°C within 10 s.
   b. Make sure that the ambient temperature on the surface of the resin casing is 240C max. for 10 s maximum.
   c. The following temperature changes are recommendable for soldering.



Style			**Through-hole Device – 4 pin**				
							
Dimensions (L x W x H mm)			4.58 x 6.4 x 3.65				
Type			General Purpose		Telecom	General Purpose	
Part Number (G3VM-)			**-61A1**	**-351A**	**-2L**	**-353A**	**-401A**
Output	**Load Voltage**		60 V	350 V	350 V	350 V	400 V
	Function		1a	1a	1a CLF	1b	1a
	Cont. load current (connection A)		500 mA	120 mA	120 mA	150 mA	120 mA
	ON resistance	**Typical**	1 Ω	35 Ω	22 Ω	15 Ω	18 Ω
		Max.	2 Ω	50 Ω	35 Ω	25 Ω	35 Ω
Input	**LED forward current (max)**		50 mA				
	LED reverse voltage (max)		5 V		6 V	5 V	
	Trigger LED current	**Typical**	1.6 mA	1 mA	1 mA	1 mA	1 mA
		Max.	3 mA	3 mA	3 mA	3 mA	3 mA
Switching Charact-eristics	**Turn-on Time**	**Typical**	0.8 ms	0.3 ms	–	1 ms	–
		Max.	2 ms	1 ms	1 ms	1 ms	1 ms
	Turn-off Time	**Typical**	0.1 ms	0.1 ms	–	1 ms	–
		Max.	0.5 ms	1 ms	1 ms	3 ms	1 ms
Dielectric Strength between I/O terminals			2,500 VAC				
Tempera-ture	**Operating**		-40°C to 85°C				
	Storage		-55°C to 125°C				
Floating capacity between I/O terminals			0.8 pF				
Insulation resistance			1,000 MΩ				
Page			378	382	380	384	386

Style			**Surface Mount Device – 4 pin**				
							
Dimensions (L x W x H mm)			4.58 x 6.4 x 3.65				
Type			General Purpose		Telecom	General Purpose	
Part Number (G3VM-)			**-61D1**	**-351D**	**-2FL**	**-353D**	**-401D**
Output	**Load Voltage**		60 V	350 V	350 V	350 V	400 V
	Function		1a	1a	1a CLF	1b	1a
	Cont. load current (connection A)		500 mA	120 mA	120 mA	150 mA	120 mA
	ON resistance	**Typical**	1 Ω	35 Ω	22 Ω	15 Ω	18 Ω
		Max.	2 Ω	50 Ω	35 Ω	25 Ω	35 Ω
Input	**LED forward current (max)**		50 mA				
	LED reverse voltage (max)		5 V		6 V	5 V	
	Trigger LED current	**Typical**	1.6 mA	1 mA	1 mA	1 mA	1 mA
		Max.	3 mA	3 mA	3 mA	3 mA	3 mA
Switching Charact-eristics	**Turn-on Time**	**Typical**	0.8 ms	0.3 ms	–	1 ms	–
		Max.	2 ms	1 ms	1 ms	1 ms	1 ms
	Turn-off Time	**Typical**	0.1 ms	0.1 ms	–	1 ms	–
		Max.	0.5 ms	1 ms	1 ms	3 ms	1 ms
Dielectric Strength between I/O terminals			2,500 VAC				
Tempera-ture	**Operating**		-40°C to 85°C				
	Storage		-55°C to 125°C				
Floating capacity between I/O terminals			0.8 pF				
Insulation resistance			1,000 MΩ				
Page			378	382	380	384	386

Style			**Small Outline Package – 4 pin**				
							
Dimensions (L x W x H mm)			3.9 x 4.4 x 2.1				
Type			Special Purpose				
Part Number (G3VM-)			**-21GR**	**21GR1**	**41GR5**	**-41GR6**	**-61GR1**
Output	**Load Voltage**		20 V	20 V	40 V	40 V	60 V
	Function		1a	1a	1a	1a	1a
	Cont. load current (connection A)		420 V	20 V	40 V	40 V	60 V
	ON resistance	**Typical**	5 Ω	1 Ω	1 Ω	10 Ω	0.32 Ω
		Max.	8 Ω	1.5 Ω	1.5Ω	15 Ω	0.7 Ω
Input	**LED forward current (max)**		50 mA	50 mA	50 mA	50 mA	50 mA
	LED reverse voltage (max)		5 V	5 V	5 V	5 V	5 V
	Trigger LED current	**Typical**	–	–	–	–	–
		Max.	4 mA	4 mA	4 mA	4 mA	3 mA
Switching Charact-eristics	**Turn-on Time**	**Typical**	–	–	–	–	1.4 ms
		Max.	0.5 ms	0.5 ms	0.5 ms	0.5 ms	3 ms
	Turn-off Time	**Typical**	–	–	–	–	0.2 ms
		Max.	0.5 ms	0.5 ms	0.5 ms	0.5 ms	1 ms
Dielectric Strength between I/O terminals			1,500 VAC	1,500 VAC	1,500 VAC	1,500 VAC	1,500 VAC
Tempera-ture	**Operating**		-20°C to 85°C	-20°C to 85°C	-20°C to 85°C	-20°C to 85°C	-40°C to 85°C
	Storage		-40°C to 125°C	-40°C to 125°C	-40°C to 125°C	-40°C to 125°C	-40°C to 125°C
Floating capacity between I/O terminals			0.8 pF	0.8 pF	0.8 pF	0.8 pF	0.8 pF
Insulation resistance			1,000 MΩ	1,000 MΩ	1,000 MΩ	1,000 MΩ	1,000 MΩ
Page			388	390	392	394	396

Style			Small Outline Package – 4 pin					
								
Dimensions (L x W x H mm)			3.9 x 4.4 x 2.1					
Type			General Purpose					
Part Number (G3VM-)			-61G1	-81G1	-201G	-351G	-353G	-401G
Output	Load Voltage		60 V	80 V	200 V	350 V	350 V	400 V
	Function		1a	1a	1a	1a	1b	1a
	Cont. load current (connection A)		400 mA	350 mA	50 mA	110 mA	120 mA	120 mA
	ON resistance	Typical	1 Ω	1 Ω	40 Ω	35 Ω	15 Ω	17 Ω
		Max.	2 Ω	1.2 Ω	50 Ω	50 Ω	25 Ω	35 Ω
Input	LED forward current (max)		50 mA					
	LED reverse voltage (max)		5 V					
	Trigger LED current	Typical	1.6 mA	1 mA	1 mA	1 mA	1 mA	1 mA
		Max.	3 mA	4 mA	3 mA	3 mA	3 mA	3 mA
Switching Charact-eristics	Turn-on Time	Typical	0.8 ms	0.3 ms	–	1 ms	–	0.3 ms
		Max.	2 ms	1 ms	1 ms	1 ms	1 ms	1 ms
	Turn-off Time	Typical	0.1 ms	0.1 ms	–	1 ms	–	0.1 ms
		Max.	0.5 ms	1 ms	1 ms	3 ms	1 ms	1 ms
Dielectric Strength between I/O terminals			1,500 VAC					
Tempera-ture	Operating		-40°C to 85°C					
	Storage		-55°C to 125°C					
Floating capacity between I/O terminals			0.8 pF					
Insulation resistance			1,000 MΩ					
Page			398	400	402	404	406	408

Style			Super Small Outline Package – 4 pin			
						
Dimensions (L x W x H mm)			1.7 x 4.2 x 1.8			
Type			Special Purpose			
Part Number (G3VM-)			-21LR	21LR1	-41LR5	-41LR6
Output	Load Voltage		20 V	20 V	40 V	40 V
	Function		1a	1a	1a	1a
	Cont. load current (connection A)		160 mA	450 mA	300 mA	120 mA
	ON resistance	Typical	5 Ω	0.8 Ω	1 Ω	10 Ω
		Max.	8 Ω	1.2 Ω	1.5 Ω	15 Ω
Input	LED forward current (max)		50 mA	50 mA	50 mA	50 mA
	LED reverse voltage (max)		5 V	5 V	5 V	5 V
	Trigger LED current	Typical	–	–	–	–
		Max.	4 mA	4 mA	4 mA	4 mA
Switching Charact-eristics	Turn-on Time	Typical	–	–	–	–
		Max.	0.5ms	0.5ms	0.5ms	0.5ms
	Turn-off Time	Typical	–	–	–	–
		Max.	0.5ms	0.5ms	0.5ms	0.5ms
Dielectric Strength between I/O terminals			1,500 VAC	1,500 VAC	1,500 VAC	1,500 VAC
Tempera-ture	Operating		-20°C to 85°C	-20°C to 85°C	-20°C to 85°C	
	Storage		-40°C to 125°C	-40°C to 125°C	-40°C to 125°C	
Floating capacity between I/O terminals			0.8 pF	0.8 pF	0.8 pF	0.8 pF
Insulation resistance			1,000 MΩ	1,000 MΩ	1,000 MΩ	1,000 MΩ
Page			410	412	414	416

Style			Through-hole Device – 6 pin								
											
Dimensions (L x W x H mm)			7.12 x 6.4 x 3.65	8.64 x 6.4 x 3.65	7.12 x 6.4 x 3.65				8.64 x 6.4 x 3.65	7.12 x 6.4 x 3.65	
Type			General Purpose	High Performance	General Purpose	Telecom	General Purpose		High Performance	Telecom	
Part Number (G3VM-)			**-61B1**	**-XN**	**-351B**	**-3L**	**-353B**	**-401B**	**-4N**	**-401BY**	**-601BY**
Output	Load Voltage		60 V	60 V	350 V	350 V	350 V	400 V	400 V	400 V	600 V
	Function		1a	1a hiperf	1a	1a CLF	1b	1a	1a hiperf	1a hi isol	1a hi isol
	Cont. load current (connection A)		500 mA	300 mA	120 mA	120 mA	150 mA	120 mA	150 mA	120 mA	100 mA
	ON resistance	Typical	1 Ω	1.4 Ω	25 Ω	22 Ω	15 Ω	17 Ω	–	17 Ω	25 Ω
		Max.	2 Ω	2 Ω	35 Ω	35 Ω	25 Ω	35 Ω	12 Ω	35 Ω	35 Ω
Input	LED forward current (max)		50 mA	30 mA	50 mA				30 mA	50 mA	
	LED reverse voltage (max)		5 V								
	Trigger LED current	Typical	1.6 mA	1 mA	1 mA	–	1 mA	1 mA	1 mA	–	1.6 mA
		Max.	3 mA	5 mA	3 mA	3 mA	3 mA	3 mA	5 mA	3 mA	5 mA
Switching Characteristics	Turn-on Time	Typical	0.8 ms	0.2 ms	0.3 ms	–	0.1 ms	0.3 ms	0.3 ms	0.3 ms	0.2 ms
		Max.	2 ms	0.5 ms	1 ms	1 ms	1 ms	1 ms	1 ms	1 ms	1.5 ms
	Turn-off Time	Typical	0.1 ms	0.2 ms	0.1 ms	–	1 ms	0.1 ms	0.3 ms	0.1 ms	0.2 ms
		Max.	0.5 ms	0.5 ms	1 ms	1 ms	3 ms	1 ms	1 ms	1 ms	1 ms
Dielectric Strength between I/O terminals			2,500 VAC							5,000 VAC	
Temperature	Operating		-40°C to 85°C								
	Storage		-55°C to 125°C								
Floating capacity between I/O terminals			0.8 pF								
Insulation resistance			1,000 MΩ								
Page			418	420	423	425	427	429	431	434	436

Style			**Surface Mount Device – 6 pin**								
											
Dimensions (L x W x H mm)			7.12 x 6.4 x 3.65	8.64 x 6.4 x 3.65	7.12 x 6.4 x 3.65				8.64 x 6.4 x 3.65	7.12 x 6.4 x 3.65	
Type			General Purpose	High Performance	General Purpose	Telecom	General Purpose		High Performance	Telecom	
Part Number (G3VM-)			**-61E1**	**-XNF**	**-351E**	**-3FL**	**-353E**	**-401E**	**-4NF**	**-401EY**	**-601EY**
Output	**Load Voltage**		60 V	60 V	350 V	350 V	350 V	400 V	400 V	400 V	600 V
	Function		1a	1a hiperf	1a	1a CLF	1b	1a	1a hiperf	1a hi isol	1a hi isol
	Cont. load current (connection A)		500 mA	300 mA	120 mA	120 mA	150 mA	120 mA	150 mA	120 mA	100 mA
	ON resistance	**Typical**	1 Ω	1.4 Ω	25 Ω	22 Ω	15 Ω	17 Ω	8 Ω	17 Ω	22 Ω
		Max.	2 Ω	2 Ω	35 Ω	35 Ω	25 Ω	35 Ω	12 Ω	35 Ω	35 Ω
Input	**LED forward current (max)**		50 mA	30 mA	50 mA				30 mA	50 mA	
	LED reverse voltage (max)		5 V								
	Trigger LED current	**Typical**	1.6 mA	1 mA	1 mA	–	1 mA	1 mA	1 mA	–	1.6 mA
		Max.	3 mA	5 mA	3 mA	3 mA	3 mA	3 mA	5 mA	3 mA	5 mA
Switching Charact-eristics	**Turn-on Time**	**Typical**	0.8 ms	0.2 ms	0.3 ms	–	0.1 ms	0.3 ms	0.3 ms	0.3 ms	0.5 ms
		Max.	2 ms	0.5 ms	1 ms	1 ms	1 ms	1 ms	1 ms	1 ms	1.5 ms
	Turn-off Time	**Typical**	0.1 ms	0.2 ms	0.1 ms	–	1 ms	0.1 ms	0.3 ms	0.1 ms	0.1 ms
		Max.	0.5 ms	0.5 ms	1 ms	1 ms	3 ms	1 ms	1 ms	1 ms	1 ms
Dielectric Strength between I/O terminals			2,500 VAC							5,000 VAC	
Tempera-ture	**Operating**		-40°C to 85°C								
	Storage		-55°C to 125°C								
Floating capacity between I/O terminals			0.8 pF								
Insulation resistance			1,000 MΩ								
Page			418	420	423	425	427	429	431	434	436

Style			**Small Outline Package – 6 pin**					
								
Dimensions (L x W x H mm)			6.3 x 4.4 x 2.1					
Type			General Purpose	Special Purpose	General Purpose			
Part Number (G3VM-)			**-61H1**	**-81HR**	**-201H1**	**-351H**	**-353H**	**-401H**
Output	**Load Voltage**		60 V	80 V	200 V	350 V	350 V	400 V
	Function		1a	1a	1a	1a	1b	1a
	Cont. load current (connection A)		400 mA	1,250 mA	200 mA	110 mA	120 mA	120 mA
	ON resistance	**Typical**	1 Ω	2 Ω	5 Ω	25 Ω	15 Ω	17 Ω
		Max.	2 Ω	4 Ω	8 Ω	35 Ω	25 Ω	35 Ω
Input	**LED forward current (max)**		50 mA					
	LED reverse voltage (max)		5 V					
	Trigger LED current	**Typical**	1.6 mA	2 mA	1 mA	1 mA	1 mA	1 mA
		Max.	3 mA	5 mA	3 mA	3 mA	3 mA	3 mA
Switching Charact-eristics	**Turn-on Time**	**Typical**	0.8 ms	2 ms	0.6 ms	0.3 ms	–	0.3 ms
		Max.	2 ms	3 ms	1.5 ms	1 ms	1 ms	1 ms
	Turn-off Time	**Typical**	0.1 ms	0.7 ms	0.1 ms	0.1 ms	–	0.1 ms
		Max.	0.5 ms	1 ms	1 ms	1 ms	3 ms	1 ms
Dielectric Strength between I/O terminals			1,500 VAC					
Tempera-ture	**Operating**		-40°C to 85°C	-20°C to 85°C	-40°C to 85°C			
	Storage		-55°C to 125°C	-40°C to 125°C	-55°C to 125°C			
Floating capacity between I/O terminals			0.8 pF					
Insulation resistance			1,000 MΩ					
Page			438	440	442	444	446	448

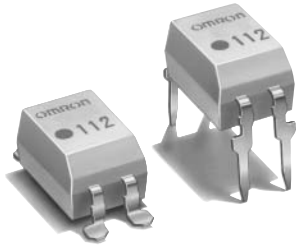
Style			Through-hole Device – 8 pin							
										
Dimensions (L x W x H mm)			9.66 x 6.4 x 3.65							
Type			Special Purpose		General Purpose		Telecom	General Purpose		
Part Number (G3VM-)			-22CO	-61CR	-62C1	-352C	-WL	-354C	-355C	-402C
Output	Load Voltage		60 V	60 V	60 V	350 V	350 V	350 V	350 V	400 V
	Function		2a	1a	2a	2a	2a CLF	2b	1c	2a
	Cont. load current (connection A)		150 mA	500 mA	500 mA	120 mA	120 mA	150 mA	100 mA	120 mA
	ON resistance	Typical	2 Ω	–	1 Ω	25 Ω	22 Ω	15 Ω	30 Ω	18 Ω
		Max.	4 Ω	0.12	2 Ω	50 Ω	35 Ω	25 Ω	35 Ω	35 Ω
Input	LED forward current (max)		50 mA							
	LED reverse voltage (max)		6V		5 V		6 V	5 V		
	Trigger LED current	Typical	1.15 mA	–	1.6 mA	1 mA	1 mA	1 mA	1 mA	1 mA
		Max.	5 mA	5 mA	3 mA	3 mA	3 mA	3 mA	3 mA	3 mA
Switching Charact-eristics	Turn-on Time	Typical	–	–	0.8 ms	0.3 ms	–	0.1 ms	0.3 ms	–
		Max.	1 ms	5 ms	2 ms	1 ms	1 ms	1 ms	1 ms	1 ms
	Turn-off Time	Typical	–	–	0.1 ms	0.1 ms	–	1 ms	0.15 ms	–
		Max.	1 ms	5 ms	0.5 ms	1 ms	1 ms	3 ms	1 ms	1 ms
Dielectric Strength between I/O terminals			2,500 VAC	1,500 VAC	2,500 VAC					
Tempera-ture	Operating		-40°C to 85°C	-20°C to 85°C	-40°C to 85°C					
	Storage		-55°C to 125°C							
Floating capacity between I/O terminals			0.8 pF							
Insulation resistance			1,000 MΩ							
Page			450	452	454	456	458	460	462	464

Style			Surface Mount Device – 8 pin							
										
Dimensions (L x W x H mm)			9.66 x 6.4 x 3.65							
Type			Special Purpose		General Purpose		Telecom	General Purpose		
Part Number (G3VM-)			-22FO	-61FR	-62F1	-352F	-WFL	-354F	-355F	-402F
Output	Load Voltage		20 V	60 V	60 V	350 V	350 V	350 V	350 V	400 V
	Function		2a	1a	2a	2a	2a CLF	2b	1c	2a
	Cont. load current (connection A)		150mA	500mA	500mA	120mA	120mA	150mA	100mA	120mA
	ON resistance	Typical	2 Ω	?	1 Ω	25 Ω	22 Ω	15 Ω	30 Ω	18 Ω
		Max.	4 Ω		2 Ω	50 Ω	35 Ω	25 W	35 Ω	35 Ω
Input	LED forward current (max)		50 mA							
	LED reverse voltage (max)		6 V		5 V		6 V	5 V		
	Trigger LED current	Typical	1.5 mA	–	1.6 mA	1 mA	1 mA	1 mA	1 mA	1 mA
		Max.	5 mA	5 mA	3 mA	3 mA	3 mA	3 mA	3 mA	3 mA
Switching Charact-eristics	Turn-on Time	Typical	–	–	0.8 ms	0.3 ms	–	0.1 ms	0.3 ms	–
		Max.	1 ms	5 ms	2 ms	1 ms	1 ms	1 ms	1 ms	1 ms
	Turn-off Time	Typical	–	–	0.1 ms	0.1 ms	–	1 ms	0.15 ms	–
		Max.	1 ms	5 ms	0.5 ms	1 ms	1 ms	3 ms	1 ms	1 ms
Dielectric Strength between I/O terminals			2,500 VAC	1,500 VAC	2,500 VAC					
Tempera-ture	Operating		-40°C to 85°C	-20°C to 85°C	-40°C to 85°C					
	Storage		-55°C to 125°C							
Floating capacity between I/O terminals			0.8 pF							
Insulation resistance			1,000 MΩ							
Page			450	452	454	456	458	460	462	464

Style			Small Outline Package – 8 pin					
								
Dimensions (L x W x H mm)			9.4 x 4.4 x 2.1					
Type			General Purpose					
Part Number (G3VM-)			-62J1	-202J1	-352J	-354J	-355J	-402J
Output	Load Voltage		60 V	200 V	350 V	350 V	350 V	400 V
	Function		2a	2a	2a	2b	1c	2a
	Cont. load current (connection A)		400mA	200mA	110mA	120mA	90mA	120mA
	ON resistance	Typical	1 Ω	5 Ω	35 Ω	15 Ω	30 Ω	17 Ω
		Max.	2 Ω	8 Ω	50 Ω	25 Ω	35 Ω	35 Ω
Input	LED forward current (max)		50 mA					
	LED reverse voltage (max)		5 V					
	Trigger LED current	Typical	1.6 mA	1 mA	1 mA	1 mA	1 mA	1 mA
		Max.	3 mA	3 mA	3 mA	3 mA	3 mA	3 mA
Switching Charact-eristics	Turn-on Time	Typical	0.8 ms	0.6 ms	0.3 ms	–	0.3 ms	0.3 ms
		Max.	2 ms	1.5 ms	1 ms	1 ms	1 ms	1 ms
	Turn-off Time	Typical	0.1 ms	0.1 ms	0.1 ms	–	0.15ms	0.1 ms
		Max.	0.5 ms	1 ms	1 ms	3 ms	1 ms	1 ms
Dielectric Strength between I/O terminals			1,500 VAC					
Tempera-ture	Operating		-40°C to 85°C					
	Storage		-55°C to 125°C					
Floating capacity between I/O terminals			0.8 pF					
Insulation resistance			1,000 MΩ					
Page			466	468	470	472	474	476

Compact, General-purpose, Analog switching MOSFET Relay, with Dielectric Strength of 2.5 kVAC between I/O Using Optical Isolation

- Upgraded G3VM-61 A/D Series.
- Switches minute analog signals.
- Leakage current of 1 A max. when output relay is open.



NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Measurement devices
- Security systems
- Amusement machines

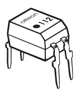
List of Models

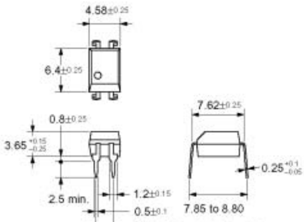
Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	60 VAC	G3VM-61A1	100	---
	Surface-mounting terminals		G3VM-61D1		
			G3VM-61D1(TR)	---	1,500

Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61A1

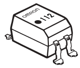


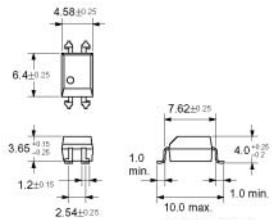


Note: The actual product is marked differently from the image shown here.

Weight: 0.25 g

G3VM-61D1



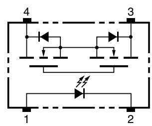


Note: The actual product is marked differently from the image shown here.

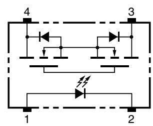
Weight: 0.25 g

Terminal Arrangement/Internal Connections (Top View)

G3VM-61A1

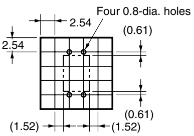


G3VM-61D1



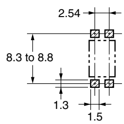
PCB Dimensions (Bottom View)

G3VM-61A1



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61D1



■ Absolute Maximum Ratings (Ta = 25°C)

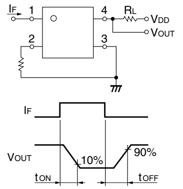
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	60	V	
	Continuous load current	I_O	500	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−5.0	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.6	3	mA	I_O = 500 mA
Output	Maximum resistance with output ON	R_{ON}	---	1	2	Ω	I_F = 5 mA, I_O = 500 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	µA	V_{OFF} = 60 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.8	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.1	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

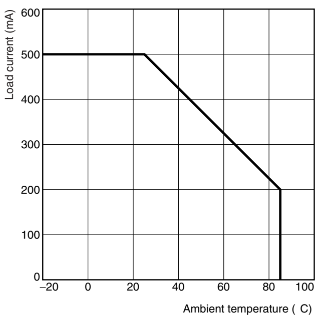
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	500	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-61A1(D1)



MOSFET Relays

Analog-switching MOSFET Relays with 350-V Load Voltage and Current Limit.

■ A 4-pin Relay available with the same terminal-pin position as 4-pin photocouplers.
■ Approved standards: UL1577 (File No. E80555)

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Electronic automatic exchange systems
- Cordless telephones
- Multi-functional telephones
- Measurement devices

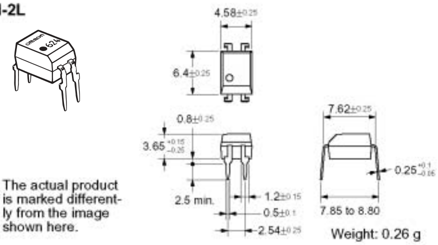
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Current limit	Number per stick	Number per tape
SPST-NO	PCB terminals	350 VAC	G3VM-2L	Yes	100	---
	Surface-mounting terminals		G3VM-2FL			
			G3VM-2FL(TR)		---	1,500

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

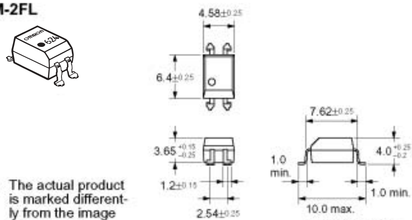
G3VM-2L



Note: The actual product is marked differently from the image shown here.

Weight: 0.26 g

G3VM-2FL

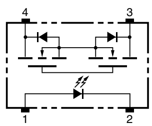


Note: The actual product is marked differently from the image shown here.

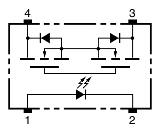
Weight: 0.26 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-2L

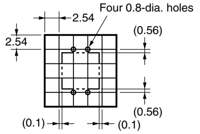


G3VM-2FL



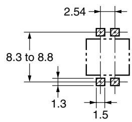
■ PCB Dimensions (Bottom View)

G3VM-2L



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-2FL



Absolute Maximum Ratings (Ta = 25°C)

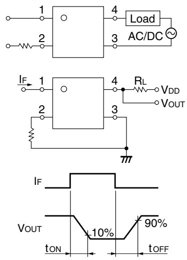
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	6	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	—	10	µA	V_R = 6 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	22	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	—	1.0	µA	V_{OFF} = 350 V
Limit current		I_{LIM}	150	—	300	mA	I_F = 5 mA, V_{DD} = 5 V, t = 5 ms
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	—	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	—	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	—	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



Recommended Operating Conditions

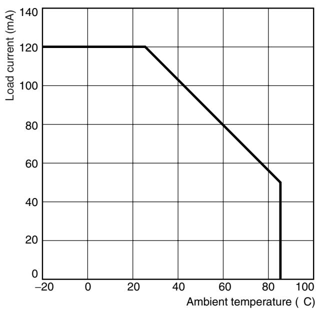
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

Engineering Data

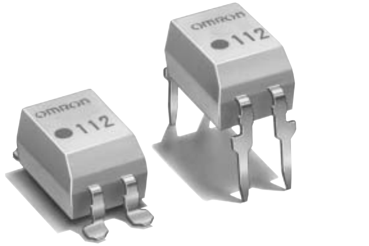
Load Current vs. Ambient Temperature

G3VM-2(F)L



New Standard Series with 350-V Load

- Upgraded G3VM-2 Series.
- Continuous load current of 120 mA.
- Dielectric strength of 2,500 Vrms between I/O.
- Operating time of 0.3 ms (typical)



NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Measurement devices
- Security systems
- Amusement machines

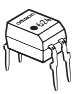
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	350 VAC	G3VM-351A	100	---
	Surface-mounting terminals		G3VM-351D		
			G3VM-351D(TR)	---	1,500

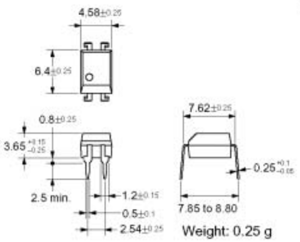
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-351A

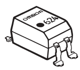


Note: The actual product is marked differently from the image shown here.

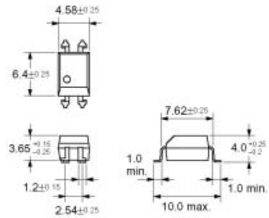


Weight: 0.25 g

G3VM-351D



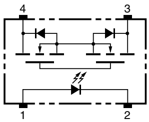
Note: The actual product is marked differently from the image shown here.



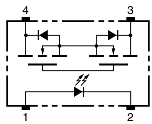
Weight: 0.25 g

Terminal Arrangement/Internal Connections (Top View)

G3VM-351A

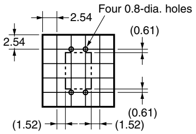


G3VM-351D



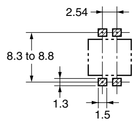
PCB Dimensions (Bottom View)

G3VM-351A



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-351D



■ Absolute Maximum Ratings (Ta = 25°C)

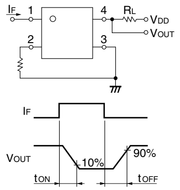
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 120 mA, t < 1 s
			---	35	50	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	µA	V_{OFF} = 350 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.1	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

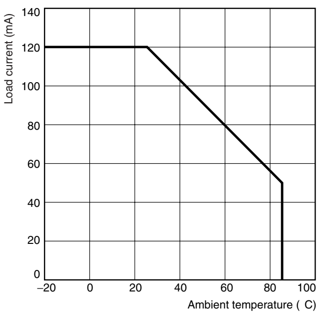
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

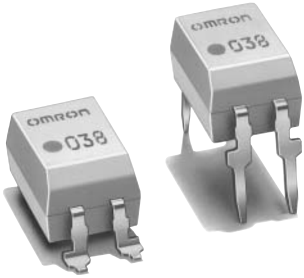
Load Current vs. Ambient Temperature

G3VM-351A(D)



Analog-switching MOSFET Relay with SPST-NC (Single-pole, Single-throw, Normally Closed) Contacts

- Switches minute analog signals.
- Switching AC and DC.



Note: The actual product is marked differently from the image shown here.

Application Examples

- Electronic automatic exchange systems
- Security systems
- Datacom (modem) systems
- FA systems
- Measurement devices

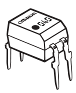
List of Models

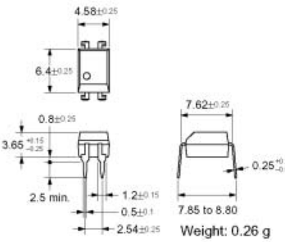
Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NC	PCB terminals	350 VAC	G3VM-353A	100	---
	Surface-mounting terminals		G3VM-353D		
			G3VM-353D(TR)	---	1,500

Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-353A

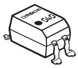


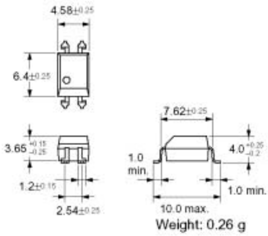


Note: The actual product is marked differently from the image shown here.

Weight: 0.26 g

G3VM-353D



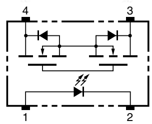


Note: The actual product is marked differently from the image shown here.

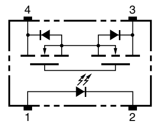
Weight: 0.26 g

Terminal Arrangement/Internal Connections (Top View)

G3VM-353A

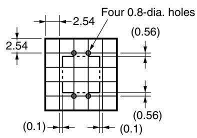


G3VM-353D



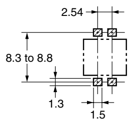
PCB Dimensions (Bottom View)

G3VM-353A



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-353D



■Absolute Maximum Ratings (Ta = 25°C)

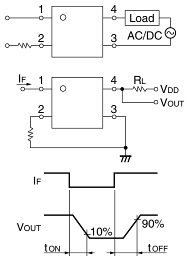
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	150	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.5	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		—	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_{OFF} = 10 μA
Output	Maximum resistance with output ON	R_{ON}	---	15	25	Ω	I_O = 150 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	μA	I_F = 5 mA, V_{OFF} = 350 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.1	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	1.0	3.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■Recommended Operating Conditions

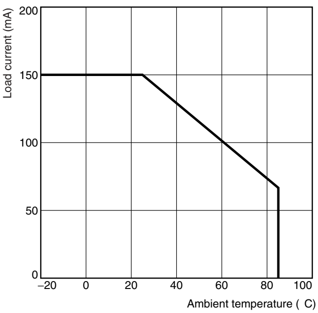
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	---	25	mA
Continuous load current	I_O	---	---	150	mA
Operating temperature	T_a	− 20	---	65	°C

■Engineering Data

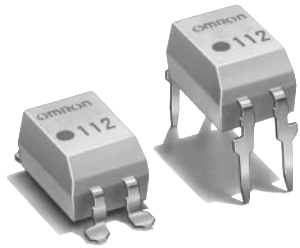
Load Current vs. Ambient Temperature

G3VM-353A(D)



Expanded Range of Analog-switching MOSFET Relays with 400-V Load Voltage

- A 4-pin Relay now available in the 400-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 2,500 Vrms between I/O.



NEW Approval pending

Note: The actual product is marked differently from the image shown here.

Application Examples

- Measurement devices
- Security systems
- Amusement machines

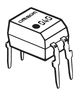
List of Models

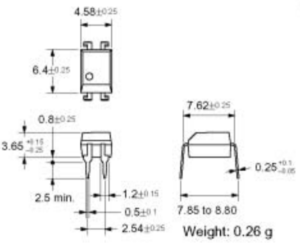
Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	400 VAC	G3VM-401A	100	---
	Surface-mounting terminals		G3VM-401D		
			G3VM-401D(TR)	---	1,500

Dimensions

Note: All units are in millimeters unless otherwise indicated.

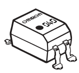
G3VM-401A

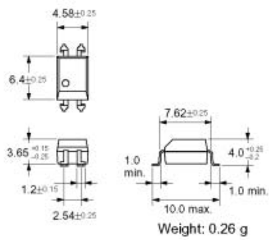




Note: The actual product is marked differently from the image shown here.

G3VM-401D

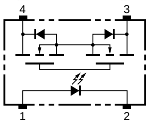




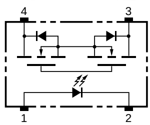
Note: The actual product is marked differently from the image shown here.

Terminal Arrangement/Internal Connections (Top View)

G3VM-401A

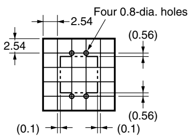


G3VM-401D



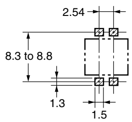
PCB Dimensions (Bottom View)

G3VM-401A



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-401D



■ Absolute Maximum Ratings (Ta = 25°C)

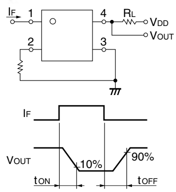
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	400	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		$V_{I\text{-}O}$	2,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	18	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	μA	V_{OFF} = 400 V
Capacity between I/O terminals		$C_{I\text{-}O}$	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		$R_{I\text{-}O}$	1,000	---	---	MΩ	$V_{I\text{-}O}$ = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

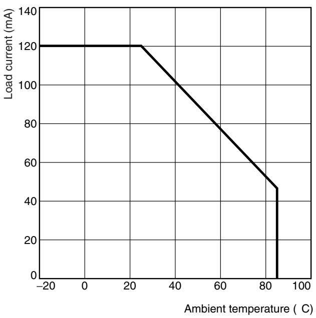
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

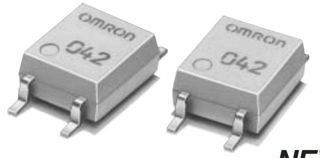
Load Current vs. Ambient Temperature

G3VM-401A(D)



New MOS FET Relay with Low Output Capacitance and ON Resistance (CxR = 5pF• Ω) in a 20-V Load Voltage Model

- Output capacitance of 1 pF (typical) allows high-frequency applications.
- Leakage current of 1.0 nA max. when output relay is open.



Note: The actual product is marked differently from the image shown here.

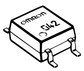
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	20 VAC	G3VM-21GR	100	
			G3VM-21GR(TR)	---	2,500

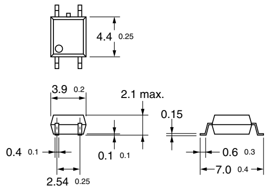
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-21GR



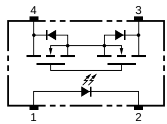
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

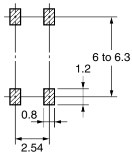
Terminal Arrangement/Internal Connections (Top View)

G3VM-21GR



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-21GR



Absolute Maximum Ratings (Ta = 25°C)

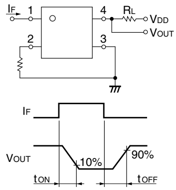
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	20	V	
	Continuous load current	I_O	160	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−1.6	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	—	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	—	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	—	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	—	5	8	Ω	I_F = 5 mA, I_O = 160 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	—	---	1.0	nA	V_{OFF} = 20 V, Ta = 50°C
	Capacity between terminals	C_{OFF}	—	1.0	2.5	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	—	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	—	---	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



Recommended Operating Conditions

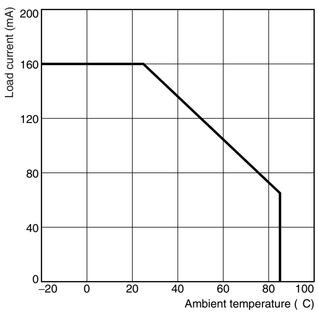
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	20	V
Operating LED forward current	I_F	7	---	30	mA
Continuous load current	I_O	---	---	160	mA
Operating temperature	T_a	25	---	60	°C

Engineering Data

Load Current vs. Ambient Temperature

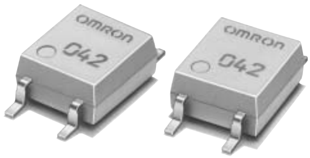
G3VM-21GR



MOSFET Relays

New MOS FET Relay with Low Output Capacitance and ON Resistance (CxR = 5pF• Ω) in a 20-V Load Voltage Model

- ON resistance of 1 W (typical) suppresses output signal attenuation.
- Leakage current of 1.0 nA max. when output relay is open.



NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

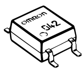
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	20 VAC	G3VM-21GR1	100	
			G3VM-21GR1(TR)	---	2,500

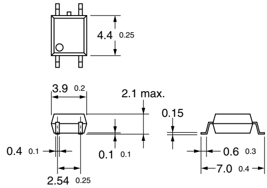
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-21GR1



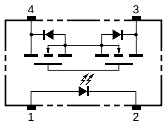
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

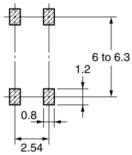
Terminal Arrangement/Internal Connections (Top View)

G3VM-21GR1



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-21GR1



■Absolute Maximum Ratings (Ta = 25°C)

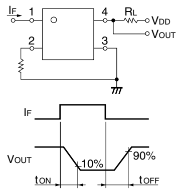
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	20	V	
	Continuous load current	I_O	300	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	–3.0	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		—	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	1	1.5	Ω	I_F = 5 mA, I_O = 300 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	nA	V_{OFF} = 20 V, Ta = 50°C
	Capacity between terminals	C_{OFF}	---	5.0	12.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



■Recommended Operating Conditions

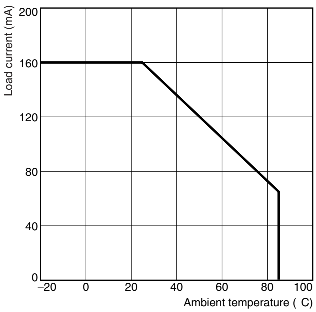
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	20	V
Operating LED forward current	I_F	7	---	30	mA
Continuous load current	I_O	---	---	300	mA
Operating temperature	T_a	25	---	60	°C

■Engineering Data

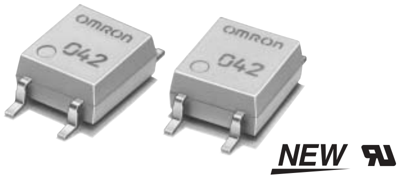
Load Current vs. Ambient Temperature

G3VM-21GR1



New MOS FET Relay with Low Output Capacitance and ON Resistance (CxR = 10pF• Ω) in a 40-V Load Voltage Model

- ON resistance of 1 Ω (typical) suppresses output signal attenuation.
- Leakage current of 1.0 nA max. when output relay is open.



Note: The actual product is marked differently from the image shown here.

Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

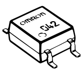
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	G3VM-41GR5	100	---
			G3VM-41GR5(TR)	---	2,500

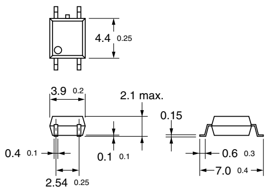
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41GR5



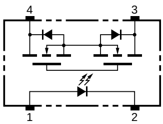
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

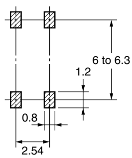
Terminal Arrangement/Internal Connections (Top View)

G3VM-41GR5



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41GR5



■ Absolute Maximum Ratings (Ta = 25°C)

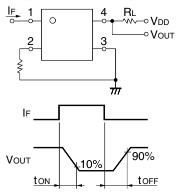
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	40	V	
	Continuous load current	I_O	300	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−3.0	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	1.0	1.5	Ω	I_F = 5 mA, I_O = 300 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	nA	V_{OFF} = 30 V, Ta = 50°C
	Capacity between terminals	C_{OFF}	---	10.0	14.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

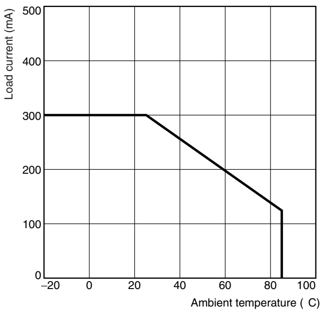
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current	I_O	---	---	300	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

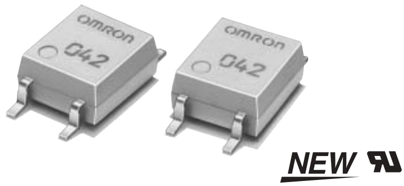
Load Current vs. Ambient Temperature

G3VM-41GR5



New MOS FET Relay with Low Output Capacitance and ON Resistance (CxR = 10pF• Ω) in a 40-V Load Voltage Model

- Output capacitance of 1 pF (typical) allows high-frequency applications.
- Leakage current of 1.0 nA max. when output relay is open.



Note: The actual product is marked differently from the image shown here.

Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

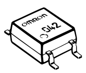
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	G3VM-41GR6	100	---
			G3VM-41GR6(TR)	---	2,500

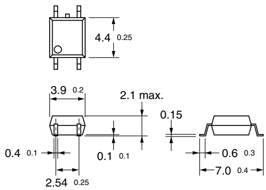
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41GR6



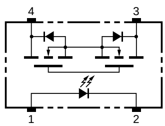
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

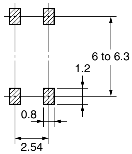
Terminal Arrangement/Internal Connections (Top View)

G3VM-41GR6



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41GR6



■ Absolute Maximum Ratings (Ta = 25°C)

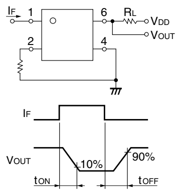
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	40	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	–1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	10	15	Ω	I_F = 5 mA, I_O = 120 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	nA	V_{OFF} = 30 V, Ta = 50°C
	Capacity between terminals	C_{OFF}	---	1.0	2.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

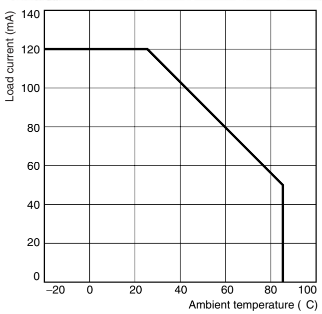
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current	I_O	---	---	120	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

Load Current vs. Ambient Temperature

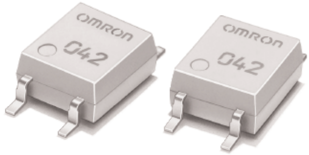
G3VM-41GR6



MOSFET Relays

New MOS FET Relay Designed for Switching Minute Signals and Analog Signals

- Upgraded G3VM-61G1 Series.
- Continuous load current of 1000 mA.
- Dielectric strength of 1,500 Vrms between I/O.



NEW 

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Data loggers
- Measurement devices
- Amusement machines

List of Models

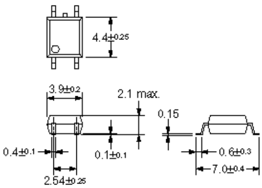
Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	60 VAC	G3VM-61GR1	100	---
			G3VM-61GR1(TR)	---	2,500

Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61GR1

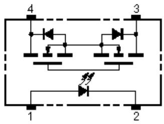
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

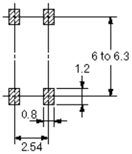
Terminal Arrangement/Internal Connections (Top View)

G3VM-61GR1



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61GR1



■ Absolute Maximum Ratings (Ta = 25°C)

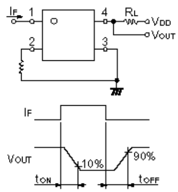
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	60	V	
	Continuous load current	I_O	1000	mA	
	ON current reduction rate	ΔI_{ON}/°C	-13.3	mA/°C	Ta ≥ 50°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 400 mA
Output	Maximum resistance with output ON	R_{ON}	---	---	0.7	Ω	I_F = 5 mA, I_O = 400 mA
	Current leakage when the relay is open	I_{LEAK}	0.25	0.2	100	nA	V_{OFF} = 60 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	1.4	3.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.6	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

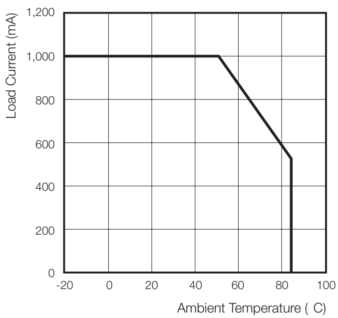
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	10	20	mA
Continuous load current	I_O	---	---	1,000	mA
Operating temperature	T_a	25	---	65	°C

■ Engineering Data

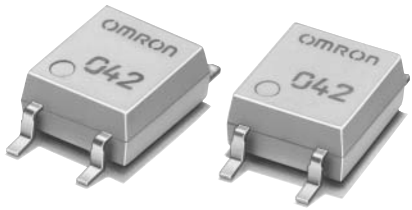
Load Current vs. Ambient Temperature

G3VM-61GR1



New MOSFET Relay Designed for Switching Minute Signals and Analog Signals

- Upgraded G3VM-S1 Series.
- Continuous load current of 400 mA.
- Dielectric strength of 1,500 Vrms between I/O.



NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Data loggers
- Measurement devices
- Amusement machines

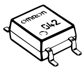
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	60 VAC	G3VM-61G1	100	---
			G3VM-61G1(TR)	---	2,500

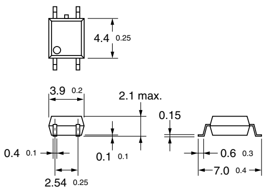
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61G1



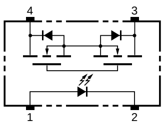
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

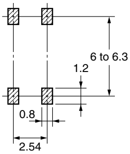
Terminal Arrangement/Internal Connections (Top View)

G3VM-61G1



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61G1



■ Absolute Maximum Ratings (Ta = 25°C)

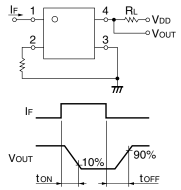
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	60	V	
	Continuous load current	I_O	400	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−4.0	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.6	3	mA	I_O = 400 mA
Output	Maximum resistance with output ON	R_{ON}	---	1	2	Ω	I_F = 5 mA, I_O = 400 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	μA	V_{OFF} = 60 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.8	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.1	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

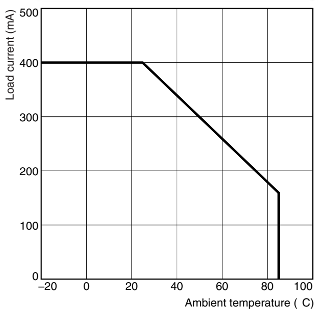
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	400	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

Load Current vs. Ambient Temperature

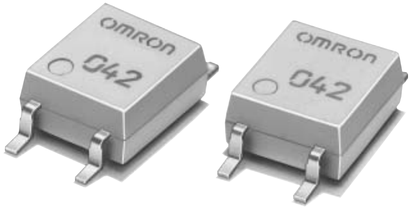
G3VM-61G1



New Relay Incorporating a MOSFET Optically Coupled with an Infrared LED

Has a 4-pin SOP Package and 80-V Load Voltage

- Continuous load current of 350 mA.
- Dielectric strength of 1,500 Vrms between I/O.



NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

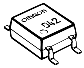
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	80 VAC	G3VM-81G1	100	---
			G3VM-81G1(TR)	---	2,500

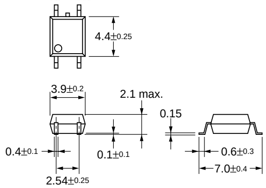
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-81G1



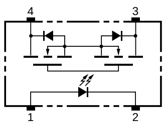
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

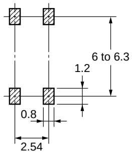
Terminal Arrangement/Internal Connections (Top View)

G3VM-81G1



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-81G1



■ Absolute Maximum Ratings (Ta = 25°C)

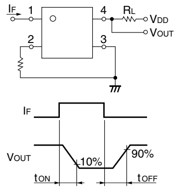
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	80	V	
	Continuous load current	I_O	350	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−3.5	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.0	4.0	mA	I_O = 350 mA
Output	Maximum resistance with output ON	R_{ON}	---	1.0	1.2	Ω	I_F = 5 mA, I_O = 350 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 30 V, Ta = 50°C
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.3	0.5	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.3	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

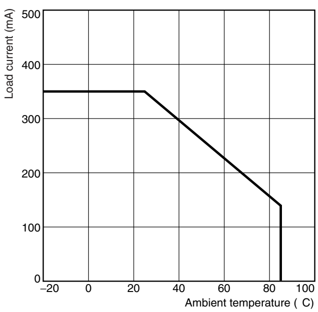
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	64	V
Operating LED forward current	I_F	5	---	30	mA
Continuous load current	I_O	---	---	350	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

Load Current vs. Ambient Temperature

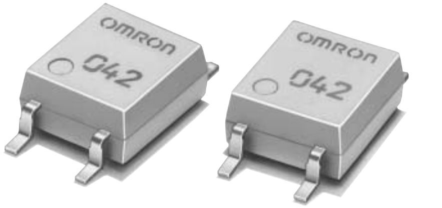
G3VM-81G1



MOSFET Relays

Slim, 2.1-mm High MOSFET Relay with Miniature, Flat, 4-pin SOP Package Load Voltage

- New models with 4-pin SOP package now available in the 200-V load voltage series.
- Leakage current of 0.01μA max. when output relay is open.
- Dielectric strength of 1,500 Vrms between I/O.



NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

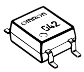
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	200 VAC	G3VM-201G	100	---
			G3VM-201G(TR)	---	2,500

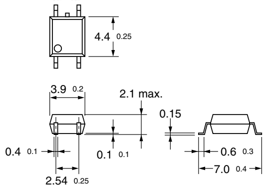
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-201G



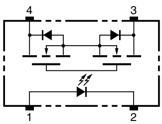
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

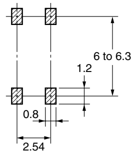
Terminal Arrangement/Internal Connections (Top View)

G3VM-201G



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-201G



■ Absolute Maximum Ratings (Ta = 25°C)

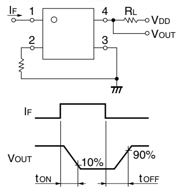
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	200	V	
	Continuous load current	I_O	50	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +100	°C	With no icing or condensation
Soldering temperature (10 s)		—	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 50 mA
Output	Maximum resistance with output ON	R_{ON}	---	30	50	Ω	I_F = 5 mA, I_O = 50 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	0.01	μA	V_{OFF} = 200 V, Ta = 25°C
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.04	0.1	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 10 V (See note 2.)
Turn-OFF time		tOFF	---	0.1	0.2	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

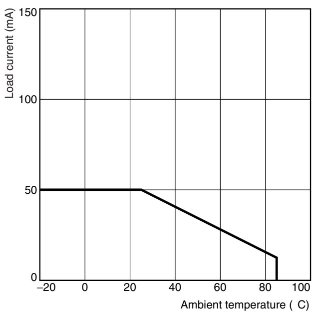
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	160	V
Operating LED forward current	I_F	5	7.5	15	mA
Continuous load current	I_O	---	---	40	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

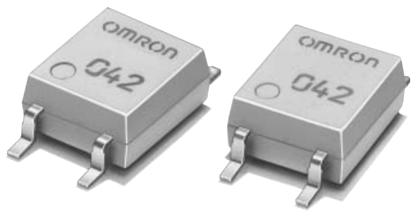
Load Current vs. Ambient Temperature

G3VM-201G



Slim, 2.1-mm High Relay Incorporating a MOSFET Optically Coupled with an Infrared LED in a Miniature, Flat SOP

- Upgraded G3VM-S2 Series.
- Continuous load current of 110 mA.
- Dielectric strength of 1,500 Vrms between I/O.



NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

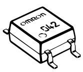
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	350 VAC	G3VM-351G	100	---
			G3VM-351G(TR)	---	2,500

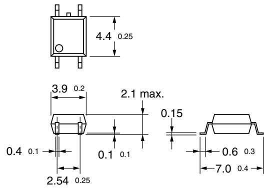
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-351G



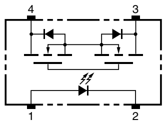
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

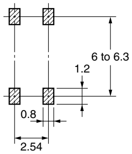
Terminal Arrangement/Internal Connections (Top View)

G3VM-351G



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-351G



■ Absolute Maximum Ratings (Ta = 25°C)

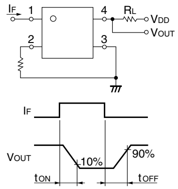
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	-0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	110	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	–1.1	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	-40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	-55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 110 mA, t < 1 s
			---	35	50	Ω	I_F = 5 mA, I_O = 110 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	µA	V_{OFF} = 350 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.1	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

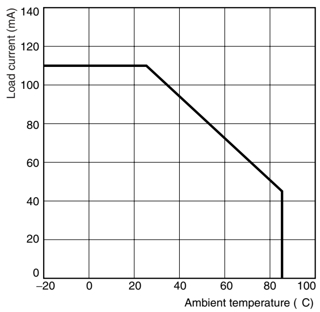
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	100	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

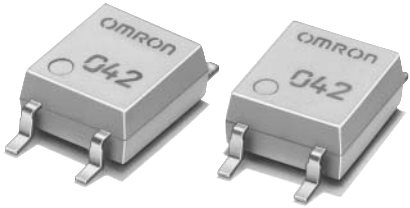
Load Current vs. Ambient Temperature

G3VM-351G



Analog-switching MOSFET Relay with SPST-NC (Single-pole, Single-throw, Normally Closed) Contacts

- New models with SPST-NC contacts and a 4-pin SOP package included in 350-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

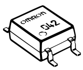
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NC	Surface-mounting terminals	350 VAC	G3VM-353G	100	---
			G3VM-353G(TR)	---	2,500

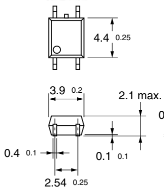
■ Dimensions

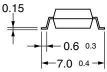
Note: All units are in millimeters unless otherwise indicated.

G3VM-353G



Note: The actual product is marked differently from the image shown here.

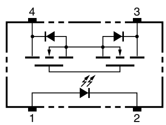




Weight: 0.1 g

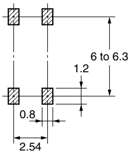
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-353G



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-353G



■ Absolute Maximum Ratings (Ta = 25°C)

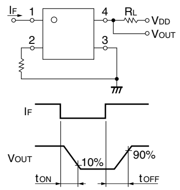
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	–1.2	mA/°C	Ta ≥ 25°C
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_{OFF} = 10 µA
Output	Maximum resistance with output ON	R_{ON}	---	15	25	Ω	I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	µA	V_{OFF} = 350 V, I_F = 5 mA
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	3.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

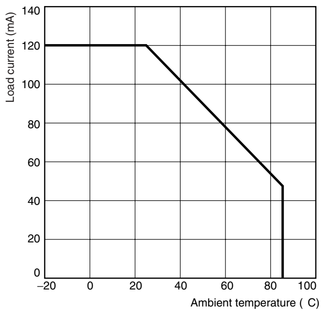
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	---	25	mA
Continuous load current	I_O	---	---	120	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

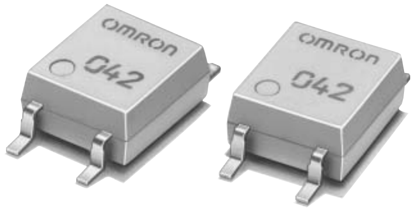
Load Current vs. Ambient Temperature

G3VM-353G



Expanded Range of Analog-Switching MOSFET Relays in 400-V Load Voltage Series

- New models with a 4-pin SOP package now included in the 400-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.



NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

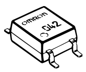
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	400 VAC	G3VM-401G	100	---
			G3VM-401G(TR)	---	2,500

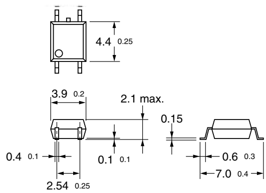
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-401G



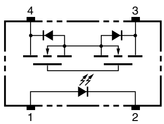
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

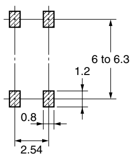
Terminal Arrangement/Internal Connections (Top View)

G3VM-401G



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-401G



■ Absolute Maximum Ratings (Ta = 25°C)

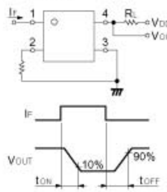
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	400	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−1.2	mA/°C	Ta ≥ 25°C
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	17	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	μA	V_{OFF} = 400 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.3	1	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.1	1	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

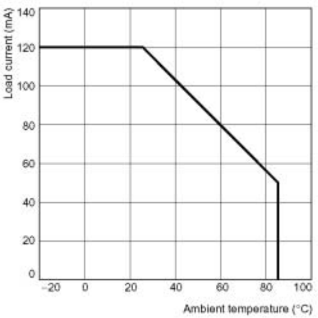
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	120	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-401G



World's Smallest SSOP Package MOS FET Relay with Low Output Capacitance and ON Resistance (CxR = 5pF• Ω) in a 20-V Load Voltage Model

NEW Approval pending

Note: The actual product is marked differently from the image shown here.

■ Output capacitance of 1 pF (typical) allows high frequency applications.

Note: Information correct as of October, 2002, according to data obtained by OMRON.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

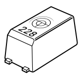
■ List of Models

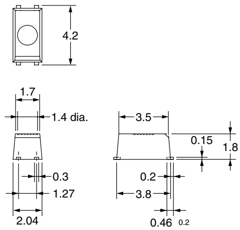
Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	20 VAC	G3VM-21LR1	---
			G3VM-21LR1(TR)	1,500

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-21LR1





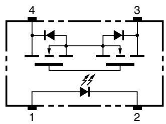
Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

Note: The actual product is marked differently from the image shown here.

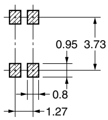
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-21LR1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-21LR1



■ Absolute Maximum Ratings (Ta = 25°C)

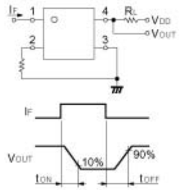
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	20	V	
	Continuous load current	I_O	450	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	–4.5	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	0.8	1.2	Ω	I_F = 5 mA, I_O = 450 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	nA	V_{OFF} = 20 V, Ta = 50°C
	Capacity between terminals	C_{OFF}	---	5.0	12.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

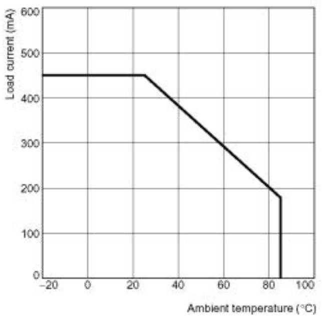
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	20	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current	I_O	---	---	450	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-21LR1



World's Smallest SSOP Package MOS FET Relay with Low Output Capacitance and ON Resistance (CxR = 5pF• Ω) in a 20-V Load Voltage Model

■ ON resistance of 1 Ω (typical) suppresses output signal attenuation.

Note: Information correct as of October, 2002, according to data obtained by OMRON.

NEW Approval pending

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

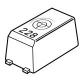
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	20 VAC	G3VM-21LR1	---
			G3VM-21LR1(TR)	1,500

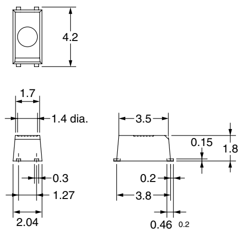
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-21LR1



Note: The actual product is marked differently from the image shown here.

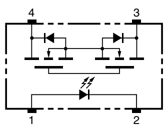


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

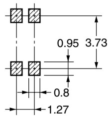
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-21LR1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-21LR1



■ Absolute Maximum Ratings (Ta = 25°C)

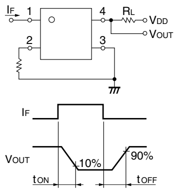
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	20	V	
	Continuous load current	I_O	450	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	–4.5	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	0.8	1.2	Ω	I_F = 5 mA, I_O = 450 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	nA	V_{OFF} = 20 V, Ta = 50°C
	Capacity between terminals	C_{OFF}	---	5.0	12.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

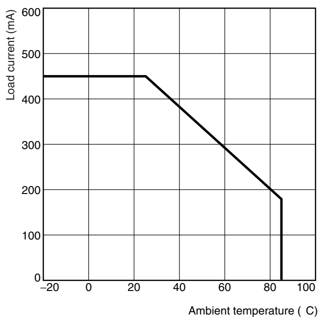
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	20	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current	I_O	---	---	450	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-21LR1



World's Smallest SSOP Package MOS FET Relay with Low Output Capacitance and ON Resistance (CxR = 10pF• Ω) in a 40-V Load Voltage Model

■ ON resistance of 1 Ω (typical) suppresses output signal attenuation.

Note: Information correct as of October, 2002, according to data obtained by OMRON.

NEW Approval pending

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

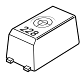
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	G3VM-41LR5	---
			G3VM-41LR5(TR)	1,500

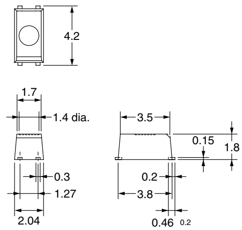
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41LR5



Note: The actual product is marked differently from the image shown here.

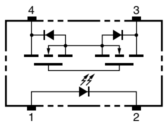


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

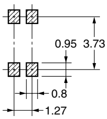
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41LR5



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41LR5



■ Absolute Maximum Ratings (Ta = 25°C)

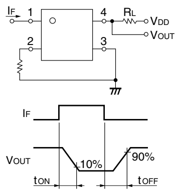
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	40	V	
	Continuous load current	I_O	300	mA	
	ON current reduction rate	ΔI_{ON}/°C	–3.0	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	1.0	1.5	Ω	I_F = 5 mA, I_O = 300 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	nA	V_{OFF} = 30 V, Ta = 50°C
	Capacity between terminals	C_{OFF}	---	10	14	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

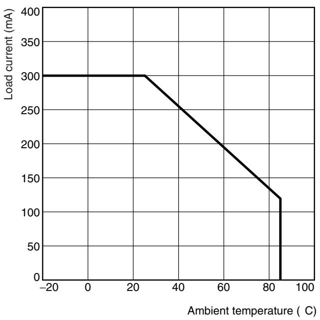
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current	I_O	---	---	300	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-41LR5



World's Smallest SSOP Package MOS FET Relay with Low Output Capacitance and ON Resistance (CxR = 10pF• Ω) in a 40-V Load Voltage Model

■ Output capacitance of 1 pF (typical) allows high-frequency applications.

Note: Information correct as of October, 2002, according to data obtained by OMRON.

NEW Approval pending

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

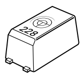
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	G3VM-41LR6	---
			G3VM-41LR6(TR)	1,500

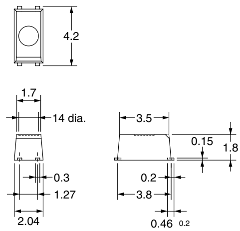
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41LR6



Note: The actual product is marked differently from the image shown here.

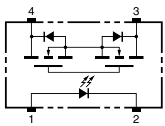


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

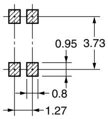
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41LR6



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41LR6



■ Absolute Maximum Ratings (Ta = 25°C)

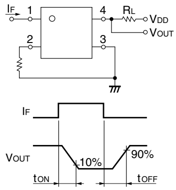
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	40	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	10	15	Ω	I_F = 5 mA, I_O = 120 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	nA	V_{OFF} = 30 V, Ta = 50°C
	Capacity between terminals	C_{OFF}	---	1.0	2.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

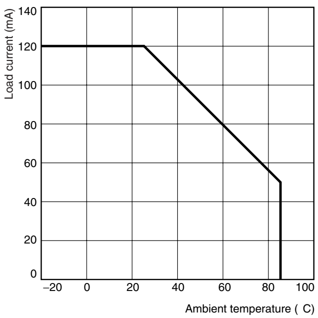
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current	I_O	---	---	120	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

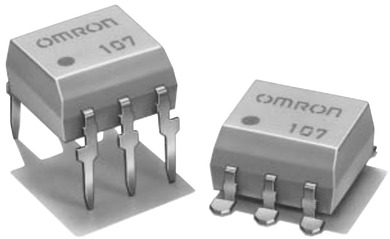
Load Current vs. Ambient Temperature

G3VM-41LR6



Analog-Switching MOSFET Relay for High Switching Currents, with Dielectric Strength of 2.5 kVAC between I/O.

- Upgraded G3VM-61 B/E Series.
- Switches minute analog signals.
- Leakage current of 1μA max. when output relay is open.



NEW Approval pending

Note: The actual product is marked differently from the image shown here.

Application Examples

- Measurement devices
- Security systems
- Amusement machines

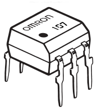
List of Models

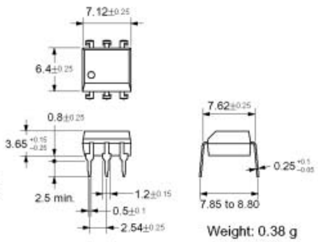
Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	60 VAC	G3VM-61B1	50	---
	Surface-mounting terminals		G3VM-61E1		
			G3VM-61E1(TR)	---	1,500

Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61B1

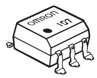


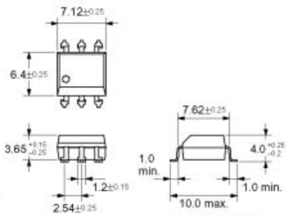


Note: The actual product is marked differently from the image shown here.

Weight: 0.38 g

G3VM-61E1



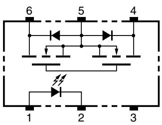


Note: The actual product is marked differently from the image shown here.

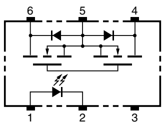
Weight: 0.38 g

Terminal Arrangement/Internal Connections (Top View)

G3VM-61B1

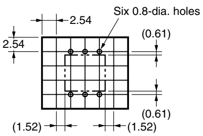


G3VM-61E1



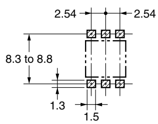
PCB Dimensions (Bottom View)

G3VM-61B1



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61E1

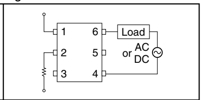
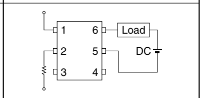
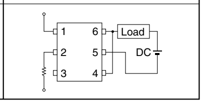


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate		$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Output dielectric strength		V_{OFF}	60	V	
	Continuous load current	Connection A	I_O	500	mA	
		Connection B		500		
		Connection C		1,000		
	ON current reduction rate	Connection A	$\Delta I_{ON}/°C$	−0.5	mA/°C	Ta ≥ 25°C
		Connection B		−0.5		
		Connection C		−10.0		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

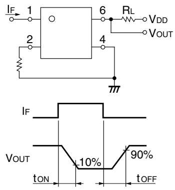
Connection Diagram

Connection A	
Connection B	
Connection C	

■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1.6	3	mA	I_O = 500 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	1	2	Ω	I_F = 5 mA, I_O = 500 mA
		Connection B		---	0.5	1	Ω	I_F = 5 mA, I_O = 500 mA
		Connection C		---	0.25	---	Ω	I_F = 5 mA, I_O = 1,000 mA
	Current leakage when the relay is open		I_{LEAK}	---	---	1.0	µA	V_{OFF} = 60 V
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time			tON	---	0.8	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			tOFF	---	0.1	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

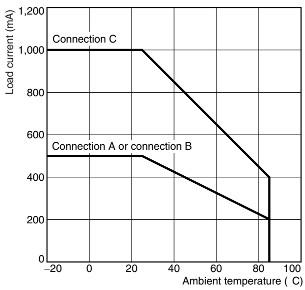
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	500	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

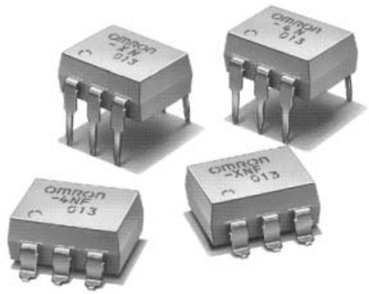
Load Current vs. Ambient Temperature

G3VM-61B1(E1)



SSR for Switching Analog Signals, with an I/O Dielectric Strength of 2.5 kVAC Using Optical Isolation

- Switches minute analog signals.
- Linear voltage and current characteristics.
- Switches AC and DC.
- Low ON-resistance.
- Current leakage less than 1 μA between output terminals when they are open.
- Surface-mounting models also available.
- UL/CSA approval pending.



Ordering Information

Contact form	Terminals	Load Voltage (peak value)	Model	Number per stick	Taping quantity
SPST-NO	PCB terminals	60 VAC	G3VM-XN	50	–
		400 VAC	G3VM-4N		
	Surface-mounting terminals	60 VAC	G3VM-XNF		
		400 VAC	G3VM-4NF		

Model Number Legend

G3VM-□□□
1 2

1. Lead Voltage

XN: A load voltage of 60 VDC or 60 VAC (peak value)

4N: A load voltage of 400 VDC or 400 VAC (peak value)

2. Terminal

None: PCB terminal

F: Surface mounting terminals

Application Examples

- Electronic automatic exchange systems
- Measurement control systems
- Data gathering systems
- Measuring systems

Specifications

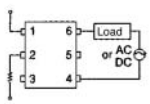
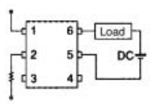
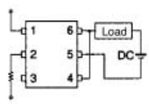
■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	G3VM-XN(F)	G3VM-4N(F)	Conditions
Input	LED forward current		I_F	30 mA		–
	Repetitive peak LED forward current		I_{FP}	1 A		100-µs pulses, 100 pps
	LED reverse voltage		V_R	5 V		–
Output	Output dielectric strength (load voltage)		V_{BO}	-60 to 60 V	-400 to 400 V	DC or AC peak value
				0 to 60 V	0 to 400 V	DC
	Continuous load current (see note 1)	A connection	I_O	300 mA	150 MA	–
		B connection		450 mA	200 MA	
		C connection		600 mA	300 MA	
Dielectric strength between I/O terminals (see note 2)			$V_{I\text{-}O}$	2,500 V AC		1 min
Ambient temperature			Ta	-20 to 85°C		With no icing or condensation
Storage temperature			Tstg	-55 to 100°C		With no icing or condensation
Max. soldering temperature and time			–	260°C		10 s

Note: 1. The load current attenuation rates for the different types of connection are as follows:
G3VM-XN(F): A: -3.0 mA/°C; B: -4.5 mA/°C; C: -6.0 mA/°C
G3VM-4N(F): A: -1.5 mA/°C; B: -2.0 mA/°C; C: -3.0 mA/°C

2. The dielectric strength between I/O terminals was measured with voltage applied to all of the LED pins and with voltage applied to all of the light-receiving parts respectively.

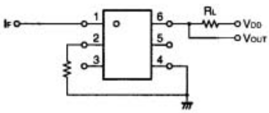
Connection Circuit Diagram

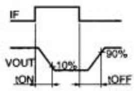
		
A connection	B connection	C connection

■ Electrical Performance (Ta = 25°C)

Item			Symbol	G3VM-XN(F)	G3VM-4N(F)	Unit	Conditions
Input	LED forward current		V_F	1.2 V min, 1.7 V max.		V	I_F = 10 mA
	Trigger LED forward current		I_{FT}	5 mA max.			I_O = 300 mA (G3VM-XN(F)) I_O = 150 mA (G3VM-4N(F))
Output	Output ON resistance	A Connection	R_{ON}	2 Ω max.	12 Ω max.	Ω	I_F = 10 mA
		B Connection		1 Ω max.	6 Ω max.		I_O = Max.
		C Connection		0.5 Ω max.	3 Ω max.		
	Switching current leakage		I_{LEAK}	1.0 µA max.		µA	Voff = 60 V (G3VM-XN(F)) Voff = 400 V (G3VM-4N(F))
Operate time			T_{ON}	0.5 ms max.	1.0 ms max.	ms	R_L = 200 Ω (sse note)
Release time			T_{OFF}	0.5 ms max.	1.0 ms max.	ms	V_{DD} = 20 V, I_F = 10 mA
Floating capacity between I/O terminals			$C_{I\text{-}O}$	0.8 pF, TYP		pF	f = 1MHz

Note: 1. The operate and release time were measured in the way shown below.



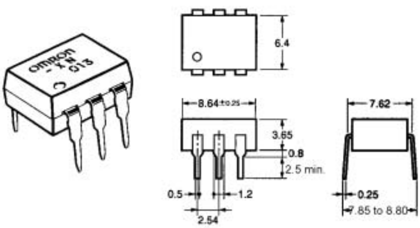


MOSFET Relays

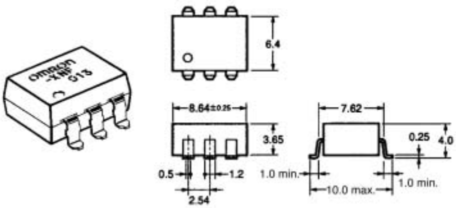
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-XN
G3VM-4N



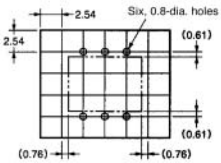
G3VM-XNF
G3VM-4NF



Note: "G3VM" is not printed on the actual product.

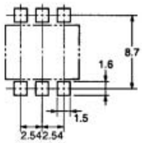
■ PCB Dimensions (Bottom View)

G3VM-XN
G3VM-4N



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-XNF
G3VM-4NF

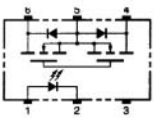


Note: Mounting pad dimensions shown are top view.

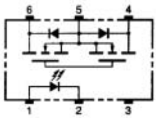
Installation

■ Terminal Arrangement/Internal connection (Top View)

G3VM-XN
G3VM-4N



G3VM-XNF
G3VM-4NF



New Series with 350-V Load Voltage

- Upgraded G3VM-3 Series.
- Continuous load current of 120 mA
- Dielectric strength of 2,500 Vrms between I/O.
- Operating time of 0.3 ms (typical).

NEW Approval pending

Note: The actual product is marked differently from the image shown here.

Application Examples

- Measurement devices
- Security systems
- Amusement machines

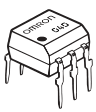
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	350 VAC	G3VM-351B	50	---
	Surface-mounting terminals		G3VM-351E		
			G3VM-351E(TR)	---	1,500

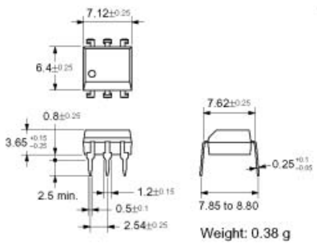
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-351B

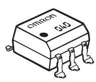


Note: The actual product is marked differently from the image shown here.

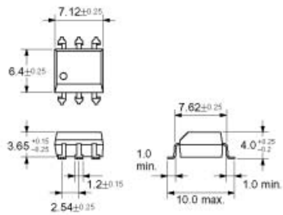


Weight: 0.38 g

G3VM-351E



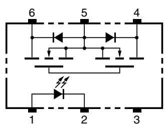
Note: The actual product is marked differently from the image shown here.



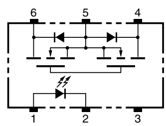
Weight: 0.38 g

Terminal Arrangement/Internal Connections (Top View)

G3VM-351B

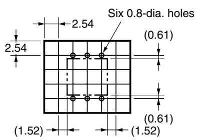


G3VM-351E



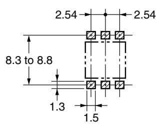
PCB Dimensions (Bottom View)

G3VM-351B



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-351E



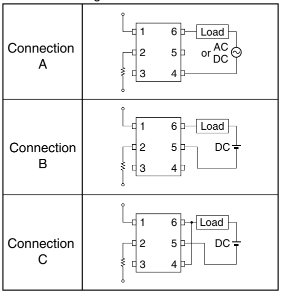
MOSFET Relays

■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Output dielectric strength		V_{OFF}	350	V	
	Continuous load current	Connection A	I_O	120	mA	
		Connection B		120		
		Connection C		240		
	ON current reduction rate	Connection A	$\Delta I_{ON}/°C$	−1.2	mA/°C	Ta ≥ 25°C
		Connection B		−1.2		
		Connection C		−2.4		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

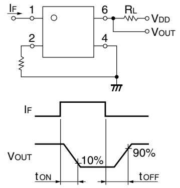
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 120 mA, t < 1 s
				---	35	50	Ω	I_F = 5 mA, I_O = 120 mA
		Connection B		---	28	40	Ω	I_F = 5 mA, I_O = 120 mA
		Connection C		---	14	20	Ω	I_F = 5 mA, I_O = 240 mA
	Current leakage when the relay is open		I_{LEAK}	---	---	1.0	μA	V_{OFF} = 350 V
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time			tON	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			tOFF	---	0.1	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

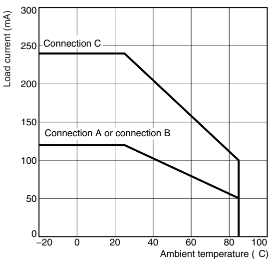
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	10	25	mA
Continuous load current	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-351B(E)



Analog-switching MOSFET Relay with 350-V Load Voltage and Current Limit.

■ Approved standards: UL1577 (File No. E80555)

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Electronic automatic exchange systems
- Multi-functional telephones
- Cordless telephones
- Measuring devices

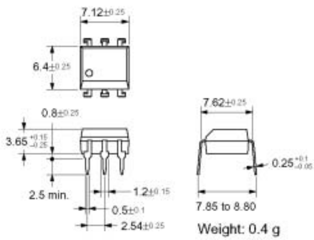
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Current limit	Number per stick	Number per tape
SPST-NO	PCB terminals	350 VAC	G3VM-3L	Yes	50	---
	Surface-mounting terminals		G3VM-3FL			
			G3VM-3FL(TR)		---	1,500

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

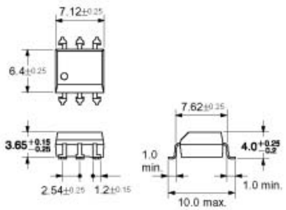
G3VM-3L



Note: The actual product is marked differently from the image shown here.

Weight: 0.4 g

G3VM-3FL

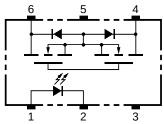


Note: The actual product is marked differently from the image shown here.

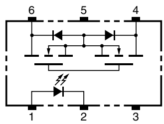
Weight: 0.4 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-3L

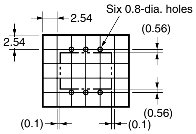


G3VM-3FL



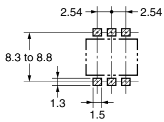
■ PCB Dimensions (Bottom View)

G3VM-3L



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-3FL



■Absolute Maximum Ratings (Ta = 25°C)

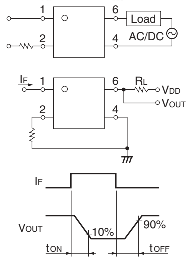
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	-0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	–1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		—	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	22	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	µA	V_{OFF} = 350 V
Limit current		I_{LIM}	150	---	300	mA	I_F = 5 mA, V_{DD} = 5 V, t = 5 ms
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■Recommended Operating Conditions

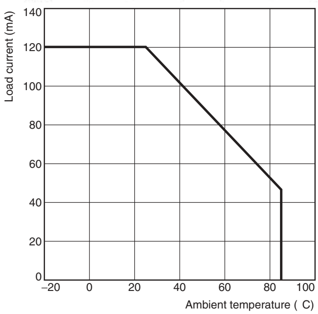
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	120	mA
Operating temperature	T_a	– 20	---	65	°C

■Engineering Data

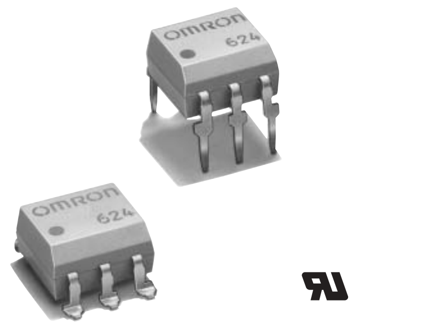
Load Current vs. Ambient Temperature

G3VM-3(F)L



Analog-switching MOSFET Relay with 350-V Load Voltage and Current Limit.

■ Approved standards: UL1577 (File No. E80555)



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Electronic automatic exchange systems
- Multi-functional telephones
- Cordless telephones
- Measuring devices

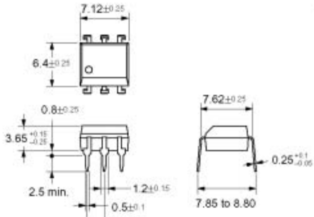
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Current limit	Number per stick	Number per tape
SPST-NO	PCB terminals	350 VAC	G3VM-3L	Yes	50	---
	Surface-mounting terminals		G3VM-3FL			
			G3VM-3FL(TR)		---	1,500

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

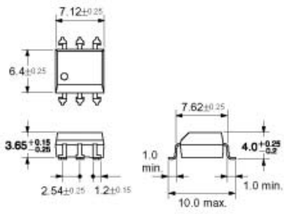
G3VM-3L



Note: The actual product is marked differently from the image shown here.

Weight: 0.4 g

G3VM-3FL

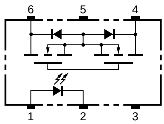


Note: The actual product is marked differently from the image shown here.

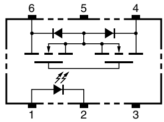
Weight: 0.4 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-3L

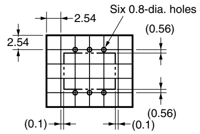


G3VM-3FL



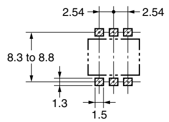
■ PCB Dimensions (Bottom View)

G3VM-3L



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-3FL



■ Absolute Maximum Ratings (Ta = 25°C)

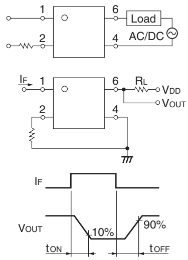
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	22	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	μA	V_{OFF} = 350 V
Limit current		I_{LIM}	150	---	300	mA	I_F = 5 mA, V_{DD} = 5 V, t = 5 ms
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

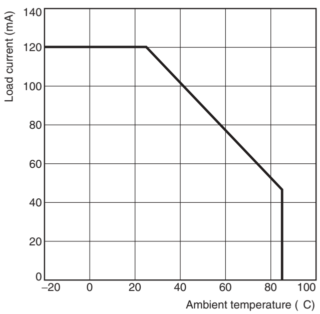
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	120	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

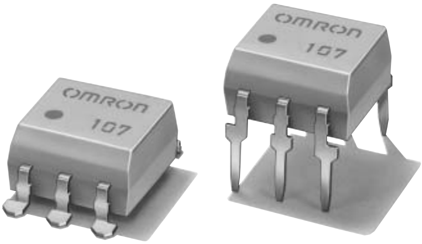
Load Current vs. Ambient Temperature

G3VM-3(F)L



New Series of Analog-switching MOSFET Relays with Dielectric Strength of 2.5 kVAC between I/O Using Optical Isolation

- Switches minute analog signals.
- Leakage current of 1μA max. when output relay is open.
- Upgraded G3VM-4N Series.



Note: The actual product is marked differently from the image shown here.

Application Examples

- Electronic automatic exchange systems
- Measurement devices
- FA systems

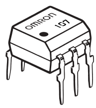
List of Models

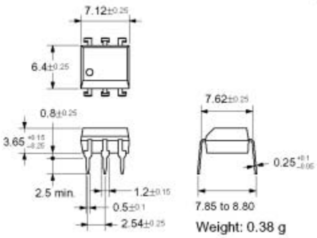
Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	400 VAC	G3VM-401B	50	---
	Surface-mounting terminals		G3VM-401E		
			G3VM-401E(TR)	---	1,500

Dimensions

Note: All units are in millimeters unless otherwise indicated.

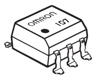
G3VM-401B

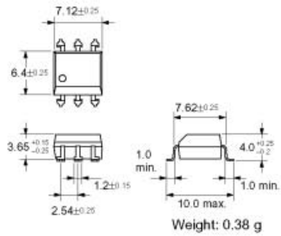




Note: The actual product is marked differently from the image shown here.

G3VM-401E

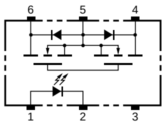




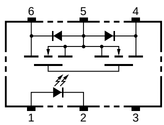
Note: The actual product is marked differently from the image shown here.

Terminal Arrangement/Internal Connections (Top View)

G3VM-401B

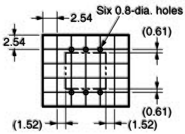


G3VM-401E



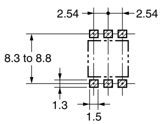
PCB Dimensions (Bottom View)

G3VM-401B



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-401E



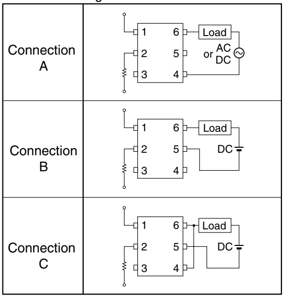
MOSFET Relays

■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Output dielectric strength		V_{OFF}	400	V	
	Continuous load current	Connection A	I_O	120	mA	
		Connection B		120		
		Connection C		240		
	ON current reduction rate	Connection A	$\Delta I_{ON}/°C$	−1.2	mA/°C	Ta ≥ 25°C
		Connection B		−1.2		
		Connection C		−2.4		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

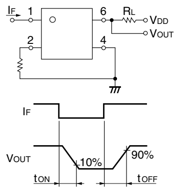
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	17	35	Ω	I_F = 5 mA, I_O = 120 mA
		Connection B		---	11	20	Ω	I_F = 5 mA, I_O = 120 mA
		Connection C		---	6	10	Ω	I_F = 5 mA, I_O = 240 mA
	Current leakage when the relay is open		I_{LEAK}	---	---	1.0	μA	V_{OFF} = 350 V
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time			tON	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			tOFF	---	0.1	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

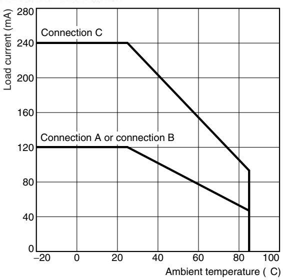
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	120	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

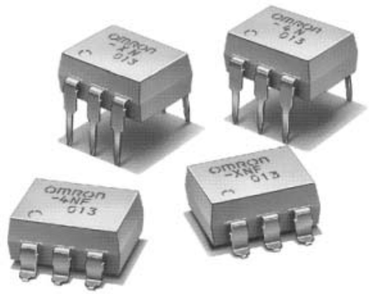
Load Current vs. Ambient Temperature

G3VM-401B(E)



SSR for Switching Analog Signals, with an I/O Dielectric Strength of 2.5 kVAC Using Optical Isolation

- Switches minute analog signals.
- Linear voltage and current characteristics.
- Switches AC and DC.
- Low ON-resistance.
- Current leakage less than 1 μA between output terminals when they are open.
- Surface-mounting models also available.
- UL/CSA approval pending.



Ordering Information

Contact form	Terminals	Load Voltage (peak value)	Model	Number per stick	Taping quantity
SPST-NO	PCB terminals	60 VAC	G3VM-XN	50	–
		400 VAC	G3VM-4N		
	Surface-mounting terminals	60 VAC	G3VM-XNF		
		400 VAC	G3VM-4NF		

Model Number Legend

G3VM-□□□
1 2

1. **Load Voltage**
   XN: A load voltage of 60 VDC or 60 VAC (peak value)
   4N: A load voltage of 400 VDC or 400 VAC (peak value)

2. **Terminal**
   None: PCB terminals
   F: Surface-mounting terminals

Application Examples

- Electronic automatic exchange systems
- Measurement control systems
- Data gathering systems
- Measuring systems

Specifications

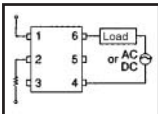
■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	G3VM-XN(F)	G3VM-4N(F)	Conditions
Input	LED forward current		I_F	30 mA		–
	Repetitive peak LED forward current		I_{FP}	1 A		100-μs pulses, 100 pps
	LED reverse voltage		V_R	5 V		–
Output	Output dielectric strength (load voltage)		V_{BO}	-60 to 60 V	-400 to 400 V	DC or AC peak value
				0 to 60 V	0 to 400 V	DC
	Continuous load current (see note 1)	A connection	I_O	300 mA	150 MA	–
		B connection		450 mA	200 MA	
		C connection		600 mA	300 MA	
Dielectric strength between I/O terminals (see note 2)			V_{I-O}	2,500 V AC		1 min
Ambient temperature			Ta	-20 to 85°C		With no icing or condensation
Storage temperature			Tstg	-55 to 100°C		With no icing or condensation
Max. soldering temperature and time			–	260°C		10 s

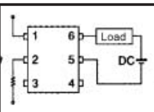
Note: 1. The load current attenuation rates for the different types of connection are as follows:
G3VM-XN(F): A: -3.0 mA/°C; B: -4.5 mA/°C; C: -6.0 mA/°C
G3VM-4N(F): A: -1.5 mA/°C; B: -2.0 mA/°C; C: -3.0 mA/°C

2. The dielectric strength between I/O terminals was measured with voltage applied to all of the LED pins and with voltage applied to all of the light-receiving parts respectively.

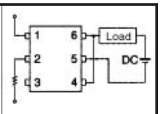
Connection Circuit Diagram



A connection



B connection

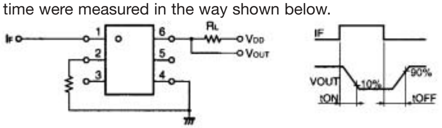


C connection

■ Electrical Performance (Ta = 25°C)

Item			Symbol	G3VM-XN(F)	G3VM-4N(F)	Unit	Conditions
Input	LED forward current		V_F	1.2 V min, 1.7 V max.		V	I_F = 10 mA
	Trigger LED forward current		I_{FT}	5 mA max.			I_O = 300 mA (G3VM-XN(F)) I_O = 150 mA (G3VM-4N(F))
Output	Output ON resistance	A Connection	R_{ON}	2 Ω max.	12 Ω max.	Ω	I_F = 10 mA
		B Connection		1 Ω max.	6 Ω max.		I_O = Max.
		C Connection		0.5 Ω max.	3 Ω max.		
	Switching current leakage		I_{LEAK}	1.0 μA max.		μA	Voff = 60 V (G3VM-XN(F)) Voff = 400 V (G3VM-4N(F))
Operate time			T_{ON}	0.5 ms max.	1.0 ms max.	ms	R_L = 200 Ω (sse note)
Release time			T_{OFF}	0.5 ms max.	1.0 ms max.	ms	V_{DD} = 20 V, I_F = 10 mA
Floating capacity between I/O terminals			C_{I-O}	0.8 pF, TYP		pF	f = 1MHz

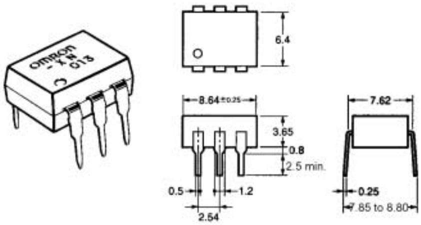
Note: 1. The operate and release time were measured in the way shown below.



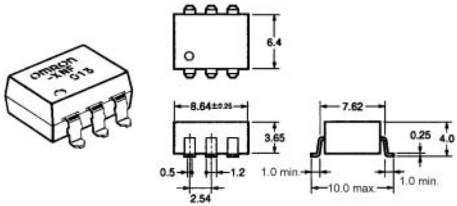
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-XN
G3VM-4N



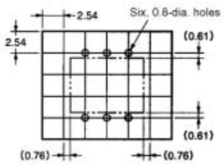
G3VM-XNF
G3VM-4NF



Note: "G3VM" is not printed on the actual product.

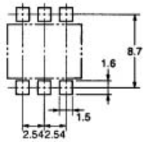
■ PCB Dimensions (Bottom View)

G3VM-XN
G3VM-4N



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-XNF
G3VM-4NF

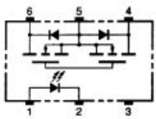


Note: Mounting pad dimensions shown are top view.

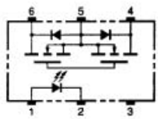
Installation

■ Terminal Arrangement/Internal connection (Top View)

G3VM-XN
G3VM-4N

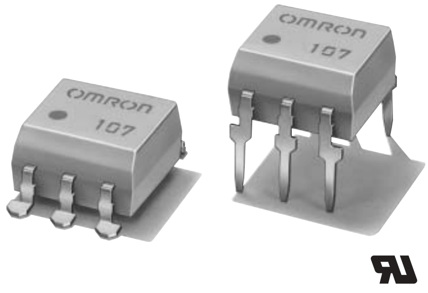


G3VM-XNF
G3VM-4NF



Analog-switching MOSFET Relay with Dielectric Strength of 5 kVAC between I/O Using Optical Isolation

- Switches minute analog signals.
- Leakage current of 1 μA max. when output relay is open.



Note: The actual product is marked differently from the image shown here.

Application Examples

- Electronic automatic exchange systems
- Measurement devices
- FA systems

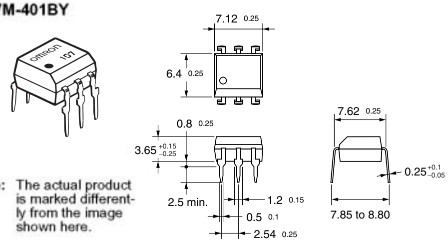
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	400 VAC	G3VM-401BY	50	---
	Surface-mounting terminals		G3VM-401EY		
			G3VM-401EY (TR)	---	1,500

Dimensions

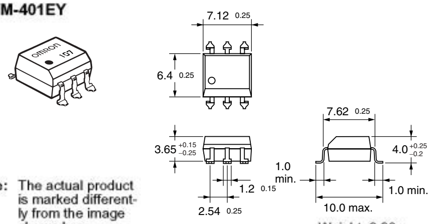
Note: All units are in millimeters unless otherwise indicated.

G3VM-401BY



Note: The actual product is marked differently from the image shown here.

G3VM-401EY

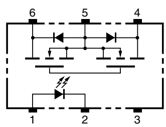


Note: The actual product is marked differently from the image shown here.

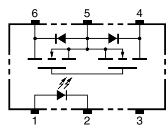
Weight: 0.38 g

Terminal Arrangement/Internal Connections (Top View)

G3VM-401BY

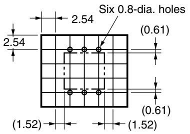


G3VM-401EY



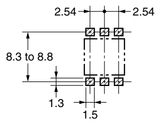
PCB Dimensions (Bottom View)

G3VM-401BY



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-401EY

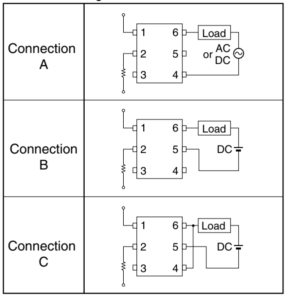


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate		$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Output dielectric strength		V_{OFF}	400	V	
	Continuous load current	Connection A	I_O	120	mA	
		Connection B		120		
		Connection C		240		
	ON current reduction rate	Connection A	$\Delta I_{ON}/°C$	−1.2	mA/°C	Ta ≥ 25°C
		Connection B		−1.2		
		Connection C		−2.4		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	5,000	Vrms	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

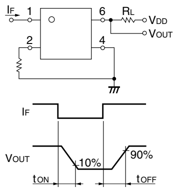
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	---	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	17	35	Ω	I_F = 5 mA, I_O = 120 mA
		Connection B		---	11	20	Ω	I_F = 5 mA, I_O = 120 mA
		Connection C		---	6	10	Ω	I_F = 5 mA, I_O = 240 mA
	Current leakage when the relay is open		I_{LEAK}	---	---	1.0	µA	V_{OFF} = 400 V
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time			tON	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			tOFF	---	0.1	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

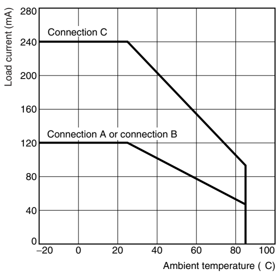
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	–	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	–	---	120	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

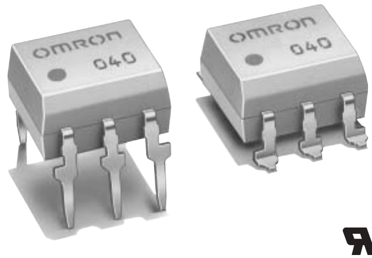
Load Current vs. Ambient Temperature

G3VM-401BY(EY)



Analog-switching MOSFET Relay with a Dielectric Strength of 5 kVAC between I/O Using Optical Isolation

- Switches minute analog signals.
- Switching AC and DC.
- Peak load voltage of 600 V.
- Dielectric strength of 5 kVAC between I/O.



Note: The actual product is marked differently from the image shown here.

Application Examples

- Electronic automatic exchange systems
- FA systems
- Measurement devices
- Security systems

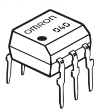
List of Models

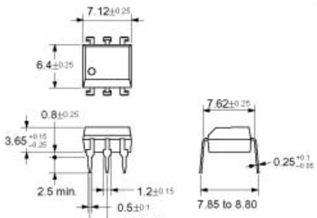
Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	600 VAC	G3VM-601BY	50	---
	Surface-mounting terminals		G3VM-601EY		
			G3VM-601EY(TR)	---	1,500

Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-601BY

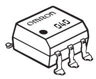


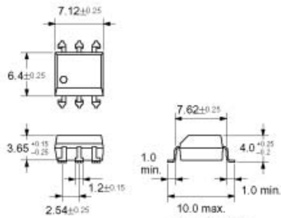


Note: The actual product is marked differently from the image shown here.

Weight: 0.4 g

G3VM-601EY



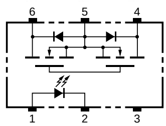


Note: The actual product is marked differently from the image shown here.

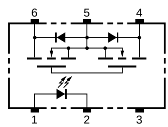
Weight: 0.4 g

Terminal Arrangement/Internal Connections (Top View)

G3VM-601BY

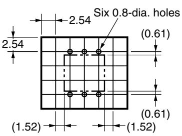


G3VM-601EY



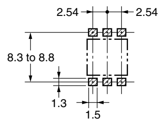
PCB Dimensions (Bottom View)

G3VM-601BY



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-601EY

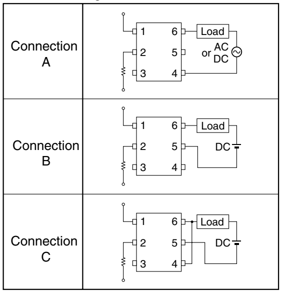


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Output dielectric strength		V_{OFF}	600	V	
	Continuous load current	Connection A	I_O	100	mA	
		Connection B		100		
		Connection C		200		
	ON current reduction rate	Connection A	$\Delta I_{ON}/°C$	−1.0	mA/°C	Ta ≥ 25°C
		Connection B		−1.0		
		Connection C		−2.0		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	5,000	Vrms	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

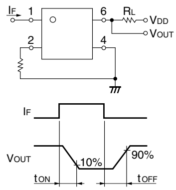
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	—	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1.6	5	mA	I_O = 100 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	25	35	Ω	I_F = 10 mA, I_O = 100 mA
				---	30	45	Ω	I_F = 10 mA, I_O = 100 mA
		Connection B		---	23	35	Ω	I_F = 10 mA, I_O = 100 mA
		Connection C		---	12	18	Ω	I_F = 10 mA, I_O = 200 mA
	Current leakage when the relay is open		I_{LEAK}	---	—	1.0	μA	V_{OFF} = 600 V
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time			tON	---	0.2	1.5	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			tOFF	---	0.2	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

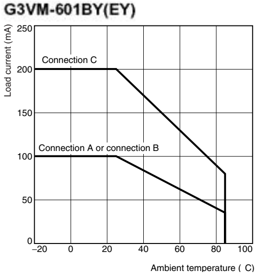
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	480	V
Operating LED forward current	I_F	7.5	15	25	mA
Continuous load current	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

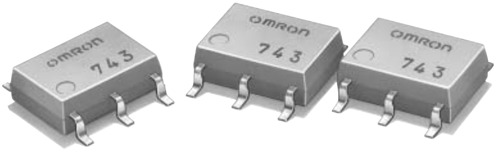
Load Current vs. Ambient Temperature

G3VM-601BY(EY)



Switches Minute Signals and Analog Signals, 6-pin SOP Package and 60-V Load Voltage

- Continuous load current of 400 mA.
- Dielectric strength of 1,500 Vrms between I/O.



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

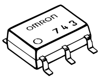
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	60 VAC	G3VM-61H1	75	---
			G3VM-61H1(TR)	---	2,500

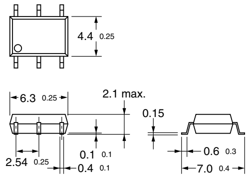
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61H1



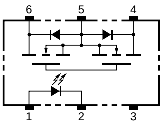
Note: The actual product is marked differently from the image shown here.



Weight: 0.13 g

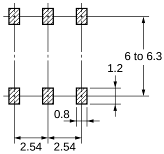
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-61H1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61H1

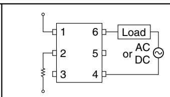
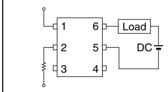
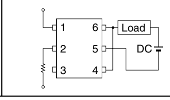


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate		$\Delta I_F/°C$	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Output dielectric strength		V_{OFF}	60	V	
	Continuous load current	Connection A	I_O	400	mA	
		Connection B		400		
		Connection C		800		
	ON current reduction rate	Connection A	$\Delta I_{ON}/°C$	–4.0	mA/°C	Ta ≥ 25°C
		Connection B		–4.0		
		Connection C		–8.0		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature			T_a	–40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

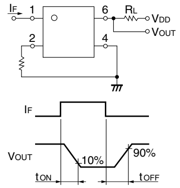
Connection Diagram

Connection A	
Connection B	
Connection C	

■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1.6	3	mA	I_O = 400 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	1	2	Ω	I_F = 5 mA, I_O = 400 mA
		Connection B		---	0.5	1	Ω	I_F = 5 mA, I_O = 400 mA
		Connection C		---	0.25	---	Ω	I_F = 5 mA, I_O = 800 mA
	Current leakage when the relay is open		I_{LEAK}	---	---	1.0	µA	V_{OFF} = 60 V
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time			tON	---	0.8	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			tOFF	---	0.1	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

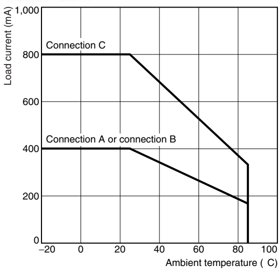
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	400	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

Load Current vs. Ambient Temperature

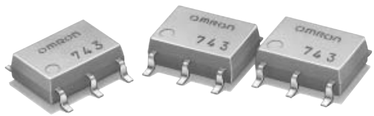
G3VM-61H1



MOSFET Relays

New High-capacity MOS FET Relays Allowing Switching of a 1.25-A Continuous Load Current with a 80-V Load Voltage.

- Continuous load current of 1,250 mA.
- Dielectric strength of 1,500 Vrms between I/O.



NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

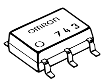
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	80 VAC	G3VM-81HR	75	---
			G3VM-81HR(TR)	---	2,500

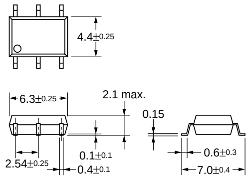
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-81HR



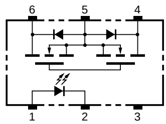
Note: The actual product is marked differently from the image shown here.



Weight: 0.13 g

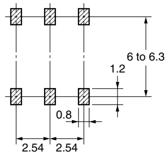
Terminal Arrangement/Internal Connections (Top View)

G3VM-81HR



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-81HR



■ Absolute Maximum Ratings (Ta = 25°C)

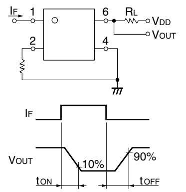
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	80	V	
	Continuous load current	I_O	1,250	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−12.5	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	2	5	mA	I_O = 1,250 mA
Output	Maximum resistance with output ON	R_{ON}	---	0.11	0.15	Ω	I_F = 5 mA, I_O = 1,250 mA
	Current leakage when the relay is open	I_{LEAK}	---	1.2	1.5	nA	V_{OFF} = 20 V, Ta = 50°C
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	2.0	3.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.7	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

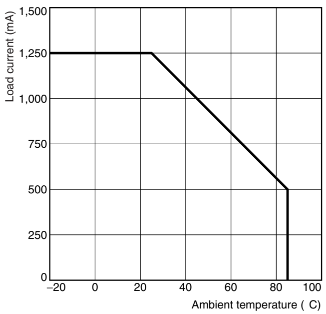
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	64	V
Operating LED forward current	I_F	5	---	30	mA
Continuous load current	I_O	---	---	1,250	mA
Operating temperature	T_a	25	---	60	°C

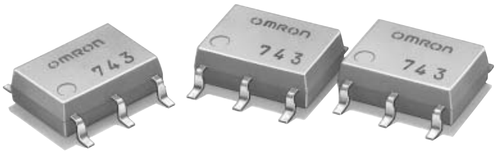
■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-81HR



Slim, 2.1-mm High, MOSFET Relay with Miniature, Flat, 6-pin SOP Package



- New models with 6-pin SOP package now available in the 200-V load voltage series.
- Continuous load current of 200 mA.
- Dielectric strength of 1,500 Vrms between I/O.

NEW

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

Note: The actual product is marked differently from the image shown here.

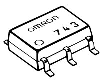
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	200 VAC	G3VM-201H1	75	---
			G3VM-201H1(TR)	---	2,500

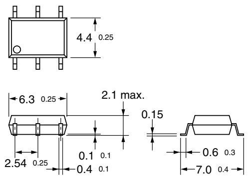
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-201H1



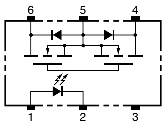
Note: The actual product is marked differently from the image shown here.



Weight: 0.13 g

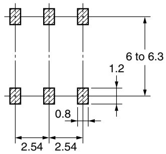
Terminal Arrangement/Internal Connections (Top View)

G3VM-201H1



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-201H1

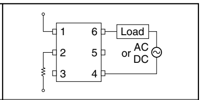
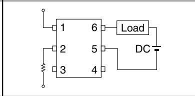
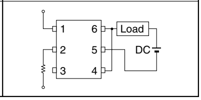


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate		$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Output dielectric strength		V_{OFF}	200	V	
	Continuous load current	Connection A	I_O	200	mA	
		Connection B		200		
		Connection C		400		
	ON current reduction rate	Connection A	$\Delta I_{ON}/°C$	−2.0	mA/°C	Ta ≥ 25°C
		Connection B		−2.0		
		Connection C		−4.0		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

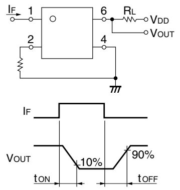
Connection Diagram

Connection A	
Connection B	
Connection C	

■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	I_O = 200 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	5	8	Ω	I_F = 5 mA, I_O = 200 mA
		Connection B		---	3	5	Ω	I_F = 5 mA, I_O = 200 mA
		Connection C		---	1.5	---	Ω	I_F = 5 mA, I_O = 400 mA
	Current leakage when the relay is open		I_{LEAK}	---	---	1.0	µA	V_{OFF} = 200 V
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time			tON	---	0.6	1.5	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			tOFF	---	0.1	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

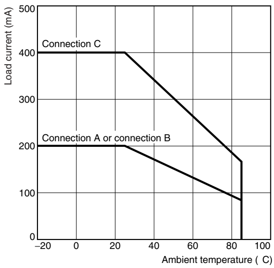
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	160	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	130	mA
Operating temperature	T_a	− 20	---	60	°C

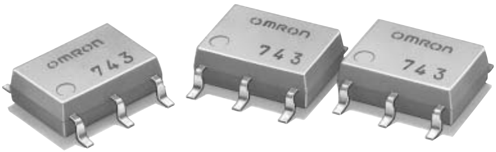
■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-201H1



Slim 2.1mm high relay incorporating a MOSFET Optically Coupled with an Infrared LED in a Miniature, Flat SOP



- Upgraded G3VM-S3 Series.
- Continuous load current of 110 mA.
- Dielectric strength of 1,500 Vrms between I/O.

NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

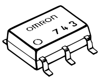
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	350 VAC	G3VM-351H	75	---
			G3VM-351H(TR)	---	2,500

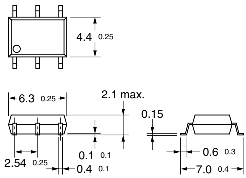
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-351H



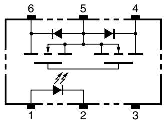
Note: The actual product is marked differently from the image shown



Weight: 0.13 g

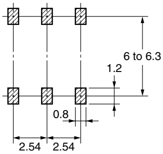
Terminal Arrangement/Internal Connections (Top View)

G3VM-351H



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-351H

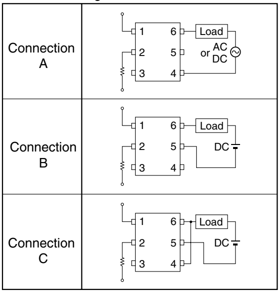


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		$\Delta I_F/°C$	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Output dielectric strength		V_{OFF}	350	V	
	Continuous load current	Connection A	I_O	110	mA	
		Connection B		110		
		Connection C		220		
	ON current reduction rate	Connection A	$\Delta I_{ON}/°C$	–1.1	mA/°C	Ta ≥ 25°C
		Connection B		–1.1		
		Connection C		–2.2		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature			T_a	–40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

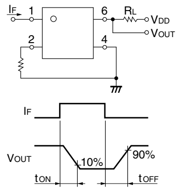
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	I_O = 110 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 110 mA, t < 1 s
				---	35	50	Ω	I_F = 5 mA, I_O = 110 mA
		Connection B		---	28	40	Ω	I_F = 5 mA, I_O = 110 mA
		Connection C		---	14	20	Ω	I_F = 5 mA, I_O = 220 mA
	Current leakage when the relay is open		I_{LEAK}	---	---	1.0	μA	V_{OFF} = 350 V
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time			tON	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			tOFF	---	0.1	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

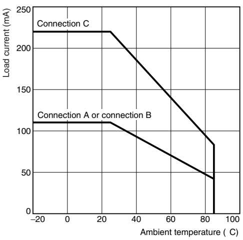
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	10	25	mA
Continuous load current	I_O	---	---	100	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

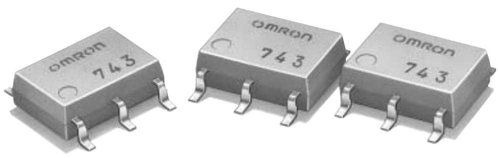
Load Current vs. Ambient Temperature

G3VM-351H



Analog-switching MOS FET Relay with SPST-NC (Single-pole, Single-throw, Normally Closed) Contacts

- New models in 350-V load voltage series with SPST-NC contacts and a 6-pin SOP package.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.



NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

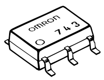
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NC	Surface-mounting terminals	350 VAC	G3VM-353H	75	---
			G3VM-353H(TR)	---	2,500

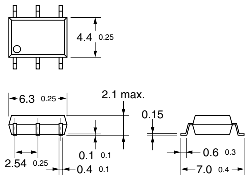
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-353H



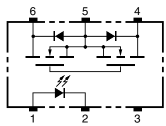
Note: The actual product is marked differently from the image shown here.



Weight: 0.13 g

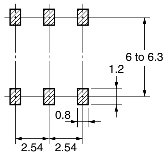
Terminal Arrangement/Internal Connections (Top View)

G3VM-353H



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-353H

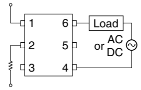
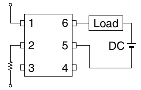
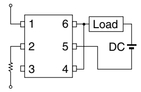


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate		$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Output dielectric strength		V_{OFF}	350	V	
	Continuous load current	Connection A	I_O	120	mA	
		Connection B		120		
		Connection C		240		
	ON current reduction rate	Connection A	$\Delta I_{ON}/°C$	−1.2	mA/°C	Ta ≥ 25°C
		Connection B		−1.2		
		Connection C		−2.4		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

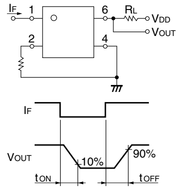
Connection Diagram

Connection A	
Connection B	
Connection C	

■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1.0	3.0	mA	I_{OFF} = 10 µA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	15	25	Ω	I_O = 120 mA
		Connection B		---	8	14	Ω	I_O = 120 mA
		Connection C		---	4	---	Ω	I_O = 240 mA
	Current leakage when the relay is open		I_{LEAK}	---	---	1.0	µA	V_{OFF} = 350 V, I_F = 5 mA
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time			tON	---	---	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			tOFF	---	---	3.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

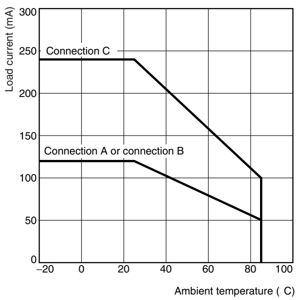
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	---	25	mA
Continuous load current	I_O	---	---	120	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

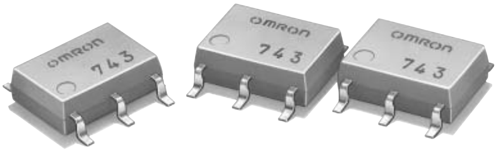
Load Current vs. Ambient Temperature

G3VM-353H



Expanded Range of Analog Switching MOSFET Relays with 400-V Load Voltage

- New models with a 6-pin SOP package now included in 400-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.



NEW

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

Note: The actual product is marked differently from the image shown here.

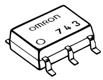
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	400 VAC	G3VM-401H	75	---
			G3VM-401H(TR)	---	2,500

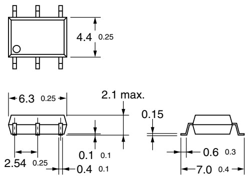
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-401H



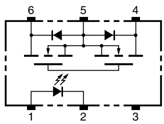
Note: The actual product is marked differently from the image shown here.



Weight: 0.13 g

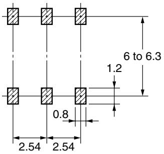
Terminal Arrangement/Internal Connections (Top View)

G3VM-401H



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-401H

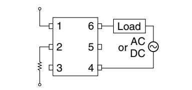
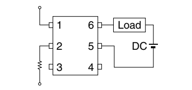
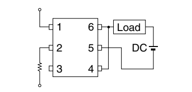


■Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		$\Delta I_F/°C$	-0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Output dielectric strength		V_{OFF}	400	V	
	Continuous load current	Connection A	I_O	120	mA	
		Connection B		120		
		Connection C		240		
	ON current reduction rate	Connection A	$\Delta I_{ON}/°C$	–1.2	mA/°C	Ta ≥ 25°C
		Connection B		–1.2		
		Connection C		–2.4		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature			T_a	–40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

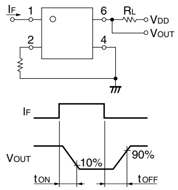
Connection Diagram

Connection A	
Connection B	
Connection C	

■Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	17	35	Ω	I_F = 5 mA, I_O = 120 mA
		Connection B		---	11	20	Ω	I_F = 5 mA, I_O = 120 mA
		Connection C		---	6	---	Ω	I_F = 5 mA, I_O = 240 mA
	Current leakage when the relay is open		I_{LEAK}	---	---	1.0	μA	V_{OFF} = 400 V
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time			tON	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			tOFF	---	0.1	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■Recommended Operating Conditions

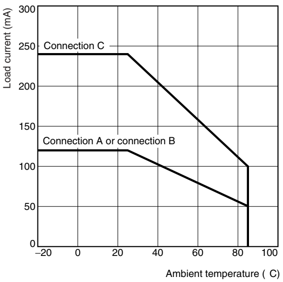
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	120	mA
Operating temperature	T_a	– 20	---	65	°C

■Engineering Data

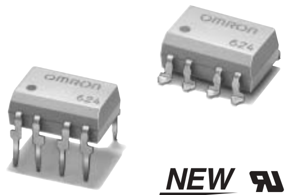
Load Current vs. Ambient Temperature

G3VM-401H



New MOS FET Relay Featuring Unique Contact Construction (1 Input Channel Drives 2 Output Channels)

- Ideal for application in line interface and data logging blocks.
- Switches minute analog signals.
- Switching AC and DC.



NEW Approval pending

Note: The actual product is marked differently from the image shown here.

Application Examples

- ADSL modems and routers
- Edge routers
- Data storage devices

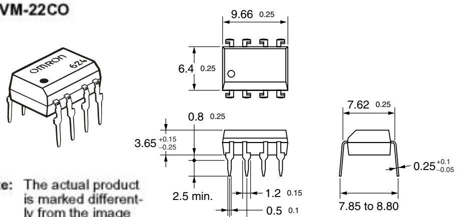
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	PCB terminals	20 VAC	G3VM-22CO	50	---
	Surface-mounting terminals		G3VM-22FO		
			G3VM-22FO(TR)	---	1,500

Dimensions

Note: All units are in millimeters unless otherwise indicated.

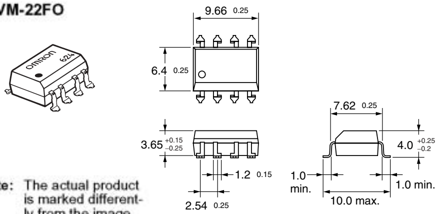
G3VM-22CO



Note: The actual product is marked differently from the image shown here.

Weight: 0.54 g

G3VM-22FO

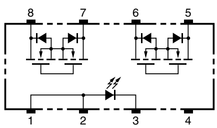


Note: The actual product is marked differently from the image shown here.

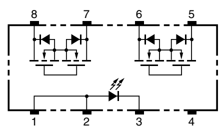
Weight: 0.54 g

Terminal Arrangement/Internal Connections (Top View)

G3VM-22CO

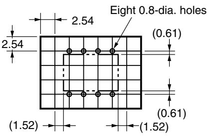


G3VM-22FO



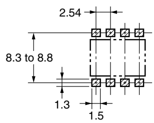
PCB Dimensions (Bottom View)

G3VM-22CO



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-22FO



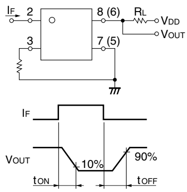
■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	6	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	20	V	
	Continuous load current	I_O	150	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	–1.5	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.5	5	mA	I_O = 150 mA
Output	Maximum resistance with output ON	R_{ON}	---	2	4	Ω	I_F = 5 mA, I_O = 150 mA
	Current leakage when the relay is open	I_{LEAK}	---	10×10^{-6}	1.0	μA	V_{OFF} = 20 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note.)
Turn-OFF time		tOFF	---	---	1.0	ms	

Note: Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

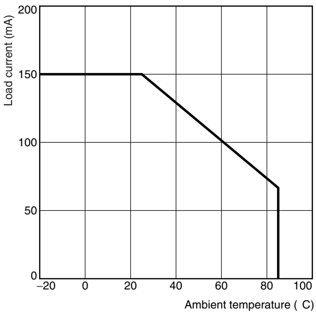
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	20	V
Operating LED forward current	I_F	5	---	30	mA
Continuous load current	I_O	---	---	150	mA
Operating temperature	T_a	– 25	---	65	°C

■ Engineering Data

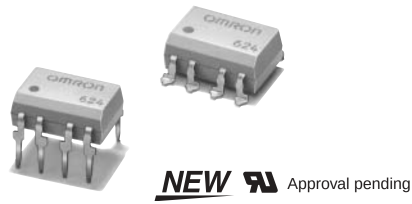
Load Current vs. Ambient Temperature

G3VM-22CO(FO)



New High-capacity MOS FET Relay Allowing Switching of a 2-A Continuous Load Current

- Package designed with 1 channel and 8 pins.
- Low ON-resistance of 0.12 Ω max.
- Leakage current of 1.0 nA (typical) between output terminals when they are open.



Note: The actual product is marked differently from the image shown here.

Application Examples

- Semiconductor testers
- Measurement devices
- Security systems

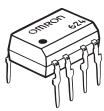
List of Models

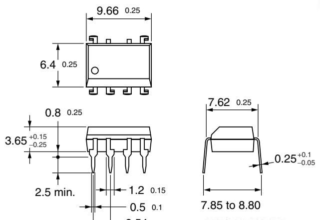
Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	60 VAC	G3VM-61CR	50	---
	Surface-mounting terminals		G3VM-61FR		
			G3VM-61FR(TR)	---	1,500

Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61CR

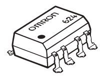


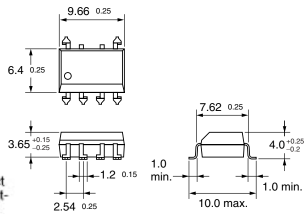


Note: The actual product is marked differently from the image shown here.

Weight: 0.54 g

G3VM-61FR



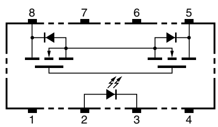


Note: The actual product is marked differently from the image shown here.

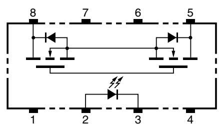
Weight: 0.54 g

Terminal Arrangement/Internal Connections (Top View)

G3VM-61CR

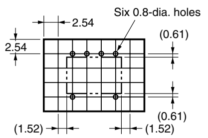


G3VM-61FR



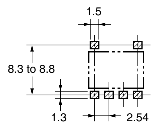
PCB Dimensions (Bottom View)

G3VM-61CR



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61FR



■ Absolute Maximum Ratings (Ta = 25°C)

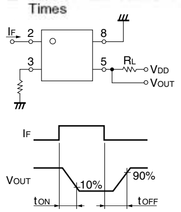
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	6	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	60	V	
	Continuous load current	I_O	2,000	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−20	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.2	1.4	V	I_F = 20 mA
	Reverse current	I_R	---	---	10	µA	V_R = 6 V
	Capacity between terminals	C_T	---	15	—	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	5	mA	I_O = 1 A
Output	Maximum resistance with output ON	R_{ON}	---	---	0.12	Ω	I_F = 10 mA, I_O = 1 A
	Current leakage when the relay is open	I_{LEAK}	---	1.0	4.0	nA	V_{OFF} = 20 V, Ta = 50°C
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	—	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	5.0	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	3.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

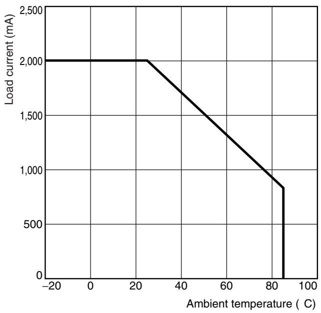
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	48	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current	I_O	---	---	2	A
Operating temperature	T_a	25	---	50	°C

■ Engineering Data

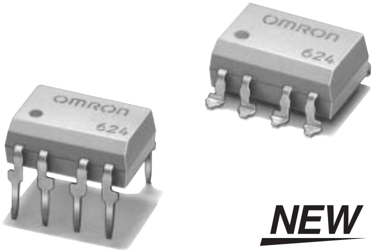
Load Current vs. Ambient Temperature

G3VM-61CR(FR)



New Analog-switching MOSFET Relays with 2 Output channels. Dielectric Strength of 2.5 kVAC between I/O.

- Switches minute analog signals.
- Dielectric strength of 2,500 Vrms between I/O.
- Surface-mounting models included in series.



NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Measurement devices
- Security systems

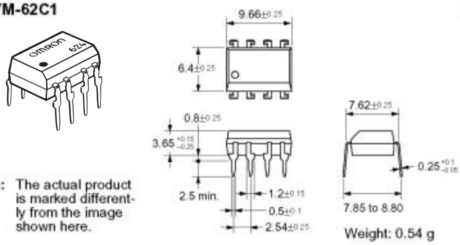
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	PCB terminals	60 VAC	G3VM-62C1	50	---
	Surface-mounting terminals		G3VM-62F1		
			G3VM-62F1(TR)	---	1,500

Dimensions

Note: All units are in millimeters unless otherwise indicated.

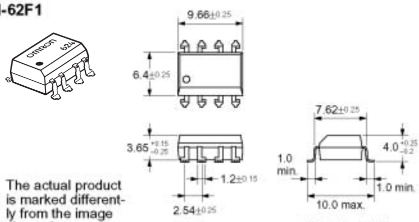
G3VM-62C1



Note: The actual product is marked differently from the image shown here.

Weight: 0.54 g

G3VM-62F1

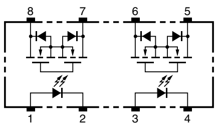


Note: The actual product is marked differently from the image shown here.

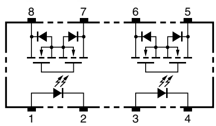
Weight: 0.54 g

Terminal Arrangement/Internal Connections (Top View)

G3VM-62C1

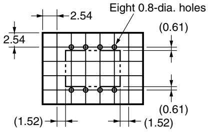


G3VM-62F1



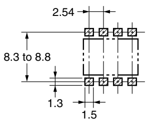
PCB Dimensions (Bottom View)

G3VM-62C1



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-62F1



Absolute Maximum Ratings (Ta = 25°C)

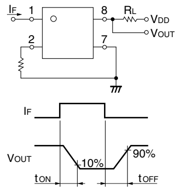
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	60	V	
	Continuous load current	I_O	500	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−5.0	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.6	3	mA	I_O = 500 mA
Output	Maximum resistance with output ON	R_{ON}	---	1.0	2.0	Ω	I_F = 5 mA, I_O = 500 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	µA	V_{OFF} = 60 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.8	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.1	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



Recommended Operating Conditions

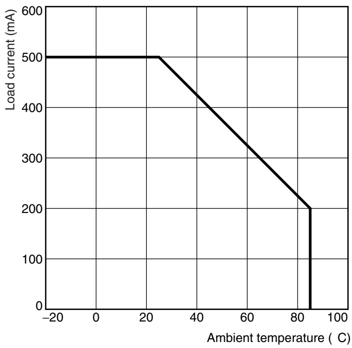
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	500	mA
Operating temperature	T_a	− 20	---	65	°C

Engineering Data

Load Current vs. Ambient Temperature

G3VM-62C1(F1)



New Series with 350-V Load Voltage Including Models with 2 Outputs.

- Upgraded G3VM-W Series.
- Continuous load current of 120 mA.
- Dielectric strength of 2,500 Vrms between I/O.

NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Measurement devices
- Security systems
- Amusement machines

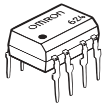
■ List of Models

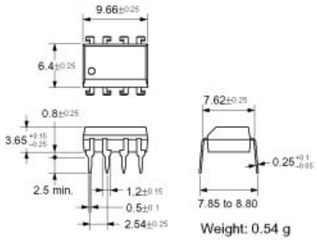
Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	PCB terminals	350 VAC	G3VM-352C	50	---
	Surface-mounting terminals		G3VM-352F		
			G3VM-352F(TR)	---	1,500

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-352C

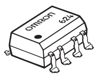


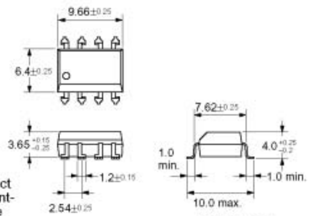


Note: The actual product is marked differently from the image shown here.

Weight: 0.54 g

G3VM-352F



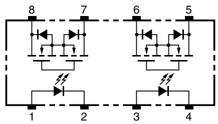


Note: The actual product is marked differently from the image shown here.

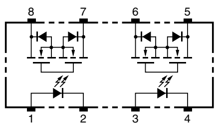
Weight: 0.54 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-352C

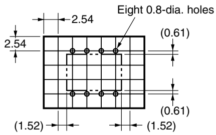


G3VM-352F



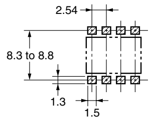
■ PCB Dimensions (Bottom View)

G3VM-352C



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-352F



■ Absolute Maximum Ratings (Ta = 25°C)

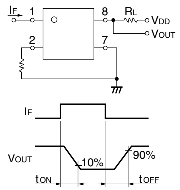
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 120 mA, t < 1 s
			---	35	50	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	μA	V_{OFF} = 350 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.1	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

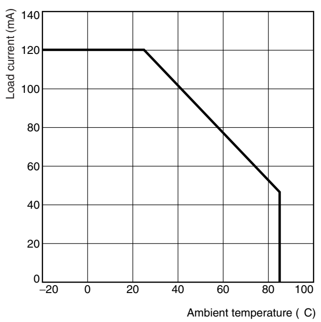
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

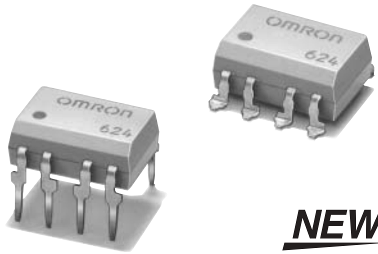
■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-352C(F)



New Series with 350-V Load Voltage Current-limiting Models with 2 Outputs.



NEW

Note: The actual product is marked differently from the image shown here.

■Application Examples

- Electronic automatic exchange systems
- Multi-functional telephones
- Cordless telephones
- Measurement devices

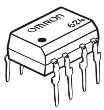
■List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Current limit	Number per stick	Number per tape
DPST-NO	PCB terminals	350 VAC	G3VM-WL	Yes	50	---
	Surface-mounting terminals		G3VM-WFL			
			G3VM-WFL(TR)		---	1,500

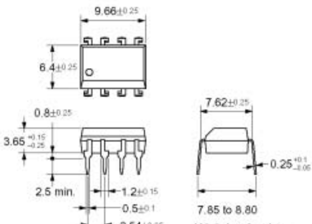
■Dimensions

Note: All units are in millimeters unless otherwise indicated.

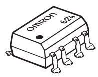
G3VM-WL



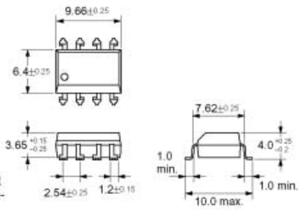
Note: The actual product is marked differently from the image shown here.



G3VM-WFL

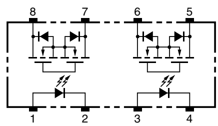


Note: The actual product is marked differently from the image shown here.

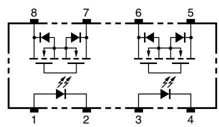


■Terminal Arrangement/Internal Connections (Top View)

G3VM-WL

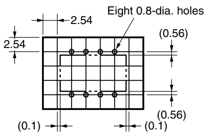


G3VM-WFL



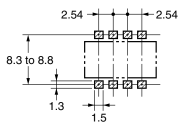
■PCB Dimensions (Bottom View)

G3VM-WL



■Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-WFL



■ Absolute Maximum Ratings (Ta = 25°C)

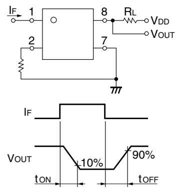
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	6	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	22	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	µA	V_{OFF} = 350 V
Limit current		I_{LIM}	150	---	300	mA	I_F = 5 mA, V_{DD} = 5 V, t = 5 ms
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

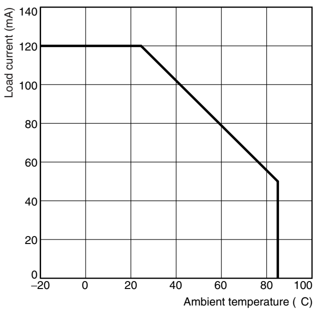
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

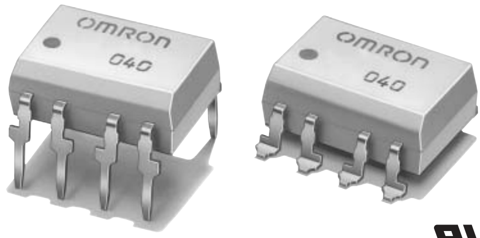
Load Current vs. Ambient Temperature

G3VM-W(F)L



Analog-switching MOSFET Relay with DPST-NC (Double-pole, Single-throw, Normally Closed) Contacts

- Switches minute analog signals.
- Switching AC and DC.



Note: The actual product is marked differently from the image shown here.

Application Examples

- Electronic automatic exchange systems
- Security systems
- Datacom (modem) systems
- FA systems
- Measurement devices

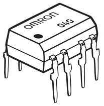
List of Models

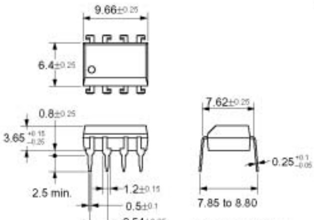
Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NC	PCB terminals	350 VAC	G3VM-354C	50	---
	Surface-mounting terminals		G3VM-354F		
			G3VM-354F(TR)	---	1,500

Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-354C

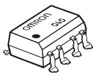


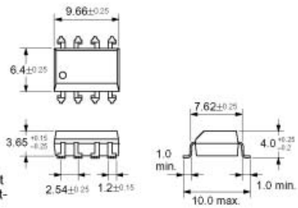


Note: The actual product is marked differently from the image shown here.

Weight: 0.54 g

G3VM-354F



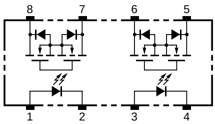


Note: The actual product is marked differently from the image shown here.

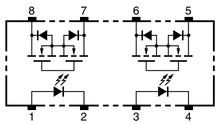
Weight: 0.54 g

Terminal Arrangement/Internal Connections (Top View)

G3VM-354C

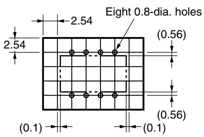


G3VM-354F



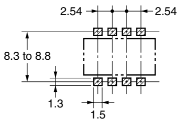
PCB Dimensions (Bottom View)

G3VM-354C



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-354F



■Absolute Maximum Ratings (Ta = 25°C)

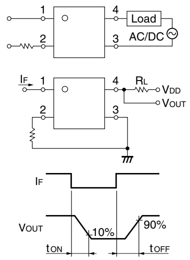
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	150	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	–1.5	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		—	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_{OFF} = 10 μA
Output	Maximum resistance with output ON	R_{ON}	---	15	25	Ω	I_O = 150 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	μA	I_F = 5 mA, V_{OFF} = 350 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.1	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	1.0	3.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■Recommended Operating Conditions

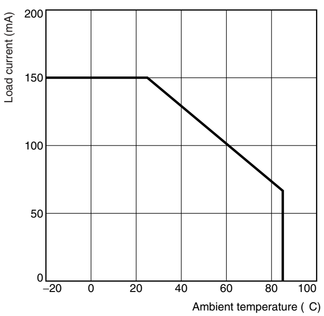
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	---	25	mA
Continuous load current	I_O	---	---	150	mA
Operating temperature	T_a	– 20	---	65	°C

■Engineering Data

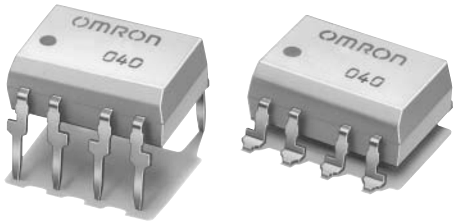
Load Current vs. Ambient Temperature

G3VM-354C(F)



New MOSFET Relay with Both SPST-NO and SPST-NC Contacts Incorporated in a Single DIP Package

- SPST-NO/SPST-NC models now included in the 350-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 2,500 Vrms between I/O.



NEW Approval pending

Note: The actual product is marked differently from the image shown here.

Application Examples

- Measurement devices
- Security systems
- Amusement machines

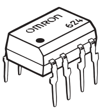
List of Models

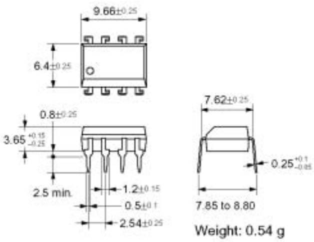
Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO/ SPST-NC	PCB terminals	350 VAC	G3VM-355C	50	---
	Surface-mounting terminals		G3VM-355F		
			G3VM-355F(TR)	---	1,500

Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-355C

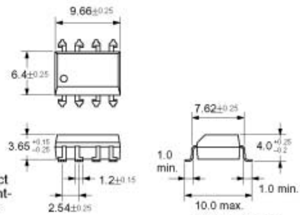




Weight: 0.54 g

Note: The actual product is marked differently from the image shown here.

G3VM-355F

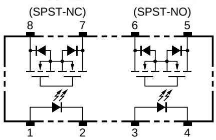


Weight: 0.54 g

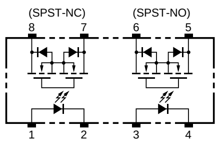
Note: The actual product is marked differently from the image shown here.

Terminal Arrangement/Internal Connections (Top View)

G3VM-355C

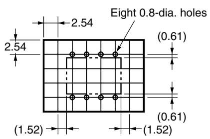


G3VM-355F



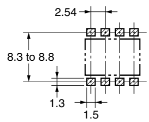
PCB Dimensions (Bottom View)

G3VM-355C



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-355F



■ Absolute Maximum Ratings (Ta = 25°C)

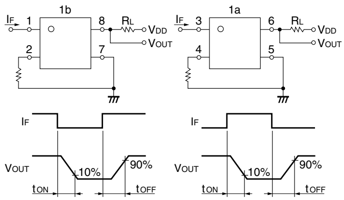
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	100	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.0	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	SPST-NO: I_O = 100 mA
							SPST-NC: I_{OFF} = 10 μA
Output	Maximum resistance with output ON	R_{ON}	---	30	35	Ω	SPST-NO: I_F = 5 mA, I_O = 100 mA
				40	50		SPST-NC: I_F = 0 mA, I_O = 100 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	μA	V_{OFF} = 350 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time	SPST-NO	tON	---	0.25	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
	SPST-NC		---	0.3	1.0	ms	
Turn-OFF time	SPST-NO	tOFF	---	0.5	1.0	ms	
	SPST-NC		---	0.15	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

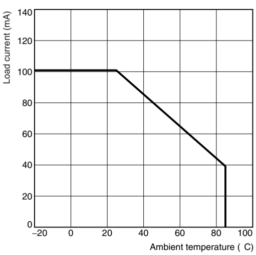
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	10	25	mA
Continuous load current	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

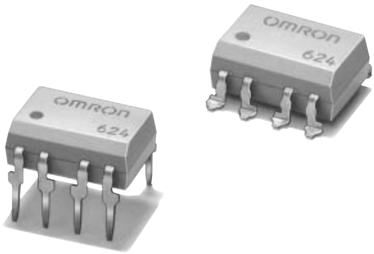
Load Current vs. Ambient Temperature

G3VM-355C(F)



New Expanded Range of Analog switching MOSFET Relays with 400-V Load Voltage with 2 Output Channels.

- A 2-channel Relay now included in the 400-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 2,500 Vrms between I/O.



NEW Approval pending

Note: The actual product is marked differently from the image shown here.

Application Examples

- Measurement devices
- Security systems
- Amusement machines

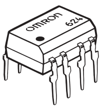
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	PCB terminals	400 VAC	G3VM-402C	50	---
	Surface-mounting terminals		G3VM-402F		
			G3VM-402F(TR)	---	1,500

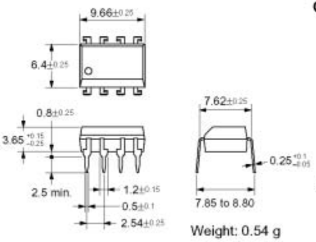
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-402C

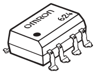


Note: The actual product is marked differently from the image shown here.

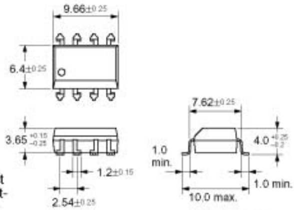


Weight: 0.54 g

G3VM-402F



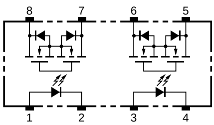
Note: The actual product is marked differently from the image shown here.



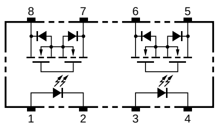
Weight: 0.54 g

Terminal Arrangement/Internal Connections (Top View)

G3VM-402C

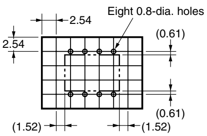


G3VM-402F



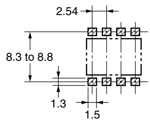
PCB Dimensions (Bottom View)

G3VM-402C



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-402F



■ Absolute Maximum Ratings (Ta = 25°C)

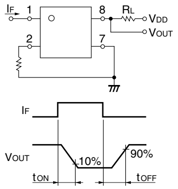
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	-0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	400	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	-1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	Vrms	AC for 1 min
Operating temperature		T_a	-40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	-55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	18	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	µA	V_{OFF} = 400 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

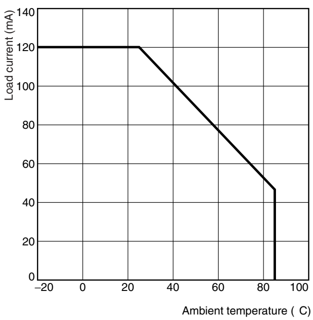
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	100	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-402C(F)



New MOSFET Relay Designed for Switching Minute Signals and Analog Signals. Has 2 Channels and a 60-V Load Voltage

■ Continuous load current of 400 mA.

■ Dielectric strength of 1,500 Vrms between I/O.

NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices
- Data Loggers
- Amusement machines

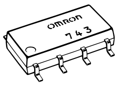
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	Surface-mounting terminals	60 VAC	G3VM-62J1	50	---
			G3VM-62J1(TR)	---	2,500

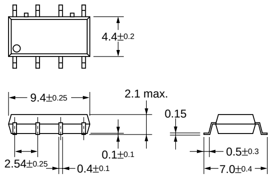
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-62J1



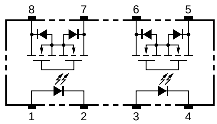
Note: The actual product is marked differently from the image shown here.



Weight: 0.2 g

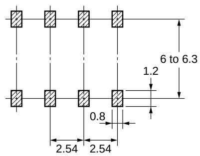
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-62J1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-62J1



Absolute Maximum Ratings (Ta = 25°C)

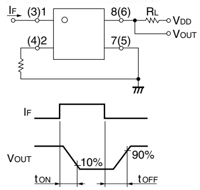
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	60	V	
	Continuous load current	I_O	400	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−4.0	mA/°C	Ta ≥ 25°C
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.6	3	mA	I_O = 400 mA
Output	Maximum resistance with output ON	R_{ON}	---	1.0	2.0	Ω	I_F = 5 mA, I_O = 400 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	μA	V_{OFF} = 60 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.8	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.1	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



Recommended Operating Conditions

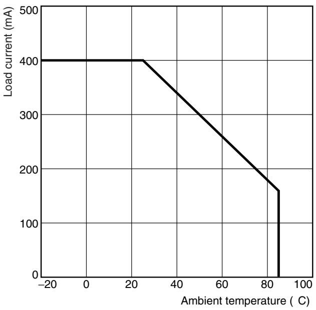
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	400	mA
Operating temperature	T_a	− 20	---	65	°C

Engineering Data

Load Current vs. Ambient Temperature

G3VM-62J1



Slim, 2.1-mm High MOSFET Relay with Miniature, Flat, 8-pin SOP Package

- New models with 2 channels and an 8-pin SOP package now available in the 200-V load voltage series.
- Continuous load current of 200 mA.
- Dielectric strength of 1,500 Vrms between I/O.

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

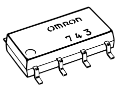
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	Surface-mounting terminals	200 VAC	G3VM-202J1	50	---
			G3VM-202J1(TR)	---	2,500

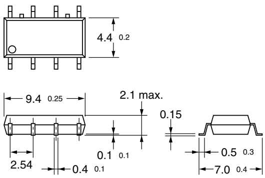
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-202J1



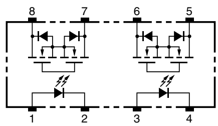
Note: The actual product is marked differently from the image shown here.



Weight: 0.2 g

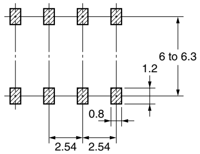
Terminal Arrangement/Internal Connections (Top View)

G3VM-202J1



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-202J1



■ Absolute Maximum Ratings (Ta = 25°C)

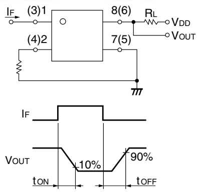
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	200	V	
	Continuous load current	I_O	200	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−2.0	mA/°C	Ta ≥ 25°C
Dielectric strength between input and output (See note 1.)		$V_{I\text{-}O}$	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 200 mA
Output	Maximum resistance with output ON	R_{ON}	---	5	8	Ω	I_F = 5 mA, I_O = 200 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	μA	V_{OFF} = 200 V
Capacity between I/O terminals		$C_{I\text{-}O}$	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		$R_{I\text{-}O}$	1,000	---	---	MΩ	$V_{I\text{-}O}$ = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.6	1.5	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.1	1	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

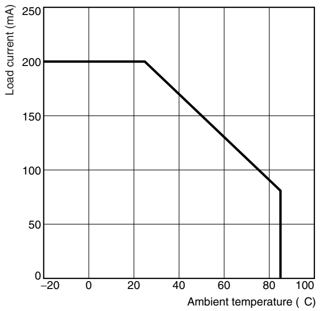
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	150	200	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	130	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-202J1



Slim, 2.1-mm High Relay Incorporating a MOSFET Optically Coupled with an Infrared LED in a Miniature, Flat SOP Package

- New models with 2 channels and an 8-pin SOP package included in 350-V load voltage series.
- Continuous load current of 110 mA.
- Dielectric strength of 1,500 Vrms between I/O.

NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

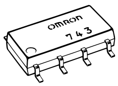
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	Surface-mounting terminals	350 VAC	G3VM-352J	50	---
			G3VM-352J(TR)	---	2,500

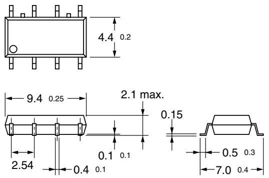
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-352J



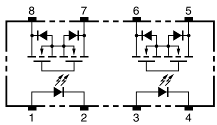
Note: The actual product is marked differently from the image shown here.



Weight: 0.2 g

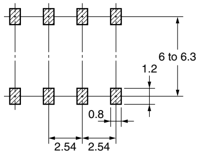
Terminal Arrangement/Internal Connections (Top View)

G3VM-352J



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-352J



■ Absolute Maximum Ratings (Ta = 25°C)

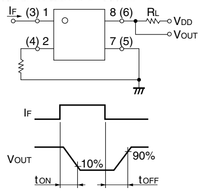
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	110	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	–1.1	mA/°C	Ta ≥ 25°C
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 110 mA
Output	Maximum resistance with output ON	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 110 mA, t < 1 s
			---	35	50	Ω	I_F = 5 mA, I_O = 110 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	μA	V_{OFF} = 350 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.3	1	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.1	1	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

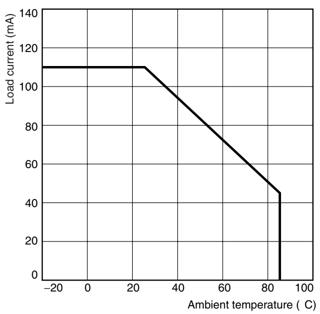
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	10	25	mA
Continuous load current	I_O	---	---	100	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

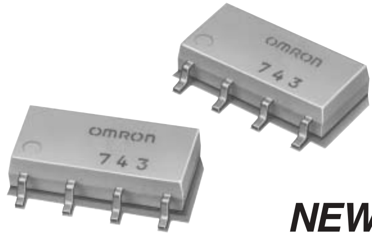
Load Current vs. Ambient Temperature

G3VM-352J



Analog-switching MOSFET Relay with DPST-NC (Double-pole, Single-throw, Normally Closed) Contacts

- New models with SPST-NC contacts and an 8-pin SOP package now included in 350-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.



NEW

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

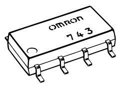
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NC	Surface-mounting terminals	350 VAC	G3VM-354J	50	---
			G3VM-354J(TR)	---	2,500

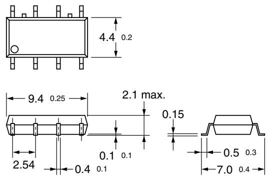
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-354J



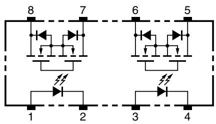
Note: The actual product is marked differently from the image shown here.



Weight: 0.2 g

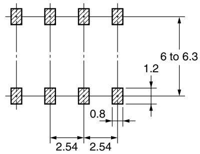
Terminal Arrangement/Internal Connections (Top View)

G3VM-354J



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-354J



Absolute Maximum Ratings (Ta = 25°C)

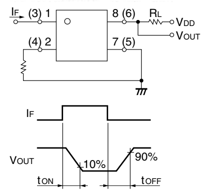
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		—	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_{OFF} = 10 μA
Output	Maximum resistance with output ON	R_{ON}	---	15	25	Ω	I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	μA	V_{OFF} = 350 V, I_F = 5 mA
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	---	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	---	3.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



Recommended Operating Conditions

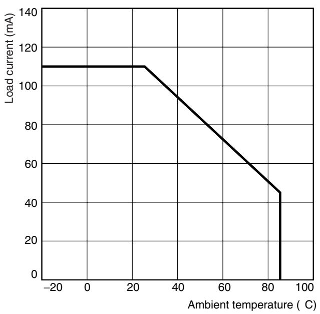
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	---	25	mA
Continuous load current	I_O	---	---	120	mA
Operating temperature	T_a	− 20	---	65	°C

Engineering Data

Load Current vs. Ambient Temperature

G3VM-354J



New MOSFET Relay with Both SPST-NO and SPST-NC Contacts Incorporated in a Single SOP Package

- SPST-NO/SPST-NC models with an 8-pin SOP package now available in the 350-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

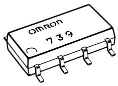
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO/ SPST-NC	Surface-mounting terminals	350 VAC	G3VM-355J	50	---
			G3VM-355J(TR)	---	2,500

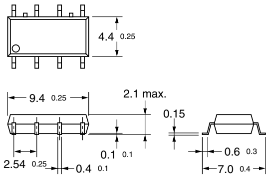
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-355J



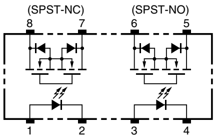
Note: The actual product is marked differently from the image shown here.



Weight: 0.2 g

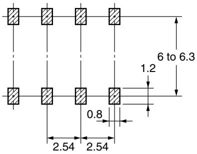
Terminal Arrangement/Internal Connections (Top View)

G3VM-355J



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-355J



■ Absolute Maximum Ratings (Ta = 25°C)

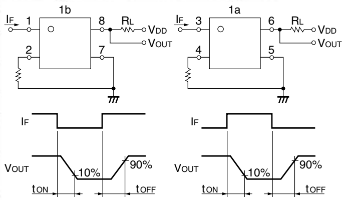
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	$\Delta I_F/°C$	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	350	V	
	Continuous load current	I_O	90	mA	
	ON current reduction rate	$\Delta I_{ON}/°C$	−0.9	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	SPST-NO: I_O = 90 mA
		I_{FC}					SPST-NC: I_{OFF} = 10 µA
Output	Maximum resistance with output ON	R_{ON}	---	30	35	Ω	SPST-NO: I_F = 5 mA, I_O = 90 mA
				40	50		SPST-NC: I_F = 0 mA, I_O = 90 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	µA	V_{OFF} = 350 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time	SPST-NO	tON	---	0.25	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
	SPST-NC		---	0.3	1.0	ms	
Turn-OFF time	SPST-NO	tOFF	---	0.5	1.0	ms	
	SPST-NC		---	0.15	1.0	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

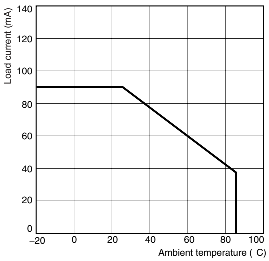
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	10	25	mA
Continuous load current	I_O	---	---	90	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-355J



Expanded Range of Analog-Switching MOSFET Relays with 400-V Load Voltage

- New models with two channels and an 8-pin SOP package included in 400-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.

Note: The actual product is marked differently from the image shown here.

Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

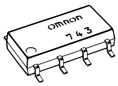
List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	Surface-mounting terminals	400 VAC	G3VM-402J	50	---
			G3VM-402J(TR)	---	2,500

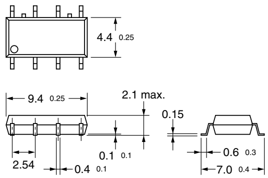
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-402J



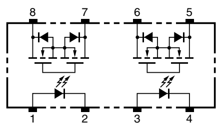
Note: The actual product is marked differently from the image shown here.



Weight: 0.2 g

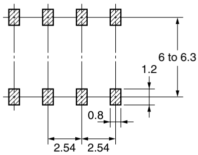
Terminal Arrangement/Internal Connections (Top View)

G3VM-402J



Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-402J



■ Absolute Maximum Ratings (Ta = 25°C)

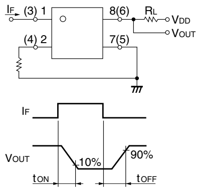
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 µs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Output dielectric strength	V_{OFF}	400	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2	mA/°C	Ta ≥ 25°C
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	µA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	17	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	---	1.0	µA	V_{OFF} = 400 V
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		tON	---	0.3	1	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		tOFF	---	0.1	1	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

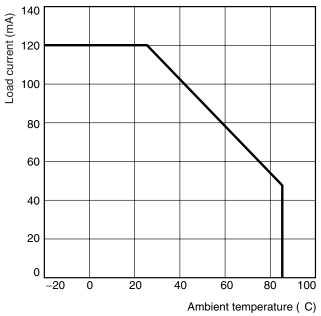
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Output dielectric strength	V_{DD}	---	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current	I_O	---	---	120	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

Load Current vs. Ambient Temperature

G3VM-402J



MOSFET Relays

■ Glossary

CONTACTS

Contact Form

The contact mechanism of the Relay.

Number of Contact Poles

The number of contact circuits.

Rated Load

The rated load of the contact of the Relay, which determines the characteristic performance of the contact of the Relay, is expressed by the switching voltage and switching current.

Maximum Switching Voltage

The switching voltage of the Relay determines the characteristic performance of the contact of the Relay. Do not apply voltage that exceeds the maximum switching voltage of the Relay.

Carry Current

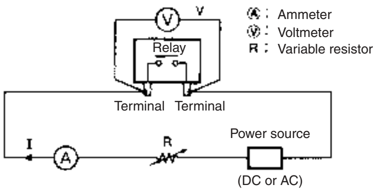
The value of the current which can be continuously applied to the Relay contacts without opening or closing them, which also allows the Relay to stay within the permissible temperature rise limit.

Maximum Switching (Contact) Current

A current which serves as a reference in determining the performance of the Relay contacts. This value will never exceed the carry current. When using a Relay, plan not to exceed this value.

Contact Resistance

The total resistance of the conductor, which includes specific resistivities, such as of the armature and terminal, and the resistance of the contacts. This value is determined by measuring the voltage drop across the contacts by the allowed test current shown in the table below.

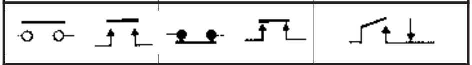
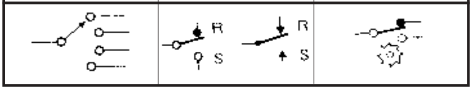


Test Current

Rated current or switched current (A)	Test current (mA)
0.01 or higher but less than 0.1	10
0.1 or higher but less than 1	100
1 or higher	1,000

To measure the contact resistance, a milliohmmeter can also be used, although the accuracy drops slightly.

Contact Symbols

NO contact	NC contact	SPDT contact
		
Double-break NO contact	**Double-break NO contact**	**Make-before-contact contact**
		
Wiper contact	**Latching Relay contact**	**Ratchet relay contact**
		

Make-before-break Contact

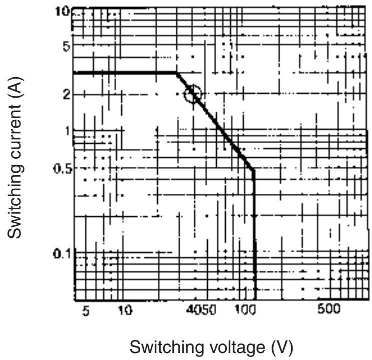
A contact arrangement in which part of the switching section is shared between both an NO and an NC contact. When the Relay operates or releases, the contact that closes the circuit operates before the contact that opens the circuit releases. Thus both the contacts are closed momentarily at the same time.

Maximum Switching Power

The maximum capacity value of the load which can be switched without causing problems of material break-down and/or electrical overload. When using a Relay, be careful not to exceed this value. For example, when switching voltage V_1 is known, max. switching current I_1 can be obtained at the point of intersection on the characteristic curve "Maximum switching power" below. Conversely, max. switching voltage V_1 can be operated if I_1 is known.

$$\text{Max. switching current } (I_1) = \frac{\text{Maximum switching power [W(VA)]}}{\text{Switching voltage } (V_1)}$$

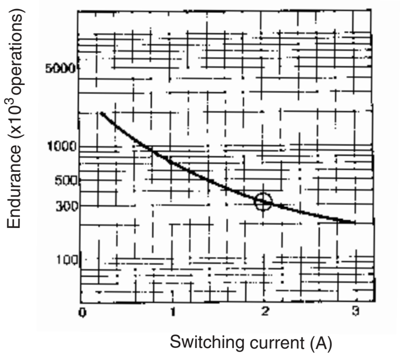
For instance, if the switching voltage = 40 V, the max. switching current = 2 A (see circled point on graph).



Electrical Endurance

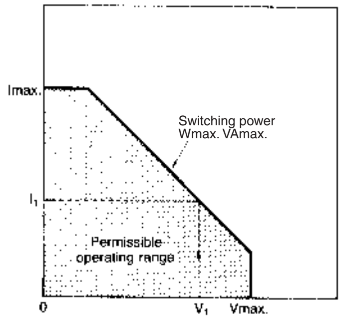
The electrical endurance of the Relay can be determined from the "Electrical life" curve shown below, based on the rated switching current (I_1) obtained above.

For instance, the electrical endurance for the max. switching current of 2 A is slightly over 300,000 operations (see circled point on graph below).



However, with a DC load, it may become difficult to break a circuit of 48 V or more, due to arcing. Determine suitability of the Relay in actual usage testing. Correlation between the contact ratings is as shown below.

Maximum Switching Power



Failure Rate

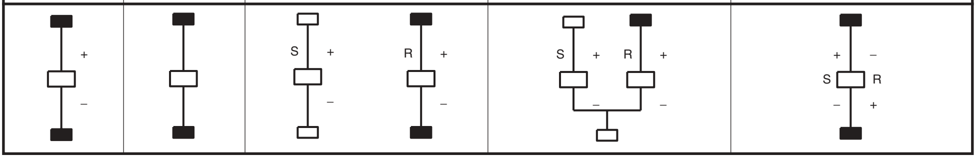
The failure rate indicates the lower limit of the switching power of a Relay. Such minute load levels are found in microelectronic circuits. This value may vary, depending on operating frequency, operating conditions, expected reliability level of the Relay, etc. It is always recommended to double-check Relay suitability under actual load conditions.

In this catalog, the failure rate of each Relay is indicated as a reference value. It indicates error level at a reliability level of 60% (λ_{60}).

$\lambda_{60} = 0.1 \times 10^{-6}$/operation means that one error is presumed to occur per 10,000,000 operations at the reliability level of 60%.

Coil

Single-stable		Double-winding		Single-winding latching
With pole	Without pole	4 terminals	3 terminals	



Coil Current (Applicable to AC-switching Type Only)

A current which flows through the coil when the rated voltage is applied to the coil at a temperature of 23°C. The tolerance is +15%, –20% unless otherwise specified.

Coil Voltage

A reference voltage applied to the coil when the Relay is used under the normal operation conditions. The following table lists the 100/110 VAC voltages

Applicable power source	Inscription on Relay	Denomination in catalog
100 V 50 Hz	100 VAC 60 Hz	100 VAC 60 Hz
100 VAC 50 Hz 100 VAC 60 Hz	100 VAC	100 VAC
100 VAC 50 Hz 100 VAC 60 Hz 100 VAC 60 Hz	100/110 VAC 60 Hz 100 VAC 50 Hz	100/(110) VAC
100 VAC 50 Hz 100 VAC 60 Hz 110 VAC 50 Hz 110 VAC 60 Hz	100/110 VAC	100/110 VAC

Power Consumption

The power (=rated voltage x rated current) consumed by the coil when the rated voltage is applied to it. A frequency of 60 Hz is assumed if the Relay is intended for AC operation.

The current flows through the coil when the rated voltage is applied to the coil at a temperature of 23°C and with a tolerance of +15% and –20% unless otherwise specified.

Coil Resistance (Applicable to DC-switching Type Only)

The resistance of the coil measured at a temperature of 23°C with a tolerance of ±10% unless otherwise specified. (The coil resistance of an AC-switching Relay may be given for reference when the coil inductance is specified.)

Must-release (Must-reset) Voltage

The threshold value of a voltage at which a Relay releases when the rated input voltage applied to the Relay coil in the operating state is decreased gradually.

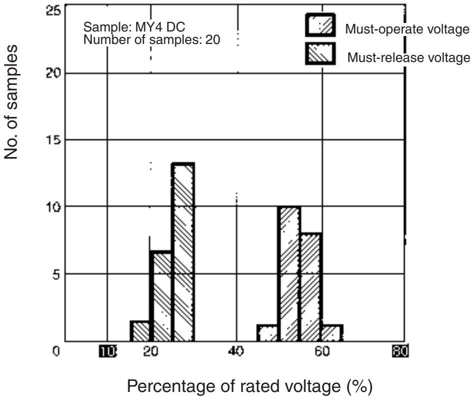
Must-operate (Must-set) Voltage

The threshold value of a voltage at which a Relay operates when the input voltage applied to the Relay coil in the reset state is increased gradually.

Example: MY4 DC Models

The distributions of the must-operate voltage and the must-release voltage are shown in the following graph.

As shown in the graph, the Relay operates at voltages less than 80% of the rated voltage and releases at voltages greater than 10% of the rated voltage. Therefore, in this catalog, the must-operate and must-release voltages are taken to be 80% max. and 10% min. respectively of the rated voltage.



Hot Start

The ratings set forth in the catalog or data sheet are measured at a coil temperature of 23°C unless otherwise specified. However, some catalogs have the description “Hot start 85% (at Ta = 40°C)”. This means that the must-operate voltage when the Relay is operated after the rated current is consecutively applied to the coil at an ambient temperature of 40°C satisfies a maximum of 85% of the rated must-operate voltage.

Maximum Switching Voltage

The maximum value (or peak value, not continuous value) of permissible voltage fluctuations in the operating power supply of the Relay coil.

Minimum Pulse Width

The minimum width of the pulsating voltage required to set and reset a Latching Relay at a temperature of 23°C.

Coil Inductance

With DC Relays, the coil inductance is obtained by adding the square waveform to a time constant. With AC Relays, it is the value at the rated frequency. In both cases, the values will be different depending on whether the Relay is in the set or the reset condition.

ELECTRICAL CHARACTERISTICS

Mechanical Life Expectancy

The life of a Relay when it is switched at the rated operating frequency, but without the rated load.

Electrical Endurance

The life of a Relay when it is switched at the rated operating frequency, with the rated load applied to its constants.

Bounce

Bouncing is the intermittent opening and closing between contacts caused by vibration or shock resulting from collision between the Relay’s moving parts (poles and terminals) and the iron core and backstop, and collision between contacts.

Operate Bounce Time

The bounce time of the normally open (NO) contact of a Relay when the rated coil voltage is applied to the Relay coil, at an ambient temperature of 23°C.

Operate Time

The time that elapses after power is applied to a Relay coil until the NO contacts have closed, at an ambient temperature of 23°C.

Bounce time is not included. For the Relays having an operate time of less than 10 ms, the mean (reference) value of its operate time is specified as follows:

Operate time	5 ms max. (mean value: approx. 2.3 ms)

Release Bounce Time

The bounce time of the normally closed (NC) contact of a Relay when the coil is deenergized at an ambient temperature of 23°C.

Release Time

The time that elapses between the moment a Relay coil is deenergized until the NC contacts have closed, at an ambient temperature of 23°C. (With a Relay having SPST-NO or DPST-NO contacts, this is the time that elapses until the NO contacts have operated under the same condition.) Bounce time is not included. For Relays having a release time of less than 10 ms, the mean (reference) value of its release time is specified as follows:

Release time	5 ms max. (mean value: approx. 2.3 ms)

Reset Time (Applicable to Latching Relays Only)

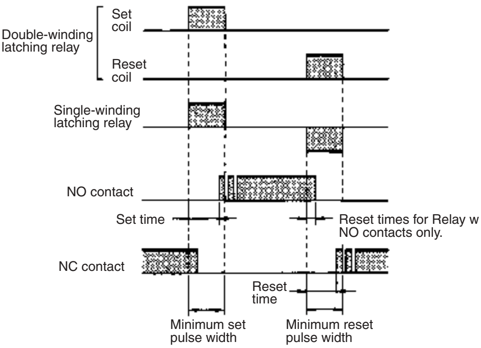
The time that elapses from the moment a Relay coil is deenergized until the NC contacts have closed, at an ambient temperature of 23°C. (With a Relay having SPST-NO or DPST-NO contacts, this is the time that elapses until the NO contacts have operated under the same condition.) Bounce time is not included. For Relays having an operate time of less than 10 ms, the mean (reference) value of its operate time is specified as follows:

Reset time	5 ms max. (mean value: approx. 2.3 ms)

Set Time (Applicable to Latching Relays Only)

The time that elapses after power is applied to a Relay coil until the NO contacts have closed, at an ambient temperature or 23°C. Bounce time is not included. For the Relays having an operate time of less than 10 ms, the mean (reference) value of its operate time is specified as follows:

Set time	5 ms max. (mean value: approx. 2.3 ms)



Dielectric Strength

The critical value which a dielectric can withstand without rupturing, when a high-tension voltage is applied for 1 minute between the following points:

Between coil and contact

Between contacts of different polarity

Between contacts of same polarity

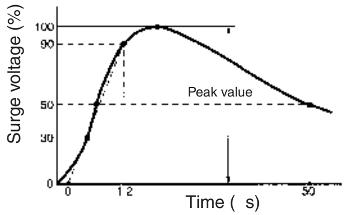
Between set coil and reset coil

Between current-carrying metal parts and ground terminal

Note that normally a leakage current of 3 mA is detected; however, a leakage current of 1 mA or 10 mA may be detected on occasion.

Impulse Withstand Voltage

The critical value which the Relay can withstand when the voltage surges momentarily due to lightning, switching an inductive load, etc. The surge waveform which has a pulse width of +1.2 x 50 ms is shown below:



Insulation Resistance

The resistance between an electric circuit (such as the contacts and coil), and grounded, non-conductive metal parts (such as the core), or the resistance between the contacts. The measured values are as follows

Rated insulation voltage	Measured value
60 V max.	250 V
61 V min.	500 V

Switching Frequency

The frequency or intervals at which the Relay continuously operates and releases, satisfying the rated mechanical and electrical service lives.

Shock Resistance

The shock resistance of a Relay is divided into two categories:

Destruction, which quantifies the characteristic change of, or damage to, the Relay due to considerably large shocks which may develop during the transportation or mounting of the Relay, and malfunction durability, which quantifies the malfunction of the Relay while it is in operation.

Stray Capacitance

The capacitance measured between terminals at an ambient temperature of 23°C and a frequency of 1 kHz.

Vibration Resistance

The vibration resistance of a Relay is divided into two categories:

Destruction, which quantifies the characteristic changes of, or damage to, the Relay due to considerably large vibrations which may develop during the transportation or mounting of the Relay, and Malfunction durability, which quantifies the malfunction of the Relay due to vibrations while it is in operation.

$\alpha = 0.002f^2A$

α: Acceleration of vibration

f: Frequency

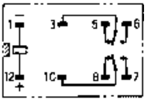
A: Double amplitude

OPERATING

Single Stable Relays (Standard Type)

These are Relays in which the contacts switch in response to the energization and deenergization of the coil and do not have any special functions.

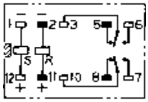
Terminal Arrangement/Internal Connections (Bottom view)



Double-winding Latching Relays

These are Relays that have a set coil and a reset coil, and have a latching mechanism enabling the set or reset condition to be locked.

Terminal Arrangement/Internal Connections (Bottom view)

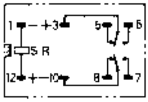


S: set coil
R: reset coil

Single-winding Latching Relays

These are Relays that have one coil, and switch between the set and reset condition according to the polarity of the applied voltage, and have a latching mechanism enabling this status to be locked.

Terminal Arrangement/Internal Connections (Bottom view)



S: set coil
R: reset coil

Stepping Relays

These are Relays in which the contacts shift ON or OFF sequentially with each coil input pulse.

Ratchet Relays

These are Relays in which the contacts alternately turn ON and OFF, or sequentially operate, when a pulse signal is input.

Precautions

General handling

- To maintain initial performance, be careful not to drop the Relay or subject it to shock.
- The case is so constructed that it will not come off with normal handling. To maintain initial performance, do not allow the case to come off.
- Use the Relay in a dry atmosphere containing little dust, SO_2, H_2S, and organic gases.
- Ensure that the voltage applied to the coil is not applied continuously in excess of the maximum permissible voltage.
- With DC-operated Relays that have a built-in diode or a built-in operation indication lamp, do not reverse the polarity connections when the polarity of the coil is specified.
- Do not use the Relay at a voltage or current greater than the specified values.
- Ensure that the ambient operating temperature does not exceed the specified value.
- With General-purpose Relays, leaving or using the Relay for a long time in an atmosphere of hydrogen sulfide gas or high temperature and high humidity will lead to the formation of a sulfide film or an oxidation film on the surface of the contact. In Miniature Relays, the contact force is weak and so the film cannot be destroyed mechanically. Also, with the very small loads, destruction of the film is not possible by arcing and so there will be contact instability and the occurrence of problems in performance and function. For these reasons, Fully Sealed Relays or Hermetically Sealed Relays should be used in atmospheres of harmful gases (such as H_2S, SO_2, NH_3, and Cl_2), humidity, and dust.
- The contact ratings of Relays approved by standards and the general ratings of the Relays could be different.

When combining Relays with various types of Sockets, check the contact ratings of the Relays before use.

OPERATING COILS

AC-operated Relays

The power supply used to operate AC-operated Relays is almost always at the commercial frequency (50 or 60 Hz). Standard voltages are 6, 12, 24, 48, 100, and 200 VAC. Because of this, when the voltage is other than a standard voltage, the Relay will be a special-order item and so inconvenience may arise with respect to price, delivery period, and stability of performance. Consequently, a Standard-voltage Relay should be selected if at all possible.

In AC-operated Relays, there is a resistance loss of the shading coil, an overcurrent loss of the magnetic circuit, a hysteresis loss, as well as other losses. The coil input also increases and so in general it is normal for the temperature rise to be higher than in a DC-operated Relay. Also, at voltages less than the must-operate voltage (i.e., the minimum operation voltage), a vibration is produced which necessitates that attention be paid to the fluctuation of the power supply voltage.

For example, when the power supply voltage drops at the time of motor stating, the Relay will be reset while vibrating and the contacts will burn, fuse, or the self holding will go out of place. In AC-operated Relays, there is an inrush current. (When the armature is in a separated condition, the impedance is low and a current flows that is larger than the rated current; when the armature is in the closed condition, the impedance increases and a current flows which is of the rated value.) When a large number of Relays are used connected in series, this factor must be taken into account together with the power consumption.

DC-operated Relays

The power supply used to operate DC-operated Relays may have voltage as a standard or it may have current as a standard. When voltage is the standard, the rated coil voltages include 5, 6, 12, 24, 48, and 100 VDC. When current is the standard, the rated current in mA is listed in the catalog.

In DC-operated Relays, when the Relay is used in an application where it is operated at some limit value, either voltage or current, the current applied to the coil will gradually increase or decrease. It is important to note that this may delay the movement of the contacts resulting in failure to meet the specified control capacity. The coil resistance value of a DC-operated Relay may change by approximately 0.4% per °C due to changes in the ambient temperature and the heat radiated by the Relay itself. Therefore, it is important to note that increases in temperature will be accompanied by higher must-operate and must-release voltages.

Power Supply Capacity

The fluctuation of the power supply voltage over a long period will of course affect Relay operation, but momentary fluctuations will also be the cause of incorrect Relay operation.

For example, when a large solenoid, Relay, motor, heater, or other device is operated from the same power supply as the one that operates the Relay, or when a large number of Relays are used, if the power supply does not have sufficient capacity when these devices are operated simultaneously, the voltage drop may prevent the Relay from operating. On the other hand, when the voltage drop is estimated and the voltage increased accordingly, if the voltage is applied to the Relay when there is no voltage drop, this will cause heating of the coil.

Provide leeway in the capacity of the power supply and keep the voltage within the switching voltage range of the Relay.

Lower Limit Value of the Must-operate Voltage

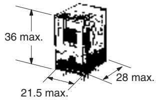
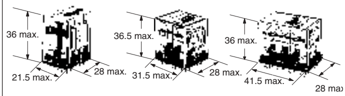
Use of Relays at high temperatures or rise of coil temperature due to a continuous flow of current through the coil will result in an increase in coil resistance which means the must-operate voltage will also increase. This matter requires attention be paid to determining a lower limit value of the operation power supply voltage. The following example and explanation should be referred to when designing the power supply.

Note: Even though the rating is a voltage rating (as is the rating for all Standard Relays), the Relay should be thought of as being current operated.

Catalog values for model MY

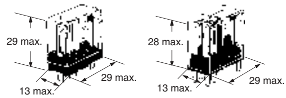
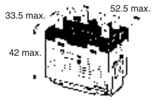
Rated voltage: 24 VDC, coil resistance: 650 Ω, must-operate voltage: 80% or less of rated voltage, at a coil temperature of 23°C.

A rated current of 36.9 mA (24 VDC/650 W = 36.9 mA) flows through this Relay, which operates at 80% or less of this value i.e., at 29.5 mA or less (36.9 mA x 0.8 = 29.5 mA). When the present coil temperature rises by 10°C, the coil resistance will be 676 W (650 Ω x 1.04 = 676 W). To have the must-operate current of 29.5 mA flow in this condition, it will be necessary to apply a voltage of 19.94 V (29.5 mA x 676 Ω =19.94 v). This voltage (which is the must-operate voltage when the coil temperature is 33°C (23°C +10°C), is 83.1% (19.94/24 = 83.1%) of the rated voltage which represents an increase compared to when the coil temperature was 23°C.

Classification		Control Panel Relay							
Model		MY – New model			LY				
Features		Versatile relay, ideal for power and sequence control applications, meets many other application requirements.			Compact, general-purpose 15-A and 10-A relays ideal for many applications.				
Appearance									
Contact Ratings	Contact Form	DPDT	4PDT		SPDT	DPDT		3PDT	4PDT
	Mechanism	Single	Single	Bifurcated	Single		Bifurc-ted	Single	
	Material	Ag	Au-clad+Ag		Ag-alloy		Ag	Ag-alloy	
	Rated Load* (Resistive load)	5 A at 250 VAC/ 30 VDC	3 A at 250 VAC/ 30 VDC		15 A at 110 VAC/ 24 VDC	10 A at 110 VAC/ 24 VDC	5 A at 110 VAC/ 24 VDC	10 A at 110 VAC/ 24 VDC	
	Max. Switching Current	10 A	5 A		15 A	10 A	7 A	10 A	
	Failure rate (mA) (reference value)	1 mA at 5 VDC	1 mA at 1 VDC	100 μA at 1 VDC	100 mA at 5 VDC		10 mA at 5 VDC	100 mA at 5 VDC	
Coil ratings	Rated Voltage	6 to 100/110 VDC 6 to 220/240 VAC			6 to 100/110 VDC 6 to 220/240 VAC				
	Power Consumption (approx.)	0.9 W (DC) 0.9 to 1.2 VA (AC)			0.9 W (DC) 0.9 to 1.2 VA (AC)			1.4 W (DC) 1.6 to 2.0 VA (AC)	1.5 W (DC) 1.95 to 2.5 VA (AC)
Endurance	Mechanical	50,000,000 (AC), 100,000,000 (DC)		20,000,000	50,000,000 (AC), 100,000,000 (DC)				
	Electrical	500,000	200,000	100,000	200,000	500,000		200,000	
Dialectric strength	Between coil and contacts	2,000 VAC for 1 min.			2,000 VAC for 1 min.				
	Between contacts of different polarity	2,000 VAC for 1 min.			–	2,000 VAC for 1 min.			
	Between contacts of same polarity	1,000 VAC for 1 min.			1,000 VAC for 1 min.				
	Between set and reset coils	–			–				
Ambient temperature (operating)		–55°C to 70°C			–25°C to 55°C			–25°C to 40°C	
Functions		• Mechanical indicator • LED indicator • Built-in diode • Test button • Arc barriers • Built-in CR			• LED indicator • Built-in diode • Built-in CR • Test button				
Sealing		Cased (unsealed)			Cased (unsealed)				
Technical Construction**		(ask sales office)							
Approved Standards		LR			LR				
Page		487			500				

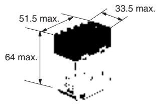
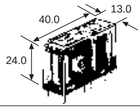
* Numbers in parentheses apply to cased (unsealed) types.

** denotes PCB terminal, plug-in (octal-pin) terminal, plug-in/solder terminal, quick-connect terminal, and screw terminal.

Classification		Control Panel Relay		Built-in Relay		
Model		G2RS		G7L		
Features		Reliable and unique test button models now available. High switching power (1 pole: 10 A). Highly functional socket also available. Environmentally friendly.		Multi-pole power relay that withstands a momentary voltage drop. Wide range of applications with 100-V and 200-V coils. Both screw terminals and PCB terminals are available.		
Appearance						
Contact Ratings	Contact Form	SPDT	DPDT	SPST-NO	DPST-NO	SPST-NO, DPST-NO
	Mechanism	Single	Single	Double-break		
	Material	Ag-alloy		Ag-alloy		
	Rated Load* (Resistive load)	10A at 250 VAC/ 30 VDC	5A at 250 VAC/ 30 VDC	30 A at 220 VAC	25 A at 220 VAC	20 A at 220 VAC
	Max. Switching Current	10 A	5 A	30 A	25 A	20 A
	Failure rate (mA) (reference value)	100 mA at 5 VDC	10 mA at 5 VDC	100 mA at 5 VDC		
Coil ratings	Rated Voltage	6 to 48 VDC 24 to 240 VAC		6 to 100 VDC 12 to 200/240 VAC		
	Power Consumption (approx.)	0.53 W (DC) 0.9 VA (AC)		1.9 W (DC) 1.7 to 2.5 VA (AC)		
Endura-nce	Mechanical	10,000,000 (AC), 20,000,000 (DC)		1,000,000		
	Electrical	100,000		100,000		
Dielec-tric strength	Between coil and contacts	5,000 VAC for 1 min.		4,000 VAC for 1 min.		
	Between contacts of different polarity	–	3,000 VAC for 1 min.	–	2,000 VAC for 1 min. (DPST-NO only)	
	Between contacts of same polarity	1,000 VAC for 1 min.		2,000 VAC for 1 min.		
	Between set and reset coils	–	–	–		
Ambient temperature (operating)		–40°C to 70°C		–25°C to 60°C		
Functions		• LED indicator • Test button • Built-in diode		• Test button (excluding P models)		
Sealing		Cased (unsealed)		Cased (unsealed)		
Technical Construction**						
Approved Standards						
Page		513		523		

* Numbers in parentheses apply to cased (unsealed) types.

** denotes PCB terminal, plug-in (octal-pin) terminal, plug-in/solder terminal, quick-connect terminal, and screw terminal.

Classification		Built-in Relay	Built-in Relay
Model		G7J	G7SA
Features		Multi-pole power relay that withstands a momentary voltage drop. Wide range of applications with 100-V and 200-V coils. Both screw terminals and PCB terminals are available.	Safety relay that conforms to EN standard. Forcibly guided contacts (En50205 Class A). Suitable for safety circuits in press machinery, machine tools and other production machinery
Appearance			
Contact Ratings	Contact Form	4PST-NO, 3PST-NO/SPST-NC, DPST-NO/DPST-NC	4PST-NO/DPST-NC, 3PST-NO/3PST-NC
	Mechanism	Double-break	Single
	Material	Ag-alloy	Ag + Au plating
	Rated Load* (Resistive load)	25 A at 220 VAC, 100,000 operations min. 25 A at 30 VDC, 100,000 operations min. (For normally closed contacts, 8 A at 220 VAC, 8 A at 30 VDC)	3 A at 240 VAC/24VDC, 100,000 operations min
	Max. Switching Current	25 A	6 A
	Failure rate (mA) (reference value)	100 mA at 24 VDC	10 mA at 5 VDC
Coil ratings	Rated Voltage	12 to 100 VDC 24 to 200/240 VAC	24 VDC
	Power Consumption	Approx. 2 W (DC) Approx. 1.8 to 2.6 VA (AC)	0.8 W
Endura-nce	Mechanical	1,000,000	10,000,000
	Electrical	100,000	100,000
Dialec-tric strength	Between coil and contacts	4,000 VAC for 1 min.	2,500 VAC for 1 min.
	Between contacts of different polarity	4,000 VAC for 1 min.	2,500 VAC for 1 min.
	Between contacts of same polarity	2,000 VAC for 1 min.	1,500 VAC for 1 min.
	Between set and reset coils	–	–
Ambient temperature (operating)		–25°C to 60°C	–40°C to 85°C
Functions		• With test button	• Forced guided contacts
Sealing		Cased	Cased
Technical Construction**			
Approved Standards		EN, IEC	
Page		538	557

* Numbers in parentheses apply to cased (unsealed) types.

** denotes PCB terminal, plug-in (octal-pin) terminal, plug-in/solder terminal, quick-connect terminal, and screw terminal.

Versatile and Function-filled Miniature Power Relay for Sequence Control and Power Switching Applications

- Many variations possible through a selection of operation indicators (mechanical and LED indicators), test button, built-in diode and CR (surge suppression), bifurcated contacts, etc.
- Arc barrier standard on 4-pole Relays.
- Dielectric strength: 2,000 VAC (coil to contact)
- Environment-friendly cadmium-free contacts.
- Safety standard approvals obtained.
- Wide range of Sockets (PY, PYF Series) and optional parts are available.
- Max. Switching Current: 2-pole: 10 A, 4-pole: 5 A
- Built-in mechanical operation indicator.
- Provided with nameplate.

LR

Ordering Information

Relays

Standard Coil Polarity

Type	Contact form	Plug-in socket/Solder terminals		Without LED indicator
		Standard with LED indicator	With LED indicator and test button	
Standard	DPDT	MY2N	MY2IN	MY2
	4PDT	MY4N	MY4IN	MY4
	4PDT (bifurcated)	MY4ZN	MY4ZIN	MY4Z
With built-in diode (DC only)	DPDT	MY2N-D2	MY2IN-D2	–
	4PDT	MY4N-D2	MY4IN-D2	–
	4PDT (bifurcated)	MY4ZN-D2	MY4ZIN-D2	–
With built-in CR (220/240 VAC, 110/120 VAC only)	DPDT	MY2N-CR	MY2IN-CR	–
	4PDT	MY4N-CR	MY4IN-CR	–
	4PDT (bifurcated)	MY4ZN-CR	MY4ZIN-CR	–

Reverse Coil Polarity

Type	Contact form	Plug-in socket/Solder terminals	
		With LED indicator	With LED indicator and test button
Standard (DC only)	DPDT	MY2N1	MY2IN1
	4PDT	MY4N1	MY4IN1
	4PDT (bifurcated)	MY4ZN1	MY4ZIN1
With built-in diode (DC only)	DPDT	MY2N1-D2	MY2IN1-D2
	4PDT	MY4N1-D2	MY4IN1-D2
	4PDT (bifurcated)	MY4ZN1-D2	MY4ZIN1-D2

Note: When ordering, add the rated coil voltage and “(s)” to the model number. Rated coil voltages are given in the coil ratings table.

Example: MY2 6VAC (S)

New model

Rated coil voltage

■ Accessories (Order Separately)

Sockets

Poles	Front-mounting Socket (DIN-track/screw mounting)	Back-mounting Socket				
		Solder terminals		Wire-wrap Terminals		PCB terminals
		Without clip	With clip	Without clip	With clip	
2	PYF08A-E PYF08A-N	PY08	PY08-Y1	PY08QN PYF08QN2	PY08QN-Y1 PY08QN2-Y1	PY08-02
4	PYF14A-E PYF14A-N	PY14	PY14-Y1	PY14QN PY14QN2	PY14QN2-Y1 PY14QN-Y1	PY14-02

Socket Hold-down Clip Pairing

Relay Type	Poles	Front-connecting Socket (DIN-track/screw mounting)		Back-connecting Socket			
				Solder/Wire-wrap terminals		PCB terminals	
		Socket	Clip	Socket	Clip	Socket	Clip
Without 2-pole test button	2	PYF08A-E PYF08A-N	PYC-A1	PY08(QN)	PYC-P PYC-P2	PY08-02	PYC-P PYC-P2
	4	PYF14A-E PYF14A-N		PY14(QN)		PY14-02	
2-pole test button	2	PYF08A-E PYF08A-N	PYC-E1	PY08(QN)	PYC-P2	PY08-02	PYC-P2

Mounting Plates for Sockets

Socket model	For 1 Socket	For 18 Sockets	For 36 Sockets
PY08, PY08QN(2), PY14, PY14QN(2)	PYP-1	PYP-18	PYP-36

Note: PYP-18 and PYP-36 can be cut into any desired length in accordance with the number of Sockets.

Track and Accessories

Supporting Track (length = 500 mm)	PFP-50N
Supporting Track (length = 1,000 mm)	PFP-100N, PFP-100N2
End Plate	PFP-M
Spacer	PFP-S

Specifications

■ Coil Ratings

Rated voltage		Rated current		Coil Resistance	Coil Induction (reference value)		Must operate voltage	Must release voltage	Max. voltage	Power consumption (approx.)
		50 Hz	60 Hz		Arm. OFF	Arm. ON	% of rated voltage			
AC	6 V*	214.1 mA	183 mA	12.2 Ω	0.04 H	0.08 H	80% max.	30% min.	110%	1.0 to 1.2 VA (60 Hz)
	12 V	106.5 mA	91 mA	46 Ω	0.17 H	0.33 H				
	24 V	53.8 mA	46 mA	180 Ω	0.69 H	1.30 H				
	48/50 V*	24.7/ 25.7 mA	21.1/ 22.0 mA	788 Ω	3.22 H	5.66 H				
	110/120 V	9.9/10.8 mA	8.4/9.2 mA	4,430 Ω	19.20 H	32.1 H				0.9 to 1.1 VA (60 Hz)
	220/240 V	4.8/5.3 mA	4.2/4.6 mA	18,790 Ω	83.50 H	136.4 H				
DC	6 V*	151 mA		39.8 Ω	0.17 H	0.33 H		10% min.		0.9 W
	12 V	75 mA		160 Ω	0.73 H	1.37 H				
	24 V	37.7 mA		636 Ω	3.20 H	5.72 H				
	48 V*	18.8 mA		2,560 Ω	10.60 H	21.0 H				
	100/110 V	9.0/9.9 mA		11,100 Ω	45.60 H	86.2 H				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/–20% for rated currents and ±15% for DC coil resistance.

2. Performance characteristic data are measured at a coil temperature of 23°C.

3. AC coil resistance and impedance are provided as reference values (at 60 Hz).

4. Power consumption drop was measured for the above data. When driving transistors, check leakage current and connect a bleeder resistor if required.

5. Rated voltage denoted by "*" will be manufactured upon request. Ask your OMRON representative.

■ Contact

Item	2-pole		4-pole		4-pole (bifurcated)	
	Resistive load (cosø = 1)	Inductive load (cosø = 0.4, L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4, L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4, L/R = 7 ms)
Rated Load	5A, 250 VAC 5A, 30 VDC	2A, 250 VAC 2 A, 30 VDC	3 A, 250 VAC 3 A, 30 VDC	0.8 A, 250 VAC 1.5 A, 30 VDC	3 A, 250 VAC 3 A, 30 VDC	0.8 A, 250 VAC 1.5 A, 30 VDC
Carry Current	10 A (see note)		5 A (see note)			
Max. switching voltage	250 VAC 125 VDC		250 VAC 125 VDC			
Max. switching current	10 A		5 A			
Max. switching power	2,500 VA 300 W	1,250 VA 300 W	1,250 VA 150 W	500 VA 150 W	1,250 VA 150 W	500 VA 150 W
Failure rate (reference value)	5 VDC, 1 mA		1 VDC, 1 mA		1 VDC, 100 mA	

■ Characteristics

Item	All relays
Contact resistance	100 mΩ max.
Operate time	20 ms max.
Release time	20 ms max.
Max. operating frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric strength	2,000 VAC, 50/60 Hz for 1.0 min (1,000 VAC between contacts of same polarity)
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.5 mm single amplitude (1.0 mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.5 mm single amplitude (1.0 mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 200 m/s^2
Endurance	See the following table
Ambient temperature	Operating: -55˚C to 70˚C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 35 g

Note: The values given above are initial values.

■ Endurance Characteristics

Pole	Mechanical life (at 18,000 operations/hr)	Electrical life (at 18,000 operations/hr under rated load)
2-pole	AC: 50,000,000 operations min. DC: 100,000,000 operations min.	500,000 operations min.
4-pole		200,000 operations min.
4-pole (bifurcated)	20,000,000 operations min.	100,000 operations min.

■ Approved Standards

VDE Recognitions (File No. 112467UG, IEC 255, VDE 0435)

No. of poles	Coil ratings	Contact ratings	Operations
2	6, 12, 24, 48/50, 100/110 110/120, 200/220, 220/240 VAC 6, 12, 24, 48, 100/110, 125 VDC	10 A, 250 VAC (cosø = 1) 10 A, 30 VDC (L/R=0 ms)	10 x 10^3
4		5 A, 250 VAC (cosø = 1) 5 A, 30 VDC (L/R=0 ms)	100 x 10^3 MY4Z AC; 50 x 10^3

UL508 Recognitions (File No. 41515)

No. of poles	Coil ratings	Contact ratings	Operations
2	6 to 240 VAC 6 to 125 VDC	10 A, 30 VDC (General purpose) 10 A, 250 VAC (General purpose)	6 x 10^3
4		5 A, 250 VAC (General purpose) 5 A, 30 VDC (General purpose)	

CSA C22.2 No. 14 Listings (File No. LR31928)

No. of poles	Coil ratings	Contact ratings	Operations
2	6 to 240 VAC 6 to 125 VDC	10 A, 30 VDC 10 A, 250 VAC	6 x 10^3
4		5 A, 250 VAC (Same polarity) 5 A, 30 VDC (Same polarity)	

IMQ (File No. EN013 to 016)

No. of poles	Coil ratings	Contact ratings	Operations
2	6, 12, 24, 48/50, 100/110 110/120, 200/220, 220/240 VAC 6, 12, 24, 48, 100/110, 125 VDC	10 A, 30 VDC 10 A, 250 VAC	10 x 10^3
4		5 A, 250 VAC 5 A, 30 VDC	100 x 10^3 MY4Z AC; 50 x 10^3

LR Recognitions (File No. 98/10014)

No. of poles	Coil ratings	Contact ratings	Operations
2	6 to 240 VAC 6 to 125 VDC	10 A, 250 VAC (Resistive) 2 A, 250 VAC (PF0.4) 10 A, 30 VDC (Resistive) 2 A, 30 VDC (L/R=7 ms)	50 x 10^3
4		5 A, 250 VAC (Resistive) 0.8 A, 250 VAC (PF0.4) 5 A, 30 VDC (Resistive) 1.5 A, 30 VDC (L/R=7 ms)	50 x 10^3

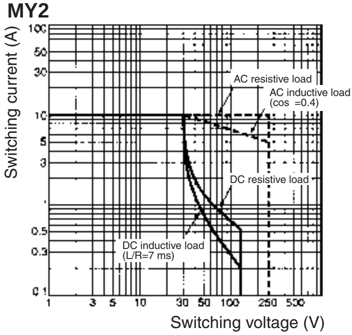
SEV Listings (File No. 99.5 50902.01)

No. of poles	Coil ratings	Contact ratings	Operations
2	6 to 240 VAC 6 to 125 VDC	10 A, 250 VAC 10 A, 30 VDC	10 x 10^3
4		5 A, 250 VAC 5 A, 30 VDC	100 x 10^3 MY4Z AC; 50 x 10^3

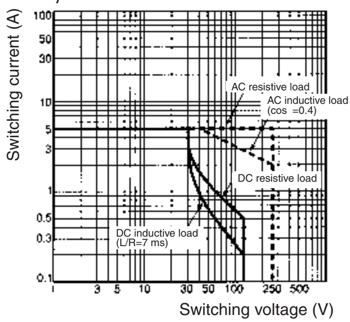
Engineering Data

■ Maximum Switching Power

MY2

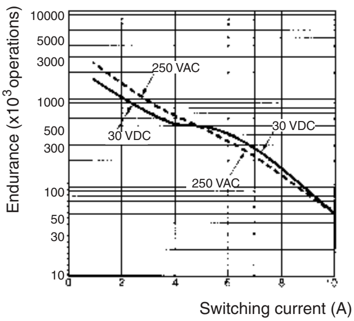


MY4, MY4Z

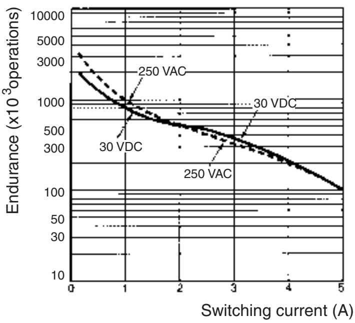


■ Endurance

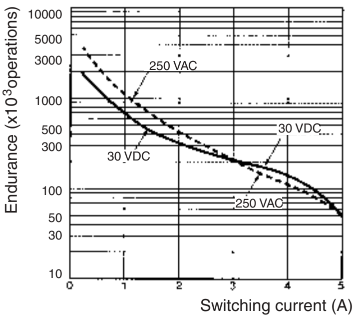
MY2 (Resistive Loads)



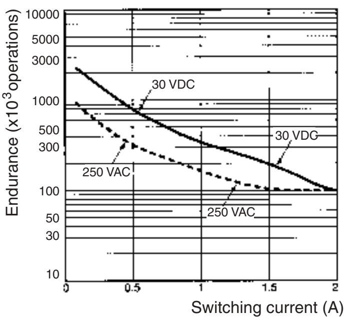
MY2 (Inductive Loads)



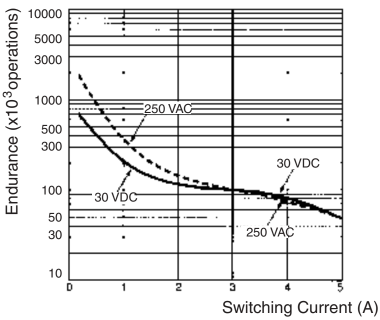
MY4 (Resistive Loads)



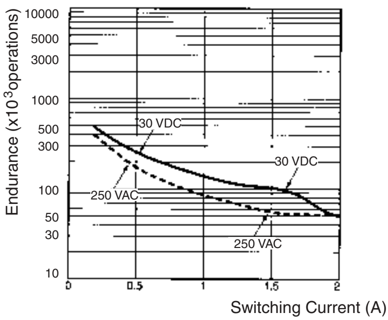
MY4 (Inductive Loads)



MY4Z (Resistive Loads)



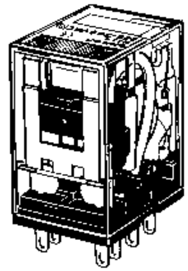
MY4Z (Inductive Loads)

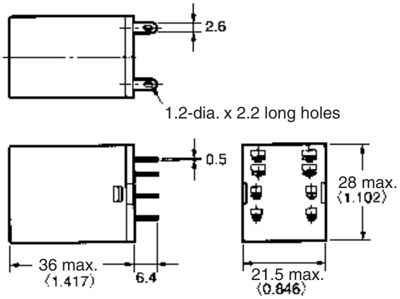


Dimensions

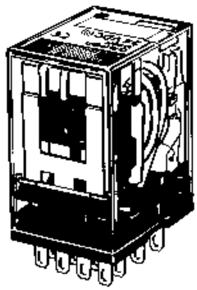
Note: All units are in millimeters unless otherwise indicated.

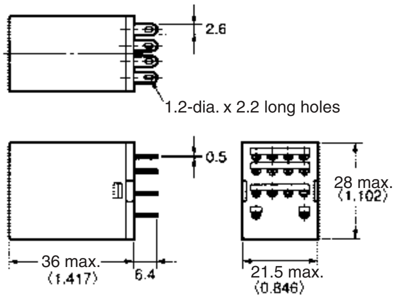
2-Pole Models



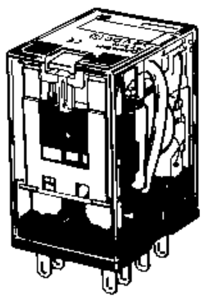


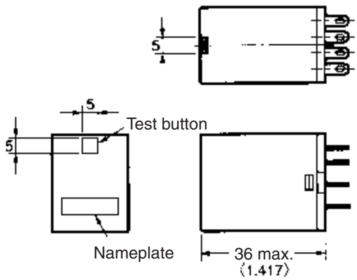
4-Pole Models





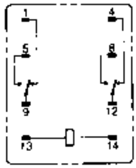
Models with Test Button



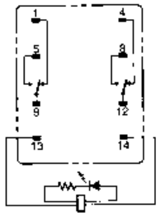


■ Terminal Arrangement/Internal Connections (Bottom View)

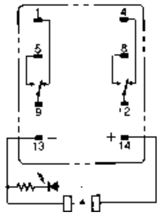
MY2



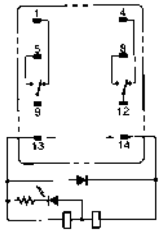
MY2N/MY2IN
(AC Models)



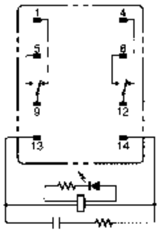
MY2N/MY2IN
(DC Models)



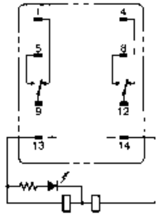
MY2N-D2/MY2IN-D2
(DC Models Only)



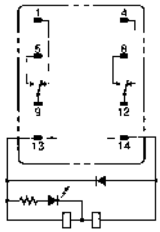
MY2N-CR/MY2IN-CR
(AC Models Only)



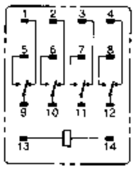
MY2N1/MY2IN1
(DC Models Only)



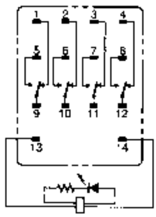
MY2N1-D2/MY2IN1-D2
(DC Models Only)



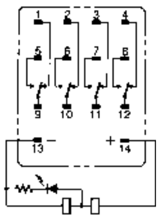
MY4(Z)



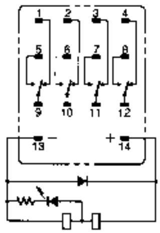
MY4(Z)N/MY4(Z)IN
(AC Models)



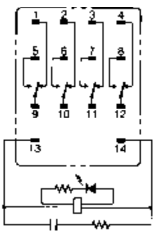
MY4(Z)N/MY4(Z)IN
(DC Models)



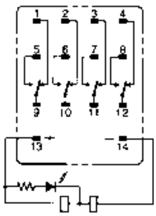
MY4(Z)N-D/MY4(Z)IN-D2
(DC Models Only)



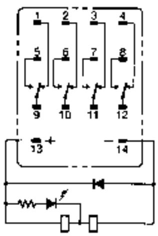
MY4(Z)N-CR/MY4(Z)IN-CR
(AC Models Only)



MY4(Z)N1/MY4(Z)IN1
(DC Models Only)



MY4(Z)N1-D2/MY4(Z)IN1-D2
(DC Models Only)



Note: The DC models have polarity.

Socket for MY

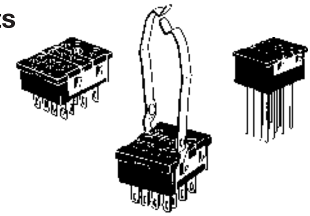
Track-mounted (DIN Track) Socket Conforms to VDE 0106, Part 100

- Snap into position along continuous sections of any mounting track.
- Facilitates sheet metal design by standardized mounting dimensions.
- Design with sufficient dielectric separation between terminals eliminates the need of any insulating sheet.

Safety Standards for Sockets

Model	Standards	File No.
PYF08A-E, PYF08A-N PYF14A-E, PYF14A-N	UL508	E87929
	CSA22.2	LR31928

Back-connecting Sockets



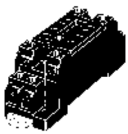
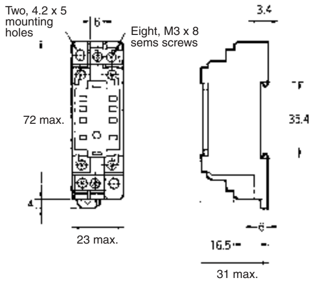
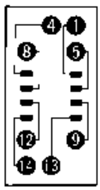
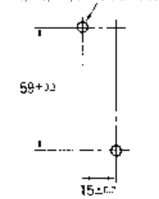
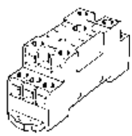
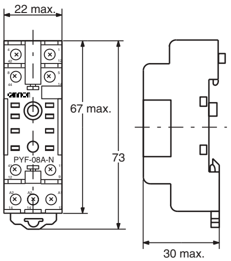
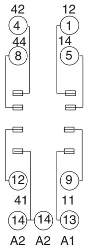
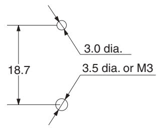
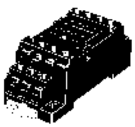
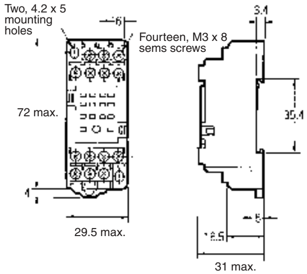
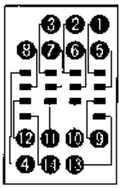
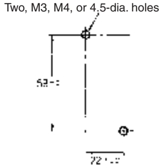
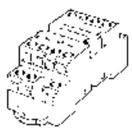
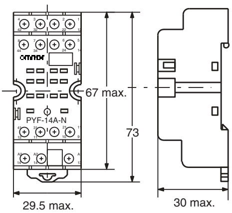
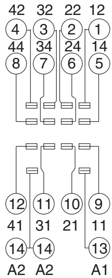
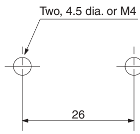
Specifications

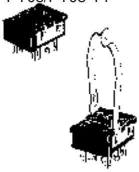
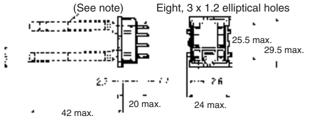
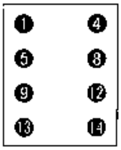
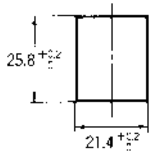
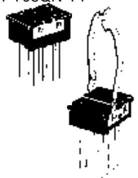
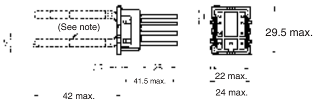
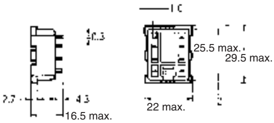
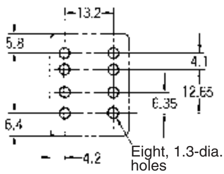
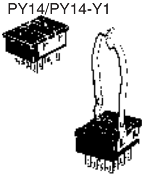
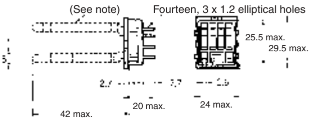
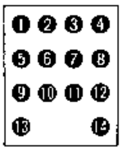
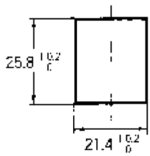
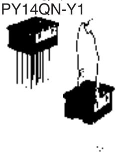
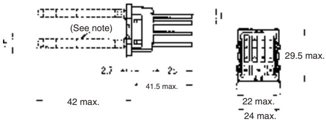
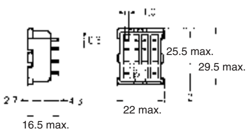
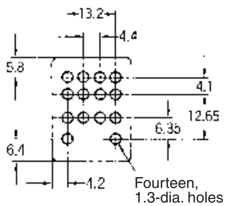
Item	Pole	Model	Carry current	Dielectric withstand voltage	Insulation resistance (see note 2)
Track-mounted Socket	2	PYF08A-E	7 A	2,000 VAC, 1 min	1,000 MΩ min.
		PYF08A-N (see note 3)	7 A (see note 4)		
	4	PYF14A-E	5 A		
		PYF14A-N (see note 3)	5 A (see note 4)		
Back-connecting Socket	2	PY08(-Y1)	7 A	1,500 VAC, 1 min	100 MΩ min.
		PY08QN(-Y1)			
		PY08-02			
	4	PY14(-Y1)	3 A		
		PY14QN(-Y1)			
		PY14-02			

Note: 1. The values given above are initial values.
2. The values for insulation resistance were measured at 500 V at the same place as the dielectric strength.
3. The maximum operating ambient temperature for the PYF08A-N and PYF14A-N is 55°C.
4. When using the PYF08A-N or PYF14A-N at an operating ambient temperature exceeding 40°C, reduce the current to 60%.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

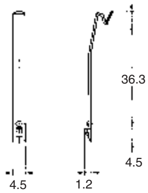
Socket	Dimensions	Terminal arrangement/ Internal connections (top view)	Mounting holes
PYF08A-E 			 (TOP VIEW) **Note:** Track mounting is also possible. Refer to page 61 for supporting tracks.
PYF08A-N 			 **Note:** Track mounting is also possible. Refer to page 61 for supporting tracks.
PYF14A-E 			 (TOP VIEW) **Note:** Track mounting is also possible. Refer to page 61 for supporting tracks.
PYF14A-N 			 **Note:** Track mounting is also possible. Refer to page 61 for supporting tracks.

Socket	Dimensions	Terminal arrangement/ Internal connections (bottom view)	Mounting holes
PY08/PY08-Y1 	 **Note:** The PY08-Y1 includes sections indicated by dotted lines.		
PY08QN/ PY08QN-Y1 	 **Note:** The PY08QN-Y1 includes sections indicated by dotted lines.		
PY08-02 			
PY14/PY14-Y1 	 **Note:** The PY14-Y1 includes sections indicated by dotted lines.		
PY14QN/ PY14QN-Y1 	 **Note:** The PY14QN-Y1 includes sections indicated by dotted lines.		
PY14-02 			

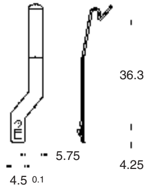
Note: Use a panel with plate thickness of 1 to 2 mm for mounting the Sockets.

■ Hold-down Clips

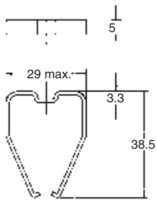
PYC-A1
(2 pcs per set)



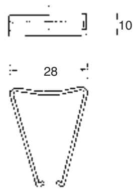
PYC-E1
(2 pcs per set)



PYC-P

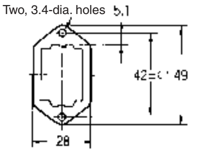


PYC-P2



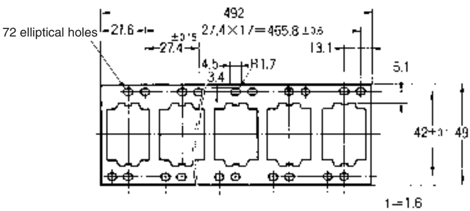
■ Mounting Plates for Back-connecting Sockets

PYP-1

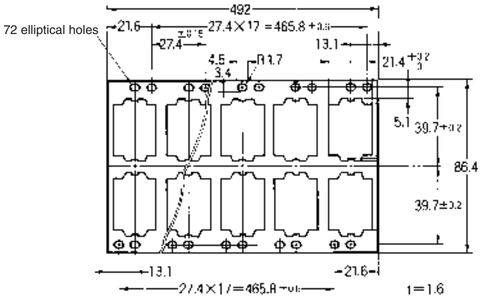


t=1.6

PYP-18



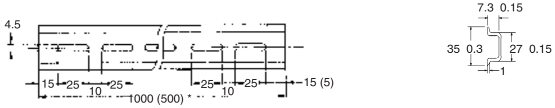
PYP-36



■ Tracks and Accessories

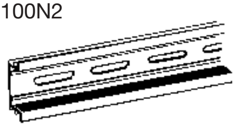
Supporting Tracks

PFP-50N/PFP-100N



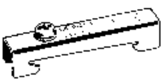
Note: The figure in the parentheses is for PFP-50N.

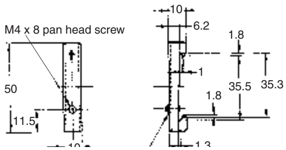
PFP-100N2



End Plate

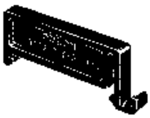
PFP-M

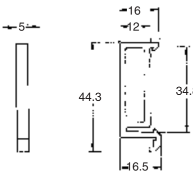




Spacer

PFP-S





ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

A Miniature Power Relay

- Equipped with arc barrier.
- Dielectric strength: 2,000 V.
- Built-in diode models added to the LY Series.
- Single-pole and double-pole models are applicable to operating coils with ratings of 100/110 VAC, 110/120 VAC, 200/220 VAC, 220/240 VAC, or 100/110 VDC).
- Three-pole and four-pole models are applicable to operating coils with ratings of 100/110 VAC, 200/220 VAC, or 100/110 VDC).

LR

Ordering Information

Open Relays

Type	Contact form	Plug-in/solder terminals	Plug-in/solder terminals with LED indicator	PCB terminals	Upper-mounting plug-in/solder terminals
Standard	SPDT	LY1	LY1N	LY1-0	LY1F
	DPDT	LY2	LY2N	LY2-0	LY2F
	DPDT (bifurcated)	LY2Z	LY2ZN	LY2Z-0	LY2ZF
	3PDT	LY3	LY3N	LY3-0	LY3F
	4PDT	LY4	LY4N	LY4-0	LY4F
With built-in diode (DC only)	SPDT	LY1-D	LY1N-D2	–	–
	DPDT	LY2-D	LY2N-D2	–	–
	DPDT (bifurcated)	LY2Z-D	LY2ZN-D2	–	–
	3PDT	LY3-D	–	–	–
	4PDT	LY4-D	LY4N-D2	–	–
With built-in CR (AC only)	SPDT	–	–	–	–
	DPDT	LY2-CR	LY2N-CR	–	–
	DPDT (bifurcated)	LY2Z-CR	LY2ZN-CR	–	–

Note: 1. When ordering, add the rated coil voltage to the model number. Rated coil voltages are given in the coil ratings table.
Example: LY2, 6 VAC
Rated coil voltage

2. Relays with #187 quick connect terminals are also available with SPDT and DPDT contact. Ask your OMRON representative for details.
3. SEV models are standard Relays excluding DPDT (bifurcated) models.
4. VDE- or LR- qualifying Relays must be specified when ordering.

■ Accessories (Order Separately)

Sockets

Poles	Front-connecting Socket	Back-connecting Socket		
	DIN track/screw terminals	Plug-in/solder terminals	Wrapping terminals	PCB terminals
1 or 2	PTF08A-E, PTF08A	PT08	PT08QN	PT08-0
3	PTF11A	PT11	PT11QN	PT11-0
4	PTF14A-E, PTF14A	PT14	PT14QN	PT14-0

Note: 1. For PTF08-E and PTF14A-E, see “Track Mounted Socket.”
2. PTF□A (-E) Sockets have met UL and CSA standards: UL 508/CSA C22.2.

Mounting Plates for Sockets

Socket model	For 1 Socket	For 10 Sockets	For 12 Sockets	For 18 Sockets
PT08 PT08QN	PYP-1	–	–	PYP-18
PT11 PT11QN	PTP-1-3	–	PTP-12	–
PT14 PT14QN	PTP-1	PTP-10	–	–

Socket-Hold-down Clip Pairings

Relay type	Poles	Front-connecting Sockets		Back-connecting Sockets	
		Socket model	Clip model	Socket model	Clip model
Standard, bifurcated contacts operation indicator, built-in diode	1, 2	PTF08A-E, PTF08A	PYC-A1	PT08(QN), PT08-0	PYC-P
	3	PTF11A		PT11(QN), PT11-0	
	4	PTF14A-E, PTF14A		PT14(QN), PT14-0	
CR Circuit	2	PTF08A-E, PTF08A	Y92H-3	PT08(QN), PT08-0	PYC-1

Specifications

■ Coil Rating

Single- and Double-pole Relays

Rated voltage		Rated current		Coil Resistance	Coil Induction (reference value)		Must operate voltage	Must release voltage	Max. voltage	Power consumption (approx.)
		50 Hz	60 Hz		Arm. OFF	Arm. ON	% of rated voltage			
AC	6 V	214.1 mA	183 mA	12.2 Ω	0.04 H	0.08 H	80% max.	30% min.	110%	1.0 to 1.2 VA (60 Hz)
	12 V	106.5 mA	91 mA	46 Ω	0.17 H	0.33 H				
	24 V	53.8 mA	46 mA	180Ω	0.69 H	1.30 H				
	50 V	25.7 mA	22 mA	788ΩW	3.22 H	5.66 H				
	100/110 V	11.7/12.9 mA	10/11 mA	3,750 Ω	14.54 H	24.6 H				0.9 to 1 VA (60 Hz)
	110/120 V	9.9/10.8 mA	8.4/9.2 mA	4,430 Ω	19.20 H	32.1 H				
	200/220 V	6.2/6.8 mA	5.3/5.8 mA	12,950 Ω	54.75 H	94.07 H				
	220/240 V	4.8/5.3 mA	4.2/4.6 mA	18,790 Ω	83.50 H	136.40 H				
DC	6 V	150 mA		40 Ω	0.16 H	0.33 H		10% min.		0.9 W
	12 V	75 mA		160 Ω	0.73 H	1.37 H				
	24 V	36.9 mA		650 Ω	3.20 H	5.72 H				
	48 V	18.5 mA		2,600 Ω	10.6 H	21.0 H				
	100/110 V	9.1/10 mA		11,000 Ω	45.6 H	86.2 H				

Note: See notes on the bottom of next page.

Three-pole Relays

Rated voltage		Rated current 50 Hz	Rated current 60 Hz	Coil Resistance	Coil Induction (reference value) Arm. OFF	Coil Induction (reference value) Arm. ON	Must operate voltage (% of rated voltage)	Must release voltage (% of rated voltage)	Max. voltage (% of rated voltage)	Power consumption (approx.)
AC	6 V	310 mA	270 mA	6.7 Ω	0.03 H	0.05 H	80% max.	30% min.	110%	1.6 to 2.0 VA (60 Hz)
	12 V	159 mA	134 mA	24 Ω	0.12 H	0.21 H				
	24 V	80 mA	67 mA	100 Ω	0.44 H	0.79 H				
	50 V	38 mA	33 mA	410 Ω	2.24 H	3.87 H				
	100/110 V	14.1/16 mA	12.4/13.7 mA	2,300 Ω	10.5 H	18.5 H				
	200/220 V	9.0/10.0 mA	7.7/8.5 mA	8,650 Ω	34.8 H	59.5 H				
DC	6 V	234 mA		25.7 Ω	0.11 H	0.21 H		10% min.		1.4 W
	12 V	112 mA		107 Ω	0.45 H	0.98 H				
	24 V	58.6 mA		410 Ω	1.89 H	3.87 H				
	48 V	28.2 mA		1,700 Ω	8.53 H	13.9 H				
	100/110 V	12.7/13 mA		8,500 Ω	29.6 H	54.3 H				

Note: See notes under next table.

Four-pole Relays

Rated voltage		Rated current 50 Hz	Rated current 60 Hz	Coil Resistance	Coil Induction (reference value) Arm. OFF	Coil Induction (reference value) Arm. ON	Must operate voltage (% of rated voltage)	Must release voltage (% of rated voltage)	Max. voltage (% of rated voltage)	Power consumption (approx.)
AC	6 V	386 mA	330 mA	5 Ω	0.02 H	0.04 H	80% max.	30% min.	110%	1.95 to 2.5 VA (60 Hz)
	12 V	199 mA	170 mA	20 Ω	0.10 H	0.17 H				
	24 V	93.6 mA	80 mA	78 Ω	0.38 H	0.67 H				
	50 V	46.8 mA	40 mA	350 Ω	1.74 H	2.88 H				
	100/110 V	22.5/25.5 mA	19/21.8 mA	1,600 Ω	10.5 H	17.3 H				
	200/220 V	11.5/13.1 mA	9.8/11.2 mA	6,700 Ω	33.1 H	57.9 H				
DC	6 V	240 mA		25 Ω	0.09 H	0.21 H		10% min.		1.5 W
	12 V	120 mA		100 Ω	0.39 H	0.84 H				
	24 V	69 mA		350 Ω	1.41 H	2.91 H				
	48 V	30 mA		1,600 Ω	6.39 H	13.6 H				
	100/110 V	15/15.9 mA		6,900 Ω	32 H	63.7 H				

Note:
1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/–20% for rated currents and ±15% for DC coil resistance.
2. Performance characteristic data are measured at a coil temperature of 23°C.
3. AC coil resistance and impedance are provided as reference values (at 60 Hz).
4. Power consumption drop was measured for the above data. When driving transistors, check leakage current and connect a bleeder resistor if required.

■ Contact Rating

Relay	Single Contact				Bifurcated contacts	
	1-pole		2-, 3- or 4-pole		2-pole	
Load	Resistive load (cosø = 1)	Inductive load (cosø = 0.4, L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4, L/R = 7 ms)	Resistive load (cosø = 1)	Inductive load (cosø = 0.4, L/R = 7 ms)
Rated Load	110 VAC 15 A 24 VDC 15 A	110 VAC 10 A 24 VDC 7 A	110 VAC 10 A 24 VDC 10 A	110 VAC 7.5 A 24 VDC 5 A	110 VAC 5A 24 VDC 5 A	110 VAC 4 A 24 VDC 4A
Rated Carry Current	15 A		10 A		7 A	
Max. switching voltage	250 VAC 125 VDC		250 VAC 125 VDC		250 VAC 125 VDC	
Max. switching current	15 A		10 A		7 A	
Max. switching power	1,700 VA 360 W	1,100 VA 170 W	1,100 VA 240 W	825 VA 120 W	550 VA 120 W	440 VA 100 W
Failure rate (reference value)*	100 mA, 5 VDC		100 mA, 5 VDC		100 mA, 5 VDC	

***Note:** P level: λ_{60} = 0.1 x 10^{-6}/operation

■ Characteristics

Item	All except Relays with bifurcated contacts	Relays with bifurcated contacts
Contact resistance	50 mΩ max.	
Operate time	25 ms max.	
Release time	25 ms max.	
Max. operating frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)	
Insulation resistance	100 MΩ min. (at 500 VDC)	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity 2,000 VAC, 50/60 Hz for 1 min between contacts of different polarity	
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.5 mm single amplitude (1.0 mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.5 mm single amplitude (1.0 mm double amplitude)	
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 200 m/s^2	
Endurance	Mechanical: AC: 50,000,000 operations min. (at 18,000 operations/hr) DC: 1,00,000,000 operations min. (at 18,000 operations/hr) Electrical: Single-, three-, and four-pole: 200,000 operations min. (at 1,800 operations/hr under rated load) Double-pole: 500,000 operations min. (at 1,800 operations/hr under rated load)	
Ambient temperature*	Operating: Single- and double-pole standard, bifurcated-contact Relays: –25°C to 55°C (with no icing) (–25°C to 70°C if carry current is 4 A or less) All other Relays: –25°C to 40°C (with no icing) (–25°C to 55°C if carry current is 4 A or less)	
Ambient humidity	Operating: 5% to 85%	
Weight	Single- and double-pole: approx. 40 g, three-pole: approx. 50 g, four-pole: approx. 70 g	

Note: 1. The values given above are initial values

2. The upper limit of 40°C for some Relays is because of the relationship between diode junction temperature and the element used.

■ Endurance Under Real Loads (reference only)

LY1

Rated voltage	Load type	Conditions	Operating frequency	Electrical life
100 VAC	AC motor	400 W, 100 VAC single-phase with 35-A inrush current, 7-A current flow	ON for 10 s, OFF for 50 s	50,000 operations
	AC lamp	300 W, 100 VAC with 51-A inrush current, 3-A current flow	ON for 5 s, OFF for 55 s	100,000 operations
		500 W, 100 VAC with 78-A inrush current, 5-A current flow		25,000 operations
	Capacitor (2,000 µF)	24 VDC with 50-A inrush current, 1-A current flow	ON for 1 s, OFF for 6 s	100,000 operations
	AC solenoid	50 VA with 2.5-A inrush current, 0.25-A current flow	ON for 1 s, OFF for 2 s	1,500,000 operations
		100 VA with 5-A inrush current, 0.5-A current flow		800,000 operations

LY2

Rated voltage	Load type	Conditions	Operating frequency	Electrical life
100 VAC	AC motor	200 W, 100 VAC single-phase with 25-A inrush current, 5-A current flow	ON for 10 s, OFF for 50 s	200,000 operations
	AC lamp	300 W, 100 VAC with 51-A inrush current, 3-A current flow	ON for 5 s, OFF for 55 s	80,000 operations
	Capacitor (2,000 µF)	24 VDC with 50-A inrush current, 1-A current flow	ON for 1 s, OFF for 15 s	10,000 operations
		24 VDC with 20-A inrush current, 1-A current flow		150,000 operations
	AC solenoid	50 VA with 2.5-A inrush current,, 0.25-A current flow	ON for 1 s, OFF for 2 s	1,000,000 operations
		100 VA with 5-A inrush current, 0.5-A current flow		500,000 operations

LY4

Rated voltage	Load type	Conditions	Operating frequency	Electrical life
100 VAC	AC motor	200 W, 200 VAC triple-phase with 5-A inrush current, 1-A current flow	ON for 10 s, OFF for 50 s	500,000 operations
		750 W, 200 VAC triple-phase with 18-A inrush current, 3.5 A current flow		70,000 operations
	AC lamp	300 W, 100 VAC with 51-A inrush current, 3-A current flow	ON for 5 s, OFF for 55 s	50,000 operations
	Capacitor (2,000 µF)	24 VDC with 50-A inrush current, 1-A current flow	ON for 1 s, OFF for 15 s	5,000 operations
		24 VDC with 20-A inrush current, 1-A current flow	ON for 1 s, OFF for 2 s	200,000 operations
	AC solenoid	50 VA with 2.5-A inrush current, 0.25-A current flow	ON for 1 s, OFF for 2 s	1,000,000 operations
		100 VA with 5-A inrush current, 0.5-A current flow		500,000 operations

■ Approved Standards

UL 508 Recognitions (File No. 41643)

No. of poles	Coil ratings	Contact ratings	Operations
1	6 to 240 VAC 6 to 125 VDC	15 A, 30 VDC (Resistive) 15 A, 240 VAC (General use) TV-5, 120 VAC 1/2 HP, 120 VAC	6 x 10^3 25 x 10^3
2		15 A, 28 VDC (Resistive) 15 A, 120 VAC (Resistive) 12 A, 240 VAC (General use) 1/2 HP, 120 VAC TV-3, 120 VAC	6 x 10^3 25 x 10^3
3 and 4		10 A, 30 VDC (Resistive) 10 A, 240 VAC (General use) 1/3 HP, 240 VAC	6 x 10^3

CSA 22.2 No. 14 Listings (File No. LR31928)

No. of poles	Coil ratings	Contact ratings	Operations
1	6 to 240 VAC 6 to 125 VDC	15 A, 30 VDC (Resistive) 15 A, 120 VAC (General use) 1/2 HP, 120 VAC TV-5, 120 VAC	6 x 10^3 25 x 10^3
2		15 A, 30 VDC (Resistive) 15 A, 120 VAC (Resistive) 1/2 HP, 120 VAC TV-3, 120 VAC	6 x 10^3
3 and 4		10 A, 30 VDC (Resistive) 10 A, 240 VAC (General use)	

SEV Listings (File No. D3,31/137)

No. of poles	Coil ratings	Contact ratings	Operations
1	6 to 240 VAC 6 to 125 VDC	15 A, 24 VDC 15 A, 220 VAC	6 x 10^3
2 to 4		10 A, 24 VDC 10 A, 220 VAC	

TÜV (File No. R9251226) (IEC255)

No. of poles	Coil ratings	Contact ratings	Operations
1 to 4	6 to 125 VDC 6 to 240 VAC	LY1, LY1-FD 15 A, 110 VAC (cos ø = 1) 10 A, 110 VAC (cos ø = 0.4) LY2, LY2-FD, LY3, LY3-FD, LY4, LY4-FD 10 A, 110 VAC (cos ø = 1) 7.5 A, 110 VAC (cos ø = 0.4)	100 x 10^3

VDE Recognitions (No. 9903UG and 9947UG)

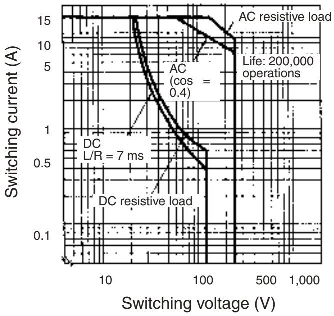
No. of poles	Coil ratings	Contact ratings	Operations
1	6, 12, 24, 50, 110, 220 VAC 6, 12, 24, 48, 110 VDC	10 A, 220 VAC (cos ø = 1) 7 A, 220 VAC (cos ø = 0.4) 10 A, 28 VDC (L/R=0 ms) 7 A, 28 VDC (L/R=7 ms)	200 x 10^3
2		7 A, 220 VAC (cos ø = 1) 4 A, 220 VAC (cos ø = 0.4) 7 A, 28 VDC (L/R=0 ms) 4 A, 28 VDC (L/R=7 ms)	

■ Approved Standards (cont.)
LR Recognitions (No. 563KOB-204523)

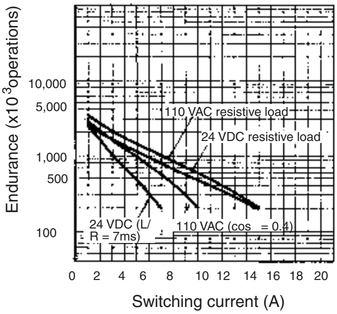
No. of poles	Coil ratings	Contact ratings
2, 4	6 to 240 VAC 6 to 110 VDC	7.5 A, 230 VAC (PF0.4) 5 A, 24 VDC (L/R=7 ms)

Engineering Data

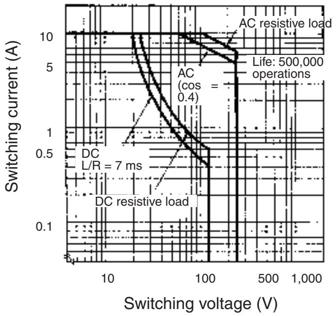
LY1
Maximum Switching Power



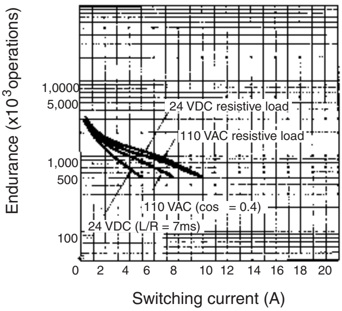
Endurance



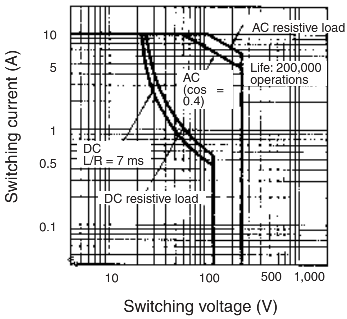
LY2
Maximum Switching Power



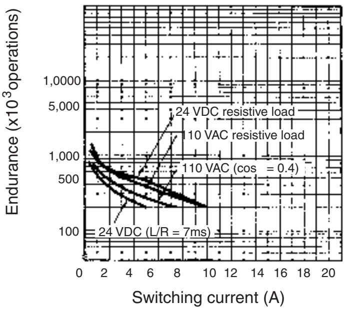
Endurance



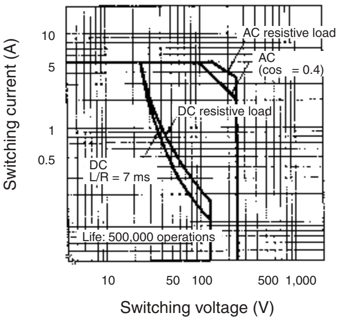
LY3 and LY4
Maximum Switching Power



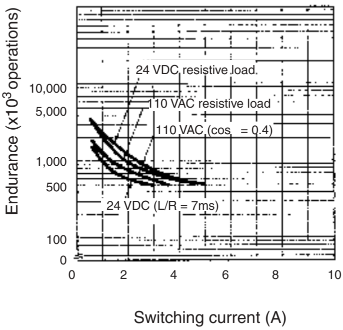
Endurance



LY2Z
Maximum Switching Power



LY2Z
Endurance

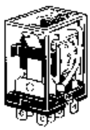


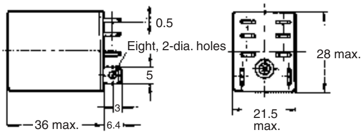
Dimensions

Note: All units are in millimeters unless otherwise indicated.

■ Relays with Solder/Plug-in Terminals

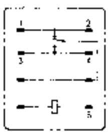
LY1
LY1N (-D2)
LY1-D



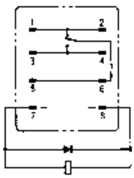


Terminal Arrangement/Internal Connections (Bottom View)

LY1

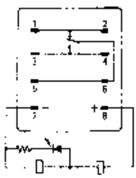


LY1-D

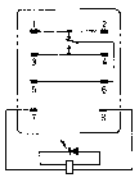


LY1N

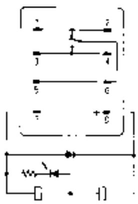
DC Model



AC Model

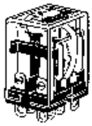


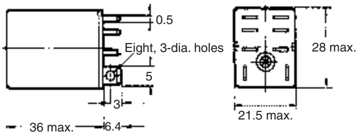
LY1N-D2



Note: The DC models have polarity.

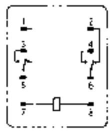
LY2	**LY2Z**
LY2-D	**LY2Z-D**
LY2N	**LY2ZN**
LY2N-D2	**LY2ZN-D2**



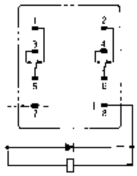


Terminal Arrangement/Internal Connections (Bottom View)

LY2(Z)

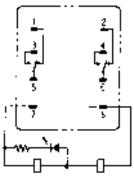


LY2(Z)-D

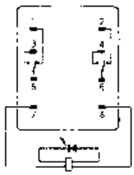


LY2(Z)N

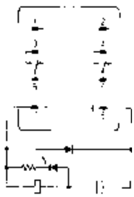
DC Model



AC Model

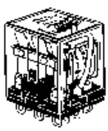


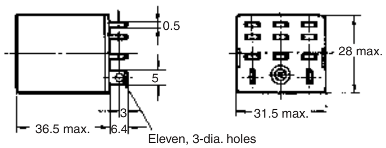
LY2(Z)N-D2



Note: The DC models have polarity.

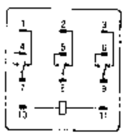
LY3
LY3N
LY3-D



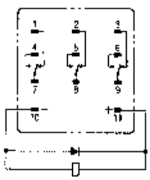


Terminal Arrangement/Internal Connections (Bottom View)

LY3

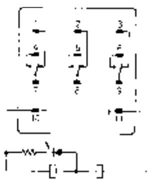


LY3-D

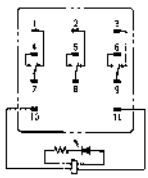


LY3N

DC Model

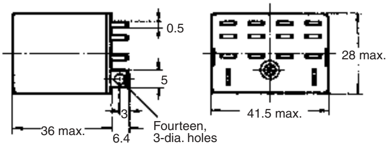


AC Model



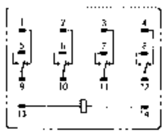
Note: The DC models have polarity.

LY4 LY4N
LY4-D LY4N-D2

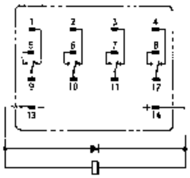


Terminal Arrangement/Internal Connections (Bottom View)

LY4

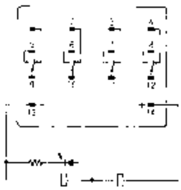


LY4-D

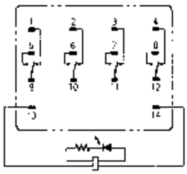


LY4N

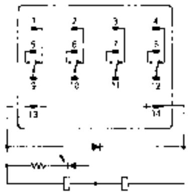
DC Model



AC Model

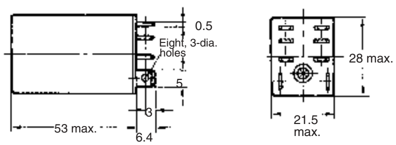


LY4N-D2



Note: The DC models have polarity.

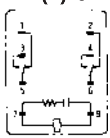
LY2-CR
LY2Z-CR
LY2N-CR
LY2ZN-CR



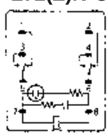
Model: LY2N-CR

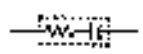
Terminal Arrangement/Internal Connections (Bottom View)

LY2(Z)-CR



LY2(Z)N-CR

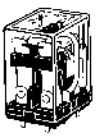


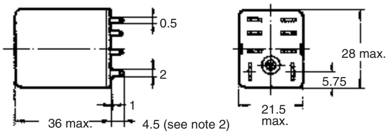


CR Element
C: 0.033 F
R: 120

■ Relays with PCB Terminals

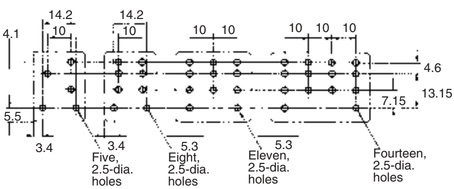
LY1-0 LY3-0
LY2-0 LY4-0





Note: 1. The above model is the LY2-0.
2. This figure is 6.4 for the LY1-0

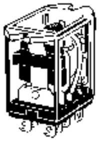
PC Board Holes (Bottom View)

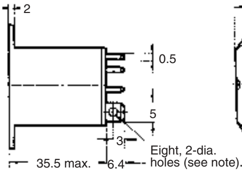


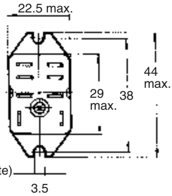
Note: 1. The tolerance for the above figures is 0.1 mm.
2. Besides the terminals, some part of the LY1-0 carries current. Due attention should be paid when mounting the LY1-0 to a double-sided PC board.

■ Upper Mounting relays

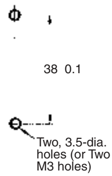
LY1F
LY2F





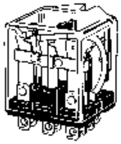


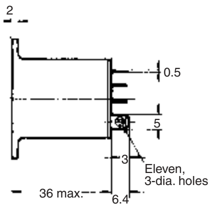
Mounting Holes

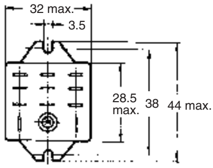


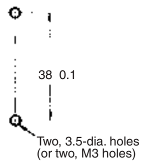
Note: 1. Eight 3-dia. holes should apply to the LY2F model.

LY3F

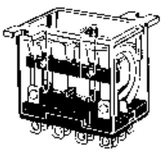


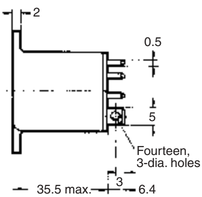


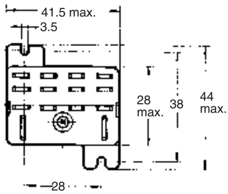




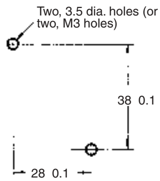
LY4F







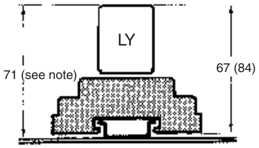
Mounting holes



■ Mounting Height with Socket

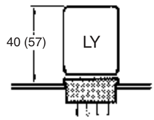
The following Socket heights should be maintained.

Front-connecting



PTF□A (-E)

Back-connecting



PT□

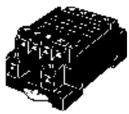
Note:
1. The PTF□A (-E) can be track-mounted or screw-mounted.
2. For the LY□-CR (CR circuit built-in type) model, this figure should be 88.

■ Sockets

PTF08A-E

PTF11A

PTF14A-E



PT08

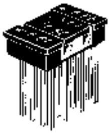
PT11

PT14

PT08QN

PT11QN

PT14QN



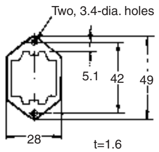
PT08-0

PT11-0

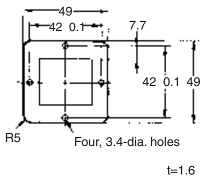
PT14-0

Mounting Plates for Back-connecting

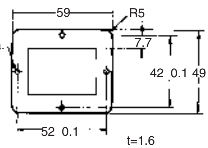
PYP-1



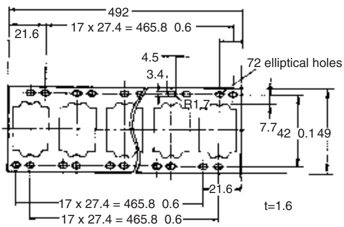
PTP-1-3



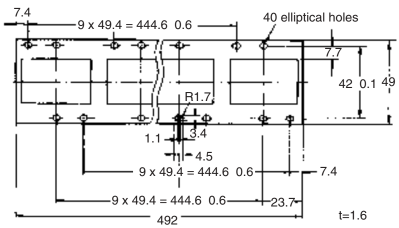
PTP-1



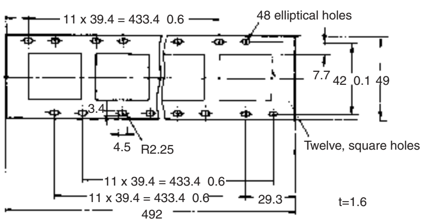
PYP-18



PTP-10

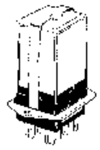


PTP-12



■ Hold-down Clips

Hold-down clips are used to hold Relays to Sockets and prevent them from coming loose due to vibration or shock.

Used with Socket		Used with Socket mounting plate	For CR circuit built-in Relay	
PYC-A1 	PYC-P 	PYC-S 	Y92H-3 	PYC-1 

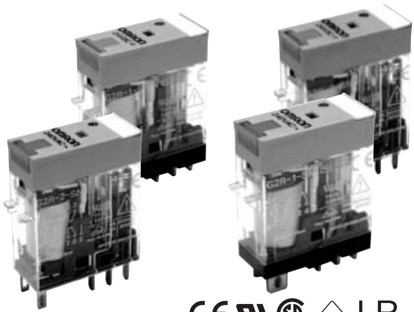
Precautions

■ Connections

Do not reverse polarity when connecting DC-operated Relays with built-in diodes or indicators.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Slim and Space-saving Power Plug-in Relay



- Lockable test button models now available.
- Built-in mechanical operation indicator.
- Provided with nameplate.
- AC type is equipped with a coil-disconnection self-diagnostic function (LED type).
- High switching power (1-pole: 10 A).
- Environment-friendly (Cd, Pb free).
- Wide range of Sockets also available.

LR

Model Number Structure

Model Number Legend

G2R □ -□ □ □ - □ □ -□
1 2 3 4 5 6 7

1. Relay Function
Blank: General purpose

2. Number of Poles
1: 1 pole
2: 2 pole

3. Contact Form
Blank: SPDT

4. Contact Type
Blank: Single

5. Terminals
S: Plug-in

6. Classification
Blank: General-purpose
N: LED indicator
D: Diode
ND: LED indicator and diode
NI: LED indicator with test button
NDI: LED indicator and diode with test button

7. Rated Coil Voltage

Ordering Information

■ List of Models

Classification		Enclosure rating	Coil ratings	Contact form	
				SPDT	**DPDT**
Plug-in terminal	General-purpose	Unsealed	AC/DC	G2R-1-S	G2R-2-S
	LED indicator			G2R-1-SN	G2R-2-SN
	LED indicator with test button			G2R-1-SNI	G2R-2-SNI
	Diode		DC	G2R-1-SD	G2R-2-SD
	LED indicator and diode			G2R-1-SND	G2R-2-SND
	LED indicator and diode with test button			G2R-1-SNDI	G2R-2-SNDI

Note: When ordering, add the rated coil voltage and "(S)" to the model number. Rated coil voltages are given in the coil ratings table.
Example: G2R-1-S 12 VDC (S) — New model
Rated coil voltage

■ Accessories (Order Separately)

Connecting Sockets

Applicable Relay model	Track/surface-mounting Socket		Back-mounting Socket	
	Screwless clamp terminal	Screw terminal	Terminals	Model
1 pole G2R-1-S(N)(D)(ND)(NI)(NDI)	• P2RF-05S (See note.) + (P2CM-S (option))	• P2RF-05-E • P2RF-05	PCB terminals	P2R-05P, P2R-057P
			Solder terminals	P2R-05A
2 poles G2R-2-S(N)(D)(ND)(NI)(NDI)	• P2RF-08S (See note.) + (P2CM-S (option))	• P2RF-08-E • P2RF-08	PCB terminals	P2R-08P, P2R-087P
			Solder terminals	P2R-08A

Note: Use of the P2CM Clip & Release Lever is recommended to ensure stable mounting.

Accessories for Screwless Clamp Terminal Socket (Option)

Name	Model
Clip & Release Lever	P2CM-S
Nameplate	R99-11 Nameplate for MY
Socket Bridge	P2RM-SR (for AC), P2RM-SB (for DC)

Mounting Tracks

Applicable Socket	Description	Model
Track-connecting Socket	Mounting track	50 cm (ℓ) x 7.3 mm (t): PFP-50N 1 m (ℓ) x 7.3 mm (t): PFP-100N 1 m (ℓ) x 16 mm (t): PFP-100N2
	End plate	PFP-M
	Spacer	PFP-S
Back-connecting Socket	Mounting plate	P2R-P*

*Used to mount several P2R-05A and P2R-08A Connecting Sockets side by side.

Specifications

■ Coil Ratings

Rated voltage		Rated current*		Coil resistance*	Coil inductance (H) (ref. value)		Must operate voltage	Must release voltage	Max. voltage	Power consumption (approx.)
		50 Hz	60 Hz		Armature OFF	Armature ON	% of rated voltage			
AC	24 V	43.5 mA	37.4 mA	253 Ω	0.81	1.55	80% max.	30% max.	110%	0.9 VA at 60 Hz
	110 V	9.5 mA	8.2 mA	5,566 Ω	13.33	26.83				
	120 V	8.6 mA	7.5 mA	7,286 Ω	16.13	32.46				
	230 V	4.4 mA	3.8 mA	27,172 Ω	72.68	143.90				
	240 V	3.7 mA	3.2 mA	30,360 Ω	90.58	182.34				

Rated voltage		Rated current*	Coil resistance*	Coil inductance (H) (ref. value)		Must operate voltage	Must release voltage	Max. voltage	Power consumption (approx.)
				Armature OFF	Armature ON	% of rated voltage			
DC	6 V	87.0 mA	69 Ω	0.25	0.48	70% max.	15% min.	110%	0.53 W
	12 V	43.2 mA	278 Ω	0.98	2.35				
	24 V	21.6 mA	1,113 Ω	3.60	8.25				
	48 V	11.4 mA	4,220 Ω	15.2	29.82				

* The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of ±10%.

Contact Ratings

Number of poles	1 pole		2 poles	
Load	Resistive load ($\cos\phi = 1$)	Inductive load ($\cos\phi = 0.4$; L/R = 7 ms)	Resistive load ($\cos\phi = 1$)	Inductive load ($\cos\phi = 0.4$; L/R = 7 ms)
Rated load	10 A at 250 VAC; 10 A at 30 VDC	7.5 A at 250 VAC; 5 A at 30 VDC	5 A at 250 VAC; 5 A at 30 VDC	2 A at 250 VAC; 3 A at 30 VDC
Rated carry current	10 A		5 A	
Max. switching voltage	440 VAC, 125 VDC		380 VAC, 125 VDC	
Max. switching current	10 A		5 A	
Max. switching power	2,500 VA, 300 W	1,875 VA, 150 W	1,250 VA, 150 W	500 VA, 90 W
Failure rate (reference value)	100 mA at 5 VDC		10 mA at 5 VDC	

Note: 1. P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation

Characteristics

Item	1 pole	2 poles
Contact resistance	100 mΩ max.	
Operate (set) time	15 ms max.	
Release (reset) time	AC: 10 ms max.; DC: 5 ms max. (w/built-in diode: 20 ms max.)	AC: 15 ms max.; DC: 10 ms max. (w/built-in diode: 20 ms max.)
Max. operating frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)	
Insulation resistance	1,000 MΩ min. (at 500 VDC)	
Dielectric strength	5,000 VAC, 50/60 Hz for 1 min between coil and contacts*; 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity	5,000 VAC, 50/60 Hz for 1 min between coil and contacts*; 3,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude)	
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 200 m/s^2 when energized; 100 m/s^2 when not energized	
Endurance	Mechanical: AC coil: 10,000,000 operations min.; DC coil: 20,000,000 operations min. (at 18,000 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr under rated load) (DC coil type)	
Ambient temperature	Operating: –40°C to 70°C (with no icing or condensation)	
Ambient humidity	Operating: 5% to 85%	
Weight	Approx. 21 g	

Note: Values given above are initial values

*4,000 VAC, 50/60 Hz for 1 minute when the P2R-05A or P2R-08A Socket is mounted.

Approved Standards

UL 508 (File No. E41643)

Model	Contact form	Coil ratings	Contact ratings	Operations
G2R-1-S	SPDT	5 to 110 VDC 5 to 240 VAC	10 A, 30 VDC (resistive) 10 A, 250 VAC (general use) TV-3 (NO contact only)	6 x 10^3
G2R-2-S	DPDT		5 A, 30 VDC (resistive) 5 A, 250 VAC (general use) TV-3 (NO contact only)	6 x 10^3

IEC.VDE (EN61810)

Contact form	Coil ratings	Contact ratings	Operations
1 pole	6, 12, 24, 48 VDC 24, 110, 120, 230, 240 VAC	5 A, 440 VAC ($\cos\phi = 1.0$) 10 A, 250 VAC ($\cos\phi = 1.0$) 10 A, 30 VDC (0 ms)	100 x 10^3
2 poles	6, 12, 24, 48 VDC 24, 110, 120, 230, 240 VAC	5 A, 250 VAC ($\cos\phi = 1.0$) 5 A, 30 VDC (0 ms)	100 x 10^3

CSA 22.2 No.0, No.14 (File No. LR31928)

Model	Contact form	Coil ratings	Contact ratings	Operations
G2R-1-S	SPDT	5 to 110 VDC 5 to 240 VAC	10 A, 30 VDC (resistive) 10 A, 250 VAC (general use) TV-3 (NO contact only)	6 x 10^3
G2R-2-S	DPDT		5 A, 30 VDC (resistive) 5 A, 250 VAC (general use) TV-3 (NO contact only)	6 x 10^3

LR

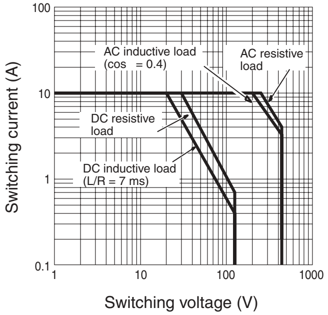
Number of poles	Coil ratings	Contact ratings	Operations
1 pole	5 to 110 VDC 5 to 240 VDC	10 A, 250 VAC (general use) 7.5 A, 250 VAC (PF0.4) 10 A, 30 VDC (resistive) 5A, 30VDC (L/R=7ms)	100 x 10^3
2 poles	5 to 110 VDC 5 to 240 VDC	5 A, 250 VAC (general use) 2 A, 250 VAC (PF0.4) 5 A, 30 VDC (resistive) 3A, 30VDC (L/R=7ms)	100 x 10^3

Engineering Data

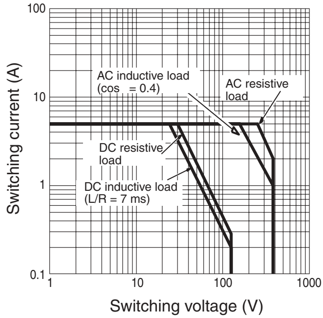
Maximum Switching Power

Plug-in Relays

G2R-1-S



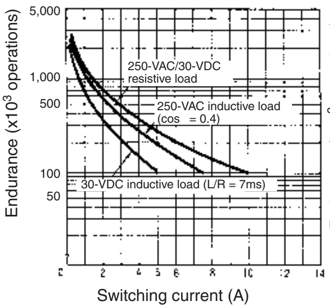
G2R-2-S



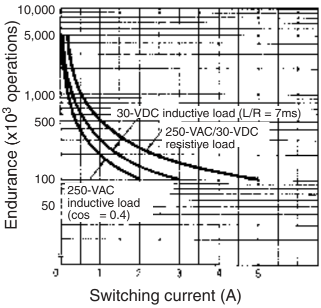
Endurance

Plug-in Relays

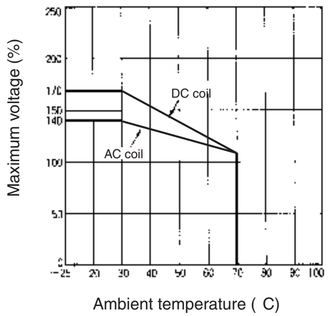
G2R-1-S



G2R-2-S



Ambient Tempreture vs Maximum Coil Voltage



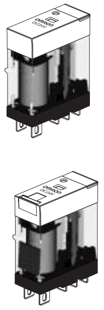
Note: The maximum voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

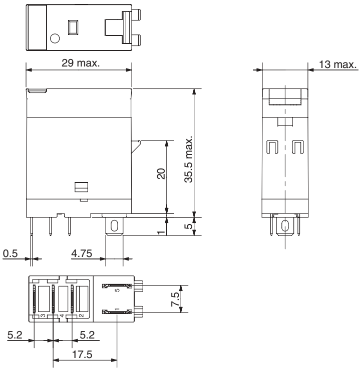
Relays with Plug-in Terminals

Note: All units are in millimeters unless otherwise indicated.

SPDT Relays

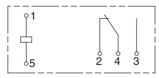
G2R-1-S, G2R-1-SN, G2R-1-SNI
G2R-1-SD, G2R-1-SND, G2R-1-SNDI



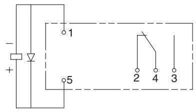


Terminal Arrangement/Internal Connections (Bottom View)

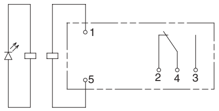
G2R-1-S



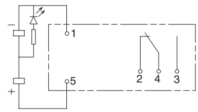
G2R-1-SD (DC)



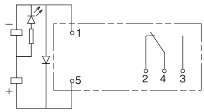
G2R-1-SN, G2R-1-SNI (AC)



G2R-1-SN, G2R-1-SNI (DC)

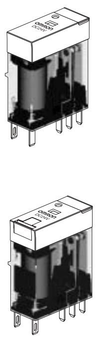


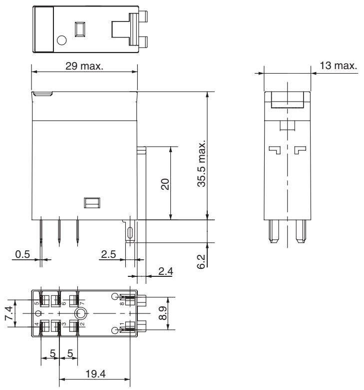
G2R-1-SND, G2R-1-SNDI (DC)



DPDT Relays

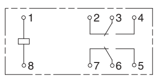
G2R-2-S, G2R-2-SN, G2R-2-SNI
G2R-2-SD, G2R-2-SND, G2R-2-SNDI



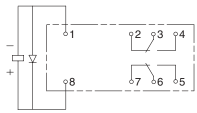


Terminal Arrangement/Internal Connections (Bottom View)

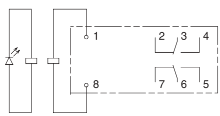
G2R-2-S



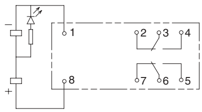
G2R-2-SD (DC)



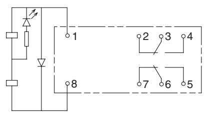
G2R-2-SN, G2R-2-SNI (AC)



G2R-2-SN, G2R-2-SNI (DC)



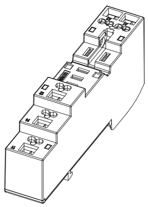
G2R-2-SND, G2R-2-SNDI (DC)



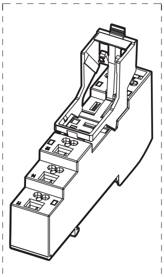
General Purpose Relays

Track/Surface Mounting Sockets

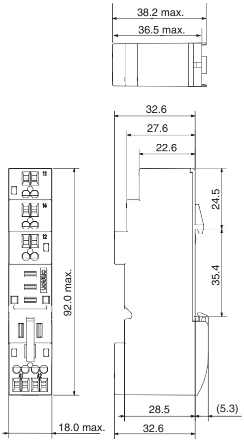
P2RF-05-S



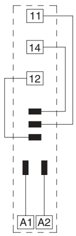
Standard model



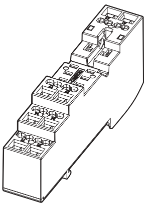
Option (with ejector and label attached)



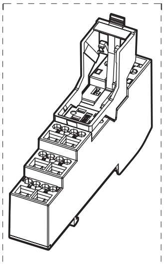
Terminal Arrangement (Top View)



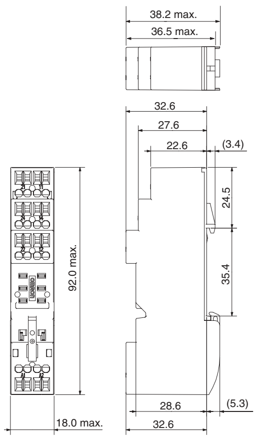
P2RF-08-S



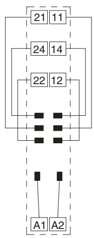
Standard model



Option (with ejector and label attached)

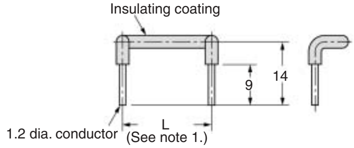


Terminal Arrangement (Top View)

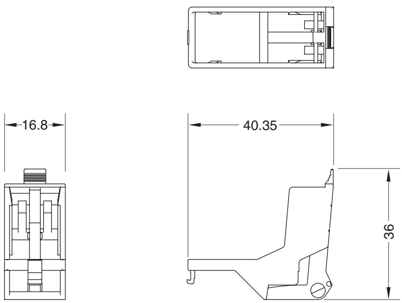


Accessories for P2RF-□-S

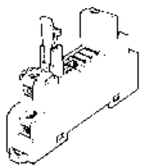
Socket Bridge

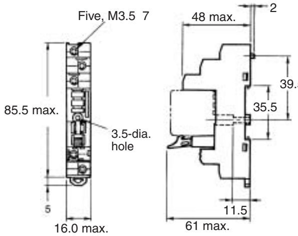


Clip and Reverse Lever

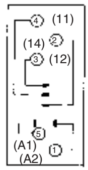


P2RF-05-E

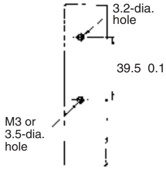




Terminal Arrangement (Top View)

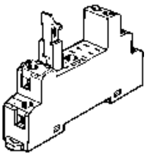


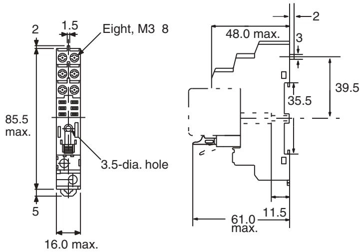
Mounting Holes (for Surface Mounting)



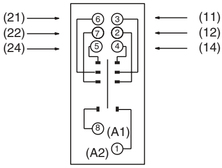
Note: Pin numbers in parentheses apply to DIN standard.

P2RF-08-E

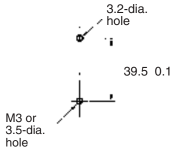




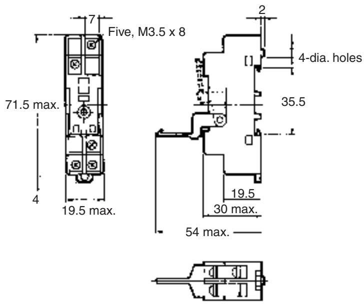
Terminal Arrangement (Top View)



Mounting Holes (for Surface Mounting)

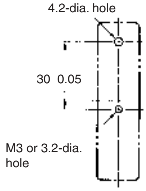


P2RF-05

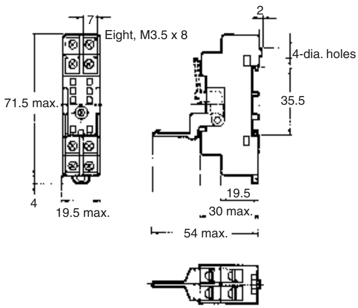


Terminal Arrangement (Top View)

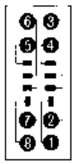
Mounting Holes (for Surface Mounting)



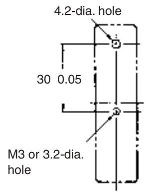
P2RF-08



Terminal Arrangement (Top View)

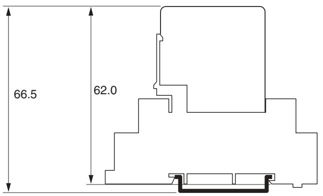


Mounting Holes (for Surface Mounting)

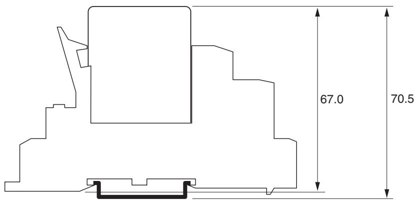


Mounting Height of Relay with Track/Surface Mounting Sockets

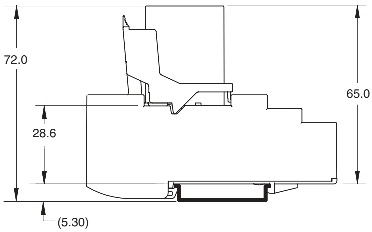
P2RF-□



P2RF-□-E

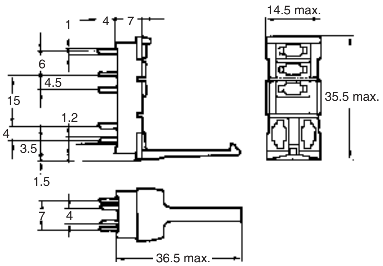


P2RF-□-S

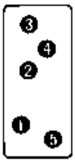


Back-connecting sockets

P2R-05P (1-pole)

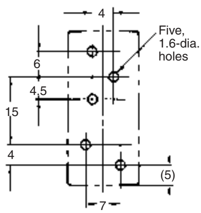


Terminal Arrangement (Bottom View)

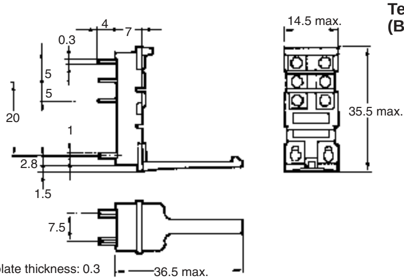


Mounting Holes

Tolerance: 0.1

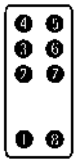


P2R-08P (2-pole)

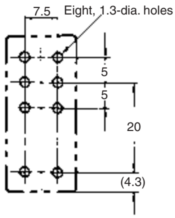


Terminal plate thickness: 0.3

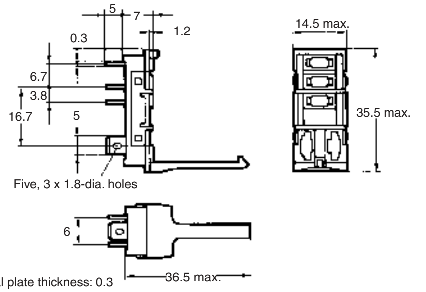
Terminal Arrangement (Bottom View)



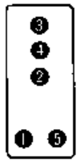
Mounting Holes



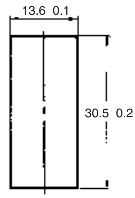
P2R-05A (1-pole)



Terminal Arrangement (Bottom View)

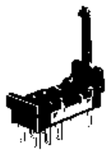


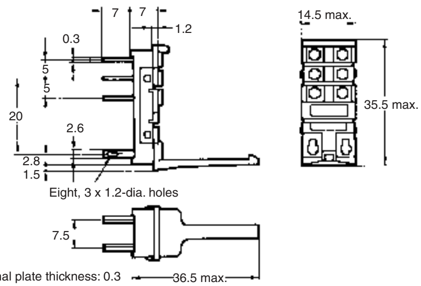
Panel Cutout

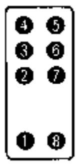


Recommended thickness of the panel is 1.6 to 2.0 mm

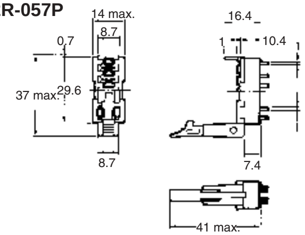
P2R-08A (2-pole)



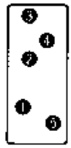




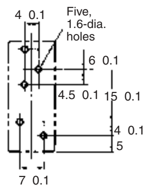
P2R-057P



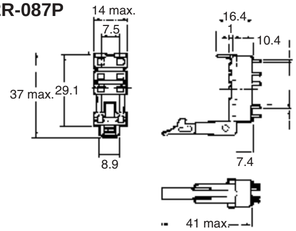
Terminal Arrangement (Bottom View)



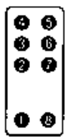
Mounting Holes



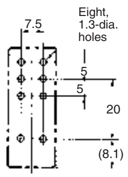
P2R-087P



Terminal Arrangement (Bottom View)

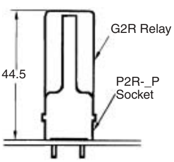


Mounting Holes

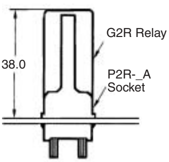


Mounting Height of Relay with Back-connecting Sockets

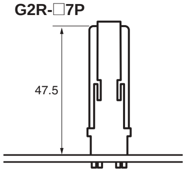
G2R-□P



G2R-□A

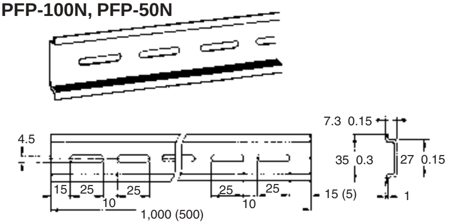


G2R-□7P

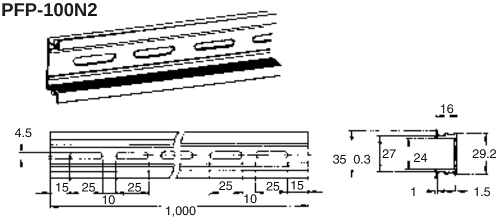


Mounting Tracks

PFP-100N, PFP-50N



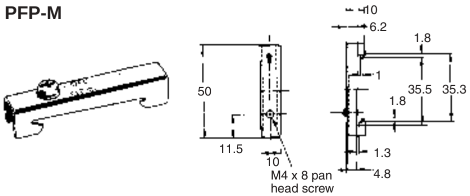
PFP-100N2



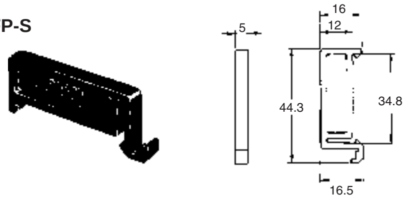
It is recommended to use a panel 1.6 to 2.0 mm thick.

End Plate

PFP-M



PFP-S



Precautions

CAUTION

Do not use the test button for any purpose other than testing. Be sure not to touch the test button accidentally as this will turn the contacts ON. Before using the test button, confirm that circuits, the load, and any other connected item will operate safely.

CAUTION

Check that the test button is released before turning ON relay circuits.

CAUTION

If the test button is pulled out too forcefully, it may bypass the momentary testing position and go straight into the locked position.

CAUTION

Use an insulated tool when you operate the test button.

PRECAUTIONS FOR P2RF-□-S CONNECTION

- Do not move the screwdriver up, down, or from side to side while it is inserted in the hole. Doing so may cause damage to internal components (e.g., deformation of the clamp spring or cracks in the housing) or cause deterioration of insulation.
- Do not insert the screwdriver at an angle. Doing so may break the side of the socket and result in a short-circuit.

A High-capacity, High-dielectric-strength Relay Compatible with Momentary Voltage Drops

- No contact chattering for momentary voltage drops up to 50% of rated voltage.
- Wide-range AC-activated coil that handles 100 to 120 or 200 to 240 VAC at either 50 or 60 Hz.
- Miniature hinge for maximum switching power, particularly for inductive loads.
- Flame-resistance materials (UL94V-0-qualifying) used for all insulation material.
- Quick-connect, screw, and PCB terminals, and DIN track mounting available.

Ordering Information

Mounting Type	Contact form	Quick-connect terminals	Screw terminals terminals	PCB terminals
E-bracket	SPST-NO	G7L-1A-T	G7L-1A-B	–
	DPST-NO	G7L-2A-T	G7L-2A-B	–
E-bracket (with test button)	SPST-NO	G7L-1A-TJ	G7L-1A-BJ	–
	DPST-NO	G7L-2A-TJ	G7L-2A-BJ	–
Upper bracket	SPST-NO	G7L-1A-TUB	G7L-1A-BUB	–
	DPST-NO	G7L-2A-TUB	G7L-2A-BUB	–
Upper bracket (with test button)	SPST-NO	G7L-1A-TUBJ	G7L-1A-BUBJ	–
	DPST-NO	G7L-2A-TUBJ	G7L-2A-BUBJ	–
PCB mounting	SPST-NO	–	–	G7L-1A-P
	DPST-NO	–	–	G7L-2A-P

Note: 1. When ordering, add the rated coil voltage to the model number.
Example: G7L-1A-T 12 VAC (∿)
Rated coil voltage

■ Accessories (Order Separately)

Terminals	Contact form	Model	P99-07 E-brackets 	P7LF-D DIN Track Mounting Adapter 	P7LF-06 Front Connecting Socket 
Quick-connect terminals	SPST-NO	G7L-1A-T	Yes	Yes	Yes
		G7L-1A-TJ	Yes	Yes	Yes
	DPST-NO	G7L-2A-T	Yes	Yes	Yes
		G7L-2A-TJ	Yes	Yes	Yes
Screw terminals	SPST-NO	G7L-1A-B	Yes	Yes	No
		G7L-1A-BJ	Yes	Yes	No
	DPST-NO	G7L-2A-B	Yes	Yes	No
		G7L-2A-BJ	Yes	Yes	No

Applicable Relay	Name	Model
G7L-1A-T/G7L-1A-TJ/G7L-1A-B/G7L-1A-BJ G7L-2A-T/G7L-2A-TJ/G7L-2A-B/G7L-2A-BJ	E-bracket	R99-07
	Adapter	P7LF-D
G7L-1A-T/G7L-1A-TJ/G7L-2A-T/G7L-2A-TJ	Front-connecting Socket	P7LF-06
G7L-1A-B/G7L-1A-BJ/G7L-1A-BUB/G7L-1A-BUBJ G7L-2A-B/G7L-2A-BJ/G7L-2A-BUB/G7L-2A-BUBJ	Cover	P7LF-C

Model Number Legend

G7L -□□ -□□□ □
1 2 3 4 , 5

1. Contact Form
1A: SPST-NO
2A: DPST-NO

2. Terminal Shape
T: Quick-connect terminals
P: PCB terminals
B: Screw terminals

3. Mounting Construction
Blank: E-bracket
UB: Upper bracket

4. Special Functions
Blank: Standard mode
J: With test button

5. Rated Coil Voltage
AC: 12, 24, 50, 100 to 120, 200 to 240
DC: 6, 12, 24, 48, 100

Application Examples

- Compressors for air conditioners and heater switching controllers.
- Switching controllers for power tools or motors.
- Power controllers for water heaters.
- Power controllers for dryers.
- Lamp controls, motor drivers, and power supply switching in copy machines, facsimile machines, and other office equipment.
- Lighting controllers.
- Power controllers for packers or food processing equipment.
- Magnetron control in microwaves.

Specifications

■ Coil Ratings

Rated Voltage		Rated current	Coil resistance	Must operate voltage	Must release voltage	Max. voltage	Power consumption (approx.)
AC (~)	12 V	142 mA	–	75% max. of rated voltage	15% min. of rated voltage	110% of rated voltage	1.7 to 2.5 VA (60 Hz)
	24 V	71 mA	–				
	50 V	34 mA	–				
	100 to 120 V	7.0 to 20.4 mA	–	75 V	18 V	132 V	
	200 to 240 V	8.5 to 10.2 mA	–	150 V	36 V	264 V	
DC (=)	6 V	317 mA	18.9 Ω	75% max. of rated voltage	15% min. of rated voltage	110% of rated voltage	1.9 W
	12 V	158 mA	75 Ω				
	24 V	79 mA	303 Ω				
	48 V	40 mA	1220 Ω				
	100 V	19 mA	5260 Ω				

Note: **1.** The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/–20% for AC rated current and ±15% for DC coil resistance.
2. Performance characteristic data are measured at a coil temperature of 23°C.
3. ~ indicates AC and = indicates DC (IEC417 publications).

■ Contact Ratings

Model	G7L-1A-T@/G7L-1A-B@		G7L-2A-T@/G7L-2A-B@		G7L-1A-P/G7L-2A-P	
	Resistive load (cosø = 1)	Inductive load (cosø = 0.4,	Resistive load (cosø = 1)	Inductive load (cosø = 0.4,	Resistive load (cosø = 1)	Inductive load (cosø = 0.4)
Rated Load	30 A, 220 VAC (~)	25 A, 220 VAC (~)	25 A, 220 VAC (~)		25 A, 220 VAC (~)	
Carry Current	30 A		25 A		20 A	
Max. switching voltage	250 VAC (~)		250 VAC (~)		250 VAC (~)	
Max. switching current	30 A		25 A		20 A	
Max. switching power	6,600 VAC (~)	5,500 VAC (~)	5,500 VAC (~)		4,400 VAC (~)	
Failure rate* (reference value)	100 mA, 5 VDC (~)		100 mA, 5 VDC (~)		100 mA, 5 VDC (~)	

***Note:** P level: λ_{60} = 0.1 x 10^{-6}/operation

General Purpose Relays

■ Characteristics

Contact resistance	50 mΩ max.
Operate time	30 ms max.
Release time	30 ms max.
Max. operating frequency	Mechanical: 1,800 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric strength	4,000 VAC min., 50/60 Hz for 1 min between coil and contacts 2,000 VAC, 50/60 Hz for 1 min between contacts of same polarity 2,000 VAC, 50/60 Hz for 1 min between contacts of different polarity (DPST-NO model)
Impulse withstand voltage	10,000 V between coil and contact (with 1.2 x 50 µs impulse wave)
Vibration resistance	Destruction: 10 to 55 to, 0.75 mm single amplitude (1.5 mm double amplitude) Malfunction: 10 to 55 to, 0.75 mm single amplitude (1.5 mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 100 m/s^2
Endurance	Mechanical: 1,000,000 operations min. (at 1,800 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr under rated load)
Ambient temperature	Operating: –25°C to 60°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Quick-connect terminal models: approx. 90 g PCB terminal models: approx. 100 g Screw terminal models: approx. 120 g

Note: The values given above are initial values

■ Approved by Standards
UL 508, 1950 Recognitions (File No. E41643)
CSA 22.2 No.14 Listings (File No.LR35535)

Model	Contact Form	Coil ratings	Contact ratings	Operations
G7L-1A-T@ G7L-1A-B@	SPST-NO	12 to 240 VAC 5 to 220 VDC	30 A, 277 VAC (RES) 25 A, 277 VAC (GEN) 30 A, 120 VAC (GEN)	100 x 10^3
			1.5 kW, 120 VAC (T) 1.5 HP, 120 VAC	6 x 10^3
			3 HP, 277 VAC	100 x 10^3 (CSA; 6 x 10^3)
			20 FLA/120 LRA, 120 VAC 17 FLA/102 LRA, 265 VAC	30 x 10^3
G7L-2A-T@ G7L-2A-B@	DPST-NO		TV-10, 120 VAC	25 x 10^3
			25 A, 277 VAC (RES) 25 A, 277 VAC (GEN) 25 A, 120 VAC (GEN)	100 x 10^3
			1.3 kW, 120 VAC (T) 1 HP, 120 VAC	6 x 10^3
			2 HP, 277 VAC	100 x 10^3 (CSA; 6 x 10^3)
			20 FLA/120 LRA, 120 VAC 17 FLA/102 LRA, 265 VAC	30 x 10^3
G7L-1A-P	SPST-NO		TV-8, 120 VAC	25 x 10^3
			20 A, 277 VAC (RES) 20 A, 277 VAC (GEN) 20 A, 120 VAC (GEN)	100 x 10^3
			1.5 kW, 120 VAC (T) 1.5 HP, 120 VAC	6 x 10^3
			3 HP, 277 VAC	100 x 10^3 (CSA; 6 x 10^3)
			20 FLA/120 LRA, 120 VAC 17 FLA/102 LRA, 265 VAC	30 x 10^3
G7L-2A-P	DPST-NO		TV-10, 120 VAC	25 x 10^3
			20 A, 277 VAC (RES) 20 A, 277 VAC (GEN) 20 A, 120 VAC (GEN)	100 x 10^3
			1.3 kW, 120 VAC (T) 1 HP, 120 VAC	6 x 10^3
			2 HP, 277 VAC 20 FLA/120 LRA, 120 VAC 17 FLA/102 LRA, 265 VAC	100 x 10^3 30 x 10^3
			TV-8, 120 VAC	25 x 10^3

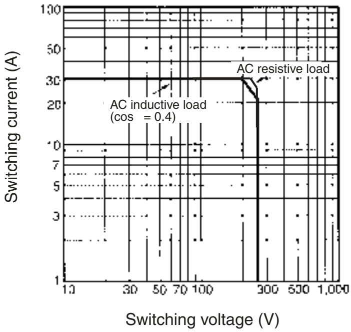
TÜV: File No. R9051158 (VDE 0435, IEC 255, IEC 950, EN60950)

Model	Contact Form	Coil ratings	Contact ratings	Operations
G7L-1A-B@	SPST-NO	6, 12, 24, 48, 100, 110, 200, 220 VDC 12, 24, 50, 100 to 120, 200 to 240 VAC	30 A, 240 VAC (cosø = 1.0) 25 A, 240 VAC (cosø = 0.4) 30 A, 120 VAC (cosø = 0.4)	100 x 10^3
G7L-2A-B@	DPST-NO		25 A, 240 VAC (cosø = 1.0) 25 A, 240 VAC (cosø = 0.4)	
G7L-1A-T@	SPST-NO		25 A, 240 VAC (cosø = 1.0) 25 A, 240 VAC (cosø = 0.4)	
G7L-2A-T@	DPST-NO		25 A, 240 VAC (cosø = 1.0) 25 A, 240 VAC (cosø = 0.4)	
G7L-1A-P	SPST-NO		20 A, 240 VAC (cosø = 1.0) 20 A, 240 VAC (cosø = 0.4)	
G7L-2A-P	DPST-NO		20 A, 240 VAC (cosø = 1.0) 20 A, 240 VAC (cosø = 0.4)	

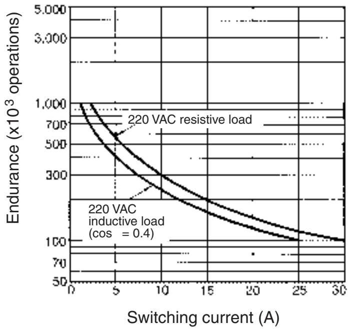
Engineering Data

G7L-1A-T/G7L-1A-B

Maximum Switching Power

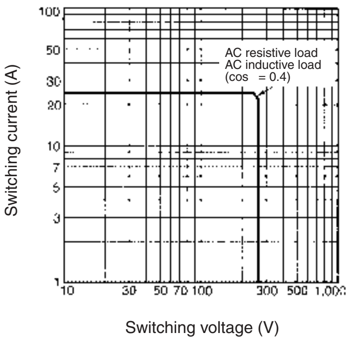


Endurance

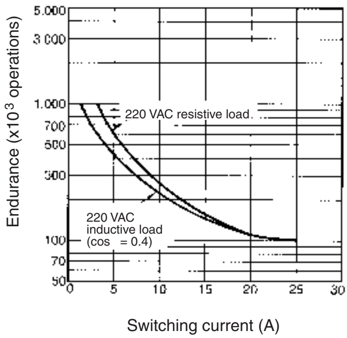


G7L-2A-T/G7L-2A-B

Maximum Switching Power

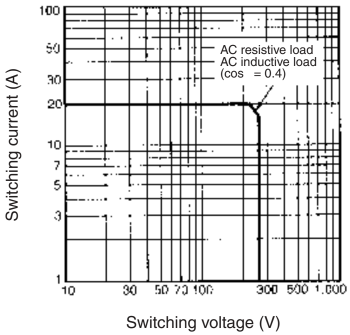


Endurance

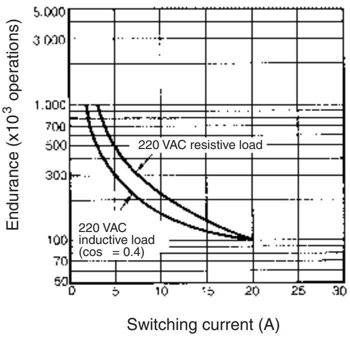


Engineering Data

G7L-1A-P/G7L-2A-P
Maximum Switching Power



Endurance

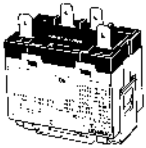


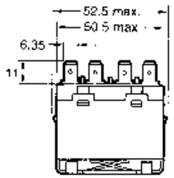
Dimensions

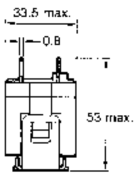
Note: 1. All units are in millimeters unless otherwise indicated.
2. E-brackets are sold separately.

■ Quick-connect Terminals with E-bracket

G7L-1A-T



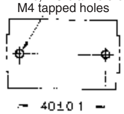




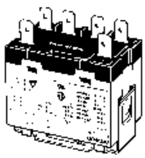
Terminal Arrangement/ Internal Connections (Top View)

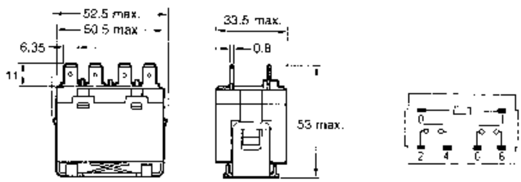
Mounting Holes

Two, 4.5-dia. hole or M4 tapped holes

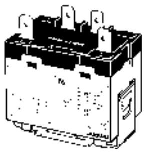


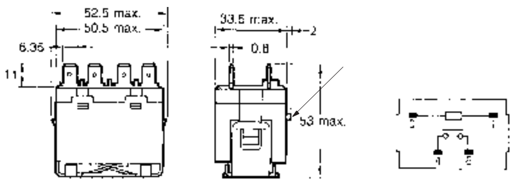
G7L-2A-T





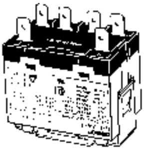
G7L-1A-TJ with Test Button

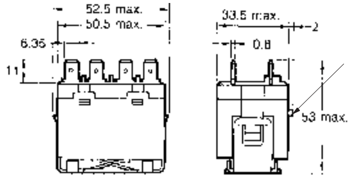




■ Quick-connect Terminals with E-bracket (contd)

G7L-2A-TJ
with Test Button



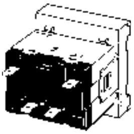


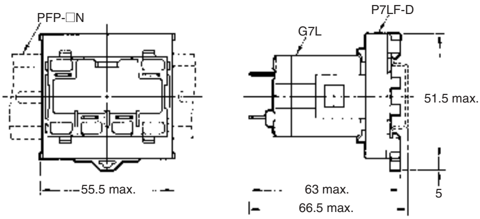
■ Quick-connect Terminals with DIN Track Mounting Adapter

Note: 1. The DIN Track Mounting Adapter and DIN tracks are sold separately.

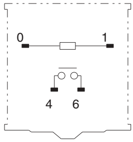
2. The DIN Track Mounting Adapter can be track-mounted or screw-mounted.

G7L-1A-T

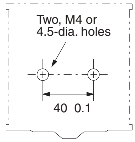




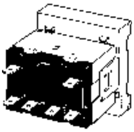
Terminal Arrangement/ Internal Connections (Top View)

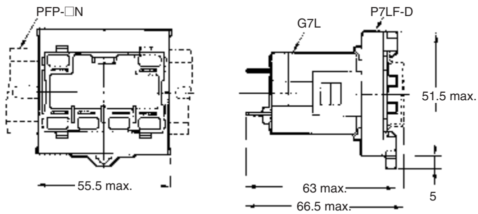


Mounting Holes

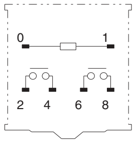


G7L-2A-T

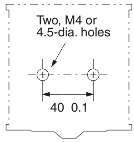




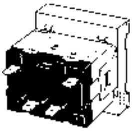
Terminal Arrangement/ Internal Connections (Top View)

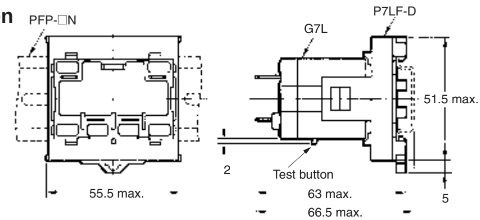


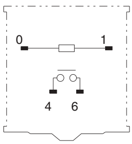
Mounting Holes



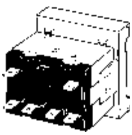
G7L-1A-TJ
with Test Button

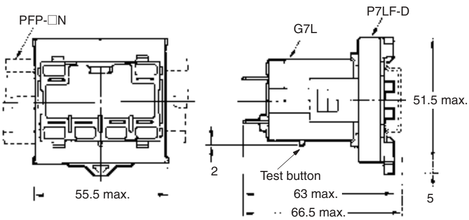


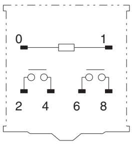




G7L-2A-TJ
with Test Button



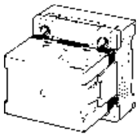
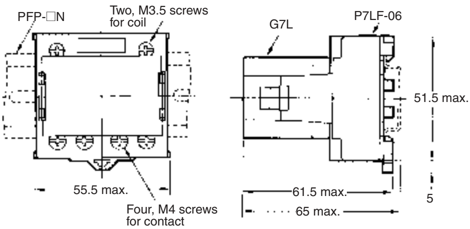




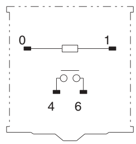
■ Quick-connect Terminals with Front-connecting Socket

Note: 1. The Front-connecting Socket and DIN tracks are sold separately.
2. The Front-connecting Socket can be track-mounted or screw-mounted.

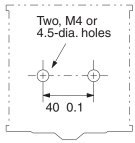
G7L-1A-T

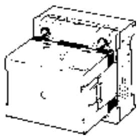
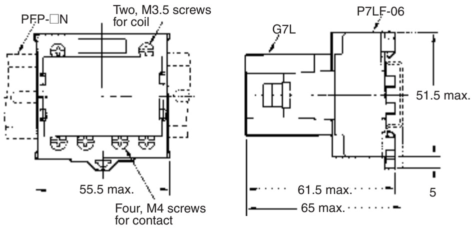
Terminal Arrangement/ Internal Connections (Top View)

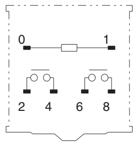


Mounting Holes

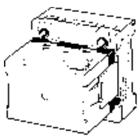
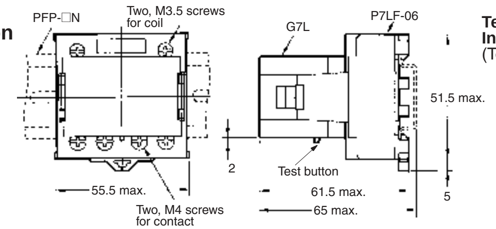


G7L-2A-T

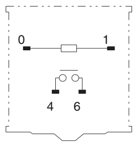





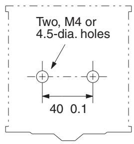
G7L-1A-TJ with Test Button

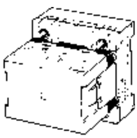
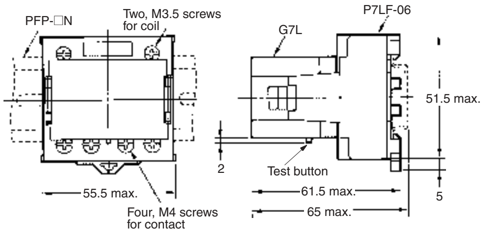
Terminal Arrangement/ Internal Connections (Top View)

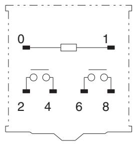


Mounting Holes



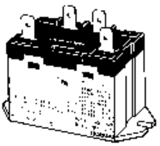
G7L-2A-TJ with Test Button

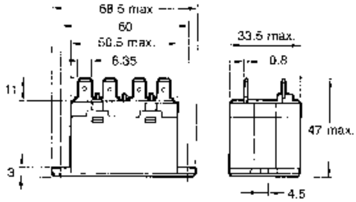





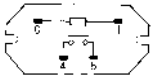
■ Quick-connect Terminals with Upper Bracket

G7L-1A-TUB



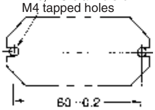


Terminal Arrangement/ Internal Connections (Top View)

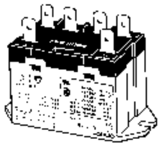


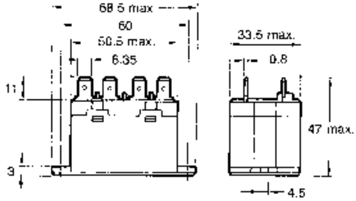
Mounting Holes

Two, 4.5-dia. hole or M4 tapped holes

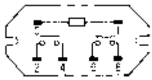


G7L-2A-TUB

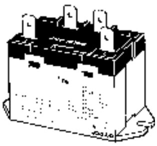


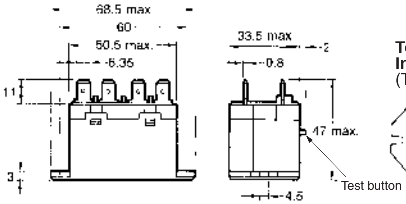


Terminal Arrangement/ Internal Connections (Top View)

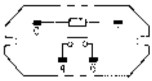


G7L-1A-TUBJ with Test Button

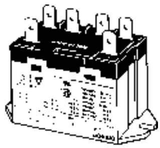


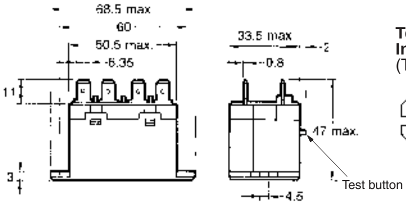


Terminal Arrangement/ Internal Connections (Top View)

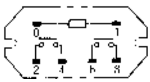


G7L-2A-TUBJ with Test Button



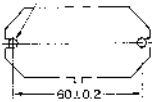


Terminal Arrangement/ Internal Connections (Top View)



Mounting Holes

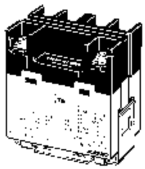
Two, 4.5-dia. hole or M4 tapped holes

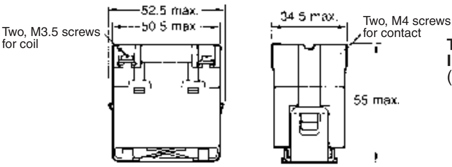


■ Screw Terminals with E-bracket

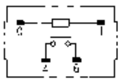
Note: E-brackets are sold separately.

G7L-1A-B



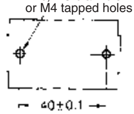


Terminal Arrangement/ Internal Connections (Top View)



Mounting Holes

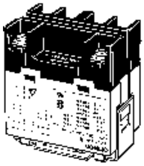
Two, 4.5-dia. hole or M4 tapped holes

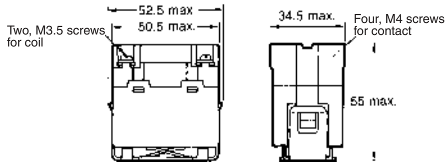


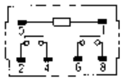
■ Screw Terminals with E-bracket (contd)

E-brackets are sold separately.

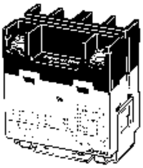
G7L-2A-B

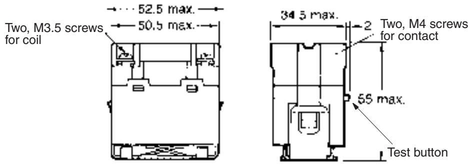


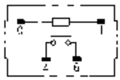




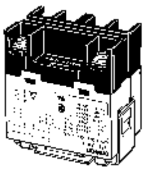
G7L-1A-BJ with Test Button

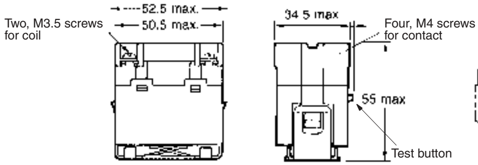


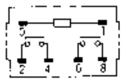




G7L-2A-BJ with Test Button



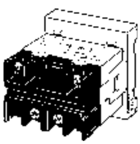


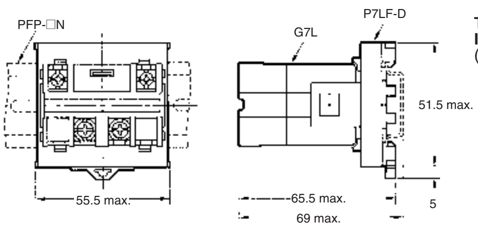


■ Screw Terminals with DIN Track Mounting Adapter

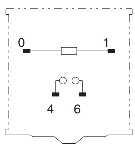
Note: 1. The DIN Track Mounting Adapter and DIN tracks are sold separately.
2. The DIN Track Mounting Adapter can be track-mounted or screw-mounted.

G7L-1A-B

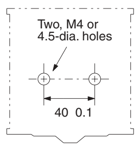




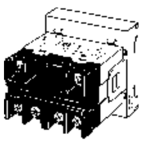
Terminal Arrangement/ Internal Connections (Top View)

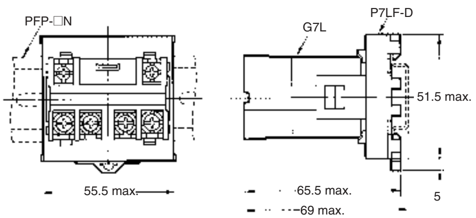


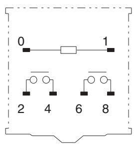
Mounting Holes



G7L-2A-B



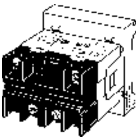


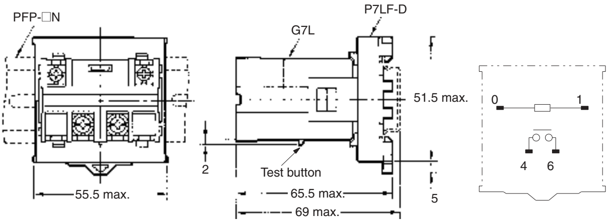


■ Screw Terminals with DIN Track Mounting Adapter (contd)

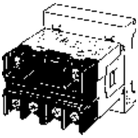
Note: 1. The DIN Track Mounting Adapter and DIN tracks are sold separately.
2. The DIN Track Mounting Adapter can be track-mounted or screw-mounted.

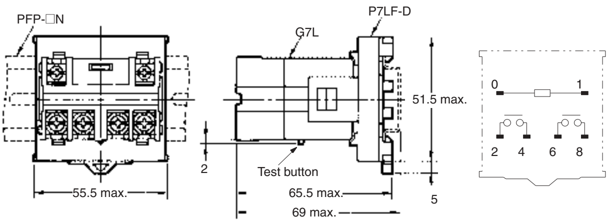
G7L-1A-BJ with Test Button





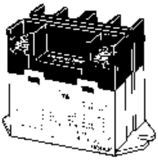
G7L-2A-BJ with Test Button

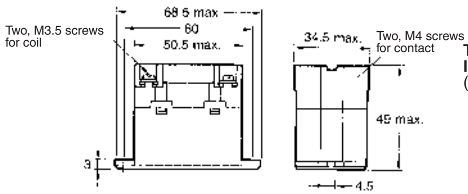




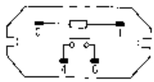
■ Screw Terminals with Upper Bracket

G7L-1A-BUB

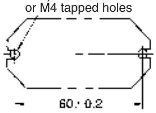




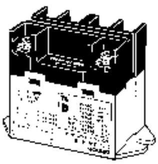
Terminal Arrangement/ Internal Connections (Top View)

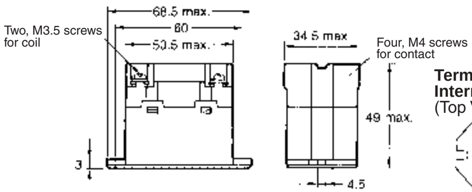


Mounting Holes

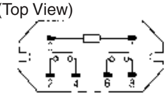


G7L-2A-BUB

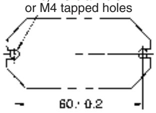




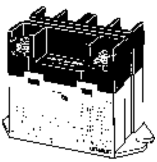
Terminal Arrangement/ Internal Connections (Top View)

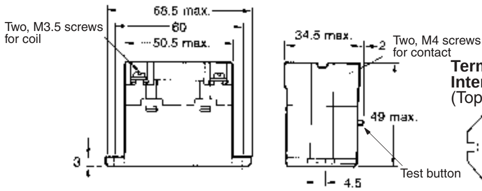


Mounting Holes

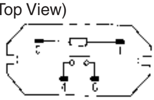


G7L-1A-BUBJ with Test Button



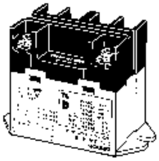


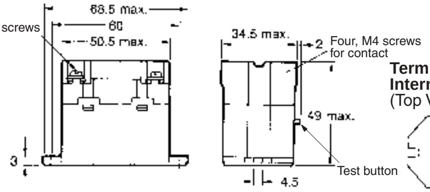
Terminal Arrangement/ Internal Connections (Top View)



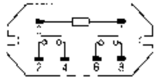
Screen Terminals with Upper Bracket (contd)

G7L-2A-BUBJ with Test Button



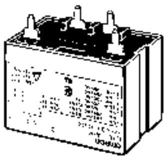


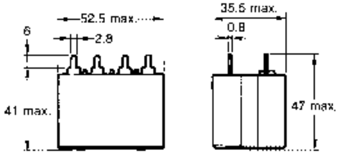
Terminal Arrangement/ Internal Connections
(Top View)



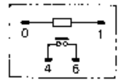
PCB Terminals with PCB Mounting

G7L-1A-P

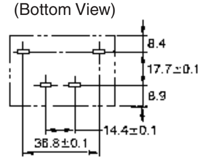




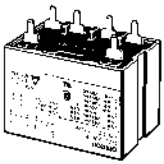
Terminal Arrangement/ Internal Connections
(Top View)

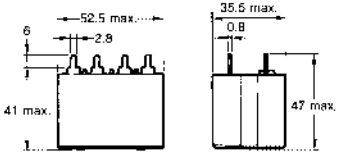


Mounting Holes
(Bottom View)

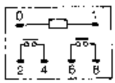


G7L-2A-P

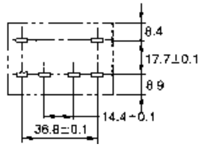




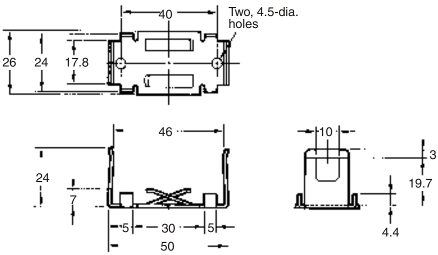
Terminal Arrangement/ Internal Connections
(Top View)



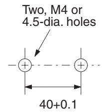
Mounting Holes
(Bottom View)



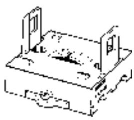
R99-07G5D E-bracket

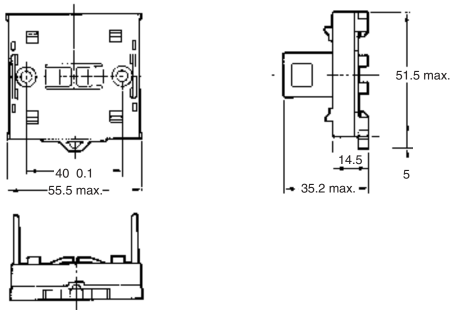


Mounting Holes
(Bottom View)

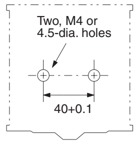


P7LF-D Adapter



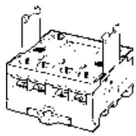


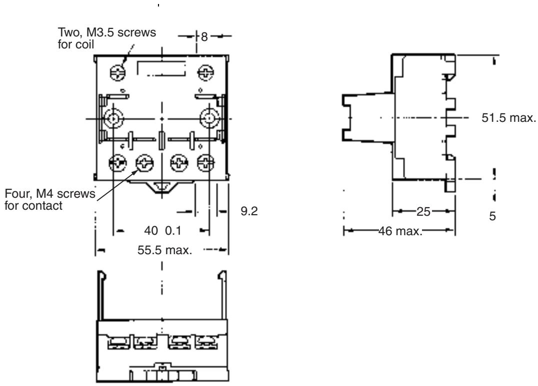
Mounting Holes
(Bottom View)



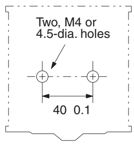
PCB Terminals with PCB Mounting (contd)

P7LF-06
Front-connecting Socket

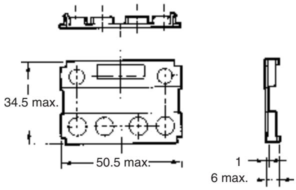




Mounting Holes
(Bottom View)



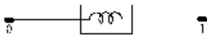
P7LF-C Cover



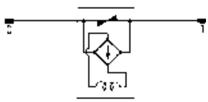
Put the P7LF-C cover onto the terminals in order to protect the user from electric shock.

Internal Coil Circuit

DC Operating Coil



AC Operating Coil



Precautions

HANDLING

- To preserve performance, do not drop or otherwise subject the Power Relay to shock.
- The case is not designed to be removed during normal handling and operation. Doing so may affect performance.
- Use the Power Relay in a dry environment free from excessive dust, SO_2, H_2S, or organic gas.
- Do not allow a voltage greater than the maximum allowable coil voltage to be applied continuously.
- Do not use the Power Relay outside of specified voltages and currents.
- Do not allow the ambient operating temperature to exceed the specified limit.

INSTALLATION

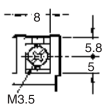
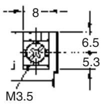
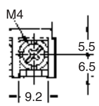
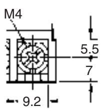
- Although there are not specific limits on the installation site, it should be as dry and dust-free as possible.
- PCB Terminal-equipped Relays weigh approximately 100 g. Be sure that the PCB is strong enough to support them. We recommend dual-side through-hole PCBs to reduce solder cracking from heat stress.
- Quick-connect terminals can be connected to Faston receptacle #250 and positive-lock connectors.
- Allow suitable slack on leads when wiring, and do not subject the terminals to excessive force.
- G7L Relays with test buttons must be mounted facing down.
- Be careful not to touch the test button accidentally. Doing so may turn ON the contact.
- Use the test button only to check the electrical conductivity. Do not switch the load directly by pushing the test button.

CLEANING PCB TERMINALS

- PCB terminals have flux-tight construction which prevents flux from penetrating into the Relay base housing, e.g., due to capillary action up the terminals when Relay is soldered onto the PCB. This type of Relay cannot be immersed for cleaning.

CONNECTING

- Refer to the following table when connecting a wire with a crimp-style terminal to the G7L.

Terminals	Screw terminals	Front-connecting Socket
Coil		
Contact		

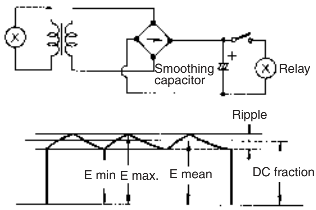
RATED CURRENT FLOW

- When using B-series (screw) products, the rated current from the screw terminals (M4) should be 20 A or less according to jet standard (electrical appliance and material control law of Japan).

OPERATING COIL

- As a rule, either a DC battery or a DC power supply with a maximum of 5% ripple must be used for the operating voltage for DC Relays. Before using a rectified AC supply, confirm that the ripple is not greater than 5%. Ripple greater than this can lead to variations in the operating and reset voltages.

  As excessive ripple can generate pulses, the insertion of a smoothing capacitor is recommended as shown below.



$$\% \text{ of ripple} = \frac{E\ max. - E\ min.}{E\ mean} \times 100$$

E max.: Max. ripple
E min.: Min. ripple
E mean: Mean DC value

- When driving a transistor, check the leakage current and connect a bleeder resistor if necessary.

DIN TRACK MOUNTING ADAPTER AND FRONT-CONNECTING SOCKET

DIN Track Mounting

- Use a DIN-conforming 50-cm track or 1-m track (both are sold separately) for mounting a number of G7L Relays.
- Cut and shorten the track to an appropriate length if the required track length is less than 50 cm.
- The DIN Track Mounting Adapter and Front-connecting Socket can be mounted on the G7L with just one hand and dismounted with ease by using a screwdriver.
- To support the G7L mounted on a DIN Track Mounting Adapter or Front-connecting Socket, use the PFP-M End Plate. Put the End Plate onto the DIN Track Mounting Adapter or Front-connecting Socket so that the surface mark of the End Plate faces upwards. Then tighten the screw of the End Plate securely with a screwdriver.

Screw Mounting

- Screw-mount the DIN Track Mounting Adapter or Front-connecting Socket securely after opening screw mounting holes on them.
- When cutting or opening holes on the panel after the Front-connecting Socket is mounted, take proper measures so that the cutting chips will not fall onto the Relay terminals. When cutting or opening holes on the upper part of the panel, mask the Front-connecting Socket properly with a cover.

A High-capacity, High-dielectric-strength, Multi-pole Relay Used Like a Contactor

- Miniature hinge for maximum switching power for motor loads as well as resistive and inductive loads.
- No contact chattering for momentary voltage drops up to 50% of rated voltage.
- Withstanding more than 4 kV between contacts that are different in polarity and between the coil and contacts.
- Flame-resistant materials (UL94V-0-qualifying) used for all insulation material..
- Standard models approved by UL and CSA.

Ordering Information

Mounting type	Contact form	PCB terminals	Screw terminals	Quick-connect terminals
PCB mounting	4PST-NO	G7J-4A-P, G7J-4A-PZ	–	–
	3PST-NO/SPST-NC	G7J-3A1B-P, G7J-3A1B-PZ	–	–
	DPST-NO/DPST-NC	G7J-2A2B-P	–	–
W-bracket (See Note)	4PST-NO	–	G7J-4A-B, G7J-4A-BZ	G7J-4A-T, G7J-4A-TZ
	3PST-NO/SPST-NC	–	G7J-3A1B-B, G7J-3A1B-BZ	G7J-3A1B-T, G7J-3A1B-TZ
	DPST-NO/DPST-NC	–	G7J-2A2B-B	G7J-2A2B-T

Note: These Relays need a W-bracket (sold separately) for mounting.
When ordering specify the voltage.
Example: G7J-4A-P 240 VAC
Rated coil voltage

Model Number Legend

G7J -□ -□ -□
1 2 3

1. Contact Form
4A: 4PST-NO
3A1B: 3PST-NO/SPST-NC
2A2B: DPST-NO/DPST-NC

2. Terminal Shape
P: PCB terminals
B: Screw terminals
T: Quick-connect terminals (#250 terminal)

3. Contact Structure
Z: Bifurcated contact
None: Single contact

Note: For bifurcated contact type, output is 1NO (4PST-NO) or 1NC (3PST-NO/SPST-NC).

PCB Terminals

Contact form	Rated voltage (V)	Model
4PST-NO	24, 50, 100 to 120, 200 to 240 VAC	G7J-4A-P
	12, 24, 48, 100 VDC	
3PST-NO/ SPST-NC	24, 50, 100 to 120, 200 to 240 VAC	G7J-3A1B-P
	12, 24, 48, 100 VDC	
DPST-NO/DPST-NC	24, 50, 100 to 120, 200 to 240 VAC	G7J-2A2B-P
	12, 24, VDC	

PCB Terminals (Bifurcated Contact)

Contact Form	Rated voltage (V)	Model
4PST-NO	200 to 240 VAC 24 VDC	G7J-4A-PZ
3PST-NO/ SPST-NC	12, 24 VDC	G7J-3A1B-PZ

W-bracket Screw Terminals

Contact form	Rated voltage(V)	Model
4PST-NO	24, 50, 100 to 120, 200 to 240 VAC	G7J-4A-B
	12, 24 VDC	
3PST-NO/ SPST-NC	24, 50, 100 to 120, 200 to 240 VAC	G7J-3A1B-B
	12, 24 VDC	
DPST-NO/DPST-NC	24, 50, 100 to 120, 200 to 240 VA.C	G7J-2A2B-B
	12, 24, VDC	

Tab Terminals

Contact form	Rated voltage(V)	Model
4PST-NO	24, 50, 100 to 120, 200 to 240 VAC	G7J-4A-T
	12, 24 VDC	
3PST-NO/ SPST-NC	24, 50, 100 to 120, 200 to 240 VAC	G7J-3A1B-B
	12, 24 VDC	
DPST-NO/ DPST-NC	24, 50, 100 to 120, 200 to 240 VA.C	G7J-2A2B-B
	12, 24, VDC	

Screw Terminals (Bifurcated Contact)

Name	Rated voltage (V)	Model
4PST-NO	Under registration	G7J-4A-B
3PST-NO/ SPST-NC	24, 50, 100 to 120, 200 to 240 VAC	G7J-3A1B-BZ
	6, 12, 24, 48, 100, 110 VDC	

Tab Terminals (Bifurcated Contact)

Contact form	Rated voltage (V)	Model
4PST-NO	100 to 120, 200 to 240 VAC	G7J-4A-TZ
3PST-NO/ SPST-NC	Under registration	G7J-3A1B-TZ

■ Accessories (Order Separately)

Name	Model	Applicable Relay
W-bracket	R99-04 for G5F	G7J-4A-B G7J-3A1B-B G7J-2A2B-B G7J-4A-T G7J-3A1B-T G7J-2A2B-T

Application Examples

- Compressors for air conditioners and heater switching controllers.
- Switching controllers for power tools or motors.
- Lamp controls, motor drivers, and power supply switching controllers in copy machines, facsimile machines, and other office equipment.
- Power controllers for packers or food processing equipment.
- Power controllers for inverters.

Specifications

■ Coil Ratings

Rated voltage		Rated current voltage	Coil Resistance	Must operate voltage	Must release voltage	Max. voltage	Power consumption
AC	**24 VAC**	75 mA	–	75% max. of rated voltage	15% min. of rated voltage	110% of rated voltage	Approx. 1.8 to 2.6 VA
	50 VAC	36 mA	–				
	100 to 120 VAC	18 to 21.6 mA	–				
	200 to 240 VAC	9 to 10.8 mA	–				
DC	**6 VDC**	333 mA	18 Ω		10% min. of rated voltage		Approx. 2.0 W
	12 VDC	167 mA	72 Ω				
	24 VDC	83 mA	288 Ω				
	48 VDC	42 mA	1,150 Ω				
	100 VDC	20 mA	5,000 Ω				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/–20% for AC rated current and ±15% for DC coil resistance. (The values given for AC rated current apply at 50 Hz or 60 Hz.)

2. Performance characteristic data are measured at a coil temperature of 23°C.

3. The maximum voltage is one that is applicable to the Relay coil at 23°C.

Contact Ratings

Item	Resistive load (cos ø = 1)	Inductive load (cosø = 0.4)	Resistive load
Contact mechanism	Double break		
Contact material	Ag alloy		
Rated load	NO: 25 A at 220 VAC (24 A at 230 VAC) NC: 8 A at 220 VAC (7.5 A at 230 VAC)		NO: 25 A at 30 VDC NC: 8 A at 30 VDC
Rated carry current	NO: 25 A (1 A) NC: 8 A (1 A)		
Max. switching voltage	250 VAC		125 VDC
Max. switching current	NO: 25 A (1 A) NC: 8 A (1 A)		

Note: The values in parentheses indicate values for a bifurcated contact.

Characteristics

Contact resistance (see note 2)	50 mΩ max.
Operate time (see note 3)	50 ms max.
Release time (see note 3)	50 ms max.
Max. operating frequency	Mechanical: 1,800 operations/hr Electrical: 1,800 operations/hr
Insulation resistance (see note 4)	1,000 MΩ min. (at 500 VDC)
Dielectric strength	4,000 VAC, 50/60 Hz for 1 min between coil and contacts 4,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 2,000 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	10,000 V between coil and contact (with 1.2 x 50 μs impulse wave)
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude) Malfunction: NO: 10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude); NC: 10 to 26 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: NO: 100 m/s^2 NC: 20 m/s^2
Endurance	Mechanical: 1,000,000 operations min. (at 1,800 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr) (see note 5)
Error rate (see note 6)	100 mA at 24 VDC (bifurcated contact: 24 VDC 10 mA)
Ambient temperature	Operating: –25°C to 60°C (with no icing or condensation)
Ambient humidity	Operating: 5% to 85%
Weight	PCB terminal: approx. 140 g Screw terminal: approx. 165 g Quick-connect terminal: approx. 140 g

Note:
1. The above values are all initial values.
2. The contact resistance was measured with 1 A at 5 VDC using the voltage drop method.
3. The operate and the release times were measured with the rated voltage imposed with any contact bounce ignored at an ambient temperature of 23°C.
4. The insulation resistance was measured with a 500-VDC megger applied to the same places as those used for checking the dielectric strength.
5. The electrical endurance was measured at an ambient temperature of 23°C.
6. This value was measured at a switching frequency of 60 operations per minute.

■ Approved by Standards

The G7J satisfies the following international standards. Approval for some international markings and symbols are still pending, however, and information on them will be added when they are approved.

UL (File No. E41643)
CSA (File No. LR35535)

Coil ratings	Contact ratings		Number of test operations
24 to 265 VAC 6 to 110 VDC	NO contact	25 A 277 VAC, Resistive	30,000
		25 A 120 VAC, General Use	
		25 A 277 VAC, General Use	
		1.5 kW 120 VAC, Tungsten	6,000
		1.5 hp 120 VAC	
		3 hp 240/265/277 VAC	
		3-phase 3 hp 240/265/277 VAC	
		3-phase 5 hp 240/265/277 VAC	30,000
		20FLA/120LRA 120 VAC	
		17FLA/102LRA 277 VAC	
		TV-10 120 VAC	25,000
		25 A 30 VDC, Resistive	30,000
		1 A 277 VAC, General Use	6,000
	NC contact	8 A 277 VAC, Resistive	30,000
		8 A 120 VAC, General Use	
		8 A 277 VAC, General Use	
		8 A 30 VDC, Resistive	
		1 A 277 VAC, General Use	6,000

Reference

UL approval: UL508 for industrial control devices
UL1950 for information processing equipment including business machines
CSA approval: CSA C22.2 No. 14 for industrial control devices
CSA C22.2 No. 950 for information processing equipment including business machines

VDE (File No. 5381UG)

Model	Coil ratings	Contact ratings	
		NO contact	NC contact
G7J-4A-B(P) (T) (Z) G7J-2A2B(P) (T) G7J-3A1B-B(P) (T) (Z)	6, 12, 24, 48, 100 VDC 24, 50, 100 to 120, 200 to 240 VAC	25 A 240 VAC cosø= 0.4 25 A 240 VAC cosø = 1 25 A 30 VDC L/R ≥ 1 *1 A 240 VAC cosø = 0.4	8 A 240 VAC cosø = 0.4) 8 A 240 VAC cosø = 1 8 A 30 VDC L/R ≥ 1 *1 A 240 VAC cosø = 0.4

Note: Add the suffix “-KM” to the model number when ordering.
*These ratings are bifurcated contact ratings.

Reference

VDE approval: VDE0435 for electromagnetic relays
IEC255 for relays

KEMA (File No. 97.9140.01)

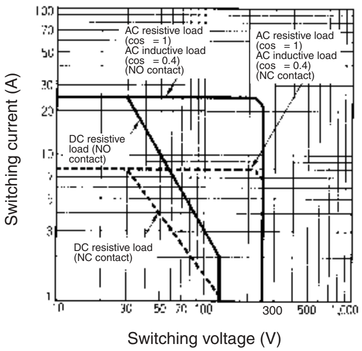
Model	Coil ratings	Contact ratings
		NO contact
G7J-4A-B(P) (T) (Z) G7J-2A2B(P) (T) G7J-3A1B-B(P) (T) (Z)	6, 12, 24, 48, 100 VDC 24, 50, 100 to 120, 200 to 240 VAC	Class AC1: 25 A at 220 VAC 11.5 A at 380 to 480 VAC Class AC3: 11.5 A at 220 VAC and 8.5 A at 380 to 480 VAC Class AC 1 : 1 A at 220 VAC

Note: Add the suffix "-KM" to the model number when ordering.
*This rating is the bifurcated contact ratings.

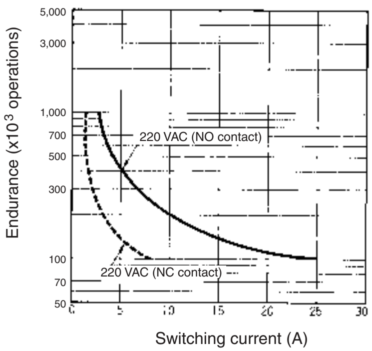
Reference
KEMA approval: EN60947-4-1 for contacts
IEC947-4-1 for contacts

Engineering Data

Maximum Switching Power

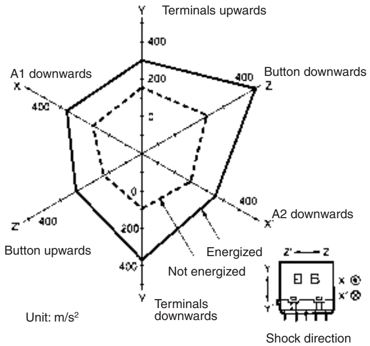


Endurance



Malfunctioning Shock

G7J-2A2B



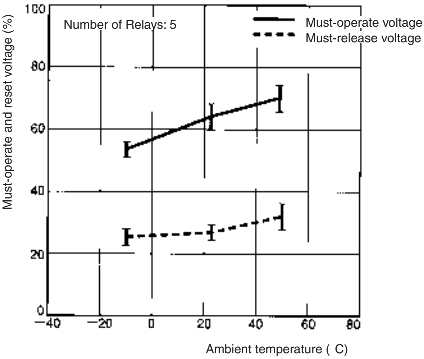
Number of samples: 5

Measurement conditions: Increase and decrease the specified shock gradually imposed in X, Y, and Z directions three times each with the Relay energized and not energized to check the shock values that cause the Relay to malfunction.

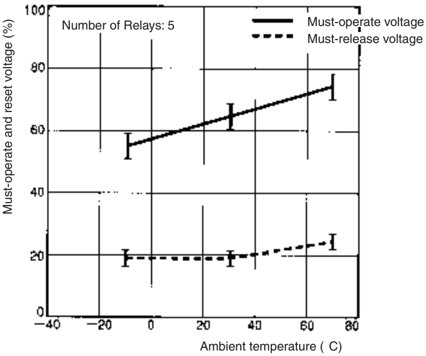
Criteria: There must not be any contact separation for 1 ms or greater with a shock of 100 m/s² imposed when the coil is energized or with a shock of 20 m/s² when the coil is not energized.

Ambient Temperature vs. Must-operate and Must-release Voltage

G7J 100 to 120 VAC

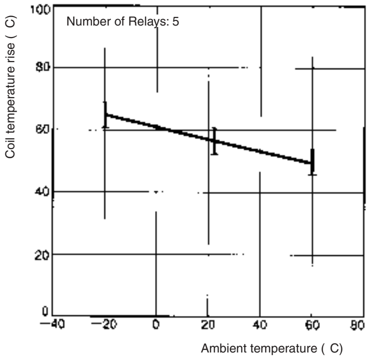


G7J 24 VDC

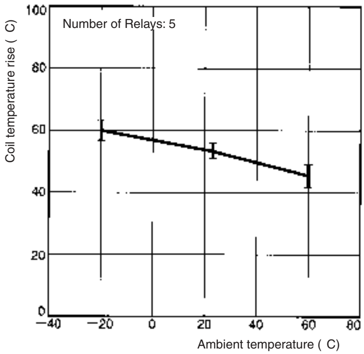


Ambient Temperature vs. Coil Temperature Rise

G7J-4A 100 to 120 VAC



G7J-4A 24 VDC



Motor Load

Item	G7J-4A-P, G7J-3A1B-P, G7J-4A-B, G7J-3A1B-B, G7J-4A-T, G7J-3A1B-T
Load	3ø, 220 VAC, 2.7 kW (with a inrush current of 78 A and a breaking current of 13 A)
Endurance	Electrical: 100,000 operations min.

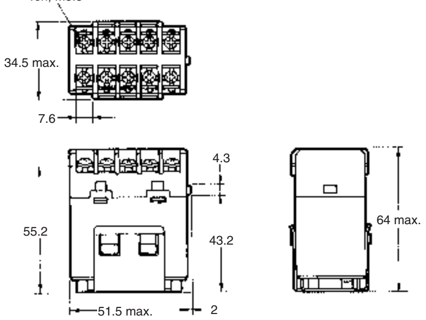
General Purpose Relays

Dimensions

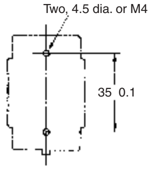
Note: All units are in millimeters unless otherwise indicated.

Screw Terminals with W-bracket

G7J-4A-B, G7J-4A-BZ, G7J-3A1B-B, G7J-3A1B-BZ, G7J-2A2B-B

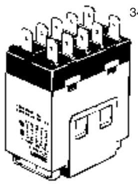


Mounting Holes

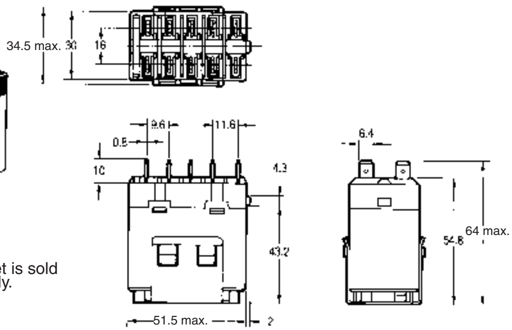


Quick-connect Terminals with W-bracket

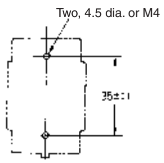
G7J-4A-T, G7J-4A-TZ, G7J-3A1B-T, G7J-3A1B-TZ, G7J-2A2B-T



Note: W-bracket is sold separately.

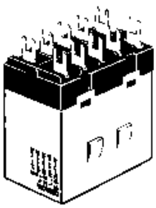


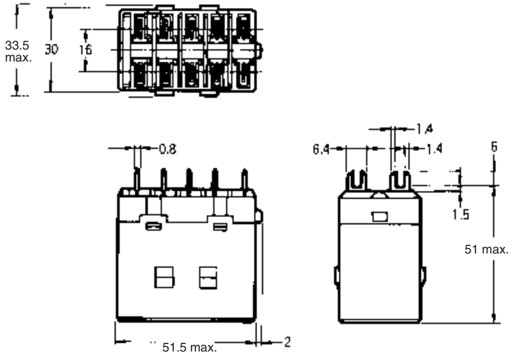
Mounting Holes



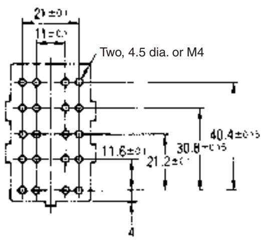
PCB Terminals with PCB Mounting

G7J-4A-P, G7J-4A-PZ, G7J-3A1B-P, G7J-3A1B-PZ, G7J-2A2B-P



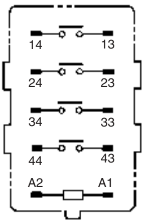


Mounting Dimensions

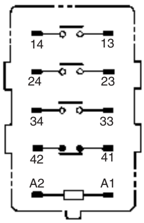


Terminal Arrangement/Internal Connections

G7J-4A-P(B) (T) (Z)

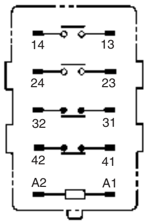


G7J-3A1B-P(B) (T) (Z)



The coil has no polarity.

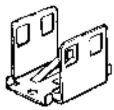
G7J-2A2B-P(B) (T)

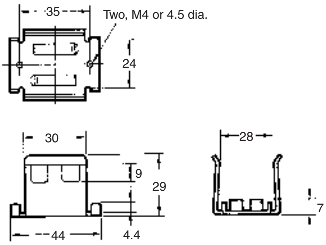


Note: Terminals 43 and 44 of the G7J-4A-P(B)(T)(Z) and contacts 41 and 42 of the G7J-3A1B-P(B)(T)(Z) are bifurcated contacts.

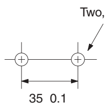
Accessories (Order Separately)

R99-04 W-bracket (for G5F)





Mounting Holes



Precautions

Installation

PCB Terminal-equipped Relays weigh approximately 140 g. Be sure that the PCB is strong enough to support them. We recommend dual-side through-hole PCBs to reduce solder cracking from heat stress.

Mount the G7J with its test button facing downwards. The Relay may malfunction due to shock if the test button faces upwards. Be careful not to press the test button by mistake because the contacts will go ON if the test button is pressed.

Be sure to use the test button for test purposes only.

The test button is used for Relay circuit tests, such as a circuit continuity test. Do not attempt to switch the load with the test button.

Minute Loads

The G7J is used for switching power loads, such as motor, transformer, solenoid, lamp, and heater loads. Do not use the G7J for switching minute loads, such as signals. Use a Relay with a bifurcated contact construction for switching minute loads, in which case, however, only SPST-NO or SPST-NC output is obtained.

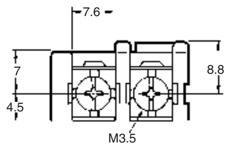
Soldering PCB Terminals

Be sure to solder the PCB terminals manually only. In the case of automatic soldering, some flux may stick to the test button and the G7J. As a result, the G7J may malfunction.

The G7J is not of enclosed construction. Therefore, do not wash the G7J with water or any detergent.

Connecting

Refer to the following diagram when connecting a wire with a screw terminal to the G7J.



Allow suitable slack on leads when wiring, and do not subject the terminals to excessive force.

Tightening torque: 0.98 N • m

Do not impose excessive external force on the G7J in the horizontal or vertical directions when inserting the G7J to the Faston receptacle or pulling the G7J out from the Faston receptacle. Do not attempt to insert or pull out more than one G7J Unit together.

Do not solder the tab terminals.

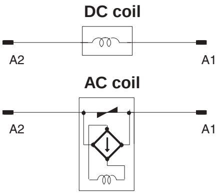
Terminal	Receptacle	Housing
#250 terminal (6.35 mm in width)	AMP170333-1 (170327-1) AMP170334-1 (170328-1) AMP170335-1 (170329-1)	AMP172076-1: natural AMP172076-4: yellow AMP172076-5: green AMP172076-6: blue

Note: Numbers in parentheses are for air feed use.

General Purpose Relays

OPERATING COIL

Internal Connections of Coils



If a transistor drives the G7J, check the leakage current, and connect a bleeder resistor if necessary.

The AC coil is provided with a built-in full-wave rectifier. If a triac, such as an SSR, drives the G7J, the G7J may not release. Be sure to perform a trial operation with the G7J and the triac before applying them to actual use.

Slim Relays with Forcibly Guided Contacts Conforming to EN Standards

- EN50205 Class A, approved by VDE.
- Ideal for use in safety circuits in production machinery.
- Four-pole and six-pole Relays are available.
- The Relay's terminal arrangement simplifies PWB pattern design.
- Reinforced insulation between inputs and outputs. Reinforced insulation between some poles.
- UL, CSA approval.
- CE marking.

Ordering Information

Relays with Forcibly Guided Contacts

Type	Sealing	Poles	Contacts	Rated voltage	Model
Standard	Flux-tight	4 poles	3PST-NO, SPST-NC	24 VDC	G7SA-3A1B
			DPST-NO, DPST-NC		G7SA-2A2B
		6 poles	5PST-NO, SPST-NC		G7SA-5A1B
			4PST-NO, DPST-NC		G7SA-4A2B
			3PST-NO, 3PST-NC		G7SA-3A3B

Sockets

Type		LED indicator	Poles	Rated voltage	Model
Track-mounting	Track mounting and screw mounting possible	No	4 poles	---	P7SA-10F
			6 poles		P7SA-14F
		Yes	4 poles	24 VDC	P7SA-10F-ND
			6 poles		P7SA-14F-ND
Back-mounting	PCB terminals	No	4 poles	---	P7SA-10P
			6 poles		P7SA-14P

Model Number Legend

G7SA-□A□B

1 2

1. NO Contact Poles

2: DPST-NO
3: 3PST-NO
4: 4PST-NO
5: 5PST-NO

2. NC Contact Poles

1: SPST-NC
2: DPST-NC
3: 3PST-NC

Ratings

■ Coil

Rated voltage	Rated current	Coil resistance	Must-operate voltage	Must-release voltage	Max. voltage	Power consumption
24 VDC	4 poles: 15 mA 6 poles: 20.8 mA	4 poles: 1,600 Ω 6 poles: 1,152 Ω	75% max. (V)	10% min. (V)	110% (V)	4 poles: Approx. 360 mW 6 poles: Approx. 500 mW

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of ±15%.
2. Performance characteristics are based on a coil temperature of 23°C.
3. The value given for the maximum voltage is for voltages applied instantaneously to the Relay coil (at an ambient temperature of 23°C) and not continuously.

■ Contacts

Load	Resistive load (cos ϕ =1)
Rated load	6 A at 250 VAC, 6 A at 30 VDC
Rated carry current	6 A
Max. switching voltage	250 VAC, 125 VDC
Max. switching current	6 A
Max. switching capacity (reference value)	1,500 VA, 180 W

Characteristics

■ Sockets

Model	Continuous current	Dielectric strength	Insulation resistance
P7SA-14□	6 A (see note 1)	2,500 VAC for 1 min. between poles	100 MΩ min. (see note 2)

Note: 1. If the P7SA-1□F is used between 55 and 85°C, reduce the continuous current (from 6 A) by 0.1 A for every degree.
2. Measurement conditions: Measurement of the same points as for the dielectric strength at 500 VDC.
3. When using the P7SA-1□F-ND at 24 VDC, use at an ambient operating temperature from –25 to 55°C.

■ Relays with Forcibly Guided Contacts

Contact resistance		100 mΩ max. (The contact resistance was measured with 1 A at 5 VDC using the voltage-drop method.)
Operating time (see note 2)		20 ms max.
Response time (see note 2)		10 ms max. (The response time is the time it takes for the normally open contacts to open after the coil voltage is turned OFF.)
Release time (see note 2)		20 ms max.
Maximum operating frequency	Mechanical	36,000 operations/hr
	Rated load	1,800 operations/hr
Insulation resistance		100 MΩ min. (at 500 VDC) (The insulation resistance was measured with a 500-VDC megger at the same places that the dielectric strength was measured.)
Dielectric strength (see notes 3, 4)		Between coil contacts/different poles: 4,000 VAC, 50/60 Hz for 1 min (2,500 VAC between poles 3–4 in 4-pole Relays or poles 3–5, 4–6, and 5–6 in 6-pole Relays.) Between contacts of same polarity: 1,500 VAC, 50/60 Hz for 1 min
Vibration resistance		10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Destruction	1,000 m/s^2
	Malfunction	100 m/s^2
Durability	Mechanical	10,000,000 operations min. (at approx. 36,000 operations/hr)
	Electrical	100,000 operations min. (at the rated load and approx. 1,800 operations/hr)
Min. permissible load (see note 5) (reference value)		5 VDC, 1 mA
Ambient temperature (see note 6)		Operating: –40°C to 85°C (with no icing or condensation) Storage: –40°C to 85°C (with no icing or condensation)

Ambient humidity	Operating: 35% to 85% Storage: 35% to 85%
Weight	4 poles: Approx. 22 g 6 poles: Approx. 25 g
Approved standards	EN61810-1 (IEC61810-1), EN50205, UL508, CSA22.2 No. 14

Note: 1. The values listed above are initial values.

2. These times were measured at the rated voltage and an ambient temperature of 23°C. Contact bounce time is not included.

3. Pole 3 refers to terminals 31–32 or 33–34, pole 4 refers to terminals 43–44, pole 5 refers to terminals 53–54, and pole 6 refers to terminals 63–64.

4. When using a P7SA Socket, the dielectric strength between coil contacts/different poles is 2,500 VAC, 50/60 Hz for 1 min.

5. Min. permissible load is for a switching frequency of 300 operations/min.

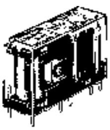
6. When operating at a temperature between 70°C and 85°C, reduce the rated carry current (6 A at 70°C or less) by 0.1 A for each degree above 70°C.

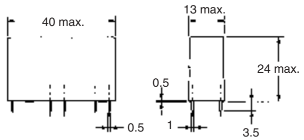
Dimensions

Note: All units are in millimeters unless otherwise indicated.

■ Relays with Forcibly Guided Contacts

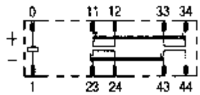
G7SA-3A1B
G7SA-2A2B



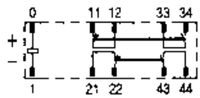


Terminal Arrangement/ Internal Connection Diagram (Bottom View)

G7SA-3A1B

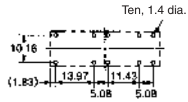


G7SA-2A2B



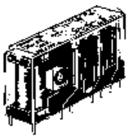
Printed Circuit Board Design Diagram (Bottom View)

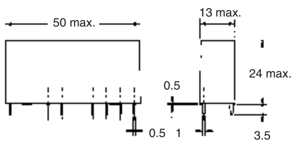
(0.1 tolerance)



Note: Terminals 23-24, 33-34, and 43-44 are normally open. Terminals 11-12 and 21-22 are normally closed.

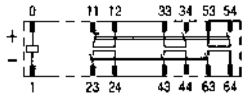
G7SA-5A1B
G7SA-4A2B
G7SA-3A3B





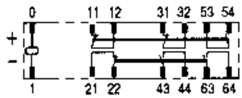
Terminal Arrangement/ Internal Connection Diagram (Bottom View)

G7SA-5A1B



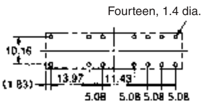
G7SA-4A2B

G7SA-3A3B



Printed Circuit Board Design Diagram (Bottom View)

(0.1 tolerance)

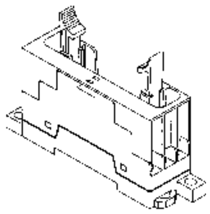


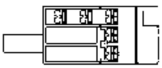
Note: Terminals 23-24, 33-34, 53-54, and 63-64 are normally open. Terminals 11-12, 21-22, and 31-32 are normally closed.

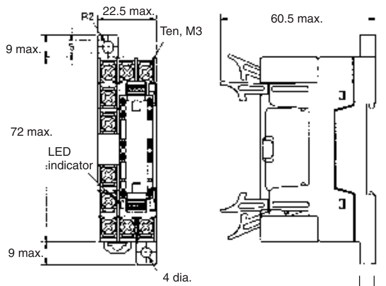
■ Sockets

Track-mounting Socket

P7SA-10F, P7SA-10F-ND





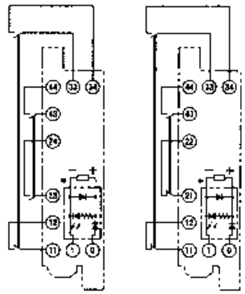


Note: The socket is shown with the finger cover removed.

Note: Only the -ND Sockets have LED indicators.

Terminal Installation/Internal Connection Diagram (Top View)

G7SA-3A1B Mounted **G7SA-2A2B Mounted**

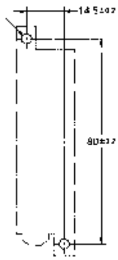


* This display circuit is available only for "-ND" models.

Note: Terminals 23-24, 33-34, and 43-44 are normally open. Terminals 11-12 and 21-22 are normally closed.

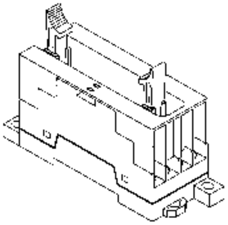
Mounting Hole Placement Diagram (Top View)

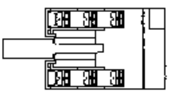
Two, 4 dia. or M3.5

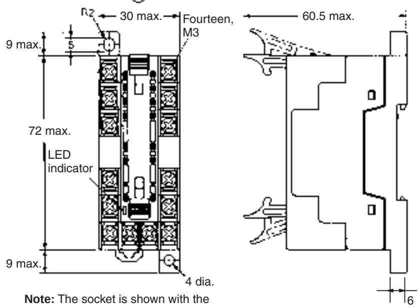


Track-mounting Socket

P7SA-14F, P7SA-14F-ND





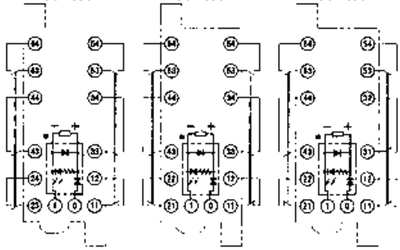


Note: The socket is shown with the finger cover removed.

Note: Only the -ND Sockets have LED indicators.

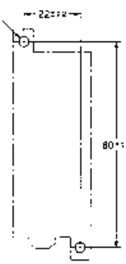
Terminal Arrangement/Internal Connection Diagram (Top View)

G7SA-5A1B Mounted **G7SA-4A2B Mounted** **G7SA-3A3B Mounted**



Mounting Hole Placement Diagram (Top View)

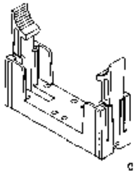
Two, 4 dia. or M3.5

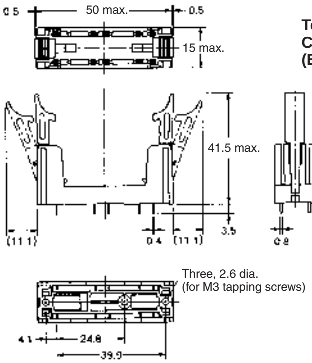


* This display circuit is available only for "-ND" models.

Note: Terminals 23-24, 33-34, 43-44, 53-54, and 63-64 are normally open. Terminals 11-12, 21-22, and 31-32 are normally closed.

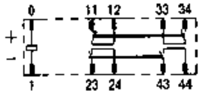
■ P7SA-10P Back-mounting Socket (for PCB)



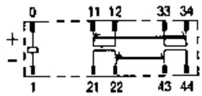


Terminal Arrangement/Internal Connection Diagram (Bottom View)

G7SA-3A1B Mounted

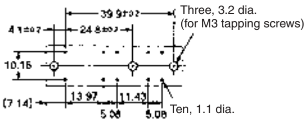


G7SA-2A2B Mounted



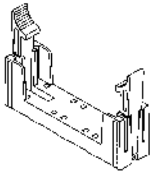
Mounting Hole Placement (Bottom View)

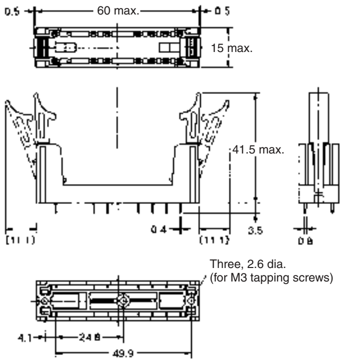
(0.1 tolerance)



Note: Terminals 23-24, 33-34, and 43-44 are normally open. Terminals 11-12 and 21-22 are normally closed.

■ P7SA-14P Back-mounting Socket (for PCB)

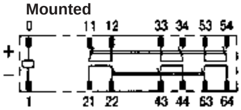




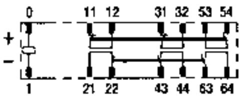
Terminal Arrangement/Internal Connection Diagram (Bottom View)

G7SA-5A1B Mounted

G7SA-4A2B Mounted

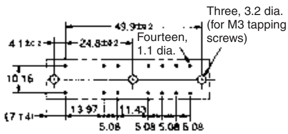


G7SA-3A3B Mounted



Mounting Hole Placement (Bottom View)

(0.1 tolerance)



Note: Terminals 23-24, 33-34, 43-44, 53-54, and 63-64 are normally open. Terminals 11-12, 21-22, and 31-32 are normally closed.

Precautions

> **CAUTION**
> Do not touch the terminal area of the Relays or the socket terminal area (charged area) while power is ON. Electric shock will result

Relays with Forcibly Guided Contacts

A Relay with Forcibly Guided Contacts is a Relay with which a safety category circuit can be configured.

Wiring

Use one of the following wires to connect to the P7SA-10F/10F-ND/14F/14F-ND.

Stranded wire: 0.75 to 1.5 mm^2
Solid wire: 1.0 to 1.5 mm^2

Tighten each screw of the P7SA-10F/10F-ND/14F/14F-ND to a torque of 0.98 N·m securely.

Wire the terminals correctly with no mistakes in coil polarity, otherwise the G7SA will not operate.

Claening

The G7SA is not of enclosed construction. Therefore, do not wash the G7SA with water or detergent.

Forcibly Guided Contacts (from EN50205)

If an NO contact becomes welded, all NC contacts will maintain a minimum distance of 0.5 mm when the coil is not energized. Likewise if an NC contact becomes welded, all NO contacts will maintain a minimum distance of 0.5 mm when the coil is energized.

■ Correct Use

Relays with Forcibly Guided Contacts

While the Relay with Forcibly Guided Contacts has the previously described forcibly guided contact structure, it is basically the same as an ordinary relay in other respects. Rather than serving to prevent malfunctions, the forcibly guided contact structure enables another circuit to detect the condition following a contact weld or other malfunction. Accordingly, when a contact weld occurs in a Relay with Forcibly Guided Contacts, depending on the circuit configuration, the power may not be interrupted, leaving the Relay in a potentially dangerous condition (as shown in Fig. 1.) .

To configure the power control circuit to interrupt the power when a contact weld or other malfunction occurs, and to prevent restarting until the problem has been eliminated, add another Relay with Forcibly Guided Contacts or similar Relay in combination to provide redundancy and a self-monitoring function to the circuit (as shown in Fig. 2).

The G9S/G9SA Safety Relay Unit, which combines Relays such as the Relay with Forcibly Guided Contacts in order to provide the above-described functions, is available for this purpose. By connecting a contactor with appropriate input and output to the Safety Relay Unit, the circuit can be equipped with redundancy and a self-monitoring function.

Fig 1

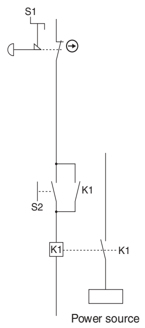
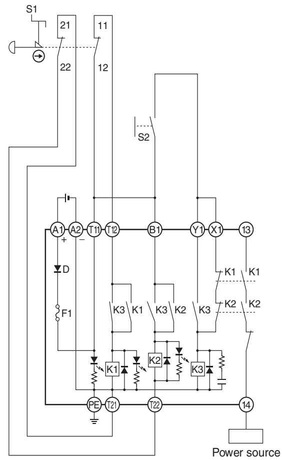


Fig 2



Glossary

The following provides information on general terms and other terms used for Switches.

■ General Terms

Basic Switch

A small-size switch which has contacts slightly separated and a snap action mechanism. Its contacts are enclosed in a case and operated by externally applying a specific force to an actuator provided on the case.

Contact Form

A configuration of switch contacts to input or output an external signal.

Contact Switch

A type of switch which uses, as opposed to a solid-state switch, mechanical contacts to break or make the external circuit.

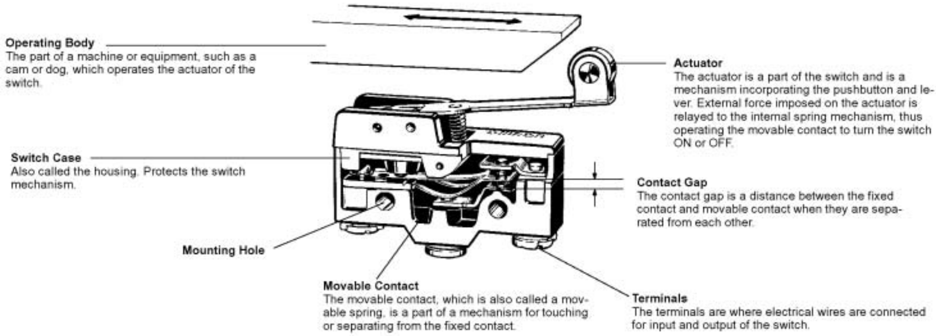
Ratings

Various parameters, such as current or voltage values, within which the normal operation of the basic switch is guaranteed.

Molded Terminal

A terminal which is molded with resin after being connected to the internal circuit of the switch with a lead to eliminate exposed currentcarrying metal parts and thereby to enhance the drip-proof properties of the switch.

■ Terms for Configuration & Structure



■ Terms Related to Life Expectancy

Mechanical Life: The duration in which the normal switching operation is performed without the contacts energized as long as the switch is used with the rated overtravel (OT).

Electrical Life: The duration in which the normal switching operation is performed under the rated load (resistive) as long as the switch is used with the rated overtravel (OT).

■ Standard Test Conditions

Switches are tested under the following conditions.

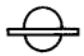
Ambient temperature 20±2°C
Relative humidity: 65±5%
Atmospheric pressure: 101.3 kPa

■ N-level Reference Value

The N-level reference value indicates the failure rate of the switch. The following formula indicates that the failure rate is 1/2,000,000 at a reliability level of 60% (λ_{60}).

$\lambda_{60} = 0.5 \times 10^{-6}$/operations

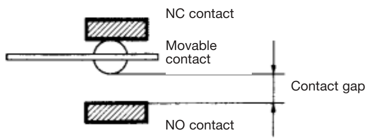
Contact Shape and Type

Shape	Type	Main material	Processing method	Main application
	Crossbar contact	Gold or silver alloy	Welding or rivetting	Crossbar contacts are used for ensuring high contact reliability for switching minute loads. The movable contact and fixed contact come in contact with each other at a right angle. Crossbar contacts are made with materials that are environment-resistant, such as gold alloy. In order to ensure excellent contact reliability, bifurcated crossbar contacts may be used.
	Needle	Silver		Needle contacts are used for ensuring improvement in contact reliability for switching loads, such as relays. A needle contact is made from a rivet contact by reducing the bending radius of the rivet contact to approximately 1 mm for the purpose of improving the contact pressure per unit area.
	Rivet	Silver Silver plated Silver alloy Gold plated		Rivet contacts are used in a wide application range from standard to heavy loads. The fixed rivet contact is usually processed so that it has a groove to eliminate compounds that may be generated as a result of switching. Furthermore, to prevent the oxidation or sulphuration of the silver contacts, the contacts may be gold-plated while the switch is stored. Contacts made with silver alloy are used for switching high current, such as the current supplied to TV sets.

Contact Gap

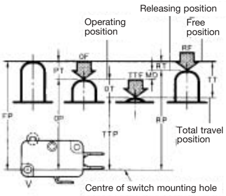
The contact gap is either 0.25, 0.5, 1.0, or 1.8 mm. Check the contact gap of the switch to be used if it is necessary to minimize the contact gap. The standard contact gap is 0.5 mm. The smaller the contact gap of a switch mechanism is, the less the movement differential (MD) is and the more sensitivity and longer life the switch has. Such a switch cannot ensure, however, excellent switching performance, vibration resistance, or shock resistance.

The snap-action switch will be less sensitive if the movement differential (MD) increases along with the contact gap due to the wear and tear of the contacts as a result of current switching operations. If the switch with a contact gap of 0.25mm is used, it will be necessary to minimize the switching current in order to prevent the wear and tear of the contacts as a result of current switching operations. A switch with a wide contact gap excels in vibration resistance, shock resistance, and switching performance.



Character displayed	Contact gap	DC switching	MD	Accuracy and life expectancy	Vibration and shock resistance	Feature
H	0.25 mm	Inferior	Minimal	Excellent	Inferior	High precision and long life
G	0.50 mm	Ordinary	Short	Good	Ordinary	General-purpose
F	1.00 mm	Good	Medium	Ordinary	Good	Performance level between G & E
E	1.80 mm	Excellent	Long	Inferior	Excellent	Highly vibration & shock resistive

■ Terms Related to Operating Characteristics

Definitions of Operating Characteristics	Classification	Term	Abbreviation	Unit	Dispersion	Definition
	Force	Operating Force	OF	N{gf, kgf}	Max.	The force applied to the actuator required to operate the switch contacts.
		Releasing Force	RF	N{gf, kgf}	Min.	The value to which the force on the actuator must be reduced to allow the contacts to return to the normal position.
		Total Travel Force	TTF	N{gf, kgf}	–	The force required for the actuator to reach the total travel position from the free position.
	Travel	Pretravel	PT	mm or degrees	Max.	The distance or angle through which the actuator moves from the free position to the operating position.
		Overtravel	OT	mm or degrees	Min.	The distance or angle of the actuator movement beyond the operating position.
		Movement Differential	MD	mm or degrees	Max.	The distance or angle from the operating position to the releasing position.
		Total Travel	TT	mm or degrees	–	The sum of the pretravel and total overtravel expressed as a distance or angle.
	Position	Free Position	FP	mm or degrees	Max.	The initial position of the actuator when no external force is applied.
		Operating Position	OP	mm or degrees	±	The position of the actuator at which the contacts snap to the operated contact position.
		Releasing Position	RP	mm or degrees	–	The position of the actuator at which the contacts snap from the operated contact position to their normal position.
		Total Travel Position	TTP	mm or degrees	–	The position of the actuator when it reaches the stopper.

Example of Fluctuation:

V-21-1□6 with max. operating force of 3.92 N {400 gf}

The above means that each switch sample operates with a maximum operating force (OF) of 3.92 N when increasing the OF imposed on the actuator from 0.

■ Terminal Symbol and Contact Form

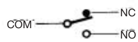
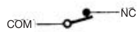
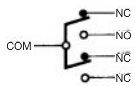
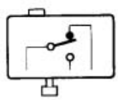
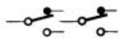
Contact	Terminal symbol
COM	Common terminal
NC	Normally closed terminal
NO	Normally open terminal

■ Terminal Types

Type	Shape
Solder terminal	
Quick-connect (#110, 187, and 250)	
Screw terminal	
PCB terminal	
PCB angle terminal	

Note: In addition to the above, molded terminals with lead wires and snap-on mounting connectors are available.

■ Contact Form

Symbol	Name	Model example
	SPDT	Standard snap-action switch
	SPST-NC	V
	SPST-NO	V
	Split-contact type	Z-10FY-B
	Maintained-contact type	Z-15ER
	DPDT	DZ

Note: The above illustrations show typical examples. For the contact form of each product, refer to an individual datasheet.

■ Terms Related to EN61058-1 Standards

Electric Shock Protective Class: Indicates the electric shock preventive level. The following classes are provided.

Class 0: Electric shocks are prevented by basic insulation only.

Class I: Electric shocks are prevented by basic insulation and grounding.

Class II: Electric shocks are prevented by double insulation or enforced insulation with no grounding required.

Class III: No countermeasures against electric shocks are required because the electric circuits in use operate in a low-enough voltage range (50 VAC max. or 70 VDC max.)

Proof Tracking Index (PTI): Indicates the index of tracking resistance, that is, the maximum dielectric strength with no short-circuiting between two electrodes attached to the switch sample while 50 drops of 0.1% ammonium chloride solution are dropped between the electrodes drop by drop. Five levels are provided. The following table indicates the relationship between these PTI levels and CTI values according to the UL Plastics Recognized Directory.

PTI	CTI Classified by UL
500	PLC level 1: 400 ≦ CTI < 600 (Check with material manufacturer if the material meets CTI 500)
375	PLC level 2: 250 ≦ CTI < 400 (Check with material manufacturer if the material meets CTI 375)
300	PLC level 2: 250 ≦ CTI < 400 (Check with material manufacturer if the material meets CTI 300)
250	PLC level 2: 250 ≦ CTI < 400
175	PLC level 3: 175 ≦ CTI < 250

Switch Category: Indicates the heat and fire resistance of the switch on the basis of IEC335-1.

Category A: The switch has a rated switching capacity of 0.5 A maximum or is used for applications where the switch is kept ON by hand or manually.

Category C: The switch has a rated switching capacity exceeding 0.5 A or is used for applications where the switch is operated only when the operator is at present.

Category D: The switch is used for all kinds of applications.

Number of Operations: Indicates the operation number of durability test provided by the standard. They are classified into the following levels and the switch must bear the corresponding symbol. A switch with high switching frequency must withstand 50,000 switching operations and that with low switching frequency must withstand 10,000 operations to satisfy IEC standards.

Number of Operations	Symbol
100,000	1E5
50,000	5E4
25,000	25E3
10,000	No symbol required
6,000	6E3
3,000	3E3
1,000	1E3
300	3E2

Ambient Temperature: Indicates the operating temperature range of the switch. If the temperature range is not between 0°C and 55°C, the switch must bear the symbol of the temperature range. Refer to the following example.

Symbol	T85	25T85
Temperature range	0°C to 85°C	–25°C to 85°C

Solder Terminal Type 1: A type of solder terminal classified by heat resistance under the following test conditions.

Dip soldering bath applied: The terminal must not wobble or make any change in insulation distance after the terminal is dipped for a specified depth and period into a dip soldering bath at a temperature of 235°C at specified speed.

Soldering iron applied: The terminal must not wobble or make any change in insulation distance after the terminal is soldered by applying wire solder that is 0.8mm in diameter for two to three seconds by using a soldering iron, the tip temperature of which is 350°C.

Solder Terminal Type 2: A type of solder terminal classified by heat resistance under the following test conditions.

Dip soldering bath applied: The terminal must not wobble or make any change in insulation distance after the terminal is dipped for a specified depth and period into a dip soldering bath at a temperature of 260°C at specified speed.

Soldering iron applied: The terminal must not wobble or make any change in insulation distance after the terminal is soldered by applying wire solder that is 0.8 mm in diameter for 5 seconds by using a soldering iron, the tip temperature of which is 350°C.

Clearance distance: The minimum space distance between two charged parts or between a charged part and a metal foil stuck to the non-metal switch housing.

Creepage distance: The minimum distance on the surface of the insulator between two charged parts or between a charged part and a metal foil stuck to the non-metal switch housing.

Distance through insulation: The minimum direct distance between the charged part and a metal foil stuck to the non-metal switch housing through air plus any other insulator thickness including the housing itself.

Cautions

Do not wire the Switch or touch any terminal of the Switch while power is connected to the Switch, otherwise an electric shock may be received.

■ Electrical Conditions

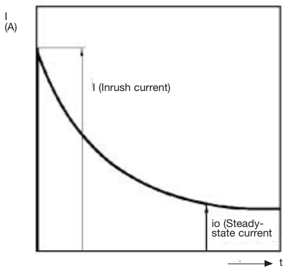
Load

The switching capacity of the Switch significantly differs depending on whether the Switch is used to break an alternating current or a direct current. Be sure to check both the AC and DC ratings of the Switch by referring to its datasheet. The control capacity will drop drastically if it is a DC load. This is because a DC load, unlike an AC load, has no current zero cross point. Therefore, if an arc is generated, it may continue for a comparatively long time. Furthermore, the current direction is always the same, which results in contact relocation phenomena, and the contacts hold each other with ease and will not separate if the surfaces of the contacts are uneven.

Some types of load have a large difference between usual current and inrush current. Make sure that the inrush current is within the permissible value. The higher the inrush current in the closed circuit is, the more the contact abrasion or shift will be. Consequently, contact weld, contact separation failures, or insulation failures may result. Furthermore, the Switch may break or become damaged.

If the load is inductive, counter-electromotive voltage will be generated. The higher the voltage is, the higher the generated energy is, which increase the abrasion of the contacts and contact relocation phenomena. Make sure to use the Switch within the rated conditions.

Inrush Current

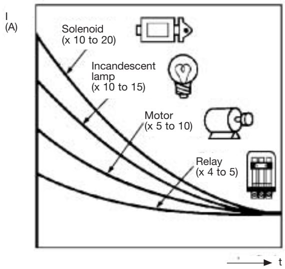


The switching capacity of each Switch appearing on a datasheet is the rated capacity. When applying the Switch to a circuit with a special load with unusual inrush and switching current and voltage waveforms, be sure to test the Switch under the actual conditions before use.

If the load is a minute voltage or current load, use a dedicated Switch for minute loads. The reliability of silver-plated contacts, which are used by standard Switch models, is insufficient in such a case.

If the Switch is used for switching both minute and heavy loads, be sure to connect relays suitable to the loads.

Types of Load vs. Inrush Current



The rated loads of the Switch are as follows:

Inductive Load: A load having aminimum power factor of 0.4 (AC) or a maximum time constant of 7 ms (DC).

Lamp Load: A load having an inrush current ten times the steady-state current.

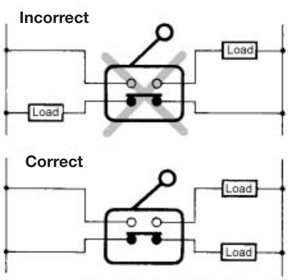
Motor Load: A load having an inrush current six times the steadystate current.

Note: It is important to know the time constant (L/R) of an inductive load in a DC circuit.

LOAD CONNECTIONS

Example of Power Source Connection (Different Polarity)

The power source may short-circuit in failure mode if the loads are connected in the same way as the “incorrect” circuit below.

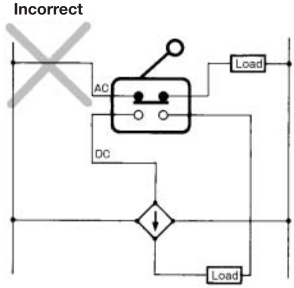


Connect the same polarities to the load.

Even in a “correct” circuit, note that the insulation performance of the switch may deteriorate and the switch life may be shortened because one load is connected to one contact.

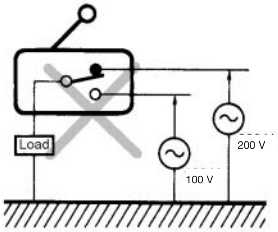
Example of Incorrect Connection of Power Source (Different Current Type)

The DC and AC power may be mixed.



Do not configure a circuit that may place a voltage between the contacts of the Switch; otherwise metal deposition will occur between the contacts.

Incorrect



Contact Protective Circuit

Apply a contact protective circuit to extend contact life, prevent noise, and suppress the generation of carbide or nitric acid. Be sure to apply the contact protective circuit properly, otherwise an adverse effect may result. The use of the contact protective circuit may delay the response time of the load.

Life Expectancy

The life of the Switch greatly varies with switching conditions. Before using the Switch, be sure to test the Switch under actual conditions. Make sure that the number of switching operations is within the permissible range. If a deteriorated Switch is used continuously, insulation failures, contact weld, contact failures, Switch damage, or Switch burnout may result.

Mounting

Before mounting, dismounting, wiring, or inspecting the Switch, be sure to turn OFF the power supply to the Switch, otherwise an electric shock may be received or the Switch may burn.

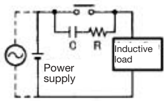
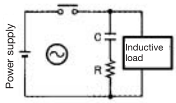
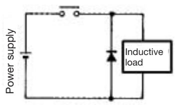
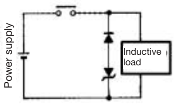
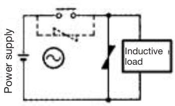
Wiring

When mounting the Switch to the mounting panel, keep a sufficient insulation distance between the mounting panel and the Switch. If the insulation distance is insufficient, add an appropriate insulation guard or separator. This is especially important if the Switch is mounted to a metal object.

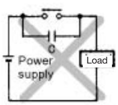
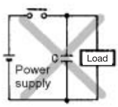
The Basic Switch does not incorporate a ground terminal. Do not mount the Basic Switch while power is being supplied.

The following provides typical examples of contact protective circuits. If the Switch is used in an excessively humid place for switching a load that generates arcs with ease, such as an inductive load, the arcs may generate NOx, which will change into HNO_3 (nitric acid) if it reacts with moisture. Consequently, the internal metal part may be corroded and result in an operating failure of the Switch. Be sure to select the best contact preventive circuit from the following in order to prevent this.

Typical Examples of Contact Protective Circuit

Circuit example		Applicable current AC	Applicable current DC	Feature	Element selection
CR circuit		See note	Yes	**Note:** When AC is switched, the load impedance must be lower than the CR impedance.	C: 0.5 to 1 µF per switching current (1 A) R: 0.5 to 1 Ω per switching voltage (1 V) The values may change according to the characteristics of the load. The capacitor suppresses the spark discharge of current when the contacts are open. The resistor limits the inrush current when the contacts are closed again. Consider these roles of the capacitor and resistor and determine the ideal capacitance and resistance values from experimentation. Use a capacitor that has low dielectric strength. When AC is switched, make sure that the capacitor has no polarity.
		Yes	Yes	The operating time will increase if the load is a relay or solenoid. It is effective to connect the CR circuit in parallel to the load when the power supply voltage is 24 or 48 V and in parallel to the contacts when the power supply voltage is 100 to 200 V.	
Diode Method		No	Yes	Energy stored in the coil is changed into current by the diode connected in parallel to the load. Then the current flowing to the coil is consumed and Joule heat is generated by the resistance of the inductive load. The reset time delay in this method is longer than that of the CR method.	The diode must withstand a peak inverse voltage 10 times higher than the circuit voltage and a forward current as high as or higher than the load current.
Diode and Zener diode method		No	Yes	This method will be effective if the reset time delay caused by the diode method is too long.	Zener voltage for a Zener diode must be about 1.2 times higher than the power source since the load may not work under some circumstances.
Varistor method		Yes	Yes	This method makes use of constant-voltage characteristic of the varistor so that no high-voltage is imposed on the contacts. This method causes a reset time delay more or less. It is effective to connect varistor in parallel to the load when the supply voltage is 24 to 48 V and in parallel to the contacts when the supply voltage is 100 to 200V.	–

Do not apply contact protective circuits as shown below.

	This circuit effectively suppresses arcs when the contacts are OFF. The capacitance will be charged, however, when the contacts are OFF. Consequently, when the contacts are ON again, short-circuited current from the capacitance may cause contact weld.		This circuit effectively suppresses arcs when the contacts are OFF. When the contacts are ON again, however, charge current flows to the capacitor, which may result in contact weld.

Microswitches

TERMINAL CONNECTIONS

Be sure to connect appropriate wires to the Switch by considering the voltage and current applied to the Switch.

Solder Terminals

When soldering lead wires to the Switch, make sure that the capacity of the soldering iron is 60 W maximum and that the temperature of the iron tip is 300°C maximum unless otherwise specified in the datasheet of the Switch. Improper soldering may cause abnormal heat radiation from the Switch and the Switch may burn.

The characteristics of the Switch will deteriorate if a soldering iron with a capacity of more than 60W is applied to any part of the Switch for 6 s or more.

Be sure to apply only the minimum required amount of flux. The Switch may have contact failures if flux intrudes into the interior of the Switch.

Quick-connect Terminals

Wire the quick-connect terminals with the specified receptacles and insert the terminals straight into the receptacles. Do not impose excessive external force on the terminals in the horizontal or vertical directions, otherwise the terminals may deform or the housing may become damaged.

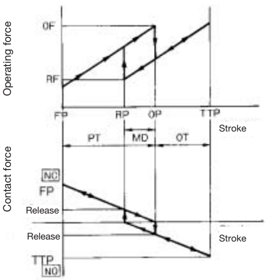
■ Mechanical Conditions

Operating Stroke Setting

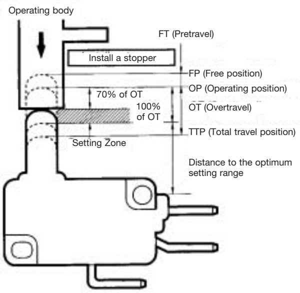
The setting of the stroke is very important for the Switch to operate with high reliability.

The chart below shows the relationship among operating force, stroke, and contact reliability. To obtain high reliability from the Switch, the Switch actuator must be manipulated within an appropriate range of operating force.

Be sure to pay the utmost attention when mounting the Switch.

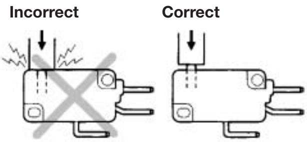


Make sure that operating body returns the actuator to the free position when the operating body has moved if the Switch is used to form a normally closed (NC) circuit. If the Switch is used to forma normally open (NO) circuit, the operating body must move the Switch actuator to a distance of 70% to 100% of the rated overtravel (OT) of the Switch.



If the stroke is set in the vicinity of the operating position (OP) or at the releasing position (RP), switching operation may become unstable. As a result, the Switch cannot ensure high reliability. Furthermore, the Switch may malfunction due to vibration or shock.

If the stroke is at the total travel position (TTP), the momentary inertia of the operating body may damage the actuator or the Switch itself. Furthermore, the life of the Switch may be shortened.



SWITCHING SPEED AND FREQUENCY

The switching frequency and speed of a Switch have a great influence on the performance of the Switch. Pay attention to the following.

- If the actuator is operated too slowly, the switching operation may become unstable, causing faulty contact or contact weld.
- If the actuator is operated too quickly, the Switch may be damaged by shock.
- If the switching frequency is too high, the switching of the contacts cannot catch up with the operating speed of the actuator.
- If the operating frequency is extremely low (i.e., once a month or less frequent), a film may be generated on the surface of the contacts, which may cause contact failures.

The permissible switching speed and switching frequency of a Switch indicates the operational reliability of the Switch. The life of the Switch may vary with the switching speed if the Switch is operated within the permissible switching speed and frequency ranges. Test a Switch sample under the actual conditions to ascertain its life expectancy.

Operating Condition

Do not leave the Switch actuated for a long time, otherwise the parts of the Switch may soon deteriorate and changes in its characteristic performance may result.

Correct Use

■ Electrical Conditions

Application of Switch to Electronic Circuits

The Basic Switch in switching operation may cause contact bouncing or chattering, thus generating noise or pulse signals that may interfere the operation of electronic circuits or audio equipment. To prevent this, take the following countermeasures.

- Design the circuits so that they include appropriate CR circuits to absorb noise or pulse signals.
- Use Switches incorporating gold-plated contacts for minute loads, which are more resistive to environmental conditions than standard Switches.

Switches for Minute Loads

Use a dedicated Switch for minute loads, otherwise contact failures may result. Be sure to connect the Switch to a load within the permissible range. Even if the load is within the permissible range, the inrush current of the load may deteriorate the contacts, thus shortening the life of the Switch. Therefore, if necessary, insert the proper contact protective circuit.

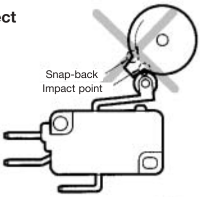
■ Mechanical Conditions

Switching Method

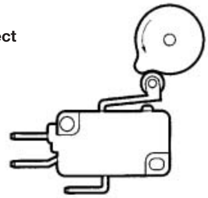
The switching method has a great influence on the performance of the Switch. Consider the following before operating the Switch.

- Design the operating body (i.e., the cam or dog) so that it will operate the actuator smoothly. If the actuator snaps backwards quickly or receives damage due to the shape of the operating body, its life expectancy may be shortened.

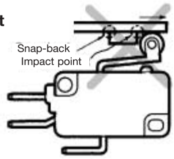
Incorrect



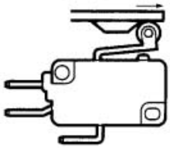
Correct



Incorrect

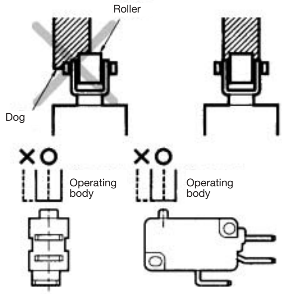


Correct

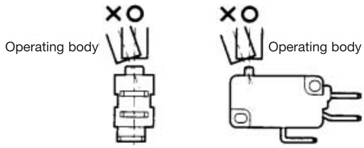


- Make sure that no improper load is imposed on the actuator, otherwise the actuator may incur local abrasion. As a result, the actuator may become damaged or its life expectancy shortened.

Incorrect **Correct**

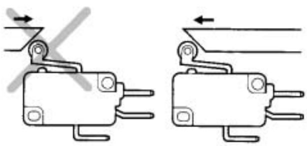


- Make sure that the operating body moves in a direction where the actuator moves. If the actuator is a pin plunger type, make sure that the operating body presses the pin plunger vertically.



Operate the actuator of a roller hinge lever or simulated hinge lever type in the direction shown below.

Incorrect **Correct**



Microswitches

- Do not modify the actuator to change the operating position (OP).
- If the lever-type actuator is used as an operating object, check the material and thickness of the lever and make sure that the force imposed on the lever is within the permissible range.

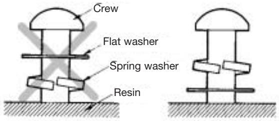
MOUNTING

When mounting the Switch, pay attention to the following.

Securing

When securing the Switch, be sure to use the specified mounting screws and tighten the screws with flat washers and springwashers securely.

If the Switch housing is made of thermoplastic, the Switch housing may incur crack damage if it comes into contact with the spring washers directly. In that case make sure that the flat washers come into contact with the Switch housing as shown below.



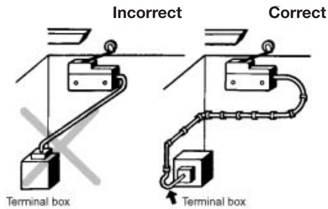
- Do not modify the Switch in any way, for example, by widening the mounting holes

Locking Agent

If glue or locking agent is applied, make sure that it does not stick to the movable parts or intrude into the interior of the Switch, otherwise the Switch may work improperly or cause contact failure. Some types of glue or locking agent may generate gas that has a bad influence on the Switch. Pay the utmost attention when selecting the glue or locking agent.

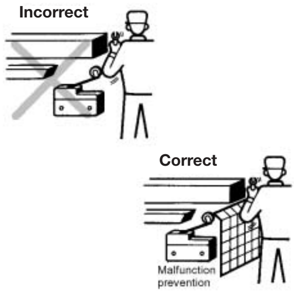
Wiring

Make sure that the lead wires are connected with no inappropriate pulling force and that the wires are supported securely.



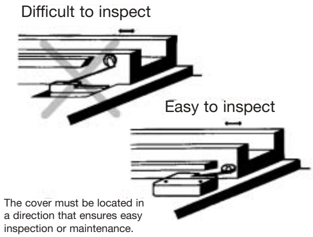
Mounting Location

Be sure not to mount the Switch in locations where the Switch may be actuated by mistake.



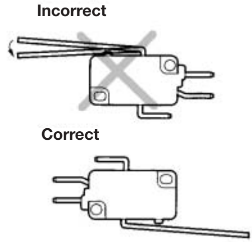
Maintenance and Inspection

Make sure that the Switch is mounted in locations that allow easy inspection or replacement of the Switch.



Mounting Direction

When using a Switch of low operating force attached with a long lever or long rod lever, make sure that the lever is in the downward direction as shown below, otherwise the Switch may not reset properly.



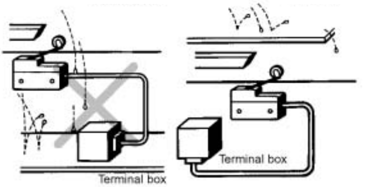
■ Operation and Storage

Oil and Water Resistance

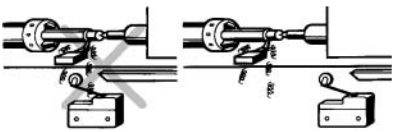
The standard Switch is not water-resistant. Protect the Switch with appropriately when using the Switch in places with water or oil spray.

If the Switch is exposed to water drops, use a sealed Switch.

Incorrect **Correct**



Incorrect **Correct**



■ Others

Handling

Do not drop the Switch, otherwise the Switch may break or deform. Do not apply oil, grease, or other lubricants to the sliding parts of the Switch, otherwise the actuator may not operate smoothly. Furthermore, the intrusion of oil, grease, or other lubricants into the internal part may cause the Switch to fail.

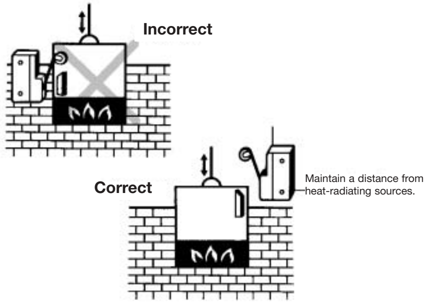
Operating Environment

Do not install the Switch in any location or direction where the Switch resonates or continuous vibration or shock is imposed on the Switch. If continuous vibration or shock is imposed on the Switch, a contact failure, malfunction, or a decrease in life expectancy may be caused by abrasive powder generated from the internal parts. If excessive vibration or shock is imposed on the Switch, the contacts may malfunction or become damaged.

Do not use the Switch in locations with corrosive gas, such as sulphuric gas (H_2S or SO_2), ammonium gas (NH_3), nitric gas (HNO_3), or chlorine gas (Cl_2), or in locations with high temperature and humidity. Otherwise, contact failure or corrosion damage may result.

If the Switch is used in places with silicone gas, arc energy may attract silicon dioxide (SiO_2) to the contacts and a contact failure may result. If there is silicone oil, silicone sealant, a wire covered with silicone, or any other silicone-based product near the Switch, attach a contact protective circuit to suppress the arcing of the Switch or eliminate the source of silicone gas generation.

Be sure to use the Switch at temperature within the specified range. If the Switch is exposed to radical temperature changes or intense heat, the performance characteristics of the Switch may change.

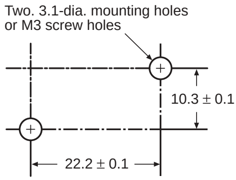


Storage Environment

When storing the Switch, make sure that the location is free of corrosive gas or dust with no high temperature or humidity. It is recommended that the Switch be inspected before use if it is stored for three months or more.

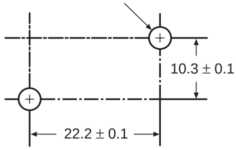
Switch Trouble and Remedial Action

Type	Location of failure	Failure	Possible cause	Remedy
Failures related to electrical characteristics	Contacts	Fault contact	Dust and dirt collect on the contacts	Clean the environment, place the contact Switch in a box, or use a sealed Switch.
			Oil or water has penetrated into the Switch.	
			Chemical substances have been generated on the contact surfaces because the atmosphere contains chemical gas.	Use a Switch having contacts with high environmental resistivity (such as gold or alloy contacts).
			Chemical substances have been generated on the contact surface when the Switch breaks a very low load.	
			Solder flux has penetrated into the Switch.	Review the soldering method or use a flux-tight Switch.
		Malfunction	The contacts are separated from each other by vibration or shock.	Use a Switch having a high contact force (generally a heavy OF).
		Contact weld	The load connected to the Switch is too heavy.	Use a Switch having higher switching capacity or insert a relay to switch heavy load.
		Insulation degradation	Contacts have been melted and scattered by arc.	Insert a contact protection circuit.
			Water has penetrated into the Switch because the Switch is placed in extremely humid environment.	Change the environment, place the Switch in a sealed box, or use a sealed Switch.
			Oil has penetrated into the Switch and been carbonized by arc heat.	
Failures related to mechanical characteristics	Actuator	Misoperation	The sliding part of the actuator has been damaged because an excessive force was applied on the actuator.	Make sure that no excessive force is applied to the actuator, or use an auxiliary actuator mechanically strong.
			Dust and dirt have penetrated into the actuator.	Clean the environment or place the Switch in a sealed box.
			The actuator does not release because the operating body is too heavy.	Use a Switch having a heavier OF.
			The Switch is loosely installed and thus does not operate even when the actuator is at the rated OP.	Secure the Switch.
		Service life is too short	The shape of the dog or cam is improper.	Change the design of the dog or cam.
			The operating method is improper.	Review the OT and operating speed.
		Damage	A shock has been applied to the actuator.	Change the environment or use a Switch mechanically strong.
			The clamping part has not been tightened enough or the Switch has been loosely mounted.	Replace the Switch with a new one.
			Deformation or drop-out.	Relocate the Switch so that improper force will not be imposed on the actuator or in the wrong direction. Review the operating method.
	Mounting section	Damage	Screws have not been inserted straight.	Check and correct screw insertion methods.
			The mounting screws were tightened with too much torque.	Tighten the screws to an appropriate torque.
			The mounting pitch is wrong.	Correct the pitch.
			The Switch is not installed on a flat surface.	Install the Switch on a flat surface.
	Terminal	Damage	An excessive force was applied to the terminal while being wired.	Do not apply an excessive force.
			The plastic part has been deformed by solder heat	Use a soldering iron rated at a lower wattage.

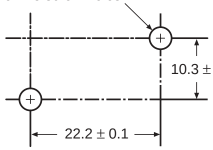
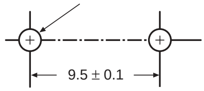
Model		D3V				
Features		Available with externally or internally fitted levers. 2 fixing positions for external levers				
Appearance						
		D3V-21	D3V-16	D3V-11	D3V-6	D3V-01
Contact	Contact Specification	Rivet				
	Contact Material	Silver alloy				
	Rating (Resistive Load)	21 A at 250 VAC	16 A at 250 VAC	11 A at 250 VAC	6 A at 250 VAC	0.1 A at 250 VAC
	Max. Operating Current	21 A	16 A	11 A	6 A	0.1 A
Operating Force (see note)		1.23 N (125 gf)	0.96 N (200 gf)	0.98 N to (100 gf)	0.49 N (50 gf)	0.49 N (50 gf)
Life Expectancy	Mechanical Ops Min.	10,000,000				
	Electrical Ops Min.	50,000	100,000	200,000	500,000	500,000
Ambient Operating Temperature		-25°C to 85°C	-25°C to 105°C (High temperature version up to 125°C)			-25°C TO 85°C
Mounting Pitch						
Actuator	Pin Plunger	•				
	Hinge Lever	•				
	Simulated Hinge Lever	•				
	Hinge Roller Lever	•				
	Short Hinge Lever	•				
	Long Hinge Lever	•				
	Short Hinge Roller Lever	•				
	Leaf Spring					
	Rotary Lever					
Terminals	Quick Connect	•				
	Solder	•				
	Screw					
	Panel Mount					
	Straight PCB					
	Angled PCB					
	Connector					
	Lead wire					
Page No.		576				

Note: These values are for pin plunger models

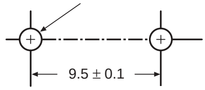
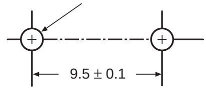
Microswitches

Model		V				
Features		Compact and highly reliable switch				
Appearance						
		V-21	**V-16**	**V-15**	**V-11**	**V-10**
Contact	**Contact Specification**	Rivet				
	Contact Material	Silver alloy				
	Rating (Resistive Load)	21 A at 250 VDC	16 A at 250 VAC	15 A at 250 VAC	11 A at 250 VAC	10 A at 250 VAC
	Max. Operating Current	21 A	16 A	15 A	11 A	10 A
Operating Force (see note)		3.92 N (400 gf)	0.98, 0.96, 3.92 N (100, 200, 400 gf)		0.98 N (100 gf)	0.98, 1.96 N (100, 200 gf)
Life Expectancy	**Mechanical Ops Min.**	50,000,000				
	Electrical Ops Min.	100,000			300,000	
Ambient Operating Temperature		-25°C to 105°C				
Mounting Pitch						
Actuator	**Pin Plunger**	•				
	Hinge Lever	•				
	Simulated Hinge Lever	•				
	Hinge Roller Lever	•				
	Short Hinge Lever	•				
	Long Hinge Lever	•				
	Short Hinge Roller Lever	•				
	Leaf Spring					
	Rotary Lever					
Terminals	**Quick Connect**	•				
	Solder	•				
	Screw	•				
	Panel Mount					
	Straight PCB					
	Angled PCB					
	Connector					
	Lead wire					
Page No.		590				

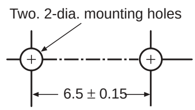
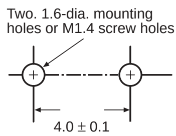
Note: These values are for pin plunger models

Model		VX		SS		
Features		Compact and highly reliable switch		Economical subminiature switch incorporating two split springs for long service life		
Appearance						
		VX-5	VX-01	SS-10	SS-5	SS-01
Contact	Contact Specification	Rivet	Crossbar	Rivet		Crossbar
	Contact Material	Silver alloy	Gold alloy	Silver alloy	Silver	Gold alloy
	Rating (Resistive Load)	5 A at 250 VAC	0.1 A at 125 VAC	10.1 A at 250 VAC	3 A at 250 VAC	0.1 A at 125 VAC
	Max. Operating Current	5 A	0.1 A	10.1 A	3 A	0.1 A
Operating Force (see note)		0.25, 0.49 N (25, 50 gf)		1.47 N (150 gf)	0.49, 1.47 N (50, 150 gf)	0.25, 0.49, 1.47 N (25, 50, 150 gf)
Life Expectancy	Mechanical Ops Min.	50,000,000	10,000,000	10,000,000	30,000,000	
	Electrical Ops Min.	500,000	1,000,000	50,000	200,000	
Ambient Operating Temperature		-25°C to 80°C		-25°C to 85°C		
Mounting Pitch						
Actuator	Pin Plunger	•		•		
	Hinge Lever	•		•		
	Simulated Hinge Lever	•		•		
	Hinge Roller Lever	•		•		
	Short Hinge Lever	•				
	Long Hinge Lever	•				
	Short Hinge Roller Lever	•				
	Leaf Spring					
	Rotary Lever					
Terminals	Quick Connect	•		•		
	Solder	•		•		
	Screw	•				
	Panel Mount					
	Straight PCB			•		
	Angled PCB					
	Connector					
	Lead wire					
Page No.		605		612		

Note: These values are for pin plunger models

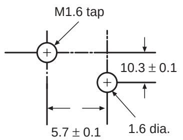
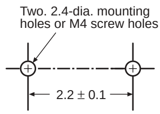
Model		SS-P		SSG	
Features		SS series compatible mounting with simple construction and easy to use design concept		Global subminiature switch conforming to EN, UL & CSA specifications	
Appearance					
		SS-3P	SS-01P	SSG-5	SSG-01
Contact	Contact Specification	Rivet	Crossbar	Rivet	Crossbar
	Contact Material	Silver Alloy	Gold Alloy	Silver alloy	PGS alloy
	Rating (Resistive Load)	3 A at 125 VAC	0.1 A at 125 VAC	3 A at 250 VAC	0.1 A at 125 VAC
	Max. Operating Current	3 A	0.1 A	3 A	0.1 A
Operating Force (see note)		0.50, 1.50 N (51, 153 gf)		0.50, 1.50 N (51, 153 gf)	
Life Expectancy	Mechanical Ops Min.	1,000,000		10,000,000	
	Electrical Ops Min.	70,000	200,000	200,000	
Ambient Operating Temperature		-25°C to 85°C		-25°C to 125°C	
Mounting Pitch					
Actuator	Pin Plunger	•		•	
	Hinge Lever	•		•	
	Simulated Hinge Lever	•		•	
	Hinge Roller Lever	•		•	
	Short Hinge Lever				
	Long Hinge Lever				
	Short Hinge Roller Lever				
	Leaf Spring				
	Rotary Lever				
Terminals	Quick Connect	•		•	
	Solder			•	
	Screw				
	Panel Mount				
	Straight PCB	•		•	
	Angled PCB				
	Connector				
	Lead wire				
Page No.		620		626	

Note: These values are for pin plunger models

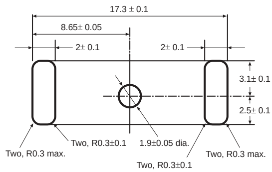
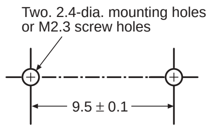
Model		D2F			D2MQ	
Features		Low cost microswitch			Ultra sub-miniature switch suitable for micro loads	
Appearance						
		D2F(-*) Standard	D2F-F* Low force	D2F-01* Micro load		
Contact	Contact Specification	Crossbar			Rivet	
	Contact Material	Silver alloy		Gold alloy	Silver plated	Gold plated
	Rating (Resistive Load)	3 A at 125 VAC	1 A at 125 VAC	0.1 A at 30 VDC	0.5 A at 30 VDC	50 mA at 30 VDC
	Max. Operating Current	3 A	1 A	0.1 A	0.5 A	50 mA
Operating Force (see note)		1.47 N (150 gf)	0.74 N (75 gf)	0.74, 1.47 N (75, 150 gf)	1.18 N (120 gf)	
Life Expectancy	Mechanical Ops Min.	10,000,000			30,000	
	Electrical Ops Min.	30,000			10,000	
Ambient Operating Temperature		-25°C to 65°C			-15°C to 70°C	
Mounting Pitch						
Actuator	Pin Plunger	•			•	
	Hinge Lever	•				
	Simulated Hinge Lever	•				
	Hinge Roller Lever	•				
	Short Hinge Lever					
	Long Hinge Lever					
	Short Hinge Roller Lever					
	Leaf Spring				•	
	Rotary Lever					
Terminals	Quick Connect					
	Solder	•				
	Screw					
	Panel Mount					
	Straight PCB	•			•	
	Angled PCB	•			•	
	Connector					
	Lead wire					
Page No.		634			640	

Note: These values are for pin plunger models

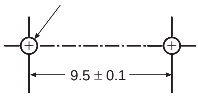
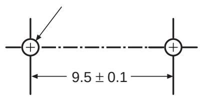
Microswitches

Model		D3C	D2X
Features		Compact, low cost microswitch	Connector terminal switch with long stroke of 6.34 mm
Appearance		 **D3C-1 Non-shorting** / **D3C-2 Shorting**	
Contact	Contact Specification	Slide	Slide
	Contact Material	Silver plating	Silver plating
	Rating (Resistive Load)	0.1 A at 30 VDC	0.1 A at 30 VDC
	Max. Operating Current	0.1 A	0.1 A
Operating Force (see note)		0.39, 1.28 N (40, 130 gf)	0.49 N (50 gf)
Life Expectancy	Mechanical Ops Min.	50,000	1,000,000
	Electrical Ops Min.	50,000	50,000
Ambient Operating Temperature		-20°C to 80°C	-10°C to 70°C
Mounting Pitch			
Actuator	Pin Plunger		
	Hinge Lever	•	
	Simulated Hinge Lever		
	Hinge Roller Lever		
	Short Hinge Lever		
	Long Hinge Lever		
	Short Hinge Roller Lever		
	Leaf Spring		
	Rotary Lever		•
Terminals	Quick Connect		
	Solder		
	Screw		
	Panel Mount		
	Straight PCB	•	
	Angled PCB		
	Connector		•
	Lead wire		
Page No.		645	649

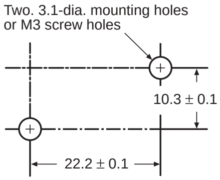
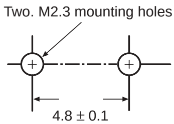
Note: These values are for pin plunger models

Model		D3K	D3M
Features		Connector terminal switch with super low operating force and long stroke	Connector terminal switch simplifies wiring and reduces production steps
Appearance			
Contact	Contact Specification	Slide	Crossbar
	Contact Material	Silver plating	Gold alloy
	Rating (Resistive Load)	10mA at 12 VDC	0.1 A at 30 VDC
	Max. Operating Current	10 mA	0.1 A
Operating Force (see note)		0.03 N (3 gf)	1.50 N (153 gf)
Life Expectancy	Mechanical Ops Min.	2,000,000	500,000
	Electrical Ops Min.	2,000,000	200,000
Ambient Operating Temperature		-10°C to 70°C	-25°C to 85°C
Mounting Pitch		Plate thickness t = 0.8  For other plate thickness see data	
Actuator	Pin Plunger		•
	Hinge Lever	•	•
	Simulated Hinge Lever		•
	Hinge Roller Lever		•
	Short Hinge Lever		
	Long Hinge Lever		
	Short Hinge Roller Lever		
	Leaf Spring		
	Rotary Lever		
Terminals	Quick Connect		
	Solder		
	Screw		
	Panel Mount		
	Straight PCB		
	Angled PCB		
	Connector	•	•
	Lead wire		
Page No.		653	657

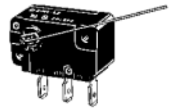
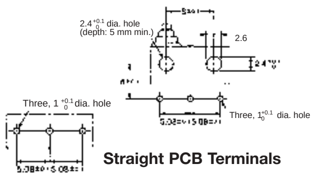
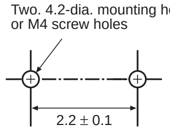
Note: These values are for pin plunger models

Model		D2SW		D2SW-P	
Features		Sealed miniature switch		Sealed basic switch with simplified construction	
Appearance					
		D2SW-3	D2SW-01	D2SW-P2	D2SW-P01
Contact	Contact Specification	Rivet	Crossbar	Rivet	Crossbar
	Contact Material	Silver	Gold alloy	Silver alloy	Gold Alloy
	Rating (Resistive Load)	3 A at 30 VDC	0.1 A at 30 VDC	2 A at 250 VAC	0.1 A at 30 VDC
	Max. Operating Current	3 A	0.1 A	2 A	0.1 A
Operating Force (see note)		1.77 N (180 gf)		1.8N (183 gf)	
Life Expectancy	Mechanical Ops Min.	5,000,000		1,000,000	1,000,000
	Electrical Ops Min.	200,000		50,000	200,000
Ambient Operating Temperature		-40°C to 85°C		-20°C to 70°C	
Mounting Pitch					
Actuator	Pin Plunger	•		•	
	Hinge Lever	•		•	
	Simulated Hinge Lever	•		•	
	Hinge Roller Lever	•			
	Short Hinge Lever				
	Long Hinge Lever				
	Short Hinge Roller Lever			•	
	Leaf Spring				
	Rotary Lever				
Terminals	Quick Connect	•		•	
	Solder	•			
	Screw				
	Panel Mount				
	Straight PCB	•		•	
	Angled PCB			•	
	Connector				
	Lead wire	•		•	
Page No.		663		669	

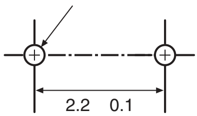
Note: These values are for pin plunger models

Model		D2VW		D2JW
Features		Sealed miniature switch		Switch for use in adverse environments such as water
Appearance				
		D2VW-5	D2VW-01	
Contact	Contact Specification	Rivet	Crossbar	Crossbar
	Contact Material	Silver alloy	Gold alloy	Gold alloy
	Rating (Resistive Load)	5 A at 250 VDC	0.1 A at 30 VDC	0.1 A at 30 VDC
	Max. Operating Current	5 A	0.1 A	0.1 A
Operating Force (see note)		1.96 N (200 gf)		2.94 N (300 gf)
Life Expectancy	Mechanical Ops Min.	10,000,000		1,000,000
	Electrical Ops Min.	100,000	1,000,000	100,000
Ambient Operating Temperature		-40°C to 90°C		-40°C to 85°C
Mounting Pitch				
Actuator	Pin Plunger	•		•
	Hinge Lever	•		•
	Simulated Hinge Lever	•		•
	Hinge Roller Lever	•		•
	Short Hinge Lever			•
	Long Hinge Lever			
	Short Hinge Roller Lever			
	Leaf Spring			
	Rotary Lever			
Terminals	Quick Connect	•		
	Solder	•		•
	Screw			
	Panel Mount			
	Straight PCB	•		
	Angled PCB			
	Connector			
	Lead wire	•		•
Page No.		678		684

Note: These values are for pin plunger models

Model		D2HW				D2MC	
Features		Ultra sub-miniature sealed switch with extra long stroke even without levers				High contact reliability	
Appearance							
		D2HW-A Without posts	D2HW-BR Posts on right	D2HW-BL Posts on left	D2HW-C M3 screw mounting	D2MC-5	D2MC-01
Contact	Contact Specification	Crossbar				Rivet	Crossbar
	Contact Material	Gold alloy				Silver alloy	Gold alloy
	Rating (Resistive Load)	2 A at 12 VDC, 1 A at 24 VDC, 0.5 A at 24 VDC				5 A at 250 VAC	0.5 A at 30 VDC
	Max. Operating Current	2 A				8 A	1 A
Operating Force (see note)		0.75 N (76 gf)				0.5, 0.75, 1.00 Nm (5.1, 7.6, 10.2 gf cm)	
Life Expectancy	Mechanical Ops Min.	1,000,000				10 x10^6 min.	
	Electrical Ops Min.	100,000				100 x10^3 min.	
Ambient Operating Temperature		-40°C to 85°C				-25°C to 80°C	
Mounting Pitch		Angled PCB Terminals  Straight PCB Terminals					
Actuator	Pin Plunger	•					
	Hinge Lever	•					
	Simulated Hinge Lever	•					
	Hinge Roller Lever						
	Short Hinge Lever						
	Long Hinge Lever	•					
	Short Hinge Roller Lever						
	Leaf Spring	•					
	Rotary Lever						
Terminals	Quick Connect						
	Solder	•					
	Screw						
	Panel Mount						
	Straight PCB	•					
	Angled PCB	•					
	Connector						
	Lead wire	•					
Page No.		689				697	

Note: These values are for pin plunger models

Model		D2D		
Features		Door interlock switch with fail safe mechanisms		
Appearance				
		D2D-1000	D2D-2000	D2D-3000
Contact	Contact Specification	Rivet		
	Contact Material	Silver		
	Rating (Resistive Load)	16 A at 250 VAC	120 A at 250 VAC	16 A at 250 VAC
	Max. Operating Current	16 A	10 A	16 A
Operating Force (see note)		NC-OFF 2.94 (600 gf) NC-ON 5.88 N (600 gf)	NC-ON 5.88 N (300 gf)	NC-OFF 2.94 N (300 gf)
Life Expectancy	Mechanical Ops Min.	10,000,000		
	Electrical Ops Min.	100,000		
Ambient Operating Temperature		-25°C to 85°C		
Mounting Pitch		Two. 4.2-dia. mounting holes or M4 screw holes 		
Actuator	Pin Plunger			
	Hinge Lever			
	Simulated Hinge Lever			
	Hinge Roller Lever			
	Short Hinge Lever			
	Long Hinge Lever			
	Short Hinge Roller Lever			
	Leaf Spring			
	Rotary Lever			
Terminals	Quick Connect			
	Solder			
	Screw	•		
	Panel Mount			
	Straight PCB			
	Angled PCB			
	Connector			
	Lead wire			
Page No.		702		

Note: These values are for pin plunger models

Reliable Basic Switch with External Lever

- ROHS compliant.
- Available by 0.1 A, 6 A, 11 A, 16 A and 21 A models, all with self-cleaning contacts.
- Available with internally or externally fitted levers, and 2 fixing positions for external levers.
- Conforms to EN61058-1 and UL1054.

Ordering Information

Model Number Legend

D3V-□□□□-□□□-□-□
1 2 3 4 5 6 7 8 9

1. **Ratings**
   - 21: 20 (4) A at 250 VAC
   - 16: 16 (3) A at 250 VAC
   - 11: 11 (3) A at 250 VAC
   - 6: 6 (2) A at 250 VAC
   - 01: 0.1 A at 125 VAC
2. **Contact Gap**
   - None: 1 mm (F gap)
   - G: 0.5 mm (G gap)
3. **Actuator**
   - None: Pin plunger
   - 1: Short hinge lever
   - 2: Hinge lever
   - 3: Long hinge lever
   - 4: Simulated roller lever
   - 5: Short hinge roller lever
   - 6: Hinge roller lever
4. **Hinge Position**
   - None: Internal/Far from plunger
   - M: External/Far from plunger
   - K: External/Near plunger
5. **Contact Form**
   - 1: SPDT
   - 2: SPST-NC
   - 3: SPST-NO
6. **Terminals**
   - A: Solder/quick-connect terminal (#187)
   - C2: Quick-connect terminal (#187)
   - C: Quick-connect terminal (#250)
7. **Maximum Operating Force**
   - 5: 1.96 N {200 gf}
   - 4A: 1.23 N {125 gf}
   - 4: 0.98 N {100 gf}
   - 3: 0.49 N {50 gf}
   - 2: 0.25 N {25 gf}

Note: These values are for the pin plunger models.

8. **Mounting Hole Size**
   - None: 3.1 mm
   - K: 2.9 mm
9. **Special Code**
   - None: Standard
   - H: High temperature (125°C)
   - E: Special rating: 21 (8) A

■ Available Combinations

	Model	D3V-21	D3V-16			D3V-11					D3V-6				D3V-01	
	Rated current	21 A	16 A			11 A					6 A				0.1 A	
	OF	1.23 N {125 gf}	1.96 N {200 gf}		0.98 N {100 gf}	1.96 N {200 gf}		0.98 N {100 gf}		0.49 N {50 gf}	1.96 N {200 gf}	0.98 N {100 gf}		0.49 N {50 gf}	0.49 N {50 gf}	0.25 N {25 gf}
Heat resis-tance	**Contact gap** / **Terminals**	G	F	G	F/G	F	G	F	G	G	F/G	F	G	G	F	F
Standard (85°C)	#187														●	●
	#250	●													❍	❍
Standard (105°C)	#187		●	❍	❍	●	❍	●	❍	❍	❍	●	❍	●		
	#250		●	❍	❍	●	❍	●	❍	❍	❍	●	❍	●		
High tem-perature (125°C)	#187		❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍		
	#250		❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍		

Note: 1. ●: Standard
❍: Semi-standard
2. Consult OMRON for models with standard approval.

Microswitches

■ List of Models

21 A (OF: 1.23 N {125 gf})

Actuator	Hinge position	Contact form		
		SPDT	SPST-NC	SPST-NO
Pin plunger	–	D3V-21G-1□4A-△	D3V-21G-2□4A-△	D3V-21G-3□4A-△
Short hinge lever	Internal	D3V-21G1-1□4A-△	D3V-21G1-2□4A-△	D3V-21G1-3□4A-△
	M	D3V-21G1M-1□4A-△	D3V-21G1M-2□4A-△	D3V-21G1M-3□4A-△
Hinge lever	Internal	D3V-21G2-1□4A-△	D3V-21G2-2□4A-△	D3V-21G2-3□4A-△
	M	D3V-21G2M-1□4A-△	D3V-21G2M-2□4A-△	D3V-21G2M-3□4A-△
Long hinge lever	Internal	D3V-21G3-1□4A-△	D3V-21G3-2□4A-△	D3V-21G3-3□4A-△
	M	D3V-21G3M-1□4A-△	D3V-21G3M-2□4A-△	D3V-21G3M-3□4A-△
Simulated hinge lever	Internal	D3V-21G4-1□4A-△	D3V-21G4-2□4A-△	D3V-21G4-3□4A-△
	M	D3V-21G4M-1□4A-△	D3V-21G4M-2□4A-△	D3V-21G4M-3□4A-△
Short hinge roller lever	Internal	D3V-21G5-1□4A-△	D3V-21G5-2□4A-△	D3V-21G5-3□4A-△
	M	D3V-21G5M-1□4A-△	D3V-21G5M-2□4A-△	D3V-21G5M-3□4A-△
Hinge roller lever	Internal	D3V-21G6-1□4A-△	D3V-21G6-2□4A-△	D3V-21G6-3□4A-△
	M	D3V-21G6M-1□4A-△	D3V-21G6M-2□4A-△	D3V-21G6M-3□4A-△

16 A (OF: 1.96 N {200 gf})

Actuator	Hinge position	Contact form		
		SPDT	SPST-NC	SPST-NO
Pin plunger	–	D3V-16-1□5-△	D3V-16-2□5-△	D3V-16-3□5-△
Short hinge lever	Internal	D3V-161-1□5-△	D3V-161-2□5-△	D3V-161-3□5-△
	M	D3V-161M-1□5-△	D3V-161M-2□5-△	D3V-161M-3□5-△
Hinge lever	Internal	D3V-162-1□5-△	D3V-162-2□5-△	D3V-162-3□5-△
	M	D3V-162M-1□5-△	D3V-162M-2□5-△	D3V-162M-3v5-△
Long hinge lever	Internal	D3V-163-1□5-△	D3V-163-2□5-△	D3V-163-3v5-△
	M	D3V-163M-1□5-△	D3V-163M-2□5-△	D3V-163M-3v5-△
Simulated hinge lever	Internal	D3V-164-1□5-△	D3V-164-2□5-△	D3V-164-3v5-△
	M	D3V-164M-1□5-△	D3V-164M-2□5-△	D3V-164M-3v5-△
Short hinge roller lever	Internal	D3V-165-1□5-△	D3V-165-2□5-△	D3V-165-3v5-△
	M	D3V-165M-1□5-△	D3V-165M-2v5-△	D3V-165M-3v5-△
Hinge roller lever	Internal	D3V-166-1□5-△	D3V-166-2□5-△	D3V-166-3v5-△
	M	D3V-166M-1□5-△	D3V-166M-2□5-△	D3V-166M-3□5-△

Note: The □ in the model number is for the terminal code.
- A: Solder/quick-connect terminals (#187)
- C2: Quick-connect terminals (#187)
- C: Quick-connect terminals (#250)

The △ in the model number is for the mounting hole size.
- None: 3.1 mm
- K: 2.9 mm

16 A (OF: 0.98 N {100 gf})

Actuator	Hinge position	Contact form		
		SPDT	SPST-NC	SPST-NO
Pin plunger	–	D3V-16-1□4-△	D3V-16-2□4-△	D3V-16-3□4-△
Short hinge lever	Internal	D3V-161-1□4-△	D3V-161-2□4-△	D3V-161-3□4-△
	M	D3V-161M-1□4-△	D3V-161M-2□4-△	D3V-161M-3□4-△
Hinge lever	Internal	D3V-162-1□4-D△	D3V-162-2□4-△	D3V-162-3□4-△
	M	D3V-162M-1□4-△	D3V-162M-2□4-△	D3V-162M-3□4-△
Long hinge lever	Internal	D3V-163-1□4-△	D3V-163-2□4-△	D3V-163-3□4-△
	M	D3V-163M-1□4-△	D3V-163M-2□4-△	D3V-163M-3□4-△
Simulated hinge lever	Internal	D3V-164-1□4-△	D3V-164-2□4-△	D3V-164-3□4-△
	M	D3V-164M-1□4-△	D3V-164M-2□4-△	D3V-164M-3□4-△
Short hinge roller lever	Internal	D3V-165-1□4-△	D3V-165-2□4-△	D3V-165-3□4-△
	M	D3V-165M-1□4-△	D3V-165M-2□4-△	D3V-165M-3□4-△
Hinge roller lever	Internal	D3V-166-1□4-△	D3V-166-2□4-△	D3V-166-3□4-△
	M	D3V-166M-1□4-△	D3V-166M-2□4-△	D3V-166M-3□4-△

11 A (OF: 1.96 N {200 gf})

Actuator	Hinge position	Contact form		
		SPDT	SPST-NC	SPST-NO
Pin plunger	–	D3V-11-1□5-△	D3V-11-2□5-△	D3V-11-3□5-△
Short hinge lever	Internal	D3V-111-1□5-△	D3V-111-2□5-△	D3V-111-3□5-△
	M	D3V-111M-1□5-△	D3V-111M-2□5-△	D3V-111M-3□5-△
Hinge lever	Internal	D3V-112-1□5-△	D3V-112-2□5-△	D3V-112-3□5-△
	M	D3V-112M-1□5-△	D3V-112M-2□5-△	D3V-112M-3□5-△
Long hinge lever	Internal	D3V-113-1□5-△	D3V-113-2□5-△	D3V-113-3□5-△
	M	D3V-113M-1□5-△	D3V-113M-2□5-△	D3V-113M-3□5-△
Simulated hinge lever	Internal	D3V-114-1□5-△	D3V-114-2□5-△	D3V-114-3□5-△
	M	D3V-114M-1□5-△	D3V-114M-2□5-△	D3V-114M-3□5-△
Short hinge roller lever	Internal	D3V-115-1□5-△	D3V-115-2□5-△	D3V-115-3□5-△
	M	D3V-115M-1□5-△	D3V-115M-2□5-△	D3V-115M-3□5-D
Hinge roller lever	Internal	D3V-116-1□5-△	D3V-116-2□5-△	D3V-116-3□5-△
	M	D3V-116M-1□5-△	D3V-116M-2□5-△	D3V-116M-3□5-△

Note: The □ in the model number is for the terminal code.

- A: Solder/quick-connect terminals (#187)
- C2: Quick-connect terminals (#187)
- C: Quick-connect terminals (#250)

The △ in the model number is for the mounting hole size.

- None: 3.1 mm
- K: 2.9 mm

11 A (OF: 0.98 N {100 gf})

Actuator	Hinge position	Contact form		
		SPDT	SPST-NC	SPST-NO
Pin plunger	–	D3V-11-1□4-△	D3V-11-2□4-△	D3V-11-3□4-△
Short hinge lever	Internal	D3V-111-1□4-△	D3V-111-2□4-△	D3V-111-3□4-△
	M	D3V-111M-1□4-△	D3V-111M-2□4-△	D3V-111M-3□4-△
Hinge lever	Internal	D3V-112-1□4-△	D3V-112-2□4-△	D3V-112-3□4-△
	M	D3V-112M-1□4-△	D3V-112M-2□4-△	D3V-112M-3□4-△
Long hinge lever	Internal	D3V-113-1□4-△	D3V-113-2□4-△	D3V-113-3□4-△
	M	D3V-113M-1□4-△	D3V-113M-2□4-△	D3V-113M-3□4-△
Simulated hinge lever	Internal	D3V-114-1□4-△	D3V-114-2□4-△	D3V-114-3□4-△
	M	D3V-114M-1□4-△	D3V-114M-2□4-△	D3V-114M-3□4-△
Short hinge roller lever	Internal	D3V-115-1□4-△	D3V-115-2□4-△	D3V-115-3□4-△
	M	D3V-115M-1□4-△	D3V-115M-2□4-△	D3V-115M-3□4-△
Hinge roller lever	Internal	D3V-116-1□4-△	D3V-116-2□4-△	D3V-116-3□4-△
	M	D3V-116M-1□4-△	D3V-116M-2□4-△	D3V-116M-3□4-△

11 A (OF: 0.49 N {50 gf})

Actuator	Hinge position	Contact form		
		SPDT	SPST-NC	SPST-NO
Pin plunger	–	D3V-11G-1□3-△	D3V-11G-2□4-△	D3V-11G-3□3-△
Short hinge lever	Internal	D3V-11G1-1□3-△	D3V-11G1-2□4-△	D3V-11G1-3□3-△
	M	D3V-11G1M-1□3-△	D3V-11G1M-2□3-△	D3V-11G1M-3□3-△
Hinge lever	Internal	D3V-11G2-1□3-△	D3V-11G2-2□3-△	D3V-11G2-3□3-△
	M	D3V-11G2M-1□3-△	D3V-11G2M-2□3-△	D3V-11G2M-3□3-△
Long hinge lever	Internal	D3V-11G3-1□3-△	D3V-11G3-2□3-△	D3V-11G3-3□3-△
	M	D3V-11G3M-1□3-△	D3V-11G3M-2□3-△	D3V-11G3M-3□3-△
Simulated hinge lever	Internal	D3V-11G4-1□3-△	D3V-11G4-2□3-△	D3V-11G4-3□3-△
	M	D3V-11G4M-1□3-△	D3V-11G4M-2□3-△	D3V-11G4M-3□3-△
Short hinge roller lever	Internal	D3V-11G5-1□3-△	D3V-11G5-2□3-△	D3V-11G5-3□3-△
	M	D3V-11G5M-1□3-△	D3V-11G5M-2□3-△	D3V-11G5M-3□3-△
Hinge roller lever	Internal	D3V-11G6-1□3-△	D3V-11G6-2□3-△	D3V-11G6-3□3-△
	M	D3V-11G6M-1□3-△	D3V-11G6M-2□3-△	D3V-11G6M-3□3-△

Note: The □ in the model number is for the terminal code.

A: Solder/quick-connect terminals (#187)
C2: Quick-connect terminals (#187)
C: Quick-connect terminals (#250)

The △ in the model number is for the mounting hole size.

None: 3.1 mm
K: 2.9 mm

6 A (OF: 0.98 N {100 gf})

Actuator	Hinge position	Contact form		
		SPDT	SPST-NC	SPST-NO
Pin plunger	–	D3V-6-1□4-△	D3V-6-2□4-△	D3V-6-3□4-△
Short hinge lever	Internal	D3V-61-1□4-△	D3V-61-2□4-△	D3V-61-3□4-△
	M	D3V-61M-1□4-△	D3V-61M-2□4-△	D3V-61M-3□4-△
Hinge lever	Internal	D3V-62-1□4-△	D3V-62-2□4-△	D3V-62-3□4-△
	M	D3V-62M-1□4-△	D3V-62M-2□4-△	D3V-62M-3□4-△
Long hinge lever	Internal	D3V-63-1□4-△	D3V-63-2□4-△	D3V-63-3□4-△
	M	D3V-63M-1□4-△	D3V-63M-2□4-△	D3V-63M-3□4-△
Simulated hinge lever	Internal	D3V-64-1□4-△	D3V-64-2□4-△	D3V-64-3□4-△
	M	D3V-64M-1□4-△	D3V-64M-2□4-△	D3V-64M-3□4-△
Short hinge roller lever	Internal	D3V-65-1□4-△	D3V-65-2□4-△	D3V-65-3□4-△
	M	D3V-65M-1□4-△	D3V-65M-2□4-△	D3V-65M-3□4-△
Hinge roller lever	Internal	D3V-66-1□4-△	D3V-66-2□4-△	D3V-66-3□4-△
	M	D3V-66M-1□4-△	D3V-66M-2□4-△	D3V-66M-3□4-△

6 A (OF: 0.49 N {50 gf})

Actuator	Hinge position	Contact form		
		SPDT	SPST-NC	SPST-NO
Pin plunger	–	D3V-6G-1□3-△	D3V-6G-2□3-△	D3V-6G-3□3-△
Short hinge lever	Internal	D3V-6G1-1□3-△	D3V-6G1-2□3-△	D3V-6G1-3□3-△
	M	D3V-6G1M-1□3-△	D3V-6G1M-2□3-△	D3V-6G1M-3□3-△
Hinge lever	Internal	D3V-6G2-1□3-△	D3V-6G2-2□3-△	D3V-6G2-3□3-△
	M	D3V-6G2M-1□3-△	D3V-6G2M-2□3-△	D3V-6G2M-3□3-△
Long hinge lever	Internal	D3V-6G3-1□3-△	D3V-6G3-2□3-△	D3V-6G3-3□3-△
	M	D3V-6G3M-1□3-△	D3V-6G3M-2□3-△	D3V-6G3M-3□3-△
Simulated hinge lever	Internal	D3V-6G4-1□3-△	D3V-6G4-2□3-△	D3V-6G4-3□3-△
	M	D3V-6G4M-1□3-△	D3V-6G4M-2□3-△	D3V-6G4M-3□3-△
Short hinge roller lever	Internal	D3V-6G5-1□3-△	D3V-6G5-2□3-△	D3V-6G5-3□3-△
	M	D3V-6G5M-1□3-△	D3V-6G5M-2□3-△	D3V-6G5M-3□3-△
Hinge roller lever	Internal	D3V-6G6-1□3-△	D3V-6G6-2□3-△	D3V-6G6-3□3-△
	M	D3V-6G6M-1□3-△	D3V-6G6M-2□3-△	D3V-6G6M-3□3-△

Note: The □ in the model number is for the terminal code.
A: Solder/quick-connect terminals (#187)
C2: Quick-connect terminals (#187)
C: Quick-connect terminals (#250)
The △ in the model number is for the mounting hole size.
None: 3.1 mm
K: 2.9 mm

01 A (OF: 0.49 N {50 gf})

Actuator	Hinge position	Contact form		
		SPDT	SPST-NC	SPST-NO
Pin plunger	–	D3V-01-1□3-△	D3V-01-2□3-△	D3V-01-3□3-△
Short hinge lever	Internal	D3V-011-1□3-△	D3V-011-2□3-△	D3V-011-3□3-△
	M	D3V-011M-1□3-△	D3V-011M-2□3-△	D3V-011M-3□3-△
Hinge lever	Internal	D3V-012-1□3-△	D3V-012-2□3-△	D3V-012-3□3-△
	M	D3V-012M-1□3-△	D3V-012M-2□3-△	D3V-012M-3□3-△
Long hinge lever	Internal	D3V-013-1□3-△	D3V-013-2□3-△	D3V-013-3□3-△
	M	D3V-013M-1□3-△	D3V-013M-2□3-△	D3V-013M-3□3-△
Simulated hinge lever	Internal	D3V-014-1□3-△	D3V-014-2□3-△	D3V-014-3□3-△
	M	D3V-014M-1□3-△	D3V-014M-2□3-△	D3V-014M-3□3-△
Short hinge roller lever	Internal	D3V-015-1□3-△	D3V-015-2□3-△	D3V-015-3□3-△
	M	D3V-015M-1□3-△	D3V-015M-2□3-△	D3V-015M-3□3-△
Hinge roller lever	Internal	D3V-016-1□3-△	D3V-016-2□3-△	D3V-016-3□3-△
	M	D3V-016M-1□3-△	D3V-016M-2□3-△	D3V-016M-3□3-△

01 A (OF: 0.25 N {25 gf})

Actuator	Hinge position	Contact form		
		SPDT	SPST-NC	SPST-NO
Pin plunger	–	D3V-01-1□2-△	D3V-01-2□2-△	D3V-01-3□2-△

Note: The □ in the model number is for the terminal code.

A: Solder/quick-connect terminals (#187)
C2: Quick-connect terminals (#187)
C: Quick-connect terminals (#250)

The △ in the model number is for the mounting hole size.

None: 3.1 mm
K: 2.9 mm

Specifications

■ Ratings

Type	Rated voltage	Non-inductive load				Inductive load			
		Resistive load		Lamp load		Inductive load		Motor load	
		NC	NO	NC	NO	NC	NO	NC	NO
D3V-21	250 VAC	21 A		3 A		12 A		4 A	
	8 VDC 30 VDC 125 VDC 250 VDC	21 A 14 A 0.6 A 0.3 A		5 A 5 A 0.1 A 0.05 A		12 A 12 A 0.6 A 0.3 A		7 A 5 A 0.1 A 0.05 A	
D3V-16	250 VAC	16 A		2 A		10 A		3 A	
	8 VDC 30 VDC 125 VDC 250 VDC	16 A 10 A 0.6 A 0.3 A		4 A 4 A 0.1 A 0.05 A		10 A 10 A 0.6 A 0.3 A		6 A 4 A 0.1 A 0.05 A	
D3V-11	250 VAC	11 A		1.5 A		6 A		2 A	
	8 VDC 30 VDC 125 VDC 250 VDC	11 A 6 A 0.6 A 0.3 A		3 A 3 A 0.1 A 0.05 A		6 A 6 A 0.6 A 0.3 A		3 A 3 A 0.1 A 0.05 A	
D3V-5	250 VAC	6 A		3 A		4 A		–	
	8 VDC 30 VDC 125 VDC 250 VDC	6 A 6 A 0.4 A 0.3 A		3 A 3 A 0.1 A 0.05 A		4 A 4 A 0.4 A 0.2 A		–	
D3V-01	125 VAC	0.1 A		–		–		–	
	8 VDC 30 VDC	0.1 A 0.1 A		–		–		–	

Note: 1. The above current values are the normal current values of models with a contact gap of 1 mm (gap F), which vary with the normal current values of models with a contact gap of 0.5 mm (gap G).
2. Inductive load has a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
3. Lamp load has an inrush current of 10 times the steady-state current.
4. Motor load has an inrush current of 6 times the steady-state current.
5. The ratings values apply under the following test conditions:
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 30 operations/min

■ Characteristics

Operating speed	0.1 mm to 1 m/s (at pin plunger models)
Operating frequency	Mechanical: 600 operations/min Electrical: 60 operations/min
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance (initial values)	D3V-21: 50 mΩ max. D3V-16, D3V-11, D3V-6: 30 mΩ max. D3V-01, 0.49 N {50 gf}: 50 mΩ max. 0.25 N {25 gf}: 100 mΩ max..
Dielectric strength (see note 1)	1,000 VAC, 50/60 Hz for 1 min between terminals of the same polarity
	2,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal parts
Vibration resistance (see note 2)	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance (see note 2)	Destruction: 400 m/s^2 {approx. 40G} max. Malfunction: 100 m/s^2 {approx. 10G} max.
Durability (see note 3)	Mechanical: 10,000,000 operations min. Electrical: D3V-21: 50,000 operations min. D3V-16: 100,000 operations min. D3V-11: 200,000 operations min. D3V-6, D3V-01: 500,000 operations min.
Degree of protection	IEC IP00
Degree of protection against electric shock	Class I
Proof tracking index (PTI)	250
Ambient operating temperature	D3V-21, D3V-01: -25°C to 85°C (with no icing) D3V-16, D3V-11, D3V-6: -25°C to 105°C (with no icing)
Ambient operating humidity	85% max. (for 5°C to 35°C)
Weight	Approx. 6.2 g (pin plunger model)

Note: 1. The dielectric strength values shown in the table are for models with a Separator.
2. For the pin plunger models, the above values apply for use at both the free position and total travel position. For the lever models, they apply at the total travel position.
3. For testing conditions, contact your OMRON sales representative.

■ Approved Standards

UL1054 (File No. E41515) CSA C22.2 No.55 (File No. LR21642) (Only Standard Ratings are listed.)

Rated voltage	D3V-21G	D3V-16	D3V-16G	D3V-11	D3V-11G	D3V-6	D3V-6G	D3V-01
125 VAC	21 A, 1/2 HP (See note.)	16 A, 1/2 HP	16 A, 1/2 HP	11 A, 1/2 HP	11 A, 1/2 HP	6 A, 1/4 HP	6 A, 1/4 HP	0.1 A
250 VAC	21 A, 1/2 HP (See note.)	16 A, 1/2 HP	16 A, 1/2 HP	11 A, 1/2 HP	11 A, 1/2 HP	6 A, 1/4 HP	6 A, 1/4 HP	–
125 VDC	–	0.6 A	0.1 A	0.6 A	0.1 A	–	–	–
250 VDC	–	0.3 A	–	0.3 A	–	–	–	–

Note: Approved projected.

EN 61058-1: 1992+A1: 1993 (License No. 119151L)

Rated voltage	D3V-21G	D3V-16	D3V-11	D3V-6	D3V-01
125 VAC	–	–	–	–	0.1 A
250 VAC	20 (4) A	16 (3) A	11 (3) A	6 (2) A	–

Testing conditions: 50,000 operations, T85 (0°C to 85°C) for D3V-21/D3V-01, T105 (0°C to 105°C) for D3V-16/D3V-11/D3V-6

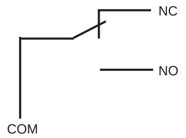
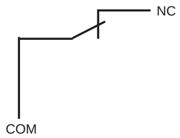
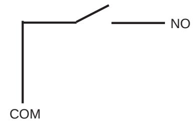
Rated voltage	D3V-21G
250 VAC	21 (8) A

Testing conditions: 10,000 operations, T85 (0°C to 85°C)

■ Contact Specifications

Item		D3V-21	D3V-16	D3V-11	D3V-6	D3V-01
Contact	Specification	Rivet				Crossbar
	Material	Silver alloy				Gold alloy
	Gap (standard value)	0.5 mm	1 mm (F gap) or 0.5 mm (G gap)			1.0 mm
Inrush current	NC	50 A max.	40 A max.	24 A max.	15 A max.	–
	NO					
Minimum applicable load		160 mA at 5 VDC				1 mA at 5 VDC

■ Contact Form

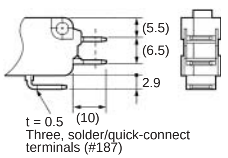
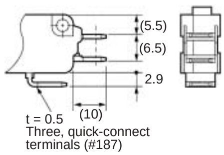
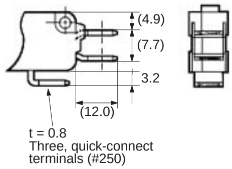
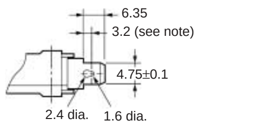
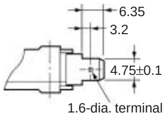
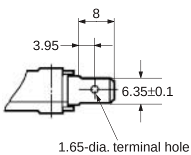
SPDT	SPST-NC	SPST-NO
		

Dimensions

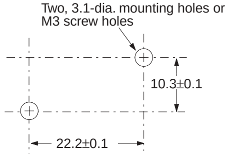
■ Terminals

Note: 1. All units are in millimeters unless otherwise indicated.

2. The table below is for the SPDT contact specifications. Two terminals will be available for SPST-NO or SPST-NC contact specifications. For terminal positions, refer to the above Contact Form.

Terminal type	Solder/Quick-connect Terminal (#187) (A)	Quick-connect Terminal (#187) (C2)	Quick-connect Terminal (#250) (C)
COM			
Terminal dimensions	 **Note:** Indicates the length to the center of the 1.6-dia. holes		

■ Mounting Holes



Microswitches

Dimensions & Operating Characteristics

Note: 1. All units are in millimeters unless otherwise indicated.

2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

3. The following illustrations and drawings are for quick-connect terminals (#187) (terminals C2). D3V models incorporate terminals A and C. These models are different from #187 models in terminal size only. Terminals A and C are omitted from the following drawings. Refer to Terminals on page 10 for these terminals.

4. The following illustrations and drawings are for models with the hinge position set to external/further than plunger. Models with the hinge position set to internal position are not shown here. For details about the internal position models, contact your OMRON sales representative. Operating characteristics are the same for these two types of models.

5. The □ in the model number is for the terminal code.

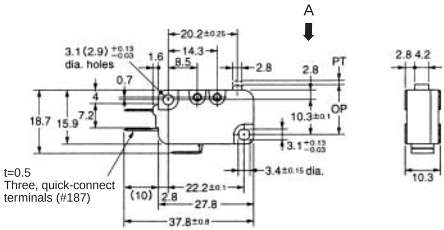
6. The △ in the model number is for the mounting hole size.

7. The hole size in the following illustrations of models with a suffix "K" in the △ is 2.9 mm.

8. The operating characteristics are for operation in the A direction (⬇).

Pin Plunger Models

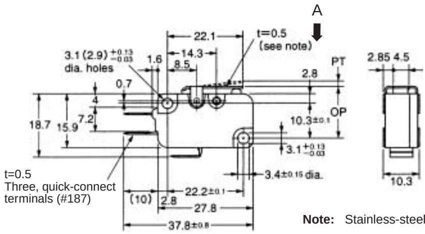
D3V-21G-1□4A-Δ
D3V-16-1□5-Δ
D3V-11-1□5-Δ
D3V-11-1□4-Δ
D3V-6-1□4-Δ
D3V-6G-1□3-Δ
D3V-01-1□2-Δ
D3V-01-1□3-Δ



Model	D3V-21G-1□4A-Δ	D3V-16-1□5-Δ D3V-11-1□5-Δ	D3V-11-1□4-Δ D3V-6-1□4-Δ	D3V-6G-1□3-Δ	D3V-01-1□3-Δ	D3V-01-1□2-Δ
OF max. RF min.	1.23 N {125 gf} 0.20 N {20 gf}	1.96 N {200 gf} 0.49 N {50 gf}	0.98 N {100 gf} 0.15 N {15 gf}	0.49 N {50 gf} 0.05 N {5 gf}	0.49 N {50 gf} 0.05 N {5 gf}	0.25 N {25 gf} 0.03 N {3 gf}
PT max. OT min. MD max.	1.2 mm 1.0 mm 0.3 mm	1.2 mm 1.0 mm 0.4 mm (F gap type) or 0.3 mm (G gap type)			1.2 mm 1.0 mm 0.4 mm	
OP	14.7±0.4 mm					

Short Hinge Lever Models

D3V-21G1M-1□4A-Δ
D3V-161M-1□5-Δ
D3V-111M-1□5-Δ
D3V-111M-1□4-Δ
D3V-61M-1□4-Δ
D3V-6G1M-1□3-Δ
D3V-011M-1□3-Δ

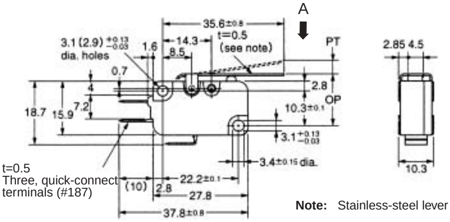


Note: Stainless-steel lever

Model	D3V-21G1M-1□4A-Δ	D3V-161M-1□5-Δ D3V-111M-1□5-Δ	D3V-111M-1□4-Δ D3V-61M-1□4-Δ	D3V-6G1M-1□3-Δ	D3V-011M-1□3-Δ
OF max. RF min.	1.23 N {125 gf} 0.20 N {20 gf}	1.96 N {200 gf} 0.49 N {50 gf}	0.98 N {100 gf} 0.15 N {15 gf}	0.49 N {50 gf} 0.05 N {5 gf}	
PT max. OT min. MD max.	1.6 mm 0.8 mm 0.5 mm	1.6 mm 0.8 mm 0.6 mm (F gap type) or 0.5 mm (G gap type)			1.6 mm 0.8 mm 0.6 mm
OP	15.2±0.5 mm				

Hinge Lever Models

D3V-21G2M-1□4A-Δ
D3V-162M-1□5-Δ
D3V-112M-1□5-Δ
D3V-112M-1□4-Δ
D3V-62M-1□4-Δ
D3V-6G2M-1□3-Δ
D3V-012M-1□3-Δ

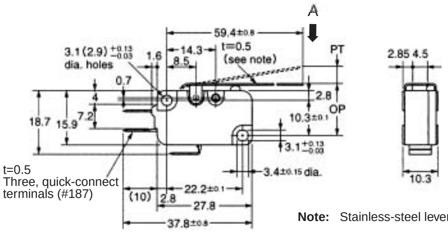


Note: Stainless-steel lever

Model	D3V-21G2M-1□4A-Δ	D3V-162M-1□5-Δ D3V-112M-1□5-Δ	D3V-112M-1□4-Δ D3V-62M-1□4-Δ	D3V-6G2M-1□3-Δ	D3V-012M-1□3-Δ
OF max. RF min.	0.78 N {80 gf} 0.06 N {6 gf}	1.23 N {125 gf} 0.14 N {14 gf}	0.59 N {60 gf} 0.06 N {6 gf}		0.29 N {30 gf} ---
PT max. OT min. MD max.	4.0 mm 1.6 mm 0.8 mm	4.0 mm 1.6 mm 1.5 mm (F gap type) or 0.8 mm (G gap type)			4.0 mm 1.6 mm 1.5 mm
OP	15.2±1.2 mm				

Long Hinge Lever Models

D3V-21G3M-1□4A-Δ
D3V-163M-1□5-Δ
D3V-113M-1□5-Δ
D3V-113M-1□4-Δ
D3V-63M-1□4-Δ
D3V-6G3M-1□3-Δ
D3V-013M-1□3-Δ

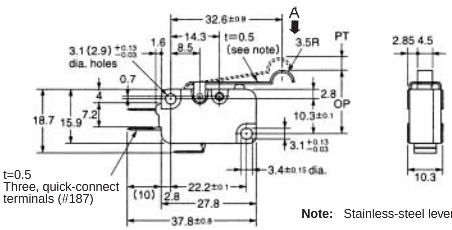


Note: Stainless-steel lever

Model	D3V-21G3M-1□4A-Δ	D3V-163M-1□5-Δ D3V-113M-1□5-Δ	D3V-113M-1□4-Δ D3V-63M-1□4-Δ	D3V-6G3M-1□3-Δ	D3V-013M-1□3-Δ
OF max. RF min.	0.44 N {45 gf} 0.03 N {3 gf}	0.69 N {70 gf} 0.06 N {6 gf}	0.34 N {35 gf} ---	0.20 N {20 gf} ---	
PT max. OT min. MD max.	9.0 mm 2.0 mm 2.0 mm	9.0 mm 2.0 mm 2.8 mm (F gap type) or 2.0 mm (G gap type)	9.0 mm 3.2 mm 2.8 mm (F gap type) or 2.0 mm (G gap type)		9.0 mm 3.2 mm 2.8 mm
OP	$15.2^{+2.6}_{-3.2}$ mm		15.2±2.6 mm		

Simulated Roller Lever Models

D3V-21G4M-1□4A-Δ
D3V-164M-1□5-Δ
D3V-114M-1□5-Δ
D3V-114M-1□4-Δ
D3V-64M-1□4-Δ
D3V-6G4M-1□3-Δ
D3V-014M-1□3-Δ

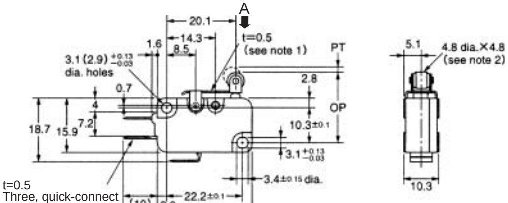


Note: Stainless-steel lever

Model	D3V-21G4M-1□4A-Δ	D3V-164M-1□5-Δ D3V-114M-1□5-Δ	D3V-114M-1□4-Δ D3V-64M-1□4-Δ	D3V-6G4M-1□3-Δ	D3V-014M-1□3-Δ
OF max. RF min.	0.83 N {85 gf} 0.07 N {7 gf}	1.23 N {125 gf} 0.14 N {14 gf}	0.59 N {60 gf} 0.06 N {6 gf}	0.29 N {30 gf} ---	
PT max. OT min. MD max.	4.0 mm 1.6 mm 1.4 mm	4.0 mm 1.6 mm 1.5 mm (F gap type) or 0.8 mm (G gap type)			4.0 mm 1.6 mm 1.5 mm
OP	18.7±1.2 mm				

Short Hinge Roller Lever Models

D3V-21G5M-1□4A-Δ
D3V-165M-1□5-Δ
D3V-115M-1□5-Δ
D3V-115M-1□4-Δ
D3V-65M-1□4-Δ
D3V-6G5M-1□3-Δ
D3V-015M-1□3-Δ

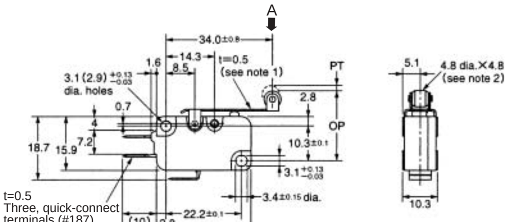


Note: 1. Stainless-steel lever
2. Oilless polyacetar resin roller

Model	D3V-21G5M-1□4A-Δ	D3V-165M-1□5-Δ D3V-115M-1□5-Δ	D3V-115M-1□4-Δ D3V-65M-1□4-Δ	D3V-6G5M-1□3-Δ	D3V-015M-1□3-Δ
OF max. RF min.	1.42 N {145 gf} 0.2 N {20 gf}	2.35 N {240 gf} 0.49 N {50 gf}	1.18 N {120 gf} 0.15 N {15 gf}	0.59 N {60 gf} 0.06 N {6 gf}	
PT max. OT min. MD max.	1.6 mm 0.8 mm 0.5 mm	1.6 mm 0.8 mm 0.6 mm (F gap type) or 0.5 mm (G gap type)			1.6 mm 0.8 mm 0.6 mm
OP	20.7±0.6 mm				

Hinge Roller Lever Models

D3V-21G6M-1□4A-Δ
D3V-166M-1□5-Δ
D3V-116M-1□5-Δ
D3V-116M-1□4-Δ
D3V-66M-1□4-Δ
D3V-6G6M-1□3-Δ
D3V-016M-1□3-Δ



Note: 1. Stainless-steel lever
2. Oilless polyacetar resin roller

Model	D3V-21G6M-1□4A-Δ	D3V-166M-1□5-Δ D3V-116M-1□5-Δ	D3V-116M-1□4-Δ D3V-66M-1□4-Δ	D3V-6G6M-1□3-Δ	D3V-016M-1□3-Δ
OF max. RF min.	0.79 N {80 gf} 0.05 N {5 gf}	1.23 N {125 gf} 0.14 N {14 gf}	0.59 N {60 gf} 0.06 N {6 gf}	0.29 N {30 gf} ---	
PT max. OT min. MD max.	4.0 mm 1.6 mm 0.8 mm	4.0 mm 1.6 mm 1.5 mm (F gap type) or 0.8 mm (G gap type)			4.0 mm 1.6 mm 1.5 mm
OP	20.7±1.2 mm				

Precautions

■ Cautions

Handling

Be careful not to drop the switch. Doing so may cause damage to the switch's internal components because it is designed for a small load.

■ Correct Use

Mounting

Use two M3 mounting screws with an appropriate screwdriver to mount the switch. Tighten the screws to a torque of 0.39 to 0.59 N • m {4 to 6 kgf • cm}.

Mounting Direction

Mount lever-operated switches with a maximum operating force of 0.49 N in a direction where the actuator weight will not be applied to the switch. Since the switch is designed for a small load, its resetting force is small. Therefore, resetting failure may occur if unnecessary load is applied to the switch.

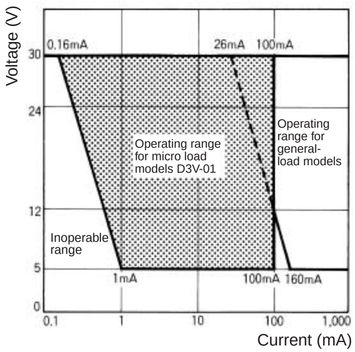
Insulation Distance

According to EN61058-1, the minimum insulation thickness for this switch should be 1.1 mm and minimum clearance distance between the terminal and mounting plate should be 1.9 mm. If the insulation distance cannot be provided in the product incorporating the switch, either use a switch with insulation barrier or use a Separator to ensure sufficient insulation distance.

Using Micro Loads

Using a model for ordinary loads to open or close the contact of a micro load circuit may result faulty contact. Use models that operate in the following range. However, even when using micro load models within the operating range shown below, if inrush current occurs when the contact is opened or closed, it may increase contact wear and so decrease life expectancy. Therefore, insert a contact protection circuit where necessary.

The minimum applicable load is the N-level reference value. This value indicates the malfunction reference level for the reliability level of 60% (λ 60). The equation, $\lambda\ 60 = 0.5 \times 10^{-6}$/operations indicates that the estimated malfunction rate is less than 1/2,000,000 operations with a reliability level of 60%.



Solder Terminal Approval Conditions

Soldering iron can be used. Soldering hook hole available.
Soldering terminal types 1 and 2 are met.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Reliable and Safe Basic Switch

- ROHS Compliant.
- Self-cleaning contacts.
- Best-seller Switches with switching currents of 10 to 21 A.
- Can be used for shutting down current in doors.
- Widely used for operating switches in applications where long life expectancy is required.
- Available in two types of cases: thermoplastic resin and thermosetting resin.
- Available with right-angle PCB terminal.
- Conforms to EN61058-1.

Ordering Information

■ Model Number Legend

V-□□□-□□□□-□

1 2 3 4 5 6 7 8

1. Ratings

21: 21 A
16: 16 A
15: 15 A
11: 11 A
10: 10 A

2. Contact Gap

None: 1 mm (F gap)
G: 0.5 mm (G gap) (for remodelling)

3. Actuator

None: Pin plunger
1: Short hinge lever
2: Hinge lever
3: Long hinge lever
4: Simulated hinge lever
5: Short hinge roller lever
6: Hinge roller lever

4. Contact Form

1: SPDT (COM bottom terminal, double-throw)
2: SPST-NC (COM bottom terminal, normally closed)
3: SPST-NO (COM bottom terminal, normally open)
4: SPDT (COM side terminal, double-throw)
5: SPST-NC (COM side terminal, normally closed)
6: SPST-NO (COM side terminal, normally open)

5. Terminals

A: Solder/quick-connect terminal (#187)
C2: Quick-connect terminal (#187)
C: Quick-connect terminal (#250)
B: Screw terminal

6. Barrier (Models with Thermoplastic Case Only)

None: Without barrier
R: Right-hand barrier
L: Left-hand barrier

7. Operating Force max.

6: 3.92 N {400 gf}
5: 1.96 N {200 gf}
4: 0.98 N {100 gf}

Note: These values are for the pin plunger models.

8. Special Purpose

T: Heat-resistive

Combinations of Available Terminals

Terminal			Model	Thermoplastic case: V-21	V-16		V-11	Thermosetting case: V-15		V-10	
			Rated current	21 A	16 A		11 A	15 A		10 A	
COM terminal position	Insulatio n barrier	Heat resistance	OF / Terminal symbol	3.92 N {400 gf}	3.92 N {400 gf}	1.96 N {200 gf}	0.98 N {100 gf}	3.92 N {400 gf}	1.96 N {200 gf}	1.96 N {200 gf}	0.98 N {100 gf}
Bottom	No	Standard (80°C)	Solder/Quick-connect terminal (#187) (A)	---	Semi-standard	Standard	Standard	Semi-standard	Standard	Standard	Standard
			Quick-connect terminal (#187) (C2)	---	Semi-standard	Standard	Standard	Semi-standard	Standard	Standard	Standard
			Quick-connect terminal (#250) (C)	Standard	Semi-standard	Standard	Standard	Semi-standard	Semi-standard	Semi-standard	Semi-standard
			Screw terminal (B)	---	---	---	---	Semi-standard	Standard	Standard	Standard
		Heat resistant (150°C)	Solder/Quick-connect terminal (#187) (A)	---	---	---	---	Semi-standard	Standard	Standard	Standard
			Quick-connect terminal (#187) (C2)	---	---	---	---	Semi-standard	Semi-standard	Semi-standard	Semi-standard
			Quick-connect terminal (#250) (C)	---	---	---	---	---	---	---	---
			Screw terminal (B)	---	---	---	---	---	---	---	---
	Yes	Standard (80°C)	Solder/Quick-connect terminal (#187) (A)	---	Semi-standard	Standard	---	---	---	---	---
			Quick-connect terminal (#187) (C2)	---	Semi-standard	Standard	---	---	---	---	---
			Quick-connect terminal (#250) (C)	Standard	Semi-standard	Standard	---	---	---	---	---
Side	No	Standard (80°C)	Solder/Quick-connect terminal (#187) (A)	---	---	---	---	Semi-standard	Standard	Standard	Standard
			Quick-connect terminal (#187) (C2)	---	---	---	---	Semi-standard	Semi-standard	Semi-standard	Semi-standard
			Quick-connect terminal (#250) (C)	Semi-standard	---	---	---	---	---	---	---

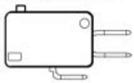
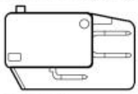
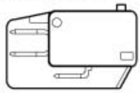
Consult OMRON for standard approvals of models.

List of Models

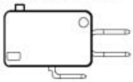
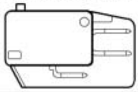
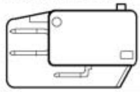
General-purpose Models

(Only standard combinations of terminal availability are shown.)

Thermoplastic Case

Actuator	COM terminal position	Contact form	Terminals (see note)	21 A (OF: 3.92 N {400 gf}) Without barrier 	Right-hand barrier 	Left-hand barrier 
Pin plunger	Bottom	SPDT	C	V-21-1C6	V-21-1CR6	V-21-1CL6
		SPST-NC	C	V-21-2C6	V-21-2CR6	V-21-2CL6
		SPST-NO	C	V-21-3C6	V-21-3CR6	V-21-3CL6
Short hinge lever	Bottom	SPDT	C	V-211-1C6	V-211-1CR6	V-211-1CL6
Hinge lever	Bottom	SPDT	C	V-212-1C6	V-212-1CR6	V-212-1CL6
Long hinge lever	Bottom	SPDT	C	V-213-1C6	V-213-1CR6	V-213-1CL6
Simulated hinge lever	Bottom	SPDT	C	V-214-1C6	V-214-1CR6	V-214-1CL6
Short hinge roller lever	Bottom	SPDT	C	V-215-1C6	V-215-1CR6	V-215-1CL6
Hinge roller lever	Bottom	SPDT	C	V-216-1C6	V-216-1CR6	V-216-1CL6

Note: C: Quick-connect terminals (#250)

Actuator	COM terminal position	Contact form	Terminals (see note)	16 A (OF: 1.96 N {200 gf})		
				Without barrier 	Right-hand barrier 	Left-hand barrier 
Pin plunger	Bottom	SPDT	A	V-16-1A5	V-16-1AR5	V-16-1AL5
			C2	V-16-1C25	V-16-1C2R5	V-16-1C2L5
			C	V-16-1C5	---	---
		SPST-NC	A	V-16-2A5	V-16-2AR5	V-16-2AL5
			C2	V-16-2C25	V-16-2C2R5	V-16-2C2L5
			C	V-16-2C5	---	---
		SPST-NO	A	V-16-3A5	V-16-3AR5	V-16-3AL5
			C2	V-16-3C25	V-16-3C2R5	V-16-3C2L5
			C	V-16-3C5	---	---
Short hinge lever	Bottom	SPDT	A	V-161-1A5	V-161-1AR5	V-161-1AL5
			C2	V-161-1C25	V-161-1C2R5	V-161-1C2L5
			C	V-161-1C5	---	---
Hinge lever	Bottom	SPDT	A	V-162-1A5	V-162-1AR5	V-162-1AL5
			C2	V-162-1C25	V-162-1C2R5	V-162-1C2L5
			C	V-162-1C5	---	---
Long hinge lever	Bottom	SPDT	A	V-163-1A5	V-163-1AR5	V-163-1AL5
			C2	V-163-1C25	V-163-1C2R5	V-163-1C2L5
			C	V-163-1C5	---	---
Simulated hinge lever	Bottom	SPDT	A	V-164-1A5	V-164-1AR5	V-164-1AL5
			C2	V-164-1C25	V-164-1C2R5	V-164-1C2L5
			C	V-164-1C5	---	---
Short hinge roller lever	Bottom	SPDT	A	V-165-1A5	V-165-1AR5	V-165-1AL5
			C2	V-165-1C25	V-165-1C2R5	V-165-1C2L5
			C	V-165-1C5	---	---
Hinge roller lever	Bottom	SPDT	A	V-166-1A5	V-166-1AR5	V-166-1AL5
			C2	V-166-1C25	V-166-1C2R5	V-166-1C2L5
			C	V-166-1C5	---	---

Note: A: Solder/quick-connect terminals (#187)
C2: Quick-connect terminals (#187)
C: Quick-connect terminals (#250)

Actuator	COM terminal position	Contact form	Terminals (see note)	11 A
				OF: 0.98 N {100 gf}
Pin plunger	Bottom	SPDT	A	V-11-1A4
			C2	V-11-1C24
			C	V-11-1C4
Short hinge lever	Bottom	SPDT	A	V-111-1A4
			C2	V-111-1C24
			C	V-111-1C4
Hinge lever	Bottom	SPDT	A	V-112-1A4
			C2	V-112-1C24
			C	V-112-1C4
Long hinge lever	Bottom	SPDT	A	V-113-1A4
			C2	V-113-1C24
			C	V-113-1C4
Simulated hinge lever	Bottom	SPDT	A	V-114-1A4
			C2	V-114-1C24
			C	V-114-1C4
Short hinge roller lever	Bottom	SPDT	A	V-115-1A4
			C2	V-115-1C24
			C	V-115-1C4
Hinge roller lever	Bottom	SPDT	A	V-116-1A4
			C2	V-116-1C24
			C	V-116-1C4

Note: A: Solder/quick-connect terminals (#187)
C2: Quick-connect terminals (#187)
C: Quick-connect terminals (#250)

Thermosetting Case

Actuator	COM terminal position	Contact form	Terminals (see note 2)	15 A	10 A	
				OF: 1.96 N {200 gf}	OF: 1.96 N {200 gf}	OF: 0.98 N {100 gf}
Pin plunger	Bottom	SPDT	A	V-15-1A5	V-10-1A5	V-10-1A4
			C2	V-15-1C25	V-10-1C25	V-10-1C24
			B	V-15-1B5	V-10-1B5	V-10-1B4
	Bottom	SPST-NC	A	V-15-2A5	V-10-2A5	V-10-2A4
			C2	V-15-2C25	V-10-2C25	V-10-2C24
			B	V-15-2B5	V-10-2B5	V-10-2B4
	Bottom	SPST-NO	A	V-15-3A5	V-10-3A5	V-10-3A4
			C2	V-15-3C25	V-10-3C25	V-10-3C24
			B	V-15-3B5	V-10-3B5	V-10-3B4
	Side	SPDT	A	V-15-4A5	V-10-4A5	V-10-4A4
		SPST-NC	A	V-15-5A5	V-10-5A5	V-10-5A4
		SPST-NO	A	V-15-6A5	V-10-6A5	V-10-6A4
Short hinge lever	Bottom	SPDT	A	V-151-1A5	V-101-1A5	V-101-1A4
			C2	V-151-1C25	V-101-1C25	V-101-1C24
			B	V-151-1B5	V-101-1B5	V-101-1B4
Hinge lever	Bottom	SPDT	A	V-152-1A5	V-102-1A5	V-102-1A4
			C2	V-152-1C25	V-102-1C25	V-102-1C24
			B	V-152-1B5	V-102-1B5	V-102-1B4
Long hinge lever	Bottom	SPDT	A	V-153-1A5	V-103-1A5	V-103-1A4
			C2	V-153-1C25	V-103-1C25	V-103-1C24
			B	V-153-1B5	V-103-1B5	V-103-1B4
Simulated hinge lever	Bottom	SPDT	A	V-154-1A5	V-104-1A5	V-104-1A4
			C2	V-154-1C25	V-104-1C25	V-104-1C24
			B	V-154-1B5	V-104-1B5	V-104-1B4
Short hinge roller lever	Bottom	SPDT	A	V-155-1A5	V-105-1A5	V-105-1A4
			C2	V-155-1C25	V-105-1C25	V-105-1C24
			B	V-155-1B5	V-105-1B5	V-105-1B4
Hinge roller lever	Bottom	SPDT	A	V-156-1A5	V-106-1A5	V-106-1A4
			C2	V-156-1C25	V-106-1C25	V-106-1C24
			B	V-156-1B5	V-106-1B5	V-106-1B4

Note: 1. A: Solder/quick-connect terminals (#187)
C2: Quick-connect terminals (#187)
B: Screw terminals

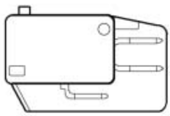
2. OF values shown in the table are for the pin plunger models.

Heat Resistant Models (Up to 150°C)

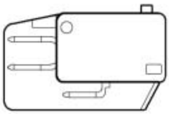
Actuator	COM terminal position	Contact specifications	Terminal specification	15 A	10 A
				OF: 1.96 N {200 gf}	OF: 0.98 N {100 gf}
Pin plunger	Bottom	SPDT	Solder/Quick-connect terminal (#187) (A)	V-15-1A5-T	V-10-1A4-T
Short hinge lever				V-151-1A5-T	V-101-1A4-T
Hinge lever				V-152-1A5-T	V-102-1A4-T
Long hinge lever				V-153-1A5-T	V-103-1A4-T
Simulated hinge lever				V-154-1A5-T	V-104-1A4-T
Short hinge roller lever				V-155-1A5-T	V-105-1A4-T
Hinge roller lever				V-156-1A5-T	V-106-1A4-T

■ Barrier (V-21 and V-16 Models Only)

Right-hand Barrier



Left-hand Barrier



Microswitches

Specifications

■ Ratings

Type	Rated voltage	Non-inductive load				Inductive laod			
		Resistive load		Lamp load		Inductive load		Motor load	
		NC	NO	NC	NO	NC	NO	NC	NO
V-21	250 VAC	21 A		3 A		12 A		4 A	
	8 VDC	21 A		5 A		12 A		7 A	
	30 VDC	14 A		5 A		12 A		5 A	
	125 VDC	0.6 A		0.1 A		0.6 A		0.1 A	
	250 VDC	0.3 A		0.05 A		0.3 A		0.05 A	
V-16	250 VAC	16 A		2 A		10 A		3 A	
	8 VDC	16 A		4 A		10 A		6 A	
	30 VDC	10 A		4 A		10 A		4 A	
	125 VDC	0.6 A		0.1 A		0.6 A		0.1 A	
	250 VDC	0.3 A		0.05 A		0.3 A		0.05 A	
V-15	250 VAC	15 A		2 A		10 A		3 A	
	8 VDC	15 A		4 A		10 A		6 A	
	30 VDC	10 A		4 A		10 A		4 A	
	125 VDC	0.6 A		0.1 A		0.6 A		0.1 A	
	250 VDC	0.3 A		0.05 A		0.3 A		0.05 A	
V-11	250 VAC	11 A		1.5 A		6 A		2 A	
	8 VDC	11 A		3 A		6 A		3 A	
	30 VDC	6 A		3 A		6 A		3 A	
	125 VDC	0.6 A		0.1 A		0.6 A		0.1 A	
	250 VDC	0.3 A		0.05 A		0.3 A		0.05 A	
V-10	250 VAC	10 A		1.5 A		6 A		2 A	
	8 VDC	10 A		3 A		6 A		3 A	
	30 VDC	6 A		3 A		6 A		3 A	
	125 VDC	0.6 A		0.1 A		0.6 A		0.1 A	
	250 VDC	0.3 A		0.05 A		0.3 A		0.05 A	

Note: 1. The above current values are the normal current values of models with a contact gap of 1 mm (gap F), which vary with the normal current values of models with a contact gap of 0.5 mm (gap G).

2. Inductive load has a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
3. Lamp load has an inrush current of 10 times the steady-state current.
4. Motor load has an inrush current of 6 times the steady-state current.
5. The ratings values apply under the following test conditions:
   Ambient temperature: 20±2°C
   Ambient humidity: 65±5%
   Operating frequency: 60 operations/min

■ Characteristics

Operating speed	0.1 mm to 1 m/s (at pin plunger models)
Operating frequency	Mechanical: 600 operations/min Electrical: 60 operations/min
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance	15 mΩ max. (initial value)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between terminals of the same polarity
	V-21, V-16, and V-11 models: 2,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal parts (see note 1)
	V-15 and V-10 models: 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal parts (see note 1)
Vibration resistance (see note 2)	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance (see note 2)	Destruction: 1,000 m/s^2 {approx. 100G} max. Malfunction: V-21/V-16/V-15: 300 m/s^2 {approx. 30G} max. V-11/V-10: 200 m/s^2 {approx. 20G} max.
Life expectancy (see note 3)	Mechanical: 50,000,000 operations min. Electrical: V-21/V-16/V-15: 100,000 operations min. (V-15 heat resistive: 20,000 operation min.) V-11/V-10: 300,000 operations min. (V-10 heat resistive: 50,000 operation min.)
Degree of protection	IP00
Degree of protection against electric shock	Class I
Proof tracking index (PTI)	175
Switch category	D (IEC335-1)
Ambient temperature	Operating: –25°C to 80°C (with no icing) –25°C to 150°C for heat-resistive model (with no icing)
Ambient humidity	Operating: 85% max. (for 5°C to 35°C)
Weight	Approx. 6.2 g (pin plunger model)

Note: 1. The dielectric strength values shown in the table are for models with a Separator.
2. For the pin plunger models, the above values apply for use at both the free position and total travel position. For the lever models, they apply at the total travel position.
3. For testing conditions, contact your OMRON sales representative.

■ Approved Standards

UL1054 (File No. E41515) CSA C22.2 No.55 (File No. LR21642) (Standard Ratings Only is listed.)

Rated voltage	V-21	V-16	V-15	V-11	V-10
125 VAC	21 A, 1/2 HP	16 A, 1/2 HP	15 A, 1/2 HP	11 A, 1/2 HP	10 A, 1/2 HP
250 VAC	21 A, 1/2 HP	16 A, 1/2 HP	15 A, 1/2 HP	11 A, 1/2 HP	10 A, 1/2 HP
125 VDC	0.6 A	0.6 A	0.6 A	0.6 A	0.6 A
250 VDC	0.3 A	0.3 A	0.3 A	0.3 A	0.3 A

VDE 0630 (File No. 6162ÜG), SEV (File No. 96. 550868. 01) DEMKO

Rated voltage	V-21	V-16	V-11
250 VAC	20 (4) A	16 (3) A	11 (2) A

Testing conditions: 50,000 operations, T105 (0°C to 105°C)

SEMKO EN61058-1 (File No. 9403007)

Rated voltage	V-16	V-11
250 VAC	16 (3) A	11 (2) A

Testing conditions: 5E4 (50,000 operations), T105 (0°C to 105°C)

TÜV Rheinland EN61058-1 (File No. T9451451)

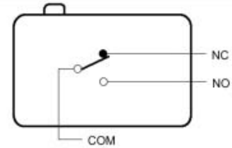
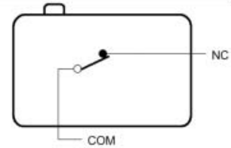
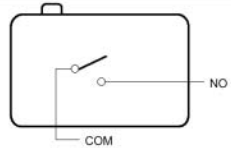
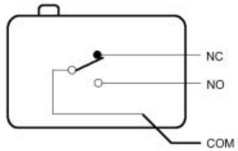
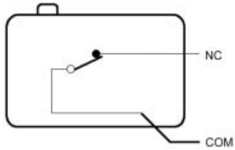
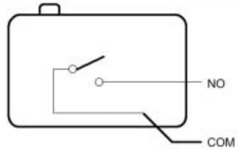
Rated voltage	V-15	V-10
250 VAC	15 A	10 A
250 VDC	0.3 A	0.3 A

Testing conditions: 5E4 (50,000 operations), T105 (0°C to 105°C)

■ Contact Specifications

Item		V-21	V-16	V-15	V-11	V-10
Contact	Specification	Rivet				
	Material	Silver alloy			Silver	
	Gap (standard value)	1 mm (F gap) or 0.5 mm (G gap)				
Inrush current	NC	50 A max.	40 A max.	36 A max.	24 A max.	
	NO					

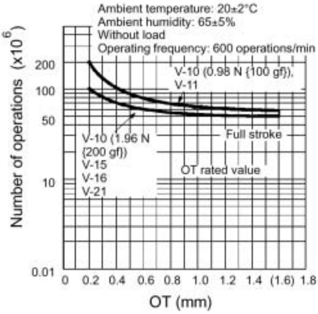
■ Contact Form

Terminal type	SPDT	SPST-NC	SPST-NO
Bottom terminal			
Side terminal			

Engineering Data

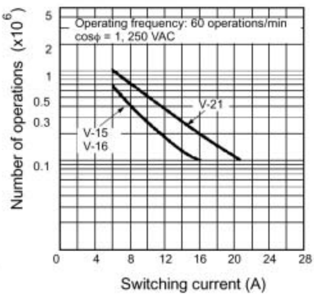
Mechanical Life Expectancy (Pin Plunger)

V-21/-16/-15/-10

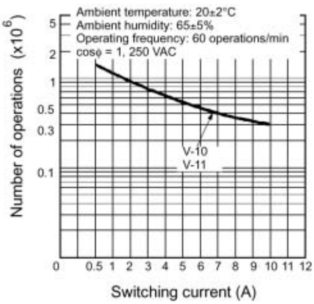


Electrical Life Expectancy

V-21/-16/-15

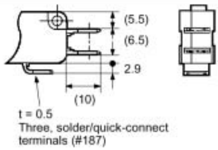
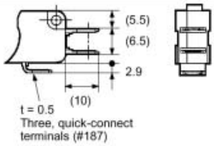
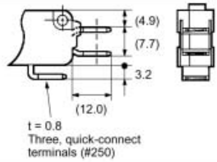
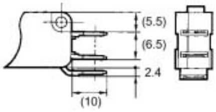
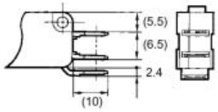
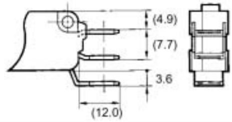
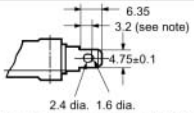
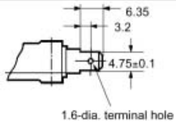
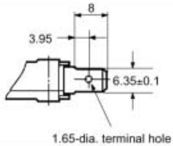


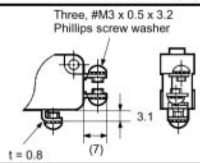
V-11/-10



Dimensions

■ Terminals

Terminal type	Solder/Quick-connect Terminal (#187) (A)	Quick-connect Terminal (#187) (C2)	Quick-connect Terminal (#250) (C)
COM bottom position			
COM side position			
Terminal dimensions	 **Note:** Indicates the length to the center of the 1.6-dia. holes		

Terminal type	Screw Terminal (B)
Bottom	

Note: 1. The above is for the SPDT contact specifications. Two terminals will be available for SPST-NO or SPST-NC contact specifications. For terminal positions, refer to the above *Contact Form*.

2. Right-angle PCB terminal type is available
D5 type: Pins at right angles, to the right.
D6 type: Pins at right angles, to the left.
Drawings will be provided if requested.

■ Dimensions and Operating Characteristics

Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

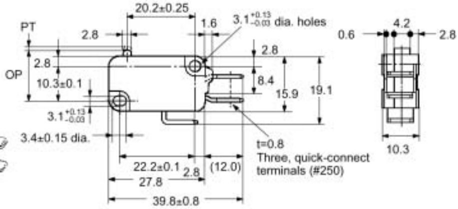
2. The following illustrations and drawings are for quick-connect terminals (#250) (terminals C). V models with a switching current of 16 A or 11 A incorporates terminals A and C2. These models are different from #250 models in terminal size only. Terminals A, C2, and side common terminals are omitted from the following drawings. Refer to *Kinds of Terminals* on page 85 for these terminals.

3. The □ in the model number is for the terminal code.

Pin Plunger

(Without Barrier)

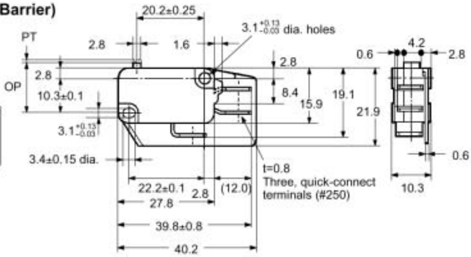
V-21-1□6
V-16-1□5
V-11-1□4



Model	V-21-1□6	V-16-1□5
OF max.	3.92 N {400 gf}	1.96 N {200 gf}
RF min.	0.78 N {80 gf}	0.49 N {50 gf}
PT max.	1.2 mm	
OT min.	1.0 mm	
MD max.	0.4 mm	
OP	14.7±0.4 mm	

(With Right-hand Barrier)

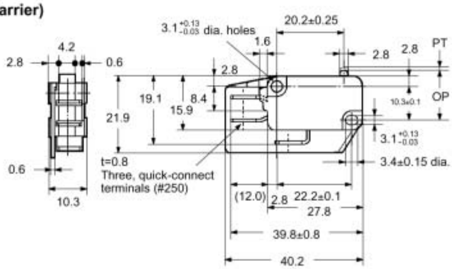
V-21-1□R6
V-16-1□R5



Model	V-11-1□4
OF max.	0.98 N {100 gf}
RF min.	0.20 N {20 gf}
PT max.	1.2 mm
OT min.	1.0 mm
MD max.	0.4 mm
OP	14.7±0.4 mm

(With Left-hand Barrier)

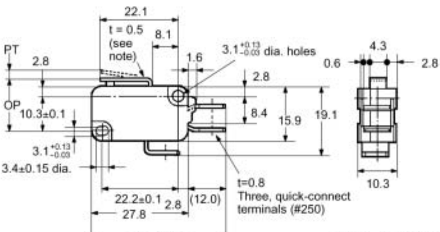
V-21-1□L6
V-16-1□L5



Short Hinge Lever

V-211-1□6
V-161-1□5
V-111-1□4

Model	V-211-1□6	V-161-1□5
OF max.	3.92 N {400 gf}	1.96 N {200 gf}
RF min.	0.49 N {50 gf}	0.49 N {50 gf}
PT max.	1.6 mm	
OT min.	0.8 mm	
MD max.	0.6 mm	
OP	15.2±0.5 mm	

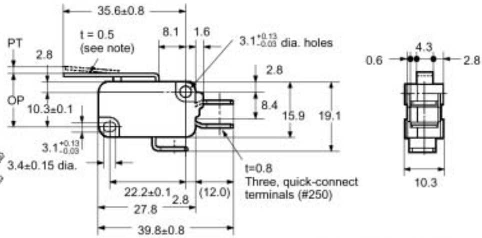


Note: Stainless-steel lever

Model	V-111-1□4
OF max.	0.98 N {100 gf}
RF min.	0.15 N {15 gf}
PT max.	1.6 mm
OT min.	0.8 mm
MD max.	0.6 mm
OP	15.2±0.5 mm

Hinge Lever

V-212-1□6
V-162-1□5
V-112-1□4



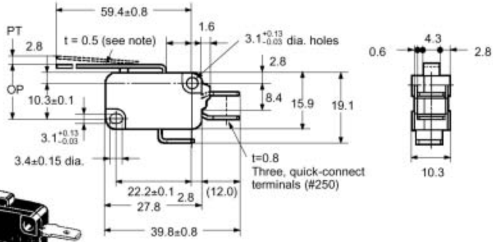
Note: Stainless-steel lever

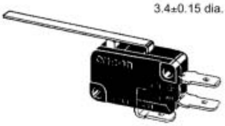
Model	V-212-1□6	V-162-1□5
OF max.	2.45 N {250 gf}	1.23 N {125 gf}
RF min.	0.25 N {25 gf}	0.14 N {14 gf}
PT max.	4.0 mm	
OT min.	1.6 mm	
MD max.	1.5 mm	
OP	15.2±1.2 mm	

Model	V-112-1□4
OF max.	0.59 N {60 gf}
RF min.	0.06 N {6 gf}
PT max.	4.0 mm
OT min.	1.6 mm
MD max.	1.5 mm
OP	15.2±0.5 mm

Long Hinge Lever

V-213-1□6
V-163-1□5
V-113-1□4





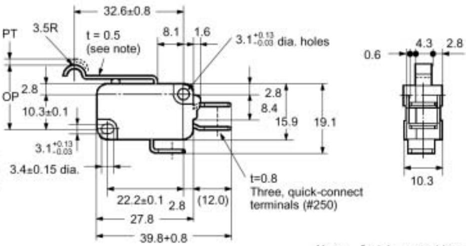
Note: Stainless-steel lever

Model	V-213-1□6	V-163-1□5
OF max.	1.27 N {130 gf}	0.69 N {70 gf}
RF min.	0.12 N {12 gf}	0.06 N {6 gf}
PT max.	9.0 mm	
OT min.	2.0 mm	
MD max.	2.8 mm	
OP	$15.2\pm^{+2.6}_{-3.2}$ mm	

Model	V-113-1□4
OF max.	0.34 N {35 gf}
RF min.	---
PT max.	9.0 mm
OT min.	3.2 mm
MD max.	2.8 mm
OP	15.2±2.6 mm

Simulated Hinge Lever

V-214-1□6
V-164-1□5
V-114-1□4



Note: Stainless-steel lever

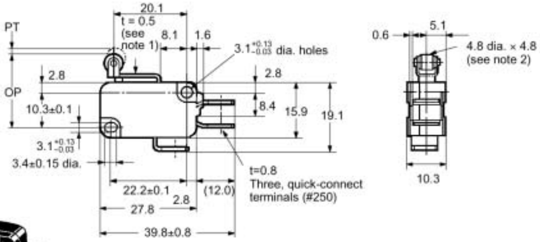
Model	V-214-1□6	V-164-1□5
OF max.	2.45 N {250 gf}	1.23 N {125 gf}
RF min.	0.25 N {25 gf}	0.14 N {14 gf}
PT max.	4.0 mm	
OT min.	1.6 mm	
MD max.	1.5 mm	
OP	18.7±1.2 mm	

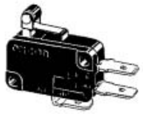
Model	V-114-1□4
OF max.	0.59 N {60 gf}
RF min.	0.06 N {6 gf}
PT max.	4.0 mm
OT min.	1.6 mm
MD max.	1.5 mm
OP	18.7±1.2 mm

Microswitches

Short Hinge Roller Lever

V-215-1□6
V-165-1□5
V-115-1□4





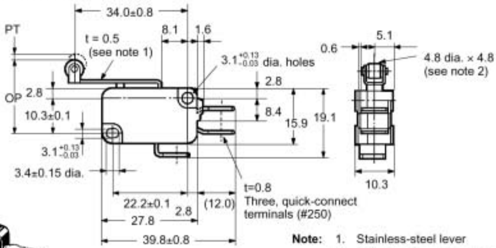
Note: 1. Stainless-steel lever
2. Oilless polyacetar resin roller

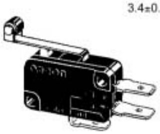
Model	V-215-1□6	V-165-1□5
OF max.	4.71 N {480 gf}	2.35 N {240 gf}
RF min.	0.49 N {50 gf}	0.49 N {50 gf}
PT max.	1.6 mm	
OT min.	0.8 mm	
MD max.	0.6 mm	
OP	20.7±0.6 mm	

Model	V-115-1□4
OF max.	1.18 N {120 gf}
RF min.	0.15 N {15 gf}
PT max.	1.6 mm
OT min.	0.8 mm
MD max.	0.6 mm
OP	20.7±0.6 mm

Hinge Roller Lever

V-216-1□6
V-166-1□5
V-116-1□4





Note: 1. Stainless-steel lever
2. Oilless polyacetar resin roller

Model	V-216-1□6	V-166-1□5
OF max.	2.45 N {250 gf}	1.23 N {125 gf}
RF min.	0.25 N {25 gf}	0.14 N {14 gf}
PT max.	4.0 mm	
OT min.	1.6 mm	
MD max.	1.5 mm	
OP	20.7±1.2 mm	

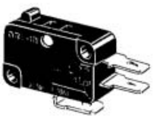
Model	V-116-1□4
OF max.	0.59 N {60 gf}
RF min.	0.06 N {6 gf}
PT max.	4.0 mm
OT min.	1.6 mm
MD max.	1.5 mm
OP	20.7±1.2 mm

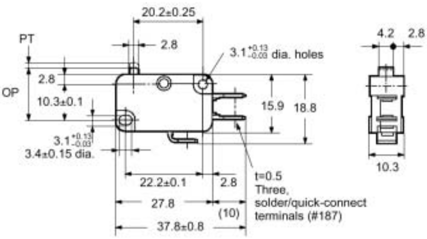
■ Thermosetting Case (V-15/-10 Models)

The following illustration and drawing are for solder and quick-connect terminals (#187) (terminals A). V models with a switching current of 15 A or 10 A incorporate terminals B or C2. These models are different from #187 models in terminal size only.
Refer to *Terminals* on page 85 for these terminals.

Pin Plunger

V-15-1□5
V-10-1□5
V-10-1□4

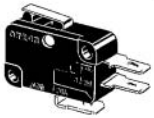


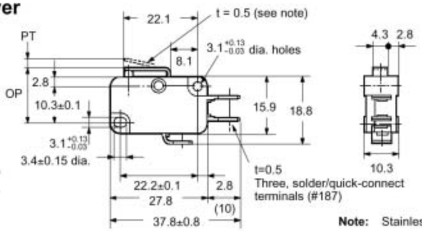


Model	V-15-1□5 V-10-1□5	V-10-1□4
OF max.	1.96 N {200 gf}	0.98 N {100 gf}
RF min.	0.49 N {50 gf}	0.20 N {20 gf}
PT max.	1.2 mm	
OT min.	1.0 mm	
MD max.	0.4 mm	
OP	14.7±0.4 mm	

Short Hinge Lever

V-151-1□5
V-101-1□5
V-101-1□4



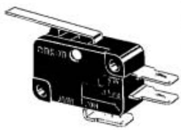


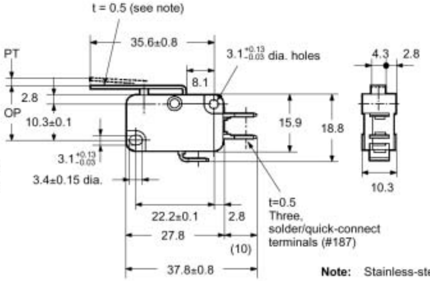
Note: Stainless-steel lever

Model	V-151-1□5 V-101-1□5	V-101-1□4
OF max.	1.96 N {200 gf}	0.98 N {100 gf}
RF min.	0.49 N {50 gf}	0.15 N {15 gf}
PT max.	1.6 mm	
OT min.	0.8 mm	
MD max.	0.6 mm	
OP	15.2±0.5 mm	

Hinge Lever

V-152-1□5
V-102-1□5
V-102-1□4



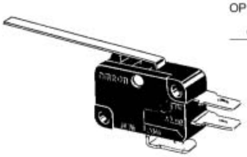


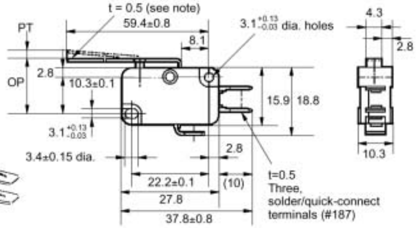
Note: Stainless-steel lever

Model	V-152-1□5 V-102-1□5	V-102-1□4
OF max.	1.23 N {125 gf}	0.59 N {60 gf}
RF min.	0.14 N {14 gf}	0.06 N {6 gf}
PT max.	4.0 mm	
OT min.	1.6 mm	
MD max.	1.5 mm	
OP	15.2±1.2 mm	

Long Hinge Lever

V-153-1□5
V-103-1□5
V-103-1□4



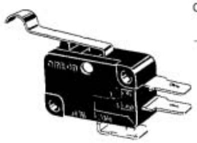


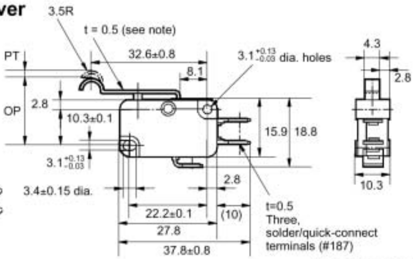
Note: Stainless-steel lever

Model	V-153-1□5 V-103-1□5	V-101-1□4
OF max.	0.69 N {70 gf}	0.34 N {35 gf}
RF min.	0.06 N {6 gf}	---
PT max.	9.0 mm	
OT min.	2.0 mm	3.2 mm
MD max.	2.8 mm	
OP	15.2± $^{+2.6}_{-3.2}$ mm	15.2±2.6 mm

Simulated Hinge Lever

V-154-1□5
V-104-1□5
V-104-1□4





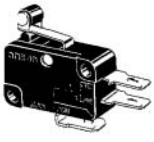
Note: Stainless-steel lever

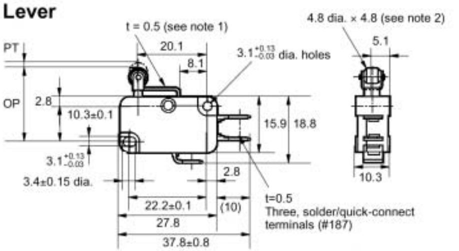
Model	V-154-1□5 V-104-1□5	V-104-1□4
OF max.	1.23 N {125 gf}	0.59 N {60 gf}
RF min.	0.14 N {14 gf}	0.06 N {6 gf}
PT max.	4.0 mm	
OT min.	1.6 mm	
MD max.	1.5 mm	
OP	18.7±1.2 mm	

Microswitches

Short Hinge Roller Lever

V-155-1□5
V-105-1□5
V-105-1□4



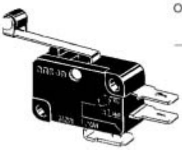


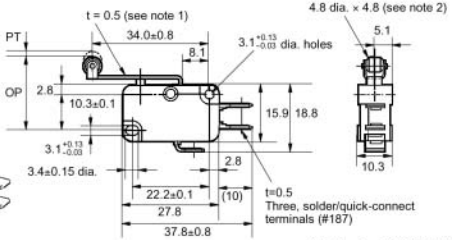
Model	V-155-1□5 V-105-1□5	V-105-1□4
OF max.	2.35 N {240 gf}	1.18 N {120 gf}
RF min.	0.49 N {50 gf}	0.15 N {15 gf}
PT max.	1.6 mm	
OT min.	0.8 mm	
MD max.	0.6 mm	
OP	20.7±0.6 mm	

Note: 1. Stainless-steel lever
2. Oilless polyacetar resin roller

Hinge Roller Lever

V-156-1□5
V-106-1□5
V-106-1□4





Model	V-156-1□5 V-106-1□5	V-106-1□4
OF max.	1.23 N {125 gf}	0.59 N {60 gf}
RF min.	0.14 N {14 gf}	0.06 N {6 gf}
PT max.	4.0 mm	
OT min.	1.6 mm	
MD max.	1.5 mm	
OP	20.7±1.2 mm	

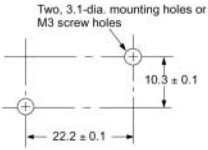
Note: 1. Stainless-steel lever
2. Oilless polyacetar resin roller

Precautions

■ Mounting Dimensions

Use two M3 mounting screws with an appropriate screwdriver to mount the switch. Tighten the screws to a torque of 0.39 to 0.59 N • m {4 to 6 kgf • cm}.

Mounting Holes



Specifications Approved by TÜV Rheinland According to EN61058-1

Appropriate Cable Size (mm^2)

Model	Solder terminal	Screw terminal
V-10	0.75, 1.25, 2.0	0.75, 1.25
V-15	1.25, 2.0	1.25

Terminal Connection

Use M3 crimp terminals for connecting to the screw terminals.

Appropriate tightening torque: 0.39 to 0.59 N • m (4 to 6 kgf • cm)

Insulation Distance

According to EN61058-1, the minimum insulation thickness for this Switch should be 1.1 mm and minimum clearance distance between the terminal and mounting plate should be 1.9 mm. If the insulation distance cannot be provided in the product incorporating the Switch, either use a Switch with insulation barrier or use a Separator to ensure sufficient insulation distance.

Solder Terminal Approval Conditions

Soldering iron can be used. Soldering hook hole available.
Soldering terminal types 1 and 2 are met.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Compact Basic Switch of Ultra-low Operating Force Assures Yet Higher Contact Reliability

- ROHS Compliant.
- Uses an internal hinge lever mechanism for ultra-low operating force and outstanding contact reliability.
- Shape is identical to that of the V Compact Basic Switches.
- Gold-alloy contact for micro-load VX-01 models.
- Conforms to EN61058-1.

Ordering Information

■ Model Number Legend

VX-□□-□□□
1 2 3 4 5

1. **Ratings**
   5: 5 A
   01: 0.1 A
2. **Actuator**
   None: Pin plunger
   1: Short hinge lever
   2: Hinge lever
   3: Long hinge lever
   4: Simulated hinge lever
   5: Short hinge roller lever
   6: Hinge roller lever
3. **Contact Form**
   1: SPDT
   2: SPST-NC
   3: SPST-NO
4. **Terminal Specifications**
   A: Solder/Quick-connect terminal (#187)
   C2: Quick-connect terminal (#187)
5. **Operating Force max.**
   2: OF 0.25 N {25 gf}
   3: OF 0.49 N {50 gf}
   Note: These values are for the pin plunger model.

■ List of Models

Actuator	Terminals (see note)	OF max.	Model	
			5 A	0.1 A
Pin plunger	A	0.25 N {25 gf}	VX-5-1A2	VX-01-1A2
		0.49 N {50 gf}	VX-5-1A3	VX-01-1A3
	C2	0.25 N {25 gf}	VX-5-1C22	VX-01-1C22
		0.49 N {50 gf}	VX-5-1C23	VX-01-1C23
Short hinge lever	A	0.49 N {50 gf}	VX-51-1A3	VX-011-1A3
	C2	0.49 N {50 gf}	VX-51-1C23	VX-011-1C23
Hinge Lever	A	0.29 N {30 gf}	VX-52-1A3	VX-012-1A3
	C2	0.29 N {30 gf}	VX-52-1C23	VX-012-1C23
Long hinge lever	A	0.20 N {20 gf}	VX-53-1A3	VX-013-1A3
	C2	0.20 N {20 gf}	VX-53-1C23	VX-013-1C23
Simulated hinge lever	A	0.29 N {30 gf}	VX-54-1A3	VX-014-1A3
	C2	0.29 N {30 gf}	VX-54-1C23	VX-014-1C23
Short hinge roller lever	A	0.59 N {60 gf}	VX-55-1A3	VX-015-1A3
	C2	0.59 N {60 gf}	VX-55-1C23	VX-015-1C23
Hinge roller lever	A	0.29 N {30 gf}	VX-56-1A3	VX-016-1A3
	C2	0.29 N {30 gf}	VX-56-1C23	VX-016-1C23

Note: 1. SPST models are also available, but not listed in the above table.

2. Terminals A: Solder/Quick-connect terminals (#187)
C2: Quick-connect terminals (#187)

Specifications

■ Ratings

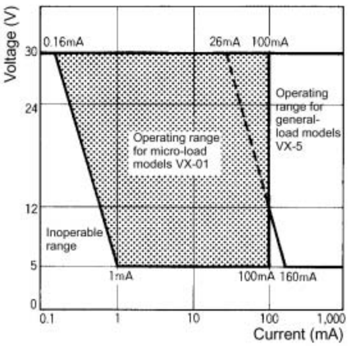
Rated current	Rated voltage	Non-inductive load				Inductive load	
		Resistive load		Lamp load			
		NC	NO	NC	NO	NC	NO
5 A	**250 VAC**	5 A		0.5 A		4 A	
	8 VDC	5 A		3 A		4 A	
	30 VDC	5 A		3 A		4 A	
	125 VDC	0.4 A		0.1 A		0.4 A	
	250 VDC	0.3 A		0.05 A		0.2 A	
0.1 A	**125 VAC**	0.1 A		---		---	
	8 VDC	0.1 A		---		---	
	30 VDC	0.1 A					

Note: 1. Inductive load has a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).

2. Lamp load has an inrush current of 10 times the steady-state current.

3. The ratings values apply under the following test conditions:
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 60 operations/min

Use the Switch in the following operating range.



Model	VX-01	VX-5
Minimum applicable load	1 mA at 5 VDC	160 mA at 5 VDC

■ Characteristics

Item	VX-5	VX-01
Operating speed	0.1 mm to 1 m/s (at pin plunger models)	
Operating frequency	Mechanical: 600 operations/min Electrical: 60 operations/min	
Insulation resistance	100 MΩ min. (at 500 VDC)	
Contact resistance	30 mΩ max. (initial value)	50 mΩ max. (initial value)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between terminals of same polarity 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground (see note 1) 1,500 VAC, 50/60 Hz for 1 min between each terminal and non-current-carrying metal parts	
Vibration resistance (see note 2)	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude	
Shock resistance (see note 2)	Destruction: 400 m/s^2 {approx. 40G} max. Malfunction: 100 m/s^2 {approx. 10G} max.	
Life expectancy	Mechanical: 50,000,000 operations min. (Refer to the following *Engineering Data*.) Electrical: 500,000 operations min. (Refer to the following *Engineering Data*.)	Mechanical: 10,000,000 operations min. (Refer to the following *Engineering Data*.) Electrical: 1,000,000 operations min. (Refer to the following *Engineering Data*.)
Degree of protection	IP00	
Degree of protection against electric shock	Class I	
Proof tracking index (PTI)	175	
Ambient temperature	Operating: –25°C to 80°C (with no icing)	
Ambient humidity	Operating: 85% max. (for 5°C to 35°C)	
Weight	Approx. 6.2 g (pin plunger models)	

Note: 1. The value for dielectric strength shown is for models with a Separator.

2. For the pin plunger models, the above values apply for use at both the free position and total travel position. For the lever models, they apply at the total travel position.

■ Approved Standards

UL1054 (File No. E41515)
CSA C22.2 No.55 (File No. LR21642)

Rated voltage	VX-5	VX-01
125 VAC 250 VAC	5 A 5 A	0.1 A (Rating: 100,000 operations) ---
30 VDC	---	0.1 A (Rating: 100,000 operations)

VDE 0630 (File No. 90430)
SEMKO (File No. 8920075)

Rated voltage	VX-5	VX-01
125 VAC	5 A	0.1 A
250 VAC	5 A	---

Note: Testing conditions: 50,000 operations, T105 (0°C to 105°C)

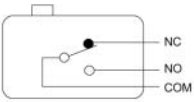
Microswitches

■ Contact Specifications

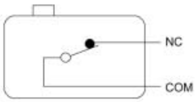
Item		VX-5 models	VX-01 models
Contact	Specification	Rivet	Crossbar
	Material	Silver alloy	Gold alloy
	Gap (standard value)	0.5 mm	
Inrush current	NC	15 A max.	---
	NO	---	---

■ Contact Form

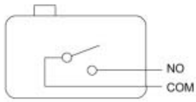
SPDT



SPST-NC



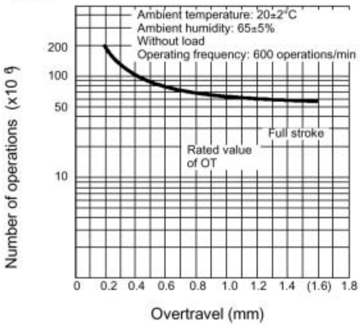
SPST-NO



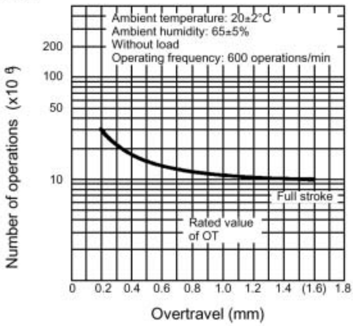
Engineering Data

Mechanical Life Expectancy (Pin Plunger)

VX-5

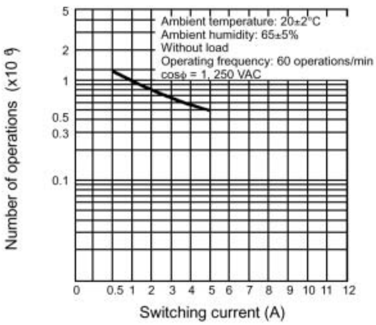


VX-01

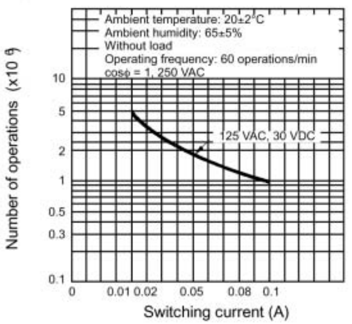


Electrical Life Expectancy

VX-5

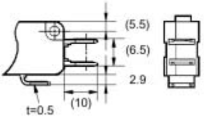
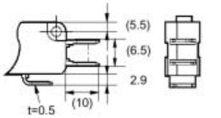
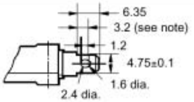
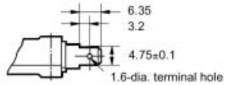


VX-01



Dimensions

■ Terminals

Terminal	Solder/Quick-connect terminal (#187) (A terminal)	Quick-connect terminal (#187) (C2 terminal)
COM terminal position is bottom.	 Three, solder/quick-connect terminals (#187)	 Three, quick-connect terminals (#187)
Terminal dimension	 **Note:** The length to the center of the 1.6-dia. holes.	

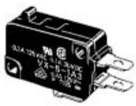
Note: The above is for the SPDT contact specifications.

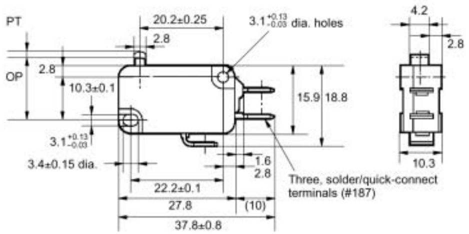
■ Dimensions and Operating Characteristics

Note:
1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. The following illustrations and drawings are for solder/quick-connect terminals (#187) (Terminal A). Illustrations for Terminal C2 are omitted. For details, refer to *Terminals*.
3. The □ in the model number is for the terminal code.
   A: Solder/quick-connect terminal (#187)
   C2: Quick-connect terminal (#187)

Pin Plunger

VX-5-1□2
VX-5-1□3
VX-01-1□2
VX-01-1□3

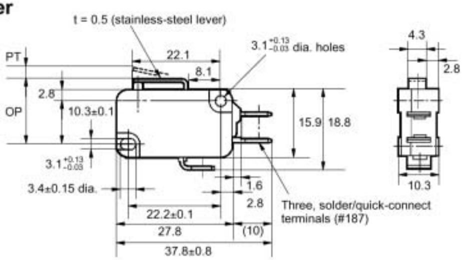




Model	VX-5-1□2	VX-5-1□3	VX-01-1□2	VX-01-1□3
OF max.	0.25 N {25 gf}	0.49 N {50 gf}	0.25 N {25 gf}	0.49 N {50 gf}
RF min.	0.03 N {3 gf}	0.05 N {5 gf}	0.03 N {3 gf}	0.05 N {5 gf}
PT max.	1.2 mm	1.2 mm	1.2 mm	1.2 mm
OT min.	1.0 mm	1.0 mm	1.0 mm	1.0 mm
MD max.	0.3 mm	0.3 mm	0.3 mm	0.3 mm
OP	14.7±0.4 mm	14.7±0.4 mm	14.7±0.4 mm	14.7±0.4 mm

Short Hinge Lever

VX-51-1□3
VX-011-1□3

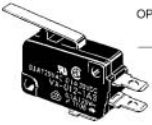


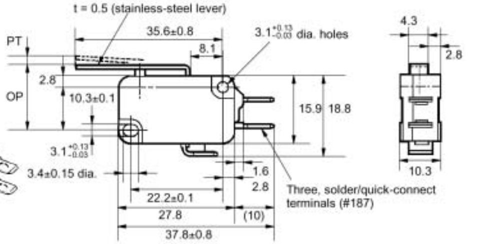
Model	VX-51-1□3	VX-011-1□3
OF max.	0.49 N {50 gf}	0.49 N {50 gf}
RF min.	0.04 N {4 gf}	0.04 N {4 gf}
PT max.	1.6 mm	
OT min.	0.8 mm	
MD max.	0.5 mm	
OP	15.2±0.5 mm	

Microswitches

Hinge Lever

VX-52-1□3
VX-012-1□3

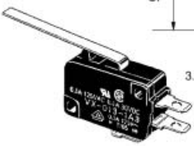


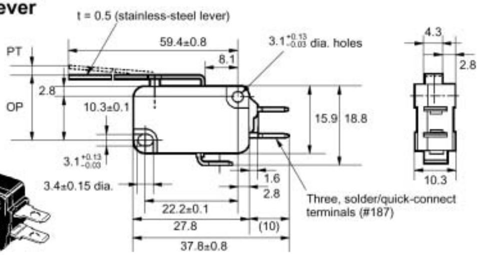


Model	VX-52-1□3	VX-012-1□3
OF max.	0.29 N {30 gf}	0.29 N {30 gf}
RF min.	---	---
PT max.	4.0 mm	
OT min.	1.6 mm	
MD max.	0.8 mm	
OP	15.2±1.2 mm	15.2±1.2 mm

Long Hinge Lever

VX-53-1□3
VX-013-1□3

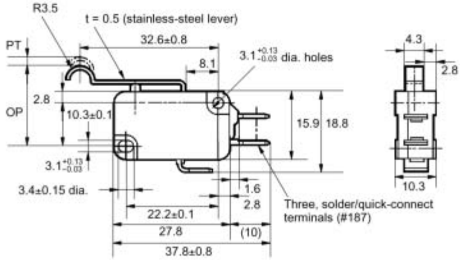




Model	VX-53-1□3	VX-013-1□3
OF max.	0.20 N {20 gf}	0.20 N {20 gf}
RF min.	---	---
PT max.	9.0 mm	
OT min.	3.2 mm	
MD max.	2.0 mm	
OP	15.2±2.6 mm	

Simulated Hinge Lever

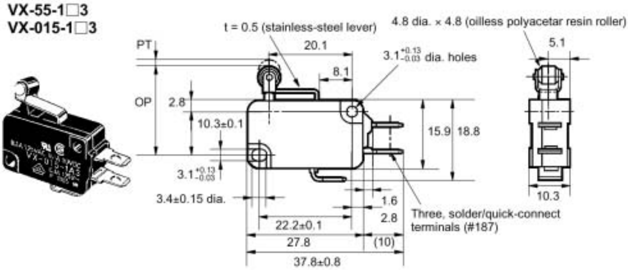
VX-54-1□3
VX-014-1□3



Model	VX-54-1□3	VX-014-1□3
OF max.	0.29 N {30 gf}	0.29 N {30 gf}
RF min.	0.02 N {2 gf}	0.02 N {2 gf}
PT max.	4.0 mm	
OT min.	1.6 mm	
MD max.	0.8 mm	
OP	18.7±1.2 mm	

Short Hinge Roller Lever

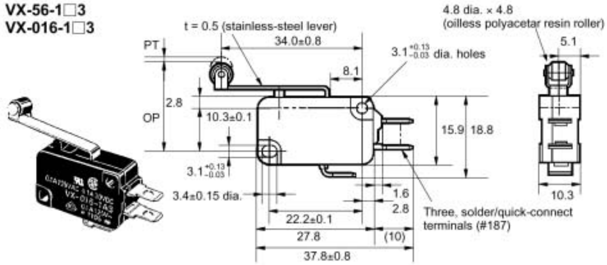
VX-55-1□3
VX-015-1□3



Model	VX-55-1□3	VX-015-1□3
OF max.	0.59 N {60 gf}	0.59 N {60 gf}
RF min.	0.04 N {4 gf}	0.04 N {4 gf}
PT max.	1.6 mm	
OT min.	0.8 mm	
MD max.	0.5 mm	
OP	20.7±0.6 mm	

Hinge Roller Lever

VX-56-1□3
VX-016-1□3

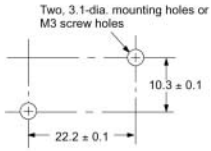


Model	VX-56-1□3	VX-016-1□3
OF max.	0.29 N {30 gf}	0.29 N {30 gf}
RF min.	---	---
PT max.	4.0 mm	
OT min.	1.6 mm	
MD max.	1.5 mm	
OP	20.7±1.2 mm	

Precautions

■ Mounting Dimensions

Use two M3 mounting screws with spring washers to mount the switch. Tighten the screws to a torque of 0.39 to 0.59 N • m {4 to 6 kgf • cm}.



■ Correct Use

Handling

Be careful not to drop the Switch. doing so may cause damage to the switch's internal components because it is designed for a small load.

Mounting Direction

For a Switch with an actuator, mount the Switch in a direction where the actuator weight will not be applied to the Switch.
Since the Switch is designed for a small load, its resetting force is small. Therefore, resetting failure may occure if unnecessary load is applied to the Switch.

Operating Temperature

Do not use the Switch under a high temperature. The thermal plastic resin used for the housing may deteriorate if exposed to high temperature.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Economical, Subminiature Basic Switch Offers Long Life (30 x 106 Operations)

- ROHS Compliant.
- Incorporating simple and stable two split springs which ensures a long service life (30,000,000 operations).
- A variety of models with low operating force to high operating force are available.
- Solder, quick-connect terminals (#110) and PCB terminals are available.
- Approval obtained for standards including UL, CSA and VDE.
- Conforms to EN61058-1.

Ordering Information

■ Model Number Legend

SS-□□□□□
1 2 3 4 5

1. **Ratings**
   01: 0.1 A
   5: 5 A
   10: 10 A
2. **Actuator**
   None: Pin plunger
   GL: Hinge lever
   GL13: Simulated hinge lever
   GL2: Hinge roller lever
3. **Operating Force (at Pin Plunger)**
   None: 1.47 N {150 gf}
   -F: 0.49 N {50 gf}
   -E: 0.25 N {25 gf}
   Note: These values are for the pin plunger model.
4. **Contact Form**
   None: SPDT
   -2: SPST-NC
   -3: SPST-NO
5. **Terminals**
   None: Solder
   T: Quick-connect terminals (#110)
   D: PCB
   Note: The PCB terminal has a right-angle terminal option.
   D1: Upward direction
   D2: Downward direction
   These are UL, CSA, and VDE approved.

Note: When suffix "-T" is placed after the model number, the model withstands high temperatures (–25°C to 125°C) and is UL and CSA approved.

■ List of Models

Rating	Actuator	OF max.	Soldering terminal	Quick-connect terminal (#110)	PCB terminal
0.1 A	Pin plunger	0.25 N {25 gf}	SS-01-E	SS-01-ET	SS-01-ED
		0.49 N {50 gf}	SS-01-F	SS-01-FT	SS-01-FD
		1.47 N {150 gf}	SS-01	SS-01T	SS-01D
	Hinge lever	0.08 N {8 gf}	SS-01GL-E	SS-01GL-ET	SS-01GL-ED
		0.16 N {16 gf}	SS-01GL-F	SS-01GL-FT	SS-01GL-FD
		0.49 N {50 gf}	SS-01GL	SS-01GLT	SS-01GLD
	Simulated hinge lever	0.08 N {8 gf}	SS-01GL13-E	SS-01GL13-ET	SS-01GL13-ED
		0.16 N {16 gf}	SS-01GL13-F	SS-01GL13-FT	SS-01GL13-FD
		0.49 N {50 gf}	SS-01GL13	SS-01GL13T	SS-01GL13D
	Hinge roller lever	0.08 N {8 gf}	SS-01GL2-E	SS-01GL2-ET	SS-01GL2-ED
		0.16 N {16 gf}	SS-01GL2-F	SS-01GL2-FT	SS-01GL2-FD
		0.49 N {50 gf}	SS-01GL2	SS-01GL2T	SS-01GL2D
5 A (see note 1)	Pin plunger	0.49 N {50 gf}	SS-5-F	SS-5-FT	SS-5-FD
		1.47 N {150 gf}	SS-5	SS-5T	SS-5D
	Hinge lever	0.16 N {16 gf}	SS-5GL-F	SS-5GL-FT	SS-5GL-FD
		0.49 N {50 gf}	SS-5GL	SS-5GLT	SS-5GLD
	Simulated hinge lever	0.16 N {16 gf}	SS-5GL13-F	SS-5GL13-FT	SS-5GL13-FD
		0.49 N {50 gf}	SS-5GL13	SS-5GL13T	SS-5GL13D
	Hinge roller lever	0.16 N {16 gf}	SS-5GL2-F	SS-5GL2-FT	SS-5GL2-FD
		0.49 N {50 gf}	SS-5GL2	SS-5GL2T	SS-5GL2D
10.1 A (see note 1)	Pin plunger	1.47 N {150 gf}	SS-10	SS-10T	SS-10D
	Hinge lever	0.49 N {50 gf}	SS-10GL	SS-10GLT	SS-10GLD
	Simulated hinge lever	0.49 N {50 gf}	SS-10GL13	SS-10GL13T	SS-10GL13D
	Hinge roller lever	0.49 N {50 gf}	SS-10GL2	SS-10GL2T	SS-10GL2D

Note: 1. EN61058-1 (IEC601058-1) approved by TÜV Rheinland.

2. SPST models are also available, but not listed in the above table.

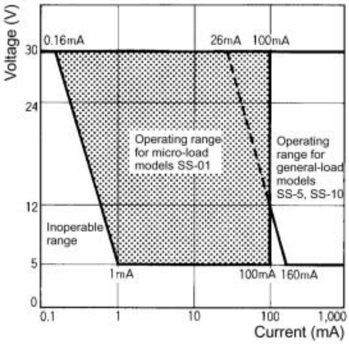
Specifications

■ Ratings

Type	Rated voltage	SS-10, SS-5								SS-01	
		Non-inductive load				Inductive load				Non-inductive load	
		Resistive load		Lamp load		Inductive load		Motor load		Resistive load	
		NC	NO	NC	NO	NC	NO	NC	NO	NC	NO
General-purpose	125 VAC	5 (10.1) A (see note 1)		1.5 A	0.7 A	3 A		2.5 A	1.3 A	0.1 A	
	250 VAC	3 (10.1) A (see note 1)		1 A	0.5 A	2 A		1.5 A	0.8 A	---	
	8 VDC	5 (10.1) A (see note 1)		2 A		5 A	4 A	3 A		0.1 A	
	14 VDC	5 (10.1) A (see note 1)		2 A		4 A	4 A	3 A		0.1 A	
	30 VDC	4 A		2 A		3 A	3 A	3 A		0.1 A	
	125 VDC	0.4 A		0.05 A		0.4 A	0.4 A	0.05 A		---	
	250 VDC	0.2 A		0.03 A		0.2 A	0.2 A	0.03 A		---	

Note: 1. Data in parentheses apply to the SS-10 models only.
2. The above values are for the steady-state current.
3. Inductive load has a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
4. Lamp load has an inrush current of 10 times the steady-state current.
5. Motor load has an inrush current of 6 times the steady-state current.
6. If the Switch is used in a DC circuit and is subjected to a surge, connect a surge suppressor across the Switch.
7. The ratings values apply under the following test conditions:
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 30 operations/min

Use the Switch within the following operating range.



Item	SS-01	SS-5 SS-10
Minimum applicable load	1 mA at 5 VDC	160 mA at 5 VDC

Characteristics

Operating speed	0.1 mm to 1 m/s (pin plunger models)
Operating frequency	Mechanical: 400 operations/min Electrical: 60 operations/min
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance (initial value)	OF 1.47 N {150 gf}: SS-01 models: 50 mΩ max. SS-5, SS-10 models: 30 mΩ max. OF 0.49 N {50 gf}: SS-01 models: 100 mΩ max. SS-5 models: 50 mΩ max. OF 0.25 N {25 gf}: SS-01 models: 150 mΩ max.
Dielectric strength	1,000 VAC (600 VAC for SS-01 models), 50/60 Hz for 1 min between terminals of the same polarities 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal part and ground, and between each terminal and non-current-carrying metal part (see note 1)
Vibration resistance (see note 2)	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Destruction: OF 1.47 N {150 gf}: 1,000 m/s^2 {approx. 100G} max. OF 0.25 N {25gf}/0.49 N {50 gf}: 500 m/s^2 {approx. 50G} max. Malfunction: OF 1.47 N {150 gf}: 300 m/s^2 {approx. 30G} max. OF 0.25 N {25 gf}/0.49 N {50 gf}: 200 m/s^2 {approx. 20G} max. **Note:** Lever-type model: Total travel position (with a contact separation time of 1 ms max.)
Life expectancy	Mechanical: 30,000,000 operations min. (Refer to the following *Engineering Data*.) 10,000,000 operations min. for SS-10 models Electrical: 200,000 operations min. (Refer to the following *Engineering Data*.) 50,000 operations min. for SS-10 models
Degree of protection	IP00
Degree of protection against electrical shock	Class 1
Proof Tracking Index (PTI)	175
Switch category	D (IEC 335-1)
Ambient temperature	Operating: –25°C to 85°C (at ambient humidity of 60% max.) (with no icing)
Ambient humidity	Operating: 85% max. (for 5°C to 35°C)
Weight	Approx. 1.6 g (pin plunger models)

Note: 1. The dielectric strength shown in the table indicates a value for models with a Separator.

2. For the pin plunger models, the above values apply for use at both the free position and total travel position. For the lever models, they apply at the total travel position.

Approved Standards

UL1054 (File No. E41515)
CSA C22.2 No. 55 (File No. LR21642)

Rated voltage	SS-10	SS-5	SS-01
125 VAC	---	5 A	0.1 A
250 VAC	10.1 A	3 A	---
30 VDC	---	---	0.1 A
120 VAC (TV)	---	2 A	---

VDE0630 (File No. 6131ÜG)
SEMKO (File No. 9812216/01), (File No. 8916091)

Rated voltage	SS-10	SS-5
250 VAC	10 A	5 A

SEV (File No. 93. 5. 51936. 01)

Rated voltage	SS-5
250 VAC	5 A

EN61058-1 (IEC601058-1)
(TÜV Rheinland, File No. J9451450)

Rated voltage	SS-10	SS-5	SS-01
250 VAC	10 A	5 A 5 (1) A motor 3 A (see note 2)	---
125 VAC	---	---	0.1 A (see note 2)
30 VDC	---	5 A (see note 2)	0.1 A (see note 2)

Note: 1. Testing conditions: 50,000 operations, T85 (0°C to 85°C)

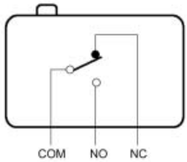
2. These approvals are only limited to OF 1.47 N {150 gf} models.

Microswitches

■ Contact Specifications

Item		SS-10	SS-5	SS-01
Contact	Specification	Rivet		Crossbar
	Material	Silver alloy	Silver	Gold alloy
	Gap (standard value)	0.5 mm		0.25 mm
Inrush current	NC	20 A max.		1 A max.
	NO	15 A max.	10 A max.	1 A max.

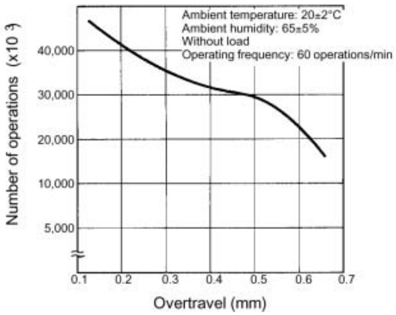
■ Contact Form (SPDT)



Engineering Data

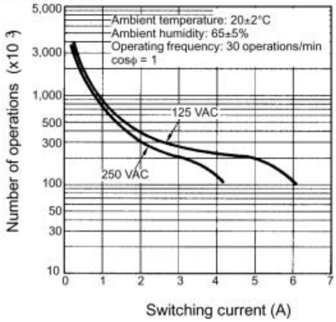
Mechanical Life Expectancy (Pin Plunger Model)

SS-5, SS-1, SS-01 Models



Electrical Life Expectancy (Pin Plunger Model)

SS-5 Models

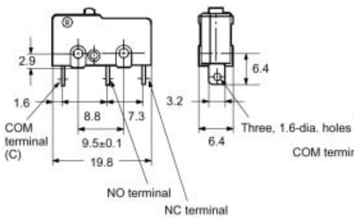


Dimensions

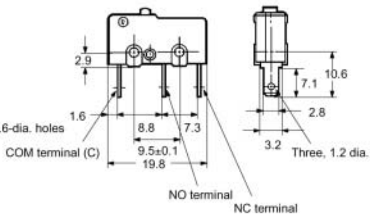
■ Terminals

Terminal plate thickness is 0.5 mm.

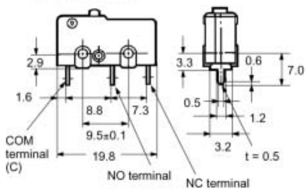
Solder Terminal



Quick-connect Terminal (#110)



PCB Terminal



■ Dimensions and Operating Characteristics

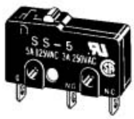
Note: 1. All units are in millimeters unless otherwise indicated.

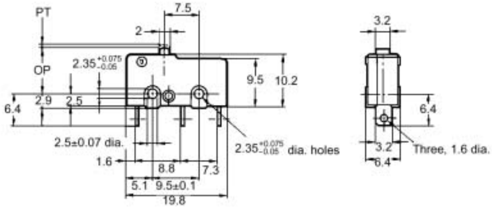
2. The following illustration and drawing are for solder terminal models. Refer to page 117 for details on models with quick-connect terminals (#110) or PCB terminals.

3. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Pin Plunger

SS-01(-E, -F)
SS-5(-F)
SS-10

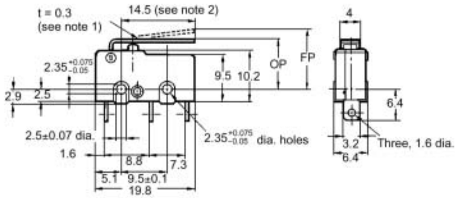




Model	SS-01-E	SS-01-F SS-5-F	SS-01 SS-5	SS-10
OF max.	0.25 N {25 gf}	0.49 N {50 gf}	1.47 N {150 gf}	1.47 N {150 gf}
RF min.	0.02 N {2 gf}	0.04 N {4 gf}	0.25 N {25 gf}	0.25 N {25 gf}
PT max.	0.5 mm	0.5 mm	0.5 mm	0.6 mm
OT min.	0.5 mm	0.5 mm	0.5 mm	0.4 mm
MD max.	0.1 mm	0.1 mm	0.1 mm	0.12 mm
OP	8.4±0.5 mm			

Hinge Lever

SS-01GL(-E, -F)
SS-5GL(-F)
SS-10GL



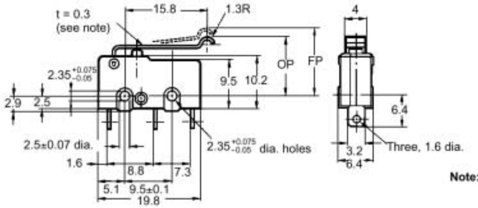
Note: 1. Stainless-steel lever

2. Besides the SS-□GL models with a hinge lever length of 14.5, the SS-□GL11 models with a hinge lever length of 18.5, the SS-□GL111 models with a hinge lever length of 22.6, and the SS-□GL1111 models with a hinge lever length of 37.8 are available. Contact your OMRON representative for these models

Model	SS-01GL-E	SS-01GL-F SS-5GL-F	SS-01GL SS-5GL	SS-10GL
OF max.	0.08 N {8 gf}	0.16 N {16 gf}	0.49 N {50 gf}	0.49 N {50 gf}
RF min.	0.01 N {1 gf}	0.02 N {2 gf}	0.06 N {6 gf}	0.06 N {6 gf}
OT min.	1.2 mm	1.2 mm	1.2 mm	1.0 mm
MD max.	0.8 mm	0.8 mm	0.8 mm	1.0 mm
FP max.	13.6 mm			
OP	8.8±0.8 mm			

Simulated Hinge Lever

SS-01GL13(-E, -F)
SS-5GL13(-F)
SS-10GL13

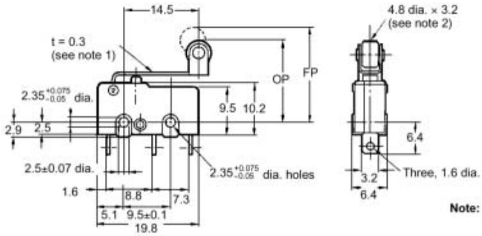


Note: Stainless-steel spring lever

Model	SS-01GL13-E	SS-01GL13-F SS-5GL13-F	SS-01GL13 SS-5GL13	SS-10GL13
OF max.	0.08 N {8 gf}	0.16 N {16 gf}	0.49 N {50 gf}	0.49 N {50 gf}
RF min.	0.01 N {1 gf}	0.02 N {2 gf}	0.06 N {6 gf}	0.06 N {6 gf}
OT min.	1.2 mm	1.2 mm	1.2 mm	1.0 mm
MD max.	0.8 mm	0.8 mm	0.8 mm	1.0 mm
FP max.	15.5 mm			
OP	10.7±0.8 mm			

Hinge Roller Lever

SS-01GL2(-E, -F)
SS-5GL2(-F)
SS-10GL2



Note:
1. Stainless-steel spring lever
2. Polyacetal resin roller

Model	SS-01GL2-E	SS-01GL2-F SS-5GL2-F	SS-01GL2 SS-5GL2	SS-10GL2
OF max.	0.08 N {8 gf}	0.16 N {16 gf}	0.49 N {50 gf}	0.49 N {50 gf}
RF min.	0.01 N {1 gf}	0.02 N {2 gf}	0.06 N {6 gf}	0.06 N {6 gf}
OT min.	1.2 mm	1.2 mm	1.2 mm	1.0 mm
MD max.	0.8 mm	0.8 mm	0.8 mm	1.0 mm
FP max.	19.3 mm			
OP	14.5±0.8 mm			

■ Separators (Insulation Sheet)

Applicable Switch	Thickness (mm)	Model (see note)
SS, D2S, D2SW	0.18	Separator for SS0.18
	0.4	Separator for SS0.4

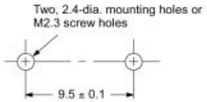
Separator for SS□

Precautions

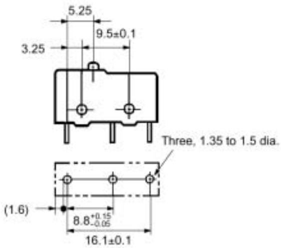
■ Mounting

Use two M2.3 mounting screws with spring washers to mount the Switch. Tighten the screws to a torque of 0.23 to 0.26 N • m {2.3 to 2.6 kgf • cm}.

Mounting Holes



PCB Mounting Dimensions (Reference)



Terminal Connection

When soldering the lead wire to the terminal, first insert the lead wire conductor through the terminal hole and then conduct soldering.

To solder the lead to the terminal, apply a soldering iron rated at 60 W max. (temperature of soldering iron: 250°C to 300°C) within 5 seconds. During soldering and one minute after soldering, do not apply any external force to the soldered terminal.

Feed solder away from the switch case so that solder or flux will not flow into the case side.

If the PCB terminal models are soldered in the solder bath, flux will permeate inside the Switch and cause contact failure. Therefore, manually solder the PCB terminal.

Specifications Approved by TÜV Rheinland According to EN61058-1

Model	Conductor size
SS-5	0.5 to 0.75 mm^2
SS-10	0.75 mm^2

Solder Terminal Approved Conditions

Soldering iron can be used. Soldering hook hole available.
Soldering terminal types 1 and 2 are met.

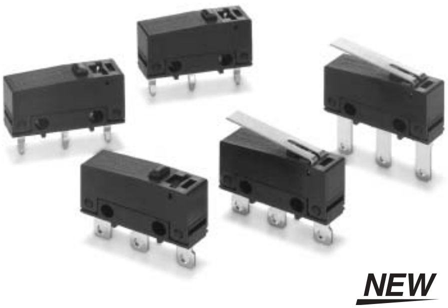
Spacing

The minimum thickness of insulation according to IEC61058-1 is 1.1 mm, and the minimum clearance between live terminals and mounting plate is 1.6 mm. If the proper insulation for the terminator cannot be obtained, add insulation such as a Separator or insulation guard on the switch.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

SS series Compatible Mounting with a Simple Construction and Easy-to-use Design Concept

- ROHS compliant.
- Insert molded case provides enhanced resistance to flux.
- Switch rating of 3 A at 125 V AC with a single-leaf movable spring. Models for micro loads are also available.
- Solder, quick-connect terminals (#110), and PCB terminals are available, including even-pitched PCB terminals.



Ordering Information

Model Number Legend

SS-□□□P□
1 2 3 4

1. Ratings

3: 3 A at 125 VAC
01: 0.1 A at 30 VAC

2. Contact Gap

G: 0.5 mm

3. Actuator

None: Pin plunger
L: Hinge lever
L13: Simulated roller lever

4. Terminals

None: Solder terminals
T: Quick-connect terminals (#110)
D: PCB terminals (Uneven pitch)
B: PCB terminals (Even pitch)

List of Models

Rating	Actuator	Terminals	Solder terminals	Quick-connect terminals (#110)	PCB terminals: Uneven pitch	PCB terminals: Even pitch
3 A	Pin plunger		SS-3GP	SS-3GPT	SS-3GPD	SS-3GPB
	Hinge lever		SS-3GLP	SS-3GLPT	SS-3GLPD	SS-3GLPB
	Simulated roller lever		SS-3GL13P	SS-3GL13PT	SS-3GL13PD	SS-3GL13PB
0.1 A	Pin plunger		SS-01GP	SS-01GPT	SS-01GPD	SS-01GPB
	Hinge lever		SS-01GLP	SS-01GLPT	SS-01GLPD	SS-01GLPB
	Simulated roller lever		SS-01GL13P	SS-01GL13PT	SS-01GL13PD	SS-01GL13PB

Specifications

Ratings

Rated voltage / Item \ Model	SS-3P	SS-01P
	Resistive load	
125 VAC	3 A	0.1 A
30 VDC	3 A	0.1 A

Note: 1. The ratings values apply under the following test conditions.
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 30 operations/min

2. Contact your OMRON representative for information on models for other loads.

Characteristics

Operating speed	0.1 mm to 1 m/s (for pin plunger models)
Operating frequency	Mechanical: 300 operations/min Electrical: 30 operations/min
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance (initial value)	SS-3P: 50 mΩ max. SS-01P: 100 mΩ max.
Dielectric strength (See note 2)	1,000 VAC, 50/60 Hz for 1 min between terminals of the same polarities 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal parts
Vibration resistance (See note 3)	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance (See note 3)	Destruction: 1,000 m/s^2 {approx. 100 G} max. Malfunction: 300 m/s^2 {approx. 30 G} max.
Durability (See note 4)	Mechanical: 1,000,000 operations min. (60 operations/min) Electrical: SS-3P: 70,000 operations min. (20 operations/min, 125 VAC) 100,000 operations min. (20 operations/min, 30 VDC) SS-01P: 200,000 operations min. (20 operations/min)
Degree of protection	IEC IP40
Degree of protection against electrical shock	Class I
Proof Tracking Index (PTI)	175
Ambient operating temperature	–25°C to 85°C (at ambient humidity of 60% max.) (with no icing)
Ambient operating humidity	85% max. (for 5°C to 35°C)
Weight	Approx. 1.6 g (for pin plunger models)

Note: 1. The data given above are initial values.

2. The dielectric strength shown in the table indicates a value for models with a Separator.
3. For the pin plunger models, the above values apply for both the free position and total travel position. For the lever models, the values apply at the total travel position. Contact opening or closing time is within 1 ms.
4. Contact your OMRON sales representative for testing conditions.

■ Approved Standards

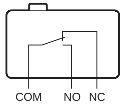
• UL, CSA, and EN approval projected for September 2003.

■ Contact Specifications

Item	Model	SS-3P	SS-01P
Contact	Specification	Rivet	Crossbar
	Material	Silver alloy	Gold alloy
	Gap (standard value)	0.5 mm	
Minimum applicable load (See note)		160 mA at 5 VDC	1 mA at 5 VDC

■ Contact Form

SPDT

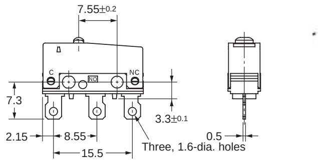


Dimensions

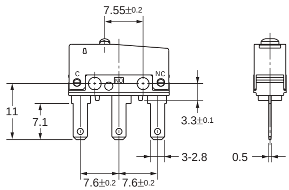
■ Terminals

Note: All units are in millimeters unless otherwise indicated. (Terminal plate thickness is 0.5 mm for all models.)

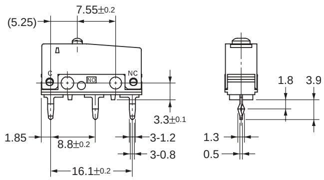
Solder Terminals



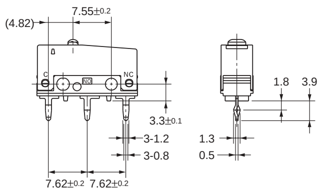
Quick-connect Terminals (#110)



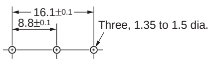
PCB Terminals (Uneven pitch)



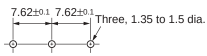
PCB Terminals (Even pitch)



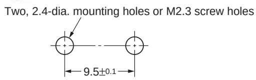
PCB Mounting Dimensions (Reference)



PCB Mounting Dimensions (Reference)



■ Mounting Holes

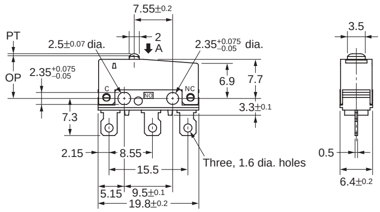


■ Dimensions and Operating Characteristics

Note:
1. All units are in millimeters unless otherwise indicated.
2. The following illustrations and drawings are for solder terminal models. terminals (#110) or PCB terminals.
3. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
4. The operating characteristics are for operation in the A direction (⬇).

Pin Plunger Models

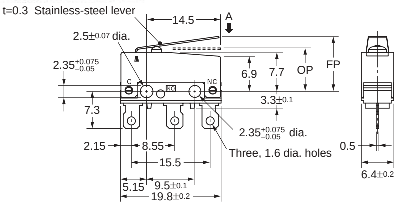
SS-3GP
SS-01GP



Model	SS-3GP	SS-01GP
OF max. **RF min.**	1.50 N 0.2 N	
PT max. **OT min.** **MD max.**	0.6 mm 0.4 mm 0.15 mm	
OP	8.4±0.3 mm	

Hinge Lever Models

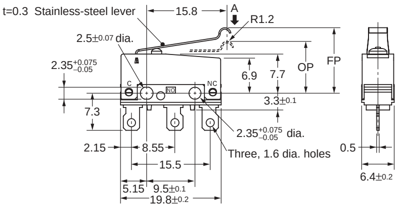
SS-3GLP
SS-01GLP



Model	SS-3GLP	SS-01GLP
OF max. **RF min.**	0.5 N 0.05 N	
OT min. **MD max.**	1.0 mm 0.8 mm	
FP max. **OP**	13.6 mm 8.8±0.8 mm	

Simulated Roller Lever Models

SS-3GL13P
SS-01GL13P



Model	SS-3GL13P	SS-01GL13P
OF max. **RF min.**	0.5 N 0.05 N	
OT min. **MD max.**	1.0 mm 0.8 mm	
FP max. **OP**	15.5 mm 10.7±0.8 mm	

Precautions

■ Cautions

Connecting to Solder Terminals

When soldering the lead wire to the terminal, first insert the lead wire conductor through the terminal hole and then conduct soldering.

Make sure that the temperature at the tip of the soldering iron is 350 to 400°C. Do not take more than 3 seconds to solder the switch terminal, and do not impose external force on the terminal for 1 min after soldering. Improper soldering involving an excessively high temperature or excessive soldering time may deteriorate the characteristics of the Switch.

Connecting to Quick-connect Terminals

Wire the quick-connect terminals (#110) with receptacles. Insert the terminals straight into the receptacles. Do not impose excessive force on the terminal in the horizontal direction, otherwise the terminal may be deformed or the housing may be damaged.

Connecting to PCB Terminal Boards

When using automatic soldering baths, we recommend soldering at 260±5°C within 5 seconds. Make sure that the liquid surface of the solder does not flow over the edge of the board.

When soldering by hand, as a guideline, solder with a soldering iron with a tip temperature of 350 to 400°C within 3 seconds, and do not apply any external force for at least 1 minutes after soldering. When applying solder, keep the solder away from the case of the Switch and do not allow solder or flux to enter the case.

■ Correct Use

Mounting

Turn OFF the power supply before mounting or removing the Switch, wiring, or performing maintenance or inspection. Failure to do so may result in electric shock or burning.

Use M2.3 mounting screws with plane washers or spring washers to securely mount the Switch. Tighten the screws to a torque of 0.23 to 0.26 N·m {2.3 to 2.7 kgf·cm}.

Mount the Switch onto a flat surface. Mounting on an uneven surface may cause deformation of the Switch, resulting in faulty operation or breakage in the housing.

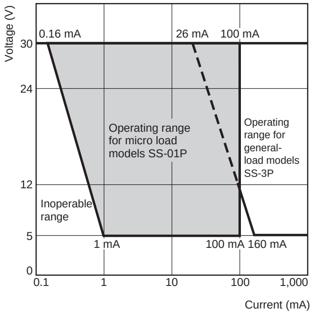
Operating Stroke Setting

Take particular care in setting the operating stroke for the pin plunger models. Make sure that the operating stroke is 60% to 90% of the rated OT distance. Do not operate the actuator exceeding the OT distance, otherwise the life expectancy of the Switch may be shortened.

Using Micro Loads

Using a model for ordinary loads to open or close the contact of a micro load circuit may result in faulty contact. Use models that operate in the following range. However, even when using micro load models within the operating range shown below, if inrush current occurs when the contact is opened or closed, it may increase contact wear and so decrease life expectancy. Therefore, insert a contact protection circuit where necessary.

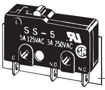
The minimum applicable load is the N-level reference value. This value indicates the malfunction reference level for the reliability level of 60% (λ_{60}). The equation, $\lambda_{60} = 0.5 \times 10^{-6}$/operations indicates that the estimated malfunction rate is less than 1/2,000,000 operations with a reliability level of 60%.



■ Separators

Thickness	Model
0.18 mm	Separator for SS0.18
0.4 mm	Separator for SS0.4

Separator for SS□



Note: The material is EAVTC (Epoxide Alkyd Varnished Tetron Cloth) and its heat-resisting temperature is 130°C.

■ Connectors

Use the following quick-connect connector made by Nippon Tanshi or Tyco Electronics. This connector is not sold by OMRON. Contact the following Nippon Tanshi or Tyco Electronics office to purchase this connector.

Nippon Tanshi Co., Ltd.	Japan	Tel: (81)463-30-1150
	Hong Kong	Tel: (852)2191-2727
Tyco Electrocics AMP K.K.	Japan	Tel: (81)44-844-8111
	U.S.A.	Tel (1)800-522-6752

This connector is for use with the SS-P and the terminal direction is 90° different from the SS Series.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Global Subminiature Basic Switch Conforming to EN61058-1 (IEC601058-1), UL1054, and CSA C22.2 No.54

- ROHS Compliant
- A wide operating temperature range of -25°C to 125°C is available for high temperature use.
- Flexible change lever using the external snap-fit lever.
- PCB terminal models are resistant to flux.
- Even-pitched PCB terminals conform to IEC1020-6-2.
- Mounting hole size conforms to IEC1020-6-2.

Ordering Information

Model Number Legend

SSG-□□□□□
1 2 3 4 5

1. **Ratings**
   01: 0.1 A
   5: 5 A
2. **Actuator**
   None: Pin plunger
   L1: Hinge lever
   L3: Simulated hinge lever
   L2: Hinge roller lever
3. **Contact Form**
   None: SPDT
   -2: SPST-NC
   -3: SPST-NO
4. **Terminals**
   H: Solder
   T: Quick-connect terminals (#110)
   P: PCB
5. **Operating Force max.**
   None: 1.5 N {153 gf}
   -5: 0.5 N {51 gf}

Note: These values are for the pin plunger model.

List of Models

Actuator	Rating	OF max.	Solder	Quick-connect terminal (#110)	PCB
Pin plunger	0.1 A	1.50 N {153 gf}	SSG-01H	SSG-01T	SSG-01P
		0.50 N {51 gf}	SSG-01H-5	SSG-01T-5	SSG-01P-5
	5 A	1.50 N {153 gf}	SSG-5H	SSG-5T	SSG-5P
		0.50 N {51 gf}	SSG-5H-5	SSG-5T-5	SSG-5P-5
Hinge lever	0.1 A	0.60 N {61 gf}	SSG-01L1H	SSG-01L1T	SSG-01L1P
		0.20 N {20 gf}	SSG-01L1H-5	SSG-01L1T-5	SSG-01L1P-5
	5 A	0.60 N {61 gf}	SSG-5L1H	SSG-5L1T	SSG-5L1P
		0.20 N {20 gf}	SSG-5L1H-5	SSG-5L1T-5	SSG-5L1P-5
Simulated hinge lever	0.1 A	0.60 N {61 gf}	SSG-01L3H	SSG-01L3T	SSG-01L3P
		0.20 N {20 gf}	SSG-01L3H-5	SSG-01L3T-5	SSG-01L3P-5
	5 A	0.60 N {61 gf}	SSG-5L3H	SSG-5L3T	SSG-5L3P
		0.20 N {20 gf}	SSG-5L3H-5	SSG-5L3T-5	SSG-5L3P-5
Hinge roller lever	0.1 A	0.60 N {61 gf}	SSG-01L2H	SSG-01L2T	SSG-01L2P
		0.20 N {20 gf}	SSG-01L2H-5	SSG-01L2T-5	SSG-01L2P-5
	5 A	0.60 N {61 gf}	SSG-5L2H	SSG-5L2T	SSG-5L2P
		0.20 N {20 gf}	SSG-5L2H-5	SSG-5L2T-5	SSG-5L2P-5

Note: SPST models are also available, but not listed in the above table.

Specifications

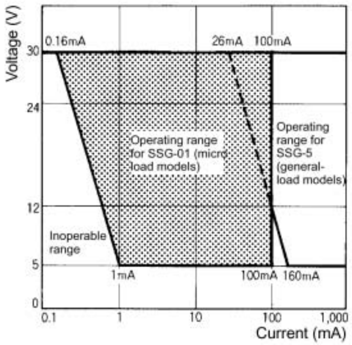
Ratings

General Ratings

Rated voltage	Non-inductive load				Inductive load			
	Resistive load		Lamp load		Inductive load		Motor load	
	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	5 (0.1) A (see note 1)		1.5 A	0.7 A	3 A		2.5 A	1.3 A
250 VAC	3 A		1 A	0.5 A	2 A		1.5 A	0.8 A
8 VDC	5 A		2 A		5 A		3 A	
14 VDC	5 A		2 A		4 A		3 A	
30 VDC	4 (0.1) A (see note 1)		2 A		3 A		3 A	
125 VDC	0.4 A		0.05 A		0.4 A		0.05 A	
250 VDC	0.2 A		0.03 A		0.2 A		0.05 A	

Note:
1. The values in the parentheses are for the SSG-01.
2. The above current ratings are the values of the steady-state current.
3. Inductive load has a power factor of 0.7 min. (AC) and a time constant of 7 ms max. (DC).
4. Lamp load has an inrush current of 10 times the steady-state current.
5. Motor load has an inrush current of 6 times the steady-state current.
6. If the Switch is used in a DC circuit and is subjected to a surge current, connect a surge suppressor across the switch.

Use the Switch in the following operation range.



Model	SSG-01	SSG-5
Minimum applicable load	1 mA at 5 VDC	160 mA at 5 VDC

■ Characteristics

Operating speed	0.1 mm to 1 m/s (at pin plunger models)
Operating frequency	Mechanical: 400 operations/min Electrical: 60 operations/min
Insulation resistance	100 MΩ min.
Contact resistance	OF 1.50 N: SSG-5 models: 30 mΩ max. SSG-01 models: 50 mΩ max. OF 0.50 N SSG-5 models: 50 mΩ max. SSG-01 models: 100 mΩ max.
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between contacts of the same polarity (600 VAC for SSG-01H and SSG-01T models) 1,500 VAC, 50/60 Hz for 1 min between each terminal and ground 1,500 VAC, 50/60 Hz for 1 min between each terminal and non-current-carrying metal part
Vibration resistance	Malfunction: 10 to 2,000 Hz, 196 m/s^2 {20G} (Contact open: 10 µs max., lever position: at TTP)
Shock resistance	Malfunction: 490 m/s^2 {approx. 50G} (Contact open: 10 µs max., lever position: at TTP)
Life expectancy	Mechanical: 10,000,000 operations min. (OT: rated value) Electrical: 200,000 operations min. (5 A at 125 VAC for SSG-5, 0.1 A at 125 VAC for SSG-01, resistive OT: full)
Degree of protection (IP code)	IP00
Degree of protection against electrical shock	Class I
Ambient temperature	Operating: –25°C to 125°C (with no icing)
Ambient humidity	Operating: 85% max. (5°C to 30°C)
Proof tracking index	175
Switch category (IEC335-1)	D
Weight	Approx. 1.6 g (pin plunger models)

■ Approved Standards

Standard	EN61058-1/IEC601058-1
Approval body	TÜV Rheinland (File No. T9451449) BEAB (File No. C0746) IMQ (File No. EL662) VDE (File No. 100873, EN61058-1 1992+AI: 1993
Rating	SSG-5 models: 5 A at 250 VAC (T125, 50,000 operations) SSG-01 models: 0.1 A at 30 VDC (T125, 50,000 operations)

UL1054 (File No. E41515), CSA C22.2 No. 55 (File No. LR21642) Approved Ratings

SSG-5 Models: 5 A at 125 VAC, 3 A at 250 VAC
3A at 250 VAC, 3A at 30 VDC (100,000 operations)
SSG-01 Models: 0.1 A at 125 VAC, 0.1 A at 30 VDC

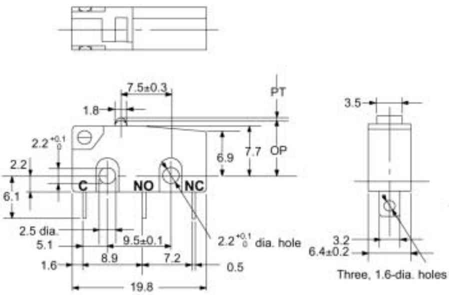
■ Contact

Item		SSG-5	SSG-01H.T	SSG-01P
Contact	Specification	Rivet	Crossbar	Crossbar
	Material	Silver	Gold alloy	Gold alloy
	Gap (standard value)	0.5 mm	0.25 mm	0.5 mm
Inrush current	NC	20 A max.	1 A max.	1 A max.
	NO	10 A max.	1 A max.	1 A max.

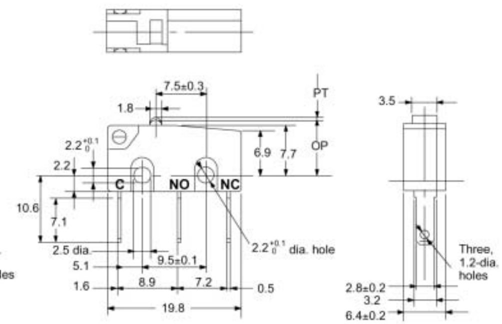
Dimensions

■ Terminals

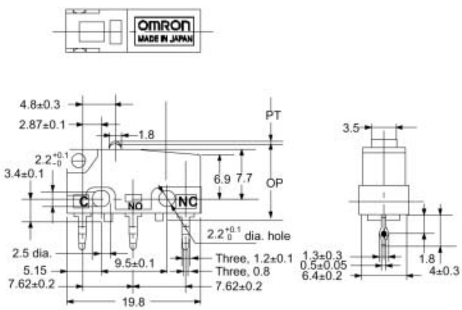
Solder Terminals



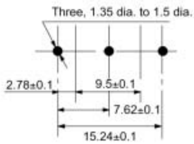
Quick-connect Terminals (#110)



PCB Terminals



PCB Mounting



Microswitches

■ Dimensions and Operating Characteristics

Note: 1. All units are in millimeters unless otherwise indicated.

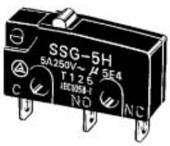
2. Every actual model number includes the code instead of □ for the kind of terminals incorporated by the model.

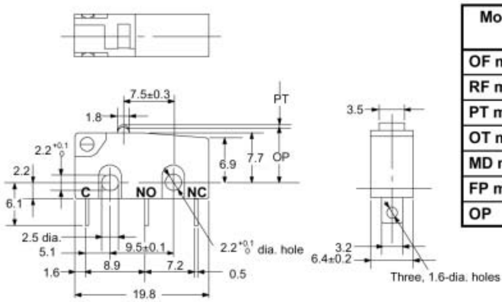
3. Unless otherwise specified, a tolerance of ±0.25 mm applies to all dimensions.

Solder/Quick-connect Terminal

Pin Plunger

SSG-01□
SSG-5□
SSG-01□-5
SSG-5□-5

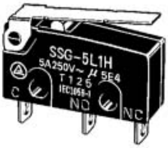


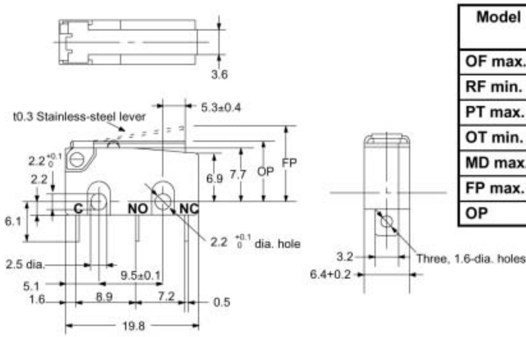


Model	SSG-01□ SSG-5□	SSG-01□-5 SSG-5□-5
OF max.	1.50 N {153 gf}	0.50 N {51 gf}
RF min.	0.25 N {25 gf}	0.04 N {4 gf}
PT max.	0.6 mm	
OT min.	0.4 mm	
MD max.	0.1 mm	
FP max.	---	
OP	8.4±0.3 mm	

Hinge Lever

SSG-01L1□
SSG-5L1□
SSG-01L1□-5
SSG-5L1□-5



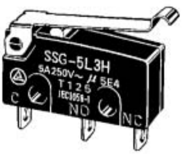


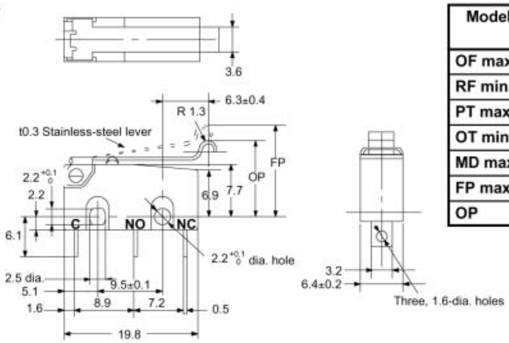
Model	SSG-01L1□ SSG-5L1□	SSG-01L1□-5 SSG-5L1□-5
OF max.	0.60 N {61 gf}	0.20 N {20 gf}
RF min.	0.06 N {6 gf}	0.02 N {2 gf}
PT max.	1.0 mm	
OT min.	0.8 mm	
MD max.	---	
FP max.	13.6 mm	
OP	$8.8^{+1.0}/_{-0.6}$ mm	

Note: Also available are models with a hinge lever length of 39 mm under the following model numbers; SSG-01L14□, SSG-5L14□, SSG-01L14□-5, and SSG-5L14□-5. Contact your OMRON representative for these models.

Simulated Hinge Lever

SSG-01L3□
SSG-5L3□
SSG-01L3□-5
SSG-51L3□-5

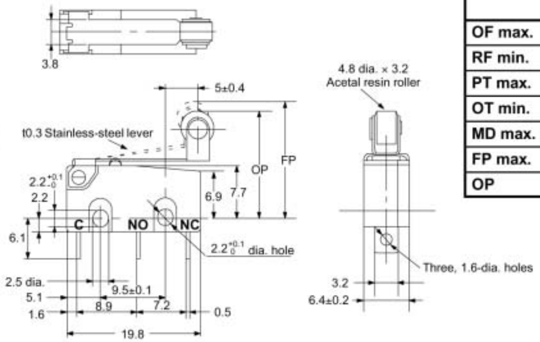




Model	SSG-01L3□ SSG-5L3□	SSG-01L3□-5 SSG-5L3□-5
OF max.	0.60 N {61 gf}	0.20 N {20 gf}
RF min.	0.06 N {6 gf}	0.02 N {2 gf}
PT max.	1.0 mm	
OT min.	0.8 mm	
MD max.	---	
FP max.	15.5 mm	
OP	$10.7^{+1.0}/_{-0.6}$ mm	

Hinge Roller Lever

SSG-01L2□
SSG-5L2□
SSG-01L2□-5
SSG-5L2□-5

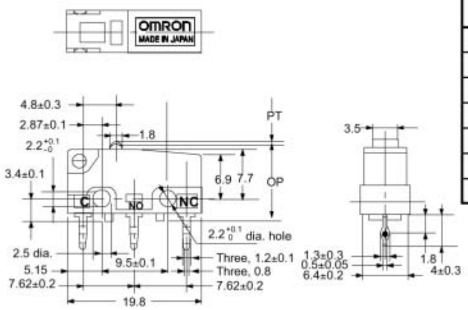


Model	SSG-01L2□ SSG-5L2□	SSG-01L2□-5 SSG-5L2□-5
OF max.	0.60 N {61 gf}	0.20 N {20 gf}
RF min.	0.06 N {6 gf}	0.02 N {2 gf}
PT max.	1.0 mm	
OT min.	0.8 mm	
MD max.	---	
FP max.	19.0 mm	
OP	$14.5^{+1.0}/_{-0.6}$ mm	

PCB Terminals

Pin Plunger

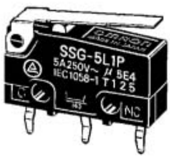
SSG-01P
SSG-5P
SSG-01P-5
SSG-5P-5

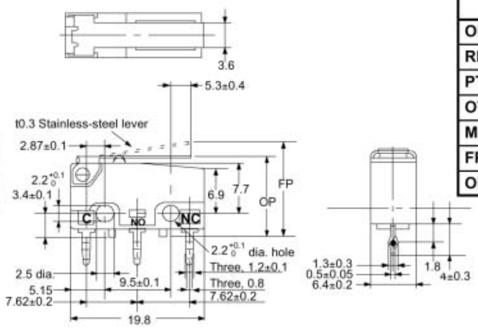


Model	SSG-01P SSG-5P	SSG-01P-5 SSG-5P-5
OF max.	1.50 N {153 gf}	0.50 N {51 gf}
RF min.	0.25 N {25 gf}	0.04 N {4 gf}
PT max.	0.6 mm	
OT min.	0.4 mm	
MD max.	0.1 mm	
FP max.	---	
OP	11.8±0.4 mm	

Hinge Lever

SSG-01L1P
SSG-5L1P
SSG-01L1P-5
SSG-5L1P-5



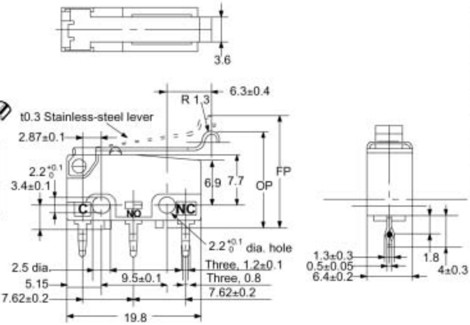


Model	SSG-01L1P SSG-5L1P	SSG-01L1P-5 SSG-5L1P-5
OF max.	0.60 N {61 gf}	0.20 N {20 gf}
RF min.	0.06 N {6 gf}	0.02 N {2 gf}
PT max.	---	
OT min.	1.0 mm	
MD max.	0.8 mm	
FP max.	17.0 mm	
OP	$12.2^{+1.1}/_{-0.7}$ mm	

Note: Also available are models with a hinge lever length of 39 mm under the following model numbers; SSG-01L14P, SSG-5L14P, SSG-01L14P-5, and SSG-5L14P-5. Contact your OMRON representative for these models.

Simulated Hinge Lever

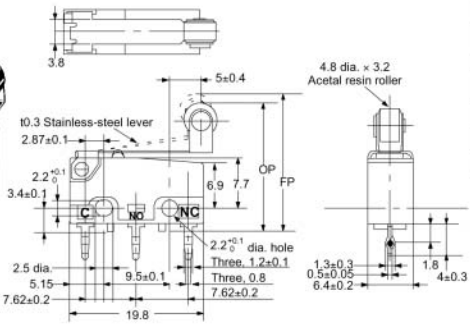
SSG-01L3P
SSG-5L3P
SSG-01L3P-5
SSG-51L3P-5



Model	SSG-01L3P SSG-5L3P	SSG-01L3P-5 SSG-5L3P-5
OF max.	0.60 N {61 gf}	0.20 N {20 gf}
RF min.	0.06 N {6 gf}	0.02 N {2 gf}
PT max.	---	
OT min.	1.0 mm	
MD max.	0.8 mm	
FP max.	18.9 mm	
OP	$14.4^{+1.1}/_{-0.7}$ mm	

Hinge Roller Lever

SSG-01L2P
SSG-5L2P
SSG-01L2P-5
SSG-5L2P-5



Model	SSG-01L2P SSG-5L2P	SSG-01L2P-5 SSG-5L2P-5
OF max.	0.60 N {61 gf}	0.20 N {20 gf}
RF min.	0.06 N {6 gf}	0.02 N {2 gf}
PT max.	---	
OT min.	1.0 mm	
MD max.	0.8 mm	
FP max.	22.4 mm	
OP	$17.9^{+1.1}/_{-0.7}$ mm	

Precautions

■ Terminal Connections

When soldering a lead wire to a switch terminal, insert the wire conductor into the hole of the switch terminal and take the following steps promptly.

- Make sure that the capacity of the soldering iron is 60 W maximum. Do not take more than 5 s to solder the switch terminal. Improper soldering involving an excessively high temperature or excessive soldering time may deteriorate the characteristics of the Switch.
- Be sure to apply only the minimum required amount of flux. The SSG may have contact failures if flux intrudes into the interior of the SSG.
- Use the following lead wires to connect to the solder terminals.

Type	Conductor size
SSG-01	AWG 22 to 20
SSG-5	AWG 20 to 18

- Soldering Categories (Refer to the conditions of EN61058-1.)

Type	Classified by EN61058-1
Solder terminal	Soldering iron used With soldering hole Solder terminal type 1.2
PCB terminal	Soldering bath used Solder terminal type 1.2

To automatically solder the Switch to a PCB in a soldering bath, complete soldering within 5 seconds at a flux temperature of 250°C and avoid the overflow of flux onto the surface of the PCB where the Switch or other parts are mounted.

Wire the quick-connect terminals (#110) with receptacles. Insert the terminals straight into the receptacles. Do not impose excessive force on the terminal in the horizontal direction, otherwise the terminal may be deformed or the housing may be damaged.

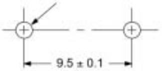
Insulation Distance

The Switch does not have a ground terminal. The minimum distance through insulation (IEC61058-1) is 0.9 mm. If proper insulation for the end product cannot be secured, additional insulation such as a Separator or insulation cover should be attached.

Mounting

When securing the SSG, be sure to use M2.2 mounting screws and tighten the screws with flat washers and spring washers securely within a torque range between 0.20 to 0.24 N • m {2 to 2.5 kgf • cm}.

Mounting Holes



Make sure that the plate to which the SSG is mounted is flat. If the plate has protruding or warped part, the SSG may not operate properly.

Operating Stroke

Make sure that the operating stroke is 70% to 100% of the rated OT distance. Do not operate the actuator exceeding the OT distance, otherwise the life expectancy of the SSG may be shortened.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

A variety of D2F Models including Models Incorporating Simulated Hinge Lever and Hinge Roller Lever

- ROHS Compliant.
- Subminiature switch (12.8 x 6.5x 5.8 (W x H x D)) ideal for PCB mounting.
- Incorporating a snapping mechanism made with two highly precise split springs which ensures a long service life (1,000,000 operations).
- Two-stage bottom different in level and insertion moulded terminals prevents flux penetration.
- PCB, self-clinching, solder, and right-angle terminals are available.
- Ideal for home appliances, audio equipment, office machines, and communications equipment.
- Conforms to EN61058-1.

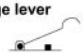
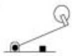
Ordering Information

■ Model Number Legend

D2F-□□□□
1 2 3 4

1. **Ratings**
   None: General load
   01: 0.1 A
2. **Operating Force max.**
   None: 1.47 N {150 gf}
   F: 0.74 N {75 gf}
   Note: These values are for the pin plunger model.
3. **Actuator**
   None: Pin plunger
   L: Hinge lever
   L2: Hinge roller lever
   L3: Simulated hinge lever
4. **Terminals**
   None: PCB terminal
   -T: Self-clinching PCB terminal
   -D: Solder terminal
   -A: Right-angle PCB terminal

■ List of Models

Actuator	Operaating force (OF) (see note)	Microvoltage/current load		Standard	
		0.1 A		1 A	3 A
		Low operating force 0.74 N {75 gf}	General-purpose 1.47 N {150 gf}	Low operating force 0.74 N {75 gf}	General-purpose 1.47 N {150 gf}
Pin plunger 	PCB terminals	D2F-01F	D2F-01	D2F-F	D2F
	Self-clinching terminals	D2F-01F-T	D2F-01-T	D2F-F-T	D2F-T
	Solder terminals	D2F-01F-D	D2F-01-D	D2F-F-D	D2F-D
	Right-angle terminals	D2F-01F-A	D2F-01-A	D2F-F-A	D2F-A
Hinge lever 	PCB terminals	D2F-01FL	D2F-01L	D2F-FL	D2F-L
	Self-clinching terminals	D2F-01FL-T	D2F-01L-T	D2F-FL-T	D2F-L-T
	Solder terminals	D2F-01FL-D	D2F-01L-D	D2F-FL-D	D2F-L-D
	Right-angle terminals	D2F-01FL-A	D2F-01L-A	D2F-FL-A	D2F-L-A
Simulated hinge lever 	PCB terminals	D2F-01FL3	D2F-01L3	D2F-FL3	D2F-L3
	Self-clinching terminals	D2F-01FL3-T	D2F-01L3-T	D2F-FL3-T	D2F-L3-T
	Solder terminals	D2F-01FL3-D	D2F-01L3-D	D2F-FL3-D	D2F-L3-D
	Right-angle terminals	D2F-01FL3-A	D2F-01L3-A	D2F-FL3-A	D2F-L3-A
Hinge roller lever 	PCB terminals	D2F-01FL2	D2F-01L2	D2F-FL2	D2F-L2
	Self-clinching terminals	D2F-01FL2-T	D2F-01L2-T	D2F-FL2-T	D2F-L2-T
	Solder terminals	D2F-01FL2-D	D2F-01L2-D	D2F-FL2-D	D2F-L2-D
	Right-angle terminals	D2F-01FL2-A	D2F-01L2-A	D2F-FL2-A	D2F-L2-A

Note: The OF values shown in the table are for the pin plunger models.

Specifications

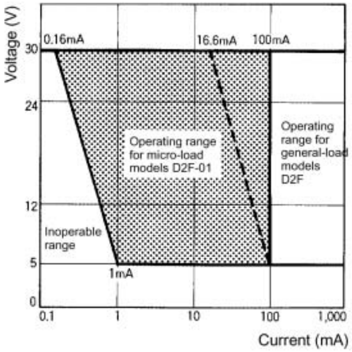
■ Ratings

Item	OF max.	D2F models		D2F-01 models	
		1.47 N {150 gf} (General-purpose)	0.74 N {75 gf} (Low operating)	1.47 N {150 gf} (General-purpose)	0.74 N {75 gf} (Low operating)
		Resistive load			
Rated voltage	**125 VAC**	3 A	1 A	---	
	30 VDC	2 A	0.5 A	0.1 A	

Note: 1. Consult your OMRON representative before using the Switch with inductive or motor loads.

2. The ratings values apply under the following test conditions:
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 30 operations/min

Use the Switch in the following operating range.



Model	D2F-01	D2F
Minimum applicable load	1 mA at 5 VDC	100 mA at 5 VDC

■ Characteristics

Operating speed	1 to 500 mm/s (at pin plunger models)
Operating frequency	Mechanical: 200 operations/min Electrical: 30 operations/min
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance (initial value)	D2F models: 30 mΩ max. D2F-F models: 50 mΩ max. D2F-01 models: 100 mΩ max.
Dielectric strength	600 VAC, 50/60 Hz for 1 min between terminals of the same polarity 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground (see note 1), and between each terminal and non-current-carrying metal part
Vibration resistance (see note 2)	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance (see note 2)	Malfunction: 300 m/s^2 {approx. 30G} max.
Life expectancy	Mechanical: 1,000,000 operations min. (Refer to *Engineering Data*.) Electrical: 30,000 operations min. (Refer to *Engineering Data*.)
Degree of protection	IP00
Degree of protection against electric shock	Class I
Proof tracking index (PTI)	175
Ambient temperature	Operating: –25°C to 65°C (with no icing)
Ambient humidity	Operating: 85% max. (for 5°C to 35°C)
Weight	Approx. 0.5 g (pin plunger models)

Note: 1. The dielectric strength shown in the table indicates a value for models with a Separator.

2. For the pin plunger models, the values are at the free position and total travel position. For the lever models, they are at the total travel position.

■ Approved Standards

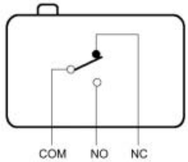
UL1054 (File No. 41515)
CSA C22.2 No. 55 (LR21642)

Rated voltage	D2F (general-purpose)	D2F (low operating force)	D2F-01
125 VAC	3 A	1 A	---
30 VDC	2 A	0.5 A	0.1 A

■ Contact Specifications

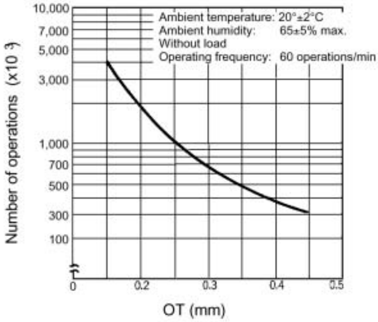
Item		D2F models	D2F-01 models
Contact	Specification	Crossbar	
	Material	Silver alloy	Gold alloy
	Gap (standard value)	0.25 mm	

Contact Form (SPDT)



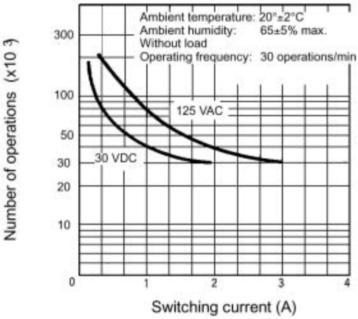
Engineering Data

Mechanical Life Expectancy (D2F, D2F-01)



The values are for the pin plunger model.

Electrical Life Expectancy (D2F)



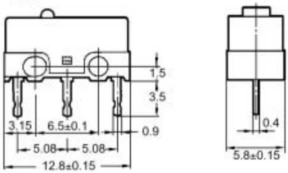
For details about the D2F-01, contact your OMRON sales representative.

Dimensions

■ Terminals

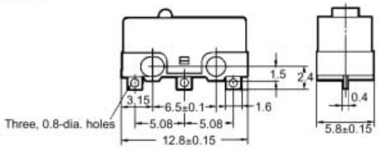
PCB Terminals (Standard)

D2F



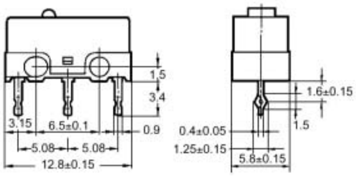
Solder Terminals

D2F-D



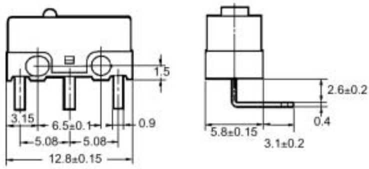
Self-clinching PCB Terminals

D2F-T



Right-angle PCB Terminals

D2F-A

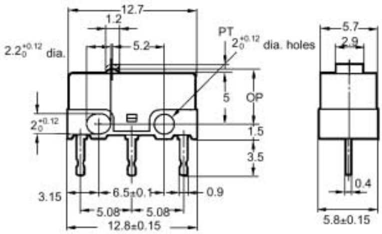


■ Dimensions and Operating Characteristics

Note:
1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
3. The following illustrations and drawings are for D2F models with PCB terminals. Self-clinching, solder, and right-angle terminals are omitted from the following drawings. Refer to page 143 for these terminals. When ordering, replace □ with the code for the terminal that you need.

Pin Plunger

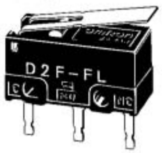
D2F□
D2F-01□
D2F-F□
D2F-01F□

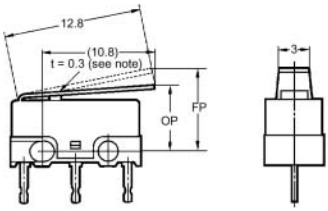


Model	D2F□ D2F-01□	D2F-F□ D2F-01F□
OF max.	1.47 N {150 gf}	0.74 N {75 gf}
RF min.	0.20 N {20 gf}	0.05 N {5 gf}
PT max.	0.5 mm	
OT min.	0.25 mm	
MD max.	0.12 mm	
OP	5.5±0.3 mm	

Hinge Lever

D2F-L□
D2F-01L□
D2F-FL□
D2F-01FL□



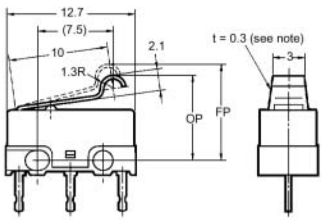


Note: Stainless-steel lever

Model	D2F-L□ D2F-01L□	D2F-FL□ D2F-01FL□
OF max.	0.78 N {80 gf}	0.25 N {25 gf}
RF min.	0.05 N {5 gf}	0.02 N {2 gf}
OT min.	0.55 mm	
MD max.	0.5 mm	
FP max.	10 mm	
OP	6.8±1.5 mm	

Simulate Hinge Lever

D2F-L3□
D2F-01L3□
D2F-FL3□
D2F-01FL3□

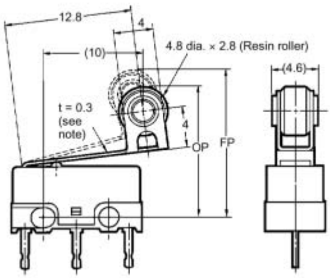


Note: Stainless-steel lever

Model	D2F-L3□ D2F-01L3□	D2F-FL3□ D2F-01FL3□
OF max.	0.78 N {80 gf}	0.39 N {40 gf}
RF min.	0.05 N {5 gf}	0.02 N {2 gf}
OT min.	0.5 mm	
MD max.	0.45 mm	
FP max.	13 mm	
OP	8.5±1.2 mm	

Hinge Roller Lever

D2F-L2□
D2F-01L2□
D2F-FL2□
D2F-01FL2□



Note: Stainless-steel lever

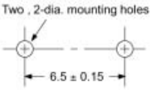
Model	D2F-L2□ D2F-01L2□	D2F-FL2□ D2F-01FL2□
OF max.	0.78 N {80 gf}	0.39 N {40 gf}
RF min.	0.05 N {5 gf}	0.02 N {2 gf}
OT min.	0.55 mm	
MD max.	0.5 mm	
FP max.	16.5 mm	
OP	13±2 mm	

Precautions

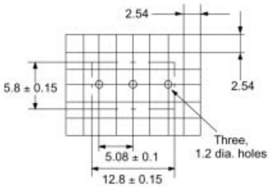
■ Mounting Dimensions

Use M2 mounting screws with plain or spring washers to mount the Switch. Tighten the screws to a torque of 0.08 to 0.1 N • m {0.8 to 1 kgf • cm}.

Mounting Holes

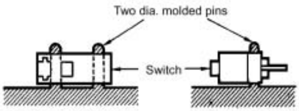


Mounting Dimensions



Molded fittings are recommended for securing the Switch.

Mounting with Molded Pin



■ Terminal Connections

When soldering the lead wire to the terminal, first insert the lead wire conductor through the terminal and then apply solder. Use a soldering iron rated at 30 W maximum (temperature of soldering iron: 350°C max.) within 3 s.

If soldering is not carried out under the proper conditions there is a danger of over-heating and subsequent heat damage.

Applying a soldering iron for too long a time or using one that is rated at more than 30 W may degrade the Switch characteristics.

When soldering the PCB terminal to the PCB, the flux and solder liquid level should not exceed the PCB level.

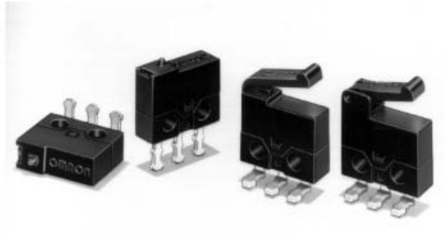
Handling

Mount the Switch on a smooth and flat surface. Mounting a Switch on an uneven surface may cause malfunction or break the housing.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Microswitches

Superminiaturised Basic Switch with Angle-terminal Models



- ROHS Compliant.
- Miniature size (6.5 x 8.2 x 2.7mm) and weight as light as 0.3g contribute to miniaturisation of devices.
- PCB mounting and angle terminals for side operation are available.
- Excels in electric characteristics with the snap-action mechanism despite superminiaturised design.
- Gold-plated (Au-P) contacts for micro load switching available in addition to the standard silver-plated contacts (Ag-P)
- Ideal for applications where size and weight requirements are crucial, such as in electronic wristwatches and miniaturised optical and audio equipment.

Ordering Information

Model Number Legend:

D2MQ-1□-□-□
1 2 3 4

1. **Ratings**
   1: 0.5 A, 30 VDC: Silver-plated contact type, 0.05 A, 30 VDC: Gold-plated contact type
2. **Actuator**
   None: Pin plunger
   L: Leaf lever
3. **Terminal Direction**
   None: Straight
   TL: Left
   TR: Right
4. **Contact Material**
   None: Silver-plated copper alloy
   105: Gold-plated copper alloy

D2MQ-4L-□-1-□
1 2 3 4

1. **Actuator**
   4L: Hinge leaf lever
2. **Contact Material (Rating)**
   None: Silver-plated copper alloy (0.5 A, 30 VDC)
   105: Gold-plated copper alloy (0.05 A, 30 VDC)
3. **Operating Position**
   1: 7.1 mm
4. **Terminal Direction**
   None: Straight
   L: Left angle
   R: Right angle

List of Models

Actuator	Terminal direction						
	Standard model (Ag-plated)			Microvoltage/ Current load model (Au-plated)	Micro load model (Au-plated)		
	Straight	Left Angle	Right Angle	Straight	Straight	Left Angle	Right Angle
Pin plunger	D2MQ-1	D2MQ-1-TL	D2MQ-1-TR	D2MQ-1-105	---	---	---
Leaf lever	D2MQ-1L	D2MQ-1L-TL	D2MQ-1L-TR	D2MQ-1L-105	---	---	---
Hinge leaf lever	D2MQ-4L-1	D2MQ-4L-1-L	D2MQ-4L-1-R	---	D2MQ-4L-105-1	D2MQ-4L-105-1-L	D2MQ-4L-105-1-R

Note: The terminal profiles shown above are ones viewed from the right side of the Switch.

Specifications

Ratings

Item	Standard model	Microvoltage/current load model
Electrical ratings	50 to 500 mA at 30 VDC (cos ϕ = 1)	5 to 50 mA at 30 VDC (cos ϕ = 1)

Note: The ratings values hold under the following test conditions:
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 20 operations/min

Characteristics

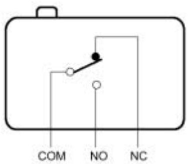
Operating speed	0.1 mm to 0.5 m/s (see note 1)
Operating frequency	Mechanical: 60 operations/min Electrical: 20 operations/min
Contact resistance	100 mΩ max. (initial value)
Insulation resistance	100 MΩ min. (at 250 VDC)
Dielectric strength	500 VAC, 50/60 Hz for 1 min between terminals at the same polarity 500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude (see note 2)
Shock resistance	Destruction: 1,000 m/s^2 {approx. 100G} max. Malfunction: 300 m/s^2 {approx. 30G} max.
Life expectancy	Mechanical: 30,000 operations min. (at full OT value) Electrical: 10,000 operations min. (at full OT value)
Degree of protection	IP00
Degree of protection against electric shock	Class I
Proof tracking index (PTI)	175
Ambient temperature	Operating: −15°C to 70°C (with no icing)
Ambient humidity	Operating: 35% to 85%
Weight	Approx. 0.3 g

Note: 1. The values are for the pin plunger model. (For different models, contact your OMRON representative.)
2. Malfunction: 1 ms max.

Contact Specifications

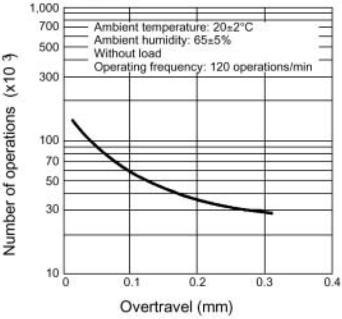
Item		Silver plating	Gold plating
Contact	Specification	Rivet	
	Material	Silver plating	Gold plating
	Gap (standard value)	0.15 mm	
Inrush current	NC	0.5 A max.	0.05 A max.
	NO	0.5 A max.	0.05 A max.

Contact Form (SPDT)

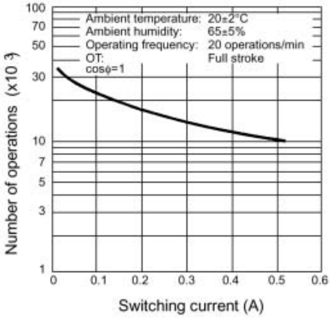


Engineering Data

Mechanical Life Expectancy (D2MQ-1)



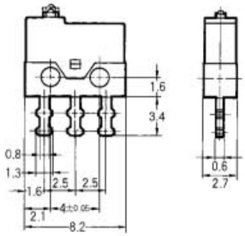
Electrical Life Expectancy (D2MQ-1)



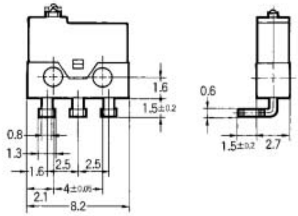
Dimensions

■ Terminals

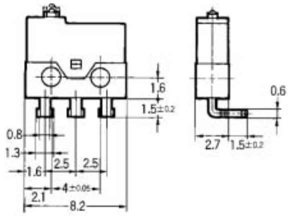
Straight Terminal



Left-angle Terminal



Right-angle Terminal



■ Dimensions and Operating Characteristics

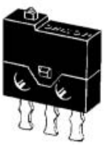
Note: 1. All units are in millimeters unless otherwise indicated.

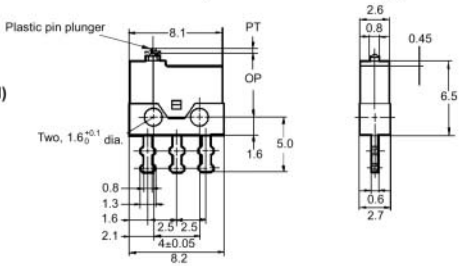
2. Unless otherwise specified, a tolerance of 0.15 mm applies to all dimensions.

3. The following illustrations are for the straight terminal models. Those for the left-angle terminals and right-angle terminals are different from straight terminal models in terminal size only. Refer to *Terminals* on page 148 for these terminals.

Pin Plunger

D2MQ-1 (Straight Terminal)
D2MQ-1-TL (Left Angle)
D2MQ-1-TR (Right Angle)
D2MQ-1-105 (Straight Terminal)

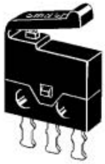


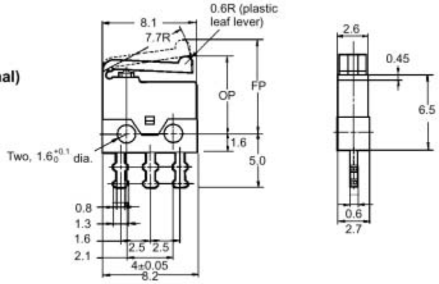


OF max.	1.18 N {120 gf}
RF min.	0.19 N {20 gf}
PT max.	0.4 mm
OT min.	0.1 mm
MD max.	0.1 mm
OP	5.7±0.2 mm

Leaf Lever

D2MQ-1L (Straight Terminal)
D2MQ-1L-TL (Left Angle)
D2MQ-1L-TR (Right Angle)
D2MQ-1L-105 (Straight Terminal)

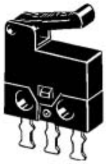


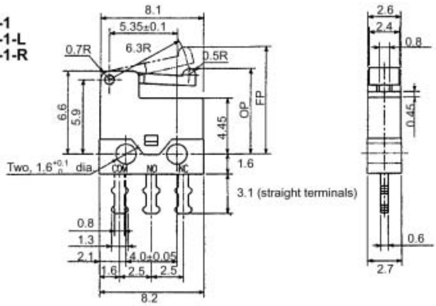


OF max.	0.59 N {60 gf}
RF min.	0.08 N {8 gf}
PT max.	2.4 mm
OT min.	0.3 mm
MD max.	0.7 mm
FP max.	9.6 mm
OP	6.7±0.5 mm

Hinge Leaf Lever

D2MQ-4L-1	**D2MQ-4L-105-1**
D2MQ-4L-1-L	**D2MQ-4L-105-1-L**
D2MQ-4L-1-R	**D2MQ-4L-105-1-R**





OF max.	0.39 N {40 gf}
RF min.	0.04 N {4 gf}
PT max.	2.1 mm
OT min.	0.3 mm
MD max.	0.7 mm
FP max.	8.7 mm
OP	7.1±0.5 mm

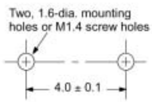
Precautions

■ Cautions

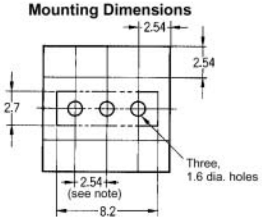
Mounting Dimensions

Use M1.4 mounting screws with screws to mount the Switch. Tighten the screws to a torque of 0.1 N • m {1 kgf • cm}.

Mounting Holes



Mounting Dimensions



Note: Terminal gap: 1 pitch

Terminal Connections

When soldering a lead wire to a terminal of the D2MQ, use a soldering iron with a maximum capacity of 15 W maximum (iron tip temperature: 250° max.) with the actuator at the free position and do not take more than 3 s to solder the lead wire, otherwise the characteristics of the Switch may change.

Applying a soldering iron for too long a time or using one that is rated at more than 15 W may degrade the Switch characteristics.

Operation

Do not apply a force more than two times the rated operating force to the actuator and leaf lever.

Make sure that the actuator is not hindered by any object from moving to or beyond the rated overtravel.

Do not change the operating position by modifying the actuator.

Do not use the Switch in an application where the operating speed is extremely slow or the actuator is set in the midpoint between the free position and operating position.

Install the pin plunger switch so that the operating force is applied in alignment with the stroke of the actuator.

Do not apply a shock to the actuator, otherwise, the Switch may be damaged.

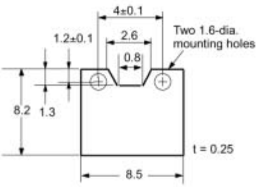
Do not apply excessive force to the actuator of the Leaf Lever Switch in the operating, releasing, and horizontal directions.

Separator

When mounting the Switch on a metallic surface, be sure to provide a Separator between the Switch and mounting plate.

The Separator must be made of hard material and must be processed as shown below.

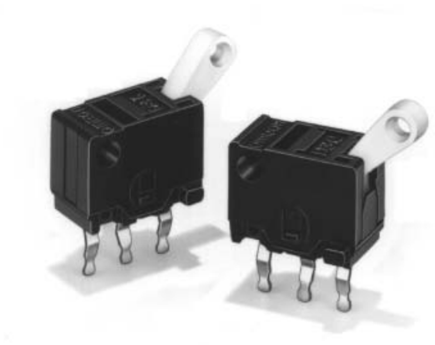
Dimensions of Separator



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Low-cost Super Subminiature Basic Switch with a Long Stroke

- ROHS Compliant.
- Compact (8 x 6 x 4.2 (W x H x D)), light (approximately 0.3g), and low-cost.
- Built-in slide mechanism for selecting shorting or non-shorting timing of the switch.
- Available with a 3mm long stroke.
- Ideal for household appliances, sound equipment, office equipment, communications equipment, etc.



Ordering Information

Model Number Legend:

D3C-□2□0
1 2

1. **Switching Timing**
   1: Non-shorting
   2: Shorting

2. **Operating Force max.**
   1: 1.28 N {130 gf}
   2: 0.39 N {40 gf}

List of Models

Actuator	OF 1.28 N {130 gf}		OF 0.39 N {40 gf}	
	Non-shorting Model	Shorting Model	Non-shorting Model	Shorting Model
Hinge lever 	D3C-1210	D3C-2210	D3C-1220	D3C-2220

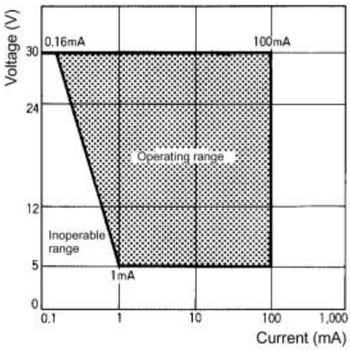
Specifications

Ratings

Electrical ratings	0.1 A at 30 VDC (resistive load)

Note: The ratings values hold under the following test conditions:
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 30 operations/min

Use the Switch within the following operating range.

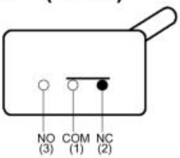


Minimum operating load	1 mA at 5 VDC

■ Characteristics

Operating speed	1 to 500 mm/s
Operating frequency	Mechanical: 200 operations/min Electrical: 30 operations/min
Insulation resistance	100 MΩ (at 250 VDC)
Contact resistance	50 mΩ max. (initial value)
Dielectric strength	250 VAC, 50/60 Hz for 1 min between terminals of same polarity 250 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Malfunction: 300 m/s^2 {approx. 30G} max.
Life expectancy	50,000 operations min.
Degree of protection	IP00
Degree of protection against electric shock	Class I
Proof tracking index (PTI)	175
Ambient temperature	Operating: –20°C to 80°C (with no icing)
Ambient humidity	Operating: 65% max. (for 5°C to 35°C)
Weight	Approx. 0.3 g

■ Contact Form (SPDT)



Dimensions

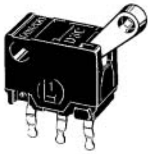
Note: 1 All units are in millimeters unless otherwise indicated.

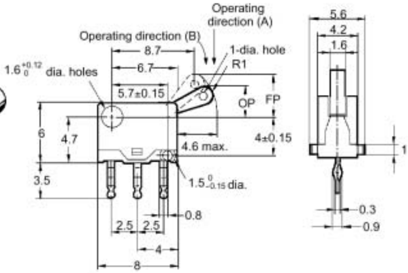
2 Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

■ Dimensions and Operating Characteristics

Hinge Lever

D3C-1210/-2210
D3C-1220/-2220



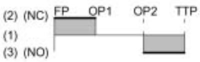


	Non-shorting Model		Shorting Model	
	D3C-1210	D3C-1220	D3C-2210	D3C-2220
OF max.	1.28 N {130 gf} (0.98 N)	0.39 N {40 gf} (0.29 N)	1.28 N {130 gf} (0.98 N)	0.39 N {40 gf} (0.29 N)
RF min.	0.10 N {10 gf} (0.15 N)	0.03 N {3 gf} (0.05 N)	0.10 N {10 gf} (0.15 N)	0.03 N {3 gf} (0.05 N)
TTP	1.3±0.4 mm		1.3±0.4 mm	
FP max.	4.8 mm		4.8 mm	
OP1	3.5±0.3 mm		3.4±0.3 mm	
OP2	2.5±0.3 mm		2.6±0.3 mm	

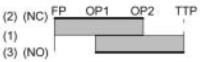
Note: The values for operating characteristics apply for operation in direction (A) shown above. The values in parentheses indicate those for operation in direction (B).

Switching Timing

Non-shorting Model



Shorting Model

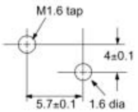


Precautions

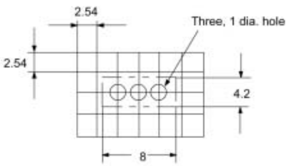
■ Mounting Dimensions

When mounting the D3C with screws, use M1.6 mounting screws with plain washers or spring washers. Tighten the screws to a torque of 4.9 to 9.8 x 10^{-2} N • m {0.5 to 1 kgf • cm}.

Mounting Holes



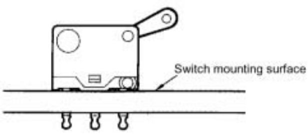
PCB Dimensions



■ Terminal Connections

When soldering the lead wire to the terminal, first bind the lead wire to the terminal and then apply the 6 (Sn) : 4 (Pb) solder to the terminal. Complete soldering within five seconds at a soldering iron temperature of 260°C. Soldering at a temperature exceeding 260°C, soldering for more than five seconds, or repeated soldering will degrade the Switch characteristics.

Control PCB soldering so that flux and solder liquid level does not exceed the PCB. It is recommended that flux guard be applied to the Switch mounting surface.



Microswitches

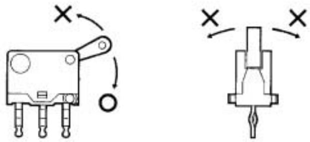
Mounting

Mount the Switch on a flat and even surface. Mounting on an uneven surface may cause the Switch to deform, resulting in malfunction or breakage in the housing.

When mounting on a PCB, the PCB must be prepared as shown previously. Provide a distance of 2.54 mm between terminals.

Application of Operation Force to the Lever

Apply operation forces to the lever in its operating direction. Applying operating force to the lever in any other directions will damage the Switch or cause malfunction.

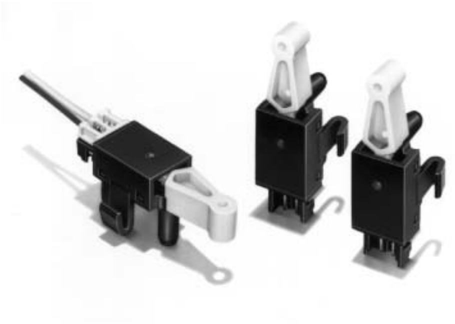


Mounting Plate

Use materials other than ABS or polycarbonate for the mounting plate. Since grease is used for the Switch, cracks may be caused if grease from the Switch comes in contact with such materials.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

A Switch with Crimp-type Connectors that Greatly Reduces Wiring Time



- ROHS Compliant.
- Clip-on wiring AMP crimp-type connectors.
- Snap-fit attachment for easy installation.
- Operation possible from either side to enable mounting in either direction.

Ordering Information

Model	D2X

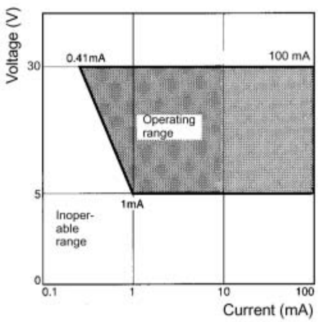
Specifications

■ Ratings

30 VDC	0.1 A (resistive load)

Micro-load Use

Be sure that the load is within the following range.



Minimum operating load	1 mA at 5 VDC

Microswitches

Characteristics

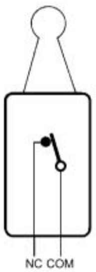
Operating speed	0.1 to 100 mm/s
Operating frequency	Mechanical: 60 operations/min Electrical: 30 operations/min
Insulation resistance	100 MΩ min. (at 250 VDC)
Contact resistance	200 mΩ max. (initial value)
Dielectric strength	250 VAC, 50/60 Hz for 1 min between terminals of same polarity 250 VAC, 50/60 Hz for 1 min between current-carrying metal part and ground
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Malfunction: 300 m/s^2 {approx. 30G} max.
Life expectancy (see note)	Mechanical: 1,000,000 operations min. Electrical: 50,000 operations min.
Degree of protection	IP00
Degree of protection against electric shock	Class I
Proof tracking index (PTI)	175
Ambient temperature	Operating: −10°C to 70°C (with no icing)
Ambient humidity	Operating: 45% to 85% (for 5°C to 35°C)
Weight	Approx. 1 g

Note: Contact your OMRON sales representative for testing conditions.

Contact Specifications

Contact	Specification	Slide
	Material	Silver plating

Contact Form (SPST-NC)



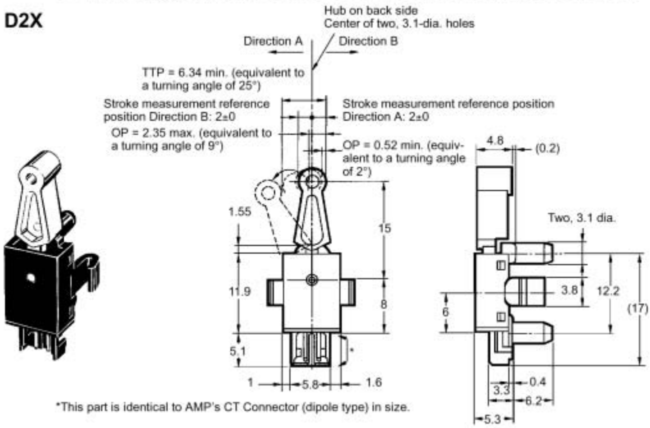
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.

2. Unless specified, a tolerance of ±0.4 mm applies to all dimensions.

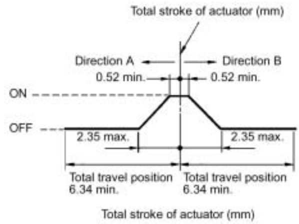
3. The operating characteristics are for cases where the actuator operates in the A (←) direction or B (→) direction.

D2X



*This part is identical to AMP's CT Connector (dipole type) in size.

OF max.	0.49 N {50 gf}
RF min.	0.02 N {2 gf}
OP	0.52 to 2.35 mm
TTP min.	6.34 mm



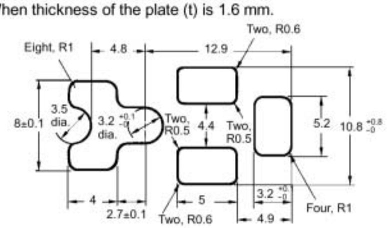
Precautions

■ Mounting Dimensions

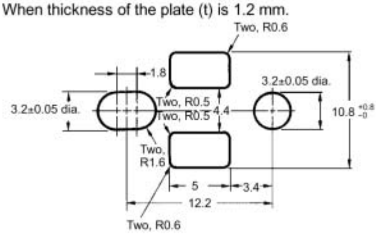
Mounting Plate

Make sure that the bur is placed to backside of Mounting Plate.

When thickness of the plate (t) is 1.6 mm.



When thickness of the plate (t) is 1.2 mm.



Note: 1. Allowable deviation from the center is ±0.07 mm.

2. Unless otherwise specified, a tolerance of ±0.1 mm applies to all dimensions.

■ Correct Use

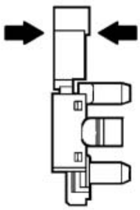
Refer to pages 22 to 29 for common precautions.

Operating Object

The operating object must fully press the lever when the operating object travels and must be perfectly separated from the lever when the operating object is in the free position. The operating object must not be pressed excessively to exceed the TTP, otherwise the D2X may be damaged. Be sure that the operating object imposes a proper load on the lever according to the motion of the lever.

Lever Load

Do not impose loads in the following directions on the lever, otherwise the Switch may be damaged or malfunction.



Wiring Connector

Use the following type CT connectors of Nippon AMP for wiring.

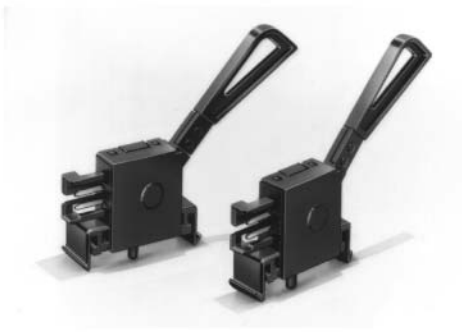
Press-fit connector:	173977-2
Crimp-style connector housing:	179228-2
Crimp-style connector contact:	179227-1

The above connectors are not sold by OMRON. Contact the following offices for these connectors:

- AMP (Japan), Ltd.
  Phone: 81-44-844-8111
- AMP Inc. (U.S.A.)
  Phone: 1-800-522-6752
- AMP of Great Britain Ltd.
  Phone: 44-181-954-2356
- AMP Products Pacific Ltd. (Hong Kong)
  Phone: 852-2735-1628

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Requires Only Minimal Operating Force



- ROHS Compliant.
- Detects cards and paper sheets with a 0.03-N (3-gf) operating force.
- Snap-fit onto 0.8, 1.0 or 1.2mm thick mounting objects.
- Easy wiring ensured through quick-connect terminals.
- Long 45 degree stroke angle makes it easier to design a wide range of mechanisms.
- Long-life ensured with 2,000,000 switching operations.

Ordering Information

Model	Minimum order
D3K-B	100

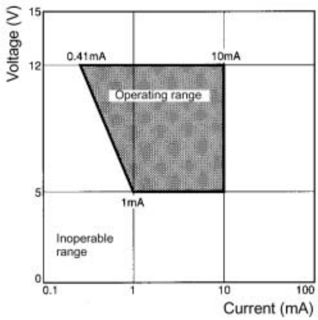
Note: Only orders in multiples of 100 are accepted.

Specifications

■ Ratings

12 VDC	10 mA (resistive load)

Use the Switch under the following operating range.



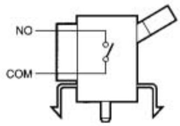
Minimum operating load	1 mA at 5 VDC

Characteristics

Operating speed	0.1 to 100 mm/s
Operating frequency	Mechanical: 30 operations/min Electrical: 30 operations/min
Insulation resistance	100 MΩ min. (at 250 VDC)
Contact resistance	200 mΩ max. (initial value)
Dielectric strength	250 VAC, 50/60 Hz for 1 min between terminals of same polarity 250 VAC, 50/60 Hz for 1 min between current-carrying metal part and ground
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude (at a contact separation time of 1 ms max.) (see note)
Shock resistance	Malfunction: 300 m/s^2 {30G} (at a contact separation time of 1 ms max.) (see note)
Life expectancy (see note)	Mechanical: 2,000,000 operations min. Electrical: 2,000,000 operations min.
Degree of protection	IP00
Degree of protection against electric shock	Class III
Ambient temperature	Operating: −10°C to 70°C (with no icing or condensation)
Ambient humidity	Operating: 35% to 85% (for 5°C to 35°C)
Weight	Approx. 0.9 g

Note: These values are possible on condition that the actuator of the D3K is operated up to the total travel position (TTP).

Contact Form

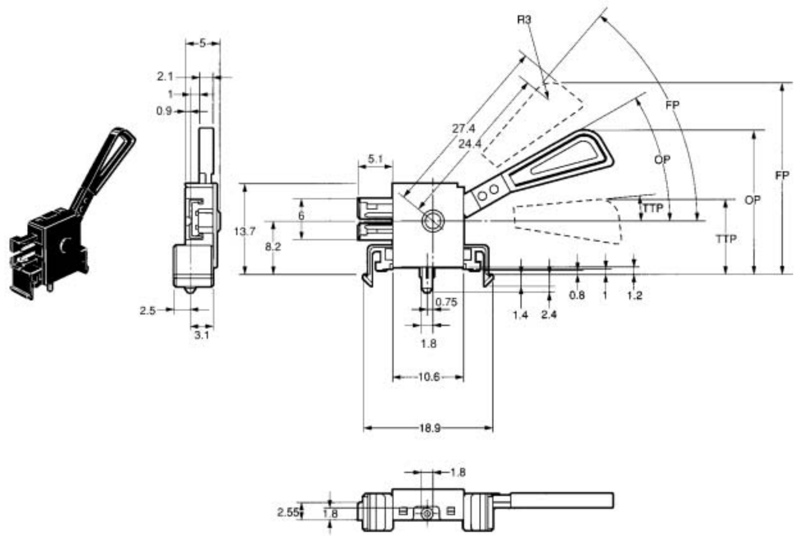


Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless specified, a tolerance of ±0.4 mm applies to all dimensions.

■ Dimensions and Operating Characteristics

D3K



OF max.	0.03 N {3 gf}
TTF max.	0.05 N {5 gf}
TTP max.	11.4 mm {5°}
FP max.	28.7 mm {50°}
OP	21.6±2 mm {30±5°}

Precautions

■ Mounting Dimensions

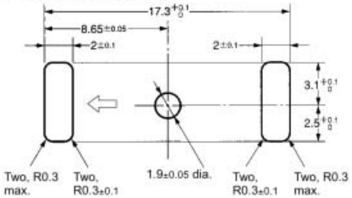
Mounting

Refer to the following mounting hole dimensions and be sure that the burred side is opposite to the Switch mounting side.

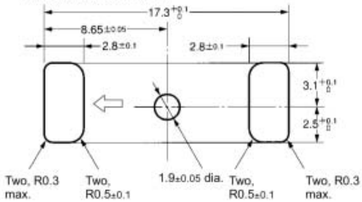
If further mounting security is required for the prevention of rattling, contact your OMRON representative.

By changing the 1.9±0.05-dia. hole to a 1.7 to 1.8-dia. hole, the pin on the Switch side will need to be pressed in. This will reduce the clattering of the pin.

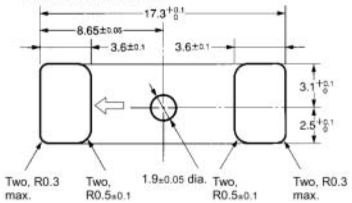
- Plate thickness t=0.8



- Plate thickness t=1.0



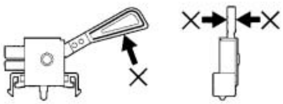
- Plate thickness t=1.2



Note: The switch lever is set in the direction indicated by an arrow in the above illustrations.

Lever Load

Do not impose loads in the following directions on the lever, otherwise the D3K may be damaged or malfunction.



Operating Object

The operating object must fully press the lever when the operating object travels and must be perfectly separated from the lever when the operating object is in the free position. The operating object must not be pressed excessively to exceed the TTP, otherwise the D3K may be damaged. Be sure that the operating object imposes a proper load on the lever according to the motion of the lever.

■ Connector

Use the following type CT connectors of Nippon AMP for wiring the D3K:

Press-fit connector:	173977-2
Crimp-style connector housing:	179228-2
Crimp-style connector contact	179227-1

The above connectors are not sold by OMRON. Contact the following offices for these connectors:

- AMP (Japan), Ltd.
  Phone: 81-44-844-8111
- AMP Inc. (U.S.A.)
  Phone: 1-800-522-6752
- AMP of Great Britain Ltd.
  Phone: 44-181-954-2356
- AMP Products Pacific Ltd. (Hong Kong)
  Phone: 852-2735-1628

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Saves Wiring Effort, Production Steps, and Time

- ROHS Compliant.
- Easy wiring ensured through the quick-connect terminals.
- External actuator mounts in either of two directions and increases Switch mounting flexibility.
- Horizontal layout of terminals saves mounting space.
- Same mounting pitch as the OMRON SS Subminiature Basic Switch.

Ordering Information

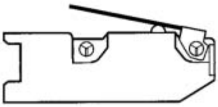
■ Model Number Legend

D3M-01□□□
1 2 3

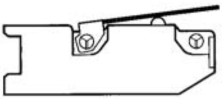
1. Actuator Mounting Position

None: No actuator

K: Pushbutton close to actuator fulcrum



L: Pushbutton far from actuator fulcrum



2. Actuator

None: Pin plunger

1: Hinge lever

2: Hinge roller lever

3: Simulated hinge lever

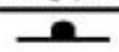
3. Contact Form

None: SPST-NC (with red pushbutton)

-3: SPST-NO (with black pushbutton)

Note: For details about models with a low operating force, contact your OMRON sales representative.

■ List of Models

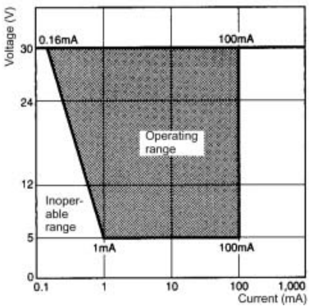
Actuator	Actuator mounting position		Contact type	Model
Pin plunger	---		SPST-NC	D3M-01
			SPST-NO	D3M-01-3
Hinge lever	K		SPST-NC	D3M-01K1
			SPST-NO	D3M-01K1-3
	L		SPST-NC	D3M-01L1
			SPST-NO	D3M-01L1-3
Hinge roller lever	K		SPST-NC	D3M-01K2
			SPST-NO	D3M-01K2-3
	L		SPST-NC	D3M-01L2
			SPST-NO	D3M-01L2-3
Simulated hinge lever	K		SPST-NC	D3M-01K3
			SPST-NO	D3M-01K3-3
	L		SPST-NC	D3M-01L3
			SPST-NO	D3M-01L3-3

Specifications

■ Ratings

Rated voltage	Resistive load
30 VDC	0.1 A

Use the D3M in the following permissible operating range.



Minimum Applicable Load (Level N)

Voltage	Resistive load
5 VDC	1 mA

■ Characteristics

Permissible operating speed (see note 1)	0.1 mm/s to 1 m/s
Permissible operating frequency	Mechanical: 400 operations/min max.
	Electrical: 60 operations/min max.
Insulation resistance	100 MΩ min. at 500 VDC
Contact resistance (initial value)	100 mΩ max. including connector and 50-mm AWG28 lead-wire resistance
Dielectric strength	1,000 VAC at 50/60 Hz for 1 min between terminals of the same polarity
	1,500 VAC at 50/60 Hz for 1 min between charged metal part and ground
	1,500 VAC at 50/60 Hz for 1 min between non-charged metal part and each terminal
Vibration resistance (see note 2)	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude for 1 ms max. with contacts closed or open.
Shock resistance (see note 2)	Destruction: 1,000 m/s^2 {approx. 100G} max.
	Malfunction: 300 m/s^2 {approx. 30G} for 1 ms max. with contacts closed or open.
Life expectancy	Mechanical: 500,000 operations (at full-stroke operating speed of 10 mm/s at a frequency of 60 operations/min)
	Electrical: 200,000 operations (at full-stroke operating speed of 10 mm/s at a frequency of 30 operations/min)
Enclosure rating	IP00
Degree of protection against electric shock	Class I
Proof tracking index (PTI)	175
Ambient temperature	Operating: –25°C to 85°C (with no icing)
Ambient humidity	Operating: 85% max. (5°C to 35°C)
Weight	Approx. 2 g (pin plunger models)

Note: 1. The permissible operating speed applies to pin plunger models.
2. If a lever actuator model is used, the above values apply for use at the total travel position.

■ Approved Standards

UL1054 (File No. E41515)
CSA C22.2 No. 55 (File No. LR21642)
TÜV EN61058-1 (File No. R9750979)

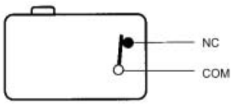
Rated voltage	Rated current
30 VDC	0.1 A

■ Contact Specifications

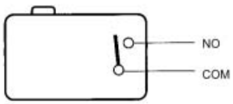
Contact	Crossbar
Material	Gold alloy
Distance between contacts	0.5 mm

■ Contact Form

SPST-NC



SPST-NO



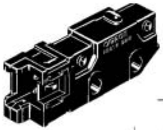
Dimensions

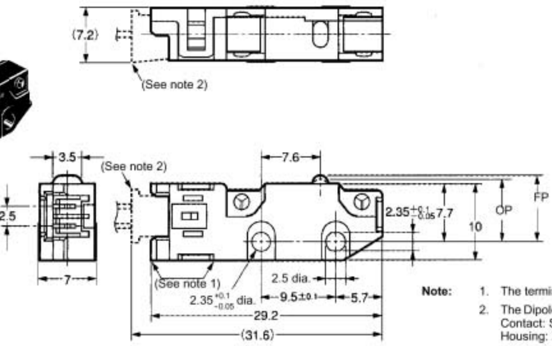
Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

■ Dimensions and Operating Characteristics

Pin Plunger

D3M-01
D3M-01-3



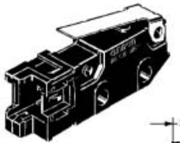


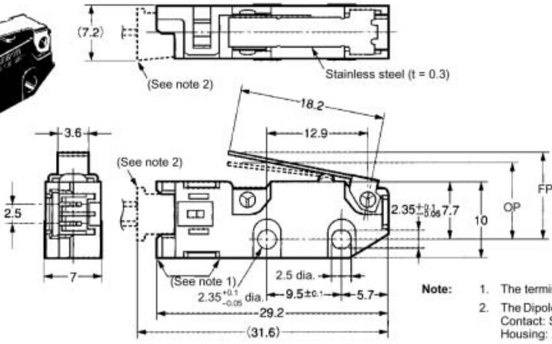
OF max.	1.50 N {153 gf}
RF min.	0.25 N {25 gf}
PT max.	0.6 mm
OT min.	0.4 mm
MD max.	0.1 mm
OP	8.4±0.3 mm

Note: 1. The terminals connect to JST's Dipole XA Connector.
2. The Dipole XA Connector consists of the following components.
Contact: SXA-001T-P0.6
Housing: XAP-02V-1

Hinge Lever

D3M-01K1
D3M-01K1-3

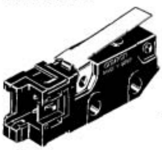


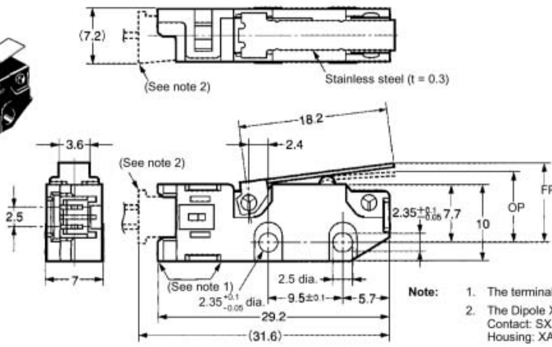


OF max.	0.50 N {51 gf}
RF min.	0.06 N {6 gf}
OT min.	1.2 mm
MD max.	0.8 mm
FP max.	14.0 mm
OP	10.0±0.8 mm

Note: 1. The terminals connect to JST's Dipole XA Connector.
2. The Dipole XA Connector consists of the following components.
Contact: SXA-001T-P0.6
Housing: XAP-02V-1

D3M-01L1
D3M-01L1-3



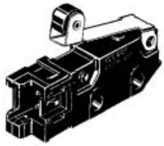


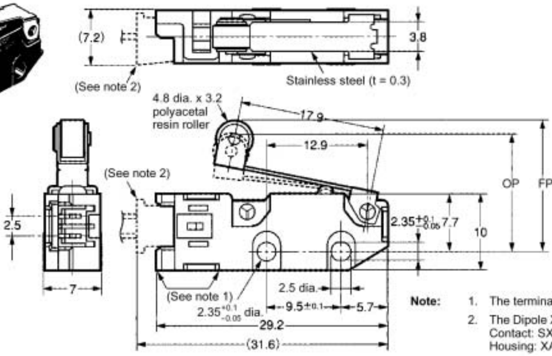
OF max.	1.00 N {102 gf}
RF min.	0.10 N {10 gf}
OT min.	0.7 mm
MD max.	0.6 mm
FP max.	11.5 mm
OP	9.2±0.6 mm

Note: 1. The terminals connect to JST's Dipole XA Connector.
2. The Dipole XA Connector consists of the following components.
Contact: SXA-001T-P0.6
Housing: XAP-02V-1

Hinge Roller Lever

D3M-01K2
D3M-01K2-3

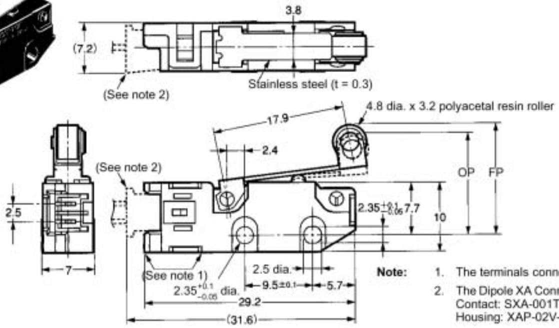




OF max.	0.50 N {51 gf}
RF min.	0.06 N {6 gf}
OT min.	1.2 mm
MD max.	0.8 mm
FP max.	19.7 mm
OP	15.7±0.8 mm

Note:
1. The terminals connect to JST's Dipole XA Connector.
2. The Dipole XA Connector consists of the following components.
Contact: SXA-001T-P0.6
Housing: XAP-02V-1

D3M-01L2
D3M-01L2-3

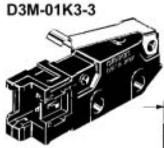


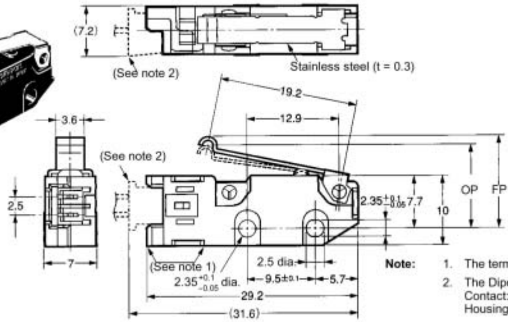
OF max.	1.00 N {102 gf}
RF min.	0.10 N {10 gf}
OT min.	0.7 mm
MD max.	0.6 mm
FP max.	17.2 mm
OP	14.9±0.6 mm

Note:
1. The terminals connect to JST's Dipole XA Connector.
2. The Dipole XA Connector consists of the following components.
Contact: SXA-001T-P0.6
Housing: XAP-02V-1

Simulated Hinge Lever

D3M-01K3
D3M-01K3-3



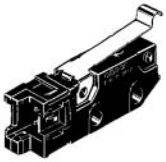


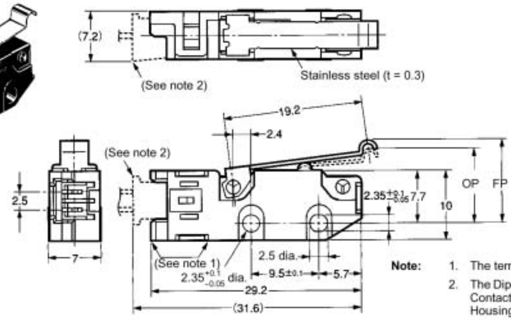
OF max.	0.50 N {51 gf}
RF min.	0.06 N {6 gf}
OT min.	1.2 mm
MD max.	0.8 mm
FP max.	16.2 mm
OP	12.2±0.8 mm

Note:
1. The terminals connect to JST's Dipole XA Connector.
2. The Dipole XA Connector consists of the following components.
Contact: SXA-001T-P0.6
Housing: XAP-02V-1

Microswitches

D3M-01L3
D3M-01L3-3





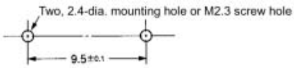
OF max.	1.00 N {102 gf}
RF min.	0.10 N {10 gf}
OT min.	0.7 mm
MD max.	0.6 mm
FP max.	13.6 mm
OP	11.3±0.6 mm

Note:
1. The terminals connect to JST's Dipole XA Connector.
2. The Dipole XA Connector consists of the following components.
   Contact: SXA-001T-P0.6
   Housing: XAP-02V-1

Precautions

■ Mounting Dimensions

Use M2.3 screws, flat washers, and spring washers to mount the D3M securely. Make sure that the tightening torque applied to each screw is within a range from 0.23 to 0.26 N • m {2.3 to 2.7 kgf • cm}.



Operating Stroke

Make sure that the dog is separated from the actuator when the actuator is in the free position and that the actuator is pressed appropriately when the D3M is actuated. The actuator must not be pressed excessively to reach the maximum overtravel position, otherwise the D3M may be damaged.

Make sure the actuator is pressed in the direction where the D3M is actuated.

■ Correct Use

Wiring Connectors

The terminals connect to JST's Dipole XA Connector.

The Dipole XA Connector consists of the following components.
Contact: SXA-001T-P0.6
Housing: XAP-02V-1

OMRON does not sell the Dipole XA Connector. Contact the following.

J.S.T. Manufacturing Co., Ltd. (Japan)
Tel: (81)45-543-1271
Fax: (81)45-544-1503

J.S.T. (U.K.) Ltd. (United Kingdom)
Tel: (44)1986-874131
Fax: (44)1986-874276

J.S.T. Corporation (U.S.A.)
Tel: (1)847-473-1957
Fax: (1)847-473-0144

J.S.T. (H.K.) Co. Ltd. (Hong Kong)
Tel: (852)24137979
Fax: (852)24111193

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

High-quality Sealed Miniature Basic Switch Conforming to IP67 (Lead wire type only)

- ROHS Compliant.
- Monoblock construction assures high sealing capability and is ideal for dusty places or where water is sprayed.
- A wide operating temperature range of -40°C to 85°C is ideal for any operating environment.
- Ideal for the automobile, agricultural machinery, automatic vending machine, refrigerator, ice-manufacturing, bath equipment, hot-water supply, air conditioner, and factory machine industries, which require highly environment-resistive capabilities.

Ordering Information

Model Number Legend

D2SW-□□□□
1 2 3 4

1. Ratings
01: 0.1 A
3: 3 A

2. Actuator
None: Pin plunger
L1: Hinge lever
L2: Hinge roller lever
L3: Simulated hinge lever

3. Contact Form
None: SPDT
-2: SPST-NC (Lead wire model only)
-3: SPST-NO (Lead wire model only)

4. Terminals
H: Solder terminal (HS for UL and CSA approval)
D: PCB terminal (DS for UL and CSA approval)
T: Quick-connect terminal (#110) (TS for UL and CSA approval)
M: With lead wire (MS for UL and CSA approval)

List of Models

Actuator		Model	
		3 A	0.1A
Pin plunger	Solder terminals	D2SW-3H	D2SW-01H
	Quick-connect terminals (#110)	D2SW-3T	D2SW-01T
	PCB terminals	D2SW-3D	D2SW-01D
	With lead wires	D2SW-3M	D2SW-01M
Hinge lever	Solder terminals	D2SW-3L1H	D2SW-01L1H
	Quick-connect terminals (#110)	D2SW-3L1T	D2SW-01L1T
	PCB terminals	D2SW-3L1D	D2SW-01L1D
	With lead wires	D2SW-3L1M	D2SW-01L1M
Simulated hinge lever	Solder terminals	D2SW-3L3H	D2SW-01L3H
	Quick-connect terminals (#110)	D2SW-3L3T	D2SW-01L3T
	PCB terminals	D2SW-3L3D	D2SW-01L3D
	With lead wires	D2SW-3L3M	D2SW-01L3M
Hinge roller lever	Solder terminals	D2SW-3L2H	D2SW-01L2H
	Quick-connect terminals (#110)	D2SW-3L2T	D2SW-01L2T
	PCB terminals	D2SW-3L2D	D2SW-01L2D
	With lead wires	D2SW-3L2M	D2SW-01L2M

Note: The standard lengths of the lead wires (AV0.5f) of models incorporating them are 30 cm.

Specifications

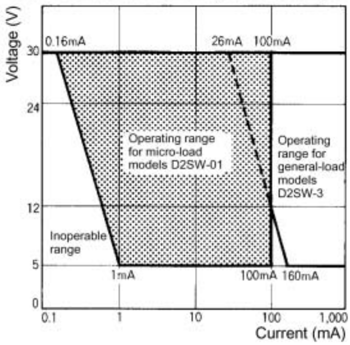
■ Ratings

Model	Rated voltage	Non-inductive load				Inductive load			
		Resistive load		Lamp load		Inductive load		Motor load	
		NC	NO	NC	NO	NC	NO	NC	NO
D2SW-3	125 VAC	3 A		1 A	0.5 A	1 A	0.5 A	1 A	0.5 A
	250 VAC	2 A		0.5 A	0.3 A	0.5 A	0.3 A	0.5 A	0.3 A
	30 VDC	3 A		1 A		1 A		1 A	
D2SW-01	125 VAC	0.1 A		---		---		---	
	30 VDC	0.1 A		---		---		---	

Note:
1. The above current ratings are the values of the steady-state current.
2. Inductive load has a power factor of 0.7 min. (AC) and a time constant of 7 ms max. (DC).
3. Lamp load has an inrush current of 10 times the steady-state current.
4. Motor load has an inrush current of 6 times the steady-state current.
5. The ratings values apply under the following test conditions:
   Ambient temperature: 20±2°C
   Ambient humidity: 65±5%
   Operating frequency: 30 operations/min

Model	D2SW-01	D2SW-3
Minimum applicable load	1 mA at 5 VDC	160 mA at 5 VDC

Use the Switch in the following operation range.



■ Characteristics

Item	D2SW-3	D2SW-01
Operating speed	0.1 mm to 1 m/s (at pin plunger models)	
Operating frequency	Mechanical: 300 operations/min Electrical: 60 operations/min	
Insulation resistance	100 MΩ min. (at 500 VDC)	
Contact resistance	30 mΩ max. (initial value) for terminal models	50 mΩ max. (initial value) for terminal models
	50 mΩ max. (initial value) for lead wire models	70 mΩ max. (initial value) for lead wire models
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between terminals of the same polarity 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal parts (see note 1)	600 VAC, 50/60 Hz for 1 min between terminals of the same polarity 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal parts (see note 1)
Vibration resistance (see note 2)	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude	
Shock resistance (see note 2)	Malfunction: 300 m/s^2 {approx. 30G} max.	
Life expectancy (see note 3)	Mechanical: 5,000,000 operations min. (OT value)	
	Electrical: 200,000 operations min. (3 A at 125 VAC), 100,000 operations min. (2 A at 250 VAC)	Electrical: 200,000 operations min.
Degree of protection	IP67 for lead wire models IP50 for terminal models	
Proof tracking index (PTI)	175	
Switch category (IEC335-1)	A (IEC335)	
Degree of protection against electric shock	Class 1	
Ambient temperature	Operating: –40°C to 85°C (with no icing)	
Ambient humidity	Operating: 95% max. (for 5°C to 35°C)	
Weight	Approx. 2 g (for a pin plunger model with terminal)	

Note:
1. The dielectric strength shown is for models with a Separator.
2. For the pin plunger models, the above values apply for use at the free position, operating position, and total travel position. For the lever models, they apply at the total travel position.
3. For testing conditions, contact your OMRON sales representative.

Approved Standards

UL1054 (File No. E41515)
CSA C22.2 No.55 (File No. LR21642)

Rated voltage	D2SW-3□	D2SW-01□
125 VAC 250 VAC	3 A 2 A	0.1 A ---
30 VDC	3 A	0.1 A

VDE/EN61058-1 (IEC601058-1) (File No. 85002)

Rated voltage	D2SW-01□H
125 VAC	0.1 A

Testing conditions: 5E4 (50,000 operations), T85 (0°C to 85°C)

Contact Specifications

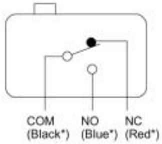
Item		D2SW-3	D2SW-01
Contact	Specification	Rivet	Crossbar
	Material	Silver	Gold alloy
	Gap (standard value)	0.5 mm	0.5 mm
Inrush current	NC	20 A max.	1 A max.
	NO	10 A max.	1 A max.

Separators (Insulation Sheet)

Applicable switch	Thickness (mm)	Model
SS, D2S, D2SW	0.18	Separator for SS0.18
	0.4	Separator for SS0.4

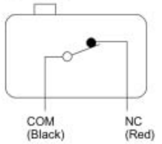
Contact Form

SPDT

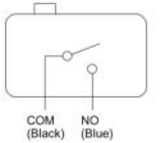


*Indicates the color of the lead wire.

SPST-NC



SPST-NO

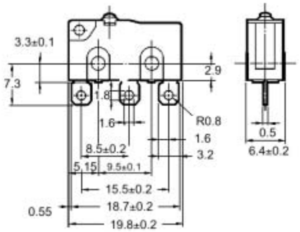


Microswitches

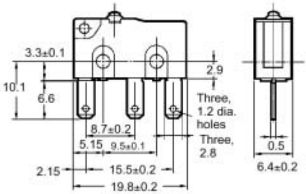
Dimensions

■ Terminals

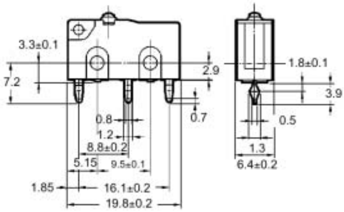
Solder Terminals (H)



Quick-connect Terminals (#110) (T)



PCB Terminals (D)



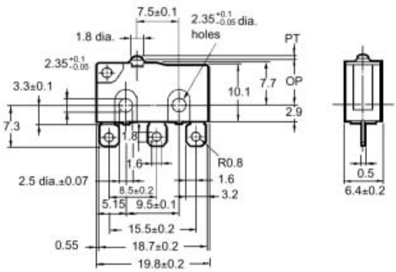
■ Dimensions and Operating Characteristics

Note:
1. All units are in millimeters unless otherwise indicated.
2. The following illustrations and dimensions are for models with soldered terminals. Refer to *Terminals* for models with quick-connect and PCB terminals (#110).
3. The dimensions not described are the same as those of models with pin plungers.
4. Unless otherwise specified, tolerance of ±0.4 mm applies to all dimensions.
5. The □ in the model number is for a terminal code such as H, T, D, or M.

Terminal Models

Pin Plunger

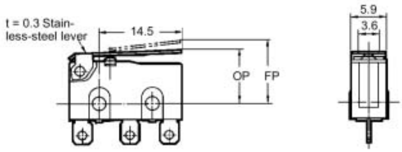
D2SW-3□
D2SW-01□



OF	1.77 N {180 gf}
RF min.	0.29 N {30 gf}
PT max.	0.6 mm
OT min.	0.5 mm
MD max.	0.1 mm
OP	8.4±0.3 mm

Hinge Lever

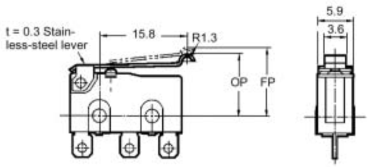
D2SW-3L1□
D2SW-01L1□



OF	0.59 N {60 gf}
RF min.	0.06 N {6 gf}
OT min.	1.0 mm
MD max.	0.8 mm
FP max.	13.6 mm
OP	8.8±0.8 mm

Simulated Hinge Lever

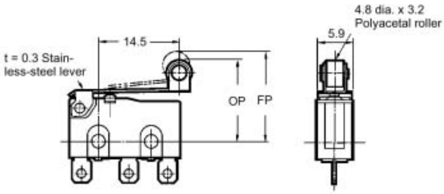
D2SW-3L3□
D2SW-01L3□



OF	0.59 N {60 gf}
RF min.	0.06 N {6 gf}
OT min.	1.0 mm
MD max.	0.8 mm
FP max.	15.5 mm
OP	10.7±0.8 mm

Hinge Roller Lever

D2SW-3L2□
D2SW-01L2□

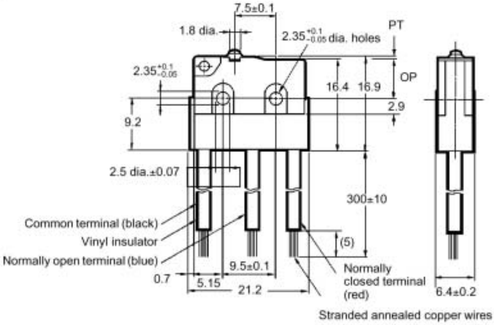


OF	0.59 N {60 gf}
RF min.	0.06 N {6 gf}
OT min.	1.0 mm
MD max.	0.8 mm
FP max.	19.3 mm
OP	14.5±0.8 mm

Lead Wire Model

Pin Plunger

D2SW-3M
D2SW-01M



OF max.	1.77 N {180 gf}
RF min.	0.29 N {30 gf}
PT max.	0.6 mm
OT min.	0.5 mm
MD max.	0.1 mm
OP	8.4±0.3 mm

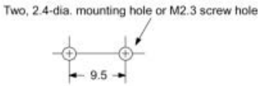
Precautions

■ Cautions

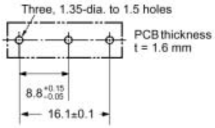
Mounting Dimensions

Use two M3 mounting screws with spring washers to mount the Switch. Tighten the screws to a torque of 0.23 to 0.26 N • m {2.3 to 2.7 kgf • cm}.

Mounting Holes



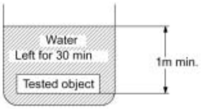
PCB Mounting



Degree of Protection

The D2SW was tested underwater and passed the following water-tightness tests, which however, does not mean that the D2SW can be used in the water.

IEC Publication 529, degree of protection IP67. Refer to the following illustration for the test method.

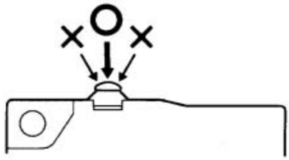


Protection Against Chemicals

Prevent the Switch from coming into contact with oil and chemicals. Otherwise, damage to or deterioration of Switch materials may result.

Operation

With the pin plunger models, set the Switch so that the plunger can be pushed in from directly above. Since the plunger is covered with a rubber cap, applying a force from lateral directions may cause damage to the plunger or reduction in the sealing capability.



Handling

Handle the Switch carefully so as not to break the sealing rubber of the plunger.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Sealed Basic Switch with Simplified Construction, Mounting Compatible with SS and D2SW Series.

- Sealing by using rubber packing means the switch can be used in dust-proof or in temporary water-proof environments (IEC IP67).
- Switch rating of 2A at 250 VAC possible with a single-leaf movable spring. Models for micro loads are also available.
- Solder, quick-connect terminals (#110), PCB terminals and molded lead wires are available. Even-pitched PCB terminals are also standardized.

Ordering Information

Model Number Legend

D2SW-P□□□□
1 2 3 4

1. Ratings

2: 2 A at 250 VAC
01: 0.1 A at 30 VAC

2. Actuator

None: Pin plunger
L1: Hinge lever
L2: Hinge roller lever
L3: Simulated roller lever

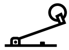
3. Contact Form

None: SPDT
-2: SPST-NC (Molded lead wire models only)
-3: SPST-NO (Molded lead wire models only)

4. Terminals

None: Solder terminals
T: Quick-connect terminals (#110)
D: PCB terminals (Uneven pitch)
B: PCB terminals (Even pitch)
M: Molded lead wires

■ List of Models

Rating	Actuator	Terminal	Solder terminals	Quick-connect terminals (#110)	PCB terminals: Uneven pitch	PCB terminals: Even pitch	Molded lead wires
2A	**Pin plunger**		D2SW-P2H	D2SW-P2T	D2SW-P2D	P2SW-P2B	D2SW-P2M
	Hinge lever		D2SW-P2L1H	D2SW-P2L1T	D2SW-P2L1D	D2SW-P2L1B	D2SW-P2L1M
	Hinge roller lever		D2SW-P2L2H	D2SW-P2L2T	D2SW-P2L2D	D2SW-P2L2B	D2SW-P2L2M
	Simulated roller lever		D2SW-P2L3H	D2SW-P2L3T	D2SW-P2L3D	D2SW-P2L3B	D2SW-P2L3M
0.1A	**Pin plunger**		D2SW-P01H	D2SW-P01T	D2SW-P01D	D2SW-P01B	D2SW-P01M
	Hinge lever		D2SW-P01L1H	D2SW-P01L1T	D2SW-P01L1D	D2SW-P01L1B	D2SW-P01L1M
	Hinge roller lever		D2SW-P01L2H	D2SW-P01L2T	D2SW-P01L2D	D2SW-P01L2B	D2SW-P01L2M
	Simulated roller lever		D2SW-P01L3H	D2SW-P01L3T	D2SW-P01L3D	D2SW-P01L3B	D2SW-P01L3M

Note: Consult your OMRON sales representative for details on SPST-NO and SPST-NC models.

Specifications

Model	Rated voltage	Resistive load
D2SW-P2	30 VDC	2 A
	250 VAC	
D2SW-P01	30 VDC	0.1 A
	125 VAC	

Note: The ratings values apply under the following test conditions.
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 20 operations/min

■ Characteristics

Item / Model	D2SW-P2	D2SW-P01
Operating speed	0.1 mm to 500 mm/s (pin plunger models)	
Operating frequency	Machanical:120 operations/min max. Electrical: 20 operations/min max.	
Insulation resistance	100 MΩ min. (at 500 VDC)	
Contact resistance (initial value)	Terminal models: 50 mΩ max. Molded lead wire models: 100 mΩ max.	Terminal models: 100 mΩ max. Molded lead wire models: 150 mΩ max.
Dielectric strength (see note 2)	1,000 VAC, 50/60 Hz for 1 min between terminals of the same polarities	600 VAC, 50/60 Hz for 1 min between terminals of the same polarities
	1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal parts	
Vibration resistance (see note 3)	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude	
Shock resistance (see note 3)	Destruction: 1,000 m/s^2 {approx. 100G} max. Malfunction: 300 m/s^2 {approx. 30G} max.	
Durability (see note 4)	Mechanical: 1,000,000 operations min. (60 operations/min.) Electrical: 50,000 operations min. (20 operations/min)	Mechanical: 1,000,000 operations min. (60 operations/min.) Electrical: 200,000 operations min. (20 operations/min.)
Degree of protection	IEC IP67 (see note 5) (excluding the terminals on terminal models)	
Degree of protection against electric shock	Class I	
Proof tracking index (PTI)	175	
Ambient operating temperature	-20°C to 70°C (at ambient humidity of 60% max.) (with no icing)	
Ambient operating humidity	85% max. (for 5°C to 35°C)	
Weight	Approx. 2 g (pin plunger models with terminals)	

Note: 1. The data given above are initial values.
2. The dielectric strength shown in the table indicates a value for models with a Separator.
3. For the pin plunger models, the above values apply for both the free position and total travel position. For the lever models, the values apply at the total travel position. Contact opening or closing time is within 1ms.
4. Consult your OMRON sales representative for testing conditions.
5. The test to meet standards checks for water intrusion after immersion for 30 minutes. The test does not check for switching operation underwater. Refer to **'Degree of Protection'** of **'Instructions for Correct Use'**.

■ Approved Standards

Consult your OMRON sales representative for specific models with standard approval.

UL1054 (File No. E41515) /CSA C22.2 No. 55 (UL approval)

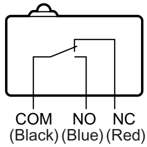
Model	Rated voltage	Resistive load
125 VAC **250 VAC**	**–** **2 A**	**0.1 A** **–**
30 VDC	**2 A**	**0.1 A**

■ Approved Standards

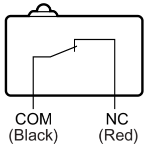
Item	Model	D2SW-P2	D2SW-P01
Contact	Specification	Rivet	Crossbar
	Material	Silver alloy	Gold alloy
	Gap (Standard value)	0.5 mm	
Minimum applicable load (see note)		160 mA at 5 VDC	1 mA at 5 VDC

■ Contact Form

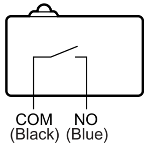
SPDT



SPST-NC (Molded lead wire models only)



SPST-NO (Molded lead wire models only)



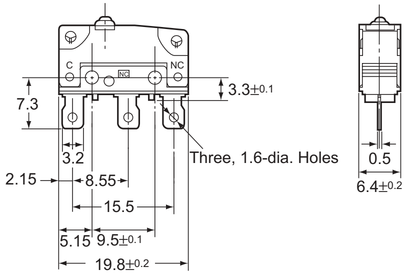
Note: Lead wire colors are indicated in parentheses.

Dimensions

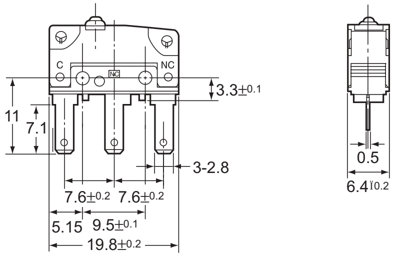
■ Terminals

Note: 1. All units are in millimeters unless otherwise indicated.
2.Terminal plate thickness is 0.5 mm for all models.

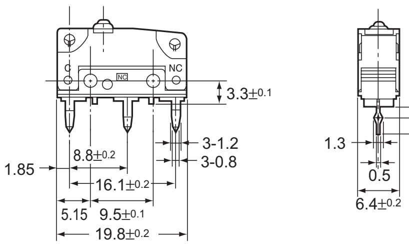
Solder Terminals



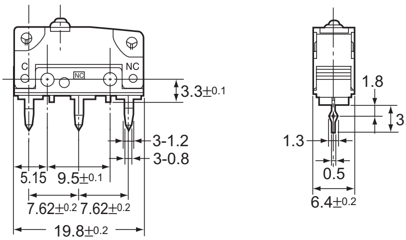
Quick-connect Terminals (#110)



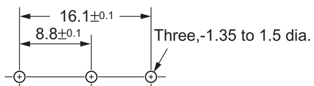
PCB Terminals (Uneven pitch)



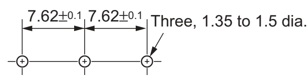
PCB Terminals (Even pitch)



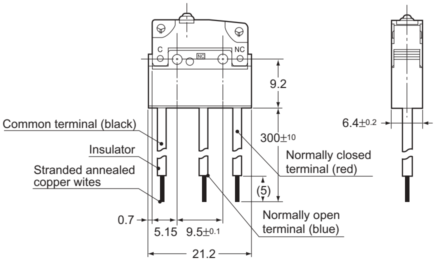
PCB Mounting Dimensions (Reference)



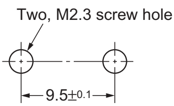
PCB Mounting Dimensions (Reference)



Moulded Lead wires



■ Mounting Holes



Microswitches

■ Dimensions and Operating Characteristics

Note: 1. All units are in millimeters unless otherwise indicated.

2. The following illustrations and drawings are for solder terminal models. Refer to page ??? for details on models with quick-connect terminals (#110) or PCB terminals or molded lead wires.

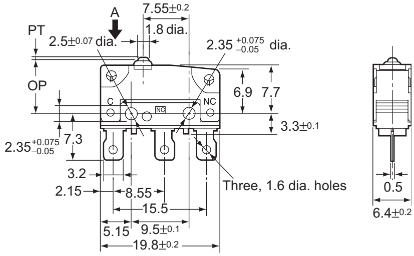
3. The □ in the model number is for the contact form code or the terminal code.

4. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

5. The operating characteristics are for operation in the A direction (⬇)

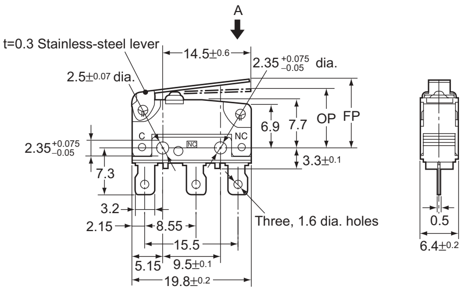
Pin Plunger Models
D2SW-P2□□
D2SW-P01□□

Item	D2SW-P2□□	D2SW-P01□□
OF max. **RF min.**	1.8 N {183 gf} 0.2 N {20 gf}	
PT max. **OT min.** **MD max.**	0.6 mm 0.4 mm 0.15 mm	
OP	8.4±0.3 mm	

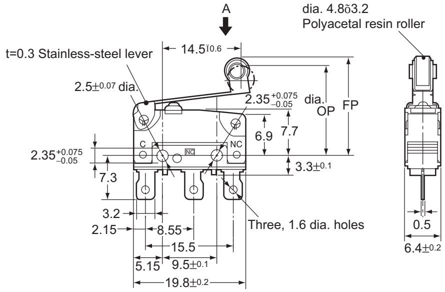


Hinge Lever Models
D2SW-P2L1□□
D2SW-P01L1□□

Item	D2SW-P2L1□□	D2SW-P01L1□□
OF max. **RF min.**	0.6 N {61 gf} 0.05 N {5 gf}	
OT min. **MD max.**	0.8 mm 0.8 mm	
FP max. **OP**	13.6 mm 8.8±0.8 mm	

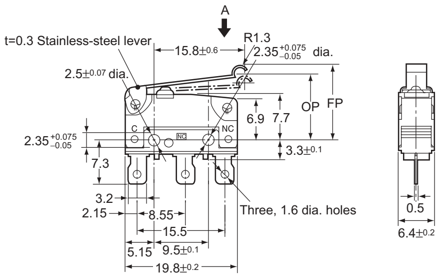


Hinge Roller Lever Models
D2SW-P2L2□□
D2SW-P01L2□□



Item	D2SW-P2L1□□	D2SW-P01L1□□
OF max. **RF min.**	0.6 N {61 gf} 0.05 N {5 gf}	
OT min. **MD max.**	0.8 mm 0.8 mm	
FP max. **OP**	19.3 mm 14.5±0.8 mm	

Simulated Roller Lever Models
D2SW-P2L3□□
D2SW-P01L3□□



Item	D2SW-P2L3□□	D2SW-P01L3□□
OF max. **RF min.**	0.6 N {61 gf} 0.05 N {5 gf}	
OT min. **MD max.**	0.8 mm 0.8 mm	
FP max. **OP**	15.5 mm 10.7±0.8 mm	

Microswitches

Precautions

■ Cautions

DEGREE OF PROTECTION

Do not use this product in water. Although this models satisfy the test conditions for the standard given below, this test is to check the ingress of water into the switch enclosure after submerging the Switch in water for a given time. Satisfying this test condition does not mean that the Switch can be used in water.

IEC 60529: 2001 Degrees of protection provided by enclosures (IP Code)

Code: IP67 (The test to meet the standard checks for water intrusion after immersion for 30 minutes.)

Do not operate the Switch when it is exposed to water spray, or when water drops adhere to the Switch surface, or during sudden temperature changes, otherwise water may intrude into the interior of the Switch due to a suction effect.

Prevent the Switch from coming into contact with oil and chemicals. Otherwise, damage to or deterioration of Switch materials may result.

Do not use the Switch in areas where it is exposed to silicon adhesives, oil, or grease, otherwise faulty contact may result due to the generation of silicon oxide.

The environment-resistant performance of the switch differs depending on operating loads, ambient atmospheres, and installation conditions, etc. Please perform an operating test of the switch in advance under actual usage conditions.

CONNECTING TO TERMINALS

Connecting to Solder Terminals

When soldering the lead wire to the terminal, first insert the lead wire conductor through the terminal hole and the conduct soldering.

Make sure that the temperature at the tip of the soldering iron is 350 to 400°C. Do not take more than 3 seconds to solder the switch terminal, and do not impose external force on the terminal for 1 min after soldering. Improper soldering involving an excessively high temperature or excessive soldering time may deteriorate the characteristics of the Switch.

Connecting to Quick-connect Terminals

Wire the quick-connect terminals (#110) with receptacles. Insert the terminals straight into the receptacles. Do not impose excessive force on the terminal in the horizontal direction, otherwise the terminal may be deformed or the housing may be damaged.

Connecting to PCB Terminal Boards

When using automatic soldering baths, we recommend soldering at 260±5°C within 5 seconds. Make sure that the liquid surface of the solder does not flow over the edge of the board.

When soldering by hand, as a guideline, solder with a soldering iron with a tip temperature of 350 to 400°C within 3 seconds, and do not apply any external force for at least 1 minutes after soldering. When applying solder, keep the solder away from the case of the Switch and do not allow solder or flux to enter the case.

SIDE-ACTUATED (CAM/DOG) OPERATION

When using a cam or dog to operate the Switch, factors such as the operating speed, operating frequency, push-button indentation, and material and shape of the cam or dog will affect the durability of the Switch. Confirm performance specifications under actual operation conditions before using the Switch in applications.

■ Correct Use

MOUNTING

Turn OFF the power supply before mounting or removing the Switch, wiring, or performing maintenance or inspection. Failure to do so may result in electric shock or burning.

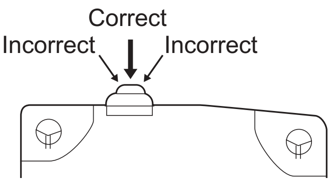
Use M2.3 mounting screws with plane washers or spring washers to securely mount the Switch. Tighten the screws to a torque of 0.23 to 0.26 N·m {2.3 to 2.7 kgf·cm}. Exceeding the specified torgue may result in deterioration of the sealing or damage.

Mount the Switch onto a flat surface. Mounting on an uneven surface may cause deformation of the Switch, resulting in faulty operation or damage.

OPERATING BODY

Use an operating body with low frictional resistance and of a shape that will not interfere with the sealing rubber, otherwise the plunger may be damaged or the sealing may deteriorate.

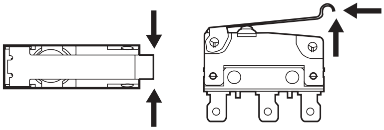
With the pin plunger models, set the Switch so that the plunger can be pushed in from directly above. Since the plunger is covered with a rubber cap, applying a force from lateral directions may cause damage to the plunger or reduction in the sealing capability.



HANDLING

Do not handle the Switch in a way that may cause damage to the sealing rubber.

When handling the Switch, ensure that uneven pressure or, as shown in the following diagram, pressure in a direction other than the operating direction is not applied to the Actuator, otherwise the Actuator or Switch may be damaged, or durability may be decreased.



WIRING MOLDED LEAD WIRE MODELS

When wiring molded lead wire models, ensure that there is no weight on the wire or that there are no sharp bends near the parts where the wire is drawn out. Otherwise, damage to the Switch or deterioration in the sealing may result.

OPERATING STROKE SETTING

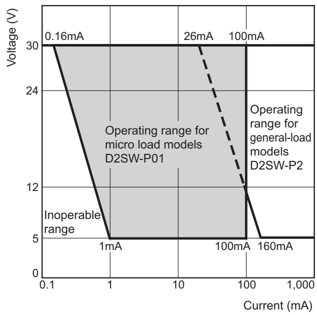
Set the operating stroke so that the actuator is completely disengaged when the switch is in the free position (FP), and is pushed to a point between 60% and 90% of the OT distance after the switch is operated.

Insufficient or excessive pushing of the actuator may result in decreased switch durability or damage to the switch.

USING MICRO LOADS

Using a model for ordinary loads to open or close the contact of a micro load circuit may result in a faulty contact. Use models that operate in the following range. However, even when using micro load models within the operating range shown below, if inrush current occurs when the contact is opened or closed, it may increase contact wear and so decrease durability. Therefore, insert a contact protection circuit where necessary. The minimum applicable load is the N-level reference value. This value indicates the malfunction reference level for the reliability level of 60% (l60).

The equation, $\lambda 60 = 0.5 \times 10^{-6}$/operations indicates that the estimated malfunction rate is less than 1/2,000,000 operations with a reliability level of 60%.



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

High-quality, High-precision Miniature Switch Conforms to IP67(Lead wire type only)

- ROHS Compliant.
- Monoblock construction made from single-liquid epoxy resin assures high sealing capability.
- V-model internal mechanism assures high operating-position accuracy and long life.
- A wide operating temperature range of -40°C to 90°C is ideal for any operating environment.
- General-load (5A at 250VAC) models and Micro-load models are available.
- Conforms to EN61058-1.

Ordering Information

Model Number Legend

D2VW-□□-□□

1 2 3 4

1. **Ratings**
   5: 5 A
   01: 0.1 A
2. **Actuator**
   None: Pin plunger
   L1A: Short hinge lever
   L1: Hinge lever
   L1B: Long hinge lever
   L3: Simulated hinge lever
   L2A: Short hinge roller lever
   L2: Hinge roller lever
3. **Contact Form**
   1: SPDT
   2: SPST-NC
   3: SPST-NO
4. **Terminal**
   None: Solder/Quick-connect terminals (#187)
   Note: HS for UL and CSA approval.
   M: Lead wire
   Note: MS for UL and CSA approval.

List of Models

Actuator		Model	
		0.1 A	5 A
Pin plunger	Solder and quick-connect terminals (#187)	D2VW-01-1	D2VW-5-1
	Lead wire	D2VW-01-1M	D2VW-5-1M
Short hinge lever	Solder and quick-connect terminals (#187)	D2VW-01L1A-1	D2VW-5L1A-1
	Lead wire	D2VW-01L1A-1M	D2VW-5L1A-1M
Hinge Lever	Solder and quick-connect terminals (#187)	D2VW-01L1-1	D2VW-5L1-1
	Lead wire	D2VW-01L1-1M	D2VW-5L1-1M
Long hinge lever	Solder and quick-connect terminals (#187)	D2VW-01L1B-1	D2VW-5L1B-1
	Lead wire	D2VW-01L1B-1M	D2VW-5L1B-1M
Simulated hinge lever	Solder and quick-connect terminals (#187)	D2VW-01L3-1	D2VW-5L3-1
	Lead wire	D2VW-01L3-1M	D2VW-5L3-1M
Short hinge roller lever	Solder and quick-connect terminals (#187)	D2VW-01L2A-1	D2VW-5L2A-1
	Lead wire	D2VW-01L2A-1M	D2VW-5L2A-1M
Hinge roller lever	Solder and quick-connect terminals (#187)	D2VW-01L2-1	D2VW-5L2-1
	Lead wire	D2VW-01L2-1M	D2VW-5L2-1M

Note: The standard lengths of the lead wires (AV0.75f) of models incorporating them are 30 cm.

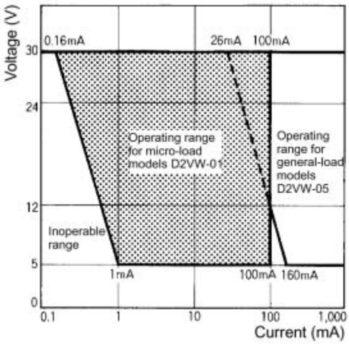
Specifications

■ Ratings

Model	Rated voltage	Non-inductive load				Inductive laod	
		Resistive load		Lamp load		Inductive load	
		NC	NO	NC	NO	NC	NO
D2VW-5	125 VAC	5 A		0.5 A		4 A	
	250 VAC	5 A		0.5 A		4 A	
	30 VDC	5 A		3 A		4 A	
	125 VDC	0.4 A		0.1 A		0.4 A	
D2VW-01	125 VAC	0.1 A		---		---	
	30 VDC	0.1 A		---		---	

Note:
1. The above current ratings are the values of the steady-state current.
2. Inductive load has a power factor of 0.7 min. (AC) and a time constant of 7 ms max. (DC).
3. Lamp load has an inrush current of 10 times the steady-state current.
4. The ratings values apply under the following test conditions:
   Ambient temperature: 20±2°C
   Ambient humidity: 65±5%
   Operating frequency: 30 operations/min

Use the Switch in the following operating range.



Model	D2VW-01	D2VW-5
Minimum applicable load	1 mA at 5 VDC	160 mA at 5 VDC

Microswitches

■ Characteristics

Operating speed	0.1 mm to 1 m/s (at pin plunger models)
Operating frequency	Mechanical: 300 operations/min Electrical: 60 operations/min
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance (initial value)	50 mΩ max. (100 mΩ max. for lead wire model)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between terminals of same polarity 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground (see note 1) 1,500 VAC, 50/60 Hz for 1 min between each terminal and non-current-carrying metal parts
Vibration resistance (see note 2)	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance (see note 2)	Malfunction: 300 m/s^2 {approx. 30G} max.
Life expectancy (see note 3)	Mechanical: 10,000,000 operations min. Electrical: 100,000 operations min. (1,000,000 operations min. for D2VW-01 models)
Degree of protection	IP67 for lead wire model IP50 for terminal model
Degree of protection against electric shock	Class I
Proof tracking index (PTI)	175
Ambient temperature	Operating: –40°C to 90°C (with no icing) (see note 4)
Ambient humidity	Operating: 95% max. (for 5°C to 35°C)
Weight	Approx. 7 g (terminal type pin plunger models)

Note: 1. The dielectric strength shown in the table indicates the value for models with a Separator.
2. For the pin plunger models, the above values apply for use at both the free position and total travel position. For the lever models, they apply at the total travel position.
3. For testing conditions, consult your OMRON sales representative.
4. The operating temperature of the lead wire (AV0.75f) for the lead wire model is between –40°C to 85°C.

■ Approved Standards

UL1054 (File No. E41515)
CSA C22.2 No.55 (File No. LR21642)

Rated voltage	D2VW-5 Models	D2VW-01 Models
125 VAC 250 VAC	3 A 3 A	0.1 A ---
30 VDC	---	0.1 A

VDE/EN61058-1 (IEC61058-1) (File No. 104068)

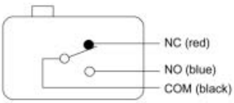
Rated voltage	D2VW-5 Models	D2VW-01 Models
125 VAC 250 VAC	--- 3 A	0.1 A ---

■ Contact Specifications

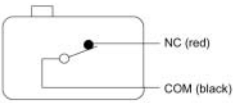
Item		D2VW-5	D2VW-01
Contact	Specification	Rivet	Crossbar
	Material	Silver alloy	Gold alloy
	Gap (standard value)	0.5 mm	
Inrush current	NC	15 A max.	---
	NO	15 A max.	---

■ Contact Form

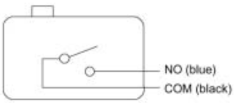
SPDT



SPST-NC



SPST-NO



Note: Colors in parentheses indicate lead wire colors.

Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

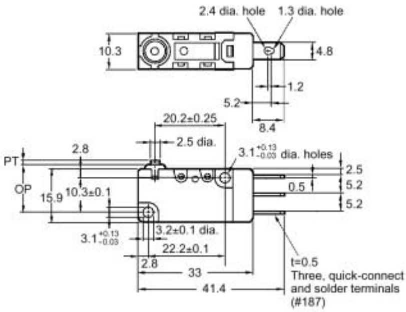
■ Terminal Models

The pin plunger model is shown here as a typical example. Operating characteristics and dimensions of the actuator section are the same as for the lead wire models.

■ Dimensions and Operating Characteristics

Pin Plunger

D2VW-01-1
D2VW-5-1

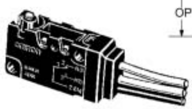


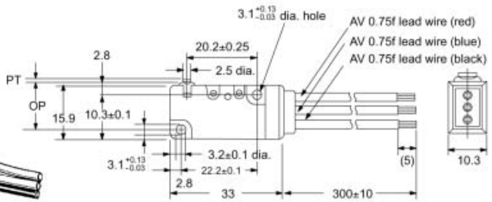
OF max.	1.96 N {200 gf}
RF min.	0.29 N {30 gf}
PT max.	1.2 mm
OT min.	1.0 mm
MD max.	0.4 mm
OP	14.7±0.4 mm

■ Lead Wire Models

Pin Plunger

D2VW-01-1M
D2VW-5-1M

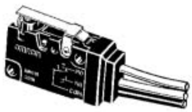


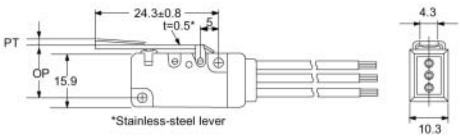


OF max.	1.96 N {200 gf}
RF min.	0.29 N {30 gf}
PT max.	1.2 mm
OT min.	1.0 mm
MD max.	0.4 mm
OP	14.7±0.4 mm

Short Hinge Lever

D2VW-01L1A-1M
D2VW-5L1A-1M

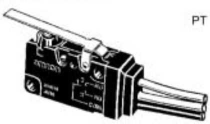


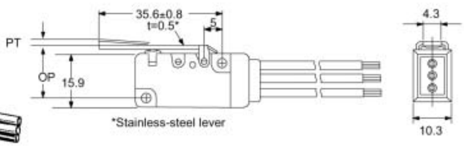


OF max.	1.96 N {200 gf}
RF min.	0.20 N {20 gf}
PT max.	1.6 mm
OT min.	0.8 mm
MD max.	0.5 mm
OP	15.2±0.5 mm

Hinge Lever

D2VW-01L1-1M
D2VW-5L1-1M

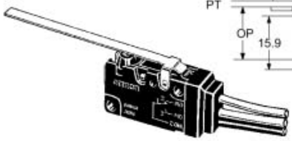


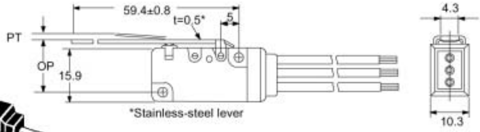


OF max.	1.18 N {120 gf}
RF min.	0.15 N {15 gf}
PT max.	4.0 mm
OT min.	1.6 mm
MD max.	0.8 mm
OP	15.2±1.2 mm

Long Hinge Lever

D2VW-01L1B-1M
D2VW-5L1B-1M



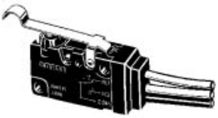


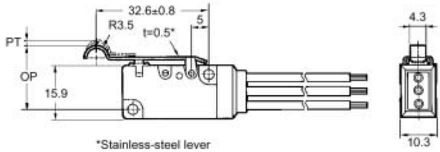
*Stainless-steel lever

OF max.	0.59 N {60 gf}
RF min.	0.05 N {5 gf}
PT max.	9.0 mm
OT min.	3.2 mm
MD max.	2.0 mm
OP	15.2±2.6 mm

Simulated Hinge Lever

D2VW-01L3-1M
D2VW-5L3-1M



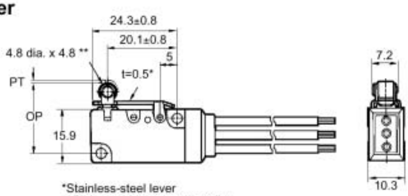


*Stainless-steel lever

OF max.	1.18 N {120 gf}
RF min.	0.15 N {15 gf}
PT max.	4.0 mm
OT min.	1.6 mm
MD max.	0.8 mm
OP	18.7±1.2 mm

Short Hinge Roller Lever

D2VW-01L2A-1M
D2VW-5L2A-1M

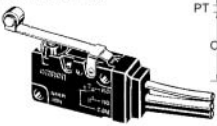


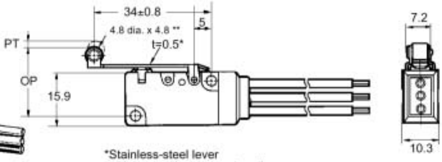
*Stainless-steel lever
**Oil-less polyacetar resin roller

OF max.	2.25 N {230 gf}
RF min.	0.20 N {20 gf}
PT max.	1.6 mm
OT min.	0.8 mm
MD max.	0.5 mm
OP	20.7±0.6 mm

Hinge Roller Lever

D2VW-01L2-1M
D2VW-5L2-1M





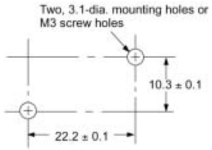
*Stainless-steel lever
**Oil-less polyacetar resin roller

OF max.	1.18 N {120 gf}
RF min.	0.15 N {15 gf}
PT max.	4.0 mm
OT min.	1.6 mm
MD max.	0.8 mm
OP	20.7±1.2 mm

Precautions

Mounting Dimensions

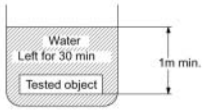
Use two M3 mounting screws with spring washers to mount the switch. Tighten the screws to a torque of 0.39 to 0.59 N • m {4 to 6 kgf • cm}.



Degree of Protection

The D2VW was tested under water and passed the following water-tightness tests, which however, does not mean that the D2VW can be used in the water.

IEC Publication 529, class IP67. Refer to the following illustration for the test method at OMRON.

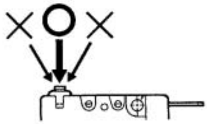


Protection Against Chemicals

Prevent the Switch from coming into contact with oil and chemicals. Otherwise, damage to or deterioration of Switch materials may result.

Operation

With the pin plunger models, set the Switch so that the plunger can be pushed in from directly above. Since the plunger is covered with a rubber cap, applying a force from lateral directions may cause damage to the plunger or reduction in the sealing capability.



Handling

Handle the Switch carefully so as not to break the sealing rubber of the plunger.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Ultra-small and Highly Sealed

- ROHS Compliant.
- Degree of protection for the lead wire models conforms to IEC IP67. (Lead wire type only).
- Wide range of operating temperature from -40°C to 85°C .
- Gold crossbar contact and coil spring offer long life expectancy and high contact reliability.

Ordering Information

Model Number Legend

D2JW-01□-□
1 2 3

1. **Ratings**
   - 01: 0.1 A, 30 VDC
2. **Actuator**
   - 1: Pin plunger
   - K1A1: Short hinge lever
   - K11: Hinge lever
   - K31: Simulated hinge lever
   - K21: Hinge roller lever
3. **Terminal**
   - None: Solder terminal
   - MD: Molded lead wire terminal

List of Models

Actuator	Model	
	Solder	Molded lead wire
Pin plunger	D2JW-011	D2JW-011-MD
Short hinge lever	D2JW-01K1A1	D2JW-01K1A1-MD
Hinge lever	D2JW-01K11	D2JW-01K11-MD
Simulated hinge lever	D2JW-01K31	D2JW-01K31-MD
Hinge roller lever	D2JW-01K21	D2JW-01K21-MD

Note: The standard lengths of the lead wires (AVS0.3f) of models incorporating them are 30 cm.

Specifications

■ Ratings

Electrical ratings	0.1 A at 30 VDC (resistive load)

The ratings values apply under the following test conditions:

Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 30 operations/min

Minimum applicable load	1 mA at 5 VDC

■ Characteristics

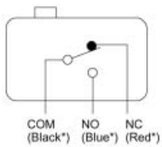
Operating speed	1 mm to 250 mm/s (see note 1)
Operating frequency	Mechanical: 240 operations/min Electrical: 30 operations/min
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance (initial value)	100 mΩ max. (molded lead wire models: 140 mΩ max.)
Dielectric strength	600 VAC, 50/60 Hz for 1 min between terminals of the same polarity 1,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground (see note 2), and between each terminal and non-current-carrying metal parts
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude (see note 3)
Shock resistance	Destruction: 1,000 m/s^2 {approx. 100G} max. Malfunction: 200 m/s^2 {approx. 20G} max. (see note 3)
Life expectancy	Mechanical: 1,000,000 operations min. Electrical: 100,000 operations min.
Degree of protection	IP67 for molded lead wire terminal models IP50 for solder terminal models
Degree of protection against electric shock	Class I
Proof tracking index (PTI)	175
Ambient temperature	Operating: −40°C to 85°C (with no icing or condensation)
Ambient humidity	Operating: 35% to 98%
Weight	Approx. 7 g (molded lead wire models, pin plunger models)

Note: 1. The operating speed value shown is for pin plunger models. (For different models, contact your OMRON representative.)
2. The dielectric strength values shown apply for use with Separator (terminal type).
3. The values shown apply for malfunctions of 1 ms max.

■ Contact Specifications

Contact	Specification	Crossbar
	Material	Gold alloy
	Gap (standard value)	0.5 mm
Inrush current	NC	0.1 A max.
	NO	0.1 A max.

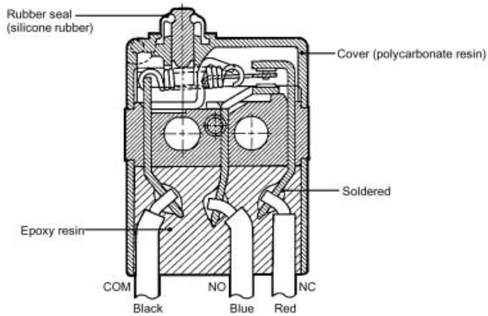
■ Contact Form (SPDT)



*Indicates the color of the lead wire.

Microswitches

Nomenclature



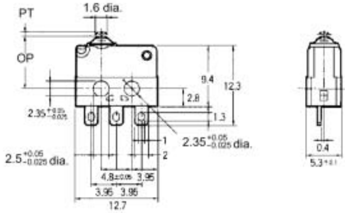
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
3. Actuators of the molded lead wire terminals are omitted here. The dimensions (other than the terminals) and operating characteristics of the molded lead wire terminals are the same as those for the solder terminals.

■ Dimensions and Operating Characteristics

Pin Plunger

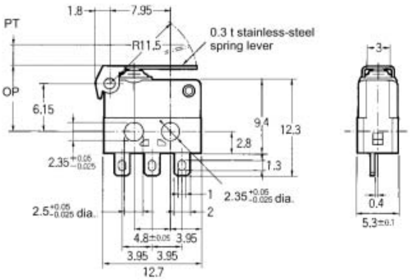
D2JW-011



OF max.	2.45 N {250 gf}
RF min.	0.98 N {100 gf}
PT max.	0.6 mm
OT min.	0.3 mm
MD max.	0.1 mm
OP	8.1±0.3 mm

Short Hinge Lever

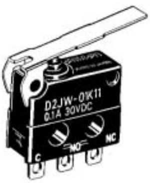
D2JW-01K1A1

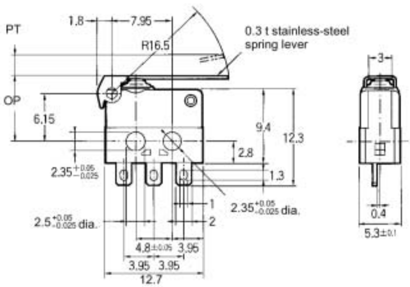


OF max.	1.15 N {117 gf}
RF min.	0.23 N {23 gf}
PT max.	5.4 mm
OT min.	0.7 mm
MD max.	0.5 mm
OP	8.4±0.8 mm

Hinge Lever

D2JW-01K11

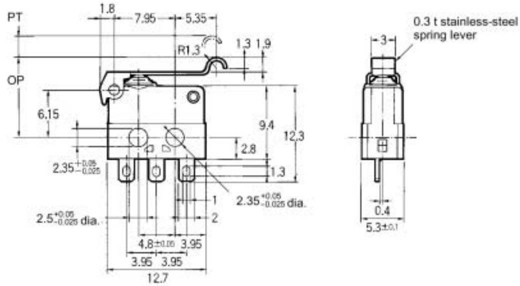




OF max.	0.80 N {82 gf}
RF min.	0.15 N {16 gf}
PT max.	6.4 mm
OT min.	1.4 mm
MD max.	0.7 mm
OP	8.4±0.8 mm

Simulated Hinge Lever

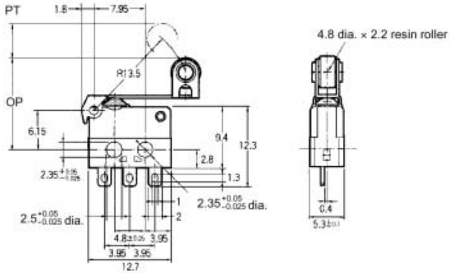
D2JW-01K31



OF max.	0.95 N {97 gf}
RF min.	0.19 N {20 gf}
PT max.	5.5 mm
OT min.	1.1 mm
MD max.	0.6 mm
OP	10.3±0.8 mm

Hinge Roller Lever

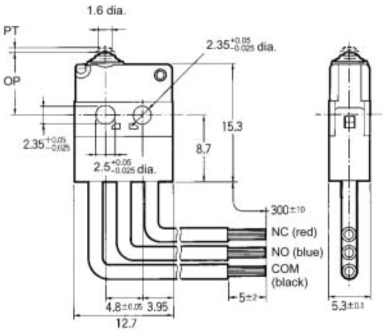
D2JW-01K21



OF max.	0.98 N {100 gf}
RF min.	0.19 N {20 gf}
PT max.	5.2 mm
OT min.	1.1 mm
MD max.	0.5 mm
OP	14.6±0.8 mm

Molded Lead Wire

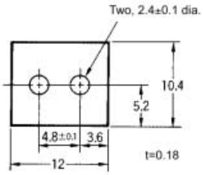
D2JW-01□□□-MD



Note: Letters and numbers are inserted in □ by the actuator.

■ Separator (Order Separately)

Model	Separator for D2JW



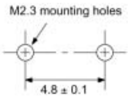
Precautions

■ Cautions

Mounting Dimensions

Use M2.3 mounting screws with plain or spring washers to mount the Switch. Tighten the screws to a torque of 0.20 to 0.29 N • m {2 to 3 kgf • cm}.

Mounting Holes



Terminal Connection

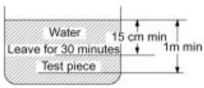
To solder the lead to the terminal, apply a soldering iron rated at 30 W max. (temperature of soldering iron: 250°C max.) within 3 seconds.

If soldering is not carried out under the proper conditions there is a danger of over-heating and subsequent heat damage. Applying a soldering iron for too long a time or using one that is rated at more than 30 W may degrade the Switch characteristics.

Degree of Protection

The D2JW satisfies the following test condition specified by the IEC Publication 529:

Degree of protection: IP67
Test method:See the figure below.



Note: Temperature difference between the test piece and water must be 5°C or more.

Leave the test piece in water for 30 min with the top of the test piece submerged 15 cm or more below the water level and the bottom of the test piece submerged 1 m or more below the water level.

This test is to check the ingress of water into the switch enclosure after submerging the switch in water for a given time. Even if this test condition is met, the switch cannot be used in water.

Protection Against Chemicals

Prevent the Switch from coming into contact with oil and chemicals. Otherwise, damage to or deterioration of Switch materials may result.

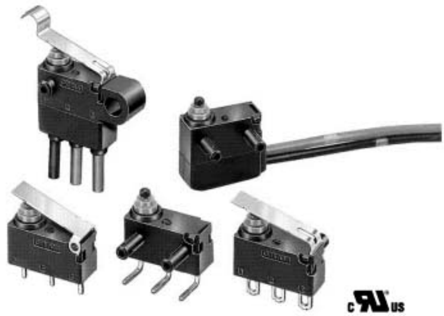
Separator

When mounting the Switch on a metallic surface, be sure to use a Separator between the Switch and the mounting plate.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Smallest sealed snap-action switch in the industry with a very long stroke for reliable ON/OFF action

- ROHS Compliant.
- The case dimensions are 78% of conventional models, contributing to down-sizing of mechanical modules.
- Extra-long stroke even without levers, (OT: 1.4mm)



Ordering Information

■ Model Number Legend:

D2HW-□□□□□
1 2 3 4 5

1. Mounting Structure
- A: Without posts (base-mounting)
- BR: Posts on right
- BL: Posts on left
- C: M3-screw mounting

2. Ratings
- 2: 1 mA at 5 VDC to 2 A at 12 VDC

3. Actuator
- 0: Pin plunger
- 1: Hinge lever
- 2: Long hinge lever
- 3: Simulated roller hinge lever
- 4: Hinge roller lever
- 6: Leaf lever
- 7: Simulated roller leaf lever
- 8: Long leaf lever

4. Contacts
- 1: SPDT
- 2: SPST-NC (Molded lead wire models only.)
- 3: SPST-NO (Molded lead wire models only.)

5. Terminals
- D: Straight PCB terminals
- DR: Right-angled PCB terminals
- DL: Left-angled PCB terminals
- H: Solder terminals
- M: Molded lead wires downwards
- MR: Molded lead wires on right-side
- ML: Molded lead wires on left-side

Note Add “S” to the end of the model number for the UL/CSA-approved version.

List of Models

PCB-mounted Models

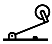
Actuator	Terminals		Contact form	Model		
				With posts on right	With posts on left	Without posts
Pin plunger	For PCB	Straight	SPDT	---	---	D2HW-A201D
		Angled		D2HW-BR201DR	D2HW-BL201DL	---
Hinge lever		Straight		---	---	D2HW-A211D
		Angled		D2HW-BR211DR	D2HW–BL211DL	---
Long hinge lever		Straight		---	---	D2HW-A221D
		Angled		D2HW-BR221DR	D2HW-BL221DL	---
Simulated roller hinge lever		Straight		---	---	D2HW-A231D
		Angled		D2HW-BR231DR	D2HW-BL231DL	---

Note Add "S" to the end of the model number for the UL/CSA-approved version. Consult your OMRON representative for details.

Models with Solder Terminals or Molded Lead Wires

Actuator	Terminals		Contact form	Model		
				With posts on right	With posts on left	M3-screw mounting
Pin plunger	Solder		SPDT	D2HW-BR201H	D2HW-BL201H	D2HW-C201H
	Molded lead wires	Downwards	SPDT	D2HW-BR201M	D2HW-BL201M	D2HW-C201M
			SPST-NC	D2HW-BR202M	D2HW-BL202M	D2HW-C202M
			SPST-NO	D2HW-BR203M	D2HW-BL203M	D2HW-C203M
		Right-side	SPST-NC	D2HW-BR202MR	D2HW-BL202MR	D2HW-C202MR
			SPST-NO	D2HW-BR203MR	D2HW-BL203MR	D2HW-C203MR
		Left-side	SPST-NC	D2HW-BR202ML	D2HW-BL202ML	---
			SPST-NO	D2HW-BR203ML	D2HW-BL203ML	---
Hinge lever	Solder		SPDT	D2HW-BR211H	D2HW-BL211H	D2HW-C211H
	Molded lead wires	Downwards	SPDT	D2HW-BR211M	D2HW-BL211M	D2HW-C211M
			SPST-NC	D2HW-BR212M	D2HW-BL212M	D2HW-C212M
			SPST-NO	D2HW-BR213M	D2HW-BL213M	D2HW-C213M
		Right-side	SPST-NC	D2HW-BR212MR	D2HW-BL212MR	D2HW-C212MR
			SPST-NO	D2HW-BR213MR	D2HW-BL213MR	D2HW-C213MR
		Left-side	SPST-NC	D2HW-BR212ML	D2HW-BL212ML	---
			SPST-NO	D2HW-BR213ML	D2HW-BL213ML	---
Long hinge lever	Solder		SPDT	D2HW-BR221H	D2HW-BL221H	D2HW-C221H
	Molded lead wires	Downwards	SPDT	D2HW-BR221M	D2HW-BL221M	D2HW-C221M
			SPST-NC	D2HW-BR222M	D2HW-BL222M	D2HW-C222M
			SPST-NO	D2HW-BR223M	D2HW-BL223M	D2HW-C223M
		Right-side	SPST-NC	D2HW-BR222MR	D2HW-BL222MR	D2HW-C222MR
			SPST-NO	D2HW-BR223MR	D2HW-BL223MR	D2HW-C223MR
		Left-side	SPST-NC	D2HW-BR222ML	D2HW-BL222ML	---
			SPST-NO	D2HW-BR223ML	D2HW-BL223ML	---

Note: 1. The length of standard lead wires (AVSS0.5) for molded lead wire models is 30 cm.
2. Add "S" to the end of the model number for the UL/CSA-approved version. Consult your OMRON representative for details.

Actuator	Terminals		Contact form	Model		
				With posts on right 	With posts on left 	M3-screw mounting 
Simulated roller hinge lever 	Solder		SPDT	D2HW-BR231H	D2HW-BL231H	D2HW-C231H
	Molded lead wires	Downwards	SPDT	D2HW-BR231M	D2HW-BL231M	D2HW-C231M
			SPST-NC	D2HW-BR232M	D2HW-BL232M	D2HW-C232M
			SPST-NO	D2HW-BR233M	D2HW-BL233M	D2HW-C233M
		Right-side	SPST-NC	D2HW-BR232MR	D2HW-BL232MR	D2HW-C232MR
			SPST-NO	D2HW-BR233MR	D2HW-BL233MR	D2HW-C233MR
		Left-side	SPST-NC	D2HW-BR232ML	D2HW-BL232ML	---
			SPST-NO	D2HW-BR233ML	D2HW-BL233ML	---
Hinge roller lever 	Solder		SPDT	D2HW-BR241H	D2HW-BL241H	D2HW-C241H
	Molded lead wires	Downwards	SPDT	D2HW-BR241M	D2HW-BL241M	D2HW-C241M
			SPST-NC	D2HW-BR242M	D2HW-BL242M	D2HW-C242M
			SPST-NO	D2HW-BR243M	D2HW-BL243M	D2HW-C243M
		Right-side	SPST-NC	D2HW-BR242MR	D2HW-BL242MR	D2HW-C242MR
			SPST-NO	D2HW-BR243MR	D2HW-BL243MR	D2HW-C243MR
		Left-side	SPST-NC	D2HW-BR242ML	D2HW-BL242ML	---
			SPST-NO	D2HW-BR243ML	D2HW-BL243ML	---
Leaf lever 	Solder		SPDT	D2HW-BR261H	D2HW-BL261H	D2HW-C261H
	Molded lead wires	Downwards	SPDT	D2HW-BR261M	D2HW-BL261M	D2HW-C261M
			SPST-NC	D2HW-BR262M	D2HW-BL262M	D2HW-C262M
			SPST-NO	D2HW-BR263M	D2HW-BL263M	D2HW-C263M
		Right-side	SPST-NC	D2HW-BR262MR	D2HW-BL262MR	D2HW-C262MR
			SPST-NO	D2HW-BR263MR	D2HW-BL263MR	D2HW-C263MR
		Left-side	SPST-NC	D2HW-BR262ML	D2HW-BL262ML	---
			SPST-NO	D2HW-BR263ML	D2HW-BL263ML	---
Simulated roller leaf lever 	Solder		SPDT	D2HW-BR271H	D2HW-BL271H	D2HW-C271H
	Molded lead wires	Downwards	SPDT	D2HW-BR271M	D2HW-BL271M	D2HW-C271M
			SPST-NC	D2HW-BR272M	D2HW-BL272M	D2HW-C272M
			SPST-NO	D2HW-BR273M	D2HW-BL273M	D2HW-C273M
		Right-side	SPST-NC	D2HW-BR272MR	D2HW-BL272MR	D2HW-C272MR
			SPST-NO	D2HW-BR273MR	D2HW-BL273MR	D2HW-C273MR
		Left-side	SPST-NC	D2HW-BR272ML	D2HW-BL272ML	---
			SPST-NO	D2HW-BR273ML	D2HW-BL273ML	---
Long leaf lever 	Molded lead wires	Downwards	SPDT	D2HW-BR281M	D2HW-BL281M	D2HW-C281M
			SPST-NC	D2HW-BR282M	D2HW-BL282M	D2HW-C282M
			SPST-NO	D2HW-BR283M	D2HW-BL283M	D2HW-C283M
		Right–side	SPST-NC	---	---	D2HW-C282MR
			SPST-NO	---	---	D2HW-C283MR

Note: **1.** The length of standard lead wires (AVSS 0.5) for molded lead wire models is 30 cm.
2. Add "S" to the end of the model number for the UL/CSA-approved version. Consult your OMRON representative for details.

Specifications

■ Ratings

Rated voltage (V)	Resistive load
125 VAC	0.1 A
12 VDC 24 VDC 42 VDC	2 A 1 A 0.5 A

Note: The ratings values apply under the following test conditions:
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 30 operations / min

Microswitches

Characteristics

Item	Specification
Operating speed	1 mm to 500 mm/s (for pin plunger models)
Operating frequency	30 operations/min
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance (initial value)	100 mΩ max. (molded lead wire models: 150 mΩ max.)
Dielectric strength	600 VAC, 50/60 Hz for 1 min between terminals of the same polarity 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal parts
Vibration resistance (see note 2)	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance (see note 2)	Destruction: 1,000 m/s^2 {approx. 100 G} max. Malfunction: 300 m/s^2 {approx. 30 G} max.
Durability (see note 3)	Mechanical: 1,000,000 operations min. (30 operations/min) Electrical: 100,000 operations min. (20 operations/min)
Degree of protection	IEC IP67 (excluding the terminals on terminal models)
Degree of protection against electric shock	Class I
Proof tracking index (PTI)	175
Ambient operating temperature	–40 to 85°C (with no icing)
Ambient operating humidity	95% max. (for 5 to 35°C)
Weight	Approx. 0.7 g (for pin plunger models with terminals)

Note:
1. The data given above are initial values.
2. For the pin plunger models, the above values apply for use at the free position, operating position, and total travel position. For the lever models, they apply at the total travel position.
   The values shown apply for malfunctions of 1 ms max.
3. For testing conditions, contact your OMRON sales representative.

Approved Standards

UL1054 (File No. E41515)/CSA C22.2 No. 55 (cUL approval)

Consult your OMRON sales representative for models with standard approval.

Rated voltage	D2HW
125 VAC	0.1 A
12 VDC	2 A

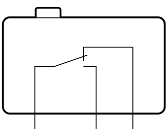
Contact Specifications

Item	Specification
Specification	Crossbar
Material	Gold alloy
Gap (standard value)	0.5 mm
Minimum applicable load (see note)	1 mA at 5 VDC

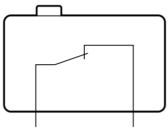
Note Minimum applicable loads are indicated by N standard reference values. This value represents the failure rate at a 60% (λ60) reliability level.
The equation λ60=035×10–6/operations indicates that a failure rate of 1/2,000,000 operations can be expected at a reliability level of 60%.

Contact Form

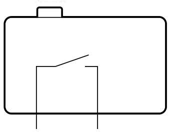
SPDT



SPST-NC (Molded Lead Wire Models Only)



SPST-NO (Molded Lead Wire Models Only)



Note Molded lead wire colors are indicated in parentheses.

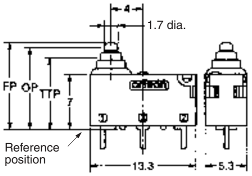
Dimensions

Mounting Structure and Reference Positions for Operating Characteristics

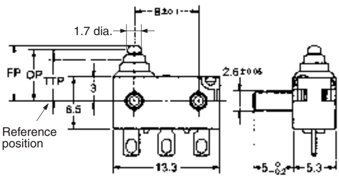
Note All units are in millimeters unless otherwise indicated.

The reference positions used for FP, OP, and TTP values are as shown below for each type of mounting.

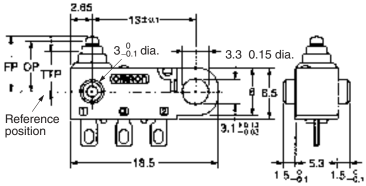
D2HW-A□ Models without Posts



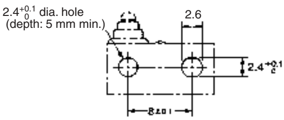
D2HW-B□ Models with Posts



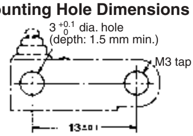
D2HW-C□ M3-screw Mounting Models



Mounting Hole Dimensions (Reference)

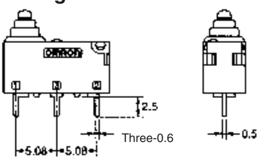


Mounting Hole Dimensions (Reference)

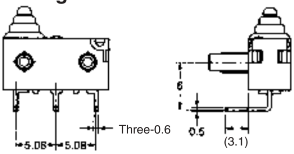


Terminals

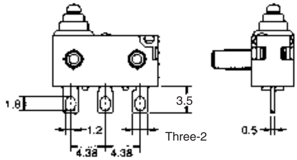
Straight PCB Terminals



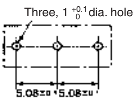
Angled PCB Terminals



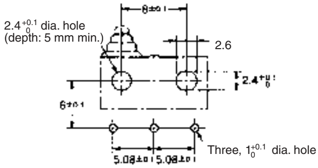
Solder Terminals



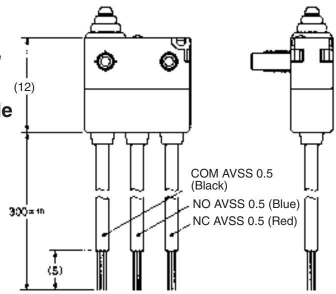
PCB Cutout Dimensions (Reference)



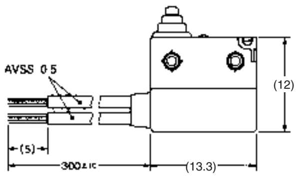
PCB Cutout Dimensions (Reference)



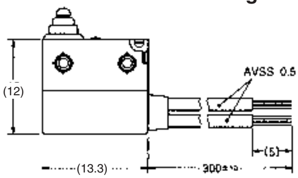
Molded Lead Wires Downwards



Molded Lead Wires on Left-side



Molded Lead Wires on Right-side

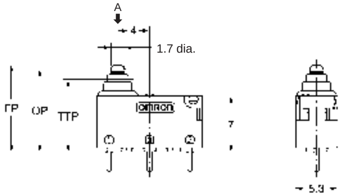


■ Dimensions and Operating Characteristics

Note: 1. All units are in millimeters unless otherwise indicated.
2. Dimensions not indicated in the above diagrams have a tolerance of ±0.2 mm.
3. The operating characteristics are for operation in the A direction (A ⬇).

Pin Plunger Models

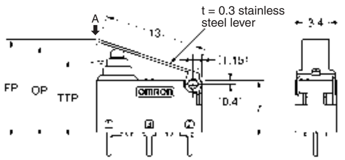
D2HW-□20□□



Charac-teristic	Models without posts	Models with posts and M3-mounting models
OF max.	0.75 N {76 gf}	
RF min.	0.10 N {10 gf}	
OT ref.	(1.4 mm)	
MD max.	0.25 mm	
FP max.	11.2 mm	7.2 mm
OP	10.4±0.2 mm	6.4±0.2 mm
TTP max.	9.1 mm	5.1 mm

Hinge Lever Models

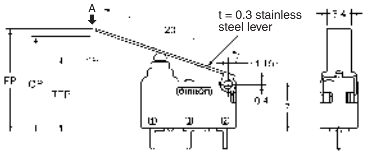
D2HW-□21□□



Charac-teristic	Models without posts	Models with posts and M3-mounting models
OF max.	0.75 N {76 gf}	
RF min.	0.07 N {7 gf}	
OT ref.	(1.6 mm)	
MD max.	0.5 mm	
FP max.	12.8 mm	8.8 mm
OP	11.5±0.5 mm	7.5±0.5 mm
TTP max.	10 mm	6 mm

Long Hinge Lever Models

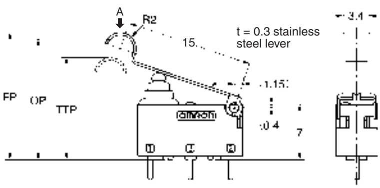
D2HW-□22□□



Charac-teristic	Models without posts	Models with posts and M3-mounting models
OF max.	0.5 N {50 gf}	
RF min.	0.03 N {3 gf}	
OT ref.	(2.5 mm)	
MD max.	0.8 mm	
FP max.	15.5 mm	11.5 mm
OP	13.3±0.8 mm	9.3±0.8 mm
TTP max.	11 mm	7 mm

Simulated Roller Hinge Lever Models

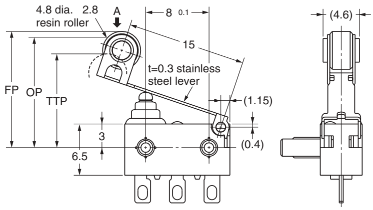
D2HW-□23□□



Charac-teristic	Models without posts	Models with posts and M3-mounting models
OF max.	0.65 N {66 gf}	
RF min.	0.05 N {5 gf}	
OT ref.	(1.9 mm)	
MD max.	0.5 mm	
FP max.	16.5 mm	12.5 mm
OP	15.2±0.5 mm	11.2±0.5 mm
TTP max.	13.5 mm	9.5 mm

Hinge Roller Lever Models

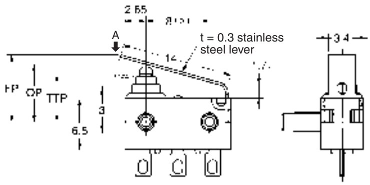
D2HW-□24□□



Characteristic	Models with posts and M3-mounting models
OF max. **RF min.**	0.65 N {66 gf} 0.03 N {3 gf}
OT ref. **MD max.**	(1.9 mm) 0.6 mm
FP max. **OP** **TTP max.**	15.3 mm 14±0.6 mm 12.3 mm

Leaf Lever Models

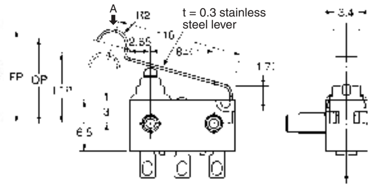
D2HW-□26□□



Characteristic	Models with posts and M3-mounting models
OF max. **RF min.**	1.8 N {183 gf} 0.20 N {20 gf}
OT ref. **MD max.**	(1.8 mm) 0.5 mm
FP max. **OP** **TTP max.**	9.3 mm 7.4±0.5 mm 5.8 mm

Simulated Roller Leaf Lever Models

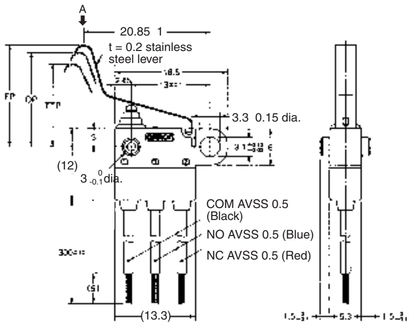
D2HW-□27□□



Characteristic	Models with posts and M3-mounting models
OF max. **RF min.**	1.8 N {183 gf} 0.20 N {20 gf}
OT ref. **MD max.**	(2.0 mm) 0.5 mm
FP max. **OP** **TTP max.**	12.5 mm 10.8±0.5 mm 8.9 mm

Long Leaf Lever Models

D2HW-□28□□



Characteristic	Models with posts and M3-mounting models
OF max. **RF min.**	0.9 N {92 gf} 0.05 N {5 gf}
OT ref. **MD max.**	(2.8 mm) 0.7 mm
FP max. **OP** **TTP max.**	19 mm 15.4±1.5 mm 12.8 mm

Precautions

■ Cautions

Degree of Protection

Do not use this product in water. Although molded lead wire models satisfy the test conditions for the standard given below, this test is to check the ingress of water into the switch enclosure after submerging the Switch in water for a given time. Satisfying this test condition does not mean that the Switch can be used in water.

IEC Publication 529, degree of protection IP67.

Do not operate the Switch when it is exposed to water spray, or when water drops adhere to the Switch surface, or during sudden temperature changes, otherwise water may intrude into the interior of the Switch due to a suction effect.

Prevent the Switch from coming into contact with oil and chemicals. Otherwise, damage to or deterioration of Switch materials may result.

Do not use the Switch in areas where it is exposed to silicon adhesives, oil, or grease, otherwise faulty contact may result due to the generation of silicon oxide.

Terminal Connection

When soldering the lead wire to the terminal, first insert the lead wire conductor through the terminal hole and then conduct soldering.

Made sure that the capacity of the soldering iron is 30 W maximum. Do not take more than 3 s to solder the switch terminal.

Improper soldering involving an excessively high temperature or excessive soldering time may deteriorate the characteristics of the Switch.

When soldering the lead wire to the PCB terminal, pay careful attention so that the flux and solder liquid level does not exceed the PCB level.

Side-actuated (Cam/Dog) Operation

When using a cam or dog to operate the Switch, factors such as the operating speed, operating frequency, push-button indentation, and material and shape of the cam or dog will affect the durability of the Switch. Confirm performance specifications under actual operation conditions before using the Switch in applications.

■ Correct Use

Mounting

Turn OFF the power supply before mounting or removing the Switch, wiring, or performing maintenance or inspection. Failure to do so may result in electric shock or burning.

For M3-screw mounting models, use M3 mounting screws with plane washers or spring washers to securely mount the Switch. Tighten the screws to a torque of 0.29 N·m {3 kgf·cm}. Exceeding the specified torque may result in deterioration of the sealing or damage.

For models with posts, secure the posts by thermal caulking or by pressing into an attached device. When pressed into an attached device, provide guides on the opposite ends of the posts to ensure that they do not fall out or rattle.

Mount the Switch onto a flat surface. Mounting on an uneven surface may cause deformation of the Switch, resulting in faulty operation or damage.

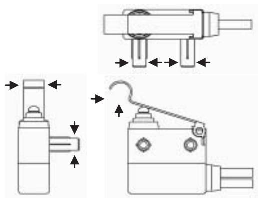
Operating Body

Use an operating body with low frictional resistance and of a shape that will not interfere with the sealing rubber, otherwise the plunger may be damaged or the sealing may deteriorate.

Handling

Do not handle the Switch in a way that may cause damage to the sealing rubber.

When handling the Switch, ensure that pressure is not applied to the posts in the directions shown in the following diagram. Also, ensure that uneven pressure or pressure in a direction other than the operating direction is not applied to the Actuator as shown in the following diagram. Otherwise, the post, Actuator, or Switch may be damaged, or the service life may be reduced.



Wiring Molded Lead Wire Models

When wiring molded lead wire models, ensure that there is no weight on the wire or that there are no sharp bends near the parts where the wire is drawn out. Otherwise, damage to the Switch or deterioration in the sealing may result.

Using Micro Loads

Even when using micro load models within the operating range, inrush currents or surges may decrease the life expectancy of the Switch. Therefore, insert a contact protection circuit where necessary.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

High Reliable Rotary-action Switch for Low Torque Operation

- ROHS Compliant.
- 0.5A rated model employs crossbar alloy #1 contacts which exhibit unsurpassed contact reliablity in very small load ranges.
- Long life (10,000,000 mechanical operations min.) through use of a movable coil spring.
- Conforms to EN61058-1.

Ordering Information

■ Model Number Legend

D2MC-□□□
1 2 3

1. **Ratings**
   5: 5 A at 250 VAC
   0.1: 0.5 A at 125 VAC, 0.5 A at 30 VDC
2. **OF**
   E: 0.5 mN • m {5.1 gf • cm} max.
   F: 0.75 mN • m {7.6 gf • cm} max.
   H: 1.00 mN • m {10.2 gf • cm} max.
3. **Direction of Actuator**
   None: Clockwise
   L: Counterclockwise

■ List of Models

Direction of actuation	OF	5 A	0.5 A
Clockwise	0.5 m N • m {5.1 gf • cm}	D2MC-5E	D2MC-01E
	0.75 m N • m {7.6 gf • cm}	D2MC-5F	D2MC-01F
	1.00 m N • m {10.2 gf • cm}	D2MC-5H	D2MC-01H
Counterclockwise	0.5 m N • m {5.1 gf • cm}	D2MC-5EL	D2MC-01EL
	0.75 m N • m {7.6 gf • cm}	D2MC-5FL	D2MC-01FL
	1.00 m N • m {10.2 gf • cm}	D2MC-5HL	---

Note: All the models listed here are supplied without actuator lever. If an actuator lever is required, please order separately by indicating the model number of the actuator lever (CAA1M). Refer to page 200.

Microswitches

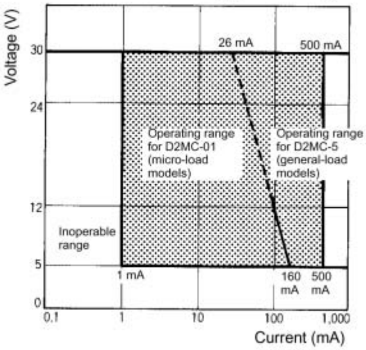
Specifications

■ Ratings

Item	D2MC-5	D2MC-01
Electrical ratings	5 A at 125/250 VAC (cosϕ = 1)	0.5 A at 125VAC/30 VDC (cosϕ = 1)

Note: The ratings values apply under the following test conditions:
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 20 operations/min for the D2MC-5 and 60 operations/min for the D2MC-01.

Use the Switch in the following operation range.



■ Characteristics

Item	D2MC-5	D2MC-01
Operating speed	1° to 360°/sec	
Operating frequency	Mechanical: 240 operations/min Electrical: 20 operations/min	Mechanical: 240 operations/min Electrical: 60 operations/min
Insulation resistance	100 MΩ min. (at 500 VDC)	
Contact resistance	20 mΩ max. (initial value)	100 mΩ max. (initial value)
Dielectric strength	600 VAC, 50/60 Hz for 1 min between terminals of same polarity 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal part	
Vibration resistance (see note)	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude	
Shock resistance (see note)	Destruction: 1,000 m/s^2 {100 G} max. Malfunction: D2MC-5E, -01E: 100 m/s^2 {10 G} max. D2MC-5F, -01F: 100 m/s^2 {10 G} max. D2MC-5H, -01H: 200 m/s^2 {20 G} max.	
Life expectancy	Mechanical: 10,000,000 operations min. Electrical: 100,000 operations min.	Mechanical: 10,000,000 operations min. Electrical: 100,000 operations min. (1,000,000 operations at 0.1 A, 125 VAC/30 VDC)
Degree of protection	IP00	
Degree of protection against electric shock	Class I	
Proof tracking index (PTI)	175	
Ambient temperature	Operating: −25°C to 80°C (with no icing)	
Ambient humidity	Operating: 35 to 85% max.	
Weight	Approx. 10 g	

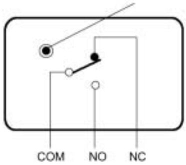
Note: Malfunction: 1 ms max.

■ Approved Standards

UL508 (File No. E41515)
CSA C22.2 No. 55 (File No. LR21642)

Rated voltage	D2MC-01	D2MC-5
125 VAC	0.5 A	5 A
250 VAC	---	5 A
30 VDC	0.5 A	---

■ Contact Form (SPDT)

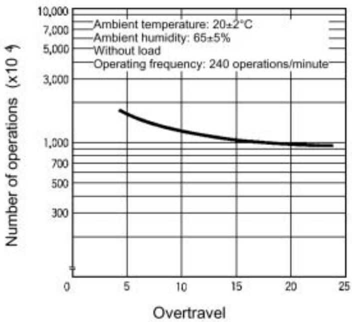


■ Contact Specifications

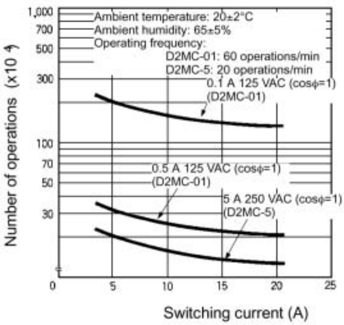
Item		D2MC-5	D2MC-01
Contact	Specification	Rivet	Crossbar
	Material	Silver alloy	Gold alloy
	Gap (standard value)	0.5 mm	
Inrush current	NC	15 A max.	0.5 A max.
	NO	7 A max.	0.5 A max.

Engineering Data

Mechanical Life Expectancy



Electrical Life Expectancy



Microswitches

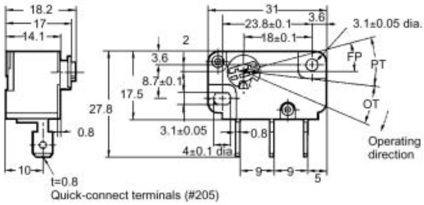
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
3. The following illustrations and operating characteristics are for the clockwise rotation direction. In case of the counterclockwise direction, only the rotation direction of the rotating axis is different, i.e., external dimensions are the same.

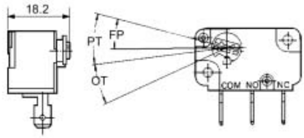
■ Dimensions and Operating Characteristics

D2MC-5E (L)
D2MC-5F (L)
D2MC-5H (L)
D2MC-01E (L)
D2MC-01F (L)
D2MC-01H (L)

Clockwise



Counterclockwise



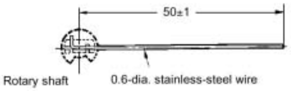
Model	D2MC-5E (01E)□	D2MC-5F (01F)□	D2MC-5H (01H)□
OF max.	0.5 mN • m {5.1 gf • cm}	0.75 mN • m {7.6 gf • cm}	1.0 mN • m {10.2 gf • cm}
RF min.	0.05 mN • m {0.6 gf • cm}	0.09 mN • m {0.9 gf • cm}	0.13 mN • m {1.3 gf • cm}
PT max.	21°		
OT min.	17°		
MD min.	3°		
RT min.	5°		
TT min.	38°		
FP	15±3°		

Note: For the counterclockwise rotation direction, designate "L" in the box (□).

Accessories (Order Separately)

■ Actuator Lever

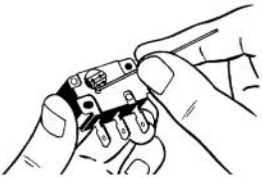
CAA1M for Snap-on Mounting



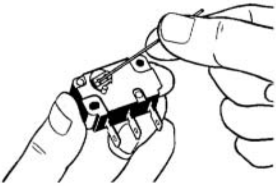
In addition to the standard wire lever model shown here, various other levers are available upon request.

Mounting Actuator Lever

1. Insert the end of the actuator lever into the hole in the rotary disc.



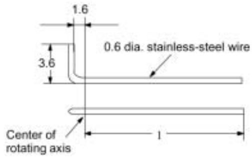
2. Push the lever down in the direction of the groove in the rotary disc.



Designing Own Actuator

If you decide to make your own actuator lever, the materials used should be stainless steel, piano wire, hard aluminum wire, etc.

There are no restrictions on the tip shape or length of the actuator lever. However, if the lever is too long, improper switch resetting or contact chattering may occur. Therefore, the shape of lever as shown below is suitable.



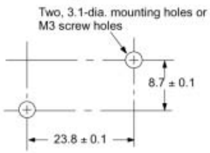
The appropriate value of dimension (l) from the fulcrum is 50 mm.

Precautions

Mounting/Soldering

Use M3 mounting screws with plane washers or spring washers to mount the switch. Tighten the screws to a torque of 0.20 to 0.29 N • m {2 to 3 kgf • cm}.

Mounting Holes



Do not change the operating position by modifying the actuator.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Power Switch with Fail-safe Mechanisms

- ROHS Compliant.
- Minimum contact gap of 3mm for general power switches is satisfied. Highly reliable design conforms to European safety standards.
- Fail-safe mechanisms with double return spring and direct drive positive contact opening features.
- Conforms to Class II of VDE Insulation.
- Pull-on lock model for easy maintenance is also available.

Ordering Information

Model Number Legend

D2D-□□0□
1 2 3

1. **Construction**
   - 1: Single pole, 3-mm contact gap
   - 2: Pull-on-lock type, 1-mm contact gap
   - 3: Double-pole, 3-mm contact gap
2. **Mounting**
   - 0: Screw mounting
   - 1: Panel snap-fit mounting
3. **Contact Form**
   - 0: SPDB-NO/NC
   - 1: SPDB-NO
   - 2: SPDB-NC
   - 3: SPDB-NO+SPDB-NO/NC
   - 4: DPDB-NO

List of Models

Mounting method	Contact form	Standard	Pull-on lock (see note)
		Contact gap: 3 mm min.	Contact gap: 1 mm
Screw mounting	SPDB-NO/NC	D2D-1000	D2D-2000
	SPDB-NO	D2D-1001	---
	SPDB-NC	D2D-1002	---
Panel mounting	SPDB-NO/NC	D2D-1100	D2D-2100
	SPDB-NO	D2D-1101	---
	SPDB-NC	D2D-1102	---
	SPDB-NO+SPDB-NO/NC	D2D-3103	---
	DPDB-NO	D2D-3104	---

Note: Refer to page 208 for the pull-on lock function.

Specifications

■ Ratings

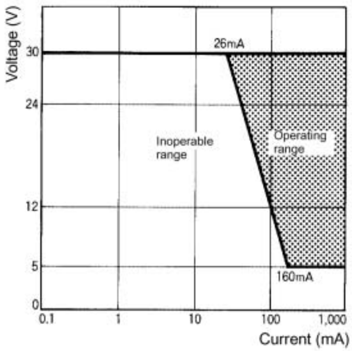
Type	Rated voltage	Non-inductive load		Inductive load	
		Resistive load		Motor load	
		NC	NO	NC	NC
Standard	125 VAC	16 A		4 A	
	250 VAC	16 A		4 A	
Pull-on lock	125 VAC	10 A		---	
	250 VAC	10 A		---	

Note: 1. The above values are for the steady-state current.

2. Motor load has an inrush current of 6 times the steady-state current.

3. The ratings values hold under the following test conditions:
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 60 operations/min

Use the Switch under the following operating range.



Minimum applicable load	160 mA at 5 VDC

Microswitches

Characteristics

Item		D2D-1000 models	D2D-2000 models	D2D-3000 models
Operating speed		10 mm to 1 m/s		
Operating frequency		Mechanical: 300 operations/min Electrical: 60 operations/min		
Insulation resistance		100 MΩ min. (at 500 VDC)		
Contact resistance		50 mΩ max. (initial value)		
Dielectric strength (50/60 Hz 1mm)	Between terminals of same polarity	2,000 VAC	1,000 VAC	2,000 VAC
	Between terminals and ground (see note1)	2,000 VAC	1,500 VAC	2,000 VAC
	Between terminals and non-current-carrying metal part	2,500 VAC	1,500 VAC	---
	Between terminals and actuator	4,000 VAC	---	4,000 VAC
Vibration resistance		Malfunction: 10 to 55 Hz, 1.5-mm double amplitude		
Shock resistance		Malfunction: 500 m/s^2 {approx. 50G} max. (300 m/s^2 {approx. 30G} max. for pull-on models)		
Life expectancy (see note 2)		Mechanical: 10,000,000 operations min. Electrical: 100,000 operations min.		
Degree of protection		IP00		
Degree of protection against electric shock		Class II		
Proof tracking index (PTI)		175		
Switch category		D (IEC335-1)		
Ambient temperature		Operating: –25°C to 85°C (for an ambient humidity of 60% max.) (with no icing)		
Ambient humidity		Operating: 85% max. (for 5°C to 35°C)		
Weight		Approx. 14 g (D2D-1000)		

Note: 1. The dielectric strength shown in the table indicates a value for models with a Separator.
2. Contact your OMRON sales representative for testing conditions.

Approved Standards

UL1054 (File No. E41515)
CSA C22.2 No. 55 (File No. LR21642)

Rated voltage	D2D-1000	D2D-2000	D2D-3000
125 VAC	---	---	3/4 HP
250 VAC	16 A	10 A	16 A, 1-1/2 HP

VDE (File No. 6147ÜG)/(File No. 92542)

Rated voltage	D2D-1000	D2D-2000	D2D-3000
250 VAC	16 (4) A	10 A	16 (4) A

Testing conditions: 50,000 operations, T85 (0°C to 85°C)

Note: The values in parentheses indicate motor load ratings.

TÜV EN61058-1 (File No. R9551934)

Rated voltage	D2D-3104
24 VDC	4 A

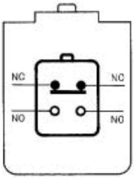
Testing conditions: 5E4 (50,000 operations), T85 (0°C to 85°C)

Contact Specifications

Item		Standard model	Pull-on lock model
Contact	Specification	Rivet	
	Material	Silver	
	Gap (standard value)	3 mm min.	1 mm
Inrush current	NC	30 A max.	24 A max.
	NO	30 A max.	24 A max.

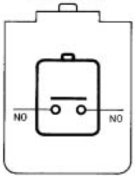
■ Contact Form

SPDB-NO/NC



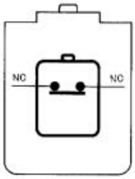
D2D-1000 D2D-2000
D2D-1100 D2D-2100

SPDB-NO



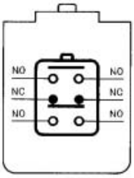
D2D-1001
D2D-1101

SPDB-NC



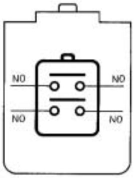
D2D-1002
D2D-1102

SPDB-NO
+SPDB-NO/NC



D2D-3103

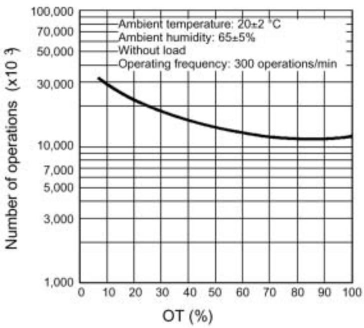
DPDB-NO



D2D-3104

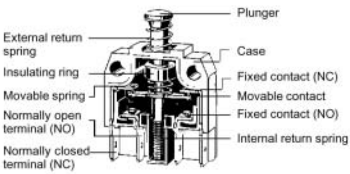
Engineering Data

Mechanical Life Expectancy (D2D-1000)

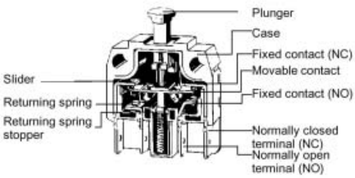


Nomenclature

Standard Model



Pull-on Lock Model



Dimensions

■ Dimensions and Operating Characteristics

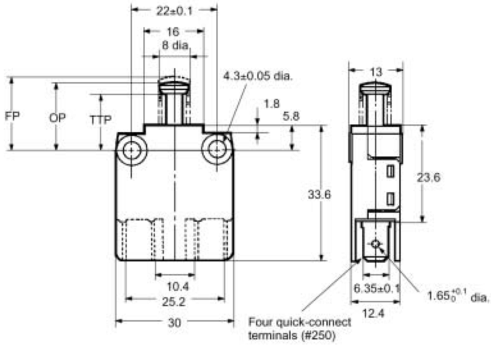
Note: 1. All units are in millimeters unless otherwise indicated.

2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

■ Standard Models

Screw Mounting

D2D-1000
D2D-1001
D2D-1002

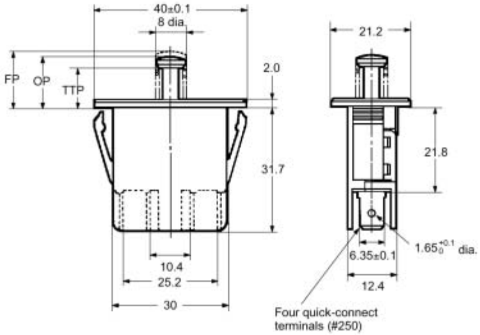


Note: NC-OFF: The force applied to the actuator to cause it to move from the free position to the position at which the NC contact opens.
NO-ON: The force applied to the actuator to cause it to move from the free position to the position at which the NO contact closes.

Model		Screw mount		
		D2D-1000	D2D-1001	D2D-1002
OF max.	NC-OFF	2.94 N {300 gf}	---	2.94 N {300 gf}
	NO-ON	5.88 N {600 gf}	5.88 N {600 gf}	---
TTF max.		7.35 N {750 gf}	7.35 N {750 gf}	7.35 N {750 gf}
OT min.		2.3 mm	2.3 mm	5.5 mm
TTP max.		10 mm	10 mm	10 mm
FP max.		16.4 mm	17 mm	16.4 mm
OP	NC-OFF	15.9±0.4 mm	---	15.9±0.4 mm
	NO-ON	12.7±0.4 mm	12.7±0.4 mm	---

Panel Mounting

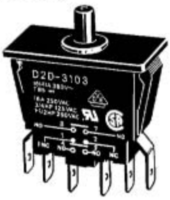
D2D-1100
D2D-1101
D2D-1102

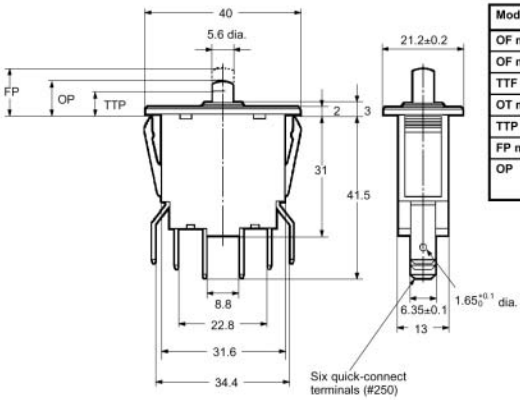


Model		Panel mounting		
		D2D-1100	D2D-1101	D2D-1102
OF max.	NC-OFF	2.94 N {300 gf}	---	2.94 N {300 gf}
	NO-ON	5.88 N {600 gf}	5.88 N {600 gf}	---
TTF max.		7.35 N {750 gf}	7.35 N {750 gf}	7.35 N {750 gf}
OT min.		2.3 mm	2.3 mm	5.5 mm
TTP max.		6 mm	6 mm	6 mm
FP max.		12.4 mm	13 mm	12.4 mm
OP	NC-OFF	11.9±0.4 mm	---	11.9±0.4 mm
	NO-ON	8.7±0.4 mm	8.7±0.4 mm	---

Panel Mounting

D2D-3103

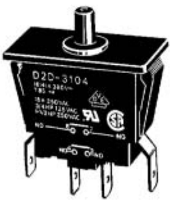


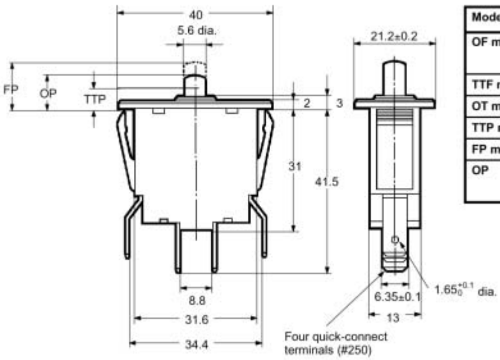


Model		D2D-3103
OF max.	NC-OFF	2.94 N {300 gf}
OF max.	NO-ON	5.88 N {600 gf}
TTF max.		9.81 N {1,000 gf}
OT min.		2.3 mm
TTP max.		6.4 mm
FP max.		12.4 mm
OP	NC-OFF	11.9±0.8 mm
	NO-ON	8.7±0.8 mm

Panel Mounting

D2D-3104

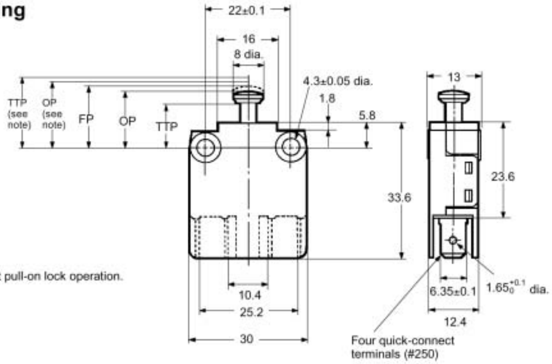




Model		D2D-3104
OF max.	NC-OFF	---
	NO-ON	5.88 N {600 gf}
TTF max.		9.81 N {1,000 gf}
OT min.		2.3 mm
TTP max.		6.4 mm
FP max.		13.5 mm
OP	NC-OFF	---
	NO-ON	8.7±0.8 mm

Pull-on Lock Models

Screw Mounting
D2D-2000

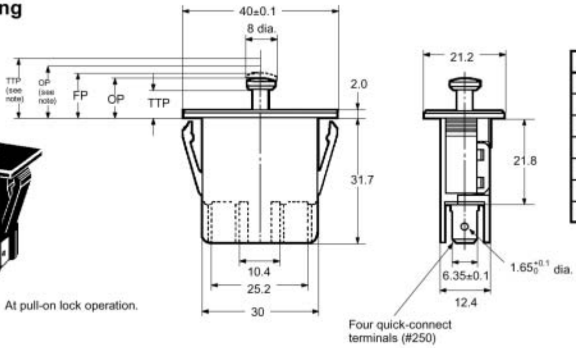


Note: At pull-on lock operation.

Momentary Operation (Normal Operation)

Model		D2D-2000	D2D-2100
OF max.	NC-OFF	1.96 N {200 gf}	
	NO-ON	2.94 N {300 gf}	
TTF max.		5.88 N {600 gf}	
OT min.		4.5 mm	
TTP max.		8.3 mm	4.3 mm
FP max.		14.3 mm	10.3 mm
OP	NC-OFF	13.5± 0.6 mm	9.5±0.6 mm
	NO-ON	12.7± 0.6 mm	8.7±0.6 mm

Panel Mounting
D2D-2100



Note: At pull-on lock operation.

Pull-on Lock Operation

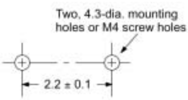
Model	D2D-2000	D2D-2100
OF max.	19.61 N {2,000 gf}	
PT max.	2 mm	
OT min.	0.4 mm	
MD max.	1.5 mm	
TTP max.	16.5 mm	12.5 mm
FP max.	14.3 mm	10.3 mm
OP	15.1±0.6 mm	11.1±0.6 mm

Precautions

Mounting Dimensions

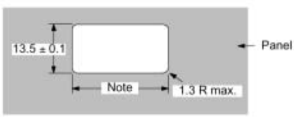
Use M4 mounting screws with plain or spring washers to mount the Switch. Tighten the screws to a torque of 0.49 to 0.69 N • m {5 to 7 kg • cm}.

Mounting Holes



Panel Cutout Dimensions

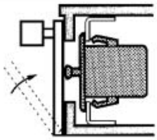
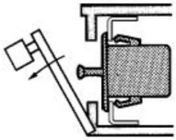
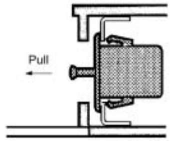
Panel thickness: 1.0 to 2.5 mm



Note: Dimension is 36.7±0.1 with a panel thickness of 1.0 mm and 37.0±0.1 with a panel thickness of 2.5 mm

■ Pull-on Lock Function

When opening or closing the door, the power ON state of the Switch can be checked with the door left open. By closing the door after maintenance inspection, the Switch will resume the normal momentary action. (This feature is ideal for conducting the electrical continuity test, inspection, repair, etc. of the Switch after its assembly.)

Example		To turn ON the power when the door is closed	To turn OFF the power when the door is open	To turn ON the power with the door left open
State				
Connection	NO	ON	OFF	ON
	NC	OFF	ON	OFF

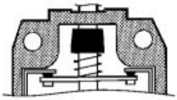
■ Fail-safe Mechanisms

Double Spring Feature for Ensuring a Contact Opening

Two return springs are provided for the pin plunger. Thus, when either of the spring is broken, this feature will prevent the Switch from malfunctioning or short-circuiting.
Applicable Models: D2D-1000 and 3000 models

Direct Drive Positive Contact Opening Feature for Ensuring NC Contact Opening

The section marked ▲ will positively break the circuit if a contact weld occurs in the Switch.
Applicable Models: D2D-1000 Models



Example of D2D-1000.

Handling

Apply operation force to the pin plunger in the direction it operates. Applying forces laterally or from an oblique direction may damage the pin plunger.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

■ Cautions

Use the DIP Switch within the rated voltage and current ranges, otherwise the DIP Switch may have a shortened life expectancy, radiate heat, or burn out. This particularly applies to the instantaneous voltages and currents when switching.

■ Correct Use

CIRCUIT DESIGN

Although the minimum current is 10 mA (3.5 VDC), contact reliability may need to be improved in some cases. This is particularly true when switching causes an increase in instantaneous current, such as in C-MOS IC applications. Do not let the peak current exceed the rated value here or any other time.

Only BCD/hexadecimal 1-2-4-8 code is available for A6C/A6CV/A6R/A6RV models. If BCD/hexadecimal 1-2-4-8 complement code is required, make the appropriate provisions in the circuit.

MOUNTING

Normally the default striker setting is OFF for slide-type DIP Switches and the default rotor setting is 0 for Rotary DIP Switches. Do not change these settings when mounting, soldering, washing or drying Switches. In rare cases, the striker may be deformed by heat generated during soldering.

Automatic Insertion Machine

Use a body stopper system for the chute stopper of automatic insertion machines. When mounting Switches using an insertion machine incorporating a half-lead stopper, make sure the machine will not deform the terminals of the Switch, or improper insertion may result. Check actual mounting conditions prior to using a half-lead stopper system.

A printed circuit board that is 1.2 to 1.6 mm thick is recommended.

Holes on the PCB should be at least 0.9 mm in diameter for automatic insertion.

Manual or IC Socket Insertion

Commercially available insertion tools are recommended for mounting ICs on PCBs.

Terminal pitch, dimensions and other features are identical to that of standard ICs for IC socket compatibility (except for the A6H and A6S).

Align the terminals so they slide in simultaneously when the Switch is inserted into socket holes or into mounting holes pre-drilled at the specified dimensions. Apply downward force on the Switch until the terminals are properly seated on the PCB.

Do not try to remove a Switch by inserting a screwdriver between it and the PCB, and then twisting the screwdriver to peel the Switch off. Use a commercially available inserter/remover to remove the Switch.

SOLDERING

Observe the following conditions when soldering the DIP Switch.

General Precautions for Soldering

Set the pins to OFF before soldering an A6ER DIP Switch.

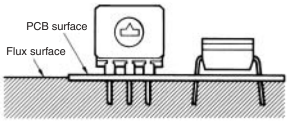
Before soldering the Switch on a PCB, make sure there is no unnecessary space between the Switch and the PCB.

Before soldering the Switch on a multilayer PCB, conduct a test to make sure the Switch will not be deformed by soldering heat on the pattern or land of the multilayer PCB.

Automatic Soldering Bath (Except A6S/A6H)

Soldering temperature: 260°C max.
Soldering time: 5 s max. for a 1.6-mm thick, single-side PCB

Do not use an automatic soldering bath or manual soldering for A6S or A6H models.
Confirm in advance that flux will not bubble up onto the side of the PCB to which the Switch is mounted. Depending on the type of Switch, the flux may have an adverse effect if it enters the Switch.

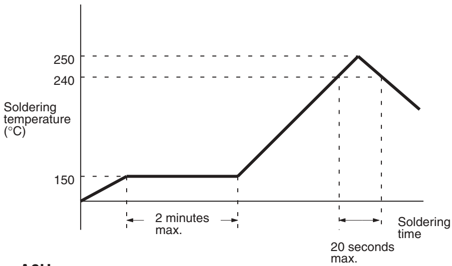


The A6S and A6H are designed specifically for reflow soldering. Do not use an automatic soldering bath or manual soldering for these models.

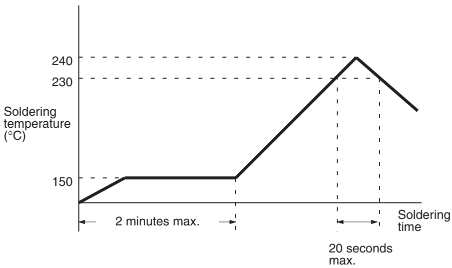
Reflow Soldering

Observe the following conditions for reflow soldering the A6S and A6H models.

A6S



A6H



Do not use reflow soldering for any models other than the A6S and A6H. Otherwise the plastic case may melt or deform.

The soldering conditions and the temperature around the Switch may vary with the type of reflow bath. Check the temperature profile and confirm soldering conditions as well as the amount of heat applied to the Switch prior to soldering.

Manual Soldering (Except A6S/A6H)

Soldering temperature: 350°C at the tip of the soldering iron.
Soldering time: 3 s max. for a 1.6-mm thick, single-side PCB

Do not solder the Switch more than twice including any rectification soldering. An interval of five minutes is required between the first and second soldering

WASHING

Washable and Non-washable Models

The models for which washing are possible are shown in the following table.

Washable	A6A, A6C, A6CV, A6D, A6DR, A6T (with seal tape), A6S (with seal tape), A6H (with seal tape)
Non-washable	A6R, A6RV, A6T (standard/raised actuator), A6S (standard/raised actuator), A6E, A6ER

Washing Procedure

Ultrasonic cleaning is not available for slide-type DIP Switches with seal tape. These models may be wiped or dipped into washing agents for one minute maximum.

Slide-type DIP Switches with seal tape can be washed as long as the seal tape is not removed or pasted before washing. Non-compliance here will cause the quality of the seal to decline.

Washing equipment incorporating more than one washing bath can be used to clean washable models, provided that the washable models are cleaned for one minute maximum per bath and the total cleaning time does not exceed three minutes.

Washing Agents

Apply alcohol-based solvents to clean washable models. Do not apply water or any other agents to clean any washable models, as such agents may degrade the materials or performance of the Switch.

Washing Precautions

Do not impose any external force on washable models while washing.

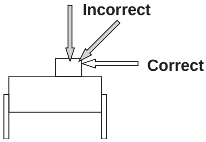
Do not clean washable models immediately after soldering. The cleaning agent may be absorbed into the incomplete seal through respiration as the Switch cools. Wait for at least three minutes after soldering before cleaning.

Do not use washable Switches submerged in water or in locations exposed to water.

HANDLING

Slide-type DIP Switch operation

Do not apply excessive operating force to the Switch. Otherwise the Switch may be damaged or deformed, and the switch mechanism may malfunction as a result. Apply an operating force not exceeding 200% of the maximum rated operating force to the Switch.



Set slide-type DIP Switches with a tiny, rounded object, such as the tip of a ball-point pen or a small screwdriver. Do not set the DIP Switch using tweezers or any other sharp object that may damage it. Do not set the DIP Switch using the point of a mechanical pencil, or lead powder or fragments may fall into the Switch and internal circuit board, causing the DIP Switch to malfunction and reducing the dielectric strength of the circuit board.

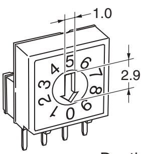
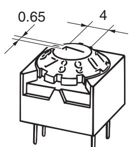
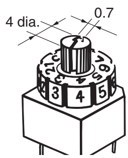
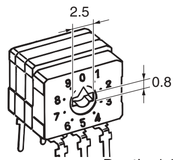
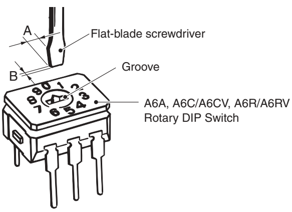
Although raised-type (A6B standard type) and piano-type strikers can be operated by fingertip, do not push too hard or too fast because this will deform or damage the striker.

Rotary DIP Switch Operation

Set rotary-type DIP Switches with a flat-blade screwdriver that fits into the screwdriver groove. Using a screwdriver of inappropriate dimensions, or using a tool other than a flat-blade screwdriver may cause damage to the groove that may make the Switch impossible to operate.

Insert the flat-blade screwdriver vertically to operate the Switch. The Switch may be damaged if the screwdriver is inserted at an angle.

Do not use excessive force to operate the Switch, or it may damage or deform the Switch.

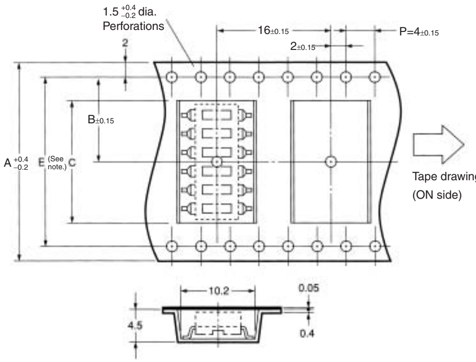
Item	A6R/A6RV	A6A		A6C/A6CV
	Top/Side operation, flat type	Standard type, flat type	Shaft type, wheel type	Top/Side operation type
Screwdriver groove	 Depth: 1.0	 Depth: 0.9	 Depth: 0.9	 Depth: 1.0
Applicable screwdriver: A	1.8 to 2.1	3.5 to 3.8		2.0 to 2.4
Applicable screwdriver: B	0.7 to 0.8	0.4 to 0.5		0.5 to 0.6
Part Names				

Note: All units are in millimeters unless otherwise indicated.

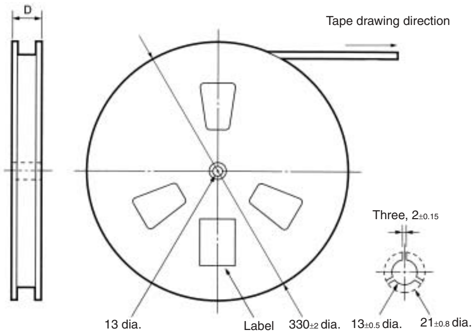
DIP Switches

■ Packing specifications

• A6S models with embossed taping specifications are shown below



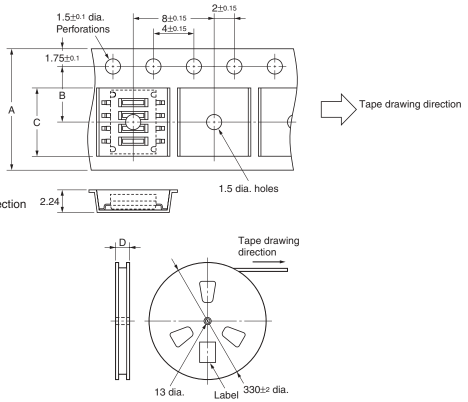
Note: The perforations along both sides are for 8-pole Switches only. The perforations on the bottom of the diagram are not for 4- and 6-pole Switches.



Applicable Models	A6S-□102-P
Standard	Conforms to JEITA.
Package Quantity	900 per reel

No. of Poles	4	5	6
A $^{+0.4}_{-0.2}$	24	24	32
B±0.15	11.5	11.5	14.2
C	11.6	16.7	21.7
D	(30)	(30)	(38)
E	–	–	28.4

• A6H models with embossed taping specifications are shown below



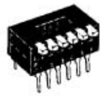
Applicable Models	A6H-□102-P
Standard	Conforms to JEITA.
Package Quantity	4,000 per reel

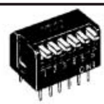
No. of Poles	4	6	8	10
A $^{+0.3}_{-0.1}$	12	24	24	24
B±0.15	5.5	11.5	11.5	11.5
C	(6.6)	(11.7)	(11.7)	(14.4)
D	(18)	(30)	(30)	(30)

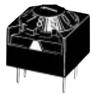
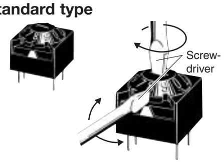
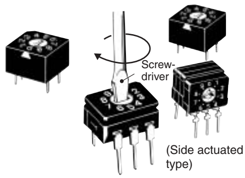
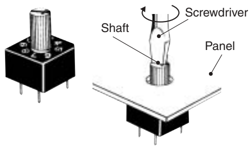
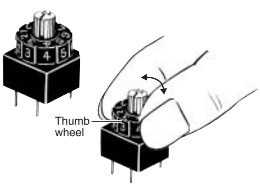
Model		A6H			A6S			
Appearance								
Accutator		Flat			Flat			Raised
Sealimg		–	Seal tape		–	Seal tape		–
			Stick	Embossed taping (units of 4,000)		Stick	Embossed taping (units of 900) (see note)	
Terminal		SMT			SMT			
Automatic mounting		Yes						
Washable		No	Yes	Yes	No	Yes	Yes	No
No. of poles	1	–	–	–	–	–	–	–
	2	–	–	–	A6S-2101	A6S-2102	–	A6S-2104
	3	–	–	–	A6S-3101	A6S-3102	–	A6S-3104
	4	A6H-4101	A6H-4102	A6H-4102-P	A6S-4101	A6S-4102	A6S-4102-P	A6S-4104
	5	–	–	–	A6S-5101	A6S-5102	–	A6S-5104
	6	A6H-6101	A6H-6102	A6H-6102-P	A6S-6101	A6S-6102	A6S-6102-P	A6S-6104
	7	–	–	–	A6S-7101	A6S-7102	–	A6S-7104
	8	A6H-8101	A6H-8102	A6H-8102-P	A6S-8101	A6S-8102	A6S-8102-P	A6S-8104
	9	–	–	–	A6S-9101	A6S-9102	–	A6S-9104
	10	A6H-0101	A6H-0102	A6H-0102-P	A6S-0101	A6S-0102	–	A6S-0104
Page		717			719			

Note: Embossed taping specifications are available for A6S models with 4, 6, and 8 poles. (When ordering add "-P" to the model number.)

Model		A6T			A6D	
Appearance						
Accutator		Flat		Raised	Flat	Raised
Seal tape		–	Seal tape	–	Internal seal tape	
Terminal		DIP				
Automatic mounting		Yes				
Washable		No	Yes	No	Yes	Yes
No. of poles	1	A6T-1101	A6T-1102	A6T-1104	–	–
	2	A6T-2101	A6T-2102	A6T-2104	–	–
	3	A6T-3101	A6T-3102	A6T-3104	–	-
	4	A6T-4101	A6T-4102	A6T-4104	A6D-4100	A6D-4103
	5	A6T-5101	A6T-5102	A6T-5104	–	–
	6	A6T-6101	A6T-6102	A6T-6104	A6D-6100	A6D-6103
	7	A6T-7101	A6T-7102	A6T-7104	–	–
	8	A6T-8101	A6T-8102	A6T-8104	A6D-8100	A6D-8103
	9	A6T-9101	A6T-9102	A6T-9104	–	–
	10	A6T-0101	A6T-0102	A6T-0104	A6D-0100	A6D-0103
Page		719			722	

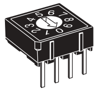
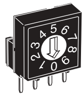
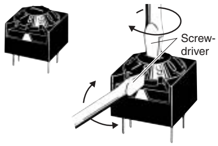
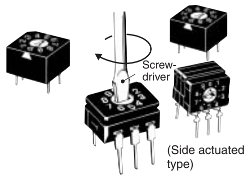
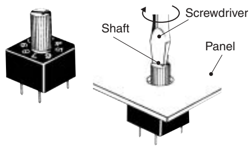
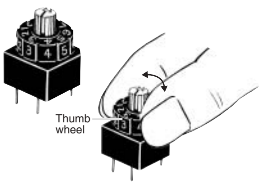
Model		A6E		A6DR
Appearance				
Accutator		Flat	Raised	Side (long-lever)
Seal tape		–		Internal seal tape
Terminal		DIP		DIP
Automatic mounting		No		No
Washable		No	No	Yes
No. of poles	1	–	–	–
	2	A6E-2101	A6E-2104	–
	3	A6E-3101	A6E-3104	–
	4	A6E-4101	A6E-4104	A6DR-4100
	5	A6E-5101	A6E-5104	–
	6	A6E-6101	A6E-6104	A6DR-6100
	7	A6E-7101	A6E-7104	–
	8	A6E-8101	A6E-8104	A6DR-8100
	9	A6E-9101	A6E-9104	–
	10	A6E-0101	A6E-0104	A6DR-0100
Page		725		722

Model		A6ER	
Appearance			
Accutator		Side (short-lever)	Side (long-lever)
Seal tape		–	
Terminal		DIP	
Automatic mounting		No	
Washable		No	No
No. of poles	1	–	–
	2	A6ER-2101	A6ER-2104
	3	A6ER-3101	A6ER-3104
	4	A6ER-4101	A6ER-4104
	5	A6ER-5101	A6ER-5104
	6	A6ER-6101	A6ER-6104
	7	A6ER-7101	A6ER-7104
	8	A6ER-8101	A6ER-8104
	9	A6ER-9101	A6ER-9104
	10	A6ER-0101	A6ER-0104
Page		725	

Model			A6A		A6C		A6CV	
Appearance								
Seal tape			Internal seal tape					
Terminals			DIP					
No. of switching positions			10	16	10	16	10	16
Type	**Standard type**  The rotary switch can be turned from the top or the side.	**BCD/ hexadecimal 1-2-4-8 (see note 1)**	A6A-10R	A6A-16R	–		–	
		BCD/ hexadecimal 1-2-4-8 complement (see note 2)	A6A-10C	A6A-16C				
	Flat type  Switching part contained within flat surface. No raised edges allows space saving.	**BCD/ hexadecimal 1-2-4-8**	A6A-10RF	A6A-16RF	A6C-10R (N)	A6C-16R (N)	A6CV-10R	A6CV-16R
		BCD/ hexadecimal 1-2-4-8 complement	A6A-10CF	A6A-16CF	–		–	
	Extended shaft type  Extended shaft enables switching to be performed from outside the device through a panel or another kind of cover.	**BCD/ hexadecimal 1-2-4-8**	A6A-10RS	A6A-16RS	–		–	
		BCD/ hexadecimal 1-2-4-8 complement	A6A-10CS	A6A-16CS				
	Thumbwheel type  Thumbwheel allows easy switching using fingers.	**BCD/ hexadecimal 1-2-4-8**	A6A-10RW	A6A-16RW	–		–	
		BCD/ hexadecimal 1-2-4-8 complement	A6A-10CW	A6A-16CW				
Page			728		732			

Note 1: "BCD/hexadecimal 1-2-4-8" is a binary code that takes the value 1 for voltages that are high with respect to ground and takes the value 0 for voltages that are low with respect to ground.

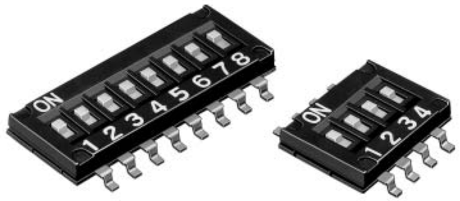
Note 2: "BCD/hexadecimal 1-2-4-8 complement" is a binary code that take the opposite value to "BCD/hexadecimal 1-2-4-8," i.e., takes the value 0 for high voltages and 1 for low voltages.

Model			A6R		A6RV	
Appearance						
Seal tape			–			
Terminals			DIP			
No. of switching positions			10	16	10	16
Type	Standard type  The rotary switch can be turned from the top or the side.	**BCD/ hexadecimal 1-2-4-8 (see note 1)**	–		–	
		BCD/ hexadecimal 1-2-4-8 complement (see note 2)				
	Flat type  Switching part contained within flat surface. No raised edges allows space saving.	**BCD/ hexadecimal 1-2-4-8**	A6R-101RF A6R-102RF	A6R-161RF A6R-162RF	A6RV-101RF A6RV-102RF	A6RV-161RF A6RV-162RF
		BCD/ hexadecimal 1-2-4-8 complement	–		–	
	Extended shaft type  Extended shaft enables switching to be performed from outside the device through a panel or another kind of cover.	**BCD/ hexadecimal 1-2-4-8**	A6R-101RS A6R-102RS	A6R-161RS A6R-162RS	A6RV-101RS A6RV-102RS	A6RV-161RS A6RV-162RS
		BCD/ hexadecimal 1-2-4-8 complement	–		–	
	Thumbwheel type  Thumbwheel allows easy switching using fingers.	**BCD/ hexadecimal 1-2-4-8**	–		–	
		BCD/ hexadecimal 1-2-4-8 complement				
Page			735			

Note 1: "BCD/hexadecimal 1-2-4-8" is a binary code that takes the value 1 for voltages that are high with respect to ground and takes the value 0 for voltages that are low with respect to ground.

Note 2: "BCD/hexadecimal 1-2-4-8 complement" is a binary code that take the opposite value to "BCD/hexadecimal 1-2-4-8," i.e., takes the value 0 for high voltages and 1 for low voltages.

Ultra-low Profile, Half-pitch, Surface-mounting DIP Switch



- ROHS compliant.
- Very low profile of 1.55 mm.
- Mounting space reduced by 63% (compared with conventional models).
- Washable, seal tape models available.
- Embossed taping models available.

Ordering Information

Type (striker color)		Standard models (White)	Models with seal tape (White)	
			Stick models	Embossed taping models (See note)
No. of poles	Quantity per stick			
4	75	A6H-4101	A6H-4102	A6H-4102-P
6	54	A6H-6101	A6H-6102	A6H-6102-P
8	40	A6H-8101	A6H-8102	A6H-8102-P
10	33	A6H-0101	A6H-0102	A6H-0102-P

Note: Embossed taping models are packaged in units of 4,000. Orders must be made in multiples of 4,000. Switches are not sold individually.

Specifications

Rating/Characteristics

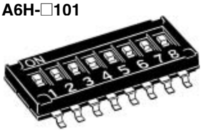
Switching capacity	25 mA at 24 VDC 10 μA (minimum current) at 3.5 VDC
Ambient temperature	Operating: 20 to 70°C (with no icing or condensation) Storage: -40 to 85°C (with no icing or condensation)
Ambient humidity	Operating: 35% to 90%
Insulation resistance	100 MΩ min. (at 250 VDC)
Contact resistance	200 mΩ max. (initial value)
Dielectric strength	300 VAC for 1 min between terminals of the same polarity, and between terminals of different polarity
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Malfunction: 300 m/s^2 min.
Life expectancy	Mechanical: 1,000 operations min. Electrical: 1,000 operations min.
Operating force	0.29 to 0.49 N
Enclosure rating	Equivalent to IP40
Weight	0.09 g (4 poles) 0.12 g (6 poles) 0.15 g (8 poles) 0.18 g (10 poles)

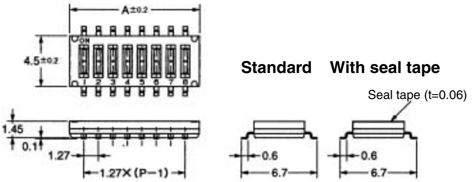
Dimensions

Note 1: All units are in millimeters unless otherwise indicated.
2: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

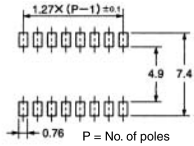
Standard

A6H-□101



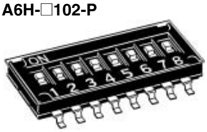


Dimensions of PCB pad (Top View)



With Seal Tape

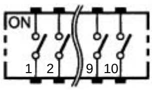
A6H-□102
A6H-□102-P



No. of poles	Model		Dimension A
4	A6H-4101	A6H-4102	6.31
6	A6H-6101	A6H-6102	8.85
8	A6H-8101	A6H-8102	11.39
10	A6H-0101	A6H-0102	13.93

Installation

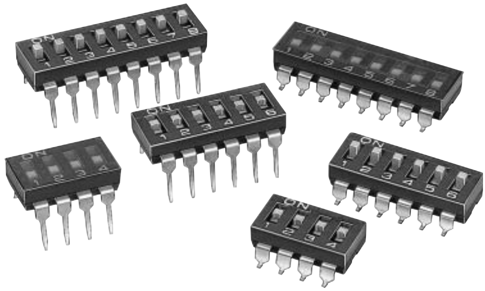
■ Internal Connections (Top View)



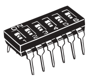
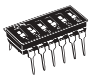
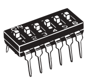
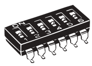
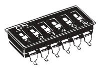
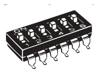
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Low-cost DIP Switch with Slide Pins

- Designed to DIP (Dual Inline Package) standards and allows automatic mounting with IC insertion machines.
- Washable models with seal tape available.
- SMT (surface-mounted terminal) models available with embossed taping specifications (units of 900).
- Gold-plated twin contacts and a slide-type, self-cleaning mechanism ensure high reliability.



Ordering Information

Type (striker color)		Flat actuator (Yellow)		Raised actuator (Yellow)	Type (striker color)		Flat actuator (Yellow)			Raised actuator (Yellow) (See note 2)
		Standard	With seal tape				Standard	With seal tape		
		DIP terminal	DIP terminal	DIP terminal			DIP terminal	DIP terminal		DIP terminal
										
No. of poles	Quantity per stick				No. of poles	Quantity per stick		Per stick	Per embossed tape (units of 900) (See note 1)	
1	130	A6T-1101	A6T-1102	A6T-1104	1	–	–	–	–	–
2	76	A6T-2101	A6T-2102	A6T-2104	2	76	A6S-2101	A6S-2102	–	A6S-2104
3	55	A6T-3101	A6T-3102	A6T-3104	3	55	A6S-3101	A6S-3102	–	A6S-3104
4	42	A6T-4101	A6T-4102	A6T-4104	4	42	A6S-4101	A6S-4102	A6S-4102-P	A6S-4104
5	35	A6T-5101	A6T-5102	A6T-5104	5	35	A6S-5101	A6S-5102	–	A6S-5105
6	28	A6T-6101	A6T-6102	A6T-6104	6	28	A6S-6101	A6S-6102	A6S-6102-P	A6S-6104
7	25	A6T-7101	A6T-7102	A6T-7104	7	25	A6S-7101	A6S-7102	–	A6S-7104
8	22	A6T-8101	A6T-8102	A6T-8104	8	22	A6S-8101	A6S-8102	A6S-8102-P	A6S-8104
9	20	A6T-9101	A6T-9102	A6T-9104	9	20	A6S-9101	A6S-9102	–	A6S-9104
10	18	A6T-0101	A6T-0102	A6T-0104	10	18	A6S-0101	A6S-0102	A6S-0102-P	A6S-0104

Note 1: Switches are packaged in units of 900. Orders must be made in multiples of 900. Switches are not sold individually.
Note 2: Raised actuators on embossed tape must be requested separately because orders can vary by such factors as units per order.

Specifications

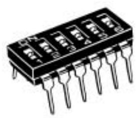
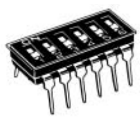
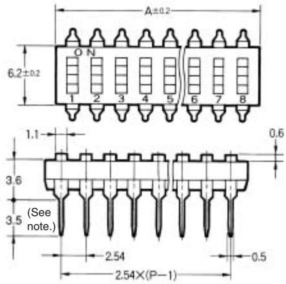
■ Rating/Characteristics

Switching capacity	25 mA at 24 VDC 10 μA (minimum current) at 3.5 VDC
Ambient temperature	Operating: -20°C to 70°C (with no icing)
Ambient humidity	Operating: 35% to 90%
Insulation resistance	100 MΩ min. (at 250 VDC)
Contact resistance	200 mΩ max. (initial value)
Dielectric strength	500 VAC for 1 min between terminals of the same polarity, and between terminals of different polarity
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Malfunction: 300 m/s^2 min.
Life expectancy	Mechanical: 1,000 operations min. Electrical: 1,000 operations min.
Operating force	Flat/raised type 0.29 N min. {30 gf}
Weight	A6T: 0.26 g (2 poles), 0.44 g (4 poles), 0.62 g (6 poles), 0.79 g (8 poles), 0.96 g (10 poles) A6S: 0.25 g (2 poles), 0.41 g (4 poles), 0.58 g (6 poles), 0.73 g (8 poles), 0.87 g (10 poles)

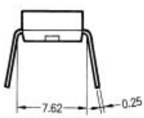
Dimensions

Note 1: All units are in millimeters unless otherwise indicated.
2: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Flat Actuator with DIP Terminal Standard/With Seal Tape
A6T-□101
A6T-□102

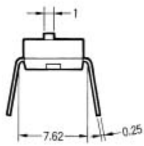




Flat Actuator Standard

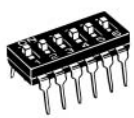


With Seal Tape

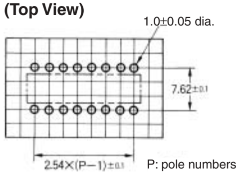
Raised Actuator



Raised Actuator with DIP Terminal
A6T-□104

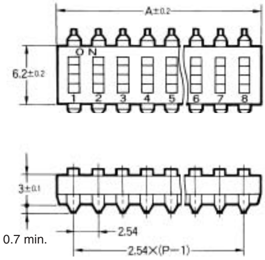


PCB Dimensions (Top View)

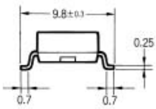


No. of poles	Model			Dimension A
1	A6T-1101	A6T-1102	A6T-1104	3.48
2	A6T-2101	A6T-2102	A6T-2104	6.02
3	A6T-3101	A6T-3102	A6T-3104	8.56
4	A6T-4101	A6T-4102	A6T-4104	11.10
5	A6T-5101	A6T-5102	A6T-5104	13.64
6	A6T-6101	A6T-6102	A6T-6104	16.18
7	A6T-7101	A6T-7102	A6T-7104	18.72
8	A6T-8101	A6T-8102	A6T-8104	21.26
9	A6T-9101	A6T-9102	A6T-9104	23.80
10	A6T-0101	A6T-0102	A6T-0104	26.34

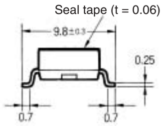
Flat Actuator with SMT Terminal
Standard/With Seal Tape
A6S-□101
A6S-□102



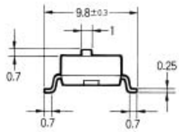
Flat Actuator Standard



With Seal Tape

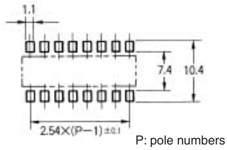


Raised Actuator



Raised Actuator with SMT Terminal
A6S-□104

PCB Dimensions (Top View)

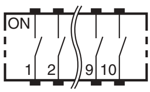


P: pole numbers

No. of poles	Model			Dimension A
2	A6S-2101	A6S-2102	A6S-2104	6.02
3	A6S-3101	A6S-3102	A6S-3104	8.56
4	A6S-4101	A6S-4102	A6S-4104	11.10
5	A6S-5101	A6S-5102	A6S-5104	13.64
6	A6S-6101	A6S-6102	A6S-6104	16.18
7	A6S-7101	A6S-7102	A6S-7104	18.72
8	A6S-8101	A6S-8102	A6S-8104	21.26
9	A6S-9101	A6S-9102	A6S-9104	23.80
10	A6S-0101	A6S-0102	A6S-0104	26.34

Installation

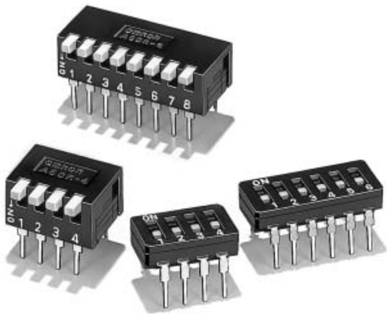
■ Internal Connections (Top View)



DIP Switches

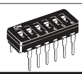
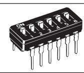
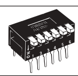
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

High Performance DIP Switches with Dustproof Construction (Internally Sealed)



- ROHS compliant.
- Dustproof construction yields superior contact reliability.
- Designed to DIP (Dual Inline Package) standards and allows automatic mounting with IC insertion machines (Flat actuator types only).
- Smooth, sure switching action.
- Gold-plated twin contacts and a slide-type, self-cleaning mechanism ensure high reliability.

Ordering Information

Type (striker color)		Flat actuator (Yellow)	Raised actuator (Yellow)	Side actuator (Yellow)
No. of poles	**Quantity per stick**			
4	43	A6D-4100	A6D-4103	A6DR-4100
6	30	A6D-6100	A6D-6103	A6DR-6100
8	23	A6D-8100	A6D-8103	A6DR-8100
10	19	A6D-0100	A6D-0103	A6DR-0100

Note 1: The side-actuator model has a flat actuator inside.
2: Contact your OMRON sales representatives to request special markings or designations.
3: The quantity per stick applies only to A6Ds. A6DRs are packaged 50 to a box.

Specifications

■ Rating/Characteristics

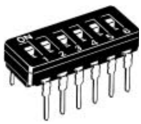
Switching capacity	100 mA at 5 VDC and 30 mA at 30 VDC (switching current) 10 μA at 3.5 VDC (minimum current)
Ambient temperature	Operating: -20 to 70°C (no icing)
Ambient humidity	35 to 90%
Insulation resistance	100 mΩ min. (at 250 VDC)
Contact resistance	100 mΩ max. (initial value)
Dielectric strength	500 VAC for 1 minute between terminals of the same polarity, and between terminals of different polarity
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5 mm double amplitude
Shock resistance	Malfunction: 300 m/s^2 min.
Life expectancy	Mechanical: 5,000 operations min. Electrical: 2,000 operations min.
Operating force	4.90 N max.
Weight	Flat and raised actuators: 0.45 g (4 poles), 0.65 g (6 poles), 0.80 g (8 poles), 1.0 g (10 poles) Side-actuators: 0.8 g (4 poles), 1.2 g (6 poles), 1.7 g (8 poles), 2.2 g (10 poles)

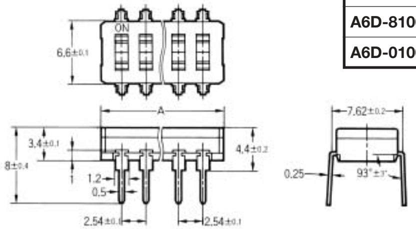
Dimensions

Note 1: All units are in millimeters unless otherwise indicated.
2: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Flat Actuator
A6D-□100

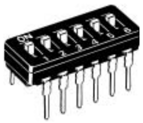
Model	Dimension A±0.2
A6D-4100	12.2
A6D-6100	17.3
A6D-8100	22.4
A6D-0100	27.4

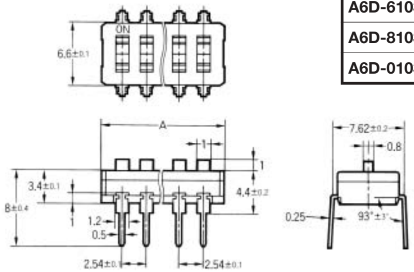




Raised Actuator
A6D-□103

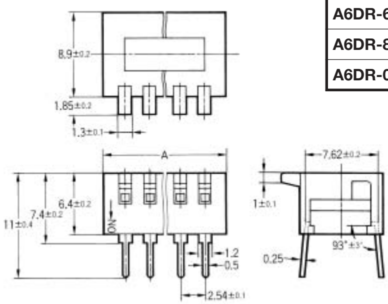
Model	Dimension A±0.2
A6D-4103	12.2
A6D-6103	17.3
A6D-8103	22.4
A6D-0103	27.4





Raised Actuator
A6D-□103

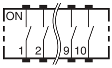
Model	Dimension A±0.2
A6DR-4100	12.2
A6DR-6100	17.3
A6DR-8100	22.4
A6DR-0100	27.4



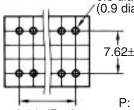
Installation

Internal Connections (Top View)

Internal connections (top view)



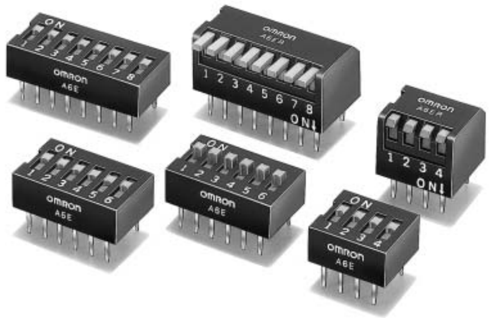
Mounting holes (top view)
(Single-sided PCB, t=1.2 to 1.6)



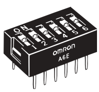
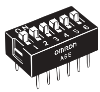
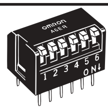
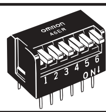
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Low-cost DIP Switch

- ROHS compliant.
- The sealed bottom prevents flux penetration.
- A variety of models with short or long actuators (levers) available.



Ordering Information

Type (striker color)		Flat actuator (Yellow)	Raised actuator (Yellow)	Type	Side actuator (short-lever) (Yellow)	Side actuator (long-lever) (Yellow)
		DIP Terminal	DIP Terminal		DIP Terminal	DIP Terminal
No. of poles	Quantity per stick			Quantity per stick		
2	73	A6E-2101	A6E-2104	70	A6ER-2101	A6ER-2104
3	52	A6E-3101	A6E-3104	50	A6ER-3101	A6ER-3104
4	40	A6E-4101	A6E-4104	39	A6ER-4101	A6ER-4104
5	33	A6E-5101	A6E-5104	32	A6ER-5101	A6ER-5104
6	28	A6E-6101	A6E-6104	27	A6ER-6101	A6ER-6104
7	24	A6E-7101	A6E-7104	24	A6ER-7101	A6ER-7104
8	21	A6E-8101	A6E-8104	21	A6ER-8101	A6ER-8104
9	19	A6E-9101	A6E-9104	19	A6ER-9101	A6ER-9104
10	17	A6E-0101	A6E-0104	17	A6ER-0101	A6ER-0104

Specifications

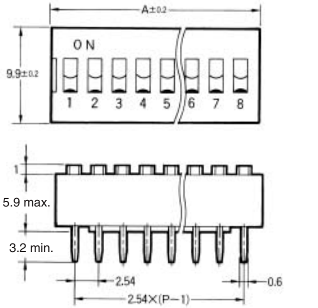
Rating/Characteristics

Switching capacity	25 mA at 24 VDC, 10 µA (minimum current) at 3.5 VDC
Ambient temperature	Operating: -20°C to 70°C (with no icing)
Ambient humidity	Operating: 35% to 90%
Insulation resistance	100 MΩ min. (at 250 VDC)
Contact resistance	200 mΩ max. (initial value)
Dielectric strength	500 VAC for 1 min between terminals of the same polarity, and between terminals of different polarity
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Malfunction: 300 m/s2 min.
Life expectancy	Mechanical: 1,000 operations min. Electrical: 1,000 operations min.
Operating force	0.29 N min. {30 gf}
Weight	A6E: 0.66 g (2 poles), 1.00 g (4 poles), 1.32 g (6 poles), 1.65 g (8 poles), 1.98 g (10 poles) A6ER: 1.01 g (2 poles), 1.51 g (4 poles), 2.00 g (6 poles), 2.51 g (8 poles), 3.02 g (10 poles)

Dimensions

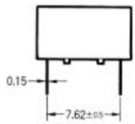
Note 1: All units are in millimeters unless otherwise indicated.
2: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Flat Actuator with DIP Terminal
A6E-□101

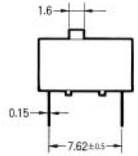


P: Pole numbers

Flat Actuator

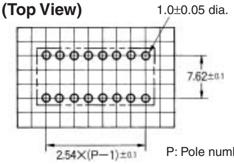


Raised Actuator



Raised Actuator with DIP Terminal
A6E-□104

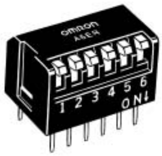
PCB Dimensions (Top View)

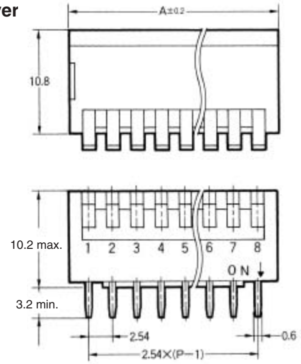


P: Pole numbers

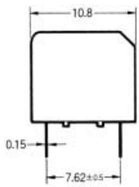
No. of poles	Model		Dimension A
2	A6E-2101	A6E-2104	6.64
3	A6E-3101	A6E-3104	9.18
4	A6E-4101	A6E-4104	11.72
5	A6E-5101	A6E-5104	14.26
6	A6E-6101	A6E-6104	16.80
7	A6E-7101	A6E-7104	19.34
8	A6E-8101	A6E-8104	21.88
9	A6E-9101	A6E-9104	24.42
10	A6E-0101	A6E-0104	26.96

DIP Terminal
Side Actuator (short-lever
A6ER-□101

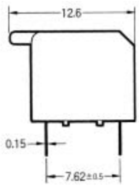




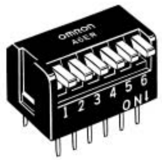
Side Actuator (long-lever)



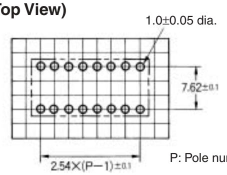
Side Actuator (short-lever)



Side Actuator (long-lever)
A6ER-□104



PCB Dimensions
(Top View)

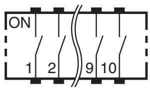


P: Pole numbers

No. of poles	Model		Dimension A
2	A6E-2101	A6E-2104	6.64
3	A6E-3101	A6E-3104	9.18
4	A6E-4101	A6E-4104	11.72
5	A6E-5101	A6E-5104	14.26
6	A6E-6101	A6E-6104	16.80
7	A6E-7101	A6E-7104	19.34
8	A6E-8101	A6E-8104	21.88
9	A6E-9101	A6E-9104	24.42
10	A6E-0101	A6E-0104	26.96

Installation

■ Internal Connections (Top View)

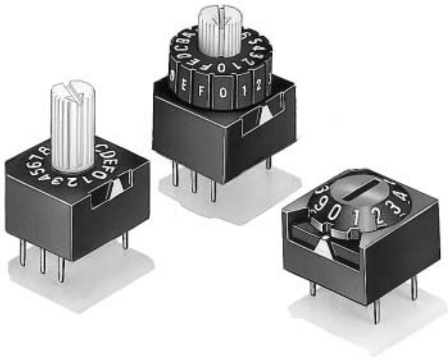


ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

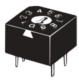
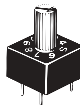
DIP Switches

Select the Right Rotary DIP Switch for the Type of Operation

- ROHS compliant.
- Series includes a standard type that can be operated from the top or side, an extended shaft type that can be operated while mounted on a panel, and a flat type.
- A slider lock and rotating PCB system ensure stable contact reliability.
- Completely sealed construction prevents flux entry during automatic flow soldering.



Ordering Information

No. of Switching positions	Type (rotor color) / Appearance / Output code	Standard type (Black)	Flat type (White)	Extended shaft type (White)	Thumbwheel type (White)
	Appearance				
10	BCD/hexadecimal 1-2-4-8 code	A6A-10R	A6A-10RF	A6A-10RS	A6A-10RW
	BCD/hexadecimal 1-2-4-8 complement code	A6A-10C	A6A-10CF	A6A-10CS	A6A-10CW
16	BCD/hexadecimal 1-2-4-8 code	A6A-16R	A6A-16RF	A6A-16RS	A6A-16RW
	BCD/hexadecimal 1-2-4-8 complement code	A6A-16C	A6A-16CF	A6A-16CS	A6A-16CW

Note 1: Contact your OMRON sales representatives to request special markings or designations.
2: The standard packing configuration is units of 100 per box.

Specifications

■ Rating/Characteristics

Switching capacity	1 mA to 0.1 A at 5 to 28 VDC (switching current)
Ambient temperature	Operating: -10 to 70°C (no icing)
Ambient humidity	85% max.
Insulation resistance	10 MΩ min. (at 250 VDC)
Contact resistance	200 mΩ max. (initial value)
Dielectric strength	500 VAC at 50/60 Hz for 1min between ground and the charging plate 250 VAC at 50/60 Hz for 1min between terminals of the same polarity
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5 mm double amplitude
Shock resistance	Malfunction: 300 m/s^2 min.
Operating force	1.18 to 2.45 x 10^{-2} N·m
Weight	Approx. 0.75g for the A6A-10R

■ 10-position Models

Type / Termonal No. / Postion	BCD/hexadecimal 1-2-4-8 code				BCD/hexadecimal 1-2-4-8 complement code			
	1	2	3	4	5	6	7	8
0					•	•	•	•
1	•					•	•	•
2		•			•		•	•
3	•	•					•	•
4			•		•	•		•
5	•		•			•		•
6		•	•		•			•
7	•	•	•					•
8				•	•	•	•	
9	•			•		•	•	

■ 16-position Models

Type / Termonal No. / Postion	BCD/hexadecimal 1-2-4-8 code				BCD/hexadecimal 1-2-4-8 complement code			
	1	2	3	4	5	6	7	8
0					•	•	•	•
1	•					•	•	•
2		•			•		•	•
3	•	•					•	•
4			•		•	•		•
5	•		•			•		•
6		•	•		•			•
7	•	•	•					•
8				•	•	•	•	
9	•			•		•	•	
A		•		•	•		•	
B	•	•		•			•	
C			•	•	•	•		
D	•		•	•		•		
E		•	•	•	•			
F	•	•	•	•				

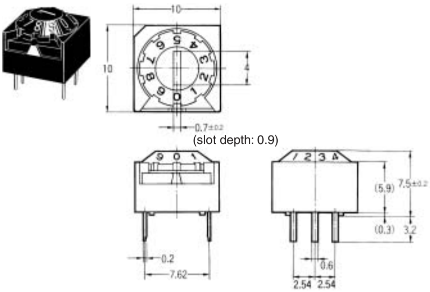
Note: ‘•’ indicates that the internal switch is ON.

Dimensions

Note 1: All units are in millimeters unless otherwise indicated.

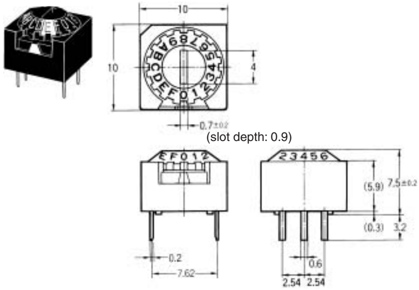
Standard Type, 10 Positions

A6A-10R, A6A-10C



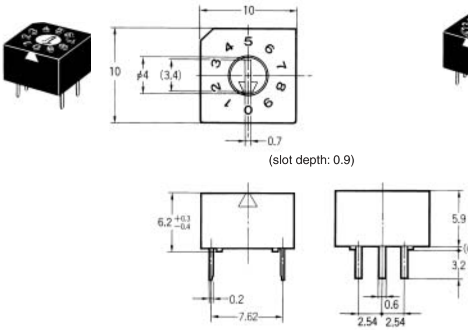
Standard Type, 16 Positions

A6A-16R, A6A-16C



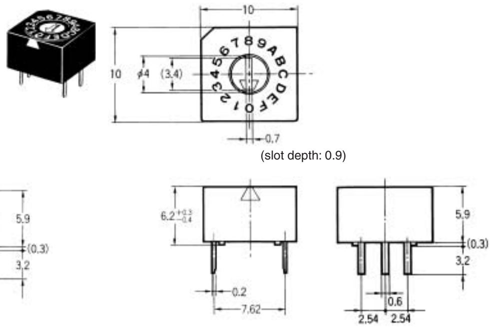
Flat Type, 10 Positions

A6A-10RF, A6A-10CF



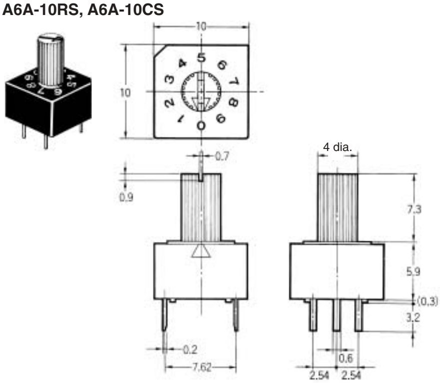
Flat Type, 16 Positions

A6A-16RF, A6A-16CF



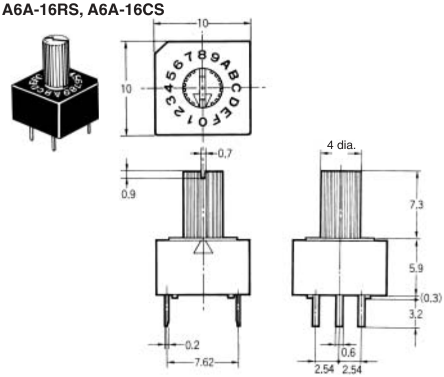
Extended Shaft Type, 10 Positions

A6A-10RS, A6A-10CS

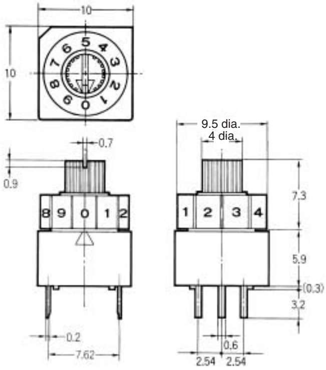


Extended Shaft Type, 16 Positions

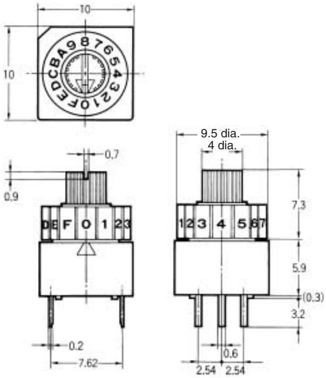
A6A-16RS, A6A-16CS



Thumbwheel Type, 10 Positions
A6A-10RW, A6A-10CW



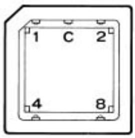
Thumbwheel Type, 16 Positions
A6A-16RW, A6A-16CW



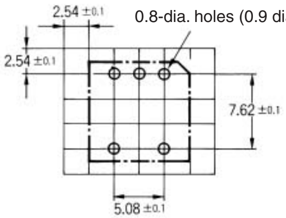
Installation

■ Internal Connections (Top View)

Terminal arrangement (bottom view)



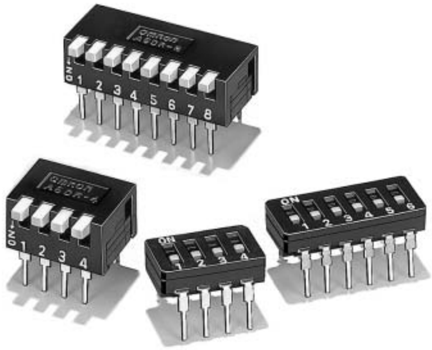
Mounting holes (top view)



DIP Switches

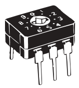
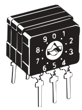
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Internally Sealed DIL-IC Type Rotary DIP Switch



- ROHS compliant.
- A precision rotary cam and contact driving mechanisms facilitate miniaturization.
- Reductions of 72% in height, 66% vertically, 90% horizontally and 43% in overall volume compared with the A6A allow for higher density mounting.
- Insert-molded terminals and an O-ring sealed rotor provide an airtight structure that keeps out dust, dirt and flux.
- Offset between terminal pins and side of case allows simple circuit inspection.

Ordering Information

No. of Switching positions	Type (rotor colour) / Appearance / Output code	Top actuated type (Yellow)	Side actuated type (Yellow)
			
10	BCD/hexadecimal 1-2-4-8	A6C-10R (N)	A6CV-10R
16	BCD/hexadecimal 1-2-4-8	A6C-16R (N)	A6CV-16R

Note : A6Cs are packaged 55 units to a stick. A6CVs are packaged 100 to a box.

Specifications

Rating/Characteristics

Switching capacity	1 mA to 0.1 A (switching capacity) at 5 to 30 VDC Minimum permissible load of 10 mA (resistor load) at 3.5 VDC
Ambient temperature	Operating: -20 to 70°C (no icing)
Ambient humidity	35 to 95%
Insulation resistance	100 MΩ min. (at 250 VDC)
Contact resistance	200 mΩ max.
Dielectric strength	250 VAC for 1 minute between terminals of the same pole
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5 mm double amplitude
Shock resistance	Malfunction: Approx. 300 m/s²
Life expectancy	Mechanical: 10,000 operations min. Electrical: 2,000 operations min.
Operating torque	0.98×10^{-2} N·m max.
Weight	A6C-10R (N): approx. 0.4 g A6CV-10R: approx. 0.7 g

Output Code Tables

■ 10-position Models

Type	A6C-10R, A6CV-10R			
Code	BCD/hexadecima• 1-2-4-8 code			
Position	**1**	**2**	**3**	**4**
0				
1	•			
2		•		
3	•	•		
4			•	
5	•		•	
6		•	•	
7	•	•	•	
8				•
9	•			•

■ 16-position Models

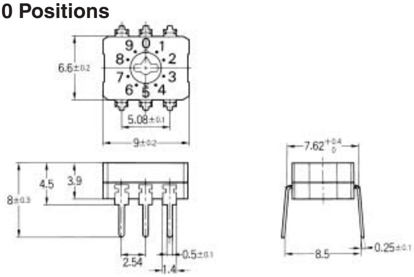
Type	A6C-16R, A6CV-16R			
Code	BCD/hexadecimal 1-2-4-8 code			
Position	**1**	**2**	**3**	**4**
0				
1	•			
2		•		
3	•	•		
4			•	
5	•		•	
6		•	•	
7	•	•	•	
8				•
9	•			•
A		•		•
B	•	•		•
C			•	•
D	•		•	•
E		•	•	•
F	•	•	•	•

Note: '•' n the above tables shows the output terminal No. that has continuity with the common terminal (C).

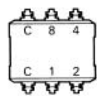
Dimensions

Note 1: All units are in millimeters unless otherwise indicated.

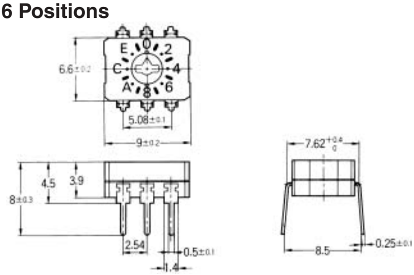
Top Actuated, 10 Positions
A6C-10R (N)



Terminal arrangement (top view)

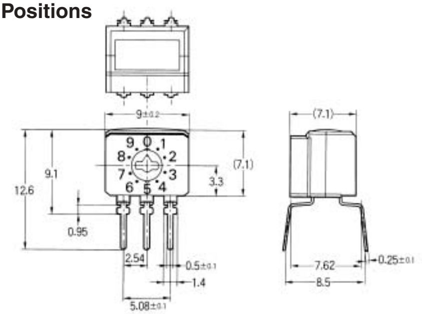


Top Actuated, 16 Positions
A6C-16R (N)

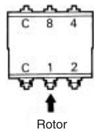


DIP Switches

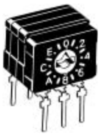
Side Actuated, 10 Positions
A6CV-10R

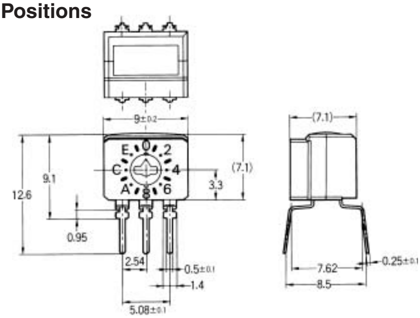


Terminal arrangement (top view)



Side Actuated, 16 Positions
A6CV-16R

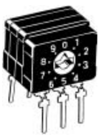


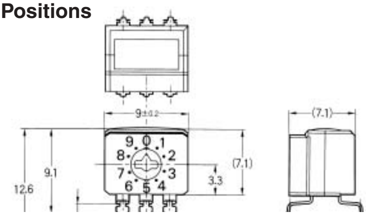


Installation

Internal Connections (Top View)

Side Actuated, 10 Positions
A6CV-10R

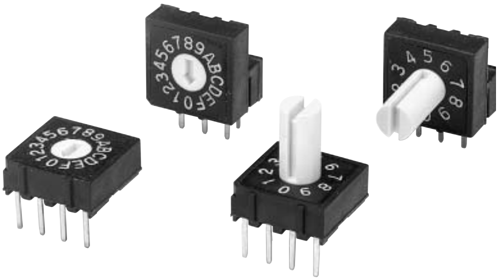




ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

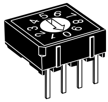
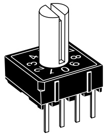
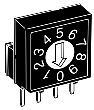
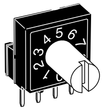
Low-cost Rotary DIP Switches

- ROHS compliant.
- Series includes top-actuated, side-actuated, flat, and extended-shaft models.
- The rotor has an O-ring sealed construction that prevents the ingress of dirt and dust.
- Two different types of terminal arrangement are available for each model to allow flexibility in the circuit design.



Ordering Information

List of Models

			Type	Top-actuated, flat (White) (White)	Top-actuated, extended shaft	Side-actuated, flat (White) (White)	Side-actuated, extended shaft
Appearance							
No. of Positions	**Quantity per stick**	**Terminal Arrangement**	**Output Code**				
10	48	4 x 1	Real code	A6R-101RF	A6R-101RS	A6RV-101RF	A6RV-101RS
		3 x 3	Real code	A6R-102RF	A6R-102RS	A6RV-102RF	A6RV-102RS
16	48	4 x 1	Real code	A6R-161RF	A6R-161RS	A6RV-161RF	A6RV-161RS
		3 x 3	Real code	A6R-162RF	A6R-162RS	A6RV-162RF	A6RV-162RS

Note: Switches are delivered in units of 48. Orders must be made in multiples of 48.

Specifications

Rating/Characteristics

Rating	25 mA at 24 VDC
Ambient operating temperature	-25 to 80°C (with no icing or condensation)
Ambient operating humidity	35% to 95%
Insulation resistance	100 MΩ min. (at 250 VDC)
Contact resistance	200 mΩ max. (initial value)
Dielectric strength	250 VAC for 1 minute between terminals of the same polarity
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Malfunction: Approx. 300 m/s^2
Electrical life expectancy	5,000 steps min.
Operating torque	1.96 x 10^{-2} N·m max.
Weight	4x1, top-actuated: 0.64 g 3x3, top-actuated: 0.62 g 4x1, side-actuated: 0.8 g 3x3, side-actuated: 0.83 g (Add 0.13 g for the extended-shaft version of each model.)

Output Code Tables

■ 10-position Models

Code	Real Code			
Position	1	2	3	4
0				
1	•			
2		•		
3	•	•		
4			•	
5	•		•	
6		•	•	
7	•	•	•	
8				•
9	•			•

■ 16-position Models

Code	Real Code			
Position	1	2	3	4
0				
1	•			
2		•		
3	•	•		
4			•	
5	•		•	
6		•	•	
7	•	•	•	
8				•
9	•			•
A		•		•
B	•	•		•
C			•	•
D	•		•	•
E		•	•	•
F	•	•	•	•

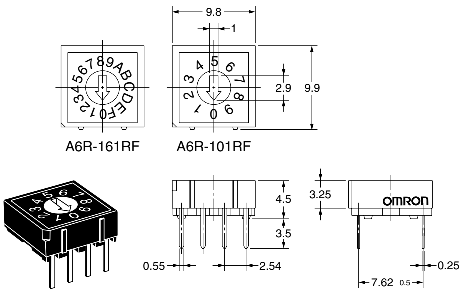
Note: '•' indicates that the internal switch is ON.

Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. A tolerance of ±0.4 mm applies to the above dimensions unless otherwise specified.

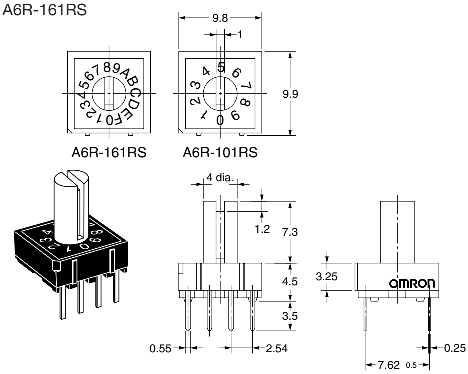
Top-actuated Flat Models with 4x1 Terminal Arrangement

A6R-101RF
A6R-161RF



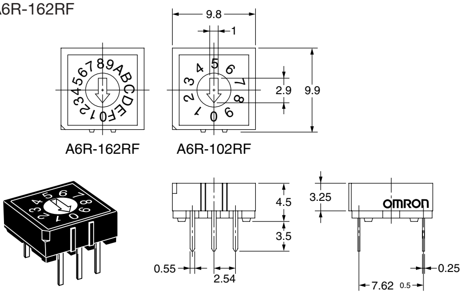
Top-actuated Extended-shaft Models with 4x1 Terminal Arrangement

A6R-101RS
A6R-161RS



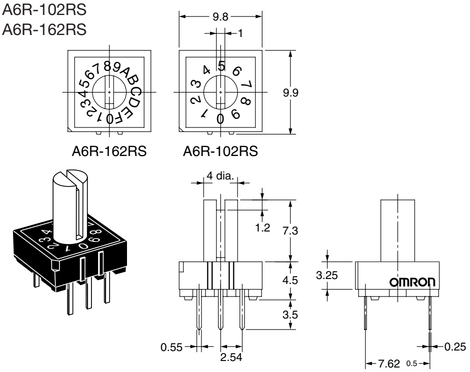
Top-actuated Flat Models with 3x3 Terminal Arrangement

A6R-102RF
A6R-162RF



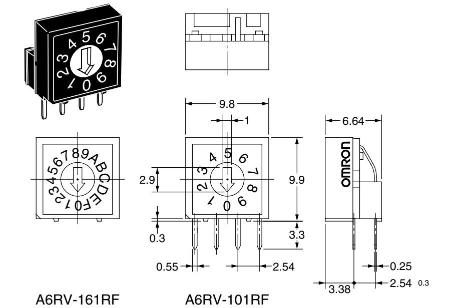
Top-actuated Extended-shaft Models with 3x3 Terminal Arrangement

A6R-102RS
A6R-162RS



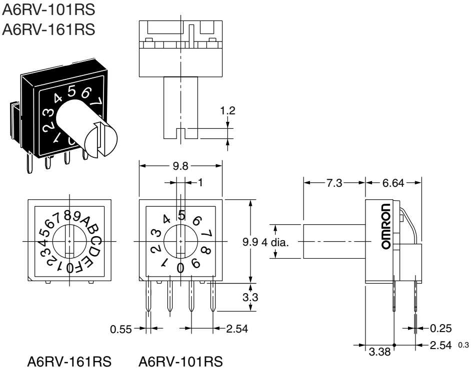
Side-actuated Flat Models with 4x1 Terminal Arrangement

A6RV-101RF
A6RV-161RF



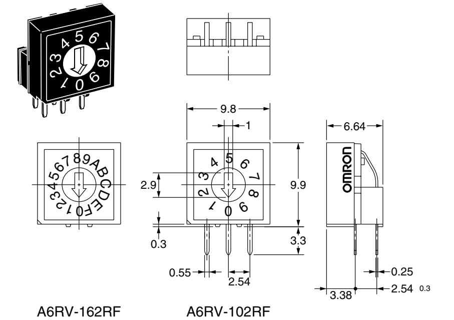
Side-actuated Extended-shaft Models with 4x1 Terminal Arrangement

A6RV-101RS
A6RV-161RS



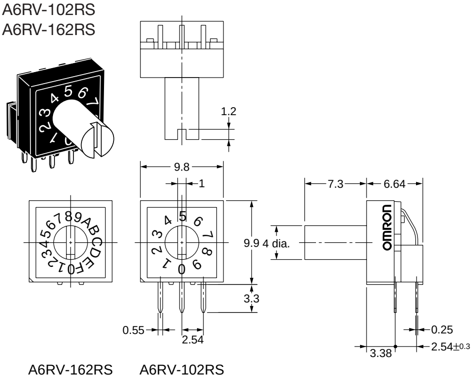
Side-actuated Flat Models with 3x3 Terminal Arrangement

A6RV-102RF
A6RV-162RF



Side-actuated Extended-shaft Models with 3x3 Terminal Arrangement

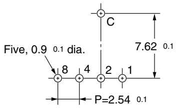
A6RV-102RS
A6RV-162RS



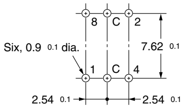
■ PCB Cutout Dimensions

Top-actuated Models

4x1 Terminal Arrangement

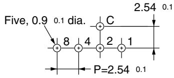


3x3 Terminal Arrangement

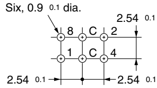


Side-actuated Models

4x1 Terminal Arrangement



3x3 Terminal Arrangement



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

■ Cautions

Use the Switch within the rated voltage and current ranges, otherwise the Switch may have a shortened life expectancy, radiate heat, or burn out. This particularly applies to the instantaneous voltages and currents when switching.

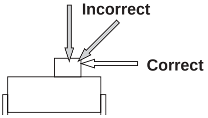
■ Correct Use

HANDLING

Operation

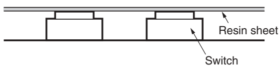
Do not repeatedly operate the Switch with excessive force. Applying excessive pressure or applying additional force after the plunger has stopped may deform the disc spring of the Switch, resulting in malfunction.

Be sure to set up the Switch so that the plunger will operate in a straight vertical line. A decrease in the life of the Switch may result if the plunger is pressed off-center or from an angle.



DUST PROTECTION

The Switches are not sealed and should be protected with a resin sheet as shown below when used in dust-prone environments.



PCBS

The Switch is designed for a 1.6-mm thick, single-side PCB.

Using PCBs with a different thickness or using double-sided, through-hole PCBs may result in loose mounting, improper insertion, or poor heat resistance in soldering. These effects will occur, depending on the type of holes and patterns of the PCB. Therefore, it is recommended that a verification test is conducted before use.

If the PCBs are separated after mounting the Switch, particles from the PCBs may enter the Switch.

SOLDERING

General Precautions

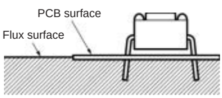
Before soldering the Switch on a multilayer PCB, test to confirm that soldering can be performed properly. Otherwise the Switch may be deformed by the soldering heat on the pattern or lands of the multilayer PCB.

Do not solder the Switch more than twice, including rectification soldering. An interval of five minutes is required between the first and second soldering.

Automatic Soldering Baths
(B3F, B3W, B3WN, B3M, B3J)

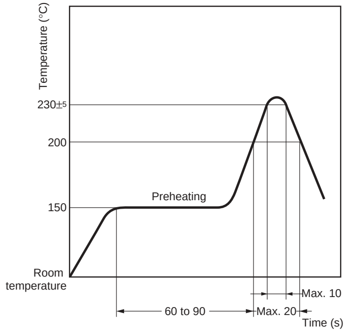
Soldering temperature: 260°C max.
Soldering time: 5 s max. for a 1.6-mm thick single-side PCB

Make sure that no flux will rise above the level of the PCB. If flux overflows onto the mounting surface of the PCB, it may enter the Switch and cause a malfunction.



Reflow Soldering (Surface Mounting)
(B3FS, B3SN, B3S, B6J)

Solder the terminals within the heating curve shown in the following diagram.



Note: The above heating curve applies if the PCB thickness is 1.6 mm.

The peak temperature may vary depending on the reflow bath used. Confirm the conditions beforehand.

Do not use an automatic soldering bath for surface-mounted Switches. The soldering gas or flux may enter the Switch and damage the Switch's push-button operation.

Manual Soldering (All Models)

Soldering temperature: 350°C max. at the tip of the soldering iron
Soldering time: 3 s max. for a 1.6-mm thick, single-side PCB

Before soldering the Switch on a PCB, make sure that there is no unnecessary space between the Switch and the PCB.

WASHING

Washable and Non-washable Models

Washable (sealed types)	B3W, B3WN, B3S, B3SN
Non-washable (Standard types)	B3F, B3FS, B3M, B3J

Standard Switches are not sealed, and cannot be washed. Doing so will cause the washing agent, together with flux or dust particles on the PCB, to enter the Switch, resulting in malfunction.

Washing Methods

Washing equipment incorporating more than one washing bath can be used to clean washable models, provided that the washable models are cleaned for one minute maximum per bath and the total cleaning time does not exceed three minutes.

Washing Agents

Apply alcohol-based solvents to clean washable models. Do not apply any other agents or water to clean any washable model, as such agents may degrade the materials or performance of the Switch.

Washing Precautions

Do not impose any external force on washable models while washing.

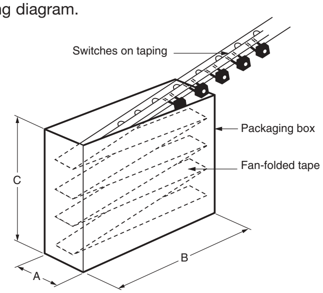
Do not clean washable models immediately after soldering. The cleaning agent may be absorbed into the Switch through respiration as the Switch cools. Wait for at least three minutes after soldering before cleaning washable models.

Do not use Sealed Switches while submersed in water or in locations exposed to water.

SWITCH PACKAGING (TAPING SPECIFICATION MODELS)

RADIAL TYPES

The tape is packaged by fan-folding into the box, as shown in the following diagram.



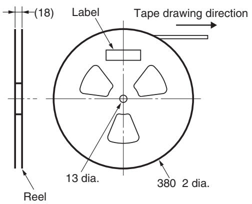
Model	A	B	C
B3F	50 mm	325 mm	275 mm
B3WN	53 mm	326 mm	350 mm

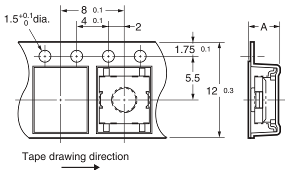
Do not apply any external force to the packaging box, or subject it to vibration. Doing so may deform the Switch terminals.

Remove the tape slowly, making sure that the Switches are not entangled or caught. Otherwise the terminals may be deformed.

Do not store the packaged Switches in locations subject to high temperatures or high humidity. The packaging boxes are sealed with paper tape and are not airtight. Storing the packaged Switches in locations with high temperature or high humidity may result in deterioration of the tape and Switches, and long-term storage under such conditions may cause discoloration of the Switch terminals.

Packaging Specifications for Embossed Tape (B3FS-1000P/-1002P, B3SN)



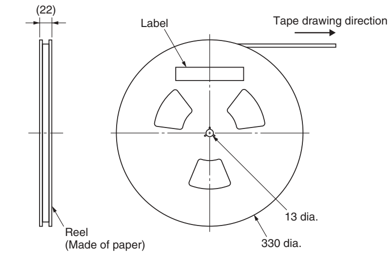


Model	A
B3FS-1000P B3FS-1002P	3.9 mm
B3SN	3.6 mm

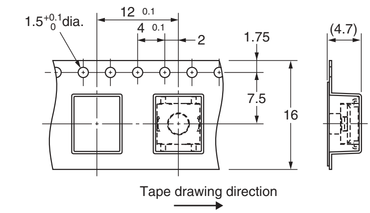
Standards	Conforms to JEITA.
Package	3,000 Switches
Heat resistance	50°C for 24 hours (without deformation)

Note: Switches with ground terminals are packaged with the ground terminal on the opposite side of the guide hole.

B3FS-1010P

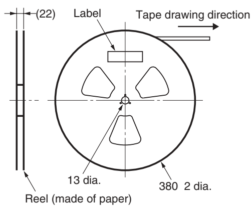


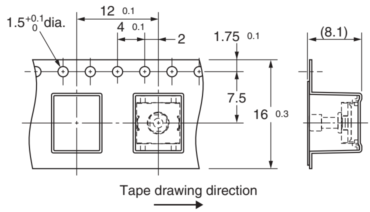
$1.5^{0.1}$ dia.



Standards	Conforms to JEITA.
Package	1,000 Switches
Heat resistance	60°C for 24 hours (without deformation)

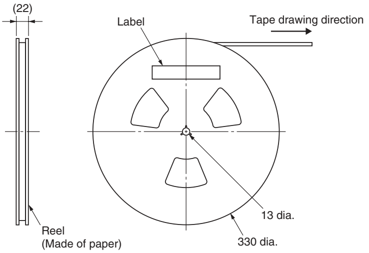
B3FS-1050P

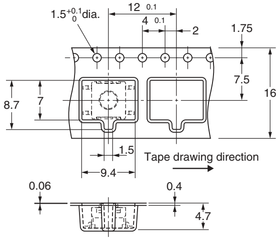




Standards	Conforms to JEITA.
Package	1,000 Switches
Heat resistance	60°C for 24 hours (without deformation)

B3S





Standards	Conforms to JEITA.
Package	1,000 Switches
Heat resistance	50°C for 24 hours (without deformation)

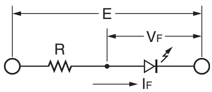
Note: Switches with ground terminals are packaged with the ground terminal on the opposite side of the guide hole.

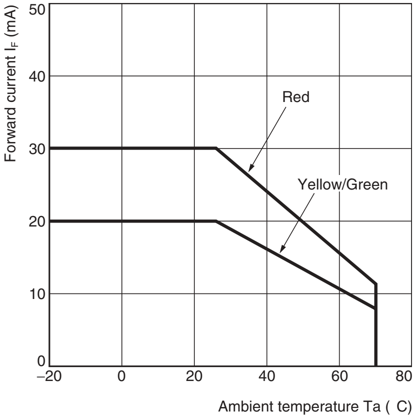
LEDs (B3J)

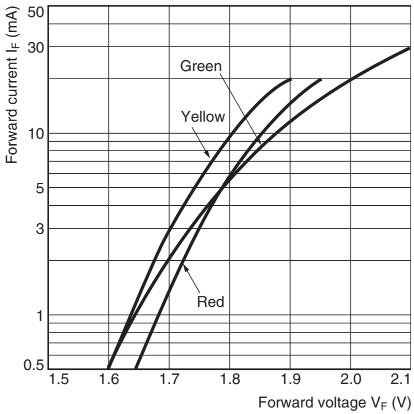
Make sure that the polarity of the LEDs is correct. The polarity is not indicated on the Switch, but the positive pole is located on the back surface of the Switch on the side without the OMRON mark.

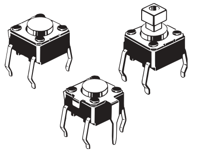
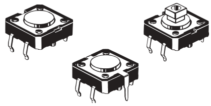
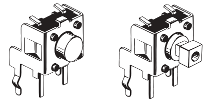
Connect limiting resistors to the LEDs. The Switch does not have built-in limiting resistors, so satisfy the LED characteristics by obtaining the limiting resistance according to the following formula based on the voltage to be used.

$$\text{Limiting resistance (R)} = \frac{\text{(Voltage used (E) – LED forward voltage (VF))}}{\text{LED forward current (IF)}} \ (\Omega)$$

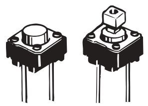
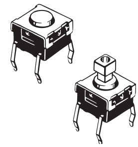
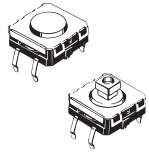






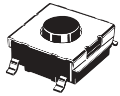
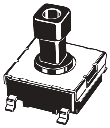
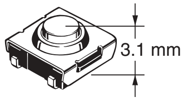
Item			Standard Switches									
Model			**B3F**									
Size			6 x 6 mm									
Appearance												
						Standard		Long life expect-ancy	High reliability	Vertical type		
Features			Wide range of models, including 6 x 6 mm, 12 x 12 mm, vertical, and high-force types.									
Contact			Silver-plated			Silver-plated		Silver-plated	Gold-plated	Silver-plated		
	Plunger	**Operating force**	0.98 N {100 gf}	1.47 N {150 gf}	2.55 N {260 gf}	1.27 N {130 gf}	2.55 N {260 gf}	1.27 N {130 gf}	1.27 N {130 gf}	0.98 N {100 gf}	1.47 N {150 gf}	2.55 N {260 gf}
Type	Flat type (height: 3.1mm)	Without ground	–	–	–	–	–	–	–	–	–	–
		With ground	–	–	–	–	–	–	–	–	–	–
	Flat type (height 4.3 mm) (vertical model: 3.15 mm)	Without ground	B3F-1000	B3F-1002	B3F-1005	B3F-4000	B3F-4001	B3F-5000	B3F-5001	–	–	–
		With ground	B3F-1100	B3F-1102	B3F-1105	B3F-4100	B3F-4105	B3F-5100	B3F-5101	B3F-3100	B3F-3102	B3F-3105
	Flat type (height 5.0 mm) (vertical model: 3.85 mm)	Without ground	B3F-1020	B3F-1022	B3F-1025	–	–	–	–	–	–	–
		With ground	B3F-1120	B3F-1122	B3F-1125	–	–	–	–	B3F-3120	B3F-3122	B3F-3125
	Flat type and others	Without ground	–	–	–	–	–	–	–	–	–	–
		With ground	B3F-1110	–	–	–	–	–	–	–	–	–
	Projected type (height 7.3 mm) (vertical model: 6.15 mm)	Without ground	B3F-1050	B3F-1052	B3F-1055	B3F-4050	B3F-4055	B3F-5050	B3F-5051	–	–	–
		With ground	B3F-1150	B3F-1152	B3F-1155	B3F-4155	B3F-5155	B3F-5150	B3F-5151	B3F-3150	B3F-3152	B3F-3155
Life expectancy (operations)			1,000,000	300,000	100,000	3,000,000	1,000,000	10,000,000	10,000,000	1,000,000	300,000	100,000
Enclosure rating			None (IP00)									
Cleaning			Not possible									
Packag-ing	Bag (standard)		100			100				100		
	Box (standard)		1,500			500				1,500		
	Embossed tape (model number: P suffix)		–			–				–		
Key top (for projected type)	4 x 4mm		B32-10□0			–				B32-10□0		
	9 x 9mm		–			B32-12□0				–		
	12 x 12mm		–			B32-13□0				–		
	Diameter: 9.5mm		–			B32-16□0				–		
Page			747									

Note: The colour is indicated in □ models for key tops.

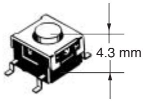
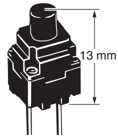
Item			Standard Switches		Sealed Switches			
Model			**B3F-6**		**B3W**			
Size			6 x 6 mm		6 x 6 mm		12 x 12 mm	
Appearance			 Radial taped type					
Features			Can be used with general-purpose radial taping parts insertion machines		Sealed construction that allows immersion cleaning after soldering. Dust-proof for application in adverse environments.			
Contact			Silver-plated		Silver-plated		Silver-plated	
	Plunger	**Operating force**	0.98 N {100 gf}	1.47 N {150 gf}	1.57 N {160 gf} max.	2.26 N {230 gf} max.	1.96 N {200 gf} max.	3.43 N {350 gf} max.
Type	Flat type (height: 3.1mm)	Without ground	–	–	–	–	–	–
		With ground	–	–	–	–	–	–
	Flat type (height 4.3 mm) (vertical model: 3.15 mm)	Without ground	B3F-6000	B3F-6002	B3W-1000	B3W-1002	B3W-4000	B3W-4002
		With ground	B3F-6100	B3F-6102	B3W-1100	B3W-1102	B3W-4100	B3W-4102
	Flat type (height 5.0 mm) (vertical model: 3.85 mm)	Without ground	B3F-6020	B3F-6022	–	–	–	–
		With ground	B3F-6120	B3F-6122	–	–	–	–
	Flat type and others	Without ground	–	–	–	–	–	–
		With ground	–	–	–	–	–	–
	Projected type (height 7.3 mm) (vertical model: 6.15 mm)	Without ground	B3F-6050	B3F-6052	B3W-1050	B3W-1052	B3W-4050	B3W-4052
		With ground	B3F-6150	B3F-6152	B3W-1150	B3W-1052	B3W-4150	B3W-4052
Life expectancy (operations)			1,000,000	300,000	1,000,000	300,000	3,000,000	1,000,000
Enclosure rating			None (IP00)		Equivalent to IP64			
Cleaning			Not possible		Possible			
Packag-ing	Bag (standard)		–		100		100	
	Box (standard)		1,000 (radial taped)		1,500		500	
	Embossed tape (model number: P suffix)		–		–		–	
Key top (for projected type)	4 x 4mm		B32-10□0		B32-10□0		–	
	9 x 9mm		–		–		B32-12□0	
	12 x 12mm		–		–		B32-13□0	
	Diameter: 9.5mm		–		–		B32-16□0	
Page			747		756			

Note: The colour is indicated in □ models for key tops.

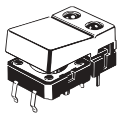
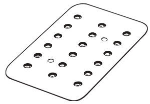
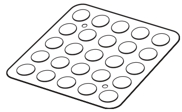
Tactile Switches

Item			SMD Switches		
Model			**B3FS**		**B3SN**
Size			6 x 6 mm		
Appearance					
Features			Surface-mounting Switches ideal for high-density mounting.		Sealed construction conforming to IP64.
Contact			Silver-plated		Silver-plated
	Plunger	**Operating force**	0.98 N {100 gf} max.	1.47 N {150 gf} max.	1.57 N {160 gf} max.
Type	Flat type (height: 3.1mm)	Without ground	B3FS-1000	B3FS-1002	B3FS-3012
		With ground	–	–	B3FS-3112
	Flat type (height 4.3 mm) (vertical model: 3.15 mm)	Without ground	B3FS-1010	B3FS-1012	–
		With ground	–	–	–
	Flat type (height 5.0 mm) (vertical model: 3.85 mm)	Without ground	–	–	–
		With ground	–	–	–
	Flat type and others	Without ground	–	–	–
		With ground	–	–	–
	Projected type (height 7.3 mm) (vertical model: 6.15 mm)	Without ground	B3W-1050	B3W-1052	–
		With ground	–	–	–
Life expectancy (operations)			1,000,000	300,000	100,000
Enclosure rating			None (IP00)		Equivalent to IP64
Cleaning			Not possible		Possible
Packaging	Bag (standard)		100		100
	Box (standard)		1,500		1,500
	Embossed tape (model number: P suffix)		Refer to precautions page		3,000 per reel
Key top (for projected type)	4 x 4mm		B32-10□0		–
	9 x 9mm		–		–
	12 x 12mm		–		–
	Diameter: 9.5mm		–		–
Page			760		763

Note: The colour is indicated in □ models for key tops.

Item			SMD Switches		Double-sealed Switches
Model			**B3S**		**B3WN**
Size			6 x 6 mm		6 x 6 mm
Appearance					
Features			Surface-mounting Tactile Switch for high-density packaging.		Double-sealed construction ensures water-tight and dust-tight performance. Conforms to IP67.
Contact			Silver-plated		Silver-plated
Type	**Plunger**	**Operating force**	1.57 N {160 gf} max.	2.25 N {230 gf} max.	1.96 N {200 gf} max.
Non-illuminated type	Flat type (height: 3.1mm)	Without ground	B3S-1000	B3S-1002	–
		With ground	B3S-1100	B3S-1002	–
	Flat type and others	Without ground	–	–	B3WN-6002(S)
		With ground	–	–	–
Illuminated type	Red LED	Without ground	–	–	–
	Green LED	With ground	–	–	–
	Yellow LED	Without ground	–	–	–
Durability			500,000	300,000	100,000
Enclosure rating			Equivalent to IP64		Equivalent to IP67
Cleaning			Possible		
Packag-ing	Bag (standard)		100		–
	Box (standard)		1,500		1,000 (radial taped)
	Embossed tape (model number: P suffix)		1,000 per reel		–
Key top (for projected type)	4 x 4mm		–		–
	9 x 9mm		–		–
	12 x 12mm		–		–
	Diameter: 9.5mm		–		–
Page			765		767

Note: 1: The color is indicated in □ models for key tops.
2: The '□' in B3J models contains the number indicating the color of the hinged button.

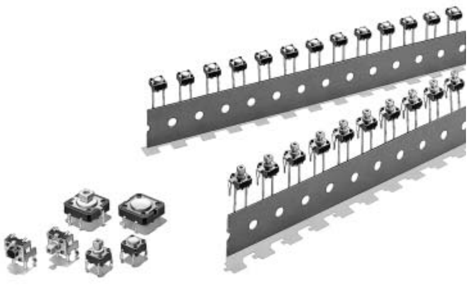
Item			Hinge Switches	Dome Arrays	Dome Arrays	
Model			**B3J**	**B3DA**	**B3D**	
Size			12 x 18 mm	–	4 mm dia.	5 mm dia.
Appearance						
Features			Hinged Tactile Switch	Superior dust-tight performance.	Single-Key type added to series of B3DA Ultra-low Profile Dome Array	
Contact			Silver-plated	Silver-plated	Stainless Steel	
Type	**Plunger**	**Operating force**	1.27 N {130 gf}	1.57 N {160 gf} max.	1.67 ±0.49 N	
Non-illuminated type	Flat type (height: 3.1mm)	Without ground	–	–	–	
		With ground	–	–	–	
	Flat type and others	Without ground	B3F-1□00	–	–	
		With ground	–	–	–	
Illuminated type	Red LED	Without ground	B3J-2□00	–	–	
	Green LED	With ground	B3J-4□00	–	–	
	Yellow LED	Without ground	B3J-3□00	–	–	
Durability			3,000,000	500,000 to 1,000,000	500,000	1,000,000
Enclosure rating			None (IP00)			
Cleaning			Not possible			
Packag-ing	Bag (standard)		–	–	–	
	Box (standard)		300	–	–	
	Embossed tape (model number: P suffix)		–	–	–	
Key top (for projected type)	4 x 4mm		–	–	–	
	9 x 9mm		–	–	–	
	12 x 12mm		–	–	–	
	Diameter: 9.5mm		–	–	–	
Page			769	772	774	

Note: 1: The color is indicated in □ models for key tops

2: The '□' in B3J models contains the number indicating the color of the hinged button.

A Wide Range of Models: 6 x 6 mm, 12 x 12 mm, Vertical, and High-force.

- ROHS compliant.
- A positive click action plus a long life equal to that of a no-contact switch.
- Radial models (taping specifications) that allow the use of general-purpose radial taping parts insertion machines have been added to the series.

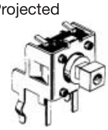


Ordering Information

6 x 6 mm Models

Type	Plunger	Height	Operating force (of)	Bags (100 Switches)	
				Without ground terminal	With ground terminal
Horizontal (B3F-1000)	Flat 	4.3 mm	0.98 N {100 gf}	B3F-1000	B3F-1100
			1.47 N {150 gf}	B3F-1002	B3F-1102
			2.55 N {260 gf}	B3F-1005	B3F-1105
			4.9 N {50 gf}	B3F-1006 (See note.)	–
		5.0 mm	0.98 N {100 gf}	B3F-1020	B3F-1120
			1.47 N {150 gf}	B3F-1022	B3F-1122
			2.55 N {260 gf}	B3F-1025	B3F-1125
			4.9 N {50 gf}	B3F-1026 (See note.)	–
		5.0 mm (7.5-mm pitch)	0.98 N {100 gf}	–	B3F-1110
		7.0 mm	0.98 N {100 gf}	B3F-1060 (See note.)	–
			1.47 N {150 gf}	B3F-1062 (See note.)	–
		9.5 mm	0.98 N {100 gf}	B3F-1070 (See note.)	–
			1.47 N {150 gf}	B3F-1072-N (See note.)	–
			2.55 N {260 gf}	B3F-1075 (See note.)	–
	Projected 	7.3 mm	0.98 N {100 gf}	B3F-1050	B3F-1150
			1.47 N {150 gf}	B3F-1052	B3F-1152
			2.55 N {260 gf}	B3F-1055	B3F-1155
			4.9 N {50 gf}	B3F-1056 (See note.)	–

6 x 6 mm Models

Type	Plunger	Height	Operating force (of)	Bags (100 Switches)	
				Without ground terminal	With ground terminal
Horizontal (B3F-3000)	Flat 	3.15 mm	0.98 N {100 gf}	–	B3F-3100
			1.47 N {150 gf}	–	B3F-3102
			2.55 N {260 gf}	–	B3F-3105
		3.85 mm	0.98 N {100 gf}	–	B3F-3120
			1.47 N {150 gf}	–	B3F-3122
			2.55 N {260 gf}	–	B3F-3125
	Projected 	6.15 mm	0.98 N {100 gf}	–	B3F-3150
			1.47 N {150 gf}	–	B3F-3152
			2.55 N {260 gf}	–	B3F-3155

Note: Switches are sold in units of 100 Switches. Orders must be made in multiples of 100 (the quantity per bag).

12 x 12 mm Models

Type	Plunger or LED colour	Height	Operating force	Bags (100 Switches)	
				Without ground terminal	With ground terminal
Standard (B3F-4000)	Flat	4.3 mm	1.27 N {130 gf}	B3F-4000	B3F-4100
			2.55 N {260 gf}	B3F-4005	B3F-4105
	Projected	7.3 mm	1.27 N {130 gf}	B3F-4050	B3F-4150
			2.55 N {260 gf}	B3F-4055	B3F-4155
Long life expectancy (B3F-5000)	Flat	4.3 mm	1.27 N {130 gf}	B3F-5000	B3F-5100
	Projected	7.3 mm		B3F-5050	B3F-5150
High reliability gold-plated (B3F-5000)	Flat	4.3 mm	1.27 N {130 gf}	B3F-5001	B3F-5101
	Projected	7.3 mm		B3F-5051	B3F-5151

Note: Switches are sold in units of 100 Switches. Orders must be made in multiples of 100 (the quantity per bag).

6 x 6 mm Radial Models (Taping Specifications)

Type	Plunger	Height	Operating force 0.98 N {100 gf}		Operating force 1.47 N {150 gf}	
			Without ground terminal	With ground terminal	Without ground terminal	With ground terminal
Standard (B3F-4000)	Flat	4.3 mm	B3F-6000	B3F-6100	B3F-6002	B3F-6102
		5.0 mm	B3F-6020	B3F-6120	B3F-6022	B3F-6122
	Projected	7.3 mm	B3F-6050	B3F-6150	B3F-6052	B3F-6152

Note: Switches are sold in units of 1,000 Switches. Orders must be made in multiples of 1,000. Switches are not sold individually.

■ Accessories (Order Separately)

Special Key Tops are available for projected plunger models.

Specifications

■ Rating/Characteristics

Switching capacity	1 to 50 mA, 5 to 24 VDC (resistive load)
Ambient temperature	-25°C to 70°C (with no icing)
Ambient humidity	35% to 85%
Contact form	SPST-NO
Contact resistance	100 mΩ max. (initial value) (rated: 1 mA, 5 VDC)
Insulation resistance	100 MΩ min. (at 250 VDC)
Dielectric strength	500 VAC, 50/60 Hz for 1 min
Bounce time	5 ms max.
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5 mm double amplitude
Shock resistance	Destruction: 1,000 m/s² {approx. 100G} max. Malfunction: 100 m/s² {approx. 10G} max.
Life expectancy	B3F-1000, B3F-3000, B3F-6000: 1,000,000 operations min (OF: 0.98 N) (B3F-1070: 500,000 operations min) 300,000 operations min (OF: 1.47 N) 100,000 operations min (OF: 2.55 N) 50,000 operations min (OF: 4.9 N) B3F-4000: 3,000,000 operations min (OF: 1.28 N) 1,000,000 operations min (OF: 2.55 N) B3F-5000: 10,000,000 operations min.
Weight	6 x 6 mm models: approx. 0.25 g 12 x 12 mm models (standard types): approx. 0.85 g Radial models: approx. 0.25 g

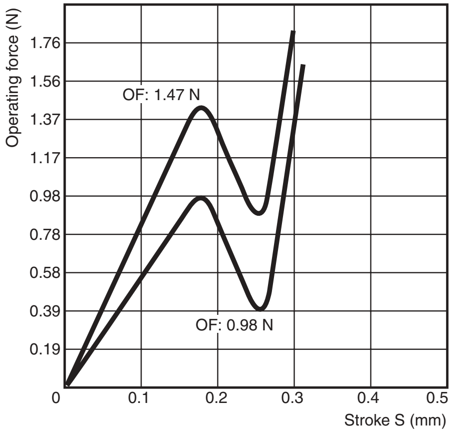
■ Operating Characteristics

Operating force (OF)	B3F-1000, B3F-3000, B3F-6000				B3F-4000, B3F-5000	
	0.98 N	**1.47 N**	**2.55 N**	**4.9 N**	**1.27 N**	**2.55 N**
	B3F-1□□0 B3F-3□□0 B3F-6□□0	B3F-1□□2 B3F-3□□2 B3F-6□□2	B3F-1□□5 B3F-3□□5	B3F-10□6	B3F-4□□0 B3F-5□□0	B3F-4□□5
Operating force (OF)	0.98±0.29 N {100±30 gf}	1.47±0.49 N {150±50 gf}	2.55±0.69 N {260±70 gf}	4.9±1. 47N {100±30 gf}	1.27±0.49 N {130±50 gf}	2.55±0.69 N {260±70 gf}
Relapsing force (RF)	0.2 N {20 gf} min.	0.49 N {50 gf} min.	0.49 N {50 gf} min.	0.7 N {70 gf} min.	0.29 N {30 gf} min.	0.49 N min. {50 gf}
Pretravel (PT)	$0.25^{+0.2}/_{-0.1}$ mm				$0.3^{+0.2}/_{-0.1}$ mm	

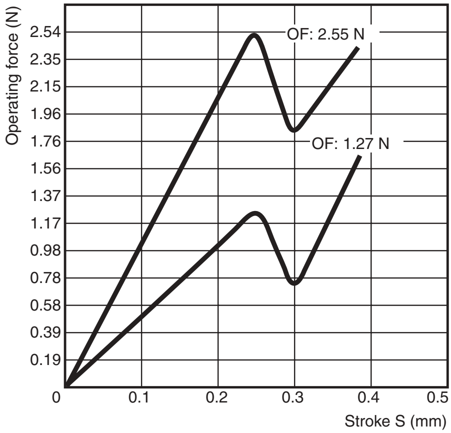
Engineering Data

Operating Force vs. Stroke (Typical)

B3F-1000, -3000, -6000



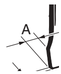
B3F-4000, -5000



Dimensions

Note 1. All units are in millimeters unless otherwise indicated. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

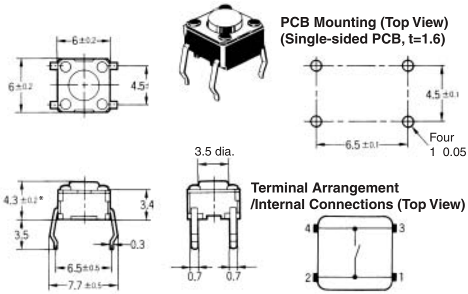
2. No terminal numbers are indicated on the Switches. The numbers used for terminals in the following graphics are indicated in the "Bottom View" diagram below. In this diagram, the Switch is rotated so that the terminals are on the right and left-hand sides, and the OMRON logo appears the right way up.



6 x 6 mm Models

Horizontal, Flat Plunger Type(without Ground Terminal)

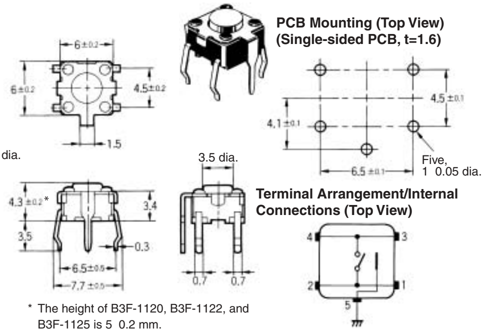
B3F-1000, B3F-1002, B3F-1005, B3F-1006
B3F-1020 (See note.), B3F-1022 (See note.),
B3F-1025 (See note.), B3F-1026 (See note.)



* The height of B3F-1020, B3F-1022, B3F-1025, and B3F-1026 is 5 0.2 mm.

Horizontal, Flat Plunger Type(with Ground Terminal, Pitch: 6.5 mm)

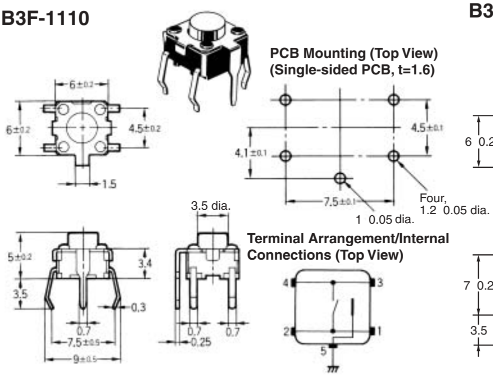
B3F-1100, B3F-1102, B3F-1105
B3F-1120 (See note.), B3F-1122 (See note.)
B3F-1125 (See note.)



* The height of B3F-1120, B3F-1122, and B3F-1125 is 5 0.2 mm.

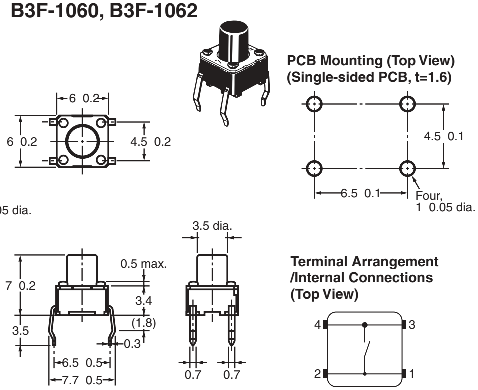
Horizontal, Flat Plunger Type (with Ground Terminal, Pitch: 7.5 mm)

B3F-1110



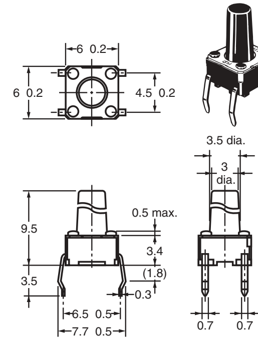
Horizontal, Flat Plunger Type (without Ground Terminal)

B3F-1060, B3F-1062

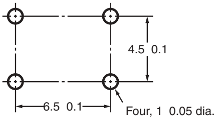


Tactile Switches

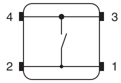
Horizontal, Flat Plunger Type (without Ground Terminal)
B3F-1070, B3F-1072-N, B3F-1075



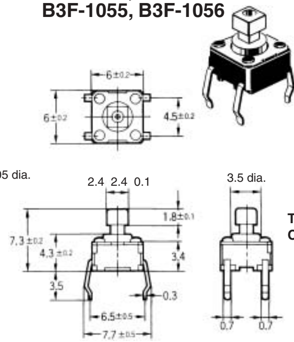
PCB Mounting (Top View)
(Single-sided PCB, t=1.6)



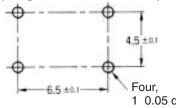
Terminal Arrangement/Internal Connections (Top View)



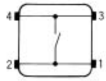
Horizontal, Projected Plunger Type (without Ground Terminal)
B3F-1050, B3F-1052
B3F-1055, B3F-1056



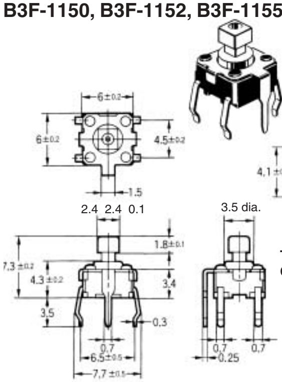
PCB Mounting (Top View)
(Single-sided PCB, t=1.6)



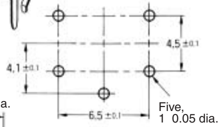
Terminal Arrangement/Interna Connections (Top View)



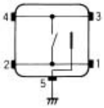
Horizontal, Projected Plunger Type (with Ground Terminal)
B3F-1150, B3F-1152, B3F-1155



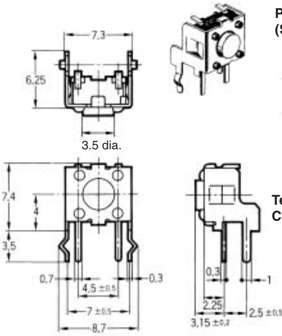
PCB Mounting (Top View)
(Single-sided PCB, t=1.6)



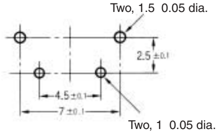
Terminal Arrangement/Internal Connections (Top View)



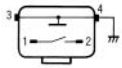
Vertical, Flat Plunger Type
B3F-3100, B3F-3102, B3F-3105



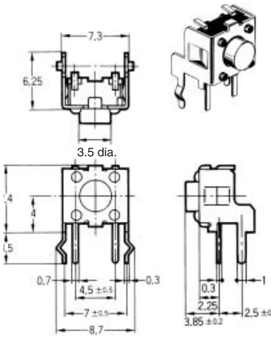
PCB Mounting (Top View)
(Single-sided PCB, t=1.6)



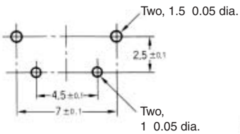
Terminal Arrangement/Internal Connections (Top View)



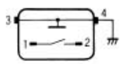
Vertical, Flat Plunger Type (Height: 3.85 mm)
B3F-3120, B3F-3122, B3F-3125



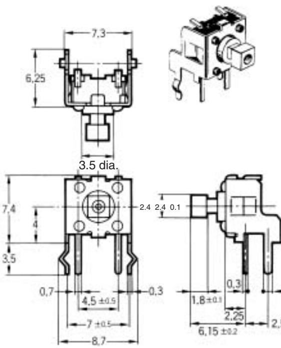
PCB Mounting (Top View)
(Single-sided PCB, t=1.6)



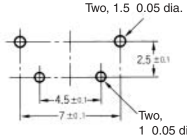
Terminal Arrangement/Internal Connections (Top View)



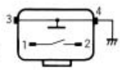
Vertical, Projected Plunger Type
B3F-3150, B3F-3152, B3F-3155



PCB Mounting (Top View)
(Single-sided PCB, t=1.6)



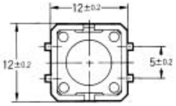
Terminal Arrangement/Internal Connections (Top View)



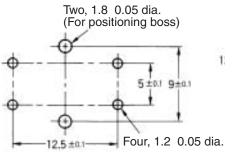
12 x 12 mm Models

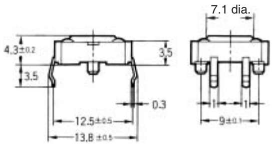
Flat Plunger Type (without Ground Terminal)

B3F-4000, B3F-4005, B3F-5000, B3F-5001

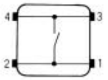


PCB Mounting (Top View)
(Single-sided PCB, t=1.6)



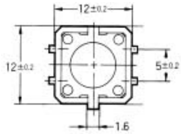


Terminal Arrangement/Internal Connections (Top View)

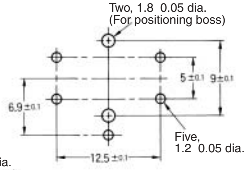


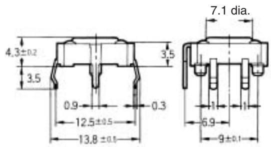
Flat Plunger Type (with Ground Terminal)

B3F-4100, B3F-4105, B3F-5100, B3F-5101

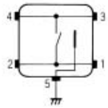


PCB Mounting (Top View)
(Single-sided PCB, t=1.6)



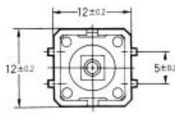


Terminal Arrangement/Internal Connections (Top View)

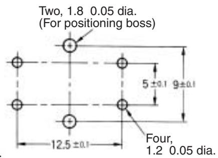


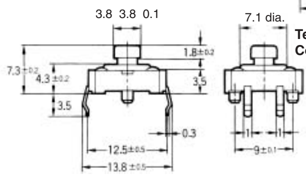
Projected Plunger Type (without Ground Terminal)

B3F-4050, B3F-4055, B3F-5050, B3F-5051

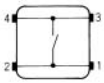


PCB Mounting (Top View)
(Single-sided PCB, t=1.6)



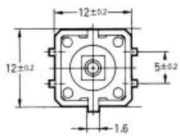


Terminal Arrangement/Internal Connections (Top View)

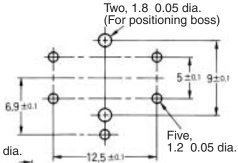


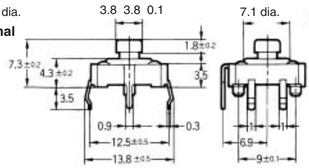
Projected Plunger Type (with Ground Terminal)

B3F-4150, B3F-4155, B3F-5150, B3F-5151

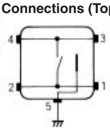


PCB Mounting (Top View)
(Single-sided PCB, t=1.6)



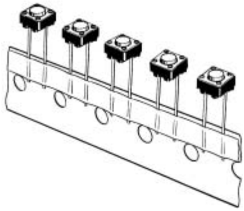


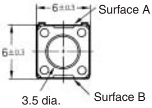
Terminal Arrangement/Internal Connections (Top View)

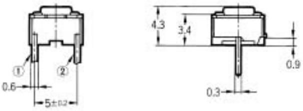


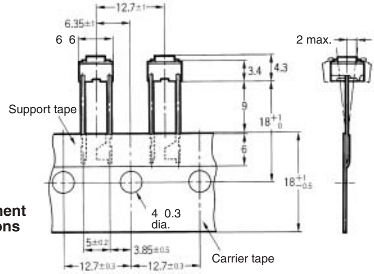
6 mm x 6 mm Radial Types (Taping Specifications): Sold in Units of 1,000 Switches

Flat Plunger Type (without Ground Terminal) B3F-6000, B3F-6002

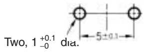








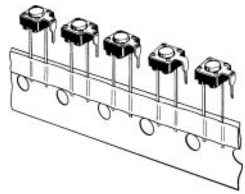
PCB Mounting (Top View) (Single-sided PCB, t=1.6)

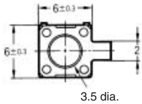


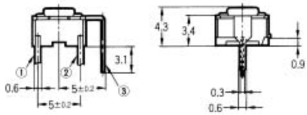
Terminal Arrangement /Internal Connections (Top View)

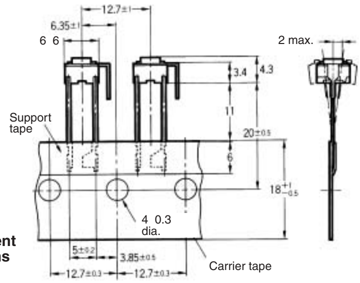
Note: The tape is random between surface A and surface B.

Flat Plunger Type (with Ground Terminal) B3F-6100, B3F-6102

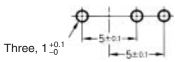




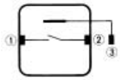




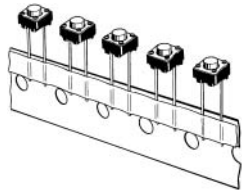
PCB Mounting (Top View) (Single-sided PCB, t=1.6)

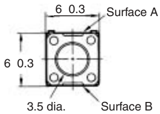


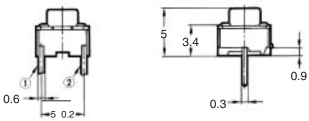
Terminal Arrangement /Internal Connections (Top View)

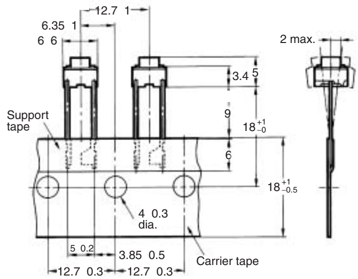


Flat Plunger Type (without Ground Terminal) B3F-6020, B3F-6022

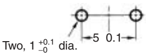




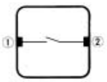




PCB Mounting (Top View) (Single-sided PCB, t=1.6)

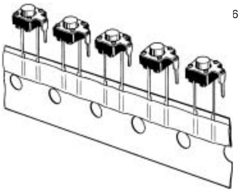


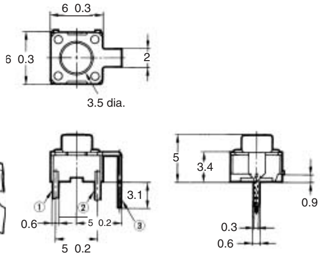
Terminal Arrangement /Internal Connections (Top View)



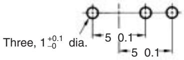
Note: The tape is random between surface A and surface B.

Flat Plunger Type (with Ground Terminal) B3F-6120, B3F-6122

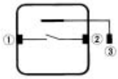


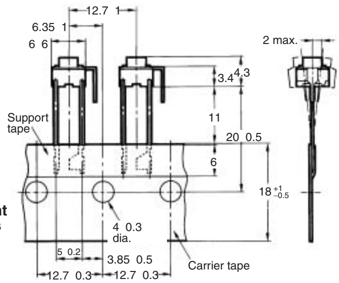


PCB Mounting
(Top View)
(Single-sided PCB, t=1.6)

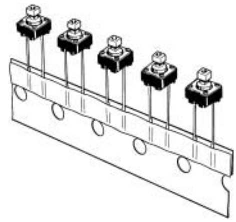


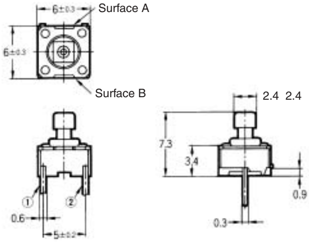
Terminal Arrangement
/Internal Connections
(Top View)



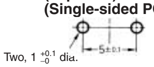


Projected Plunger Type (without Ground Terminal) B3F-6050, B3F-6052

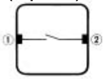


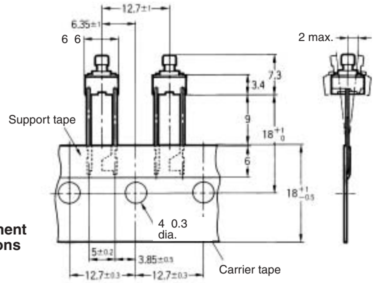


PCB Mounting
(Top View)
(Single-sided PCB, t=1.6)



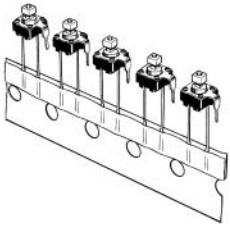
Terminal Arrangement
/Internal Connections
(Top View)

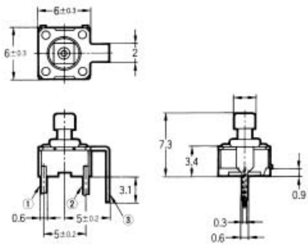




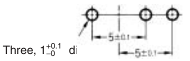
Note: The tape is random between surface A and surface B.

Projected Plunger Type (with Ground Terminal) B3F-6150, B3F-6152

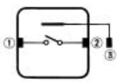


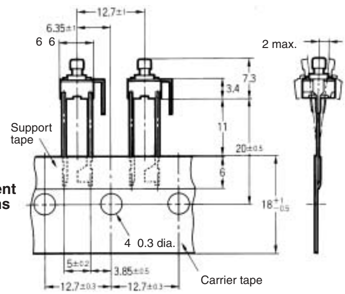


PCB Mounting
(Top View)
(Single-sided PCB, t=1.6)



Terminal Arrangement
/Internal Connections
(Top View)



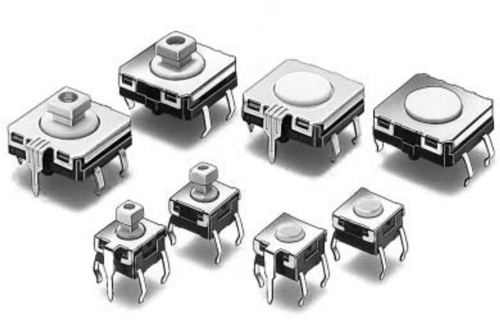


Key Tops

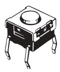
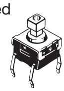
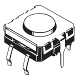
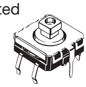
B32-series Special Key Tops are available for projected plunger models.

Allows Cleaning After Soldering with Alcohol Solvents

- ROHS compliant.
- Internal sealed construction allows immersio cleaning with alcohol solvents after soldering
- Thin, compact construction in both 12 x 12 mm and 6 x 6 mm sizes.
- Snap-action contact construction for a positive click action.
- Available with ground terminals for protection against static electricity.
- Sealed construction also provides high reliability in dusty environments.



Ordering Information

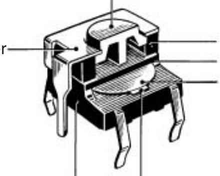
Type	Plunger	Height	Operating force (of)		Bags (100 Switches)	
			Without ground terminal	With ground terminal	Without ground terminal	With ground terminal
6 x 6 mm (B3W-1000)	Flat 	4.3 mm	Standard force	1.57 N {160 gf}	B3W-1000	B3W-1100
			High-force	2.25 N {230 gf}	B3W-1002	B3W-1102
	Projected 	7.3 mm	Standard force	1.57 N {160 gf}	B3W-1050	B3W-1150
			High-force	2.25 N {230 gf}	B3W-1052	B3W-1152
12 x 12 mm (B3W-4000)	Flat 	4.3 mm	Standard force	1.96 N {200 gf}	B3W-4000	B3W-4100
			High-force	3.43 N {350 gf}	B3W-4005	B3W-4105
	Projected 	7.3 mm	Standard force	1.96 N {200 gf}	B3W-4050	B3W-4150
			High-force	3.43 N {350 gf}	B3W-4055	B3W-4155

Note: Orders must be made in multiples of 100 (the quantity per bag).

■ Accessories (Order Separately)

Special Key Tops are available for projected Switch models.

Nomenclature



Specifications

■ Ratings/Characteristics

Switching capacity	1 to 50 mA, 5 to 24 VDC (resistive load)
Ambient temperature	-25°C to 70°C (with no icing)
Ambient humidity	35% to 85%
Contact configuration	SPST-NO
Contact resistance	100 mΩ max. (initial value) (rated: 1 mA, 5 VDC)
Insulation resistance	100 MΩ min. (at 250 VDC)
Dielectric strength	500 VAC, 50/60 Hz for 1 min
Bounce time	5 ms max.
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5 mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 {approx. 100 G} max. Malfunction: 100 m/s^2 {approx. 10 G} max.
Life expectancy	B3W-1000: 1.57 N (standard force):1,000,000 operations min. 2.26 N (high-force):300,000 operations min. B3W-4000: 1.96 N (standard force):3,000,000 operations min. 3.43 N (high-force):1,000,000 operations min.
Weight	6 x 6 mm: approx. 0.3 g, 12 x 12: approx. 1 g

■ Operating Characteristics

Item	B3W-1000		B3W-4000	
	1.57 N	2.26 N	1.96 N	3.43 N
Operating force (OF)	1.57 N {160 gf} max.	2.26 N {230 gf} max.	1.96 N {200 gf} max.	3.43 N {350 gf} max.
Releasing force (RF)	0.2 N {20 gf} min.	0.49 N {50 gf} min.	0.29 N {30 gf} min.	0.49 N {50 gf} min.
Pretravel (PT)	$0.25^{+0.2}/_{-0.1}$ mm		$0.3^{+0.2}/_{-0.1}$ mm	

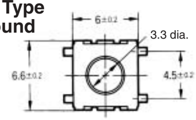
Note 1. All units are in millimeters unless otherwise indicated. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

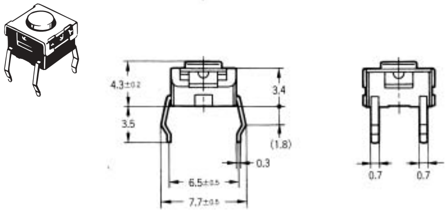
2. No terminal numbers are indicated on the Switches. The numbers used for terminals in the following graphics are indicated in the “Bottom View” diagram below. In this diagram, the Switch is rotated so that the terminals are on the right and left-hand sides, and the OMRON logo appears the right way up.

■ 6 x 6 mm Models

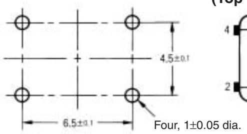
Flat Plunger Type (without Ground Terminal)

B3W-1000
B3W-1002

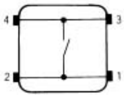




PCB Mounting (Top View) (Single-sided PCB, t=1.6)

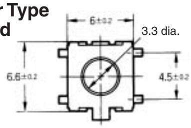


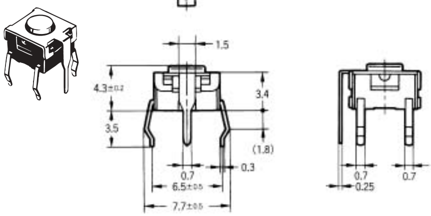
Terminal Arrangement /Internal Connections (Top View)



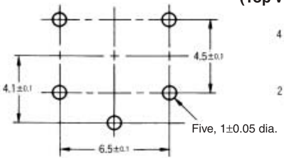
Flat Plunger Type (with Ground Terminal)

B3W-1100
B3W-1102

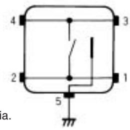




PCB Mounting (Top View) (Single-sided PCB, t=1.6)

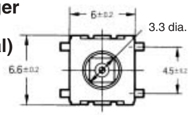


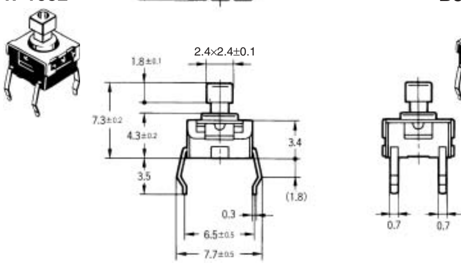
Terminal Arrangement /Internal Connections (Top View)



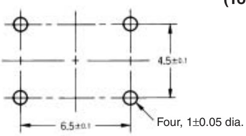
Projected Plunger Type (without Ground Terminal)

B3W-1050
B3W-1052

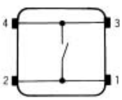




PCB Mounting (Top View) (Single-sided PCB, t=1.6)

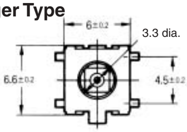


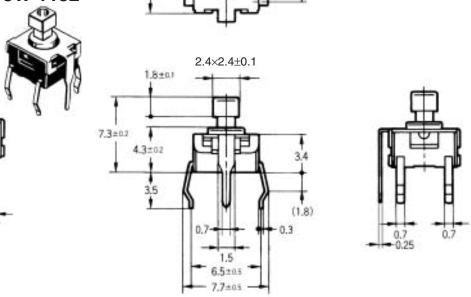
Terminal Arrangement /Internal Connections (Top View)



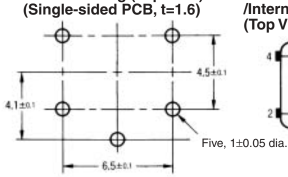
Projected Plunger Type (with Ground Terminal)

B3W-1150
B3W-1152

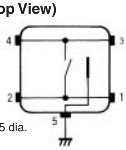




PCB Mounting (Top View) (Single-sided PCB, t=1.6)



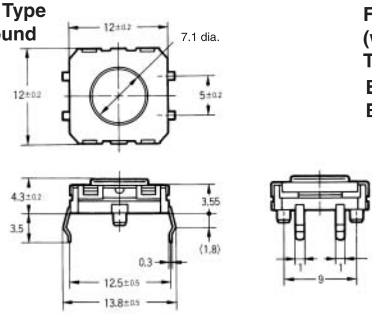
Terminal Arrangement /Internal Connections (Top View)



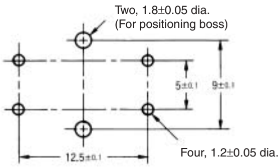
■ 12 x 12 mm Models

Flat Plunger Type (without Ground Terminal)

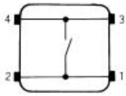
B3W-4000
B3W-4005



PCB Mounting (Top View)
(Single-sided PCB, t=1.6)

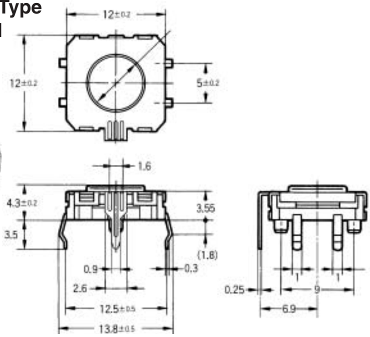


Terminal Arrangement /Internal Connections (Top View)

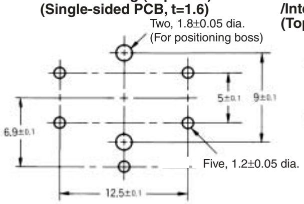


Flat Plunger Type (with Ground Terminal)

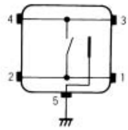
B3W-4100
B3W-4105



PCB Mounting (Top View)
(Single-sided PCB, t=1.6)

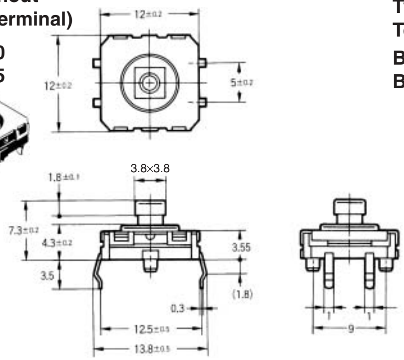


Terminal Arrangement /Internal Connections (Top View)

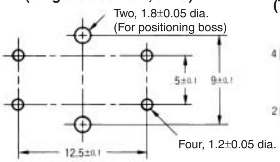


Projected Plunger Type (without Ground Terminal)

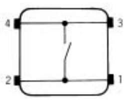
B3W-4050
B3W-4055



PCB Mounting (Top View)
(Single-sided PCB, t=1.6)

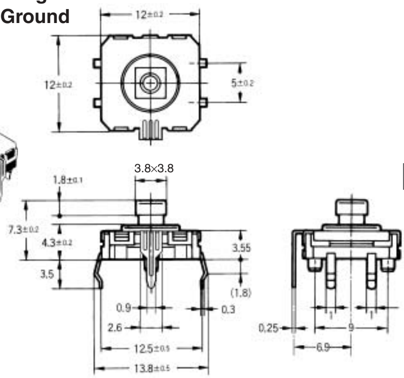


Terminal Arrangement /Internal Connections (Top View)

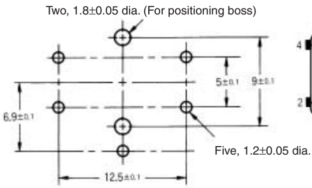


Projected Plunger Type (with Ground Terminal)

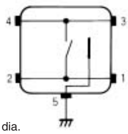
B3W-4150
B3W-4155



PCB Mounting (Top View)
(Single-sided PCB, t=1.6)



Terminal Arrangement /Internal Connections (Top View)

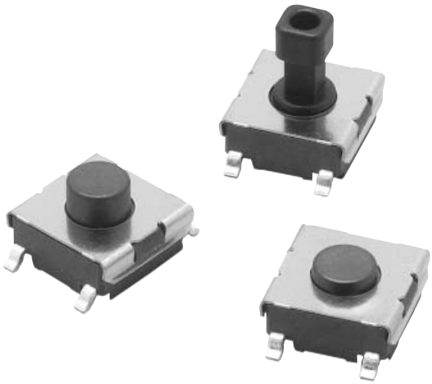


Key Tops

B32 series Special Key Tops are available for projected plunger models.

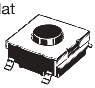
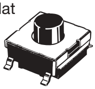
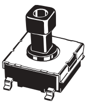
Surface-mounting Switches Ideal for High-density Mounting

- ROHS compliant.
- Tape packing style also available.
- Allows reflow soldering.
- Incorporates a snap-action contact mechanism that ensures sharp switching operations.



Ordering Information

List of Models

Type	Plunger	Height force (of)	Operating	Bag		Embossed tape	
				Model	MInimu order unit	Model	MInimum order unit
6 x 6 mm B3FS-1000 models	Flat 	3.1 mm	0.98 N {100 gf}	B3FS-1000	100	B3FS-1000P	3,000
			1.47 N {150 gf}	B3FS-1002		B3FS-1002P	
	Flat 	4.3 mm	0.98 N {100 gf}	B3FS-1010		B3FS-1010P	1,000
			1.47 N {150 gf}	B3FS-1012		B3FS-1012P	
	Projected 	7.3 mm	0.98 N {100 gf}	B3FS-1050 (See note.)		B3FS-1050P (See note.)	
			1.47 N {150 gf}	B3FS-1052 (See note.)		B3FS-1052P (See note.)	

Note: Orders must be made in multiples of the minimum order unit. Switches are not sold individually.

Specifications

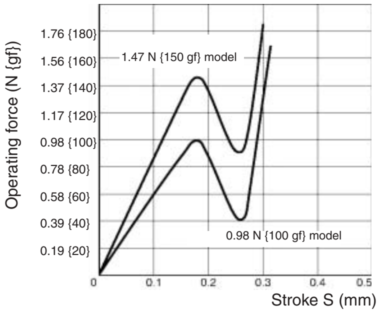
■ Ratings/Characteristics

Switching capacity	50 mA, 24 VDC (resistive load)
Ambient temperature	Operating: -25°C to 70°C (with no icing)
Ambient humidity	Operating: 35% to 85%
Contact configuration	SPST-NO
Contact resistance	100 mΩ max. (initial value) (rated: 1 mA, 5 VDC)
Insulation resistance	100 MΩ min. (at 100 VDC)
Dielectric strength	250 VAC, 50/60 Hz for 1 min
Bounce time	5 ms max.
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 {approx. 100G} max. Malfunction: 100 m/s^2 {approx. 10G} max.
Life expectancy	Standard models (0.98 N): 1,000,000 operations min. High-force models (1.47 N): 300,000 operations min.
Weight	B3F-1000: Approx. 0.2 g

Engineering Data

Operating Force vs. Stroke Characteristics

B3F-1000



■ Operating Characteristics

Item	B3FS-1000	
	0.98 N	**1.47 N**
Operating force (OF)	0.98±0.29 N {100±30 gf}	1.47±0.49 N {150±50 gf}
Releasing force (RF)	0.2 N {20 gf}min.	0.49 N {50 gf} min.
Pretravel (PT)	$0.25^{+0.2}/_{-0.1}$ mm	

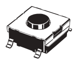
Tactile Switches

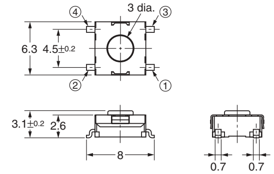
Dimensions

Note: All units are in millimeters unless otherwise indicated. Unless otherwise specified, a tolerance of ±0.4mm applies to all dimensions.

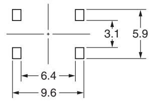
Flat Type

B3FS-1000
B3FS-1002
B3FS-1000P
B3FS-1002P

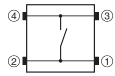




PCB Pad
(Top View)
(One-side PCB t= 1.6)

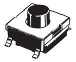


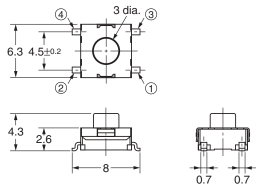
Terminal Arrangement/ Internal Connection
(Top View)



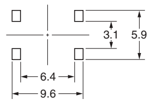
Flat Type

B3FS-1010
B3FS-1012
B3FS-1010P
B3FS-1012P

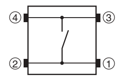




PCB Pad
(Top View)
(One-side PCB t= 1.6)

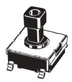


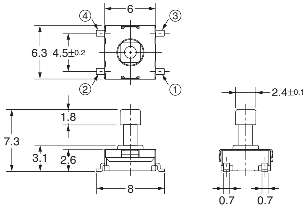
Terminal Arrangement/ Internal Connection
(Top View)



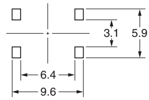
Projected Type

B3FS-1050
B3FS-1052
B3FS-1050P
B3FS-1052P

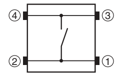




PCB Pad
(Top View)
(One-side PCB t= 1.6)



Terminal Arrangement/ Internal Connection
(Top View)



Key Tops

B32-series Special Key Tops are available for projected plunger models.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Designed as Surface-mounting Device (SMD) Meeting High-density Mounting Requirements

- ROHS Compliant
- SMD Tactile Switch ideal for high-density mounting.
- Compact and more than 1 mm thinner than conventional tactile switches.
- Available with ground terminals for protection against static electricity.
- Sealed construction conforming to IP64 (IEC-529) provides high reliability in dusty or humid environments.

Ordering Information

List of Models

Type	Bags	Embossed tape (see note)
Without ground terminal	B3SN-3012	B3SN-3012P
With ground terminal	B3SN-3112	B3SN-3112P

Note: Switches in bags must be ordered in units of 100 pieces, and Switches on embossed tape must be ordered in units of 3,000 pieces

Operating Characteristics

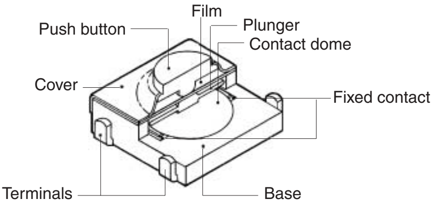
Operating force (OF)	1.57±0.49 N {160±50 gf} max.
Releasing force (RF)	0.29 N {30 gf} min.
Pretravel (PT)	0.25±0.15 mm

Specifications

Ratings/Characteristics

Switching capacity	1 to 50 mA, 5 to 24 VDC (resistive load)
Ambient temperature	Operating: –25°C to 70°C (with no icing)
Ambient humidity	Operating: 35% to 85%
Contact configuration	SPST-NO
Contact resistance	100 mΩ max. (initial value) (rated: 1 mA, 5 VDC)
Insulation resistance	100 MΩ min. (at 250 VDC)
Dielectric strength	250 VAC, 50/60 Hz for 1 min
Bounce time	5 ms max.
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5 mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 {approx. 100G} max.
Life expectancy	100,000 operations min.
Weight	Approx. 0.2 g

Nomenclature



Dimensions

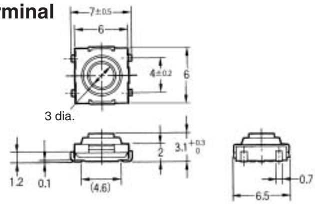
Note 1. All units are in millimeters unless otherwise indicated. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

2. No terminal numbers are indicated on the Switches. The numbers used for terminals in the following graphics are indicated in the “Bottom View” diagram below. In this diagram, the Switch is rotated so that the terminals are on the right and left-hand sides, and the OMRON logo appears the right way up.

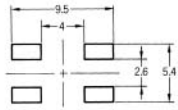
(Bottom View)

Without Ground Terminal

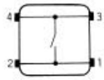
B3SN-3012
B3SN-3012P



PCB Mounting (Top View)

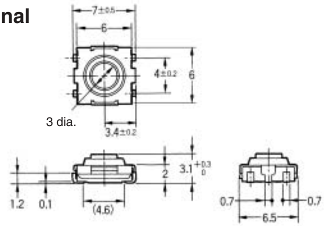


Terminal Arrangement /Internal Connections (Top View)

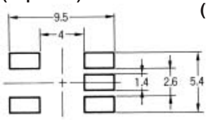


With Ground Terminal

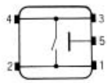
B3SN-3112
B3SN-3112P



PCB Mounting (Top View)



Terminal Arrangement /Internal Connections (Top View)



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Surface-mounting Tactile Switch for High-density Packaging

- ROHS compliant.
- Dust-sealed construction provides high reliability in locations exposed to dust.
- SMD Tactile Switch ideal for high-density mounting.
- Sealed construction conforming to IP64 (IEC-529). Can be washed after soldering.
- Ground terminal available to protect against static electricity.

Ordering Information

6 x 6 mm Type B3S-1000

Operating force (OF)		Height	Without ground terminal		With ground terminal	
			Bags (100 Switches)	Embossed tape (1,000 Switches)	Bags (100 Switches)	Embossed tape (1,000 Switches)
Standard-force	1.57 N {160 gf}	4.3 mm	B3S-1000	B3S-1000P	B3S-1100	B3S-1100P
High-force	2.25 N {230 gf}		B3S-1002	B3S-1002P	B3S-1102	B3S-1102P

Note: Switches in bags must be ordered in units of 100 Switches, and Switches on embossed tape must be ordered in units of 3,000 Switchs.

Specifications

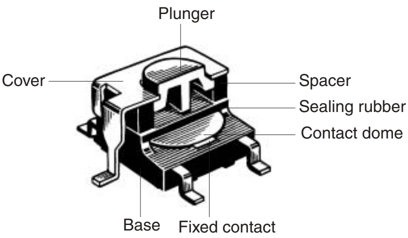
Ratings/Characteristics

Switching capacity	5 to 24 VDC, 1 to 50 mA (resistive load)
Insulation voltage	30 VDC
Ambient temperature	Operating: -25°C to 70°C (with no icing)
Ambient humidity	Operating: 35% to 85%
Contact configuration	SPST-NO
Contact resistance	100 mΩ max. (initial value) (rated: 1 mA, 5 VDC)
Insulation resistance	100 MΩ min. (at 250 VDC)
Dielectric strength	500 VAC, 50/60 Hz for 1 min
Bounce time	5 ms max.
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 {approx. 100G} max. Malfunction: 100 m/s^2 {approx. 10G} max.
Life expectancy	Standard force models (1.57 N): 500,000 operations min. High-force models (2.25 N): 300,000 operations min.
Weight	Approx. 0.3 g

Operating Characteristics

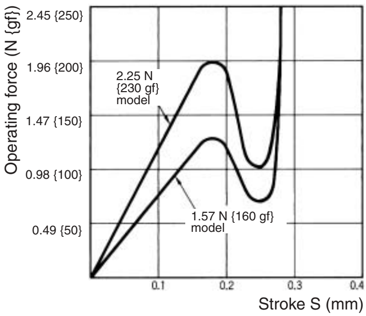
Item	B3S-1□00	B3S-1□02
Operating force (OF)	1.57 N {160 gf} max.	2.25 N {230 gf} max.
Releasing force (RF)	0.2 N {20 gf} min.	0.49 N {50 gf} min.
Pretravel (PT)	$0.25^{+0.2}/_{-0.1}$ mm	

Nomenclature



Engineering Data

Operating Force vs. Stroke (Typical)

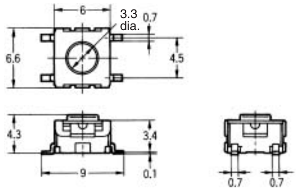


Dimensions

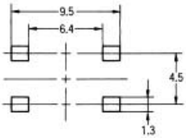
Note: All units are in millimeters unless otherwise indicated. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Without Ground Terminal

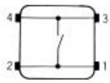
B3S-1000
B3S-1002



PCB Mounting (Top View)

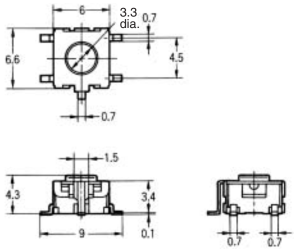


Terminal Arrangement /Internal Connections (Top View)

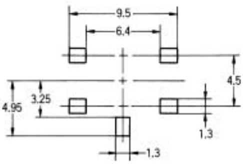


With Ground Terminal

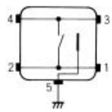
B3S-1100
B3S-1102



PCB Mounting (Top View)



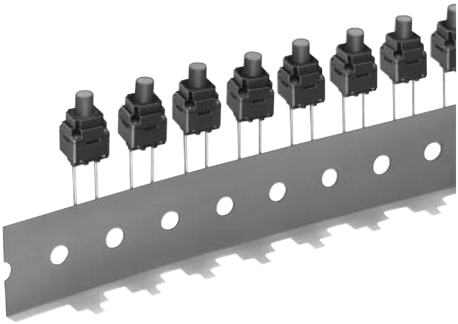
Terminal Arrangement /Internal Connections (Top View)



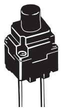
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Double-sealed Construction Ensures Watertight and Dust-tight Performance

- ROHS compliant.
- Sealed construction conforming to IP67 (IEC-529) provides high reliability in dusty or humid environments.
- As compact as 8 mm x 8 mm.
- Allows the use of radial-taping part insertion machines.



Ordering Information

Model	Height	Operating force (of)	Model without ground terminal	Minimum order unit
	13 mm	1.96 N {200 gf}	B3WN-6002(S)	1,000 Switches

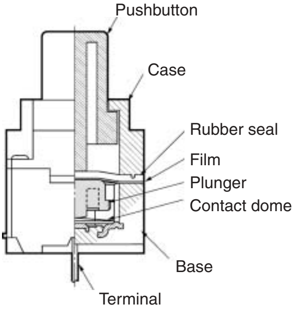
Note: Orders must be made in multiples of the minimum order unit (multiples of 1,000). Switches are not sold individually.

Specifications

■ Ratings/Characteristics

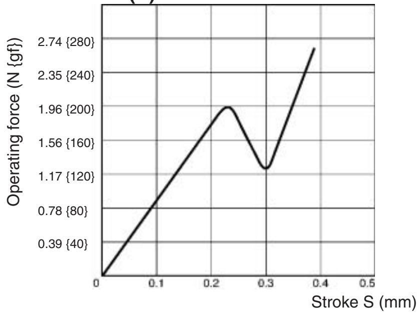
Switching capacity	50 mA, 12 VDC (resistive load)
Ambient temperature	Operating: -25°C to 85°C (with no icing)
Ambient humidity	Operating: 35% to 85%
Contact configuration	SPST-NO
Contact resistance	100 mΩ max. (initial value) (rated: 1 mA, 5 VDC)
Insulation resistance	100 MΩ min. (at 100 VDC)
Dielectric strength	250 VAC, 50/60Hz for 1 min
Bounce time	10 ms max.
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Destruction: 784 m/s^2 {approx. 80G} max. Malfunction: 100 m/s^2 {approx. 10G} max.
Life expectancy	100,000 operations min.
Weight	Approx. 0.7 g

Nomenclature



Engineering Data

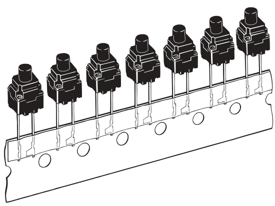
Operating Force vs. Stroke Characteristics B3WN-6002 (S)



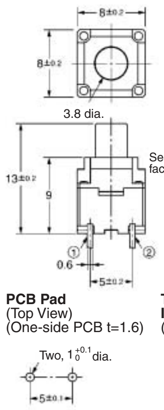
Dimensions

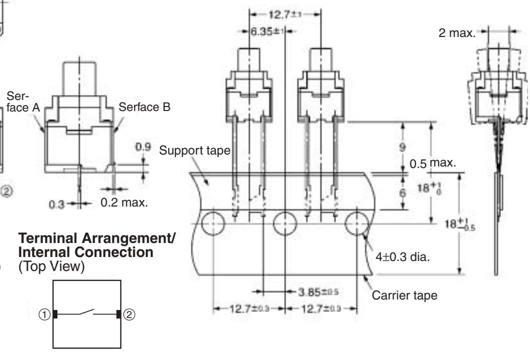
Note: All units are in millimeters unless otherwise indicated. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

B3WN-6002 (S)



Note: The tape is random between surface A and surface B.





Note: Switch fixing direction (A and B) on the tape may change.

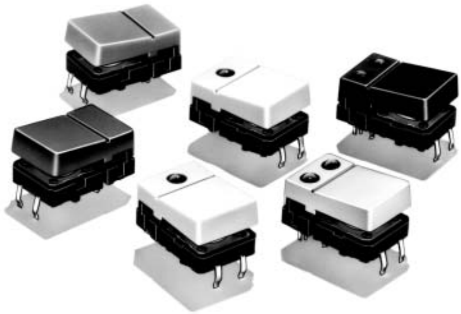
■ Operating Characteristics

Item	B3WN-6002 (S)
Operating force (OF)	1.96±0.67 N {200±70 gf}
Releasing force (RF)	0.49 N {50 gf} min.
Pretravel (PT)	$0.3^{+0.2}/_{-0.1}$ mm

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Hinged Design Developed through Ergonomics

- ROHS compliant.
- Quick, superior snap action through hook-type hinge construction.
- Available with 1 or 2 LEDs or without LEDs.
- The hinge button is available in a wide variety of colors (five standard colors).



Ordering Information

Colour	No LED	One LED			Two LEDs (left and right)		
		Red	Yellow	Green	Red/Yellow	Red/Green	Yellow/Green
Light grey	B3J-1000	B3J-2000	B3J-3000	B3J-4000	B3J-5000	B3J-6000	B3J-7000
Black	B3J-1100	B3J-2100	B3J-3100	B3J-4100	B3J-5100	B3J-6100	B3J-7100
Orange	B3J-1200	B3J-2200	B3J-3200	B3J-4200	B3J-5200	B3J-6200	B3J-7200
Yellow	B3J-1300	B3J-2300	B3J-3300	B3J-4300	B3J-5300	B3J-6300	B3J-7300
Blue	B3J-1400	B3J-2400	B3J-3400	B3J-4400	B3J-5400	B3J-6400	B3J-7400

Specifications

■ Ratings/Characteristics

Switching capacity	1 to 50 mA, 5 to 24 VDC (resistive load)
Ambient temperature	-25°C to 70°C (with no icing)
Ambient humidity	35% to 85%
Contact configuration	SPST-NO
Contact resistance	100 mΩ max. (rated: 1 mA, 5 VDC)
Insulation resistance	100 MΩ min. (at 250 VDC)
Dielectric strength	500 VAC, 50/60 Hz for 1 min
Bounce time	5 ms max.
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 {approx. 100G} max. Malfunction: 100 m/s^2 {approx. 10G} max.
Life expectancy	3,000,000 operations min.
Weight	Approx. 1.5 to 1.7 g

Operating Characteristics

Operating force (OF)	1.27±0.49 N {130±50 gf}
Releasing force (RF)	0.29 N {30 gf} min.
Pretravel (PT)	$0.3^{+0.2}/_{-0.1}$ mm

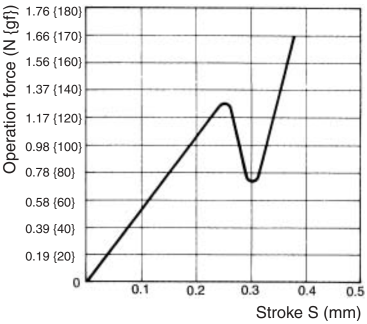
Built-in LED Performance

Item		Red	Yellow	Green
Forward voltage VF	Standard value (V)	2.0	2.0	2.1
Forward current IF	Standard value (mA)	20	20	20
Permissible loss P	Absolute maximum value (mW)	84	84	84
Reverse voltage VR	Absolute maximum value (V)	5	5	5

Note: Since the built-in LED does not contain any limiting resistors, externally connect limiting resistors within the limits shown in the above table.

Engineering Data

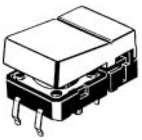
Operating Force vs. Stroke (Typical)

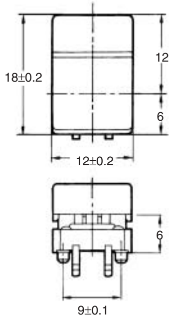


Dimensions

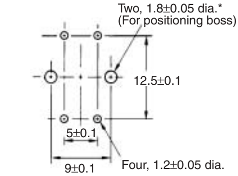
Note: All units are in millimeters unless otherwise indicated. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

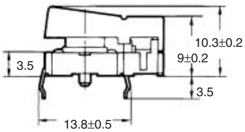
Types with no LED
B3J-1□00



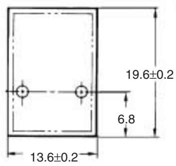


PCB Mounting (Top View)

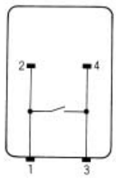




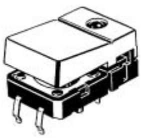
Panel Cutout

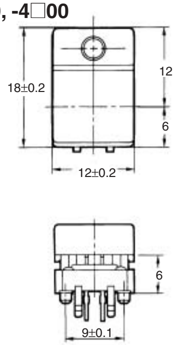


Terminal Arrangement /Internal Connections (Top View)

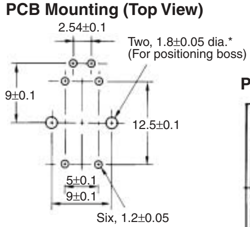


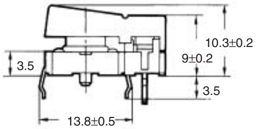
1 LED Types
B3J-2□00, -3□00, -4□00



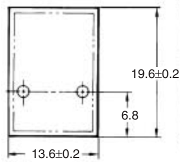


PCB Mounting (Top View)

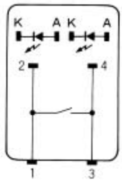




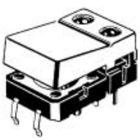
Panel Cutout

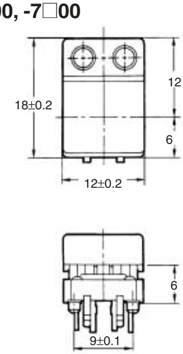


Terminal Arrangement /Internal Connections (Top View)

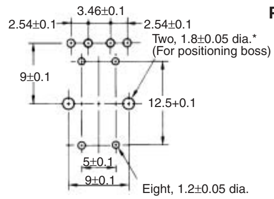


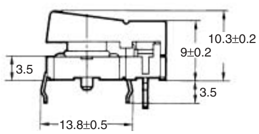
2 LED Types
B3J-5□00, -6□00, -7□00



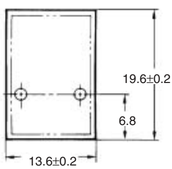


PCB Mounting (Top View)

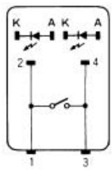




Panel Cutout



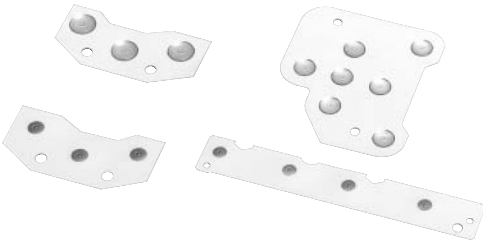
Terminal Arrangement /Internal Connections (Top View)



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Ultra-low Profile Dome Array with Dust-Proof Construction and Crisp Clicking Action

- ROHS compliant.
- No soldering required.
- Attach directly to PCB to make tactile switch.
- Matrix adhesive used to create highly dust-proof construction with good ventilation.
- Lower profile, lighter weight, and crisp clicking action achieved using stainless steel contact dome.
- OMRON's unique circular contact action ensures a high level of resistance to foreign matter.
- Can be designed and produced according to user specifications (e.g., external dimensions or key layout).

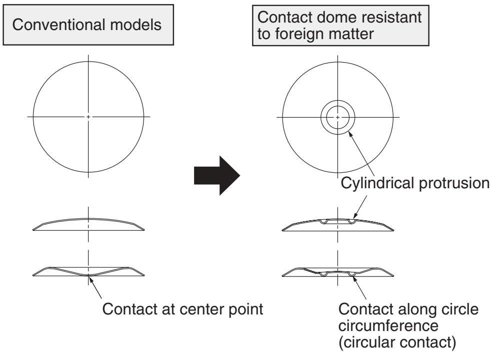


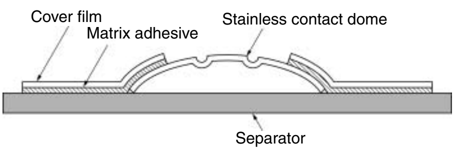
Structure

CIRCULAR CONTACT

When contact dome keys are attached to the PCB, any PCB dust or foreign particles will tend to collect in the center of the key when it is pressed. Therefore, poor contact occurs easily in keys that provide contact at the center point only.

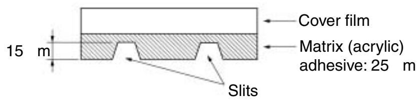
The circular contact construction provides contact along the circumference of a circle, thus preventing poor contact by avoiding the center point.





MATRIX ADHESIVE

This adhesive has grid-shaped slits for ventilation with the structure shown below. The height of the slits is 15 micrometers ensuring both ventilation and dust-proofing.



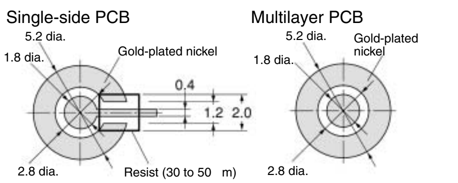
Specifications

Item	Specification
Diameter	4-mm dia. and 5-mm dia. models available
Operating force (OF)	1.57 ±0.49 N
Releasing force (RF)	0.2 N min.
Pretravel (PT)	0.2 ±0.1 mm
Thickness	0.25 ±0.1 mm
Life expectancy	4 mm dia.: 500,000 operations min. 5-mm dia.: 1,000,000 operations min.
Ambient operating temperature	-40 to 80°C
Ambient storage temperature	-40 to 85°C
Material	Stainless steel
Plating	Unplated, silver

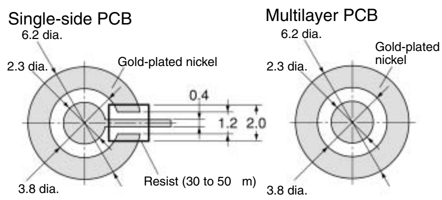
Note: Contact dome specifications not shown in this table are also available.

■ Recommended Contact Form on PCB

4-mm Diameter Contact Dome



5-mm Diameter Contact Dome



Precautions

CORRECT USE

ATTACHING TO THE PCB

Remove the Dome Array from the sheet using tweezers, and attach it above the contact on the PCB surface, which has been wiped clean in advance.

Do not reuse a B3DA Dome Array that has been detached from the PCB. Attach a new Dome Array to the PCB.

Do not touch the contact dome with bare hands, or with unclean gloves. Doing so may damage the contact dome, which is the part that comes in contact with the PCB.

REFLOW SOLDERING

The Dome Array cannot withstand heat from reflow soldering. Always perform reflow soldering before attaching the Dome Array to the PCB.

WASHING

Do not wash the Dome Array. The Dome Array is not water-resistant and must not be exposed to water or other liquids.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Single-key Type Added to Series of B3DA Ultra-low Profile Dome Arrays

- ROHS compliant.
- No soldering required.
- Attach directly to PCB to make an ultra-low profile tactile switch.
- Construction provides strong resistance to static electricity by having no soldered terminals.
- Matrix adhesive used to create highly dust-proof construction with good ventilation.
- Lower profile, lighter weight, and crisp clicking action achieved using stainless steel contact dome.

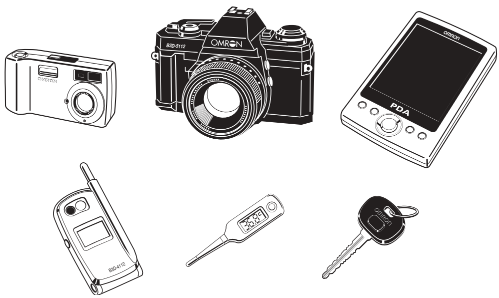
NEW

- OMRON's unique circular contact action ensures a high level of resistance to foreign matter.

Application Examples

Use Dome Keys for the operating parts on various electronic devices that require low-profile controls, as follows:

- Operating switches with few mounted parts above PCBs.
  (Example: Camera operating buttons)
- Small orders, where initial investment in Dome Arrays is not feasible.
  (Example: Trial applications, commercial equipment, etc.)
- Applications requiring a single key only.
  (Example: Reset buttons)



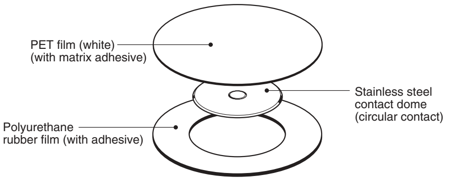
Specifications

Ratings/Characteristics

Item	Model	
	B3D-4112	B3D-5112
Diameter of contact dome	4-mm dia.	5-mm dia.
Operating force (OF)	1.67±0.49 N	
Releasing force (RF)	0.2 N min.	
Pretravel (PT)	0.2±0.1 mm	
Thickness	0.3±0.1 mm	
Life expectancy	500,000 operations min.	1,000,000 operations min.
Switching capacity	12 VDC, 10 mA (resistive load) (recommended minimum load: 3 VDC, 1 mA (resistive load)	
Ambient operating temperature	-40 to 80°C	
Ambient storage temperature	-40 to 85°C	
Contact dome	Stainless steel	
Plating	Silver	

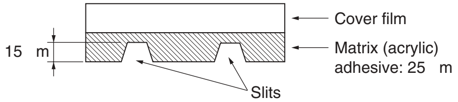
Note: The Dome Keys are sold in units of 500 (20 sheets, with 25 Dome Keys per sheet). Orders must be made in multiples of 500 Dome Keys.

Structure



MATRIX ADHESIVE

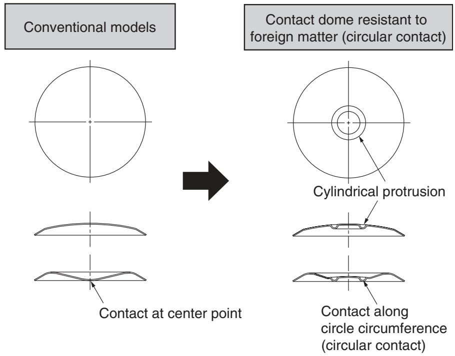
The surface structure of this adhesive has grid-shaped slits, as shown in the following cross-sectional diagram. These slits provide both ventilation and dust-proofing, which is required for contact dome operation.



CIRCULAR CONTACT

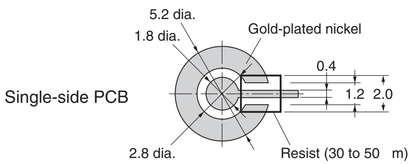
When contact dome keys are attached to the PCB, any PCB dust or foreign particles will tend to collect in the centre of the key when it is pressed. Therefore, poor contact occurs easily in keys that provide contact at the centre point only.

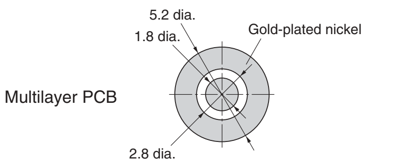
The circular contact construction provides contact along the circumference of a circle, thus preventing poor contact by avoiding the centre point.



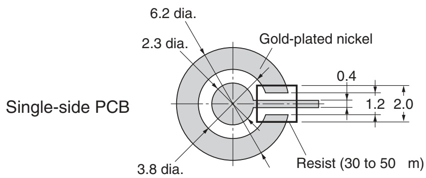
Recommended Contact Form

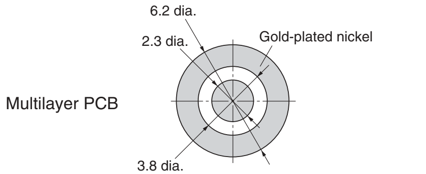
4 mm Diameter Contact Dome (B3D-4112)





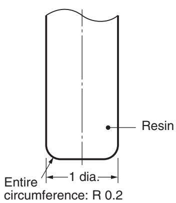
5 mm Diameter Contact Dome (B3D-5112)



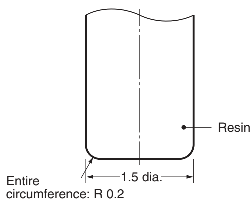


Recommended Operating Part Form

4 mm Diameter Contact Dome (B3D-4112)

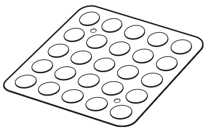


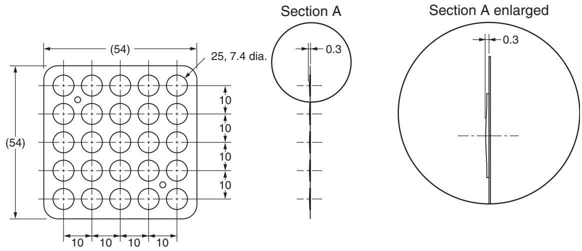
5 mm Diameter Contact Dome (B3D-5112)



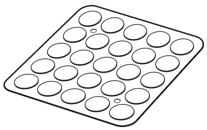
Dimensions

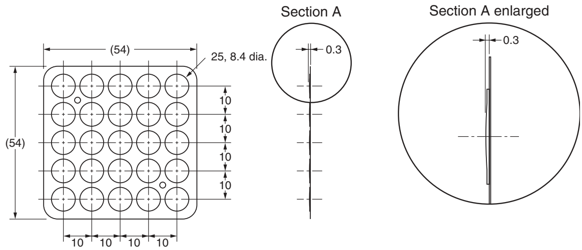
B3D-4112





B3D-5112





Precautions

CORRECT USE

ATTACHING TO THE PCB

Remove the Dome Key from the sheet using tweezers or a vacuum pick-up tool, and attach it above the contact on the PCB surface, which has been wiped clean in advance. Press down on the top surface using an elastic material, such as urethane rubber, and a force of 2.94 to 4.9 N. Place a positioning mark (circle) on the PCB for easy positioning.

Make sure that the position of the Dome Key is aligned correctly before use. Significant misalignment may result in short-circuits or reduced sensitivity.

Note: The recommended vacuum pick-up tool is the Hozan P-835 Vacuum Pick with an M suction pad (7-mm dia.).

Do not reuse a B3D Dome Key that has been detached from the PCB. Attach a new Dome Key to the PCB.

Do not touch the contact dome with bare hands, or with unclean gloves. Doing so may damage the contact dome, which is the part that comes in contact with the PCB.

REFLOW SOLDERING

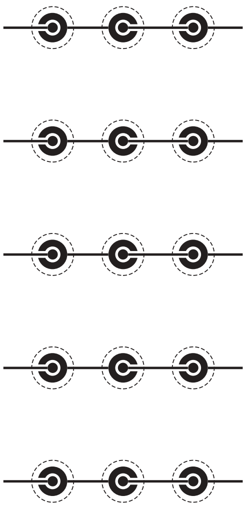
The Dome Key cannot withstand heat from reflow soldering. Always perform reflow soldering before attaching the Dome Key to the PCB.

WASHING

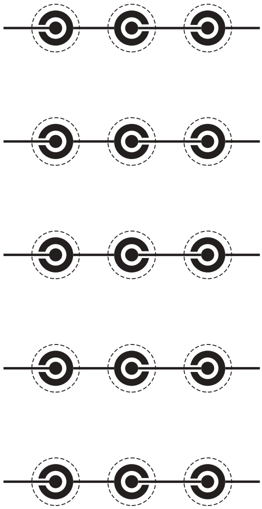
Do not wash the Dome Key. The Dome Key is not water-resistant and must not be exposed to water or other liquids.

PCB Pattern Diagrams

B3D-4112



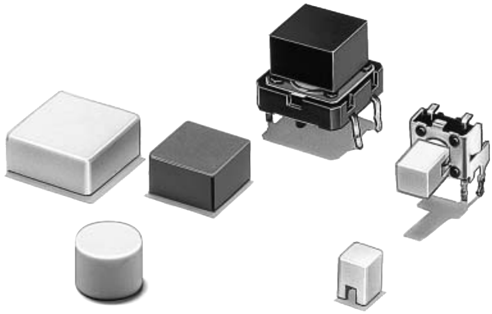
B3D-5112



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Key Top Designed Specially for Projected-plunger-type B3F and B3W Switches

- ROHS compliant.
- Available in a wide range of colors and sizes.



Ordering Information

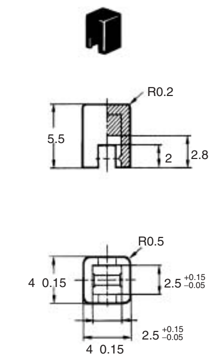
For B3F and B3W Switches

Colour	6 x 6 mm Switches (B3F-1000, B3F-3000, B3F-6000, B3W-1000, B3FS)	12 x 12 mm Switches (B3F-4000, B3F-5000, B3W-4000)		12 x 12 mm Switches
	4 x 4 mm Key Top	9 x 9 mm Key Top	12 x 12 mm Key Top	9.5-mm dia.
Light grey	B32-1000	B32-1200	B32-1300	B32-1600
Black	B32-1010	B32-1210	B32-1310	B32-1610
Orange	B32-1020	B32-1220	B32-1320	B32-1620
Yellow	B32-1030	B32-1230	B32-1330	B32-1630
Blue	B32-1040	B32-1240	B32-1340	–
White	B32-1060	B32-1260	B32-1360	–

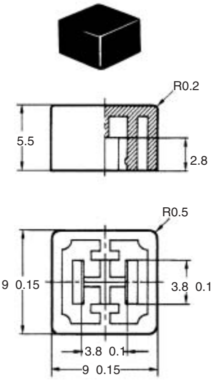
Dimensions

Note: All units are in millimeters unless otherwise indicated. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

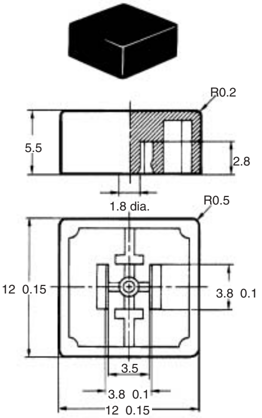
B32-10□0



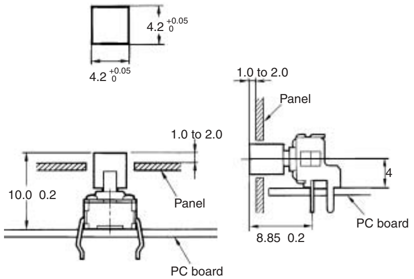
B32-12□0



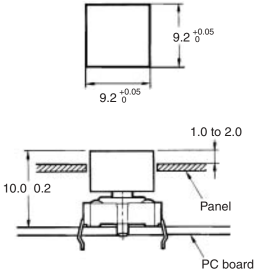
B32-13□0



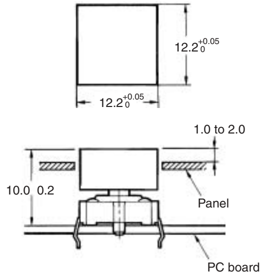
Panel Cutout



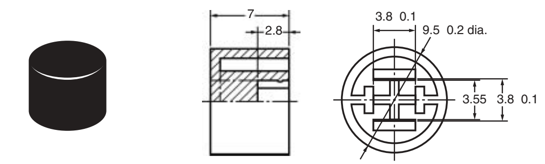
Panel Cutout



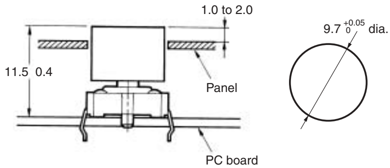
Panel Cutout



B32-16□0



Panel Cutout



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Technical Information

The Photomicrosensor is a compact optical sensor that senses objects or object positions with an optical beam. The transmissive Photomicrosensor and reflective Photomicrosensor are typical Photomicrosensors.

The transmissive Photomicrosensor incorporates an emitter and a transmissive that face each other as shown in Figure 1. When an object is located in the sensing position between the emitter and the detector, the object intercepts the optical beam of the emitter, thus reducing the amount of optical energy reaching the detector.

The reflective Photomicrosensor incorporates an emitter and a detector as shown in Figure 2. When an object is located in the sensing area of the reflective Photomicrosensor, the object reflects the optical beam of the emitter, thus changing the amount of optical energy reaching the detector.

“Photomicrosensor” is an OMRON product name. Generally, the Photomicrosensor is called a photointerrupter.

Figure 1. Transmissive Photomicrosensor

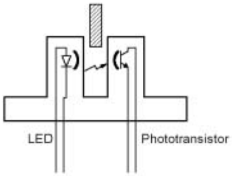
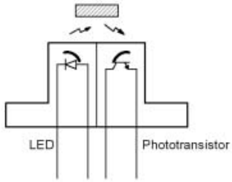


Figure 2. Reflective Photomicrosensor



■ DataSheet

Absolute Maximum Ratings and Electrical and Optical Characteristics

The datasheets of Photomicrosensors include the absolute maximum ratings and electrical and optical characteristics of the Photomicrosensors as well as the datasheets of transistors and ICs. It is necessary to understand the difference between the absolutemaximum ratings and electrical and optical characteristics of various Photomicrosensors.

Absolute Maximum Ratings

The absolute maximum ratings of Photomicrosensors and other products with semiconductors specify the permissible operating voltage, current, temperature, and power limits of these products.

The products must be operated absolutely within these limits.

Therefore, when using any Photomicrosensor, do not ignore the absolute maximum ratings of the Photomicrosensor, otherwise the Photomicrosensor will not operate precisely. Furthermore, the Photomicrosensor may be deteriorate or become damaged, in which case OMRON will not be responsible.

Practically, Photomicrosensors should be used so that there will be some margin between their absolute maximum ratings and actual operating conditions.

Electrical and Optical Characteristics

The electrical and optical characteristics of Photomicrosensors indicate the performance of Photomicrosensors under certain conditions.

Most items of the electrical and optical characteristics are indicated by maximum or minimum values. OMRON usually sells Photomicrosensors with standard electrical and optical characteristics.

The electrical and optical characteristics of Photomicrosensors sold to customers may be changed upon request. All electrical and optical characteristic items of Photomicrosensors indicated by maximum or minimum values are checked and those of the Photomicrosensors indicated by typical values are regularly checked before shipping so that OMRON can guarantee the performance of the Photomicrosensors.

In short, the absolute maximum ratings indicate the permissible operating limits of the Photomicrosensors and the electrical and optical characteristics indicate the maximum performance of the Photomicrosensors.

Terminology

The terms used in the datasheet of each Photomicrosensor with a phototransistor output circuit or a photo IC output circuit are explained below.

■ Phototransistor Output Photomicrosensor

Symbol	Item	Definition
I_{FP}	**Pulse forward current**	The maximum pulse current that is allowed to flow continuously from the anode to cathode of an LED under a specified temperature, a repetition period, and a pulse width condition.
I_C	**Collector current**	The current that flows to the collector junction of a phototransistor.
P_C	**Collector dissipation**	The maximum power that is consumed by the collector junction of a phototransistor.
I_D	**Dark current**	The current leakage of the phototransistor when a specified bias voltage is imposed on the phototransistor so that the polarity of the collector is positive and that of the emitter is negative on condition that the illumination of the Photomicrosensor is 0 ℓx.
I_L	**Light current**	The collector current of a phototransistor under a specified input current condition and at a specified bias voltage.
V_{CE} (sat)	**Collector-emitter saturated voltage**	The ON-state voltage between the collector and emitter of a phototransistor under a specified bias current condition.
I_{LEAK}	**Leakage current**	The collector current of a phototransistor under a specified input current condition and at a specified bias voltage when the phototransistor is not exposed to light.
tr	**Rising time**	The time required for the leading edge of an output waveform of a phototransistor to rise from 10% to 90% of its final value when a specified input current and bias condition is given to the phototransistor.
tf	**Falling time**	The time required for the trailing edge of an output waveform of a phototransistor to decrease from 90% to 10% of its final value when a specified input current and bias condition is given to the phototransistor.
V_{CEO}	**Collector-emitter voltage**	The maximum positive voltage that can be applied to the collector of a phototransistor with the emitter at reference potential.
V_{ECO}	**Emitter-collector voltage**	The maximum positive voltage that can be applied to the emitter of a phototransistor with the collector at reference potential.

Phototransistor/Photo IC Output Photomicrosensor

Symbol	Item	Definition
I_F	**Forward current**	The maximum DC voltage that is allowed to flow continuously from the anode of the LED to the cathode of the LED under a specified temperature condition.
V_R	**Reverse voltage**	The maximum negative voltage that can be applied to the anode of the LED with the cathode at reference potential.
V_{CC}	**Supply voltage**	The maximum positive voltage that can be applied to the voltage terminals of the photo IC with the ground terminal at reference potential.
V_{OUT}	**Output voltage**	The maximum positive voltage that can be applied to the output terminal with the ground terminal of the photo IC at reference potential.
I_{OUT}	**Output current**	The maximum current that is allowed to flow in the collector junction of the output transistor of the photo IC.
P_{OUT}	**Output permissible dissipation**	The maximum power that is consumed by the collector junction of the output transistor of the photo IC.
V_F	**Forward voltage**	The voltage drop across the LED in the forward direction when a specified bias current is applied to the photo IC.
I_R	**Reverse current**	The reverse leakage current across the LED when a specified negative bias is applied to the anode with the cathode at reference potential.
V_{OL}	**Output low voltage**	The voltage drop in the output of the photo IC when the IC output is turned ON under a specified voltage and output current applied to the photo IC.
V_{OH}	**Output high voltage**	The voltage output by the photo IC when the IC output is turned OFF under a specified supply voltage and bias condition given to the photo IC.
I_{CC}	**Current consumption**	The current that will flow into the sensor when a specified positive bias voltage is applied from the power source with the ground of the photo IC at reference potential.
I_{FT} ($I_{FT\ OFF}$)	**LED current when output is turned OFF**	The forward LED current value that turns OFF the output of the photo IC when the forward current to the LED is increased under a specified voltage applied to the photo IC.
I_{FT} ($I_{FT\ ON}$)	**LED current when output is turned ON**	The forward LED current value that turns ON the output of the photo IC when the forward current to the LED is increased under a specified voltage applied to the photo IC.
$\triangle$H	**Hysteresis**	The difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC is turned ON and when the photo IC is turned OFF.
f	**Response frequency**	The number of revolutions of a disk with a specified shape rotating in the light path, expressed by the number of pulse strings during which the output logic of the photo IC can be obtained under a specified bias condition given to the LED and photo IC (the number of pulse strings to which the photo IC can respond in a second).

Design

The following explains how systems using Photomicrosensors must be designed.

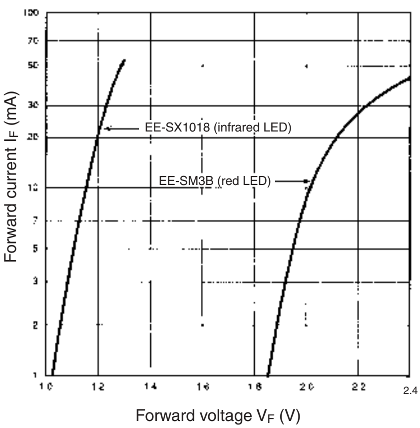
■ Emitter

Characteristics of Emitter

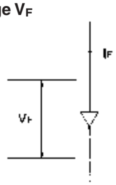
The emitter of each Photomicrosensor has an infrared LED or red LED. Figure 3 shows how the LED forward current characteristics of the EE-SX1018, which has an emitter with an infrared LED, and those of the EE-SM3B, which has an emitter with a red LED, are changed by the voltages imposed on the EE-SX1018 and EE-SM3B. As shown in this figure, the LED forward current characteristics of the EE-SX1018 greatly differ from those of the EE-SM3B. The LED forward current characteristics of any Photomicrosensor indicate how the voltage drop of the LED incorporated by the emitter of the Photomicrosensor is changed by the LED's forward current (I_F) flowing from the anode to cathode. Figure 3 shows that the forward voltage (V_F) of the red LED is higher than that of the infrared LED.

The forward voltage (V_F) of the infrared LED is approximately 1.2 V and that of the red LED is approximately 2 V provided that the practical current required by the infrared LED and that required by the red LED flow into these LEDs respectively.

Figure 3. LED Forward Current vs. Forward Voltage Characteristics (Typical)



Forward Voltage V_F



Driving Current Level

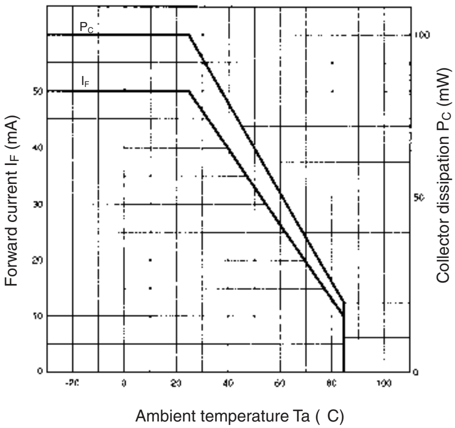
It is especially important to decide the level of the forward current (I_F) of the emitter incorporated by any Photomicrosensor. The forward current must not be too large or too small.

Before using any Photomicrosensor, refer to the absolute maximum ratings in the datasheet of the Photomicrosensor to find the emitter's forward current upper limit. For example, the first item in the absolute maximum ratings in the datasheet of the EE-SX1018 shows that the forward current (I_F) of its emitter is 50 mA at a Ta (ambient temperature) of 25°C. This means the forward current (I_F) of the emitter is 50 mA maximum at a Ta of 25°C. As shown in Figure 4, the forward current must be reduced according to changes in the ambient temperature.

Figure 4 indicates that the forward current (I_F) is approximately 27 mA maximum if the EE-SX1018 is used at a Ta of 60°C. This means that a current exceeding 27 mA must not flow into the emitter incorporated by the EE-SX1018 at a Ta of 60°C.

As for the lower limit, a small amount of forward current will be required because the LED will not give any output if the forward current IF is zero.

Figure 4. Temperature Characteristics (EE-SX1018)



In short, the forward current lower limit of the emitter of any Photomicrosensor must be 5 mA minimum if the emitter has an infrared LED and 2 mA minimum if the emitter has a red LED. If the forward current of the emitter is too low, the optical output of the emitter will not be stable. To find the ideal forward current value of the Photomicrosensor, refer to the light current (I_L) shown in the datasheet of the Photomicrosensor. The light current (I_L) indicates the relationship between the forward current (I_F) of the LED incorporated by the Photomicrosensor and the output of the LED. The light current (I_L) is one of the most important characteristics. If the forward current specified by the light current (I_L) flows into the emitter, even though there is no theoretical ground, the output of the emitter will be stable. This characteristic makes it possible to design the output circuits of the Photomicrosensor with ease. For example, the datasheet of EE-SX1018 indicates that a forward current (I_F) of 20 mA is required.

Design Method

The following explains how the constants of a Photomicrosensor must be determined. Figure 5 shows a basic circuit that drives the LED incorporated by a Photomicrosensor.

The basic circuit absolutely requires a limiting resistor (R). If the LED is imposed with a forward bias voltage without the limiting resistor, the current of the LED is theoretically limitless because the forward impedance of the LED is low. As a result the LED will burn out. Users often ask OMRON about the appropriate forward voltage to be imposed on the LED incorporated by each Photomicrosensor model that they use. There is no upper limit of the forward voltage imposed on the LED provided that an appropriate limiting resistor is connected to the LED. There is, however, the lower limit of the forward voltage imposed on the LED. As shown in Figure 3, the lower limit of the forward voltage imposed on the LED must be at least 1.2 to 2 V, otherwise no forward current will flow into the LED. The supply voltage of a standard electronic circuit is 5 V minimum. Therefore, a minimum of 5 V should be imposed on the LED. A system incorporating any Photomicrosensor must be designed by considering the following.

1. Forward current (I_F)
2. Limiting resistor (R) (refer to Figure 5)

As explained above, determine the optimum level of the forward current (I_F) of the LED. The forward current (I_F) of the EE-SX1018, for example, is 20 mA. Therefore, the resistance of the limiting resistor connected to the LED must be decided so that the forward current of the LED will be approximately 20 mA. The resistance of the limiting resistor is obtained from the following.

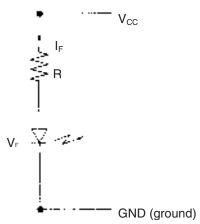
$$R = \frac{V_{CC} - V_F}{I_F}$$

In this case 5 V must be substituted for the supply voltage (V_{CC}). The forward voltage (V_F) obtained from Figure 3 is approximately 1.2 V when the forward current (I_F) of the LED is 20 mA. Therefore, the following resistance is obtained.

$$R = \frac{V_{CC} - V_F}{I_F} = \frac{5 \text{ to } 1.2V}{20 \text{ mA}} = 190$$

The forward current (IF) varies with changes in the supply voltage (VCC), forward voltage (VF), or resistance. Therefore, make sure that there is some margin between the absolute maximum ratings and the actual operating conditions of the Photomicrosensor.

Figure 5. Basic Circuit



The positions of the limiting resistor (R) and the LED in Figure 5 are interchangeable. If the LED is imposed with reverse voltages including noise and surge voltages, add a rectifier diode to the circuit as shown in Figure 6. LEDs can be driven by pulse voltages, the method of which is, however, rarely applied to Photomicrosensors.

In short, the following are important points required to operate any Photomicrosensor.

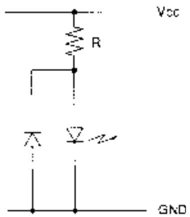
A forward voltage (VF) of approximately 1.2 V is required if the Photomicrosensor has an infrared LED and a forward voltage (VF) of approximately 2 V is required if the Photomicrosensor has a red LED.

The most ideal level of the forward current (IF) must flow into the LED incorporated by the Photomicrosensor.

Decide the resistance of the limiting resistor connected to the LED after deciding the value of the forward current (IF).

If the LED is imposed with a reverse voltage, connect a rectifier diode to the LED in parallel with and in the direction opposite to the direction of the LED.

Figure 6. Reverse Voltage Protection Circuit



■ Design of Systems Incorporating Photomicrosensors (1)

PHOTOTRANSISTOR OUTPUT

Characteristics of Detector Element

The changes in the current flow of the detector element with and without an optical input are important characteristics of a detector element. Figure 7 shows a circuit used to check how the current flow of the phototransistor incorporated by a Photomicrosensor is changed by the LED with or without an appropriate forward current (I_F) flow, provided that the ambient illumination of the Photomicrosensor is ideal (i.e., 0 lx). When there is no forward current (I_F) flowing into the LED or the optical beam emitted from the LED is intercepted by an opaque object, the ammeter indicates several nanoamperes due to a current leaking from the phototransistor. This current is called the dark current (I_D). When the forward current (I_F) flows into the LED with no object intercepting the optical beam emitted from the LED, the ammeter indicates several milliamperes. This current is called the light current (I_L).

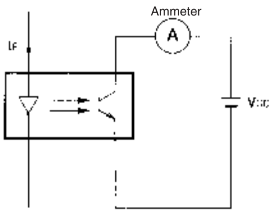
The difference between the dark current and light current is 106 times larger as shown below.

When optical beam to the phototransistor is interrupted Dark current I_D: 10^{-9} A

When optical beam to the phototransistor is not interrupted Light current I_L: 10^{-3} A

The standard light current of a phototransistor is 106 times as large as the dark current of the phototransistor. This difference in current can be applied to the sensing of a variety of objects.

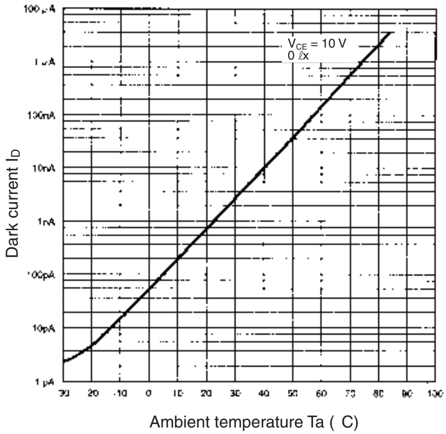
Figure 7. Measuring Circuit



The ambient illumination of the LED and phototransistor incorporated by the Photomicrosensor in actual operation is not 0 lx. Therefore, a current larger than the dark current of the phototransistor will flow into the phototransistor when the optical beam emitted from the LED is interrupted. This current is rather large and must not be ignored if the Photomicrosensor has a photoelectric Darlington transistor, which is highly sensitive, as the detector element of the Photomicrosensor. The dark current of the phototransistor incorporated by any reflective Photomicrosensor flows if there is no reflective object in the sensing area of the reflective Photomicrosensor. Furthermore, due to the structure of the reflective Photomicrosensor, a small portion of the optical beam emitted from the LED reaches the phototransistor after it is reflected inside the reflective Photomicrosensor. Therefore, the dark current and an additional current will flow into the phototransistor if there is no sensing object in the sensing area. This additional current is called leakage current (I_{LEAK}). The leakage current of the phototransistor is several hundred nanoamperes and the dark current of the phototransistor is several nanoamperes.

The dark current temperature and light current temperature dependencies of the phototransistor incorporated by any Photomicrosensor must not be ignored. The dark current temperature dependency of the phototransistor increases when the ambient temperature of the Photomicrosensor in operation is high or the Photomicrosensor has a photoelectric Darlington transistor as the detector element of the Photomicrosensor. Figure 8 shows the dark current temperature dependency of the phototransistor incorporated by the EE-SX1018.

Figure 8. Dark Current vs. Ambient Temperature Characteristics (Typical) (EE-SX1018)



Due to the temperature dependency of the phototransistor, the light current (I_L) of the phototransistor as the detector element of the Photomicrosensor increases according to a rise in the ambient temperature. As shown in Figure 9, however, the output of the LED decreases according to a rise in the ambient temperature due to the temperature dependency of the LED. An increase in the light current of the phototransistor is set off against a decrease in the output of the LED and consequently the change of the output of the Photomicrosensor according to the ambient temperature is comparatively small. Refer to Figure 10 for the light current temperature dependency of the phototransistor incorporated by the EE-SX1018.

The light current temperature dependency shown in Figure 10 is, however, a typical example. The tendency of the light current temperature dependency of each phototransistor is indefinite. This means the temperature compensation of any Photomicrosensor is difficult.

Figure 9. LED and Phototransistor Temperature Characteristics (Typical)

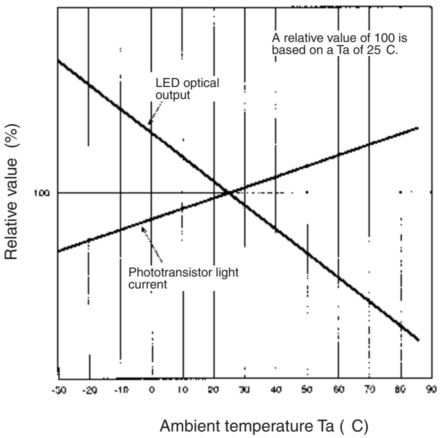
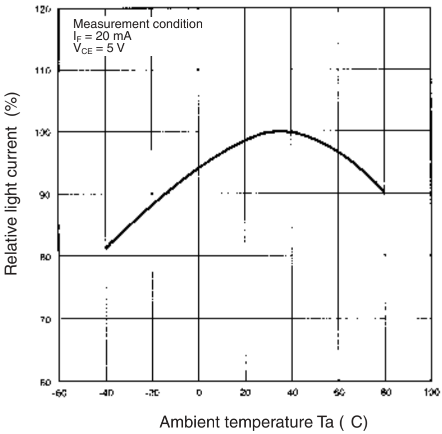


Figure 10. Relative Light Current vs. Ambient Temperature Characteristics (EE-SX1018)



Changes in Characteristics

TThe following explains the important points required for the designing of systems incorporating Photomicrosensors by considering worst case design technique. Worst case design technique is a method to design systems so that the Photomicrosensors will operate normally even if the characteristics of the Photomicrosensors are at their worst. A system incorporating any Photomicrosensor must be designed so that they will operate even if the light current (I_L) of the phototransistor is minimal and the dark current (I_D) and leakage current of the phototransistor are maximal. This means that the system must be designed so that it will operate even if the difference in the current flow of the phototransistor between the time that the Photomicrosensor senses an object and the time that the Photomicrosensor does not sense the object is minimal.

The worst light current (I_L) and dark current (I_D) values of the phototransistor incorporated by any Photomicrosensor is specified in the datasheet of the Photomicrosensor. (These values are specified in the specifications either as the minimum value or maximum value.)

Table 1 shows the dark current (I_D) upper limit and light current (I_L) lower limit values of the phototransistors incorporated by a variety of Photomicrosensors.

Systems must be designed by considering the dark current (I_D) upper limit and light current (I_L) lower limit values of the phototransistors. Not only these values but also the following factors must be taken into calculation to determine the upper limit of the dark current (I_D) of each of the phototransistors.

- External light interference
- Temperature rise
- Power supply voltage
- Leakage current caused by internal light reflection if the systems use reflective Photomicrosensors.

The above factors increase the dark current (I_D) of each phototransistor.

As for the light current (I_L) lower limit of each phototransistor, the following factors must be taken into calculation.

- Temperature change
- Secular change

The above factors decrease the light current (I_L) of each phototransistor.

Table 2 shows the increments of the dark current (I_D) and the decrements of the light current (I_D) of the phototransistors.

Therefore, if the EE-SX1018 is operated at a Ta of 60°C maximum and a VCC of 10 V for approximately 50,000 hours, for example, the dark current (I_D) of the phototransistor incorporated by the EE-SX1018 will be approximately 4 mA and the light current (I_L) of the phototransistor will be approximately 1 mA because the dark current (I_D) of the phototransistor at a Ta of 25°C is 200 nanoamperes maximum and the light current (I_L) of the phototransistor at a Ta of 25°C is 2 mA minimum.

Table 3 shows the estimated worst values of a variety of Photomicrosensors, which must be considered when designing systems using these Photomicrosensors.

The dispersion of the characteristics of the Photomicrosensors must be also considered, which is explained in detail later. The light current (I_L) of the phototransistor incorporated by each reflective Photomicrosensor shown in its datasheet was measured under the standard conditions specified by OMRON for its reflective Photomicrosensors. The light current (I_L) of any reflective Photomicrosensor greatly varies with its sensing object and sensing distance.

Table 1. Rated Dark Current (I_D) and Light Current (I_L) Values

Model	Upper limit (I_D)	Lower limit (I_L)	Condition
EE-SG3(-B)	200 nA	2 mA	I_F = 15 mA
EE-SX1018, -SX1055 EE-SX1041, -SX1042 EE-SX1070, -SX1071 EE-SX198, -SX199	200 nA	0.5 mA	I_F = 20 mA
EE-SM3 EE-SM3B EE-SJ3W-B EE-SK3W-B	250 nA	1.5 mA	I_F = 3 mA
EE-SB5(-B) EE-SF5(-B) EE-SY110	200 nA	0.2 mA	I_F = 20 mA (see note)
EE-SY201	250 nA	0.3 mA	I_F = 5 mA (see note)
Condition	V_{CE} = 10 V, 0 lx Ta = 25°C	V_{CE} = 10 V Ta = 25°C	–

Note: These values were measured under the standard conditions specified by OMRON for the corresponding Photomicrosensors.

Table 2. Dependency of Detector Elements on Various Factors

Elements		Phototransistor	Photo-Darlington transistor
Dark current I_D	**External light interference**	To be checked using experiment	To be checked using experiment
	Temperature rise	Increased by approximately 10 times with a temperature rise of 25°C.	Increased by approximately 28 times with a temperature rise of 25°C.
	Supply voltage	See Figure 11.	See Figure 12.
Light current I_L	**Temperature change**	Approximately –20% to 10%	Approximately –20% to 10%
	Secular change (20,000 to 50,000 hours) **Note:** For an infrared LED.	Decreased to approximately one-half of the initial value considering the temperature changes of the element.	Decreased to approximately one-half of the initial value considering the temperature changes of the element.

Figure 11. Dark Current Imposed Voltage Dependency (Typical) (EE-SX1018)

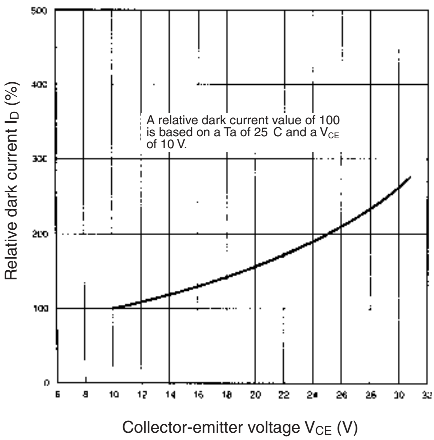


Figure 12. Dark Current Imposed Voltage Dependency (Typical) (EE-SM3B)

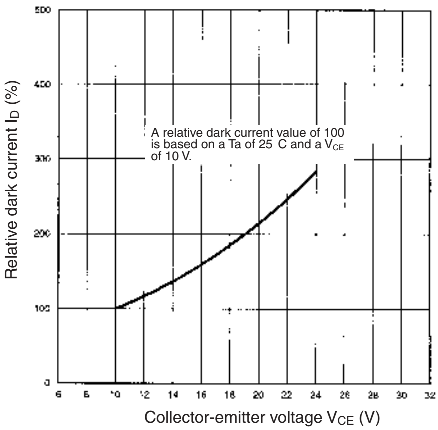


Table 3. Estimated Worst Values of a Variety of Photomicrosensors

Model	Estimated worst value (I_D)	Estimated worst value (I_L)	Condition
EE-SG3(-B)	4 nA	1 mA	I_F = 15 mA
EE-SX1018, -SX1055 EE-SX1041, -SX1042 EE-SX1070, -SX1071 EE-SX198, -SX199	4 nA	0.25 mA	I_F = 20 mA
EE-SM3 EE-SM3B EE-SJ3W-B EE-SK3W-B	25 nA	0.75 mA	I_F = 3 mA
EE-SB5(-B) EE-SF5(-B) EE-SY110	4 nA	0.1 mA	I_F = 20 mA (see note)
EE-SY201	25 nA	0.15 mA	I_F = 5 mA (see note)
Condition	V_{CE} = 10 V, 0 lx Ta = 60°C	V_{CE} = 10 V, Operating hours = 50,000 to 100,000 hrs Ta = Topr	–

Note: These values were measured under the standard conditions specified by OMRON for the corresponding Photomicrosensors with an Infrared LED.

Design of Basic Circuitry

The following explains the basic circuit incorporated by a typical Photomicrosensor and the important points required for the basic circuit.

The flowing currents (i.e., I_L and I^D) of the phototransistor incorporated by the Photomicrosensor must be processed to obtain the output of the Photomicrosensor. Refer to Figure 13 for the basic circuit. The light current (I_L) of the phototransistor will flow into the resistor (R_L) if the phototransistor receives an optical input and the dark current (I_D) and leakage current of the phototransistor will flow into the resistor (R_L) if the phototransistor does not receive any optical input. Therefore, if the phototransistor receives an optical input, the output voltage imposed on the resistor (R_L) will be obtained from the following.

IL x RL

If the phototransistor does not receive any optical input, the output voltage imposed on the resistor (RL) will be obtained from the following.

(I_D + leakage current) x R_L

The output voltage of the phototransistor is obtained by simply connecting the resistor (R_L) to the phototransistor. For example, to obtain an output of 4 V minimum from the phototransistor when it is ON and an output of 1 V maximum when the phototransistor is OFF on condition that the light current (I_L) of the phototransistor is 1 mA and the leakage current of the phototransistor is 0.1 mA, and these are the worst light current and leakage current values of the phototransistor, the resistance of the resistor (R_L) must be approximately 4.7 kΩ. Then, an output of 4.7 V (i.e., 1 mA x 4.7 kΩ) will be obtained when the phototransistor is ON and an output of 0.47 V (i.e., 0.1 mA x 4.7 kΩ) will be obtained when the phototransistor is OFF. Practically, the output voltage of the phototransistor will be more than 4.7 V when the phototransistor is ON and less than 0.47 V when the phototransistor is OFF because the above voltage values are based on the worst light current and leakage current values of the phototransistor. The outputs obtained from the phototransistor are amplified and input to ICs to make practical use of the Photomicrosensor.

Figure 13. Basic Circuit

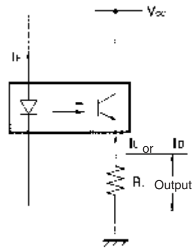
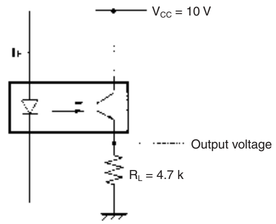


Figure 14. Output Example



EE-SX1018

Design of Applied Circuit

The following explains the designing of the applied circuit shown in Figure 15.

The light current (I_L) of the phototransistor flows into R_1 and R_2 when the phototransistor receives the optical beam emitted from the LED. Part of the light current (I_L) will flow into the base and emitter of Q_1 when the voltage imposed on R_2 exceeds the bias voltage (i.e., approximately 0.6 to 0.9 V) imposed between the base and emitter of the transistor (Q_1). The light current flowing into the base turns Q_1 ON. A current will flow into the collector of Q_1 through R_3 when Q_1 is ON. Then, the electric potential of the collector will drop to a low logic level. The dark current and leakage current of the phototransistor flow when the optical beam emitted from the LED is intercepted. The electric potential of the output of the phototransistor (i.e., (I_D + leakage current) x R_2) is, however, lower than the bias voltage between the base and emitter of Q1. Therefore, no current will flow into the base of Q_1 and Q_1 will be OFF. The output of Q_1 will be at a high level. As shown in Figure 16, when the phototransistor is ON, the phototransistor will be seemingly short-circuited through the base and emitter of the Q_1, which is equivalent to a diode, and if the light current (I_L) of the phototransistor is large and R_1 is not connected to the phototransistor, the light current (IL) will flow into Q_1 and the collector dissipation of the phototransistor will be excessively large.

The following items are important when designing the above applied circuit:

The voltage output (i.e., I_L x R_2) of the phototransistor receiving the optical beam emitted from the LED must be much higher than the bias voltage between the base and emitter of Q1.

The voltage output (i.e., (I_D + leakage current) x R_2) of the phototransistor not receiving the optical beam emitted from the LED must be much lower than the bias voltage between the base and emitter of Q1.

Therefore, it is important to determine the resistance of R_2. Figure 17 shows a practical applied circuit example using the EE-SX1018 Photomicrosensor at a supply voltage (V_{CC}) of 5V to drive a 74-series TTL IC. This applied circuit example uses R_1 and R_2 with appropriate resistance values.

Figure 15. Applied Circuit

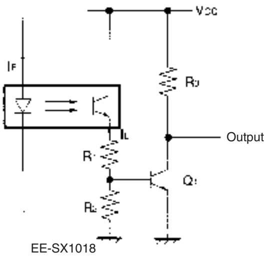


Figure 16. Equivalent Circuit

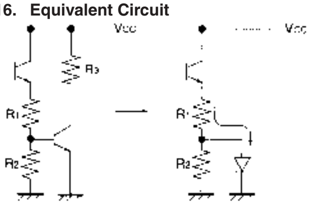
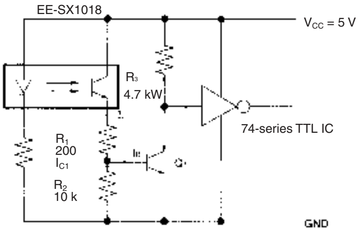


Figure 17. Applied Circuit Example



Calculation of R_2

The resistance of R_2 should be decided using the following so that the appropriate bias voltage (V_{BE}(ON)) between the base and emitter of the transistor (Q_1) to turn Q_1 ON will be obtained.

$I_{C1} \quad R_2 > V_{BE(ON)}$

$I_{C1} = I_L - I_B$

$(I_L - I_B) \text{ x } R_2 > V_{BE(ON)}$

$$R_2 > \frac{V_{BE(ON)}}{I_L - I_B}$$

The bias voltage (V_{BE}(ON)) between the base and emitter of Q_1 is approximately 0.8 V and the base current (I_B) of Q_1 is approximately 20 mA if Q_1 is a standard transistor controlling small signals. The estimated worst value of the light current (IL) of the phototransistor is 0.25 mA according to Table 3.

Therefore, the following is obtained.

$$R_2 > \frac{0.8\text{ V}}{0.25\text{ mA} - 20\text{ mA}} = \text{approx. } 3.48\text{ k}$$

R_2 must be larger than the above result. Therefore, the actual resistance of R_2 must be two to three times as large as the above result. In the above applied circuit example, the resistance of R_2 is 10 kΩ.

Verification of R_2 Value

The resistance of R_2 obtained from the above turns Q_1 ON. The following explains the way to confirm whether the resistance of R_2 obtained from the above can turns Q_1 OFF as well. The condition required to turn Q_1 OFF is obtained from the following.

(ID + a) x R_2 < VBE(OFF)

Substitute 10 kΩ for R_2, 4 mA for the dark current (ID) according to Table 3, and 10 μA for the leakage current on the assumption that the leakage current is 10 μA in formula 3. The following is obtained.

$(I_D + a) \quad R_2 > V_{BE(ON)}$

$(4 \quad A + 10 \quad A) \quad 10\text{ k} \quad = 0.140\text{ V}$

$V_{BE(OFF)} = 0.4\text{ V}$

$0.140\text{ V} < 0.4\text{ V}$

The above result verifies that the resistance of R_2 satisfies the condition required to turn Q_1 OFF.

If the appropriateness of the resistance of R_2 has been verified, the design of the circuit is almost complete.

R_1

As shown in Figure 16, when the phototransistor is ON, the phototransistor will be seemingly short-circuited through the base and emitter of the Q_1, and if the light current (I_L) of the phototransistor is large and R_1 is not connected to the phototransistor, the light current will flow into Q_1 and the collector dissipation of the phototransistor will be excessively large. The resistance of R_1 depends on the maximum permissible collector dissipation (PC) of the phototransistor, which can be obtained from the datasheet of the Photomicrosensor. The resistance of R_1 of a phototransistor is several hundred ohms. In the above applied circuit example, the resistance of R_1 is 200 Ω.

If the resistance of R_1 is determined, the design of the circuit is complete.

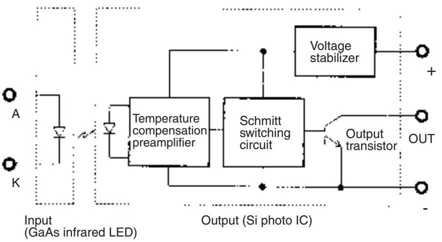
It is important to connect a transistor to the phototransistor incorporated by the Photomicrosensor to amplify the output of the phototransistor, which increases the reliability and stability of the Photomicrosensor. Such reliability and stability of the Photomicrosensor cannot be achieved if the output of the phototransistor is not amplified. The response speed and other performance characteristics of the circuit shown in Figure 15 are far superior to those of the circuit shown in Figure 13 because the apparent impedance (i.e., load resistance) of the Photomicrosensor is determined by R_1, the resistance of which is comparatively small. Recently, Photomicrosensors that have photo IC amplifier circuits are increasing in number because they are easy to use and make it possible to design systems using Photomicrosensors without problem.

■ Design of Systems Incorporating Photomicrosensors (2)

PHOTO IC OUTPUT

Figure 18 shows the circuit configuration of the EE-SX301 or EE-SX401 Photomicrosensor incorporating a photo IC output circuit. The following explains the structure of a typical Photomicrosensor with a photo IC output circuit.

Figure 18. Circuit Configuration



LED Forward Current (I_F) Supply Circuit

The LED in the above circuitry is an independent component, to which an appropriate current must be supplied from an external power supply. This is the most important item required by the Photomicrosensor.

It is necessary to determine the appropriate forward current (I_F) of the LED that turns the photo IC ON. If the appropriate forward current is determined, the Photomicrosensor can be easily used by simply supplying power to the detector circuitry (i.e., the photo IC). Refer to the datasheet of the Photomicrosensor to find the current of the LED turning the photo IC ON. Table 4 is an extract of the datasheet of the EE-SX301/EE-SX401.

Table 4. Abstract of Characteristics

Item	Symbol	EE-SX301, -SX401	
		Value	Condition
LED current when output is turned OFF (EE-SX301)	I_{FTOFF}	8 mA max.	V_{CC} = 4.5 to 16 V Ta = 25°C
LED current when output is turned ON (EE-SX401)	I_{FTON}		

To design systems incorporating EE-SX301 or EE-SX401 Photomicrosensors, the following are important points.

- A forward current equivalent to or exceeding the IFTOFF value must flow into the LED incorporated by each EE-SX301 Photomicrosensors.
- A forward current equivalent to or exceeding the IFTON value must flow into the LED incorporated by the EE-SX401 Photomicrosensors.

The IFTON value of the EE-SX301 is 8 mA maximum and so is the IFON value of the EE-SX401. The forward current (I_F) of LED incorporated by the EE-SX301 in actual operation must be 8 mA or more and so must the actual forward current of (I_F) the LED incorporated by the EE-SX401 in actual operation. The actual forward currents of the LEDs incorporated by the EE-SX301 and EE-SX401 are limited by their absolute maximum forward currents respectively. The upper limit of the actual forward current of the LED incorporated by the EE-SX301 and that of the LED incorporated by the EE-SX401 must be decided according Figure 19, which shows the temperature characteristics of the EE-SX301 and EE-SX401. The forward current (I_F) of the EE-SX301 must be as large as possible within the absolute maximum forward current and maximum ambient temperature shown in Figure 19 and so must be the forward current (I_F) of the EE-SX401. The forward current (I_F) of the EE-SX301 or that of the EE-SX401 must not be close to 8 mA, otherwise the photo IC of the EE-SX301 or that of the EE-SX401 may not operate if there is any ambient temperature change, secular change that reduces the optical output of the LED, or dust sticking to the LED. The forward current (I_F) values of the EE-SX301 and the EE-SX401 in actual operation must be twice as large as the I_{FOFF} values of the EE-SX301 and EE-SX401 respectively. Figure 20 shows the basic circuit of a typical Photomicrosensor with a photo IC output circuit.

If the Photomicrosensor with a photo IC output circuit is used to drive a relay, be sure to connect a reverse voltage absorption diode (D) to the relay in parallel as shown in Figure 21.

Detector Circuit

Supply a voltage within the absolute maximum supply voltage to the positive and negative terminals of the photo IC circuit shown in Figure 18 and obtain a current within the IOUT value of the output transistor incorporated by the photo IC circuit.

Figure 19. Forward Current vs. Ambient Temperature Characteristics (EE-SX301/-SX401)

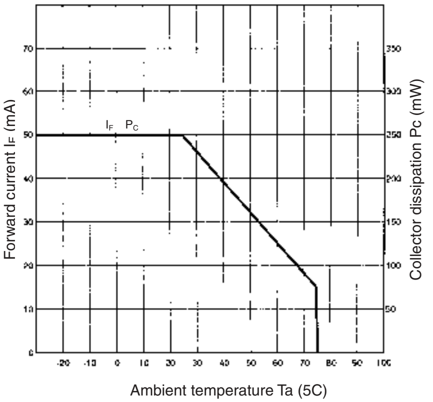


Figure 20. Basic Circuit

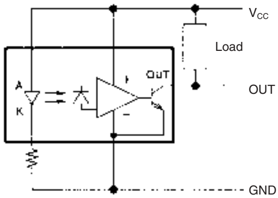
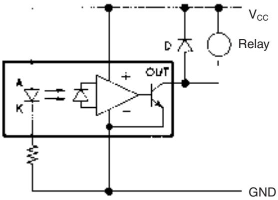


Figure 21. Connected to Inductive Load



Precautions

The following provides the instructions required for the operation of Photomicrosensors.

■ Transmissive Photomicrosensor Incorporating Phototransistor Output Circuit

When using a transmissive Photomicrosensor to sense the following objects, make sure that the transmissive Photomicrosensor operates properly.

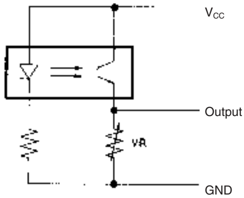
- Highly permeable objects such as paper, film, and plastic
- Objects smaller than the size of the optical beam emitted by the LED or the size of the aperture of the detector.

The above objects do not fully intercept the optical beam emitted by the LED. Therefore, some part of the optical beam, which is considered noise, reaches the detector and a current flows from the phototransistor incorporated by the detector. Before sensing such type of objects, it is necessary to measure the light currents of the phototransistor with and without an object to make sure that the transmissive Photomicrosensor can sense objects without being interfered by noise. If the light current of the phototransistor sensing any one of the objects is $I_L(N)$ and that of the phototransistor sensing none of the objects is $I_L(S)$, the signal-noise ratio of the phototransistor due to the object is obtained from the following.

$$S/N = I_L(S)/I_L(N)$$

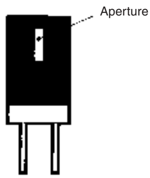
The light current (I_L) of the phototransistor varies with the ambient temperature and secular changes. Therefore, if the signal-noise ratio of the phototransistor is 4 maximum, it is necessary to pay utmost attention to the circuit connected to the transmissive Photomicrosensor so that the transmissive Photomicrosensor can sense the object without problem. The light currents of phototransistors are different to one another. Therefore, when multiple transmissive Photomicrosensors are required, a variable resistor must be connected to each transmissive Photomicrosensor as shown in Figure 22 if the light currents of the phototransistors greatly differ from one another.

Figure 22. Sensitivity Adjustment



The optical beam of the emitter and the aperture of the detector must be as narrow as possible. An aperture each can be attached to the emitter and detector to make the optical beam of the emitter and the aperture of the detector narrower. If apertures are attached to both the emitter and detector, however, the light current (IL) of the phototransistor incorporated by the detector will decrease. It is desirable to attach apertures to both the emitter and detector. If an aperture is attached to the detector only, the transmissive Photomicrosensor will have trouble sensing the above objects when

Figure 23. Aperture Example



When using the transmissive Photomicrosensor to sense any object that vibrates, moves slowly, or has highly reflective edges, make sure to connect a proper circuit which processes the output of the transmissive Photomicrosensor so that the transmissive Photomicrosensor can operate properly, otherwise the transmissive Photomicrosensor may have a chattering output signal as shown in Figure 24. If this signal is input to a counter, the counter will have a counting error or operate improperly. To protect against this, connect a 0.01- to 0.02-μF capacitor to the circuit as shown in Figure 25 or connect a Schmitt trigger circuit to the circuit as shown in Figure 26.

Figure 24. Chattering Output Signal

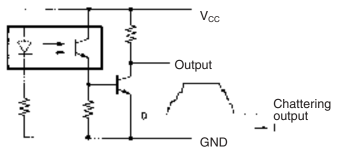


Figure 25. Chattering Prevention (1)

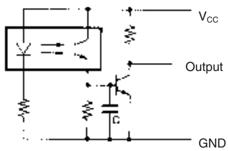
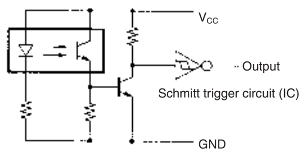


Figure 26. Chattering Prevention (2)



■ Reflective Photomicrosensor Incorporating Phototransistor Output Circuit

When using a reflective Photomicrosensor to sense objects, pay attention to the following so that the reflective Photomicrosensor operates properly.

- External light interference
- Background condition of sensing objects
- Output level of the LED

The reflective Photomicrosensor incorporates a detector element in the direction shown in Figure 27. Therefore, it is apt to be affected by external light interference. The reflective Photomicrosensor, therefore, incorporates a filter to intercept any light, the wavelength of which is shorter than a certain wavelength, to prevent external light interference. The filter does not, however, perfectly intercept the light. Refer to Figure 28 for the light interception characteristics of filters. A location with minimal external light interference is best suited for the reflective Photomicrosensor.

Figure 27. Configuration of Reflective Photomicrosensor

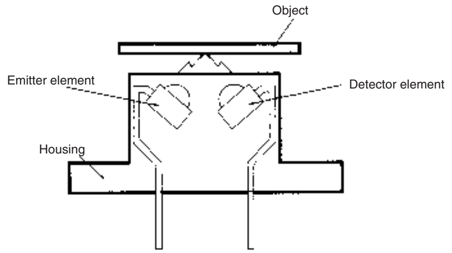


Figure 28. Light Interception Characteristics of Filters

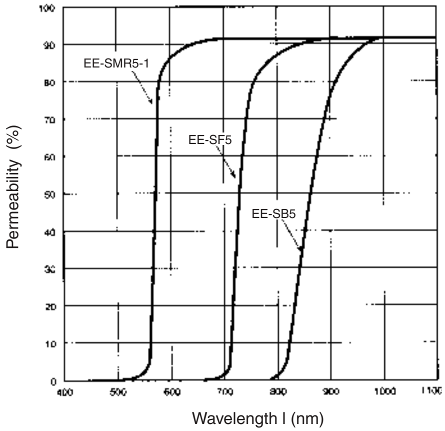
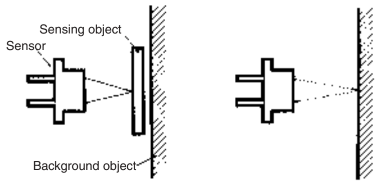


Figure 29. Influence of Background Object



With regard to the background conditions, the following description is based on the assumption that the background is totally dark.

Figure 29 shows that the optical beam emitted from the LED incorporated by a reflective Photomicrosensor is reflected by a sensing object and background object. The optical beam reflected by the background object and received by the phototransistor incorporated by the detector is considered noise that lowers the signal-noise ratio of the phototransistor. If any reflective Photomicrosensor is used to sense paper passing through the sensing area of the reflective Photomicrosensor on condition that there is a stainless steel or zinc-plated object behind the paper, the light current (IL(N)) of the phototransistor not sensing the paper may be larger than the light current (IL(S)) of phototransistor sensing the paper, in which case remove the background object, make a hole larger than the area of the sensor surface in the background object as shown in Figure 30, coat the surface of the background object with black lusterless paint, or roughen the surface of the background. Most malfunctions of a reflective Photomicrosensor are caused by an object located behind the sensing objects of the reflective Photomicrosensor.

Unlike the output (i.e., I_L) of any transmissive Photomicrosensor, the light current (I_L) of a reflective Photomicrosensor greatly varies according to sensing object type, sensing distance, and sensing object size.

Figure 30. Example of Countermeasure

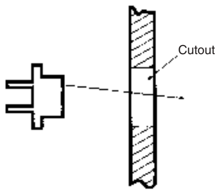
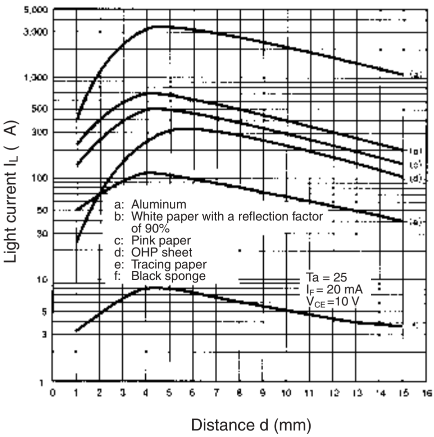


Figure 31. Sensing Distance Characteristics (EE-SF5)



The light current (I_L) of the phototransistor incorporated by the transmissive Photomicrosensor is output when there is no sensing object in the sensing groove of the transmissive Photomicrosensor. On the other hand, the light current (I_L) of the phototransistor incorporated by the reflective Photomicrosensor is output when there is a standard object specified by OMRON located in the standard sensing distance of the reflective Photomicrosensor. The light current (I_L) of the phototransistor incorporated by the reflective Photomicrosensor varies when the reflective Photomicrosensor senses any other type of sensing object located at a sensing distance other than the standard sensing distance. Figure 31 shows how the output of the phototransistor incorporated by the EE-SF5(-B) varies according to varieties of sensing objects and sensing distances. Before using the EE-SF5(-B) to sense any other type of sensing objects, measure the light currents of the phototransistor in actual operation with and without one of the sensing objects as shown in Figure 32. After measuring the light currents, calculate the signal-noise ratio of the EE-SF5(-B) due to the sensing object to make sure if the sensing objects can be sensed smoothly. The light current of the reflective Photomicrosensor is, however, several tens to hundreds of microamperes. This means that the absolute signal levels of the reflective Photomicrosensor are low. Even if the reflective Photomicrosensor in operation is not interfered by external light, the dark current (I_D) and leakage current (I_{LEAK}) of the reflective Photomicrosensor, which are considered noise, may amount to several to ten-odd microamperes due to a rise in the ambient temperature. This noise cannot be ignored. As a result, the signal-noise ratio of the reflective Photomicrosensor will be extremely low if the reflective Photomicrosensor senses any object with a low reflection ratio.

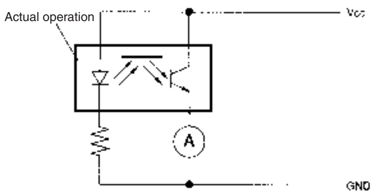
Pay utmost attention when applying the reflective Photomicrosensor to the sensing of the following.

- Marked objects (e.g., White objects with a black mark each)
- Minute objects

The above objects can be sensed if the signal-noise ratio of the reflective Photomicrosensor is not too low.

The reflective Photomicrosensor must be used with great care, otherwise it will not operate properly.

Figure 32. Output Current Measurement



Precautions

■ Correct Use

Use the product within the rated voltage range.

Applying voltages beyond the rated voltage ranges may result in damage or malfunction to the product.

Wire the product correctly and be careful with the power supply polarities.

Incorrect wiring may result in damage or malfunction to the product.

Connect the loads to the power supply. Do not short-circuit the loads.

Short-circuiting the loads may result in damage or malfunction to the product.

■ Structure and Materials

The emitter and detector elements of conventional Photomicrosensors are fixed with transparent epoxy resin and the main bodies are made of polycarbonate. Unlike ICs and transistors, which are covered with black epoxy resin, Photomicrosensors are subject to the following restrictions.

1. Low Heat Resistivity

The storage temperature of standard ICs and transistors is approximately 150°C. On the other hand, the storage temperature of highly resistant Photomicrosensors is 100°C maximum.

2. Low Mechanical Strength

Black epoxy resin, which is used for the main bodies of ICs and transistors, contains additive agents including glass fibre to increase the heat resistivity and mechanical strength of the main bodies. Materials with additive agents cannot be used for the bodies of Photomicrosensors because Photomicrosensors must maintain good optical permeability. Unlike ICs and transistors, Photomicrosensors must be handled with utmost care because Photomicrosensors are not as heat or mechanically resistant as ICs and transistors. No excessive force must be imposed on the lead wires of Photomicrosensors.

■ Mounting

Screw Mounting

If Photomicrosensors have screw mounting holes, the Photomicrosensors can be mounted with screws. Unless otherwise specified, refer to the following when tightening the screws.

Hole diameter	Screw size	Tightening torque
1.5 dia.	M1.4	0.20 N • m
2.1 dia.	M2	0.34 N • m
3.2 dia.	M3	0.54 N • m
4.2 dia.	M4	0.54 N • m

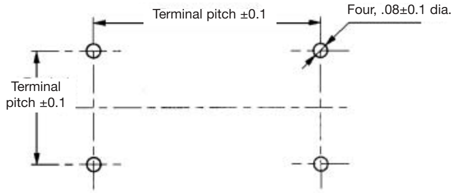
Read the following before tightening the screws.

1. The use of a torque screwdriver is recommended to tighten each of the screws so that the screws can be tightened to the tightening torque required.
2. The use of a screw with a spring washer and flat washer for the mounting holes of a Photomicrosensor is recommended. If a screw with a spring washer but without a flat washer is used for any mounting hole, the part around the mounting hole may crack.
3. Do not mount Photomicrosensors to plates stained with machining oil, otherwise the machining oil may cause cracks on the Photomicrosensors.
4. Do not impose excessive forces on Photomicrosensors mounted to PCBs. Make sure that no continuous or instantaneous external force exceeding 500 g (4.9 N) is imposed on any lead wire of the Photomicrosensors.

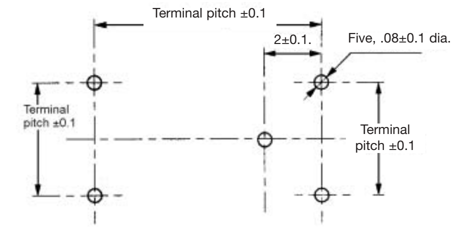
PCB Mounting Holes

Unless otherwise specified, the PCB to which a Photomicrosensor is mounted must have the following mounting holes.

Four Terminals



Five Terminals



Soldering

Lead Wires

Make sure to solder the lead wires of Photomicrosensors so that no excessive force will be imposed on the lead wires. If an excessive forces is likely to be imposed on the lead wires, hold the bases of the lead wires.

Soldering Temperature

1. Manual Soldering

Unless otherwise specified, the lead wires of Photomicrosensors can be soldered manually under the following conditions.

Soldering temperature:	350°C max. (The temperature of the tip of a 30-W soldering iron is approximately 320°C when the soldering iron is heated up.)
Soldering time:	3 s max.
Soldering position:	At least 1.5 mm away from the bases of the lead wires.

The temperature of the tip of any soldering iron depends on the shape of the tip. Check the temperature with a thermometer before soldering the lead wires. A highly resistive soldering iron incorporating a ceramic heater is recommended for soldering the lead wires.

2. Dip Soldering

The lead wires of Photomicrosensors can be dip-soldered under the following conditions unless otherwise specified.

Preheating temperature:	Must not exceed the storage temperature of the Photomicrosensors.
Soldering temperature:	260°C.
Soldering time:	10 s max.
Soldering position:	At least 1.5 mm away from the bases of the lead wires.

Do not use non-washable flux when soldering EE-SA-series Photomicrosensors, otherwise the Photomicrosensors will have operational problems.

3. Reflow Soldering

The reflow soldering of Photomicrosensors is not possible except for the EE-SX1102. The reflow soldering of the EE-SX1102 must be performed carefully under the conditions specified in the datasheet of the EE-SX1102. Before performing the reflow soldering of the EE-SX1102, make sure that the reflow soldering equipment satisfies the conditions.

External Forces

The heat resistivity and mechanical strength of Photomicrosensors are lower than those of ICs or transistors. Do not to impose external force on Photomicrosensors immediately after the Photomicrosensors are soldered. Especially, do not impose external force on Photomicrosensors immediately after the Photomicrosensors are dipsoldered.

Cleaning Precautions

Cleaning

Photomicrosensors except the EE-SA105 can be cleaned subject to the following restrictions.

1. Types of Detergent

Polycarbonate is used for the bodies of most Photomicrosensors. Some types of detergent dissolve or crack polycarbonate. Before cleaning Photomicrosensors, refer to the following results of experiments, which indicate what types of detergent are suitable for cleaning Photomicrosensors other than the EE-SA105.

Observe the law and prevent against any environmental damage when using any detergent.

Results of Experiments

Ethyl alcohol:	OK
Methyl alcohol:	OK
Isopropyl alcohol:	OK
Chlorofluorocarbon:	Depends on the additive agents (see note)
Trichlene:	NG
Acetone:	NG
Methylbenzene:	NG
Water (hot water):	The lead wires corrode depending on the conditions

Note: Chlorofluorocarbon containing ethyl alcohol or methyl alcohol as an additive agent can be used to clean Photomicrosensors except the EE-SA105. Chlorofluorocarbon containing acetone as an additive agent must not be used to clean any Photomicrosensor. For reasons of environmental protection, refrain from using any detergent containing chlorofluorocarbon.

2. Cleaning Method

Unless otherwise specified, Photomicrosensors other than the EE-SA105 can be cleaned under the following conditions. Do not apply an unclean detergent to the Photomicrosensors.

DIP cleaning: OK

Ultrasonic cleaning:	Depends on the equipment and the PCB size. Before cleaning Photomicrosensors, conduct a cleaning test with a single Photomicrosensor and make sure that the Photomicrosensor has no broken lead wires after the Photomicrosensor is cleaned.
Brushing:	The marks on Photomicrosensors may be brushed off. The emitters and detectors of reflective Photomicrosensors may have scratches and deteriorate when they are brushed. Before brushing Photomicrosensors, conduct a brushing test with a single Photomicrosensor and make sure that the Photomicrosensor is not damaged after it is brushed.

■ Operating and Temperatures

Observe the upper and lower limits of the operating and storage temperature ranges for all devices and do not allow excessive changes in temperature. As explained in the restrictions given in Structure and Materials, elements use clear epoxy resin, giving them less resistance to thermal stress than normal ICs or transistors (which are sealed with black epoxy resin). Refer to reliability test results and design PCBs so that the devices are not subjected to excessive thermal stress.

Even for applications within the operating temperature range, care must also be taken to control the humidity. As explained in the restrictions given in Structure and Materials, elements use clear epoxy resin, giving them less resistance to humidity than normal ICs or transistors (which are sealed with black epoxy resin). Refer to reliability test results and design PCBs so that the devices are not subjected to excessive thermal stress. Photomicrosensors are designed for application under normal humidities. When using them in humidified or dehumidified, high-humidity or low-humidity, environments, test performance sufficiently for the application.

■ LED Drive Currents

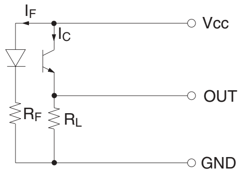
Photomicrosensors consist of LEDs and light detectors. Generally speaking, temperal changes occur to LEDs when power is supplied to them (i.e., the amount of light emitted diminishes). With less light, the photoelectric current is reduced for a sensor with a phototransistor output or the threshold current is increased for a sensor with a photo-IC output. Design circuits with sufficient consideration to the decline in the emitted light level. The reduction in emitted light is far greater for red LEDs than for infrared LEDs. Also, with red LEDs that contain aluminum, aluminum oxide will form if they are powered under high humidities, calling for a greater need for consideration of the decline in the emitted light level.

■ Light Interceptors

Select a material for the light interceptor with superior interception properties. If a material with inferior light interception properties, such as a plastic that is not black, is used, light may penetrate the interceptor and cause malfunction. With Photomicrosensors, most of which use infrared LEDs, a material that appears black to the human eye (i.e., in the visible light range) may be transparent to infrared light. Select materials carefully.

Guideline for Light Interceptors

When measuring the light interception properties of the light interceptor, use 0.1% maximum light transmission as a guideline.



CRITERIA

Where,

I_{L1} is the IL for light reception

I_{L2} is the IL for light interception by the intercepter

V_{TH} is the threshold voltage

I_{F1} is the I_F for measurement of I_L given in product specifications

I_{F2} is the IF in actual appliction ($= (V_{CC} - V_F)/R_F = (V_{CC} - 1.2)/R_F$)

I_{LMAX} is the standard upper limit of the optical current I_L

Then,

Light transmission = $I_{L2}/I_{L1} = \alpha$

Here there should be no problems if the following equation is satified.

$V_{TH} \geq (I_{F2}/I_{F1}) \times I_{LMAX} \times R_L \times \alpha$

Caution is required, however, because there are inconsistencies in light transmission.

■ Reflectors

The reflectors for most Photomicrosensors are standardized to white paper with a reflection ratio of 90%. Design the system to allow for any differences in the reflection ratio of the detection object. With Photomicrosensors, most of which use infrared LEDs, a material that appears black to the human eye (i.e., in the visible light range) may have a higher reflection ratio. Select materials carefully. Concretely, marks made with dye-based inks or marks made with petrolium-based magic markers (felt pens) can have the same reflection ratio for infrared light as white paper.

The reflectors for most Photomicrosensors are standardized to white paper with a reflection ratio of 90%. Paper, however, disperses light relatively easily, reducing the effect of the detection angle. Materials with mirrored surfaces, on the other hand, show abrupt changes in angle characteristics. Check the reflection ratio and angles sufficiently for the application.

The output from most Photomicrosensors is determined at a specified distance. Characteristics will vary with the distance. Carefully check characteristics at the specific distance for the application.

■ Output Stabilisation Time

Photomicrosensors with photo-IC outputs require 100 ms for the internal IC to stablize. Set the system so that the output is not read for 100 ms after the power supply is turned ON. Also be careful if the power supply is turned OFF in the application to save energy when the Photomicrosensor is not used.

When using a Photomicrosensor with a phototransistor output outside of the saturation region, stabilisation time is required to achieve thermal balance. Care is required when using a variable resistor or other adjustment.

Sensing Method	Sensing Distance	Model	Output Configuration	Features	Page No.
Transmissive	1 mm	EE-SX1107	Phototransistor	Ultra-compact, surface mounting	799
	2 mm	EE-SX1018	Phototransistor	Compact, general purpose	807
		EE-SX1103	Phototransistor	Ultra-compact, general purpose	799
		EE-SX1105	Phototransistor	Ultra-compact, general purpose	813
		EE-SX1108	Phototransistor	Ultra-compact, surface mounting	799
		EE-SX1131	Phototransistor	Ultra-compact, surface mounting, dual channel output	799
		EE-SX1139	Phototransistor	Ultra-compact, general purpose	816
		EE-SX4134	Photo-IC	Ultra-compact, surface mounting	819
		EE-SX4139	Photo-IC	Ultra-compact with low operating voltage	823
		EE-SX493	Photo-IC	High resolution	826
	2.8 mm	EE-SX1055	Phototransistor	Compact, cost effective	829
	3 mm	EE-SX1046	Phototransistor	With a horizontal aperture	832
		EE-SX1082	Phototransistor	With a horizontal aperture	835
		EE-SX1106	Phototransistor	Ultra-compact, general purpose	838
		EE-SX1109	Phototransistor	Ultra-compact, surface mounting	799
		EE-SX199	Phototransistor	With a positioning boss	841
		EE-SX398/ 498	Photo IC	General purpose	844
	3.4 mm	EE-SV3	Phototransistor	Screw mounting	847
		EE-SX1071	Phototransistor	General purpose	850
		EE-SX1096	Phototransistor	With a horizontal aperture	853
		EE-SX1088	Phototransistor	Screw mounting	856
		EE-SH3	Phototransistor	Screw mounting	859
		EE-SX3088/4088	Photo-IC	Screw mounting	862
	3.6 mm	EE-SG3	Phototransistor	Dust-proof construction	865
		EE-SX1057	Phototransistor	General purpose with dust-proof construction	868
	4.2 mm	EE-SX1128	Phototransistor	With a horizontal aperture	871
	5 mm	EE-SX1041	Phototransistor	General purpose	874
		EE-SX1042	Phototransistor	High profile	877
		EE-SX1081	Phototransistor	General purpose	880
		EE-SX1235A-P2	Phototransistor	Snap-in mounting	883
		EE-SX4009-P1	Photo-IC	Screw mounting	886
		EE-SX4019-P2	Photo-IC	Screw mounting	889
		EE-SX3081/4081	Photo-IC	General purpose	892
		EE-SX4235A-P2	Photo-IC	Snap-in mounting	895
	8 mm	EE-SX1070	Phototransistor	General purpose	898
		EE-SX3070/4070	Photo-IC	General purpose	901
	12 mm	EE-SPX415-P2	Photo-IC	Light modulation built-in amplifier IC	904
	14 mm	EE-SX1140	Phototransistor	Wide, high profile	907
	15 mm	EE-SX461-P11	Photo-IC	Easy to mount	910
	17 mm	EE-SPX414-P1	Photo-IC	Light modulation built-in amplifier IC	914

Sensing Method	Sensing Distance	Model	Output Configuration	Features	Page No.
Actuator	–	EE-SA102	Phototransistor	General purpose	917
		EE-SA103	Phototransistor	Compact	920
		EE-SA104	Phototransistor	Compact	923
		EE-SA107-P2	Phototransistor	Snap-in mounting with connector	926
		EE-SA407-P2	Photo-IC	Snap-in mounting with connector	929
Reflective	1 mm	EE-SY124	Phototransistor	Ultra-compact, general purpose	932
		EE-SY125	Phototransistor	Ultra-compact, surface mounting	932
		EE-SY193	Phototransistor	Ultra-compact, surface mounting	936
	3.5 mm	EE-SY171	Phototransistor	Thin	941
	4 mm	EE-SY169A	Phototransistor	High resolution (infrared LED)	944
		EE-SY169B	Phototransistor	High resolution (red LED)	947
	4.4 mm	EE-SY113	Phototransistor	Dust-proof	950
		EE-SY313/ 413	Photo-IC	Dust-proof	953
	5 mm	EE-SF5-B	Phototransistor	Dust-proof	957
		EE-SY110	Phototransistor	General purpose	960
		EE-SY310/ 410	Photo-IC	General purpose	963
Micro displacement	5.5 - 11.5 mm	Z4D-B01	Analog voltage output	Easy control and built in processor circuit	967
		Z4D-B02	Analog voltage output	Easy control and built in processor circuit	971
Multi-beam	50 - 125mm	EY3A-312	Photo-IC	3 beam high sensitivity and resisitivity to light interference	975
	125 mm	EY3A-112	Photo-IC	1 beam high sensitivity and resisitivity to light interference	978

- Surface mount design, tape and reel packaging facilitate automated PCB.
- Compact size makes these sensors ideal for use in applications with restricted space
- High-resolution sensing with phototransistor output.
- Dual channel model that is ideal for encoder applications (EE-SX1131).

Ordering Information

Appearance	Sensing Method	Slot Width	Slot Depth	Sensing Object	Weight	Part No.
	Transmissive	1 mm	2 mm	Opaque 0.15 x 0.6 mm min.	0.05 g	**EE-SX1107**
		2 mm	2.8 mm	Opaque 0.3 x 1.0 mm min.	0.1 g	**EE-SX1108**
		3 mm	3.5 mm	Opaque 0.5 x 1.0 mm min.	0.1 g	**EE-SX1109**
	Dual channel transmissive	2 mm	2.8 mm	Opaque 0.3 x 1.0 mm min.	0.1 g	**EE-SX1131**

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	25 mA (see note 1)
	Pulse foward current	I_{FP}	100 mA (see note 2)
	Reverse Voltage	V_R	5 V
Detector	**Collector-Emitter voltage**	V_{CEO}	20 V
	Emitter-Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	**Operating**	Topr	-30°C to 85°C
	Storage	Tstg	-40°C to 90°C
	Reflow soldering	Tsol	240°C (see note 3)
	Manual soldering	Tsol	300°C (see note 3)

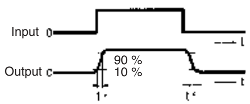
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Duty: 1/100; Pulse width: 0.1 ms.
3. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

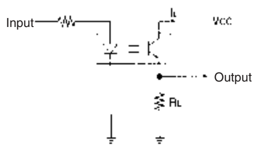
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.1 V typ., 1.3 V max.	I_F = 5 mA
	Reverse current	I_R	10 µA max.	V_R = 5 V
	Peak emission wavelength	λ_P	940 m typ.	I_F = 20 mA
Detector	**Light current**	I_L	50 µA min., 150 µA typ., 500 µA max.	I_F = 5 mA, V_{CE} = 5 V
	Dark current	I_D	100 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 50 µA
	Peak spectral sensitivity wavelength	λ_P	900 nm typ.	–
Rising time		tr	10 µs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 µA
Falling time		tf	10 µs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 µA

Note: The following figures show the rising time (tr) and falling time (tf).1

■ Response Time Measurement Circuit

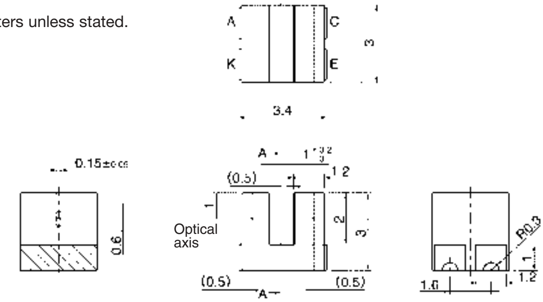




■ Dimensions

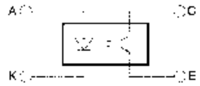
Note: All units are in millimeters unless stated.

EE-SX1107

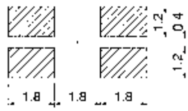


Cross section AA

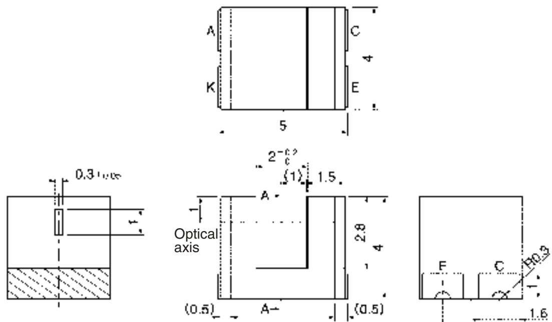
Internal Circuit



Recommended Soldering Pattern

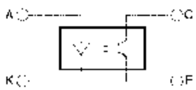


EE-SX1108

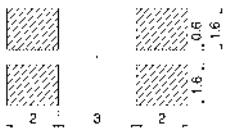


Cross section AA

Internal Circuit



Recommended Soldering Pattern



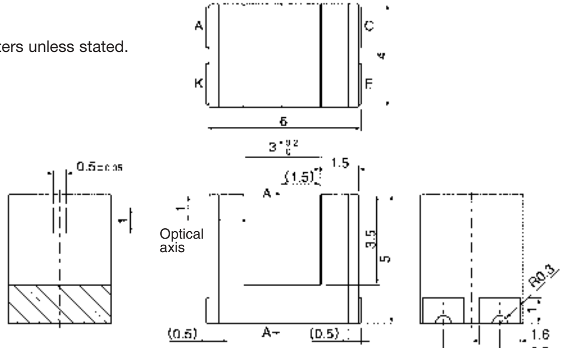
Unless otherwise stated the tolerances are ±0.15mm.

Photomicrosensors

■ Dimensions

Note: All units are in millimeters unless stated.

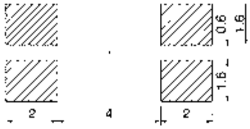
EE-SX1109



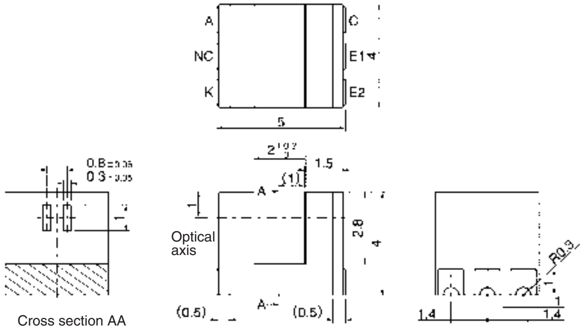
Cross section AA

Internal Circuit

Recommended Soldering Pattern

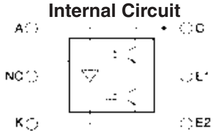


EE-SX1131

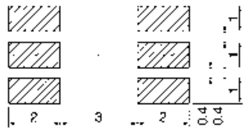


Cross section AA

Internal Circuit



Recommended Soldering Pattern

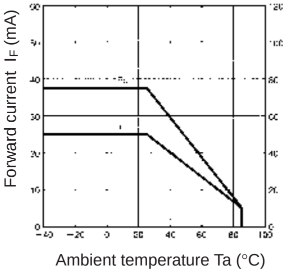


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter
E1	Emitter 1
E2	Emitter 2

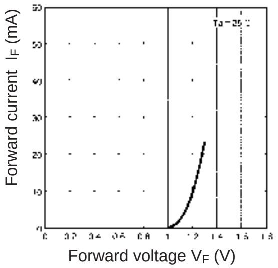
Unless otherwise stated the tolerances are ±0.15mm.

■ Engineering Data

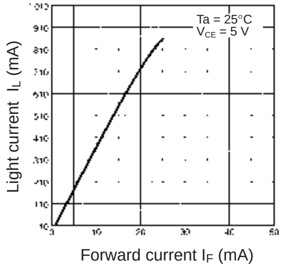
EE-SX1107/1108/1109/1131
Forward Current vs. Collector Dissipation Temperature Rating



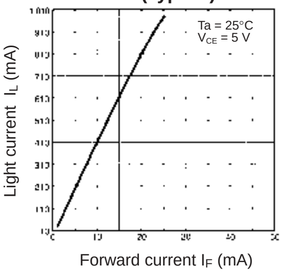
EE-SX1107/1108/1109/1131
Forward Current vs. Forward Voltage Characteristics (Typical)



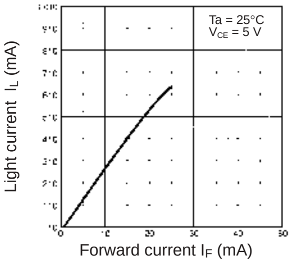
EE-SX1107
Light Current vs. Forward Current Characteristics (Typical)



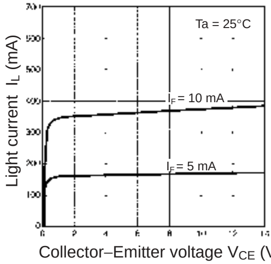
EE-SX1108/1131
Light Current vs. Forward Current Characteristics (Typical)



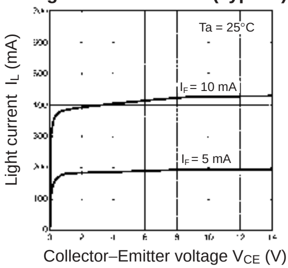
EE-SX1109
Light Current vs. Forward Current Characteristics (Typical)



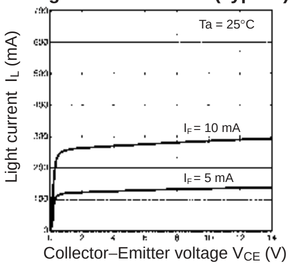
EE-SX1107
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



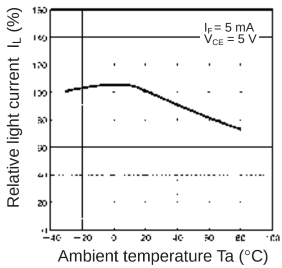
EE-SX1108/1131
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



EE-SX1109
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)

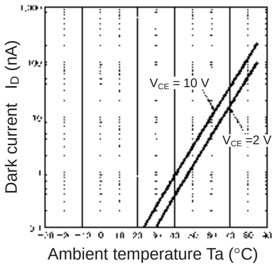


EE-SX1107/1108/1109/1131
Relative Light Current vs. Ambient Temperature Characteristics (Typical)

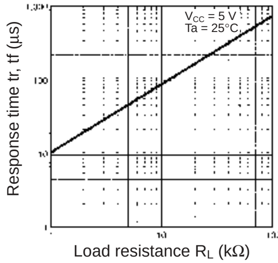


■ Engineering Data

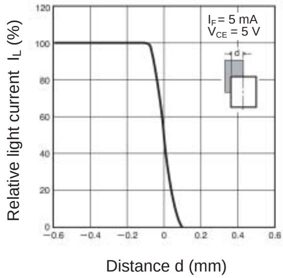
EE-SX1107/1108/1109/1131
Dark Current vs. Ambient Temperature Characteristics (Typical)



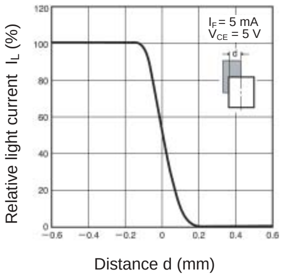
EE-SX1107/1108/1109/1131
Response Time vs. Load Resistance Characteristics (Typical)



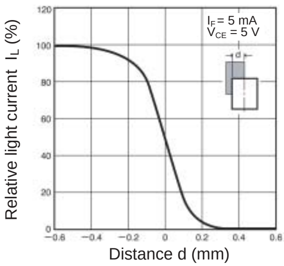
EE-SX1107
Sensing Position Characteristics (Typical)



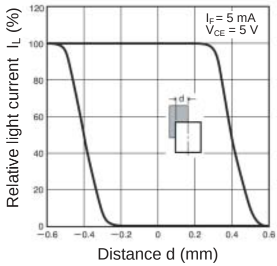
EE-SX1108
Sensing Position Characteristics (Typical)



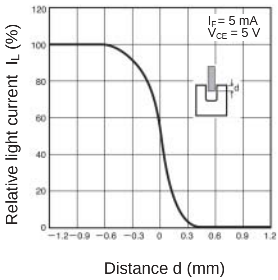
EE-SX1109
Sensing Position Characteristics (Typical)



EE-SX1131
Sensing Position Characteristics (Typical)



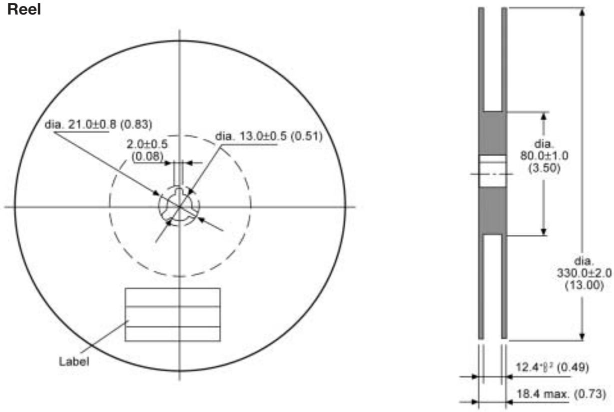
EE-SX1107/1108/1109/1131
Sensing Position Characteristics (Typical)



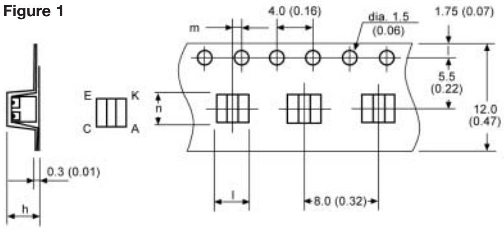
■ Tape and Reel – EE-SX1107, EE-SX1108, EE-SX1109 & EE-SX1131

Unit: mm (inch).

Reel

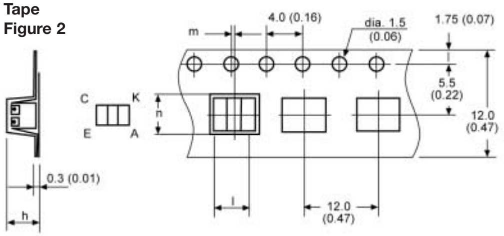


Tape
Figure 1



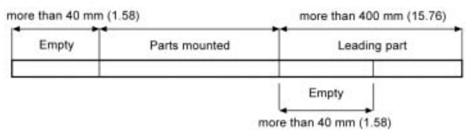
Part No.	*h*	*i*	*m*	*n*
EE-SX1107	3.2 (013)	3.6 (014)	0.9 (0.04)	3.2 (013)
EE-SX1108	4.2 (0.17)	5.2 (0.20)	0.25 (0.01)	4.2 (0.17)
EE-SX1131	4.2 (0.17)	5.2 (0.20)	0.25 (0.01)	4.2 (0.17)

Tape
Figure 2



Part No.	*h*	*i*	*m*	*n*
EE-SX1109	5.2 (0.20)	6.2 (0.24)	0.25 (0.01)	4.2 (0.17)

Tape configuration



Part No.	Pieces per reel
EE-SX1107	2000
EE-SX1108/1131	2000
EE-SX1109	1000

Photomicrosensors

Precautions

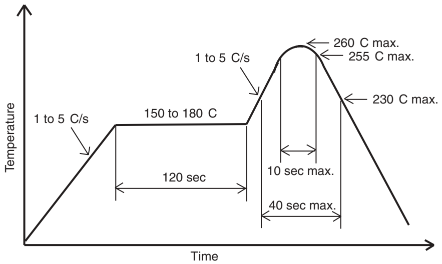
■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:

  Melting temperature: 178 to 192°C

  Composition: Sn 63%, Pb 37%
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C

Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

Reel: 60°C for 24 hours or more

Bulk: 80°C for 4 hours or more

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

■ Features

- ■ Compact model with a 2-mm-wide slot.
- ■ PCB mounting type.
- ■ High resolution with a 0.5-mm-wide aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

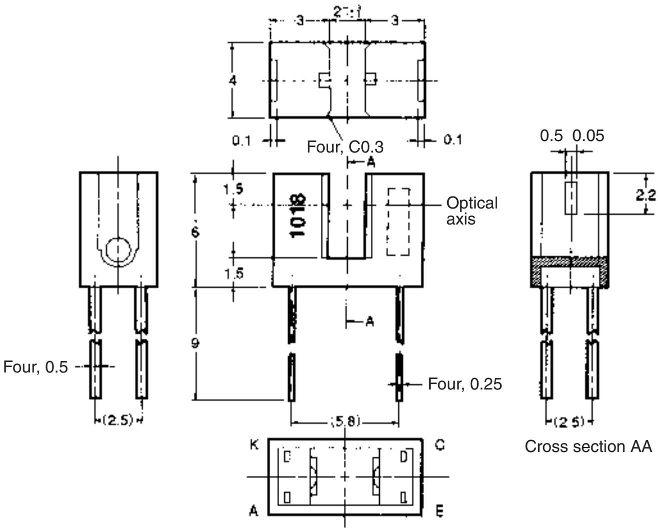
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is10μs maximum with a frequency of 100Hz.
3. Complete soldering within 10 seconds.

■ Electrical and Optical Characteristics (Ta = 25°C)

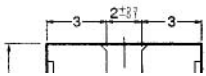
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CF} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless stated.



Internal Circuit



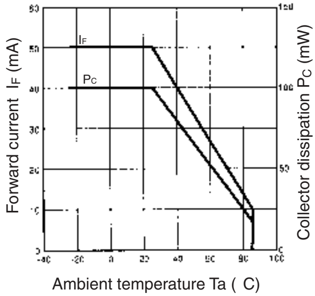
Unless otherwise specified, the tolerances are as shown below.

Terminal No.	Name
A	Anode
K	Cathode
C	Collecter
E	Emitter

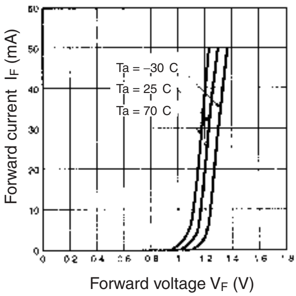
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

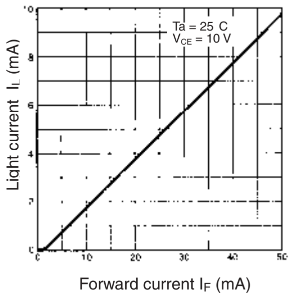
Forward Current vs. Collector Dissipation Temperature Rating



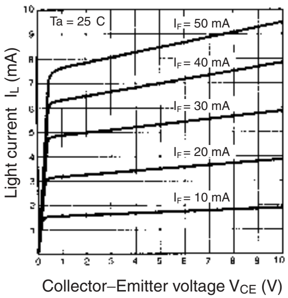
Forward Current vs. Forward Voltage Characteristics (Typical)



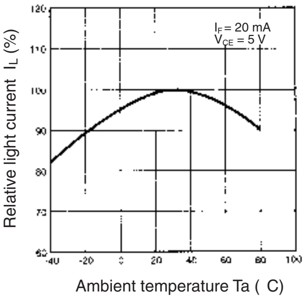
Light Current vs. Forward Current Characteristics (Typical)



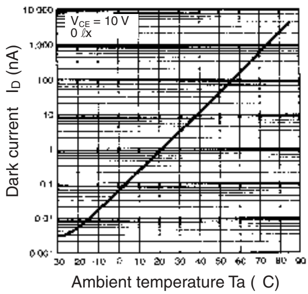
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



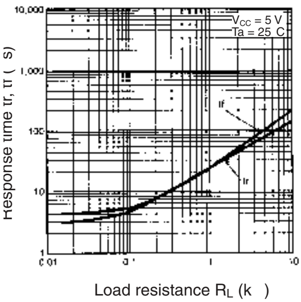
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



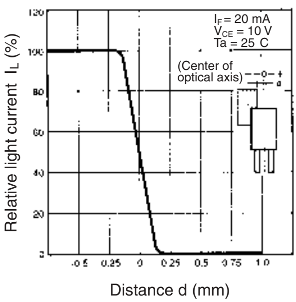
Dark Current vs. Ambient Temperature Characteristics (Typical)



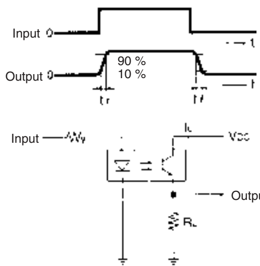
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

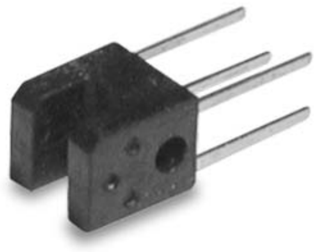


Response Time Measurement Circuit



■ Features

- Ultra-compact with a sensor width of 5 mm and a slot width of 2 mm.
- PCB mounting type.
- High resolution with a 0.4-mm-wide aperture.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	–
	Reverse Voltage	V_R	5 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	4.5 V
	Collector current	I_C	30 mA
	Collector dissipation	P_C	80 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 2)

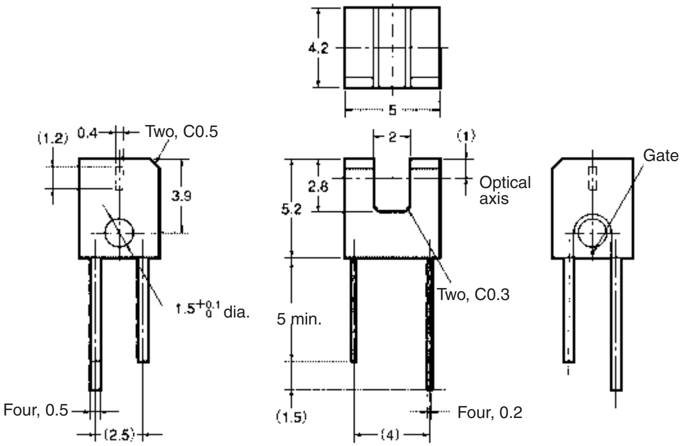
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 3 seconds.

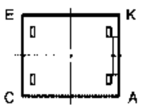
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.3 V typ., 1.6 V max.	I_F = 50 mA
	Reverse current	I_R	10 µA max.	V_R = 5 V
	Peak emission wavelength	λ_P	950 m typ.	I_F = 50 mA
Detector	**Light current**	I_L	0.5 mA	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	500 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.4 V max.	I_F = 20 mA, I_L = 0.3 mA
	Peak spectral sensitivity wavelength	λ_P	800 nm typ.	V_{CE} = 5 V
Rising time		tr	10 µs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 20 mA
Falling time		tf	10 µs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 20 mA

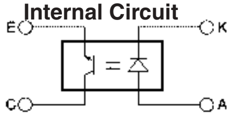
Dimensions

Note: All units are in millimeters unless stated.





Internal Circuit

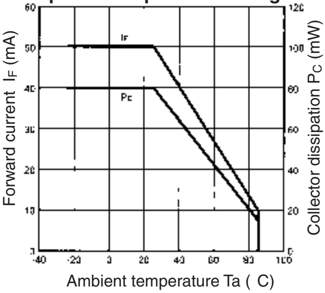


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

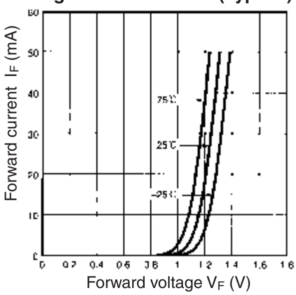
Unless otherwise stated the tolerances are ±0.2mm.

■ Engineering Data

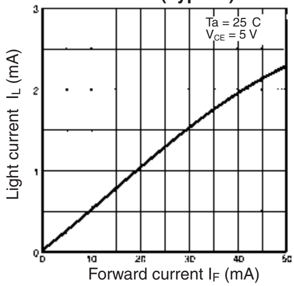
Forward Current vs. Collector Dissipation Temperature Rating



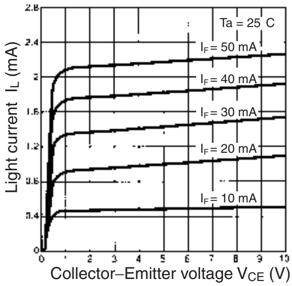
Forward Current vs. Forward Voltage Characteristics (Typical)



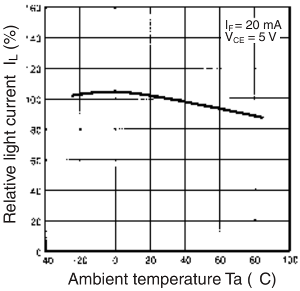
Light Current vs. Forward Current Characteristics (Typical)



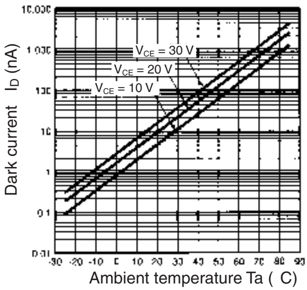
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



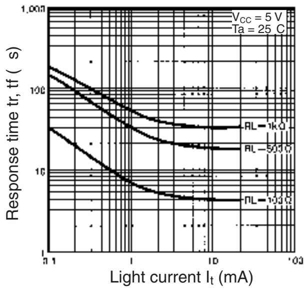
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



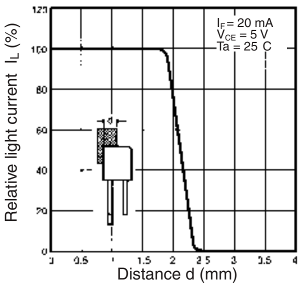
Dark Current vs. Ambient Temperature Characteristics (Typical)



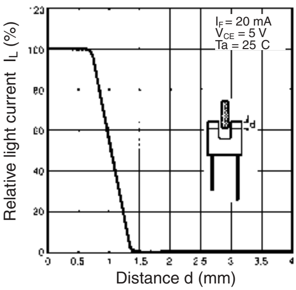
Response Time vs. Light Current Characteristics (Typical)



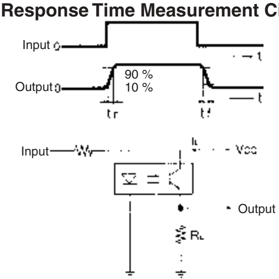
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



■ Features

- ■ Ultra-compact with a sensor width of 4.9 mm and a slot width of 2 mm.
- ■ Low-height of 3.3 mm.
- ■ PCB mounting type.
- ■ High resolution with a 0.4-mm-wide aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	–
	Reverse Voltage	V_R	5 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	4.5 V
	Collector current	I_C	30 mA
	Collector dissipation	P_C	80 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

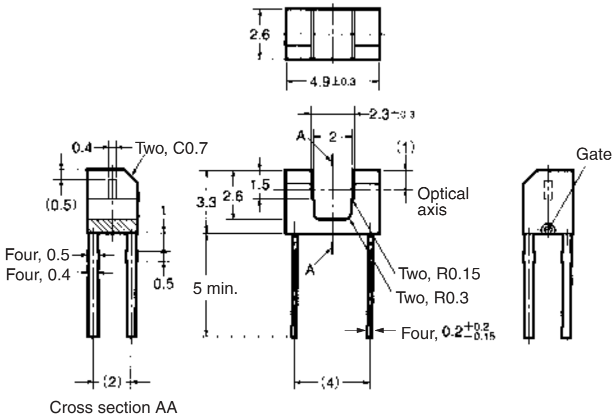
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 3 seconds.

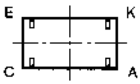
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.3 V typ., 1.6 V max.	I_F = 50 mA
	Reverse current	I_R	10 μA max.	V_R = 5 V
	Peak emission wavelength	λ_P	950 m typ.	I_F = 50 mA
Detector	**Light current**	I_L	0.2 mA min.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	500 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	800 nm typ.	V_{CE} = 5 V
Rising time		tr	10 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 20 mA
Falling time		tf	10 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 20 mA

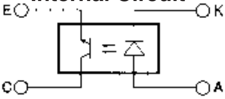
■ Dimensions

Note: All units are in millimeters unless stated.





Internal Circuit

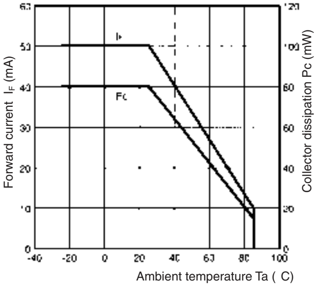


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

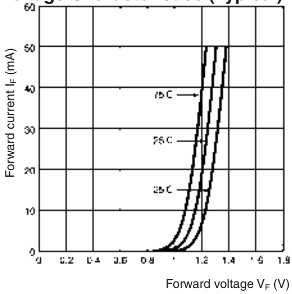
Unless otherwise stated the tolerances are ±0.2mm.

■ Engineering Data

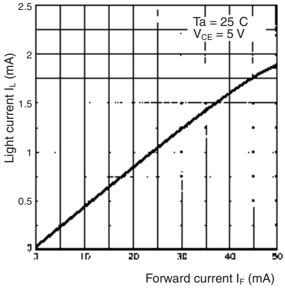
Forward Current vs. Collector Dissipation Temperature Rating



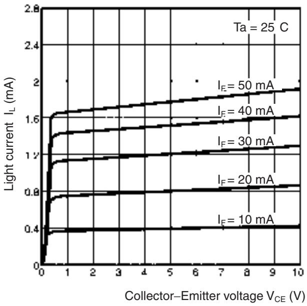
Forward Current vs. Forward Voltage Characteristics (Typical)



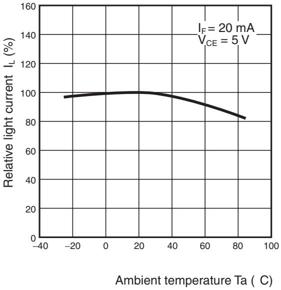
Light Current vs. Forward Current Characteristics (Typical)



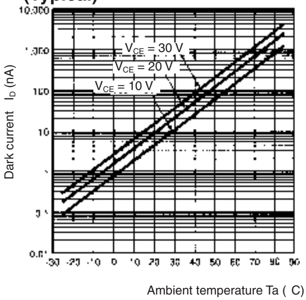
Light Current vs. Collector−Emitter Voltage Characteristics (Typical)



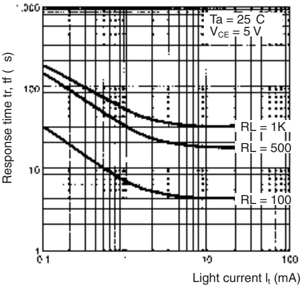
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



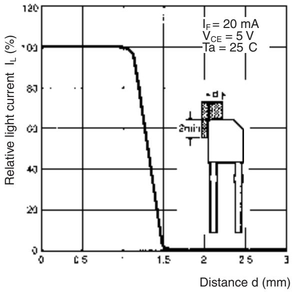
Dark Current vs. Ambient Temperature Characteristics (Typical)



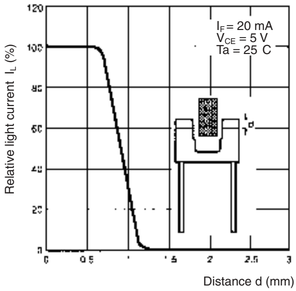
Response Time vs. Light Current Characteristics (Typical)



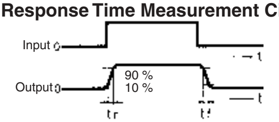
Sensing Position Characteristics (Typical)

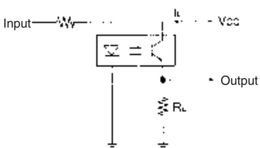


Sensing Position Characteristics (Typical)



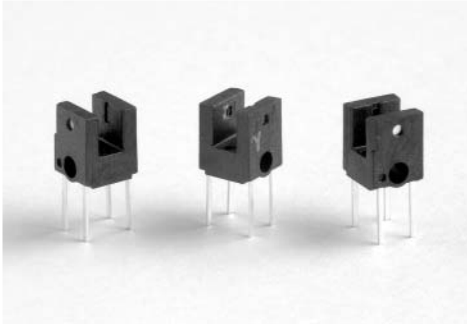
Response Time Measurement Circuit





■ Features

- ■ Ultra-compact with a 4.3-mm-wide sensor and a 2-mm-wide slot.
- ■ PCB surface mounting type.
- ■ High resolution with a 0.5-mm-wide aperture.
- ■ A light current (I_L) of 0.4 mA minimum with a forward current of (I_F) 10 mA.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 85°C
	Storage	Tstg	-40°C to 100°C
	Soldering	Tsol	260°C (see note 3)

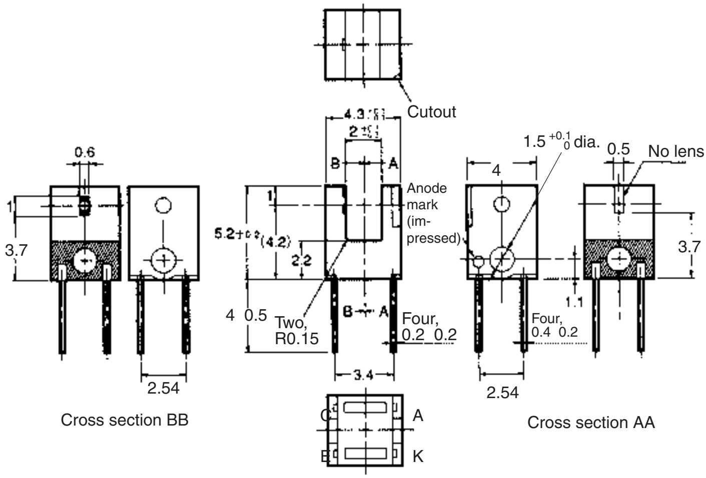
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is10μs maximum with a frequency of 100Hz.
3. Complete soldering within 3 seconds for reflow soldering and within 3 seconds for manual soldering.

■ Electrical and Optical Characteristics (Ta = 25°C)

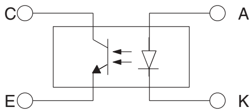
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.4 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V ℓ
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.4 mA min.	I_F = 10 mA, V_{CE} = 5 V
	Dark current	I_D	2 nA typ., 100 nA max.	V_{CE} = 10 V, 0 x
	Leakage current	I_{LEAK}	–	–
	Collector Emitter saturated voltage	V_{CE} (sat)	0.4 V max.	I_F = 20 mA, I_L = 0.1 μA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CF} = 5 V
Rising time		tr	30 μs typ., 150 μs max.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA
Falling time		tf	30 μs typ., 150 μs max	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA

Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit

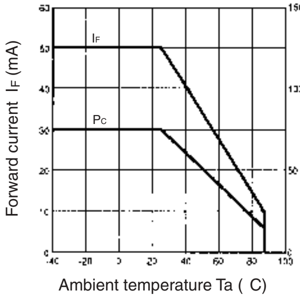


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

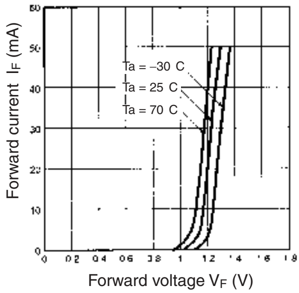
Unless otherwise specified the tolerances are ±0.1 mm.

■ Engineering Data

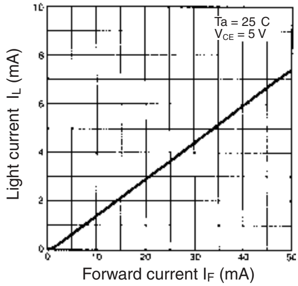
Forward Current vs. Collector Dissipation Temperature Rating



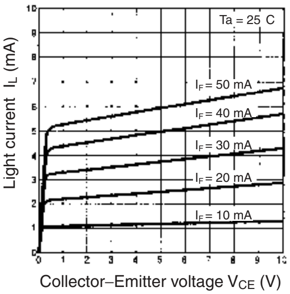
Forward Current vs. Forward Voltage Characteristics (Typical)



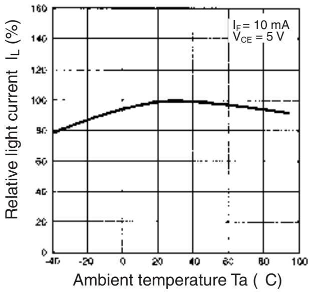
Light Current vs. Forward Current Characteristics (Typical)



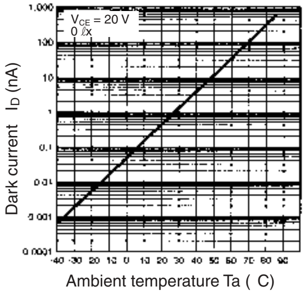
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



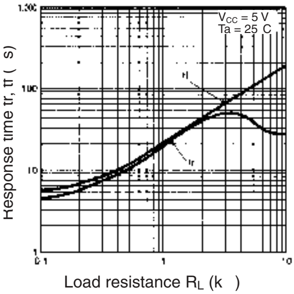
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



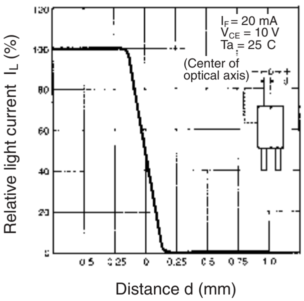
Dark Current vs. Ambient Temperature Characteristics (Typical)



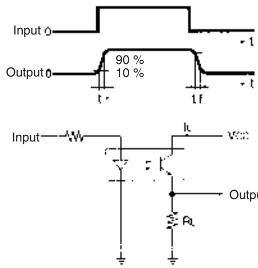
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Features

- Ultra-compact model.
- Photo IC output model.
- Operates at a V_{CC} of 2.2 to 7 V.
- PCB surface mounting type.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	25 mA (see note 1)
	Reverse Voltage	V_R	5 V
Detector	**Supply voltage**	V_{CC}	9 V
	Output voltage	V_{OUT}	17 V
	Output current	I_{OUT}	8 mA
	Possiblr output dissipation	P_{OUT}	80 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-40°C to 90°C
	Reflow soldering	Tsol	230°C (see note 2)
	Manual soldering	Tsol	300°C (see note 2)

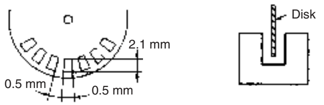
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

■ Electrical and Optical Characteristics (Ta = 25°C)

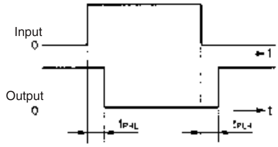
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.1 V typ., 1.4 V max.	I_F = 5 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.	VR = 5 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Power supply voltage**	V_{CC}	2.2 V min., 7 V max.	–
	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 2.2 to 7 V, I_{OL} = 8 mA, I_F = 7 mA
	High-level output current	I_{CH}	10 µA max.	V_{CC} = 2.2 to 7 V, I_F = 0 mA, V_{OUT} = 17 V
	Current consumption	I_{CC}	2.8 mA typ., 4 mA max.	V_{CC} = 7 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 2.2 to 7 V
LED current when output is ON		I_{FT}	2.0 mA typ., 3.5 mA max.	V_{CC} = 2.2 to 7 V
Hysteresis		ΔH	21% typ.	V_{CC} = 2.2 to 7 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 2.2 to 7 V, IF = 5 mA, I_{OL} = 8 mA (see note 2)
Response delay time		t_{PHL}	7 ms typ.	V_{CC} = 2.2 to 7 V, IF = 5 mA, I_{OL} = 8 mA (see note 3)
Response delay time		t_{PHL}	18 ms typ.	V_{CC} = 2.2 to 7 V, IF = 5 mA, I_{OL} = 8 mA (see note 3)

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

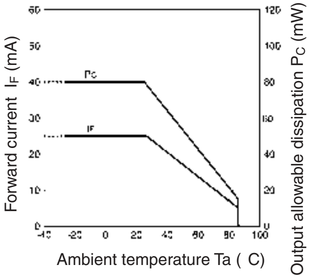
2. The value of the response frequency is measured by rotating the disk as shown below.



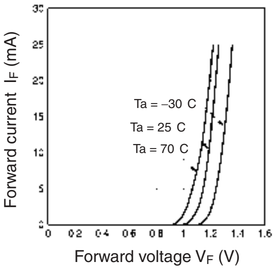
3. The following illustrations show the definition of response delay time.



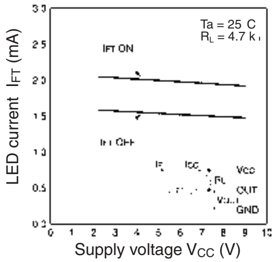
Forward Current vs. Collector Dissipation Temperature Rating



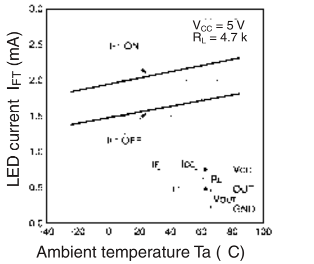
Forward Current vs. Forward Voltage Characteristics (Typical)



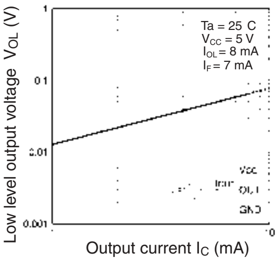
LED Current vs. Supply Voltage (Typical)



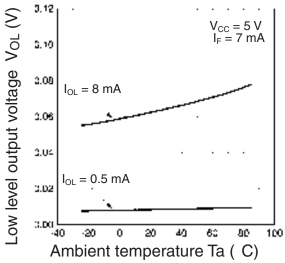
LED Current vs. Ambient Temperature Characteristics (Typical)



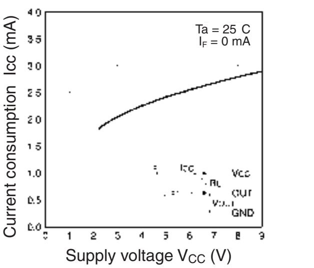
Low-level Output Voltage vs. Output Current (Typical)



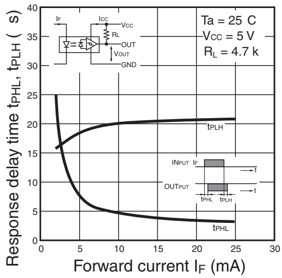
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



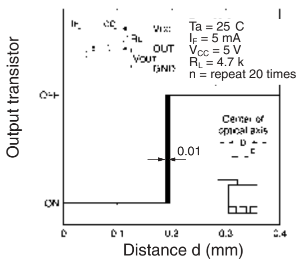
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



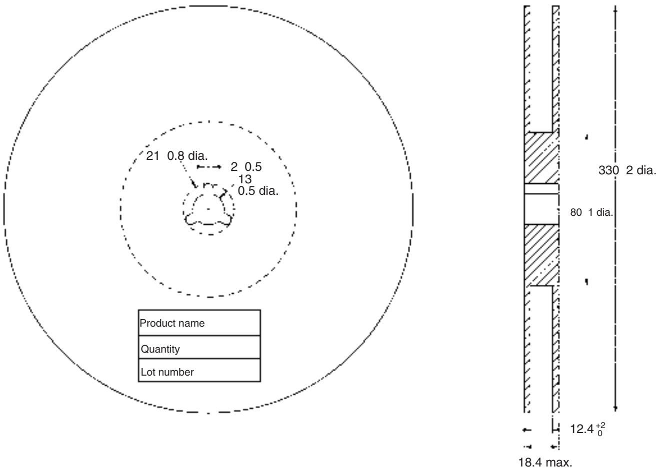
Repeat Sensing Position Characteristics (Typical)



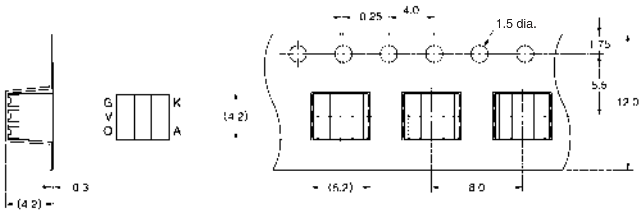
■ Tape and Reel

Unit: mm (inch).

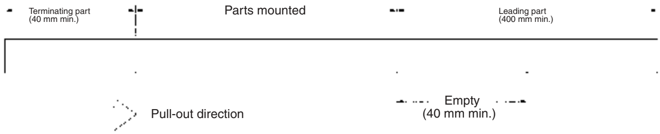
Reel



Tape



Tape configuration



Tape quantity

2,000 pcs./reel

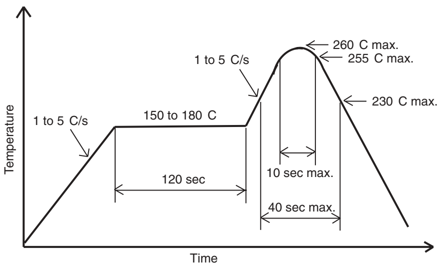
Precautions

■ Soldering Information

- The following soldering paste is recommended:

  Melting temperature: 216 to 220°C

  Composition: Sn 3.5 Ag 0.75 Cu
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25 W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C

Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

Reel: 60°C for 24 hours or more

Bulk: 80°C for 4 hours or more

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

■ Features

- ■ Ultra-compact model
- ■ Photo IC output model
- ■ Operates at V_{cc} of 2.2 to 7 V
- ■ High speed response

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Reverse Voltage	V_R	4 V
Detector	**Supply voltage**	V_{CC}	9 V
	Output voltage	V_{OUT}	17 V
	Output current	I_{OUT}	8 mA
	Permissible output dissipation	P_{OUT}	80 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-40°C to 100°C
	Soldering	Tsol	260°C (see note 2)

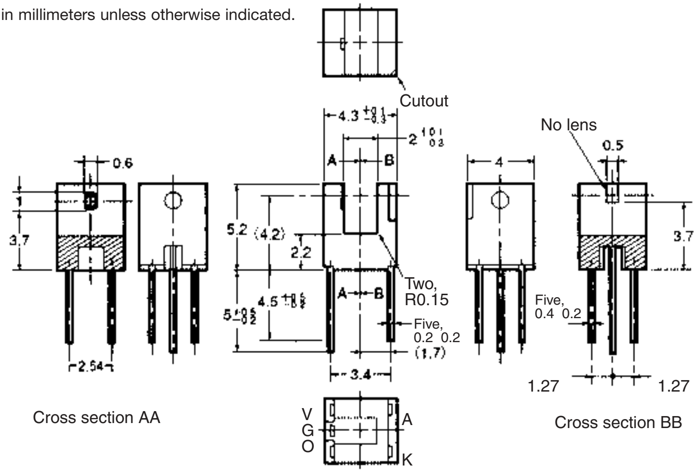
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 3 seconds.

■ Electrical and Optical Characteristics (Ta = 25°C)

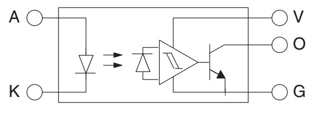
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.4 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Power supply voltage**	V_{CC}	2.2 V min., 7 V max.	–
	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 2.2 to 7 V, I_{OL} = 8 mA, I_F = 5 mA
	High-level output voltage	I_{OH}	10 μA max.	V_{CC} = 2.2 to 7 V, I_F = 0 mA, V_O = 17 V
	Current consumption	I_{CC}	2.3 mA typ., 4 mA max.	V_{CC} = 7 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 2.2 to 7 V
LED current when output is ON		I_{FT}	1.1 mA typ., 2.5 mA max.	V_{CC} = 2.2 to 7 V
Hysteresis		$\triangle H$	21% typ.	V_{CC} = 2.2 to 7 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 2.2 to 7 V, I_F = 5 mA, I_{OL} = 8mA (see note 2)
Response delay time		t_{PLH}	5 μs min.	V_{CC} = 2.2 to 7 V, I_F = 5 mA, I_{OL} = 8mA (see note 3)
Response delay time		t_{PHL}	18 μs typ.	V_{CC} = 2.2 to 7 V, I_F = 5 mA, I_{OL} = 8mA (see note 3)

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit

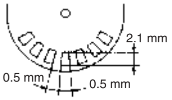


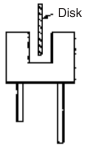
Terminal No.	Name
A	Anode
K	Cathode
V	Supply voltage V_{CC}
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified the tolerances are ±0.15mm.

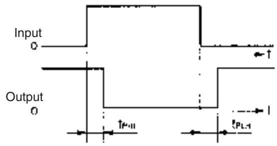
Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC is turned from ON to OFF and when the photo IC is turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below (P.P.S = pulse/s).



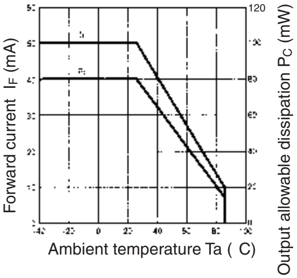


3. The following illustrations show the definition of response delay time.

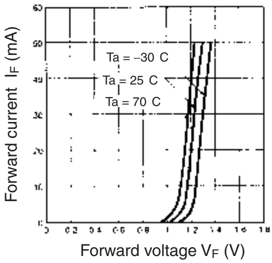


■ Engineering Data

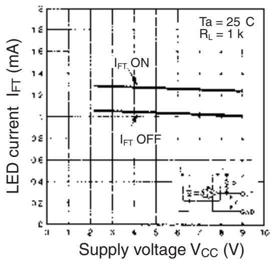
Forward Current vs. Collector Dissipation Temperature Rating



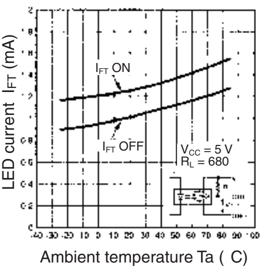
Forward Current vs. Forward Voltage Characteristics (Typical)



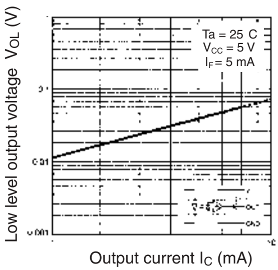
LED Current vs. Supply Voltage (Typical)



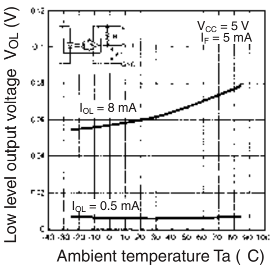
LED Current vs. Ambient Temperature Characteristics (Typical)



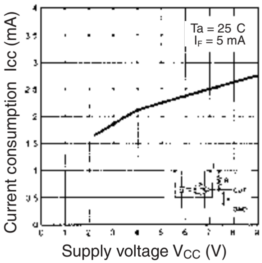
Low-level Output Voltage vs. Output Current (Typical)



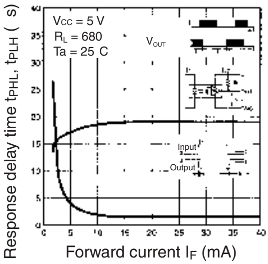
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



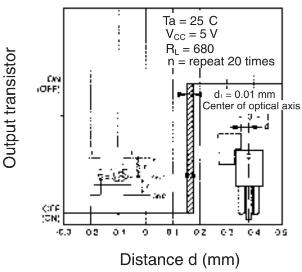
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)



■ Features

- ■ Incorporates an IC chip with a built-in detector element and amplifier.
- ■ Incorporates a detector element with a built-in temperature compensation circuit.
- ■ A wide supply voltage range: 4.5 to 16 VDC
- ■ Directly connects with C-MOS and TTL.
- ■ Allows highly precise sensing with a 0.2-mm-wide sensing aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Reverse Voltage	V_R	4 V
Detector	**Power supply voltage**	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 60°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

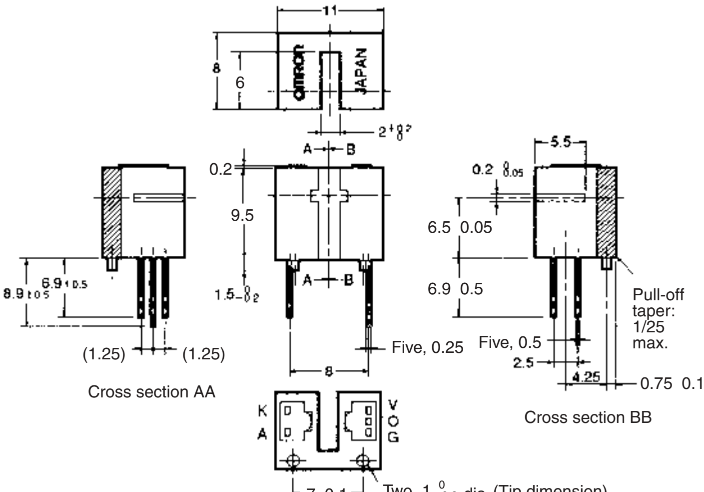
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Electrical and Optical Characteristics (Ta = 25°C)

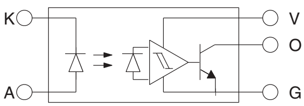
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Low-level output voltage**	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 15 mA
	High-level output voltage	V_{OH}	15 V min.	Vcc = 16 V, R_L = 1 kΩ, I_F = 0 mA
	Current consumption	I_{CC}	5 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	10 mA typ., 15 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		△H	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 µs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 µs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)

■ Dimensions

Note: All units are in millimeters unless stated.



Internal Circuit



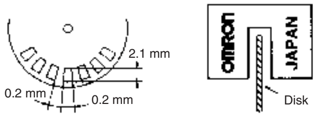
Unless otherwise specified, the tolerances are as shown below.

Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

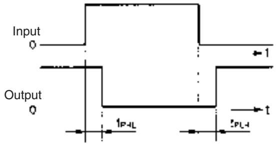
Dimensions	Tolerance
3 mm max.	±0.125
3 < mm ≤ 6	±0.150
6 < mm ≤ 10	±0.180
10 < mm ≤ 18	±0.215
18 < mm ≤ 30	±0.260

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below.

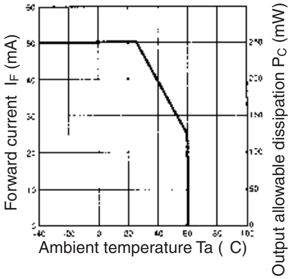


3. The following illustrations show the definition of response delay time.

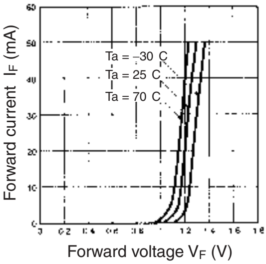


■ Engineering Data

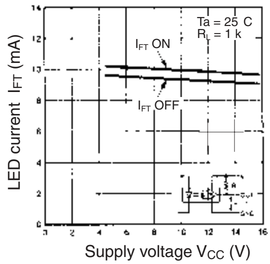
Forward Current vs. Collector Dissipation Temperature Rating



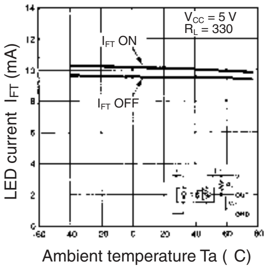
Forward Current vs. Forward Voltage Characteristics (Typical)



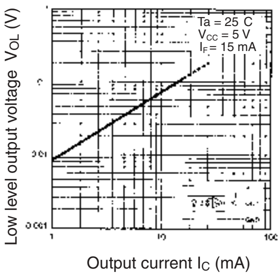
LED Current vs. Supply Voltage (Typical)



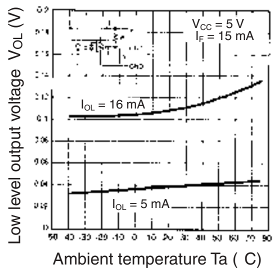
LED Current vs. Ambient Temperature Characteristics (Typical)



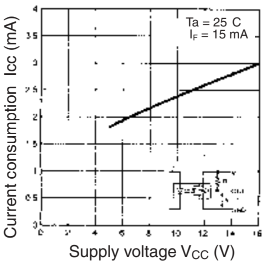
Low-level Output Voltage vs. Output Current (Typical)



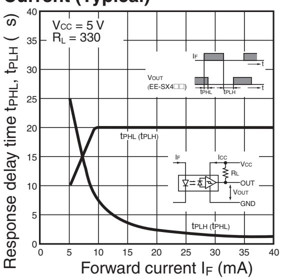
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



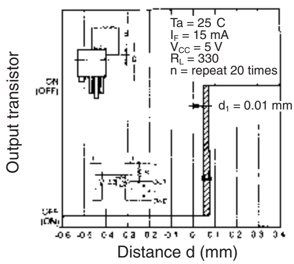
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)



Features

- Longer leads allow the sensor to be mounted to a 1.6-mm thick board.
- 5.4-mm-tall compact model.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.

Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter Voltage**	V_{CEO}	30 V
	Emitter-Collector Voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

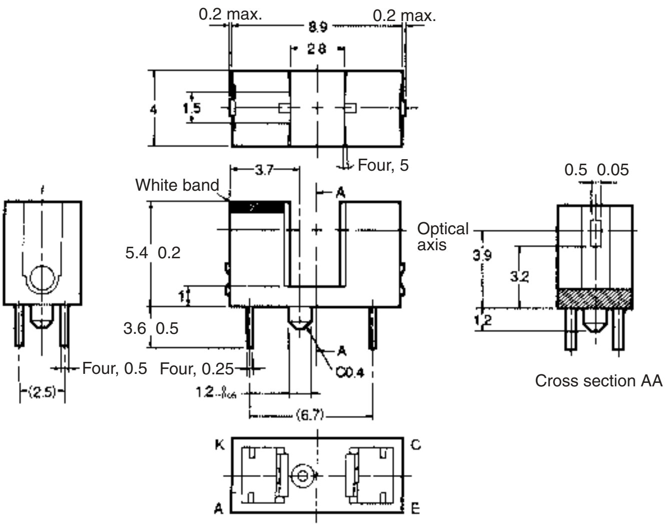
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

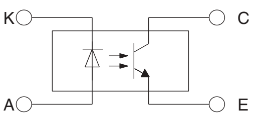
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, RL = 100 Ω, IL = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, RL = 100 Ω, IL = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



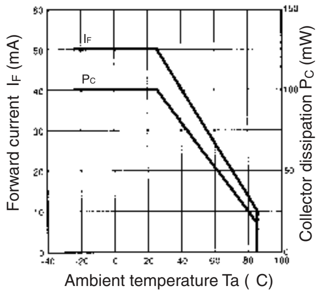
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

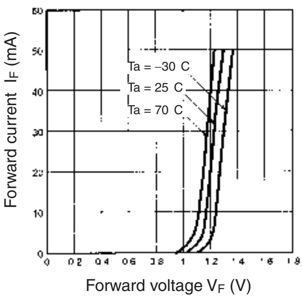
Terminal No.	Name
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

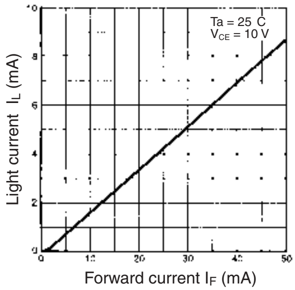
Forward Current vs. Collector Dissipation Temperature Rating



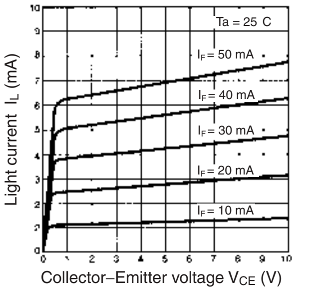
Forward Current vs. Forward Voltage Characteristics (Typical)



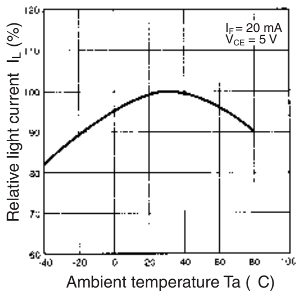
Light Current vs. Forward Current Characteristics (Typical)



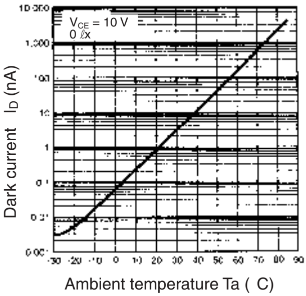
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



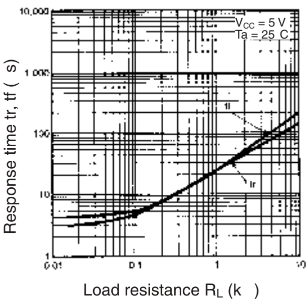
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



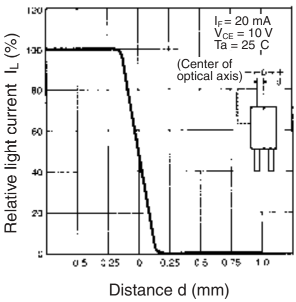
Dark Current vs. Ambient Temperature Characteristics (Typical)



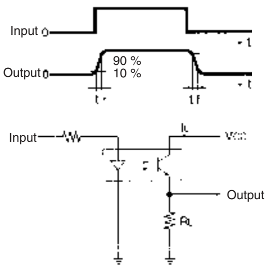
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

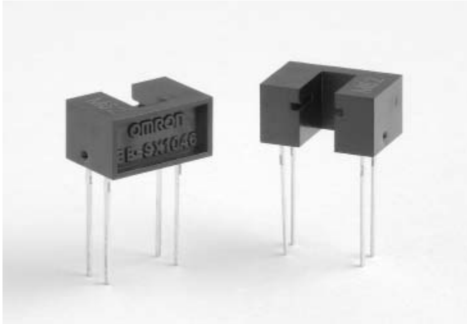


Response Time Measurement Circuit



Features

- With a horizontal sensing aperture.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.



Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

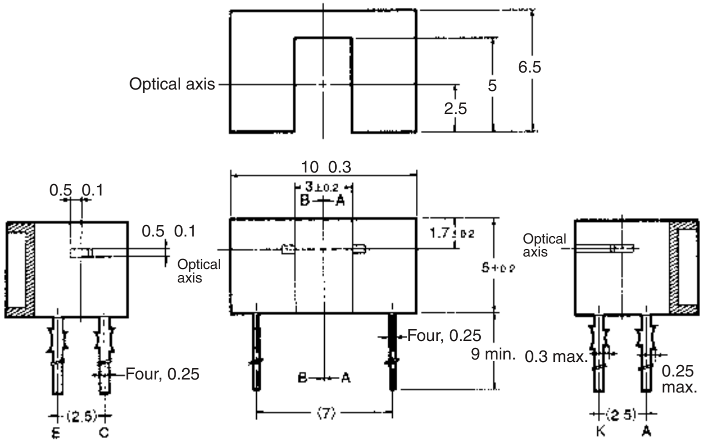
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	1.2 mA min., 14 mA Max.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CC} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100Ω, I_L = 5 mA

■ Dimensions

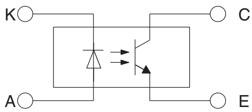
Note: All units are in millimeters unless otherwise indicated.



Cross section BB

Cross section AA

Internal Circuit



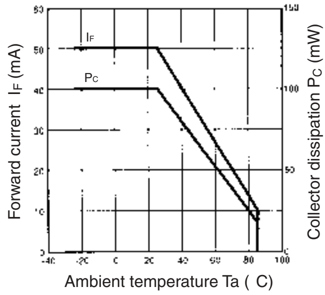
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

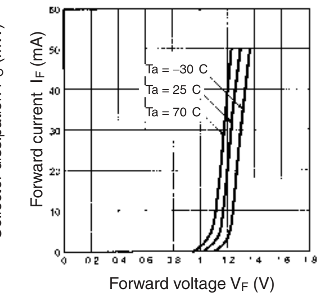
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

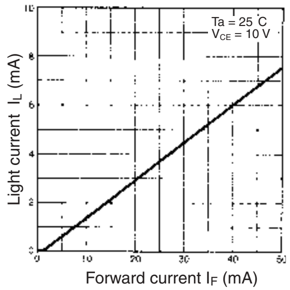
Forward Current vs. Collector Dissipation Temperature Rating



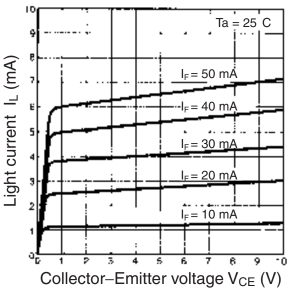
Forward Current vs. Forward Voltage Characteristics (Typical)



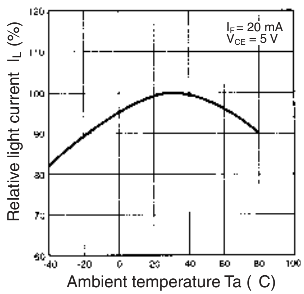
Light Current vs. Forward Current Characteristics (Typical)



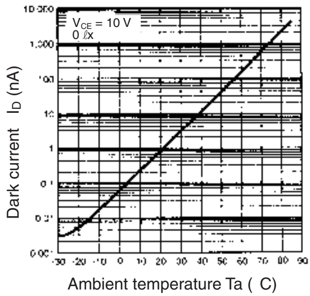
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



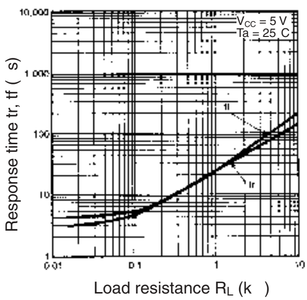
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



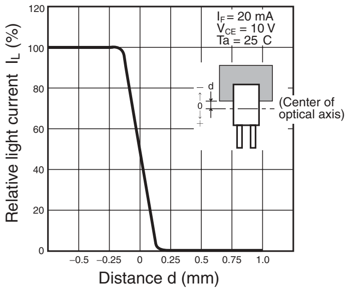
Dark Current vs. Ambient Temperature Characteristics (Typical)



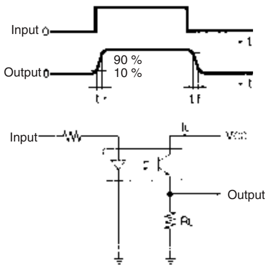
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

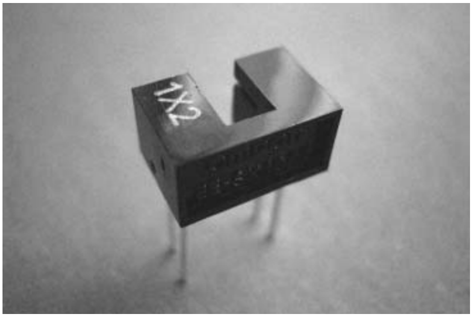


Response Time Measurement Circuit



Features

- Horizontal sensing aperture.
- PCB mounting type.
- High resolution with 0.2-mm wide aperture.



Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 85°C
	Storage	Tstg	-40°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

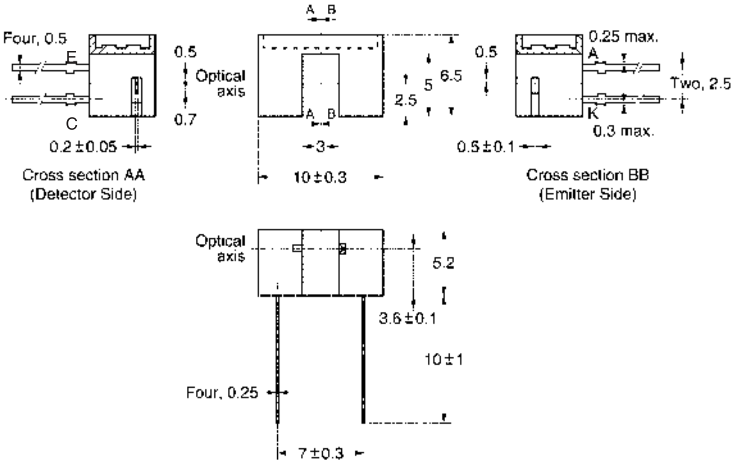
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

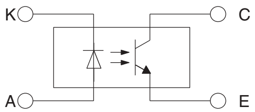
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.12 mA min.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.08 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.05 μA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CC} = 10 V
Rising time		tr	100 μs typ.	V_{CC} = 5 V, R_L = 50 kΩ, I_L = 0.1 mA
Falling time		tf	1,000 μs typ.	V_{CC} = 5 V, R_L = 50 kΩ, I_L = 0.1 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit

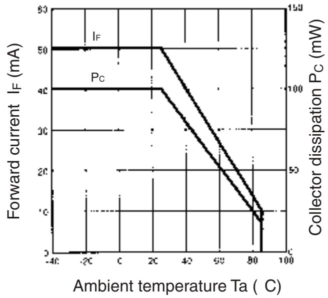


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

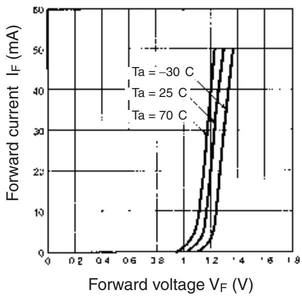
Unless otherwise specified, the tolerances are ±0.02 mm.

■ Engineering Data

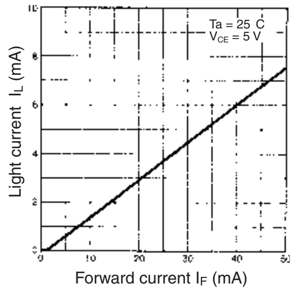
Forward Current vs. Collector Dissipation Temperature Rating



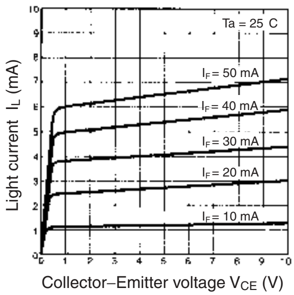
Forward Current vs. Forward Voltage Characteristics (Typical)



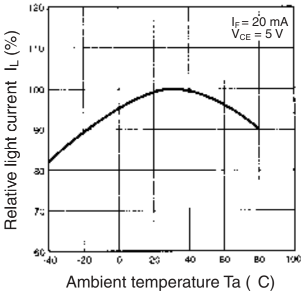
Light Current vs. Forward Current Characteristics (Typical)



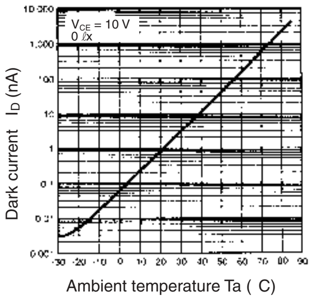
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



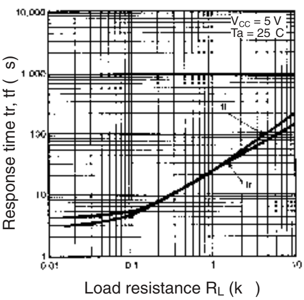
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



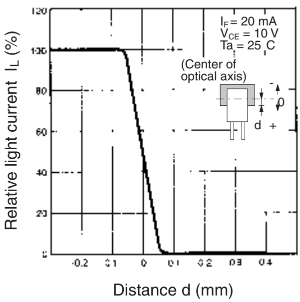
Dark Current vs. Ambient Temperature Characteristics (Typical)



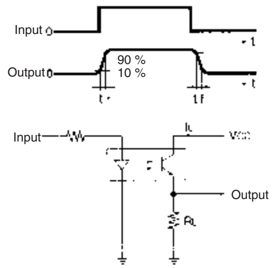
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



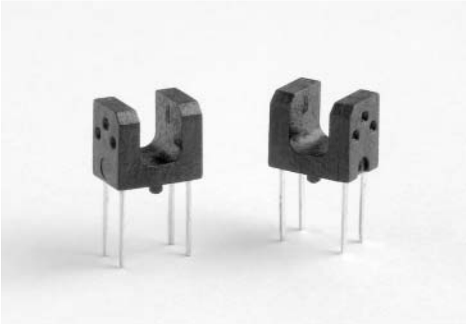
Response Time Measurement Circuit



Photomicrosensors

Features

- Ultra compact with a slot width of 3 mm.
- PCB mounting type.
- High resolution with 0.4-mm wide aperture.



Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	–
	Reverse Voltage	V_R	5 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	4.5 V
	Collector current	I_C	30 mA
	Collector dissipation	P_C	80 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

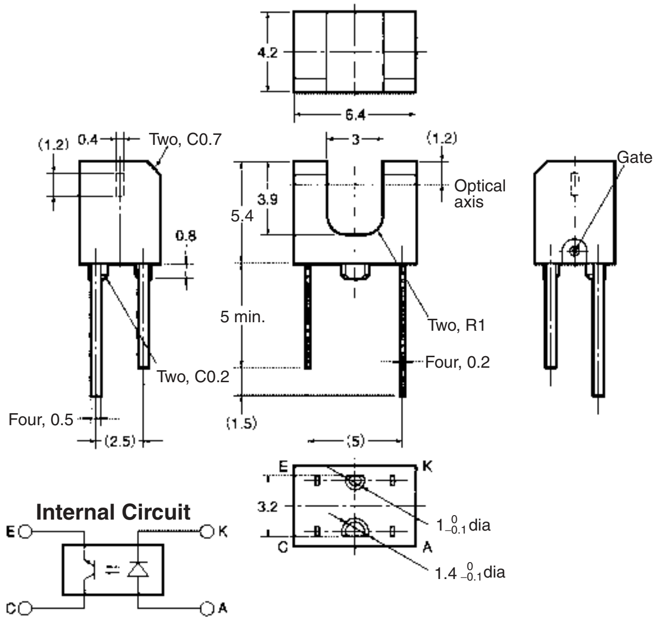
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 3 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.3 V typ., 1.6 V max.	I_F = 50 mA
	Reverse current	I_R	10 μA max.	V_R = 5 V
	Peak emission wavelength	λ_P	950 nm typ.	I_F = 50 mA
Detector	**Light current**	I_L	0.2 mA min.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	500 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.4 V max.	I_F = 20 mA, I_L = 0.1 μA
	Peak spectral sensitivity wavelength	λ_P	800 nm typ.	V_{CE} = 5 V
Rising time		tr	10 μs typ.	V_{CC} = 5 V, R_L = 100Ω, I_L = 20 mA
Falling time		tf	10 μs typ.	V_{CC} = 5 V, R_L = 100Ω, I_L = 20 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



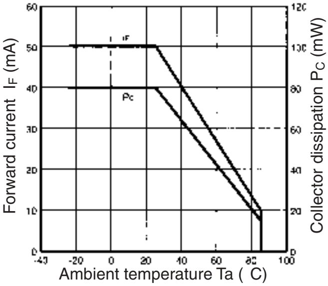
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are ± 0.2 mm.

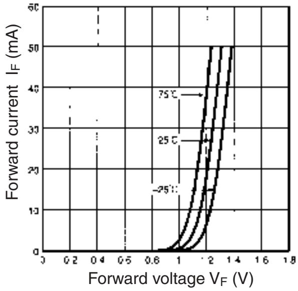
Photomicrosensors

■ Engineering Data

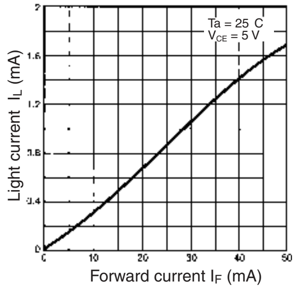
Forward Current vs. Collector Dissipation Temperature Rating



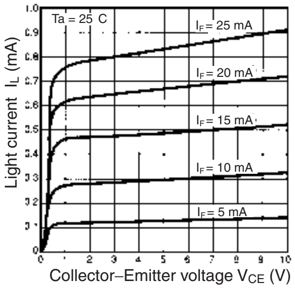
Forward Current vs. Forward Voltage Characteristics (Typical)



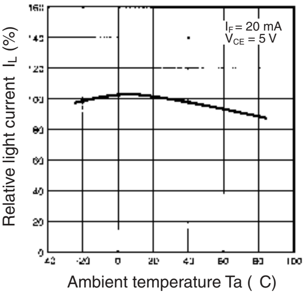
Light Current vs. Forward Current Characteristics (Typical)



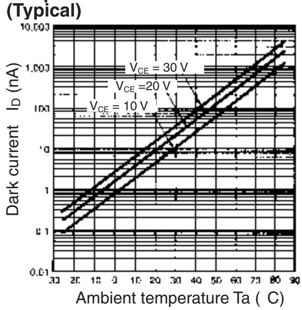
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



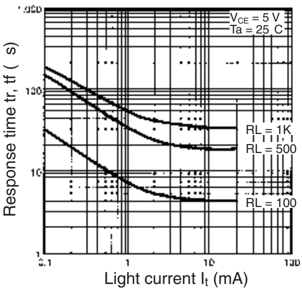
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



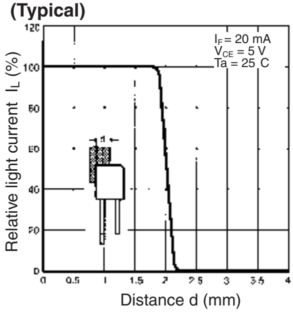
Dark Current vs. Ambient Temperature Characteristics (Typical)



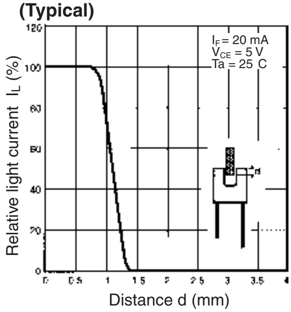
Response Time vs. Light Current Characteristics (Typical)



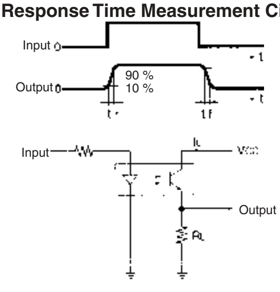
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)

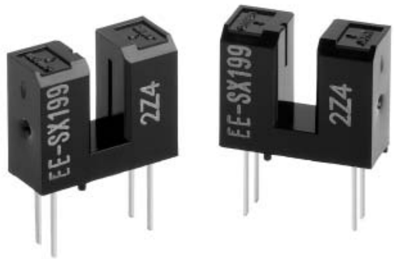


Response Time Measurement Circuit



Features

- General-purpose model with a 3-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- With a positioning boss.



Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-40°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

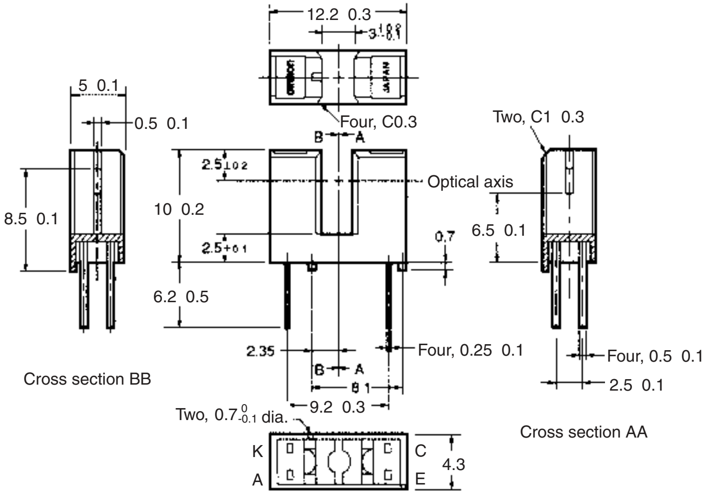
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

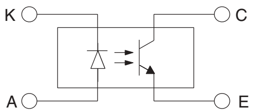
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.4 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 20 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 40 mA, I_L = 0.5mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit

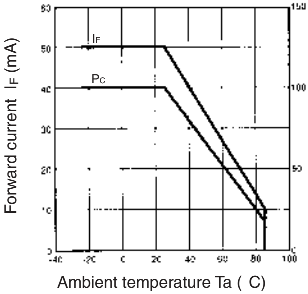


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

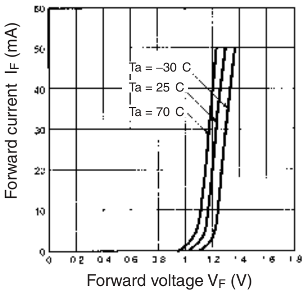
Unless otherwise specified the tolerances are ±0.2mm.

■ Engineering Data

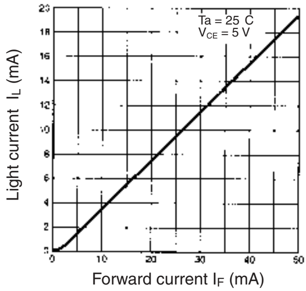
Forward Current vs. Collector Dissipation Temperature Rating



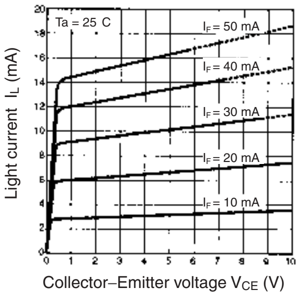
Forward Current vs. Forward Voltage Characteristics (Typical)



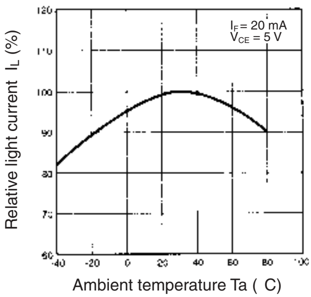
Light Current vs. Forward Current Characteristics (Typical)



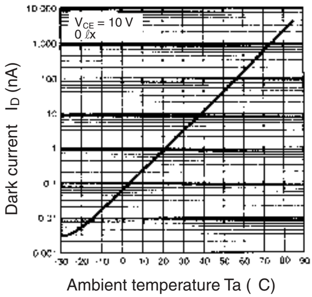
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



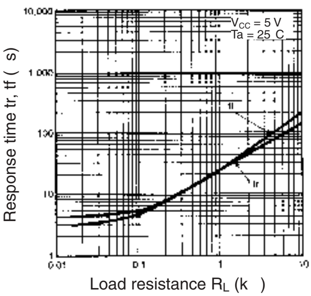
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



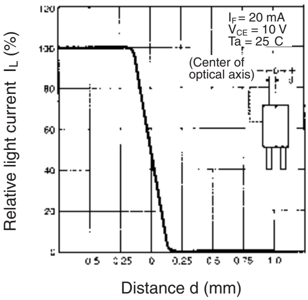
Dark Current vs. Ambient Temperature Characteristics (Typical)



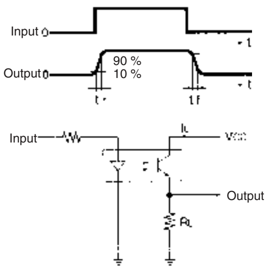
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

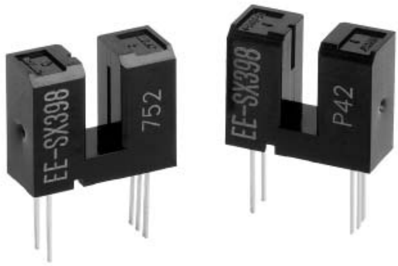


Response Time Measurement Circuit



Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX398)
- Light ON model (EE-SX498)



Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Reverse Voltage	V_R	4 V
Detector	**Power supply voltage**	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

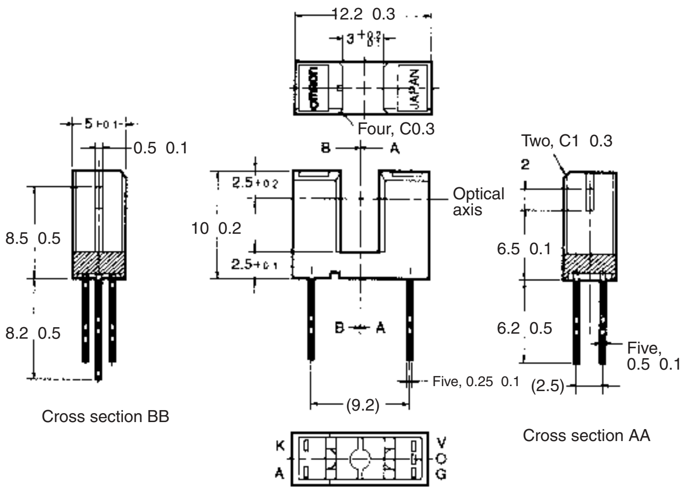
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

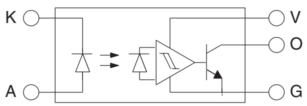
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Low-level output voltage**	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 0 mA (EE-SX398), I_F = 5 mA (EE-SX498)
	High-level output voltage	V_{OH}	15 V min.	Vcc = 16 V, R_L = 1 kΩ, I_F = 5 mA (EE-SX398), I_F = 0 mA (EE-SX498)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF **LED current when output is ON**		I_{FT}	2 mA typ., 5 mA max.	V_{CC} = 4.5 to 16
Hysteresis		$\triangle$H	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 m (see note 3)

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



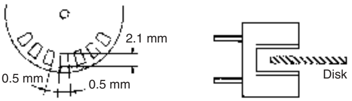
Unless otherwise specified, the tolerances are as shown below.

Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

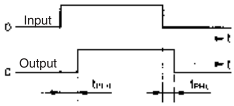
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

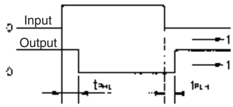
2. The value of the response frequency is measured by rotating the disk as shown below.



3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EE-SX498.



EE-SX398

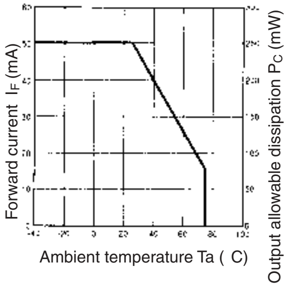


EE-SX498

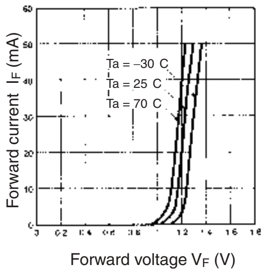
■ Engineering Data

Note: The values in the parentheses apply to the EE-SX498.

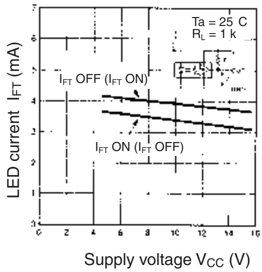
Forward Current vs. Collector Dissipation Temperature Rating



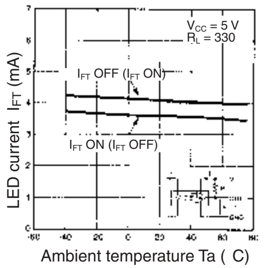
Forward Current vs. Forward Voltage Characteristics (Typical)



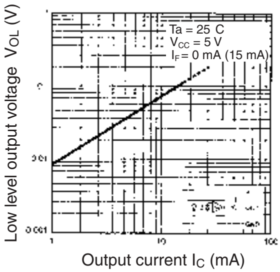
LED Current vs. Supply Voltage (Typical)



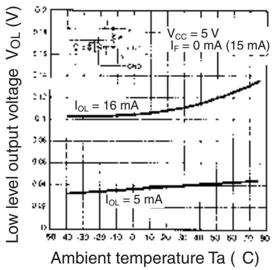
LED Current vs. Ambient Temperature Characteristics (Typical)



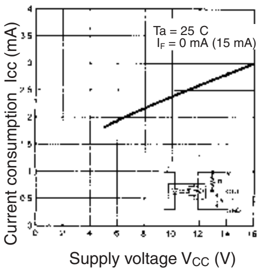
Low-level Output Voltage vs. Output Current (Typical)



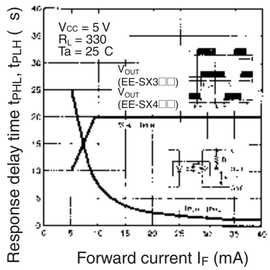
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



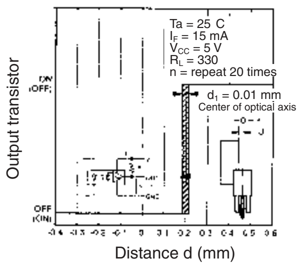
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)

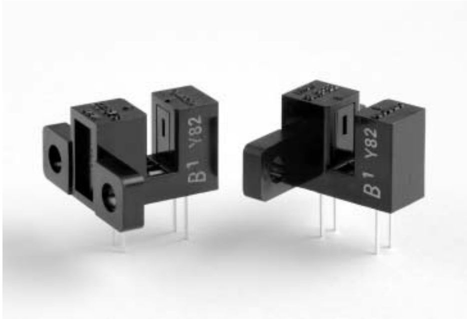


Repeat Sensing Position Characteristics (Typical)



Features

- High-resolution model with a 0.2-mm-wide or 0.5-mm-wide sensing aperture, high-sensitivity model with a 1-mm-wide sensing aperture, and model with a horizontal sensing aperture are available.
- Solder terminal models: EE-SV3/-SV3-CS/-SV3-DS/-SV3-GS
- PCB terminal models: EE-SV3-B/-SV3-C/-SV3-D/-SV3-G



Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter Voltage**	V_{CEO}	30 V
	Emitter-Collector Voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

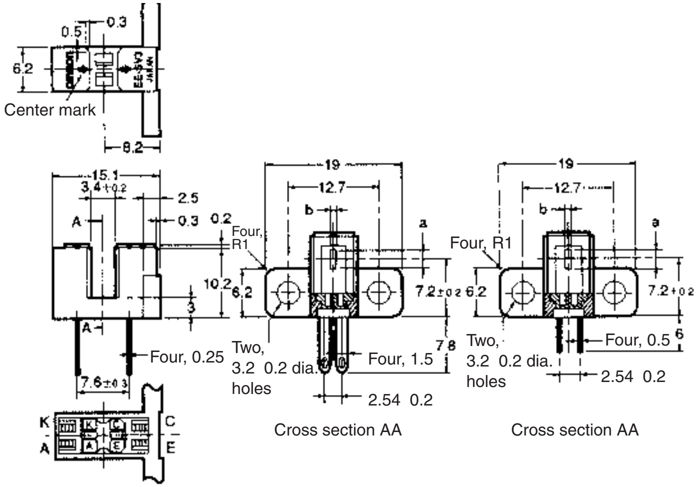
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

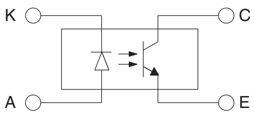
Item		Symbol	Value				Condition
			EE-SV3(-B)	EE-SV3-C(S)	EE-SV3-D(S)	EE-SV3-G(S)	
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.				I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.				V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.				I_F = 20 mA
Detector	**Light current**	I_L	0.5 to 14 mA	1 to 28 mA	0.1 mA min.	0.5 to 14 mA	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.				V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–				–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.		–	0.1 V typ. 0.4 V max.	I_F = 20 mA, I_L = 0.1 μA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.				V_{CE} = 10 V
Rising time		tr	4 μs typ.				V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.				

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Model	Aperture (a x b)
EE-SV3(-B)	2.1 x 0.5
EE-SV3-C(S)	2.1 x 1.0
EE-SV3-D(S)	2.1 x 0.2
EE-SV3-G(S)	0.5 x 2.1

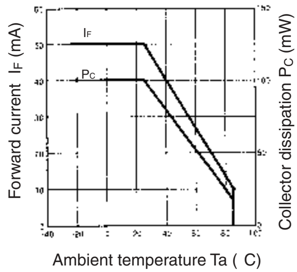
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

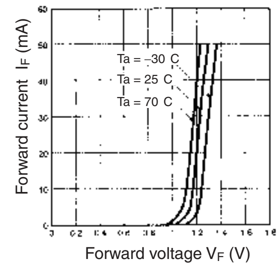
Dimensions	Tolerence
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Engineering Data

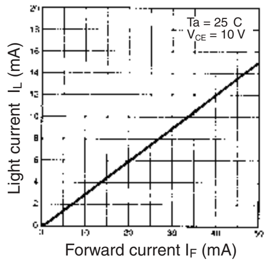
Forward Current vs. Collector Dissipation Temperature Rating



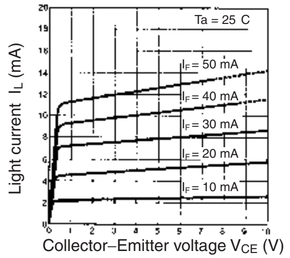
Forward Current vs. Forward Voltage Characteristics (Typical)



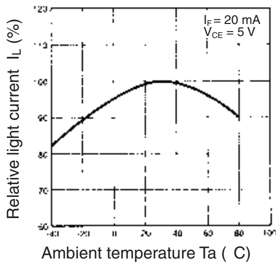
Light Current vs. Forward Current Characteristics (Typical)



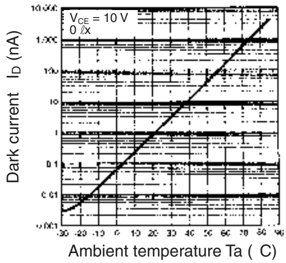
Light Current vs. Collector–Emitter Voltage Characteristics (EE-SV3(-B))



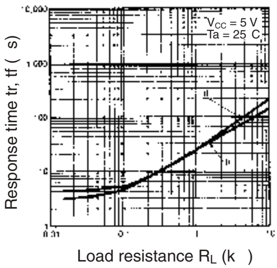
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



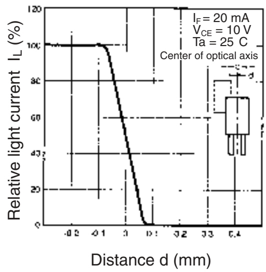
Dark Current vs. Ambient Temperature Characteristics (Typical)



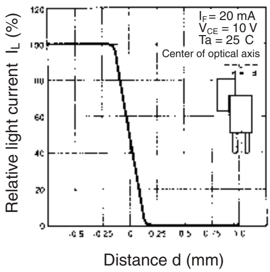
Response Time vs. Load Resistance Characteristics (Typical)



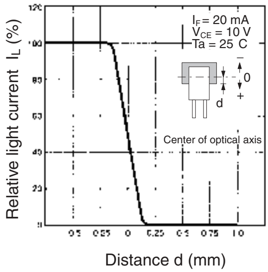
Sensing Position Characteristics (EE-SV3-D(S))



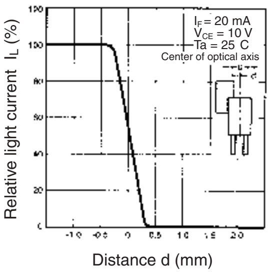
Sensing Position Characteristics (EE-SV3(-B))



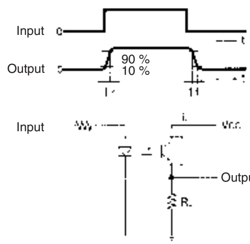
Sensing Position Characteristics (EE-SV3-G(S))



Sensing Position Characteristics (EE-SV3-C(S))

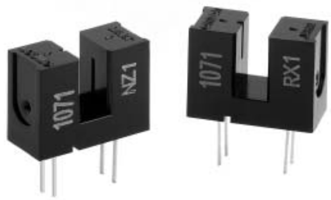


Response Time Measurement Circuit



Features

- General-purpose model with a 3.4-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.



Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

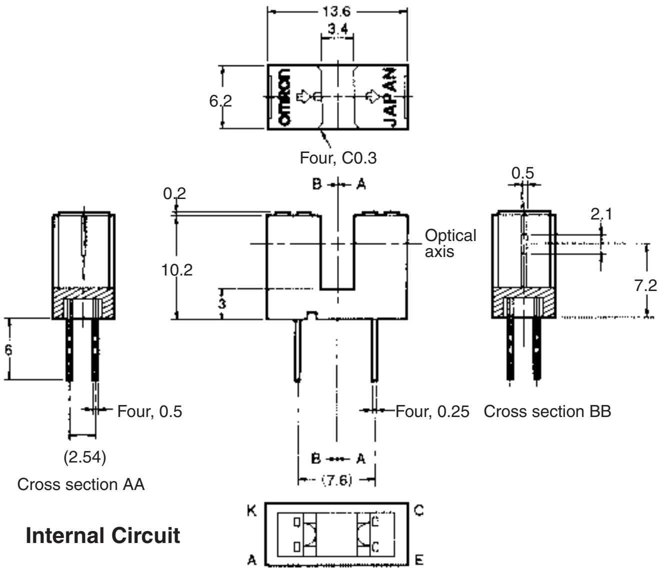
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

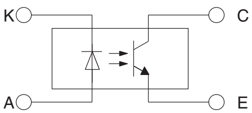
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



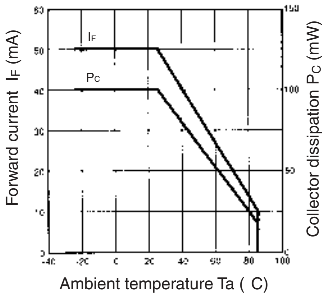
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are shown below

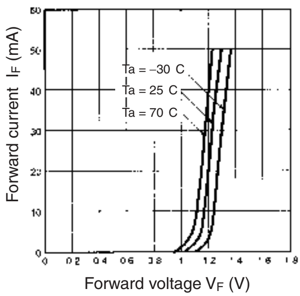
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

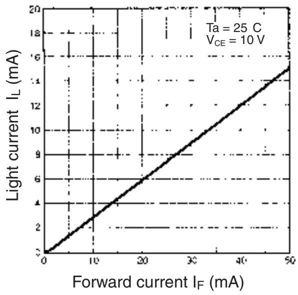
Forward Current vs. Collector Dissipation Temperature Rating



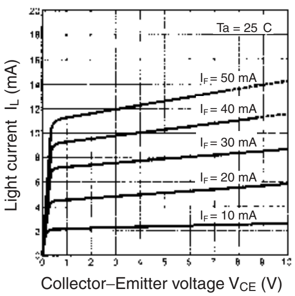
Forward Current vs. Forward Voltage Characteristics (Typical)



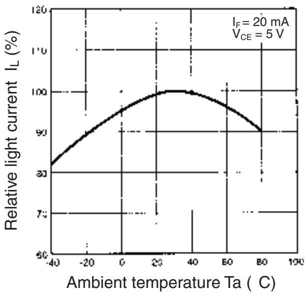
Light Current vs. Forward Current Characteristics (Typical)



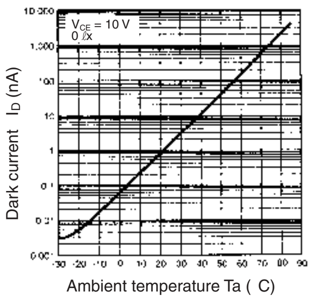
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



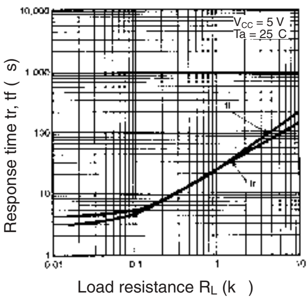
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



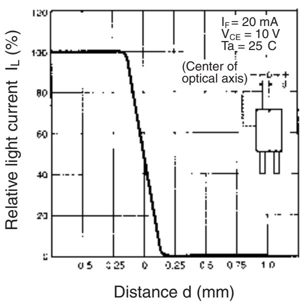
Dark Current vs. Ambient Temperature Characteristics (Typical)



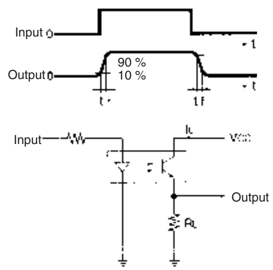
Response Time vs. Load Resistance Characteristics (Typical)



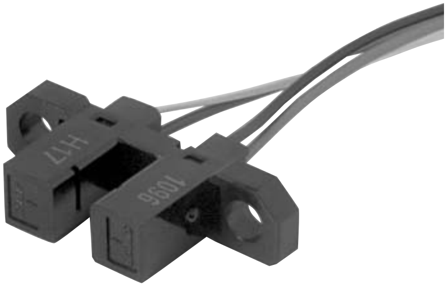
Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Features



- General-purpose model with a 3.4-mm-wide slot.
- PCB or connector mounting.
- High resolution with a 0.5-mm-wide aperture.
- With a horizontal sensing slot.
- OMRON's XK8-series Connectors can be connected without soldering. Contact your OMRON representative for information on obtaining XK8-series Connectors.

Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

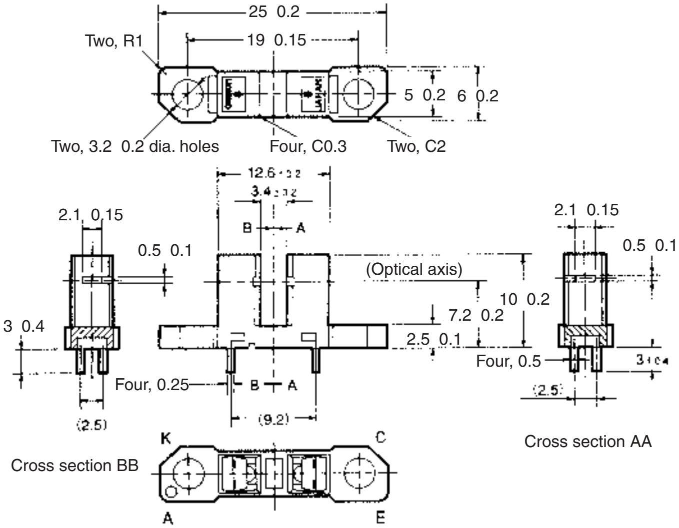
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

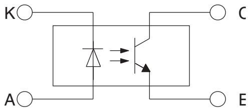
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



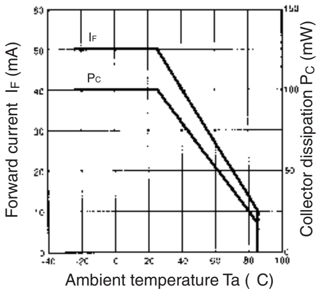
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are shown below

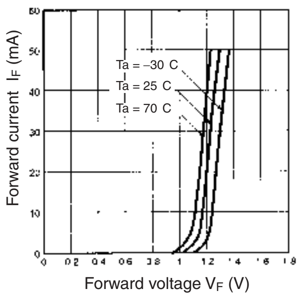
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

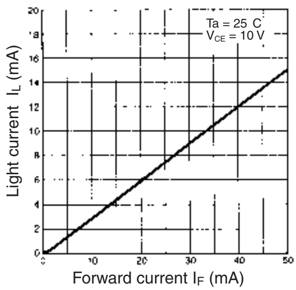
Forward Current vs. Collector Dissipation Temperature Rating



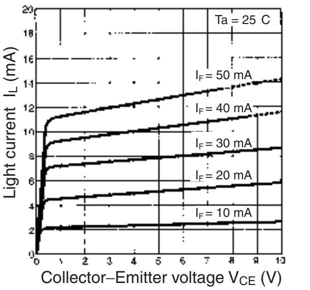
Forward Current vs. Forward Voltage Characteristics (Typical)



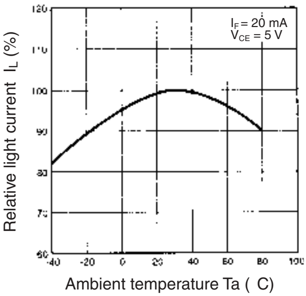
Light Current vs. Forward Current Characteristics (Typical)



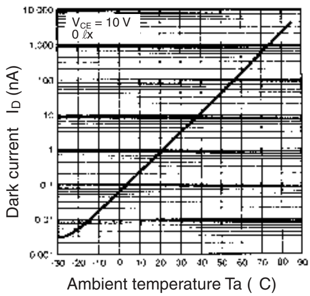
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



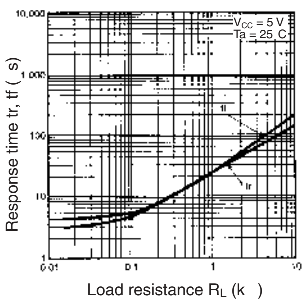
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



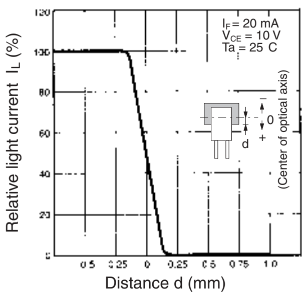
Dark Current vs. Ambient Temperature Characteristics (Typical)



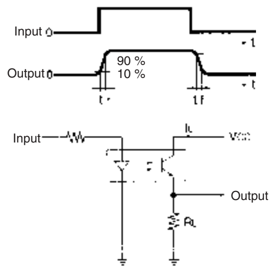
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Features

- General-purpose model with a 3.4-mm-wide slot.
- Mounts to PCBs or connects to connectors.
- High resolution with a 0.5-mm-wide aperture.
- OMRON's XK8-series Connectors can be connected without soldering. Contact your OMRON representative for information on obtaining XK8-series Connectors.

Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

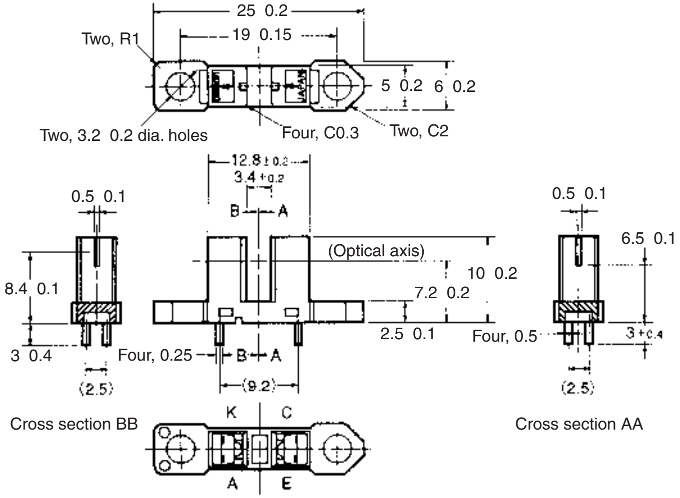
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

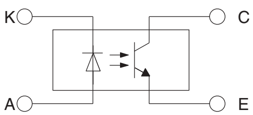
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.15 V typ., 0.4 max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



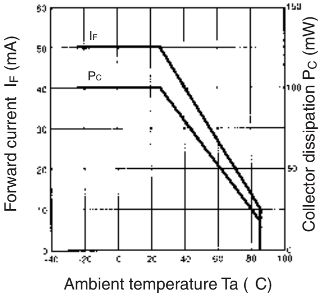
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are shown below

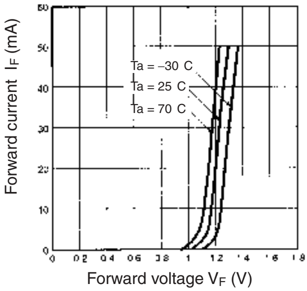
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

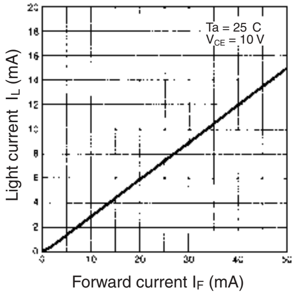
Forward Current vs. Collector Dissipation Temperature Rating



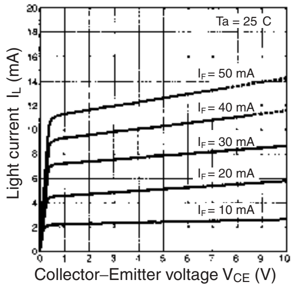
Forward Current vs. Forward Voltage Characteristics (Typical)



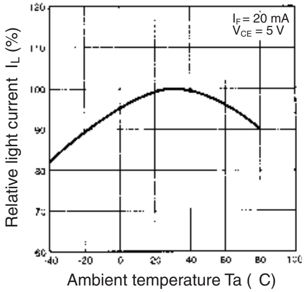
Light Current vs. Forward Current Characteristics (Typical)



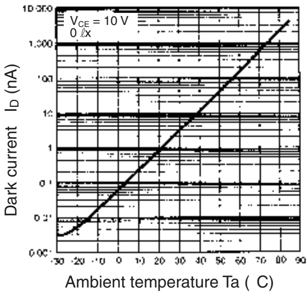
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



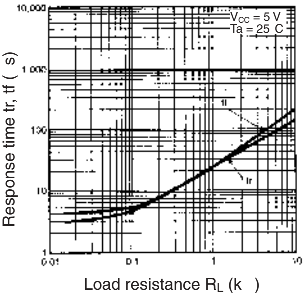
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



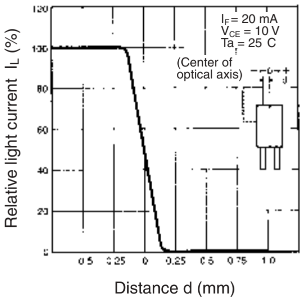
Dark Current vs. Ambient Temperature Characteristics (Typical)



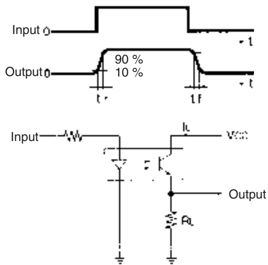
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

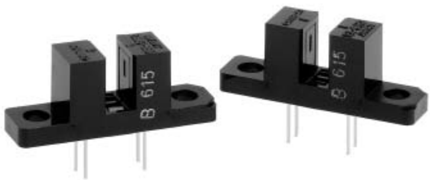


Response Time Measurement Circuit



Features

- High-resolution model with a 0.2-mm-wide or 0.5-mm-wide sensing aperture, high-sensitivity model with a 1-mm-wide sensing aperture, and model with a horizontal sensing aperture are available.
- Solder terminal models: EE-SH3/-SH3-CS/-SH3-DS/-SH3-GS
- PCB terminal models: EE-SH3-B/-SH3-C/-SH3-D/-SH3-G



Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

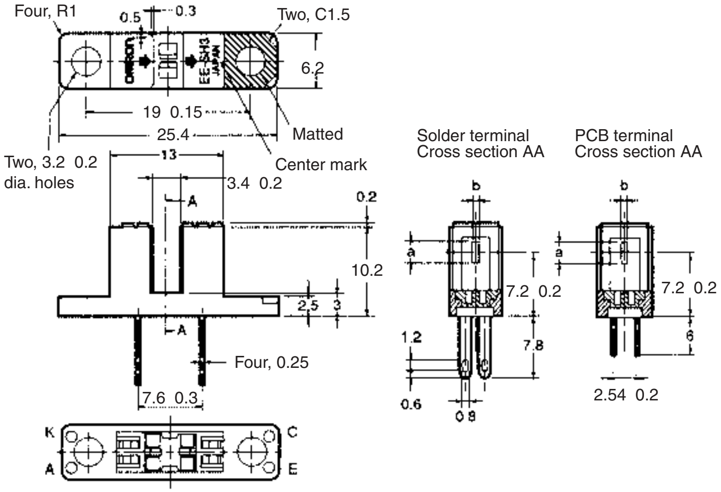
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

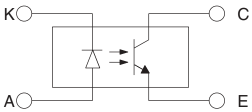
Item		Symbol	Value				Condition
			EE-SH3(-B)	**EE-SH3 -C(S)**	**EE-SH3 -D(S)**	**EE-SH3 -G(S)**	
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.				I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.				V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.				I_F = 20 mA
Detector	**Light current**	I_L	0.5 to 14 mA typ.	1 to 28 mA typ.	0.1 mA min.	0.5 to 14 mA	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.				V_{CE} = 10 V 0 ℓx
	Leakage current	I_{LEAK}	–				–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.		–	0.1 V typ. 0.4 max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.				V_{CE} = 10 V
Rising time		tr	4 μs typ.				V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.				

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Model	Aperture (a x b)
EE-SH3(-B)	2.1 x 0.5
EE-SH3-C(S)	2.1 x 1.0
EE-SH3-D(S)	2.1 x 0.2
EE-SH3-G(S)	0.5 x 2.1

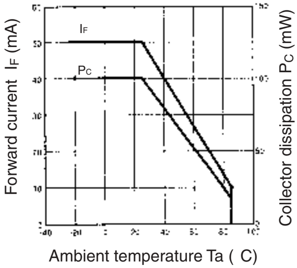
Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

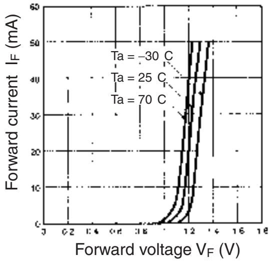
Dimensions	Tolerance
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Engineering Data

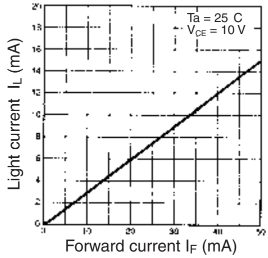
Forward Current vs. Collector Dissipation Temperature Rating



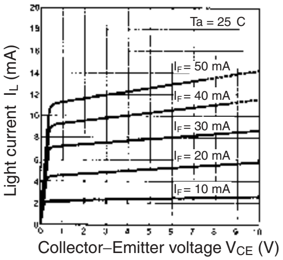
Forward Current vs. Forward Voltage Characteristics (Typical)



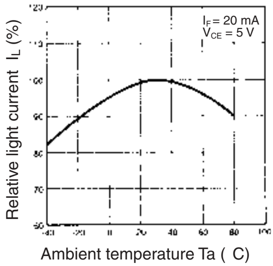
Light Current vs. Forward Current Characteristics (Typical)



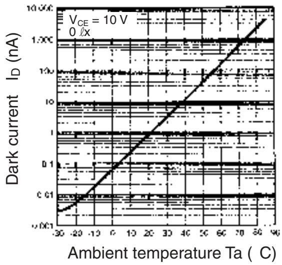
Light Current vs. Collector–Emitter Voltage Characteristics (EE-SH3(-B))



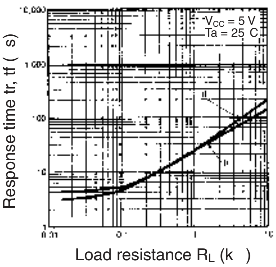
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



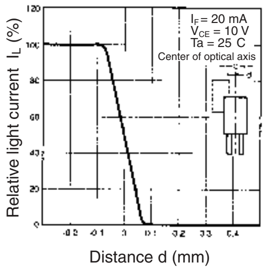
Dark Current vs. Ambient Temperature Characteristics (Typical)



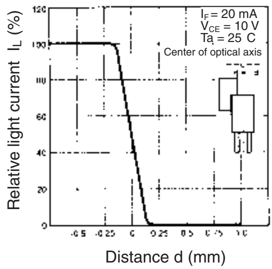
Response Time vs. Load Resistance Characteristics (Typical)



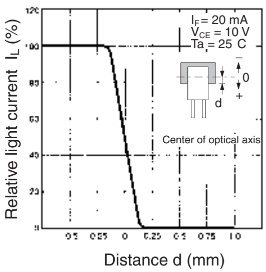
Sensing Position Characteristics (EE-SH3-D(S))



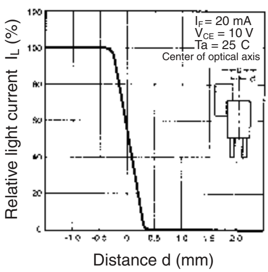
Sensing Position Characteristics (EE-SH3(-B))



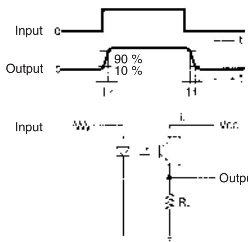
Sensing Position Characteristics (EE-SH3-G(S))



Sensing Position Characteristics (EE-SH3-C(S))



Response Time Measurement Circuit



Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- A wide supply voltage range: 4.5 to 16 VDC.
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX3088).
- Light ON model (EE-SX4088).
- OMRON's XK8-series Connectors can be connected to the lead wires without a PCB. Contact your OMRON representative for information on obtaining XK8-series Connectors.

Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Reverse Voltage	V_R	4 V
Detector	**Power supply voltage**	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

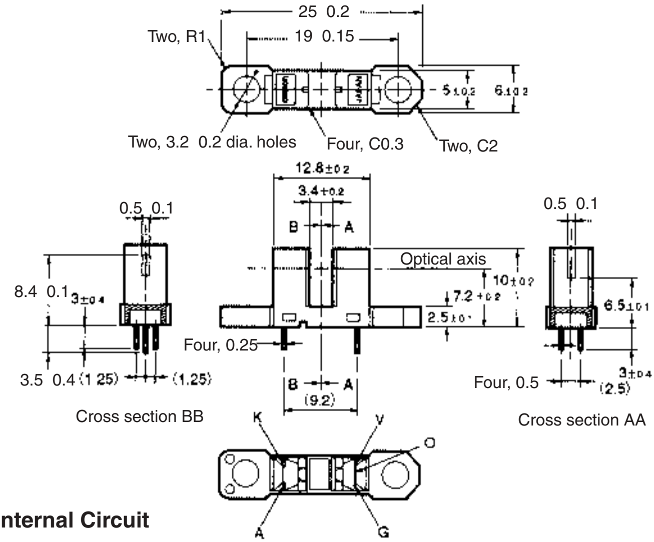
2. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

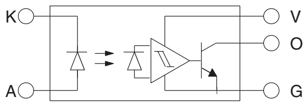
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm	I_F = 20 mA
Detector	**Low-level output voltage**	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 0 mA (EE-SX3088), I_F = 5 mA (EE-SX4088)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, I_F = 5 mA (EE-SX3088), I_F = 0 mA (EE-SX4088)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	2 mA typ., 5 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		△H	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



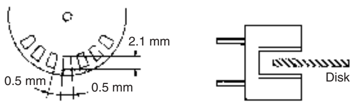
Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

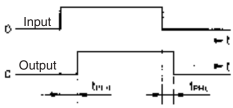
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

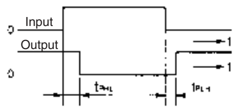
2. The value of the response frequency is measured by rotating the disk as shown below.



3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EESX4088.



EE-SX3088



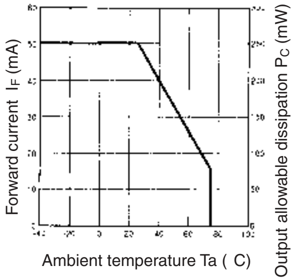
EE-SX4088

Photomicrosensors

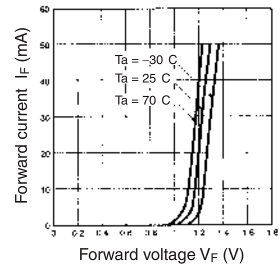
■ Engineering Data

Note: The values in the parentheses apply to EE-SX4080.

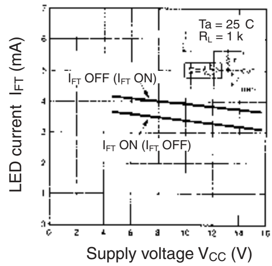
Forward Current vs. Collector Dissipation Temperature Rating



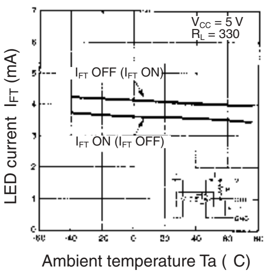
Forward Current vs. Forward Voltage Characteristics (Typical)



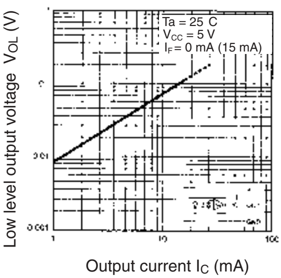
LED Current vs. Supply Voltage (Typical)



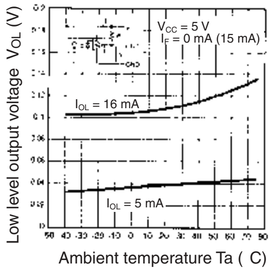
LED Current vs. Ambient Temperature Characteristics (Typical)



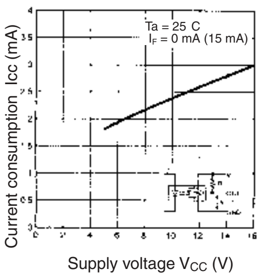
Low-level Output Voltage vs. Output Current (Typical)



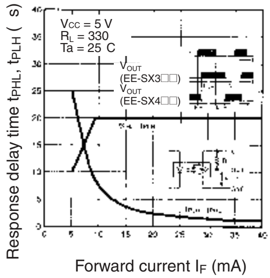
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



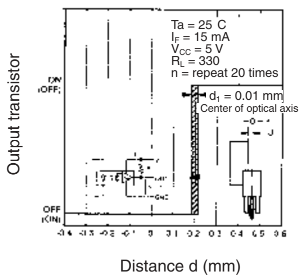
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)



Features

- Dust-proof model.
- Solder terminal model (EE-SG3).
- PCB terminal model (EE-SG3-B).

Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

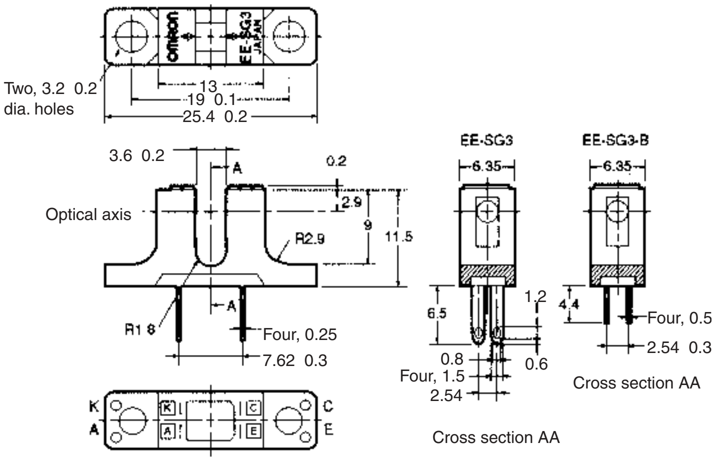
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

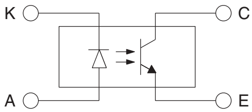
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	2 mA min., 40 mA max.	I_F = 15 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 30 mA, I_L = 1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



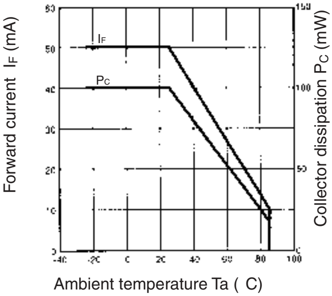
Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

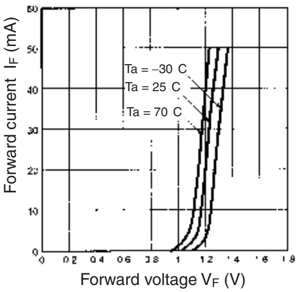
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

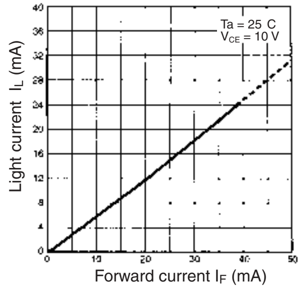
Forward Current vs. Collector Dissipation Temperature Rating



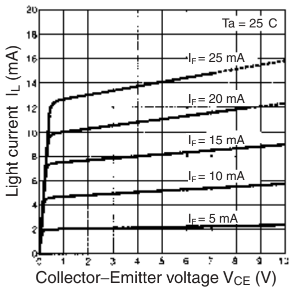
Forward Current vs. Forward Voltage Characteristics (Typical)



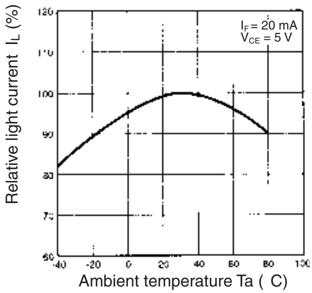
Light Current vs. Forward Current Characteristics (Typical)



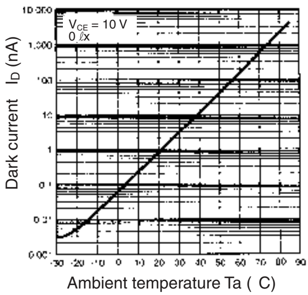
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



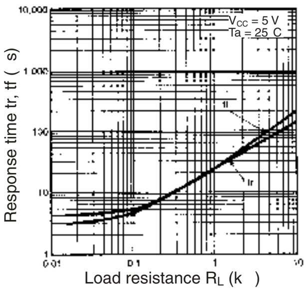
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



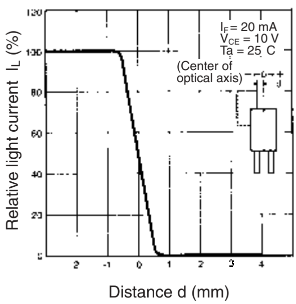
Dark Current vs. Ambient Temperature Characteristics (Typical)



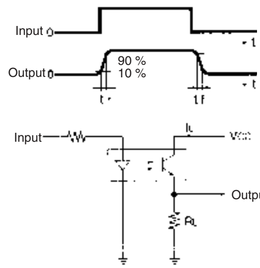
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Features

- Compact model with a 3.6-mm-wide slot.
- PCB mounting type.

Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

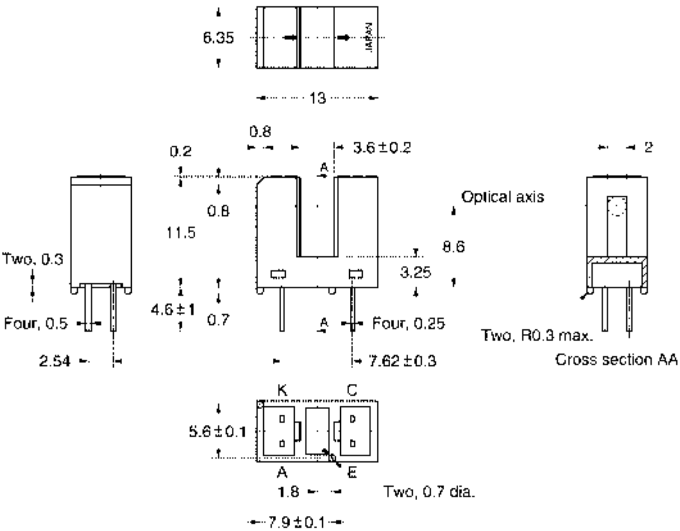
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

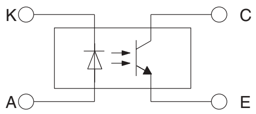
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.5 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	1.5 mA min., 8 mA typ., 30 mA max.	I_F = 15 mA, V_{CE} = 2 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.4 V max.	I_F = 30 mA, I_L = 1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 ms typ., 20 mA max.	V_{CC} = 10 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 ms typ., 20 mA max.	V_{CC} = 10 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



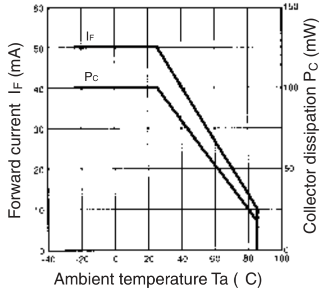
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are shown below

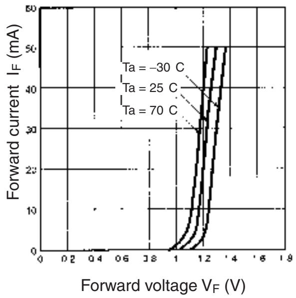
Dimensions	Tolerance
3 mm max.	±0.
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Engineering Data

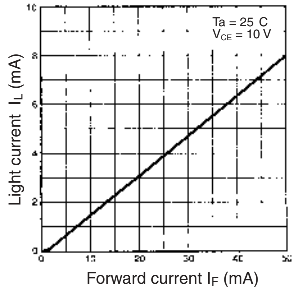
Forward Current vs. Collector Dissipation Temperature Rating



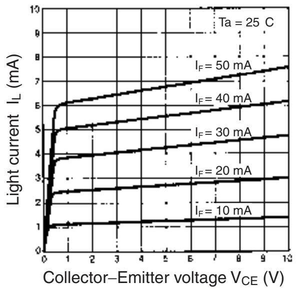
Forward Current vs. Forward Voltage Characteristics (Typical)



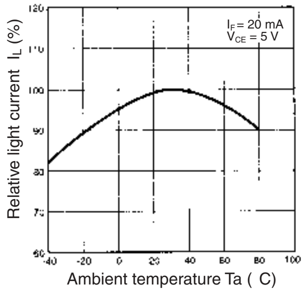
Light Current vs. Forward Current Characteristics (Typical)



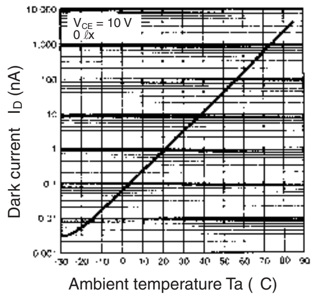
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



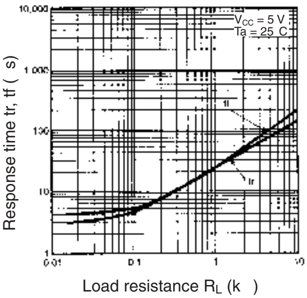
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



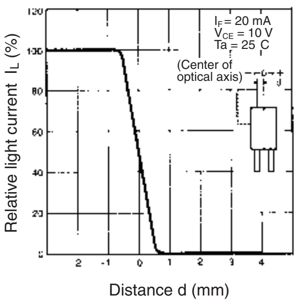
Dark Current vs. Ambient Temperature Characteristics (Typical)



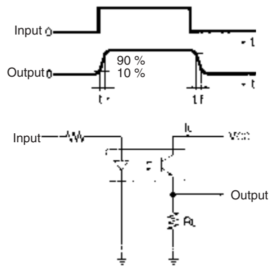
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

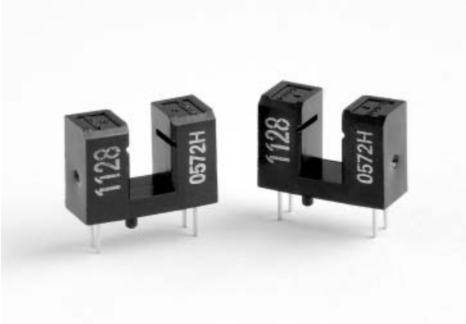


Response Time Measurement Circuit



Features

- General-purpose model with a 4.2-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- Horizontal sensing aperture.



Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter Voltage**	V_{CEO}	30 V
	Emitter-Collector Voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

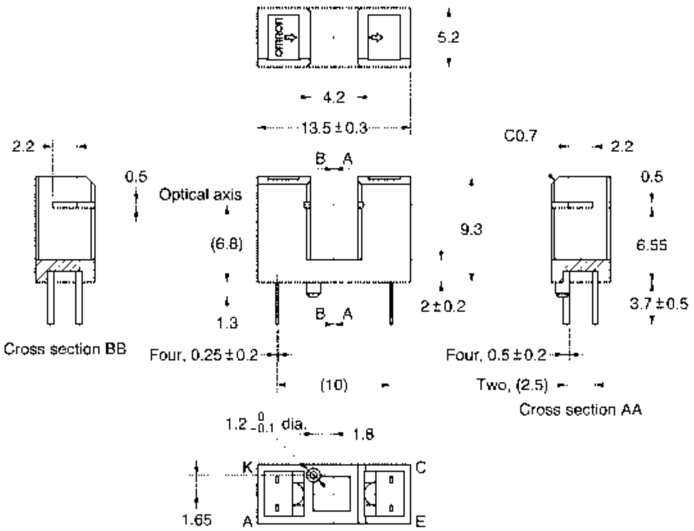
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

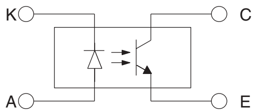
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 10 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 20 mA, I_L = 1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V. R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V. R_L = 100 Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



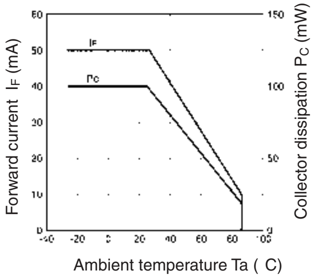
Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

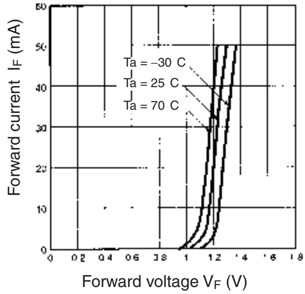
Dimensions	Tolerance
0 < mm ≤ 4	±0.100
4 < mm ≤ 18	±0.200

■ Engineering Data

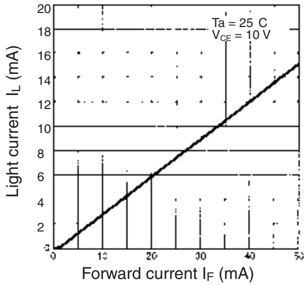
Forward Current vs. Collector Dissipation Temperature Rating



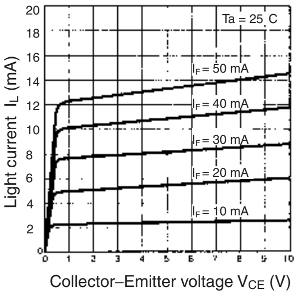
Forward Current vs. Forward Voltage Characteristics (Typical)



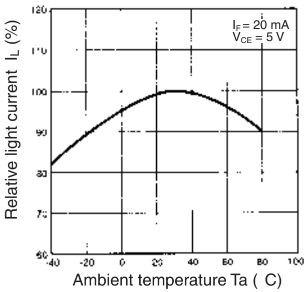
Light Current vs. Forward Current Characteristics (Typical)



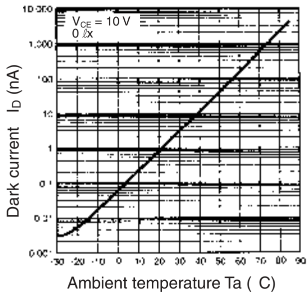
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



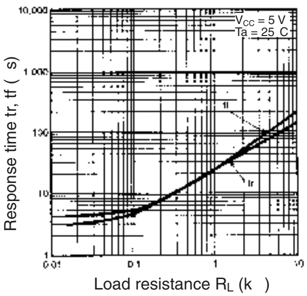
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



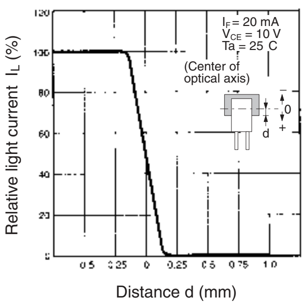
Dark Current vs. Ambient Temperature Characteristics (Typical)



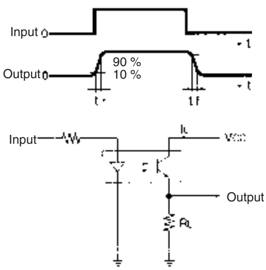
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

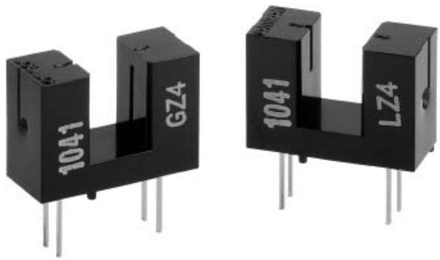


Response Time Measurement Circuit



Features

- General-purpose model with a 5-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.



Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

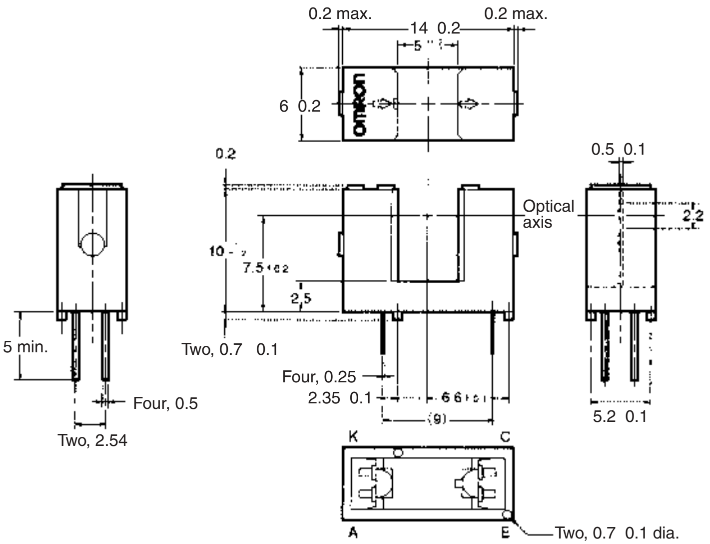
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

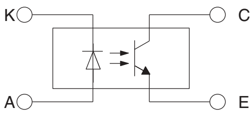
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



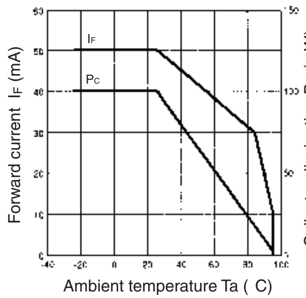
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are shown below

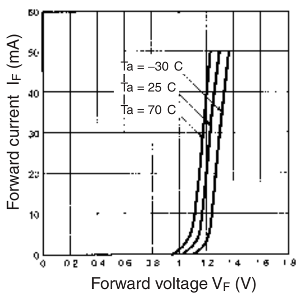
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

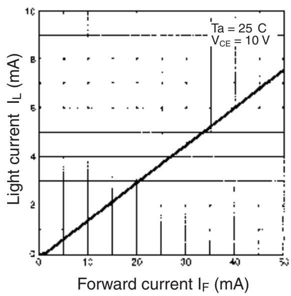
Forward Current vs. Collector Dissipation Temperature Rating



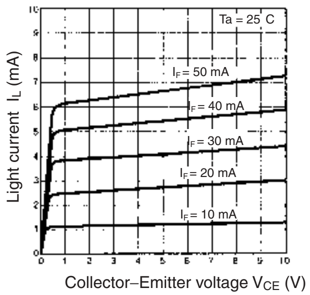
Forward Current vs. Forward Voltage Characteristics (Typical)



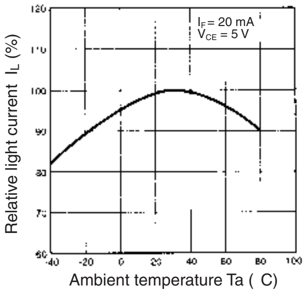
Light Current vs. Forward Current Characteristics (Typical)



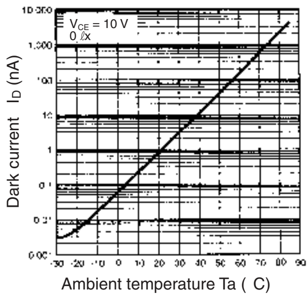
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



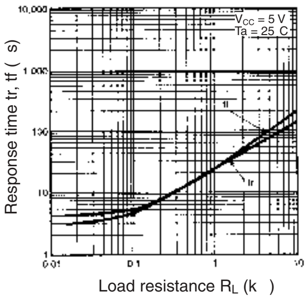
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



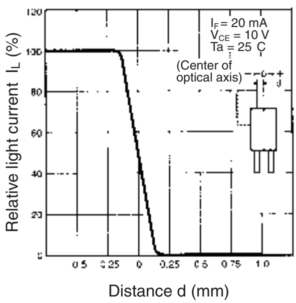
Dark Current vs. Ambient Temperature Characteristics (Typical)



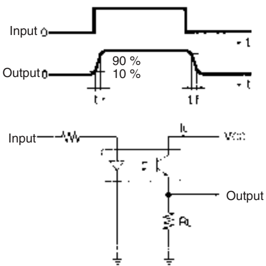
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

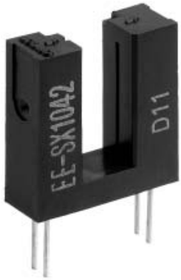


Response Time Measurement Circuit



Features

- ■ 14.5-mm-tall model with a deep slot.
- ■ PCB mounting type.
- ■ High resolution with a 0.5-mm-wide aperture.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

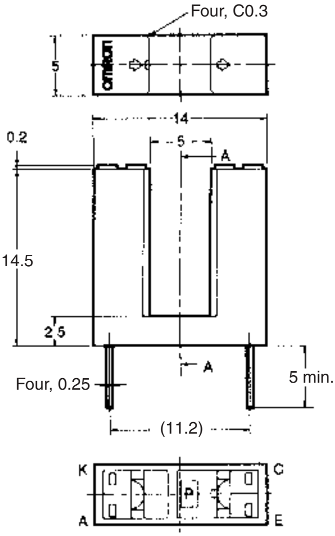
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

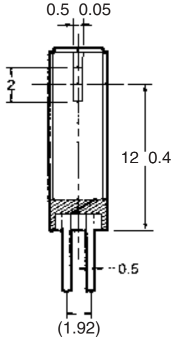
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 10 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

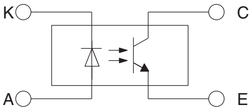
Note: All units are in millimeters unless otherwise indicated.





Cross section AA

Internal Circuit



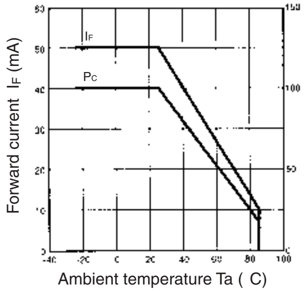
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are shown below

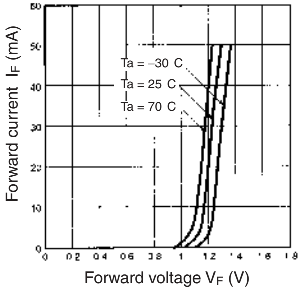
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

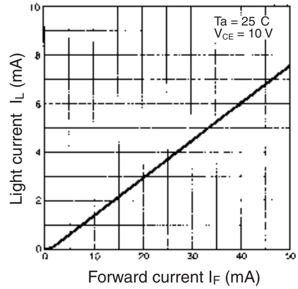
Forward Current vs. Collector Dissipation Temperature Rating



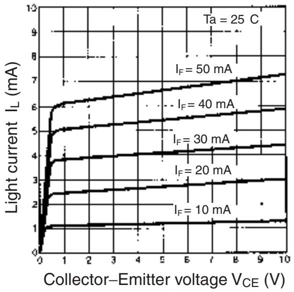
Forward Current vs. Forward Voltage Characteristics (Typical)



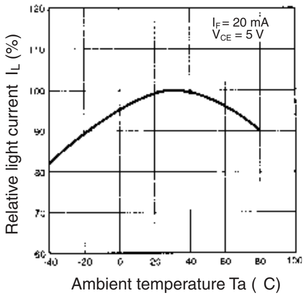
Light Current vs. Forward Current Characteristics (Typical)



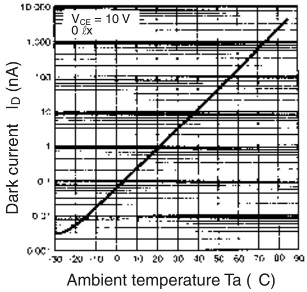
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



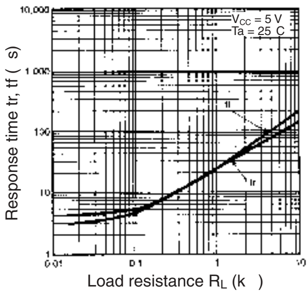
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



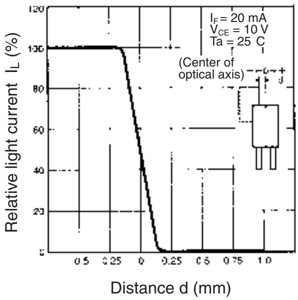
Dark Current vs. Ambient Temperature Characteristics (Typical)



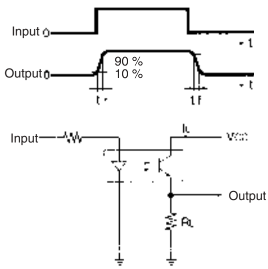
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Features

- General-purpose model with a 5-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.

Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

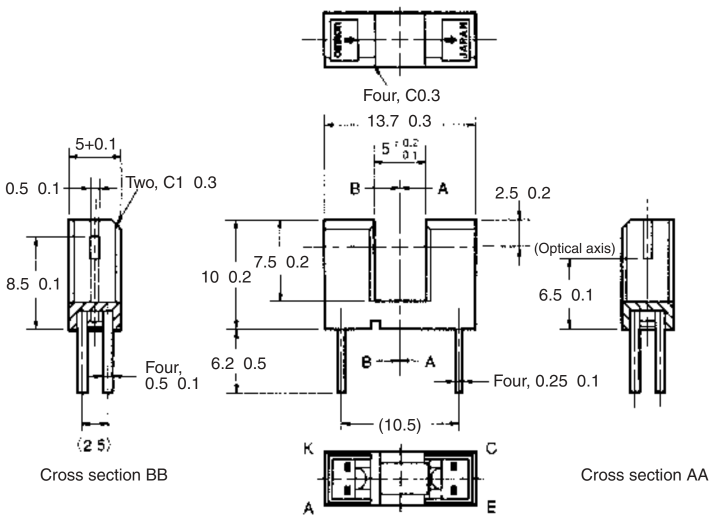
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

■ Dimensions

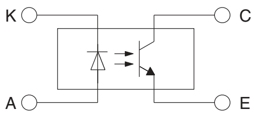
Note: All units are in millimeters unless otherwise indicated.



Cross section BB

Cross section AA

Internal Circuit



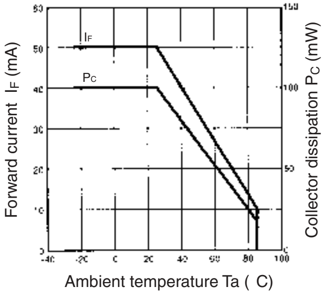
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

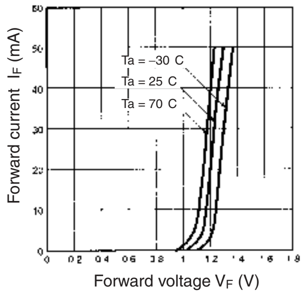
Terminal No.	Name
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

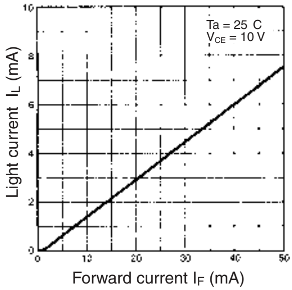
Forward Current vs. Collector Dissipation Temperature Rating



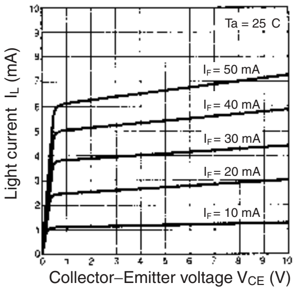
Forward Current vs. Forward Voltage Characteristics (Typical)



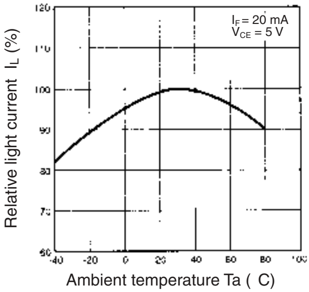
Light Current vs. Forward Current Characteristics (Typical)



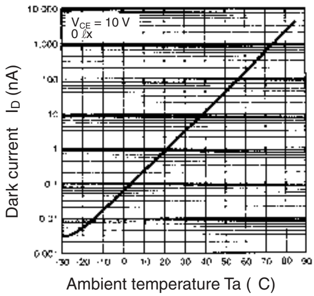
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



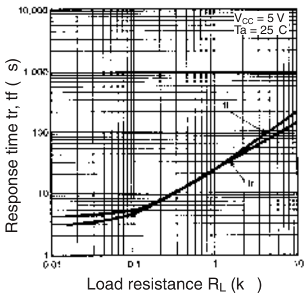
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



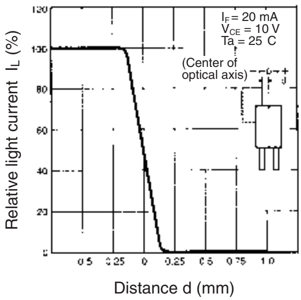
Dark Current vs. Ambient Temperature Characteristics (Typical)



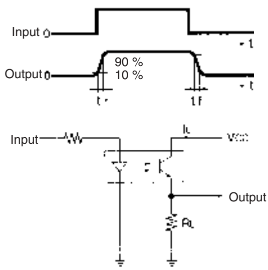
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Features

- Snap-in mounting model.
- Mounts to 1.0-, 1.2- and 1.6-mm-thick PCBs.
- High resolution with a 0.5-mm-wide aperture.
- 5-mm-wide slot.
- Connects to Tyco Electronics AMP's CT-series connectors.

Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note)
	Pulse forward current	I_{FP}	–
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note)
Ambient temperature	**Operating**	Topr	-25°C to 95°C
	Storage	Tstg	-40°C to 100°C
Soldering temperature		Tsol	–

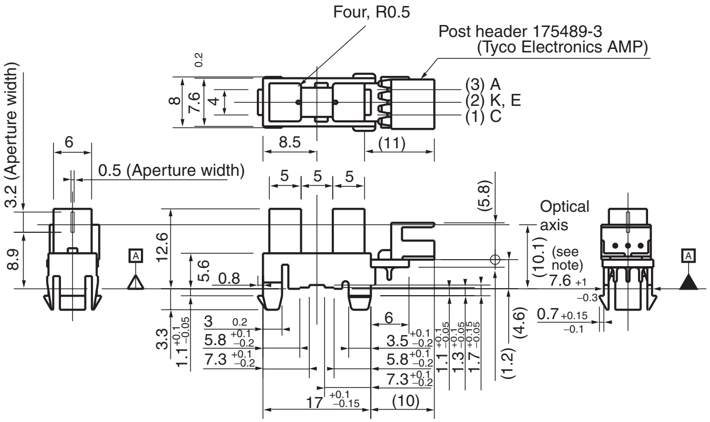
Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

Electrical and Optical Characteristics (Ta = 25°C)

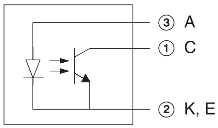
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 30 mA
Detector	**Light current**	I_L	0.6 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 20 mA, I_L = 0.3 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 5 V
Rising time		tr	8 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 1 mA
Falling time		tf	8 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 1 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Note: The asterisked dimension is specified by datum A only.

Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
A	Anode
C	Collector
K, E	Cathode, Emitter

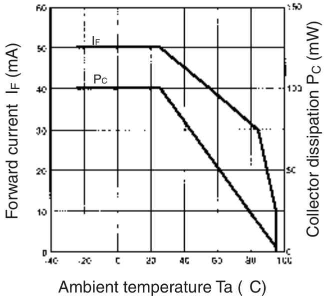
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Recommended Mating Connectors:

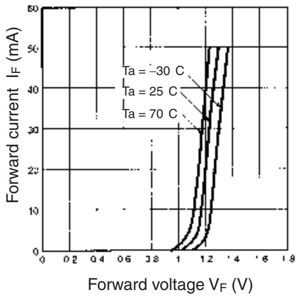
Tyco Electronics AMP 173977-3 (insulation displacement-type connector)
175778-3 (crimp-type connector)
179228-3 (crimp-type connector)

■ Engineering Data

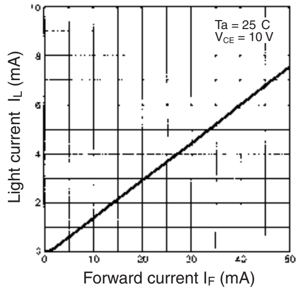
Forward Current vs. Collector Dissipation Temperature Rating



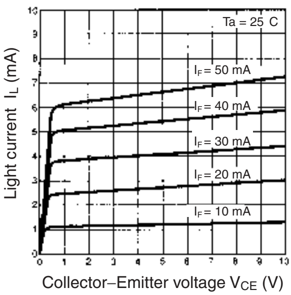
Forward Current vs. Forward Voltage Characteristics (Typical)



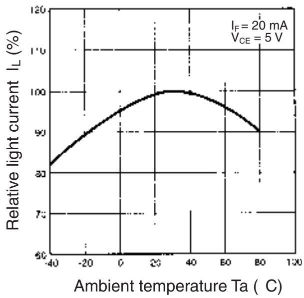
Light Current vs. Forward Current Characteristics (Typical)



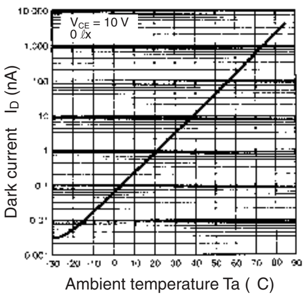
Light Current vs. Collector−Emitter Voltage Characteristics (Typical)



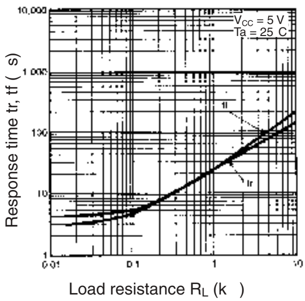
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



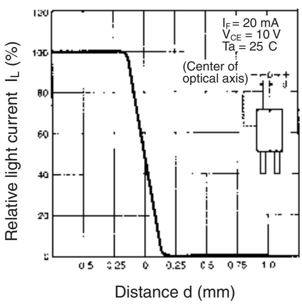
Dark Current vs. Ambient Temperature Characteristics (Typical)



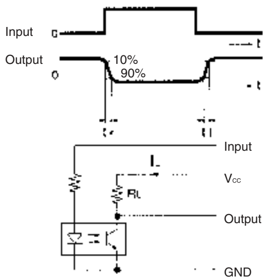
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

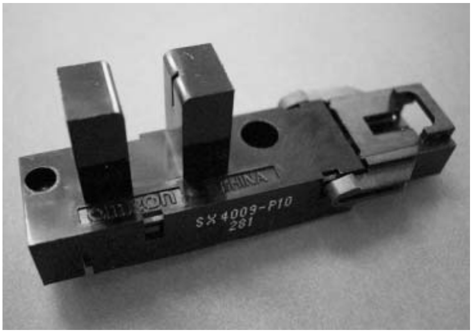


Response Time Measurement Circuit



Features

- Screw-mounting model.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 5-mm-wide groove.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to Tyco Electronics AMP's EI-series connectors.



Specifications

Absolute Maximum Ratings (Ta = 25°C)

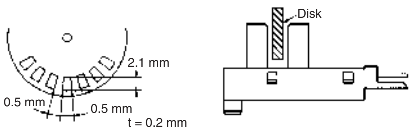
Item		Symbol	Rated value
Power supply voltage		V_{CC}	10 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	**Operating**	Topr	-25°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

Electrical and Optical Characteristics (Ta = 25°C, Vcc = 5 V ± 10%)

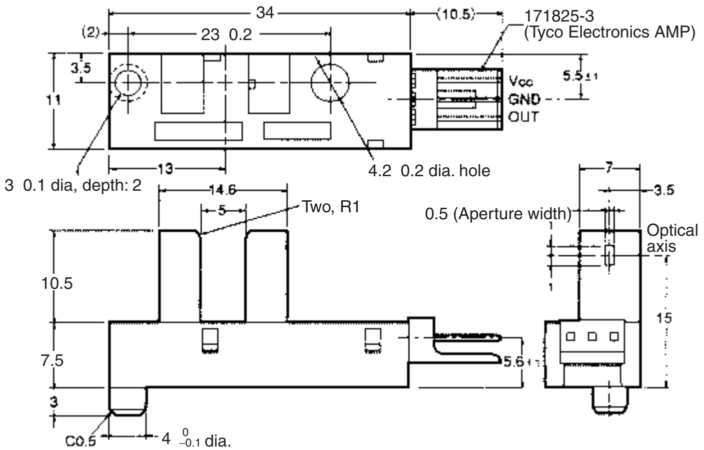
Item	Symbol	Value	Condition
Current consumption	I_{CC}	30 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.3 V max.	I_{OUT} = 16 mA Without incident (EE-SX3009-P1) With incident (EE-SX4009-P1)
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	$V_{OUT} = V_{CC}$ With incident (EE-SX3009-P1) Without incident (EE-SX4009-P1), R_L = 47 kΩ
Response frequency	f	3 kHz min.	$V_{OUT} = V_{CC}$, R_L = 47 kΩ (see note)

Note: The value of the response frequency is measured by rotating the disk as shown below.

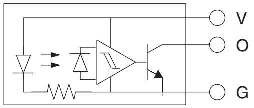


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

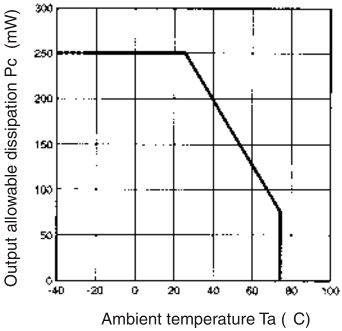
Dimensions	Tolerance
4 mm max.	±0.2
1 < mm ≤ 16	±0.3
16 < mm ≤ 63	±0.5

Recommended Mating Connectors:

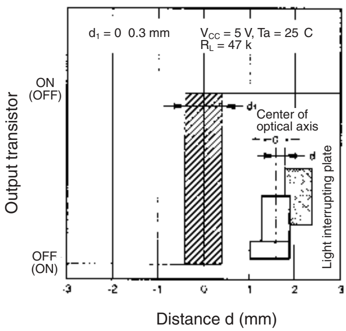
Tyco Electronics AMP 171822-3 (crimp-type connector)
172142-3 (crimp-type connector)
OMRON EE-1005 (with harness)

■ Engineering Data

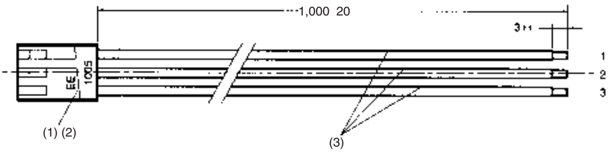
Output Allowable Dissipation vs. Ambient Temperature Characteristics



Sensing Position Characteristics (Typical)



EE-1005 Connector



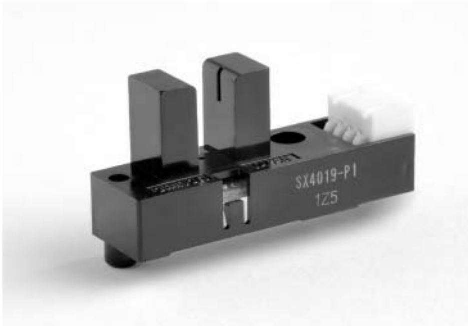
Number	Name	Model	Quantity	Maker
1	Receptacle housing	171822-3	1	Tyco Electronics AMP
2	Receptacle contact	170262-1	3	Tyco Electronics AMP
3	Lead wire	UL1007 AWG24	3	–

■ Wiring

Connector circuit no.	Lead wire colour	Output when connected to EE-SX4009-P1
1	Red	V_{CC}
2	Orange	GND
3	Yellow	OUT

Features

- Screw-mounting model.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 5-mm-wide groove.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to Tyco Electronics AMP's CT-series connectors.



Specifications

Absolute Maximum Ratings (Ta = 25°C)

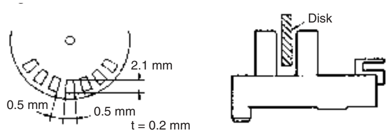
Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	**Operating**	Topr	-20°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

Electrical and Optical Characteristics (Ta = 25°C, Vcc = 5 V ± 10%)

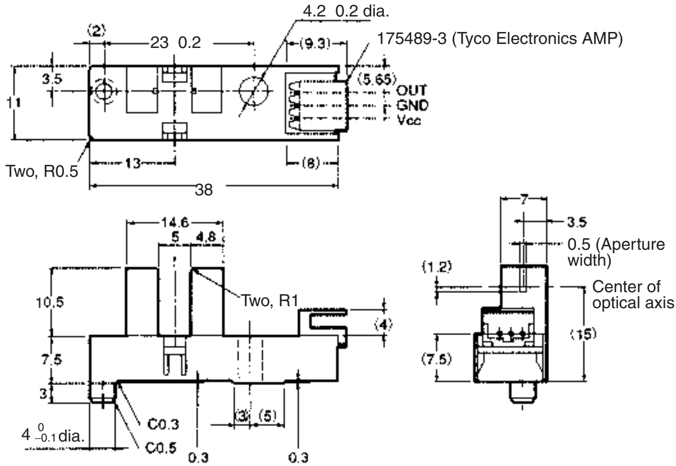
Item	Symbol	Value	Condition
Current consumption	I_{CC}	20 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.3 V max.	I_{OUT} = 16 mA Without incident (EE-SX3019-P2) With incident (EE-SX4019-P2)
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} without incident, Without incident (EE-SX3019-P2) With incident (EE-SX4019-P2), R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = $V_{CC,}$ R_L = 47 kΩ (see note)

Note: The value of the response frequency is measured by rotating the disk as shown below.

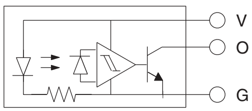


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

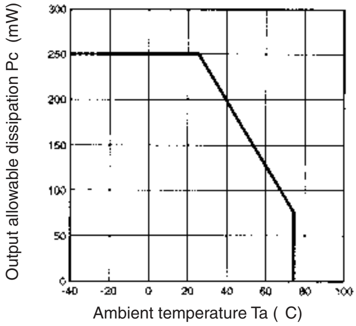
Recommended Mating Connectors:

Tyco Electronics AMP 179228-3 (crimp-type connector)
175778-3 (crimp-type connector)
173977-3 (press-fit connector)

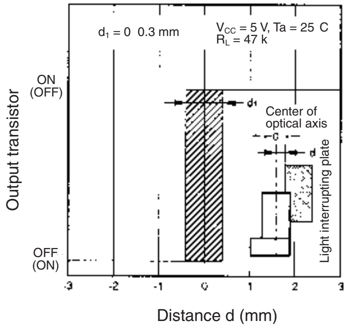
■ Engineering Data

Note: the values in the parenthesis apply to the EE-SX4019-P2.

Output Allowable Dissipation vs. Ambient Temperature Characteristics

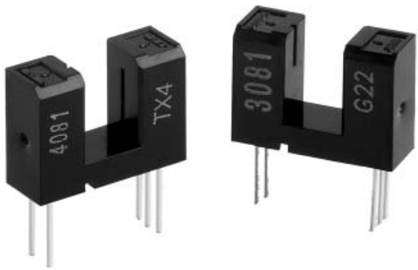


Sensing Position Characteristics (Typical)



Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX3081)
- Light ON model (EE-SX4081.



Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Reverse Voltage	V_R	4 V
Detector	**Power supply voltage**	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

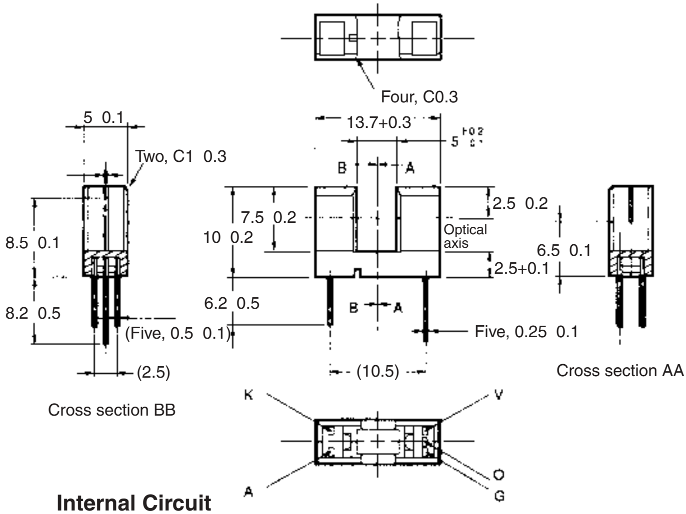
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

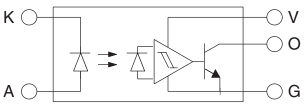
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Low-level output voltage**	I_L	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 0 mA (EE-SX3081), I_F = 8 mA (EE-SX4081)
	High-level output voltage	I_D	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, I_F = 8 mA (EE-SX3081), I_F = 0 mA (EE-SX4081)
	Current consumption	I_{CC}	3.2 mA., 10 mA max.	V_{CC} = 4.5 to 16 V
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 5 V
LED current when output is OFF		I_{FT}	8 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PHL} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PHL})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA (see note 3)

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



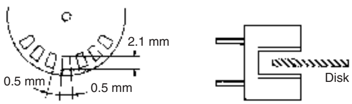
Unless otherwise specified, the tolerances are as shown below

Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

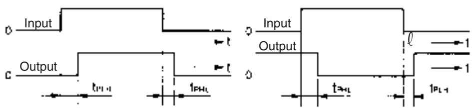
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below.



3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EESX4081.

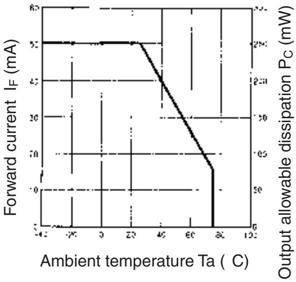


EE-SX3081 **EE-SX4081**

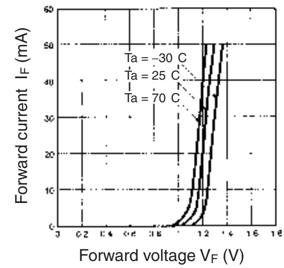
■ Engineering Data

Note: The values in the parentheses apply to EE-SX4081.

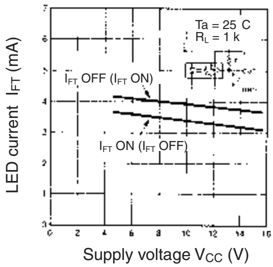
Forward Current vs. Collector Dissipation Temperature Rating



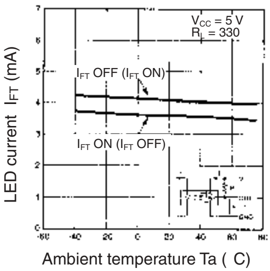
Forward Current vs. Forward Voltage Characteristics (Typical)



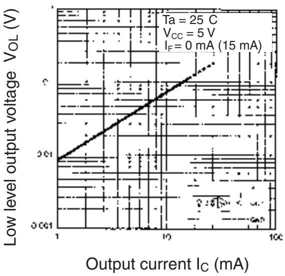
LED Current vs. Supply Voltage (Typical)



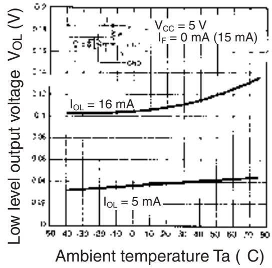
LED Current vs. Ambient Temperature Characteristics (Typical)



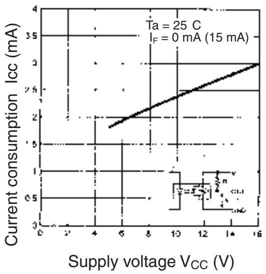
Low-level Output Voltage vs. Output Current (Typical)



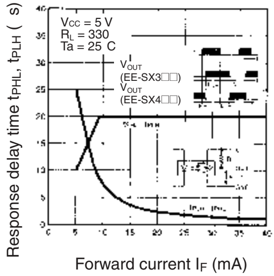
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



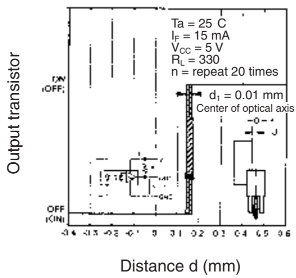
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)

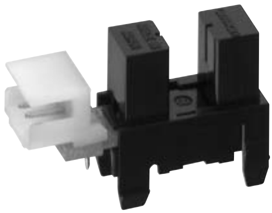


Repeat Sensing Position Characteristics (Typical)



Features

- Snap-in mounting model.
- Mounts to 1.0-, 1.2- and 1.6-mm-thick panels.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 5-mm-wide slot.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to Tyco Electronics AMP's CT-series connectors.



Specifications

Absolute Maximum Ratings (Ta = 25°C)

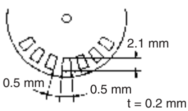
Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	**Operating**	Topr	-25°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

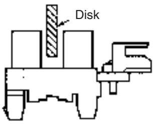
Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C

Electrical and Optical Characteristics (Ta = 25°C, Vcc = 5 V ± 10%)

Item	Symbol	Value	Condition
Current consumption	I_{CC}	16.5 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.35 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	$V_{OUT} = V_{CC}$ without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	$V_{OUT} = V_{CC}$, R_L = 47 kΩ (see note)

Note: The value of the response frequency is measured by rotating the disk as shown below.

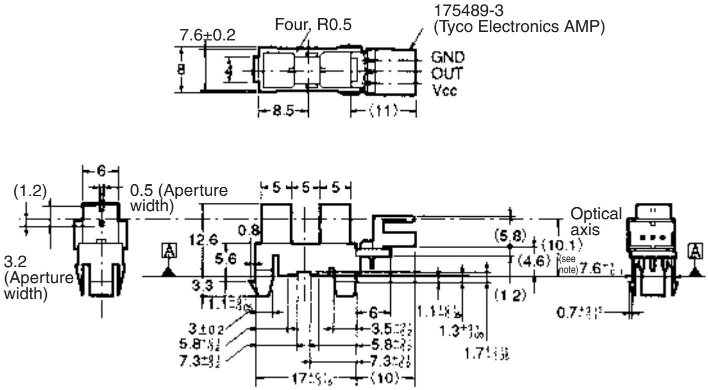




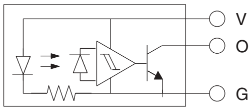
Photomicrosensors

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Note: The asterisked dimension is specified by datum A only.

Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

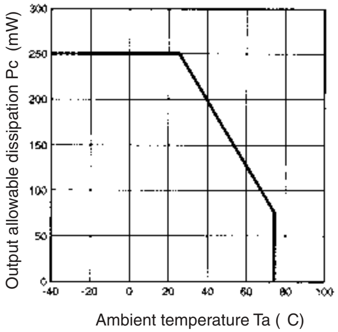
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Recommended Mating Connectors:

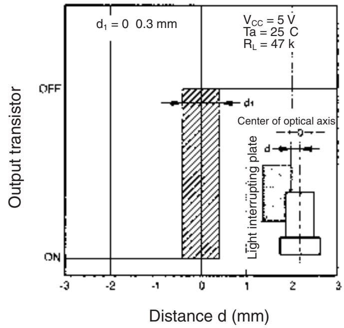
Tyco Electronics AMP 179228-3 (crimp-type connector)
175778-3 (crimp-type connector)
173977-3 (press-fit connector)

■ Engineering Data

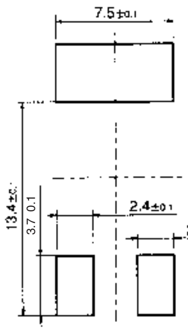
Output Allowable Dissipation vs. Ambient Temperature Characteristics



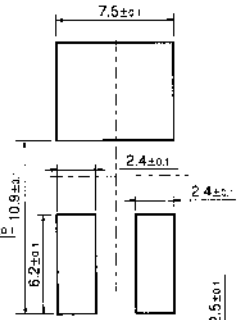
Sensing Position Characteristics (Typical)



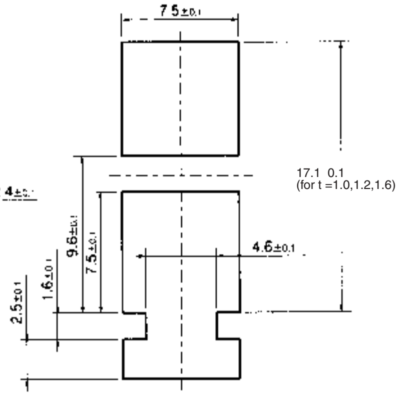
■ Recommended Mounting Holes



t = 1.0 mm



t = 1.2 mm



t = 1.6 mm

- When mounting the Photomicrosensor to a panel with a hole opened by pressing, make sure that the hole has no burrs. The mounting strength of the Photomicrosensor will decrease if the hole has burrs.
- When mounting the Photomicrosensor to a panel with a hole opened by pressing, be sure to mount the Photomicrosensor on the pressing side of the panel.
- The mounting strength of the Photomicrosensor will increase if the Photomicrosensor is mounted to a panel with a hole that is only a little larger than the size of the Photomicrosensor, in which case, however, it will be difficult to mount the Photomicrosensor to the panel. The mounting strength of the Photomicrosensor will decrease if the Photomicrosensor is mounted to a panel with a hole that is comparatively larger than the size of the Photomicrosensor, in which case, however, it will be easy to mount the Photomicrosensor to the panel. When mounting the Photomicrosensor to a panel, open an appropriate hole for the Photomicrosensor according to the application.
- After mounting the Photomicrosensor to any panel, make sure that the Photomicrosensor does not wobble.
- When mounting the Photomicrosensor to a molding with a hole, make sure that the edges of the hole are sharp enough, otherwise the Photomicrosensor may fall out.

Features

■ Wide model with a 8-mm-wide slot.

■ PCB mounting type.

■ High resolution with a 0.5-mm-wide aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 95°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

2. The pulse width is 10 μs maximum with a frequency of 100 Hz.

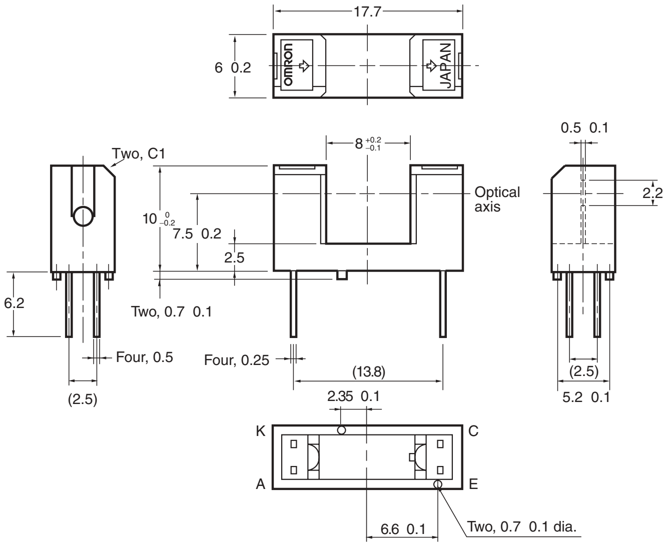
3. Complete soldering within 10 seconds.

■ Electrical and Optical Characteristics (Ta = 25°C)

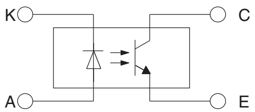
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



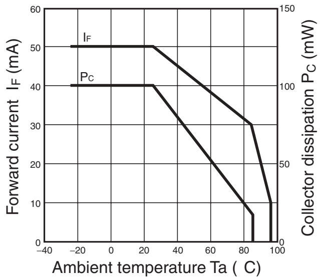
Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

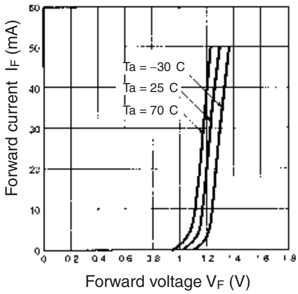
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

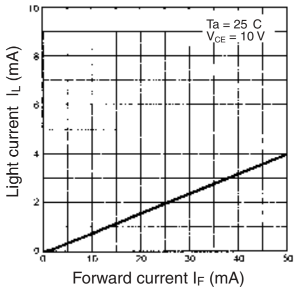
Forward Current vs. Collector Dissipation Temperature Rating



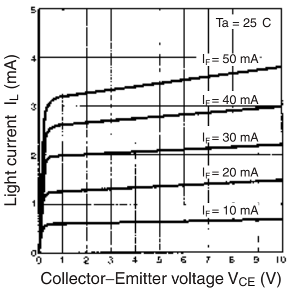
Forward Current vs. Forward Voltage Characteristics (Typical)



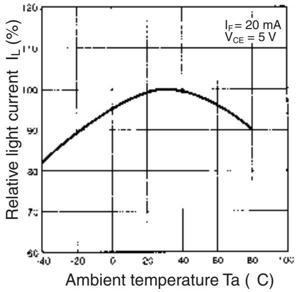
Light Current vs. Forward Current Characteristics (Typical)



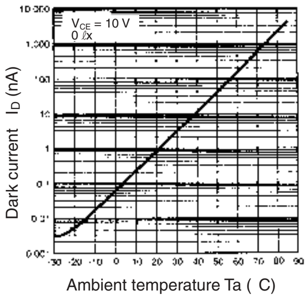
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



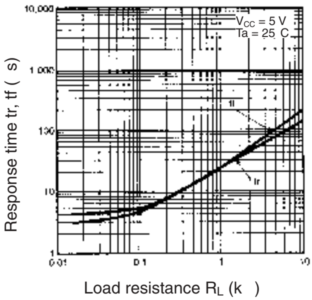
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



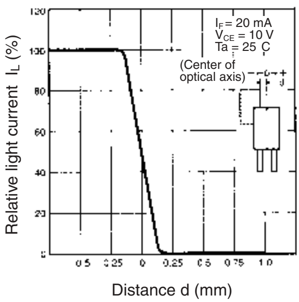
Dark Current vs. Ambient Temperature Characteristics (Typical)



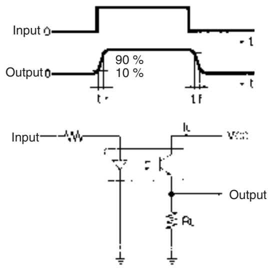
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

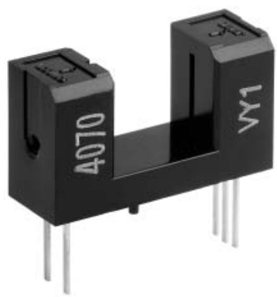


Response Time Measurement Circuit



Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX3070)
- Light ON model (EE-SX4070)



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Reverse Voltage	V_R	4 V
Detector	**Power supply voltage**	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

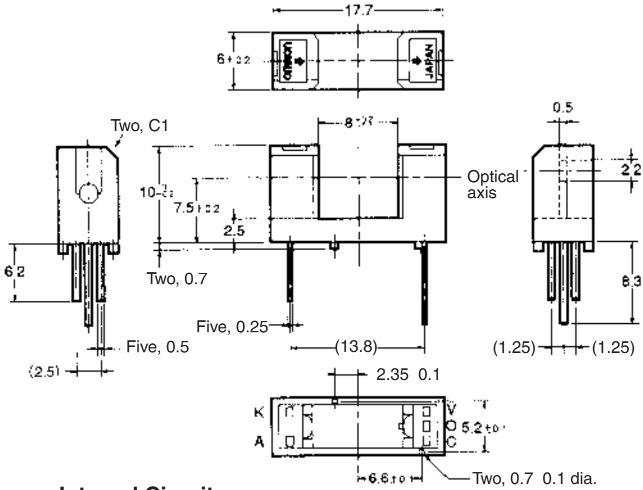
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Electrical and Optical Characteristics (Ta = 25°C)

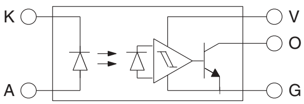
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Low-level output voltage**	I_L	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 0 mA (EE-SX3070), I_F = 10 mA (EE-SX4070)
	High-level output voltage	I_D	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, I_F = 10 mA (EE-SX3070), I_F = 0 mA (EE-SX4070)
	Current consumption	I_{CC}	3.2 mA., 10 mA max.	V_{CC} = 4.5 to 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CE} = 5 V
LED current when output is OFF		I_{FT}	10 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PHL} (t_{PHL})	3 µs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PHL})	20 µs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA (see note 3)

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



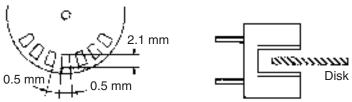
Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

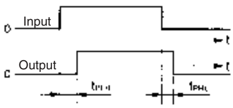
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Note:1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

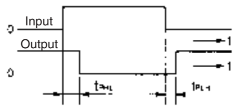
2. The value of the response frequency is measured by rotating the disk as shown below.



3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EESX4070.



EE-SX3070

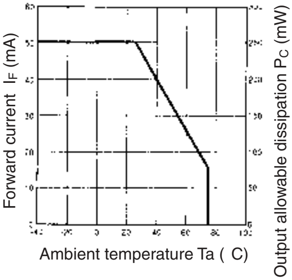


EE-SX4070

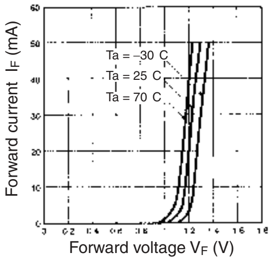
■ Engineering Data

Note: The values in the parentheses apply to EE-SX4070.

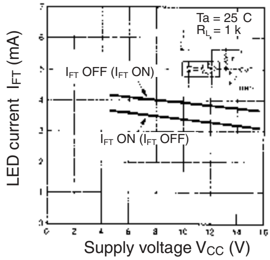
Forward Current vs. Collector Dissipation Temperature Rating



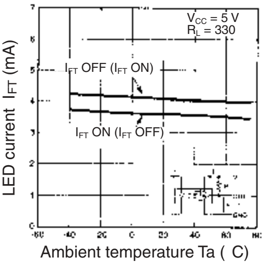
Forward Current vs. Forward Voltage Characteristics (Typical)



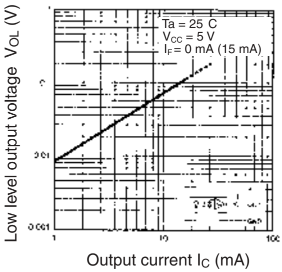
LED Current vs. Supply Voltage (Typical)



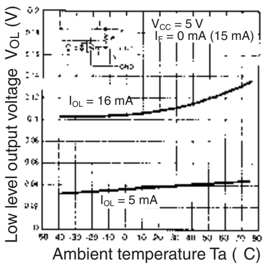
LED Current vs. Ambient Temperature Characteristics (Typical)



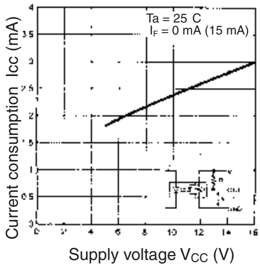
Low-level Output Voltage vs. Output Current (Typical)



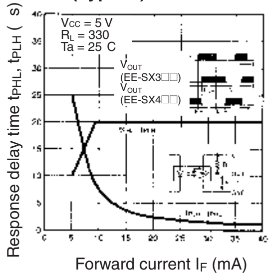
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



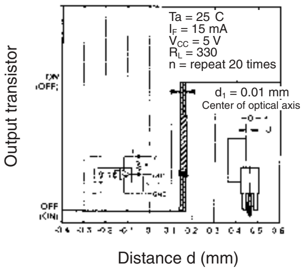
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)



Features

- Separate LED/Photo IC combinations with 12-mm slot.
- Uses light modulation via built-in amplifier IC.
- Applicable to the PA connector series from JST (Japan Solderless Terminal).

Specifications

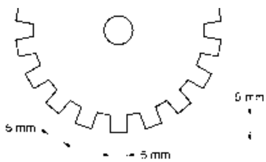
Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Rated value
Supply voltage	V_{CC}	16 VDC
Output voltage	V_{OUT}	16 V
Output current	I_{OUT}	50 mA
Operating temperature	T_{OPR}	-10°C to 60°C
Storage temperature	T_{SBG}	-40°C to 80°C

Electrical and Optical Characteristics (Ta = 25°C, Vcc = 12 V±10%)

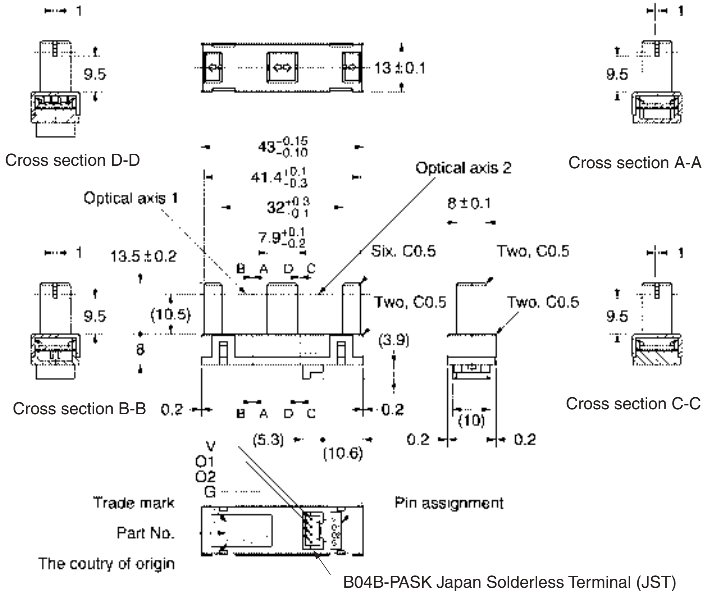
Item	Symbol	Value			Unit	Testing Conditions
		Min.	Typ.	Max.		
Current consumption	I_{CC}	–	–	35	mA	With/without object
Low level output voltage	V_{OL}	0.01	0.2	0.4	V	I_{OUT} = 20 mA without object
High level output current	I_{OH}	0	–	40	mA	V_{OUT} = 12 V with object
Ambient illumination	–	0	–	3,000	ℓx	Sunlight and fluorescent light
Response frequency	f	500	–	–	Hz	$V_{CC}0 = V_{CC}1 = V_{CC}2$ = 12 VDC RL = 1.2 kΩ (See note.)

Note: The value indicated is that measured by rotating the disk as shown below.

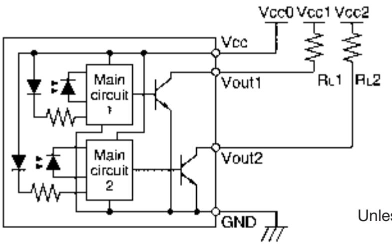


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Unless otherwise specified, the tolerances are shown below

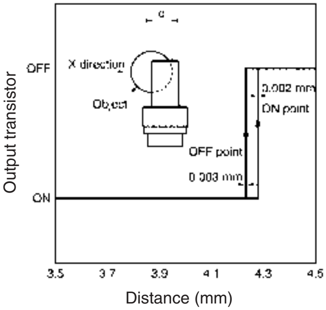
Terminal No.	Name
V	Power supply (Vcc)
O1	$V_{OUT}1$ (Optical axis1)
O2	$V_{OUT}2$ (Optical axis2)
G	Ground (GND)

Recommended Mating Connectors:
JST (Japan Solderless Terminal) PAP-04V-S

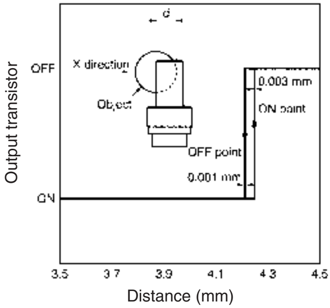
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65
30 < mm ≤ 50	±0.8

■ Engineering Data

Repetitive Sensing Position Characteristics for OUT1 (in horizontal direction, typical)



Repetitive Sensing Position Characteristics for OUT2 (in horizontal direction, typical)



Features

- General-purpose model with a 14-mm-wide slot.
- 16.3-mm-tall model with a deep slot.
- PCB mounting type..

Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter Voltage**	V_{CEO}	30 V
	Emitter-Collector Voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

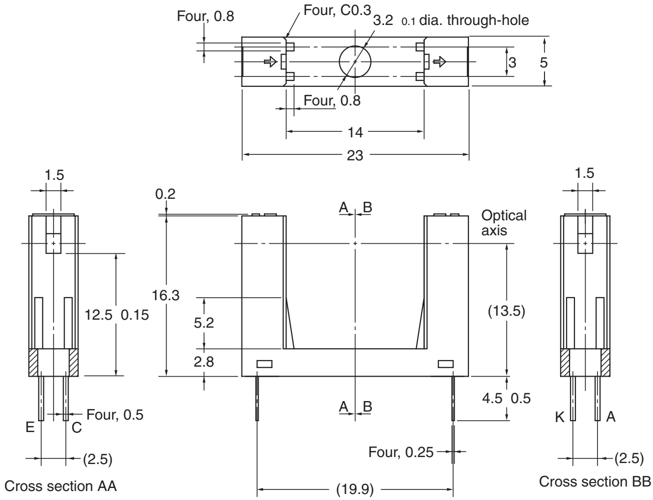
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

Electrical and Optical Characteristics (Ta = 25°C)

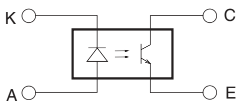
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.4 mA min.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



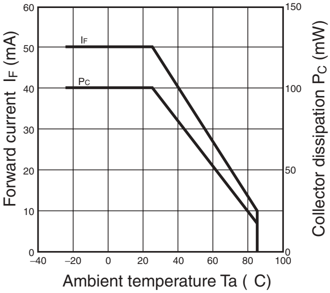
Unless otherwise specified, the tolerances are as shown below.

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

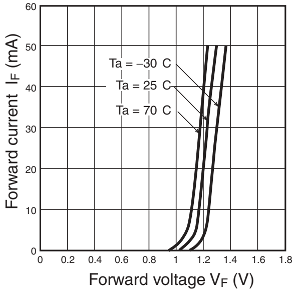
Terminal No.	Name
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

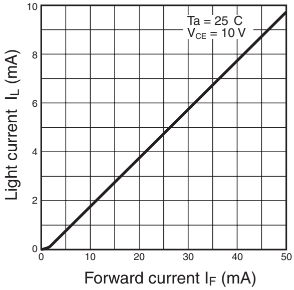
Forward Current vs. Collector Dissipation Temperature Rating



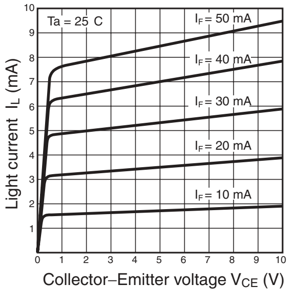
Forward Current vs. Forward Voltage Characteristics (Typical)



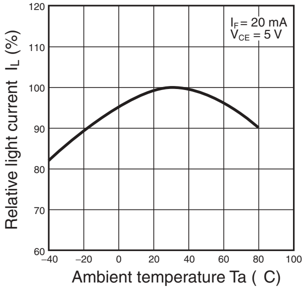
Light Current vs. Forward Current Characteristics (Typical)



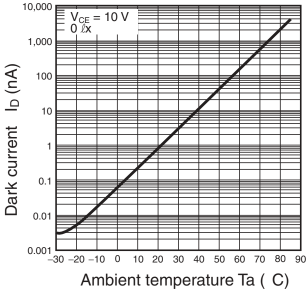
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



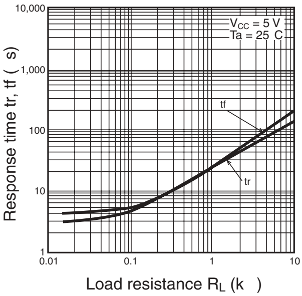
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



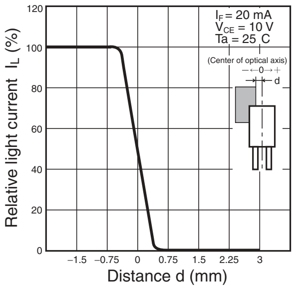
Dark Current vs. Ambient Temperature Characteristics (Typical)



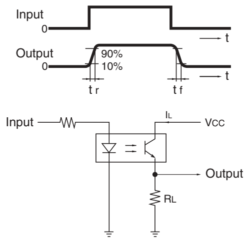
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Features

- Snap-in-mounting model.
- Mounts to 0.8- to 1.6-mm-thick panels.
- With a 15-mm-wide slot.
- Photo IC output signals directly connect with C-MOS and TTL

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

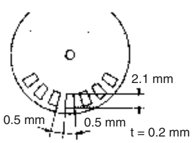
Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	**Operating**	Topr	-25°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

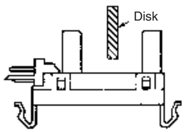
Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

■ Electrical and Optical Characteristics (Ta = 25°C, Vcc = 5 V ± 10%)

Item	Symbol	Value	Condition
Current consumption	I_{CC}	35 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.3 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

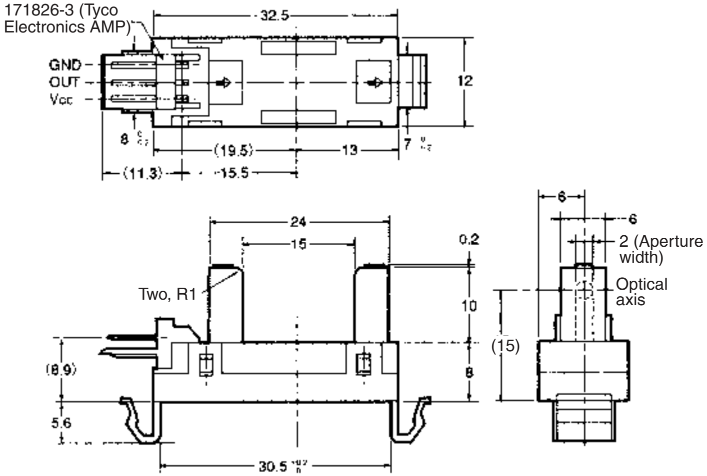
Note: The value of the response frequency is measured by rotating the disk as shown below.



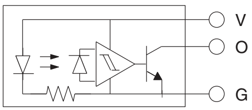


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

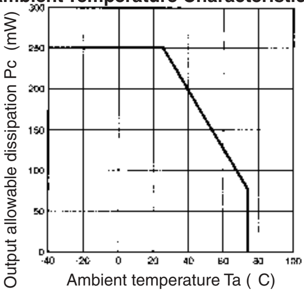
Recommended Mating Connectors:

Tyco Electronics AMP	171822-3 (crimp-type connector)
	172142-3 (crimp-type connector)
OMRON	EE-1005 (with harness)

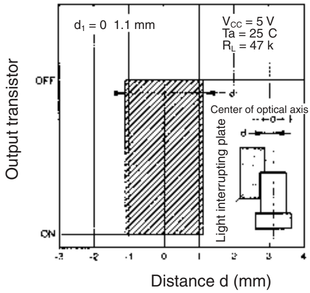
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

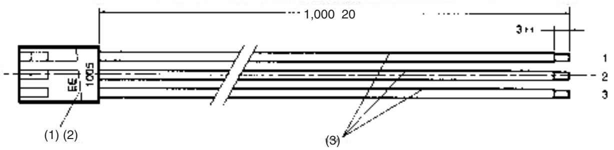
Output Allowable Dissipation vs. Ambient Temperature Characteristics



Sensing Position Characteristics (Typical)



EE-1005 Connector

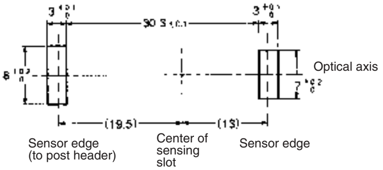


Number	Name	Model	Quantity	Maker
1	Receptacle housing	171822-3	1	Tyco Electronics AMP
2	Receptacle contact	170262-1	3	Tyco Electronics AMP
3	Lead wire	UL1007 AWG24	3	–

■ Wiring

Connector circuit no.	Lead wire colour	Output when connected to EE-SX461-P11
1	Red	V_{CC}
2	Orange	OUT
3	Yellow	GND

■ Recommended Mounting Hole Dimensions and Mounting and Dismounting Method



The Photomicrosensor can be mounted to 0.8- to 1.6-mm-thick panels.

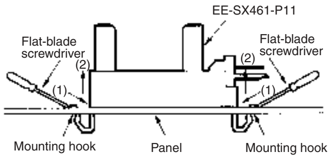
Refer to the above mounting hole dimensions and open the mounting holes in the panel to which the Photomicrosensor will be mounted.

Insert into the holes the Photomicrosensor's mounting portions with a force of three to five kilograms but do not press in the Photomicrosensor at one time. The Photomicrosensor can be easily mounted by inserting the mounting portions halfway and then slowly pressing the Photomicrosensor onto the panel.

There are two ways to dismount the Photomicrosensor. Refer to the following.

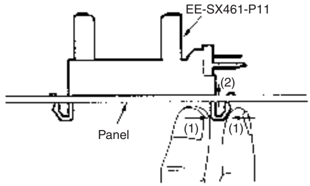
Dismounting with Screwdriver

Press the mounting hooks of the Photomicrosensor with a flat-blade screwdriver as shown in the following illustration and pull up the Photomicrosensor



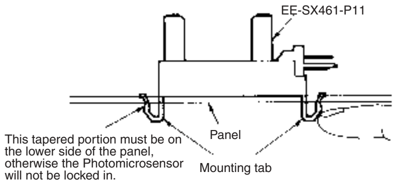
Dismounting by Hand

Squeeze the mounting tabs as shown in the following illustration and press the mounting tabs upwards.



Pressed mounting holes are ideal for mounting the Photomicrosensor. When mounting the Photomicrosensor to a panel that has pressed mounting holes for the Photomicrosensor, be sure to mount the Photomicrosensor on the pressing side of the panel, otherwise it may be difficult to mount the Photomicrosensor and an insertion force of five to six kilograms may be required.

When mounting the Photomicrosensor to a panel that has mounting holes opened by pressing, make sure that the mounting holes have no burrs, otherwise the lock mechanism of the Photomicrosensor will not work perfectly. After mounting the Photomicrosensor to a panel, be sure to check if the lock mechanism is working perfectly.



Photomicrosensors

Features

- Wide-width transmissive sensor with 17-mm slot.
- Uses light modulation via built-in amplifier IC.
- Applicable to the PH connector series from JST (Japan Solderless Terminal).

Specifications

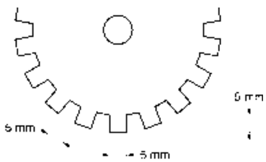
Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Rated value
Supply voltage	V_{CC}	16 VDC
Output voltage	V_{OUT}	16 V
Output current	I_{OUT}	50 mA
Operating temperature	Topr	-10°C to 60°C
Storage temperature	Tstg	-40°C to 80°C

Electrical Characteristics (Ta = 25°C, Vcc = 12)

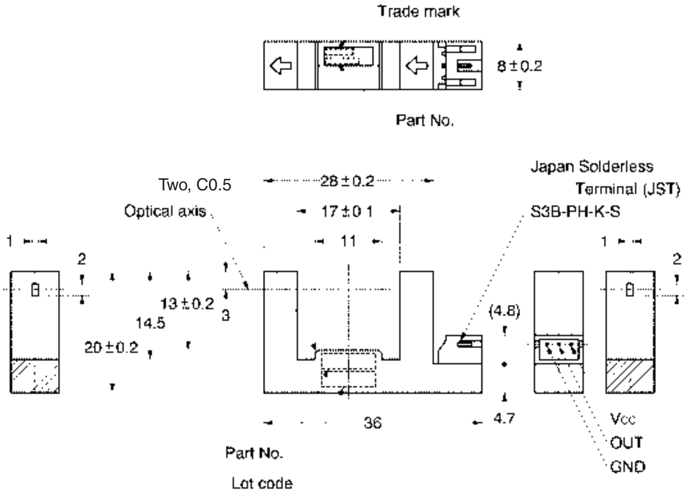
Item	Symbol	Limits			Unit	Testing Conditions
		MIN.	TYP.	MAX.		
Current consumption	I_{CC}	–	–	20	mA	With/without object
Low level output voltage	V_{OL}	0.01	0.2	0.4	V	I_{OUT} = 20 mA without object
High level output current	I_{OH}	0	–	40	mA	V_{OUT} = 12 V with object
Response frequency	f	500	–	–	Hz	$V_{CC}0 = V_{CC}$ = 12 VDC RL = 1.2 kΩ (See note.)

Note: The value indicated is that measured by rotating the disk as shown below.

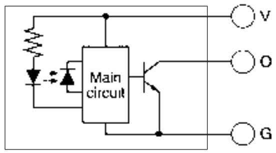


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

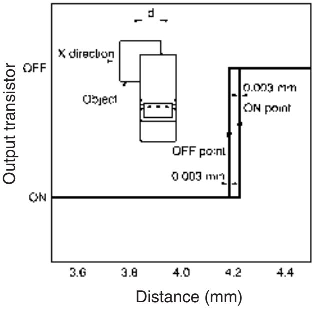
Dimensions	Tolerance
4 mm max.	±0.2
34 < mm ≤ 16	±0.3
16 < mm ≤ 63	±0.5

Recommended Mating Connectors:

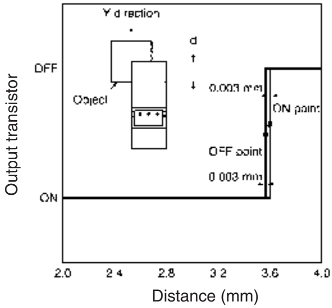
JST (Japan Solderless Terminal) PHR-3
03CR-6H
03KR-8M
03KR-6S

■ Engineering Data

Repetitive Sensing Position Characteristics (in horizontal direction, typical)



Repetitive Sensing Position Characteristics (in vertical direction, typical)



■ Features

■ An actuator can be attached.
■ PCB mounting type.
■ High resolution with a 0.5-mm-wide aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

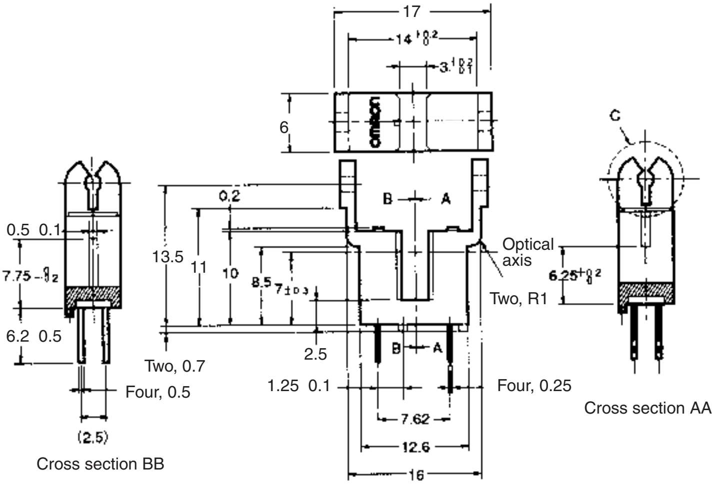
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

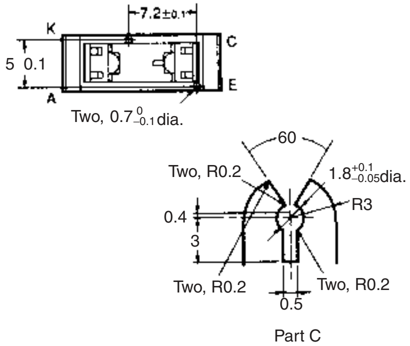
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 μA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CF} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

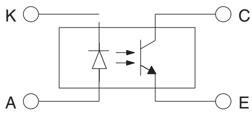
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.





Internal Circuit

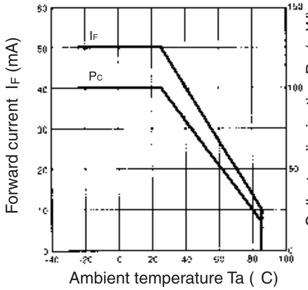


Unless otherwise specified, the tolerances are ±0.2 mm.

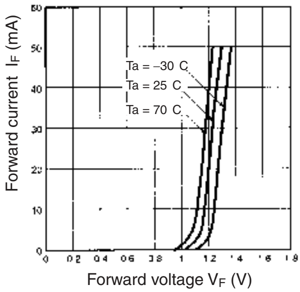
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

■ Engineering Data

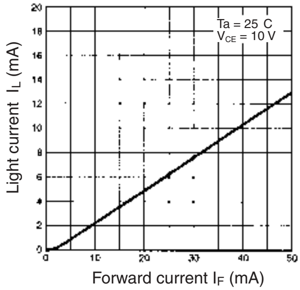
Forward Current vs. Collector Dissipation Temperature Rating



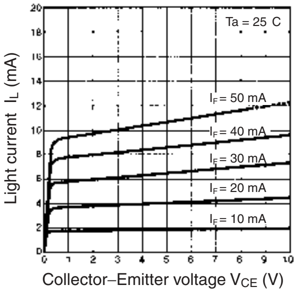
Forward Current vs. Forward Voltage Characteristics (Typical)



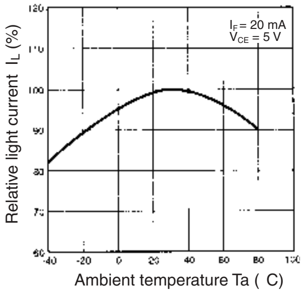
Light Current vs. Forward Current Characteristics (Typical)



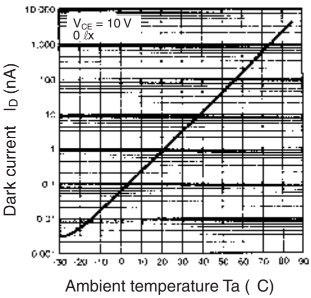
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



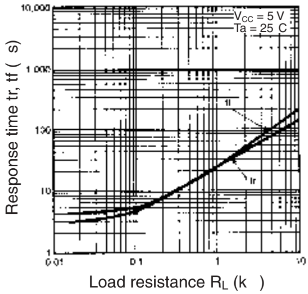
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



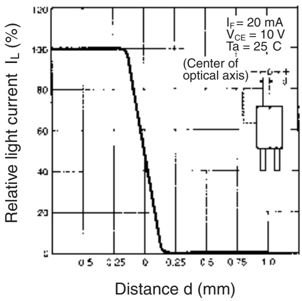
Dark Current vs. Ambient Temperature Characteristics (Typical)



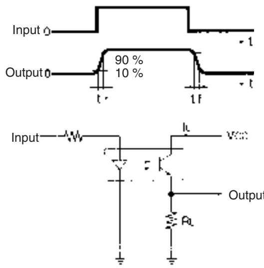
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

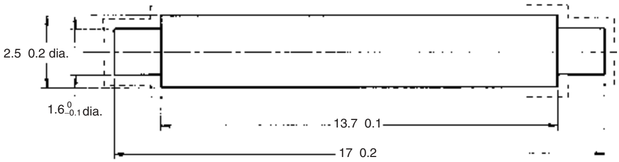


Response Time Measurement Circuit



Photomicrosensors

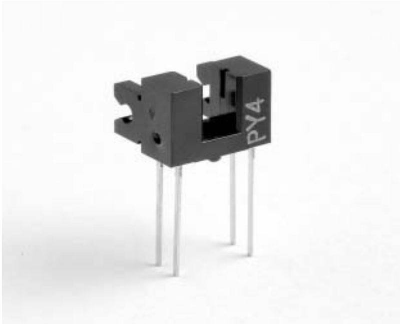
Actuator Dimensions



Note:
1. Make sure that the portions marked with dotted lines have no burrs.
2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

■ Features

- ■ An actuator can be attached.
- ■ PCB mounting type.
- ■ High resolution with a 0.5-mm-wide aperture.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

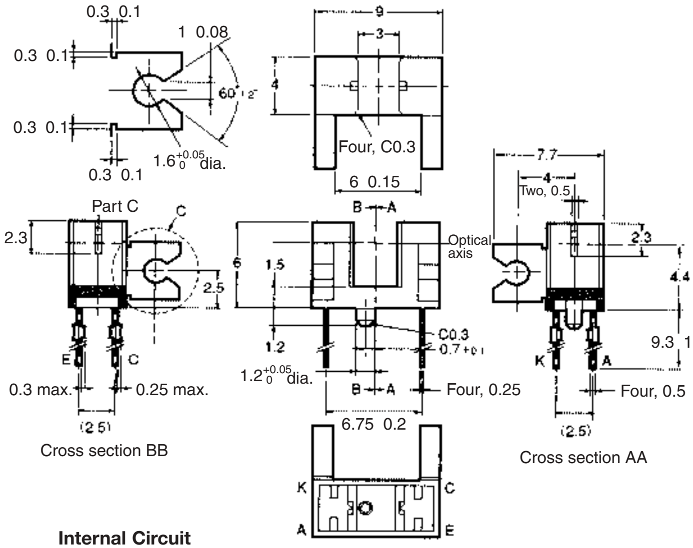
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Electrical and Optical Characteristics (Ta = 25°C)

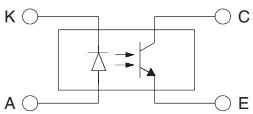
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 m typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 μA min., 14 μA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 μA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CF} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



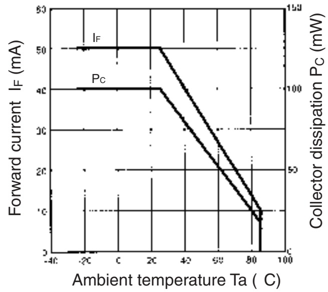
Unless otherwise specified, the tolerances are as shown below.

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

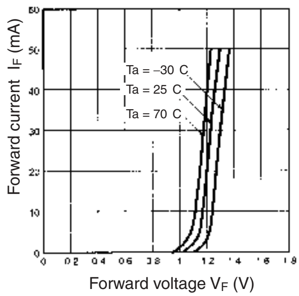
Terminal No.	Name
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

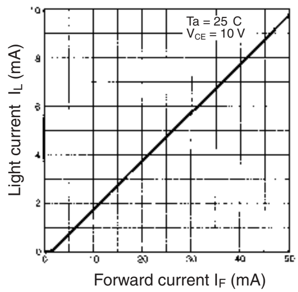
Forward Current vs. Collector Dissipation Temperature Rating



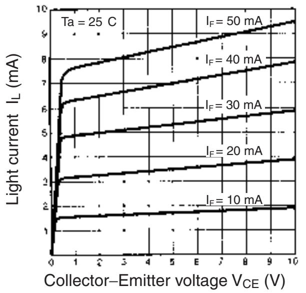
Forward Current vs. Forward Voltage Characteristics (Typical)



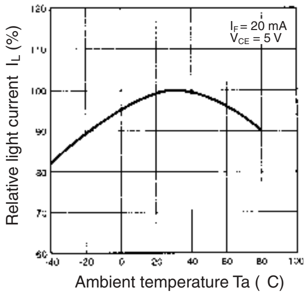
Light Current vs. Forward Current Characteristics (Typical)



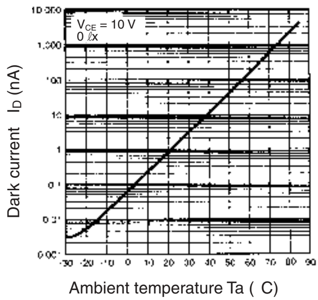
Light Current vs. Collector−Emitter Voltage Characteristics (Typical)



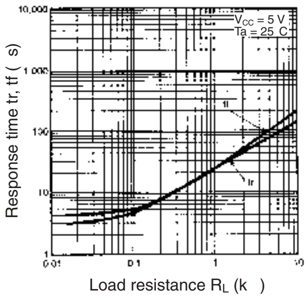
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



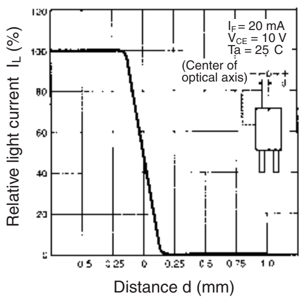
Dark Current vs. Ambient Temperature Characteristics (Typical)



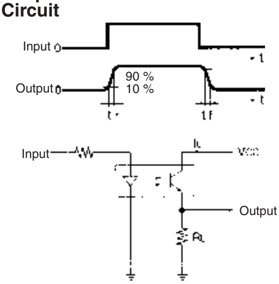
Response Time vs. Load Resistance Characteristics (Typical)



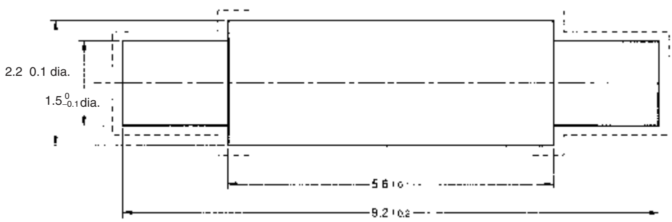
Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Actuator Dimensions

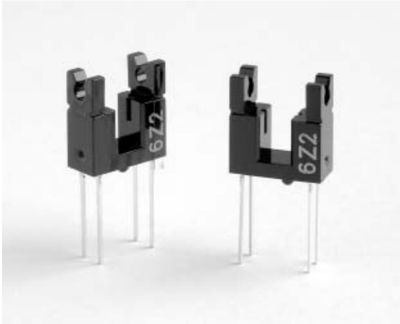


Note: 1. Make sure that the portions marked with dotted lines have no burrs.

2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

■ Features

- ■ An actuator can be attached.
- ■ PCB mounting type.
- ■ High resolution with a 0.5-mm-wide aperture.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

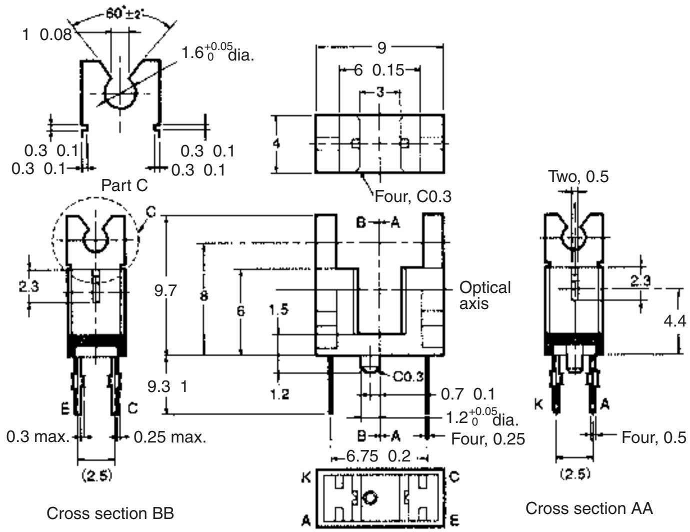
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Electrical and Optical Characteristics (Ta = 25°C)

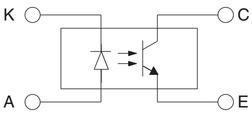
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 m typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CF} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



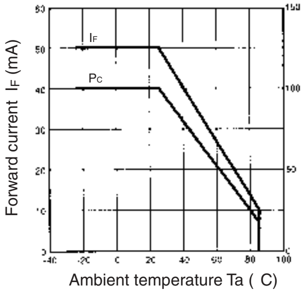
Unless otherwise specified, the tolerances are as shown below.

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

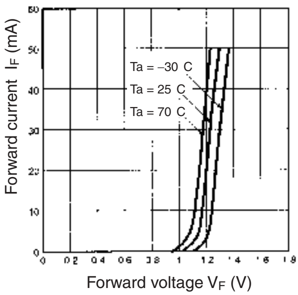
Terminal No.	Name
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

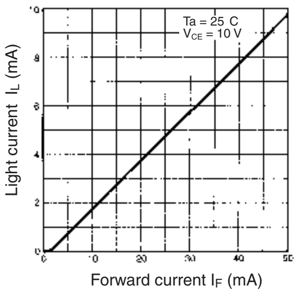
Forward Current vs. Collector Dissipation Temperature Rating



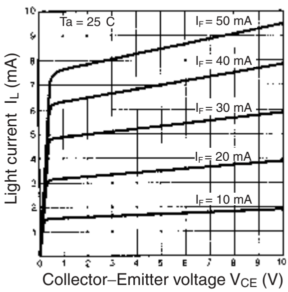
Forward Current vs. Forward Voltage Characteristics (Typical)



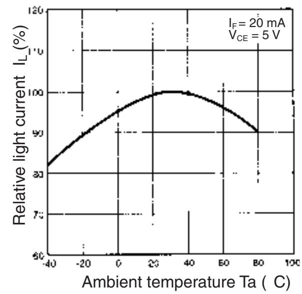
Light Current vs. Forward Current Characteristics (Typical)



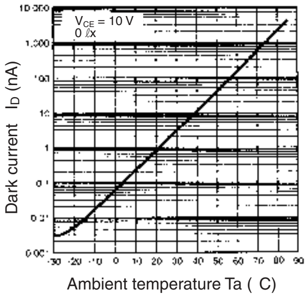
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



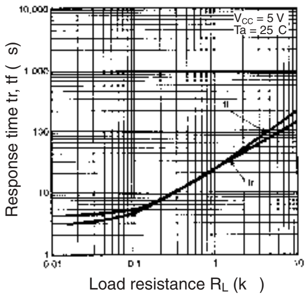
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



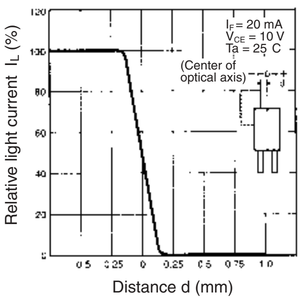
Dark Current vs. Ambient Temperature Characteristics (Typical)



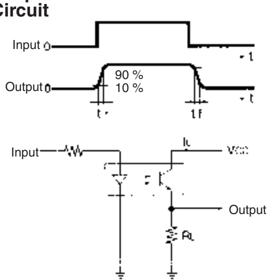
Response Time vs. Load Resistance Characteristics (Typical)



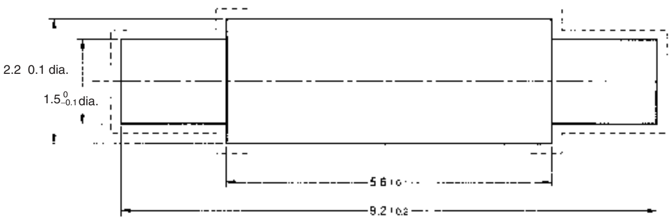
Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Actuator Dimensions



Note:
1. Make sure that the portions marked with dotted lines have no burrs.
2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

Photomicrosensors

Features

- An actuator can be attached.
- Snap-in mounting model.
- Mountable to 1.0, 1.2 and 1.6 mm thick boards.
- Connects to Tyco Electronics AMP's CT series connectors.

Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note)
	Pulse forward current	I_{FP}	–
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{ECO}	30 V
	Emitter-Collector voltage	V_{CEO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

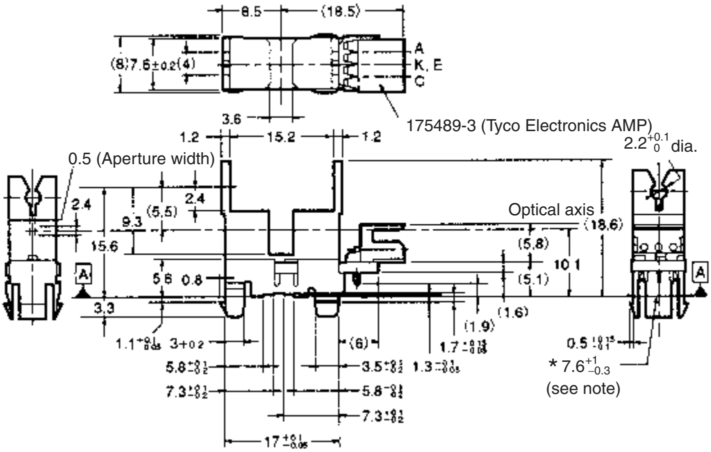
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

Electrical and Optical Characteristics (Ta = 25°C)

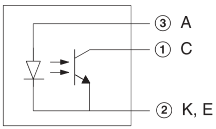
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 m typ.	I_F = 30 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.3 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 5 V
Rising time		tr	8 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 1 mA
Falling time		tf	8 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 1 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Note: The asterisked dimension is specified by datum a only.

Recommended Mating Connectors:
Tyco Electronics AMP 173977-3 (press-fit connector)
175778-3 (crimp connector)
179228-3 (crimp connector)

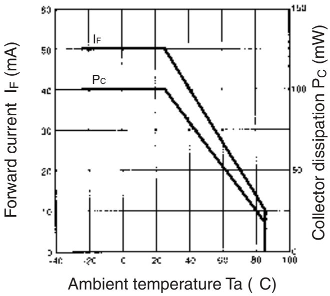
Terminal No.	Name
A	Anode
C	Collector
K, E	Cathode, Emitter

Unless otherwise specified, the tolerances are as shown below.

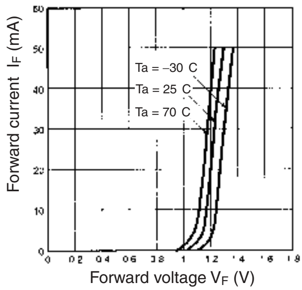
Terminal No.	Name
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

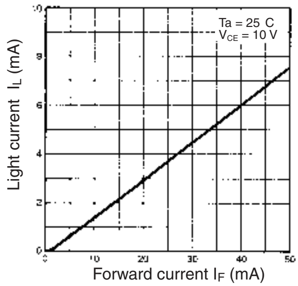
Forward Current vs. Collector Dissipation Temperature Rating



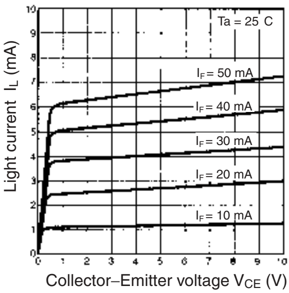
Forward Current vs. Forward Voltage Characteristics (Typical)



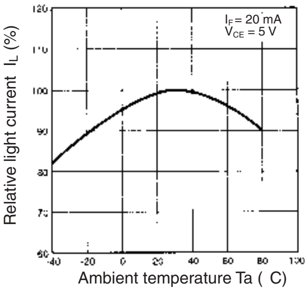
Light Current vs. Forward Current Characteristics (Typical)



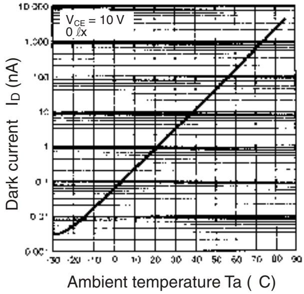
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



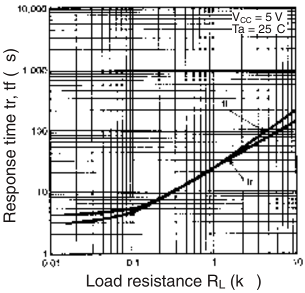
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



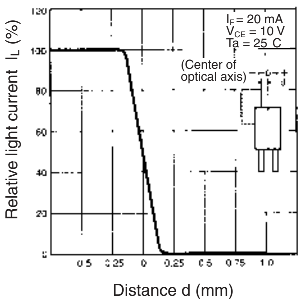
Dark Current vs. Ambient Temperature Characteristics (Typical)



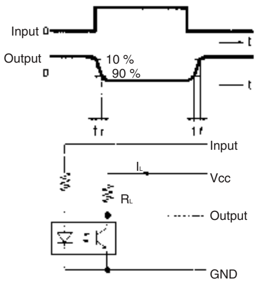
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



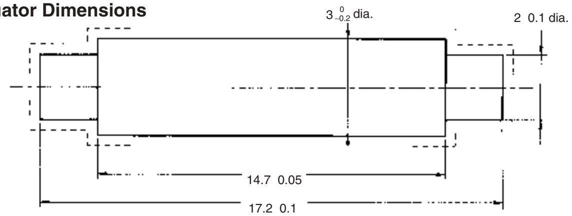
Response Time Measurement Circuit



Recommended Mounting Holes

Refer to EE-SA407-

Actuator Dimensions



Note: 1. Make sure that the portions marked with dotted lines have no burrs.
2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

Features

- An actuator can be attached.
- Snap-in mounting model.
- Mounts to 1.0-, 1.2- and 1.6-mm-thick panels.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 3.6-mm-wide slot.
- Photo IC output signals directly connect with logic circuit and TTL.
- Connects to Tyco Electronics AMP's CT-series connectors.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

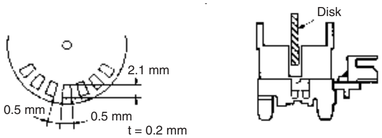
Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissable output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	**Operating**	Topr	-20°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

■ Electrical and Optical Characteristics (Ta = 25°C, V_{CC} = 5 V ±10%)

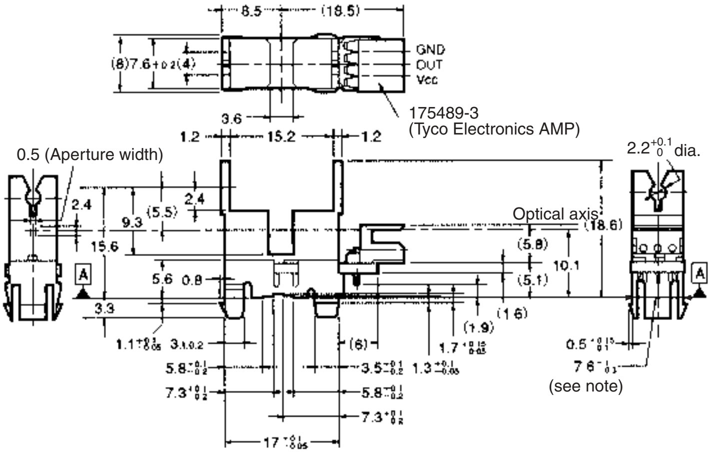
Item	Symbol	Value	Condition
Current consumption	I_{CC}	30 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.35 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

Note: The value of the response frequency is measured by rotating the disk as shown below.

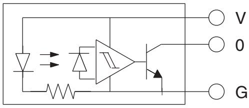


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
V	Power Supply (V_{CC})
O	Output (OUT)
G	Ground(GND)

Note: The dimension is specified by datum A only.

Unless otherwise specified, the tolerances are as shown below.

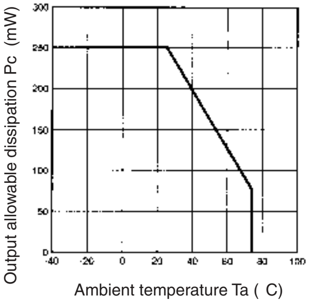
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Recommended Mating Connectors:

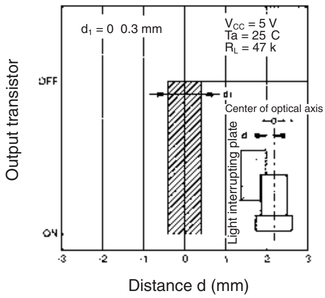
Tyco Elctronics AMP 179228-3 (insulation displacement - type connector)
175778-3 (crimp-type connector)
173977-3 (crimp-type connector)

■ Engineering Data

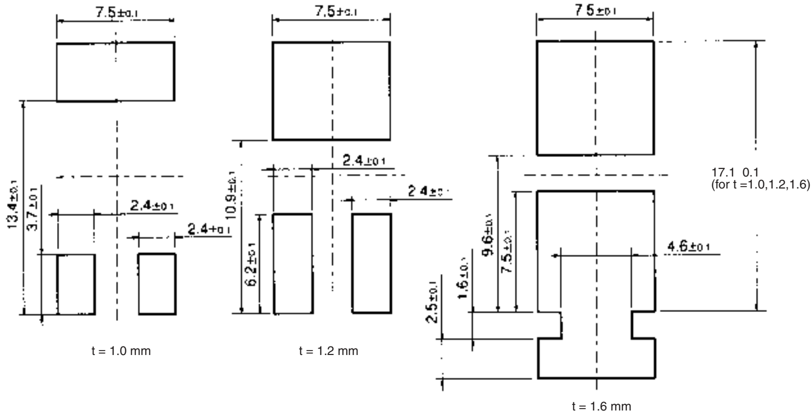
Output Allowable Dissipation vs. Ambient Temperature Characteristics



Sensing Position Characteristics (Typical)

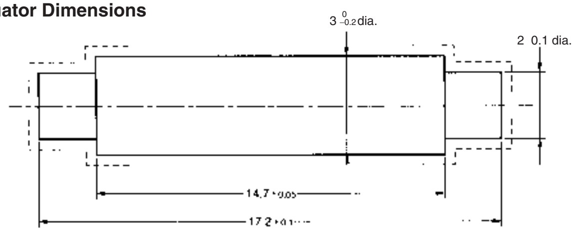


■ Recommended Mounting Holes



- When mounting the Photomicrosensor to a panel with a hole opened by pressing, make sure that the hole has no burrs. The mounting strength of the Photomicrosensor will decrease if the hole has burrs.
- When mounting the Photomicrosensor to a panel with a hole opened by pressing, be sure to mount the Photomicrosensor on the pressing side of the panel.
- The mounting strength of the Photomicrosensor will increase if the Photomicrosensor is mounted to a panel with a hole that is only a little larger than the size of the Photomicrosensor, in which case, however, it will be difficult to mount the Photomicrosensor to the panel. The mounting strength of the Photomicrosensor will decrease if the Photomicrosensor is mounted to a panel with a hole that is comparatively larger than the size of the Photomicrosensor, in which case, however, it will be easy to mount the Photomicrosensor to the panel. When mounting the Photomicrosensor to a panel, open an appropriate hole for the Photomicrosensor according to the application.
- After mounting the Photomicrosensor to any panel, make sure that the Photomicrosensor does not wobble.
- When mounting the Photomicrosensor to a molding with a hole, make sure that the edges of the hole are sharp enough, otherwise the Photomicrosensor may come fall out.

Actuator Dimensions

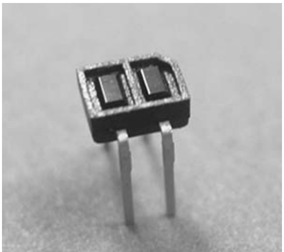


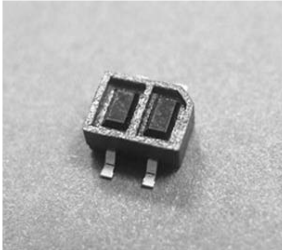
Note:
1. Make sure that the portions marked with dotted lines have no burrs.
2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

Photomicrosensors

■ Features

- ■ Ultra-compact model.
- ■ PCB Surface mounting (SY125).
- ■ Through hole mount (SY124).


EE-SY124


EE-SY125

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-40°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Electrical and Optical Characteristics (Ta = 25°C)

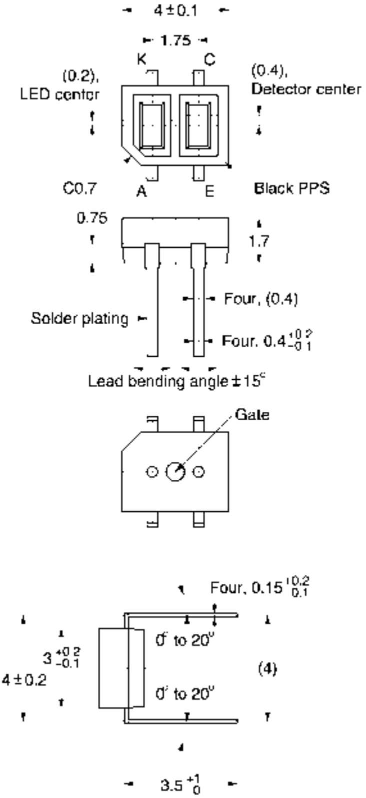
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 4 mA
Detector	**Light current**	I_L	50 μA min., 300 μA max.	I_F = 4 mA, V_{CE} = 2 V Aluminum-deposited surface, d = 1 mm (see note 1)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	200 nA max.	I_F = 4 mA, V_{CE} = 2 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	930 nm typ.	V_{CF} = 10 V
Rising time		tr	35 μs typ.	V_{CC} = 2 V, R_L = 1 kΩ, I_L = 100 μA
Falling time		tf	25 μs typ.	V_{CC} = 2 V, R_L = 1 kΩ, I_L = 100 μA

Note: The letter ‘d’ indicates the distance between the top surface of the sensor and the sensing object.

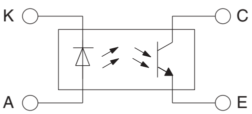
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

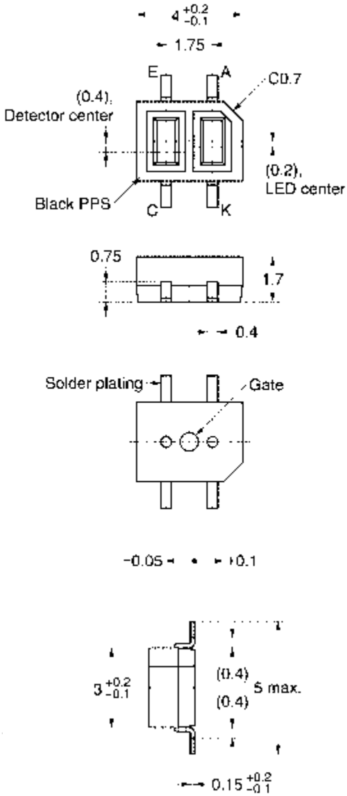
EE-SY124



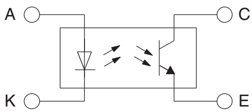
Internal Circuit



EE-SY125



Internal Circuit

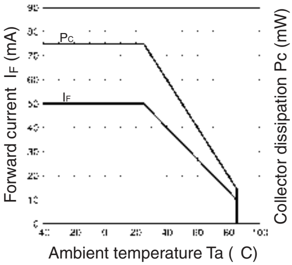


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

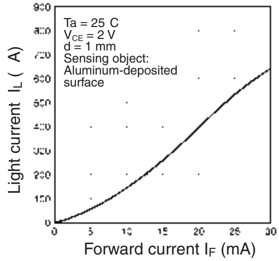
Unless otherwise specified, the tolerances are ±0.15 mm.

■ Engineering Data

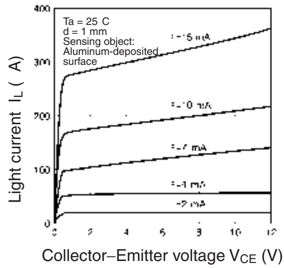
Forward Current vs. Collector Dissipation Temperature Rating



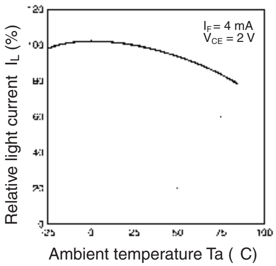
Light Current vs. Forward Current Characteristics (Typical)



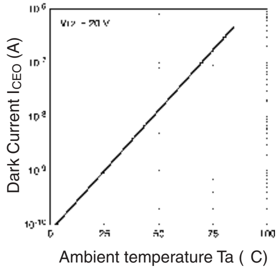
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



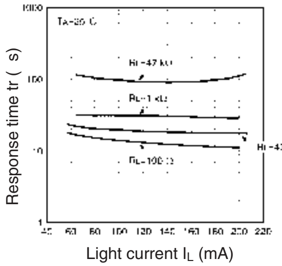
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



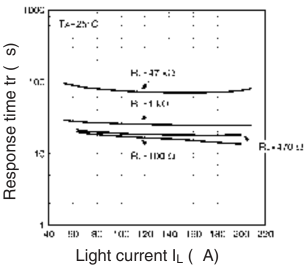
Dark Current vs. Ambient Temperature Characteristics (Typical)



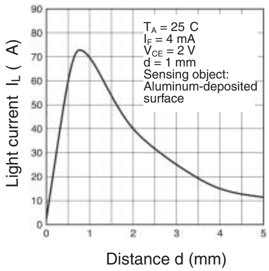
Response Time vs. Load Resistance Characteristics (Typical)



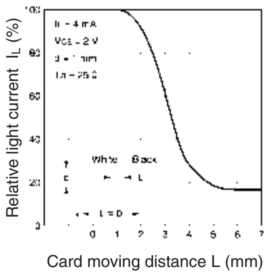
Response Time vs. Load Resistance Characteristics (Typical)



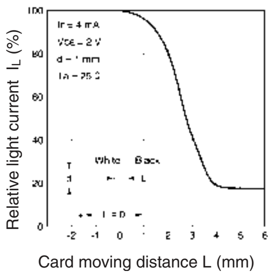
Sensing Distance Characteristics (Typical)



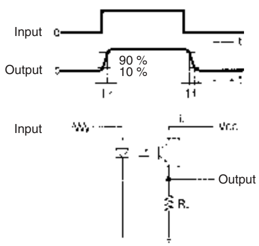
Relative Light Current vs. Card Moving Distance (1)



Relative Collector Current vs. Card Moving Distance (2)



Response Time Measurement Circuit

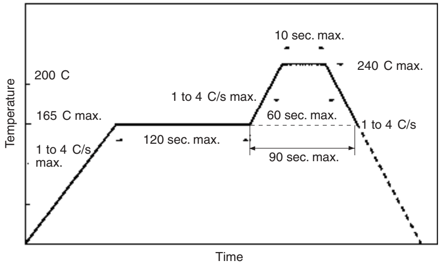


Precautions

■ Soldering Information

Reflow soldering

- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use a soldering iron of less than 25 W, and keep the temperature of the iron tip at 260°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 5 to 30°C

Humidity: 70% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored at 5 to 25°C at 60% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope at 5 to 30°C at 70% maximum humidity within two weeks.

Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use only one time:

Bulk:125°C for 16 to 24 hours

■ Features

- ■ Ultra-compact model.
- ■ PCB surface mounting type.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	25 mA (see note 1)
	Pulse foward current	I_{FP}	100 mA (see note 2)
	Reverse Voltage	V_R	6 V
Detector	**Collector-Emitter voltage**	V_{CEO}	18 V
	Emitter-Collector voltage	V_{ECO}	4 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	**Operating**	Topr	-30°C to 80°C
	Storage	Tstg	-40°C to 85°C
	Reflow soldering	Tsol	220°C (see note 3)
	Manual soldering	Tsol	300°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Duty: 1/100; Pulse width: 0.1 ms.
3. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

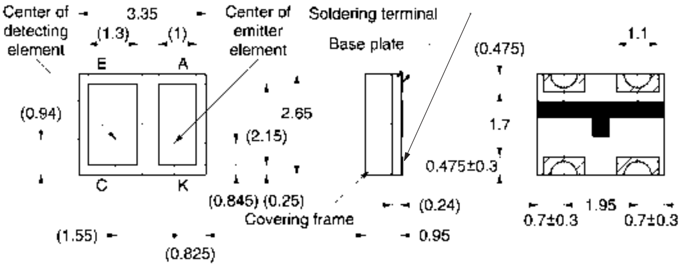
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.1 V typ., 1.3 V max.	I_F = 4 mA
	Reverse current	I_R	10 μA max.	V_R = 6 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	100 μA min., 150 μA typ., 360 μA max.	Aluminum-deposited surface, I_F = 4 mA, V_{CE} = 2 V, d = 1 mm (see note 1)
	Dark current	I_D	100 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	1 μA max.	I_F = 4 mA, V_{CE} = 2 V
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	900 nm typ.	–
Rising time		tr	25 μs typ.	V_{CC} = 2 V, R_L = 1 kΩ
Falling time		tf	30 μs typ.	V_{CC} = 2 V, R_L = 1 kΩ

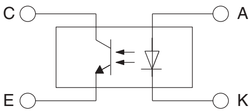
Note: The letter ‘d’ indicates the distance between the top surface of the sensor and the sensing object.

Dimensions

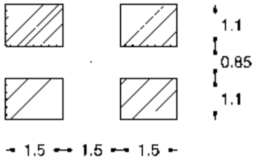
Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Recommended soldering patterns



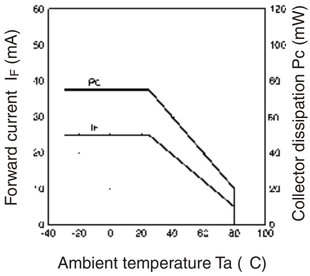
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are ±0.2 mm.

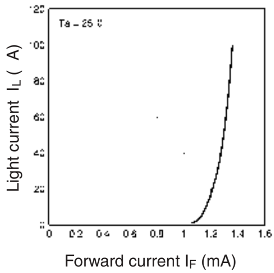
Photomicrosensors

■ Engineering Data

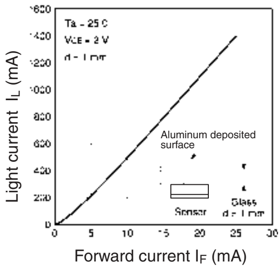
Forward Current vs. Collector Dissipation Temperature Rating



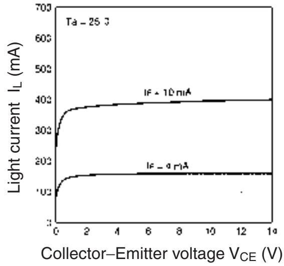
Forward Current vs. Forward Voltage Characteristics (Typical)



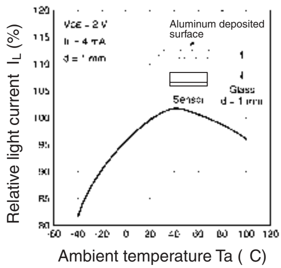
Light Current vs. Forward Current Characteristics (Typical)



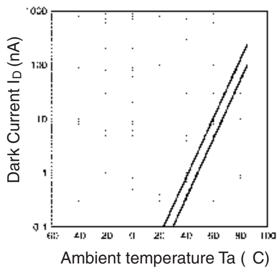
Light Current vs. Collector−Emitter Voltage Characteristics (Typical)



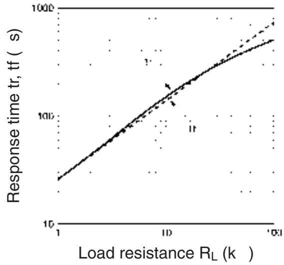
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



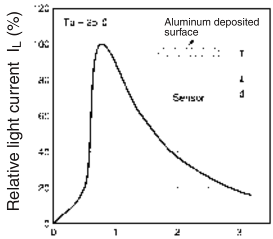
Dark Current vs. Ambient Temperature Characteristics (Typical)



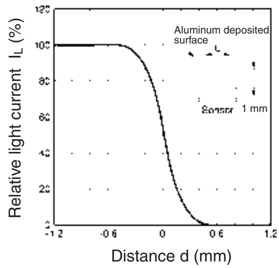
Response Time vs. Load Resistance Characteristics (Typical)



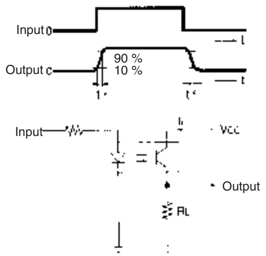
Sensing Distance Characteristics (Typical)



Sensing Position Characteristics (Typical)



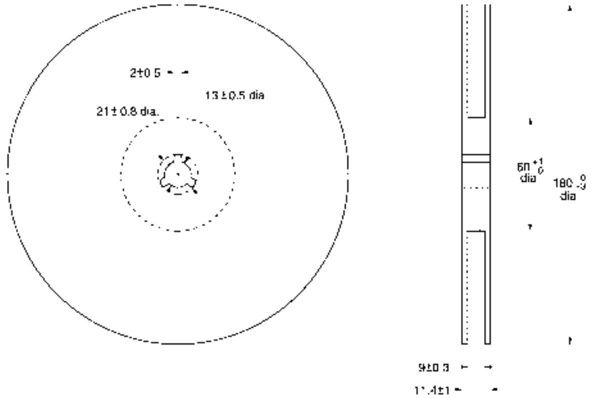
Response Time Measurement Circuit



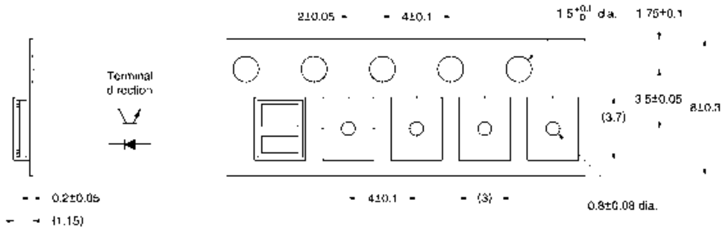
■ Tape and Reel

Unit: mm (inch).

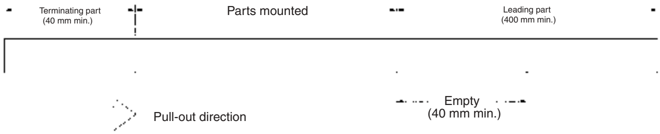
Reel



Tape



Tape configuration



Tape quantity

3,000 pcs./reel

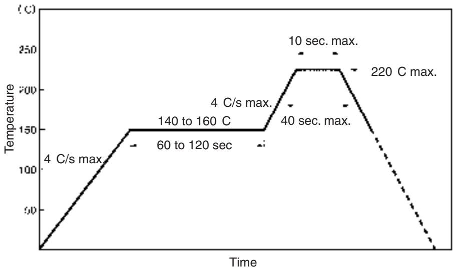
Precautions

■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:

  Melting temperature: 178 to 192°C
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C

Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

Reel: 60°C for 24 hours or more

Bulk: 80°C for 4 hours or more

■ Features

■ 3 mm tall, thin model.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 85°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

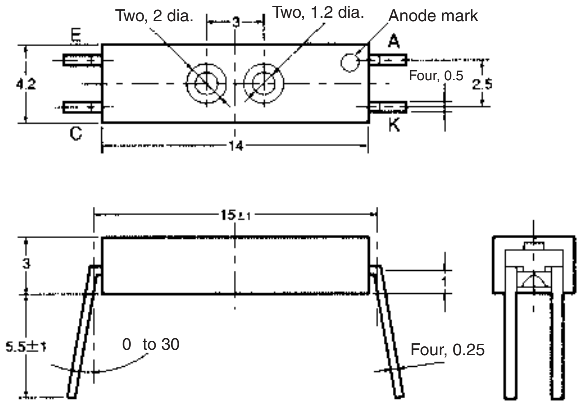
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	50 μA min., 500 μA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a reflection ratio of 90%, d = 3.5 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CC} = 10 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

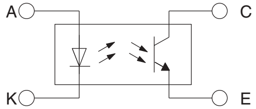
Note: The letter 'd' indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



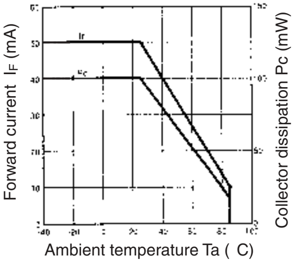
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

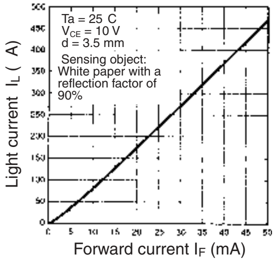
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Engineering Data

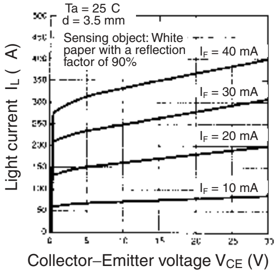
Forward Current vs. Collector Dissipation Temperature Rating



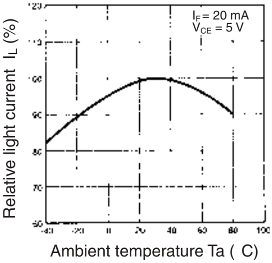
Light Current vs. Forward Current Characteristics (Typical)



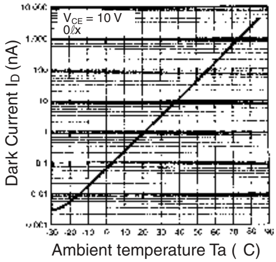
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



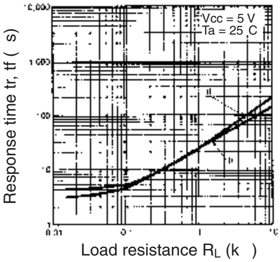
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



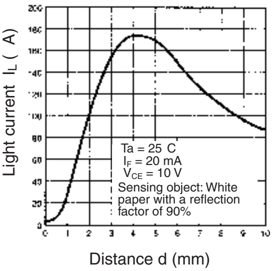
Dark Current vs. Ambient Temperature Characteristics (Typical)



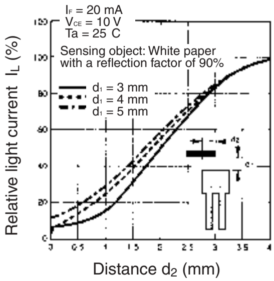
Response Time vs. Load Resistance Characteristics (Typical)



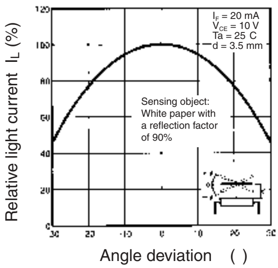
Sensing Distance Characteristics (Typical)



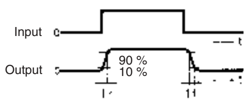
Sensing Position Characteristics (Typical)

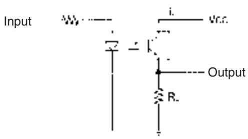


Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit





■ Features

- ■ High-quality model with plastic lenses.
- ■ Highly precise sensing range with a tolerance of ±0.6 mm horizontally and vertically.
- ■ Convergent reflective model with infrared LED.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	3 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	0°C to 70°C
	Storage	Tstg	-20°C to 80°C
Soldering temperature		Tsol	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

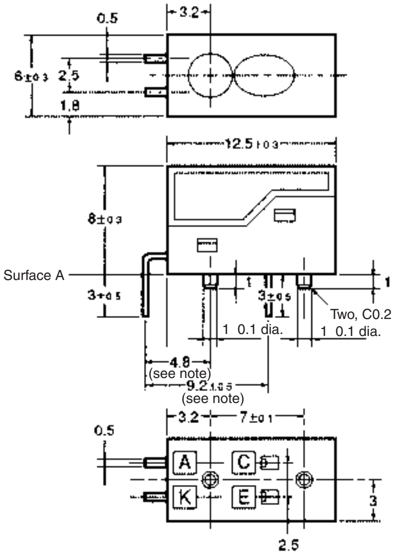
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.5 V max.	I_F = 30 mA
	Reverse current	I_R	10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	16 μA min., 2,000 μA max.	I_F = 20 mA, V_{CE} = 5 V White paper with a reflection ratio of 90%, d = 4 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 5 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 5 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CC} = 5 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

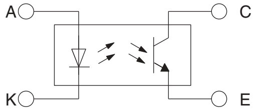
Note: The letter 'd' indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Note: These dimensions are for the surface A. Other lead wire pitch dimensions are for the housing surface.

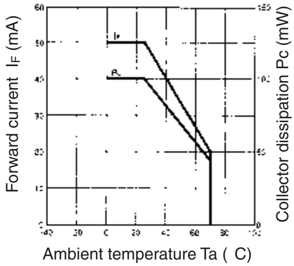
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

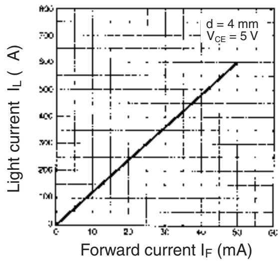
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

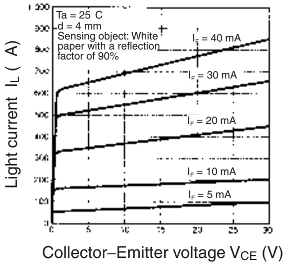
Forward Current vs. Collector Dissipation Temperature Rating



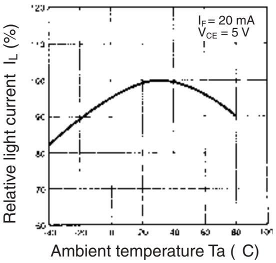
Light Current vs. Forward Current Characteristics (Typical)



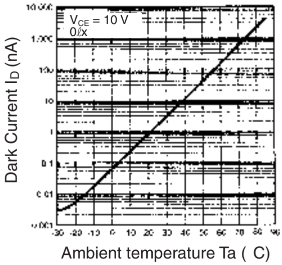
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



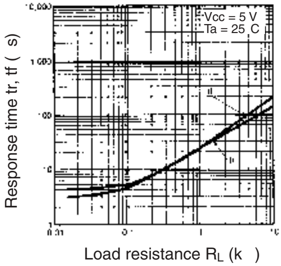
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



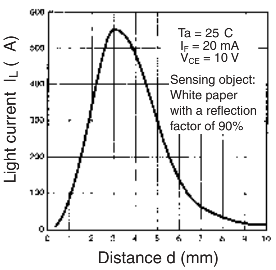
Dark Current vs. Ambient Temperature Characteristics (Typical)



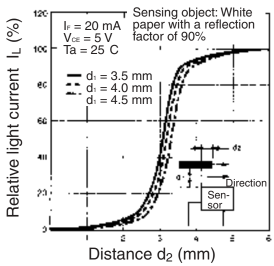
Response Time vs. Load Resistance Characteristics (Typical)



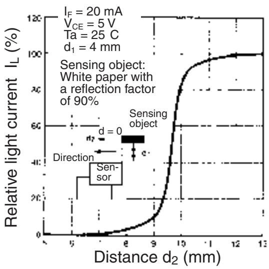
Sensing Distance Characteristics (Typical)



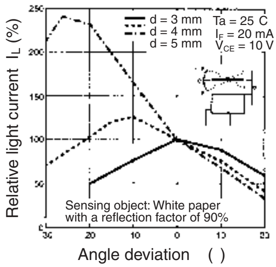
Sensing Position Characteristics (Typical)



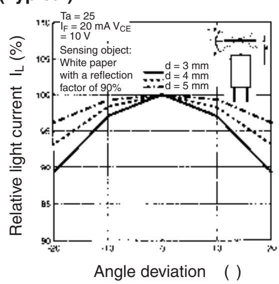
Sensing Position Characteristics (Typical)



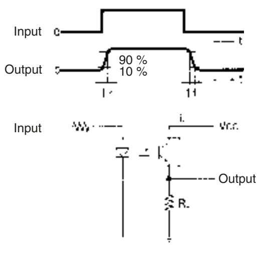
Sensing Angle Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit



■ Features

- ■ High-quality model with plastic lenses.
- ■ Highly precise sensing range with a tolerance of ±0.6 mm horizontally and vertically.
- ■ With a red LED sensing dyestuff-type links.
- ■ Limited reflective model.
- ■ Higher gain than EE-SY169.
- ■ Possible to get the same I_L as EE-SY169 with I_F=10 mA. (half of EE-SY169 condition).

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	40 mA (see note 1)
	Pulse foward current	I_{FP}	300 mA (see note 2)
	Reverse Voltage	V_R	3 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	0°C to 70°C
	Storage	Tstg	-20°C to 80°C
Soldering temperature		Tsol	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

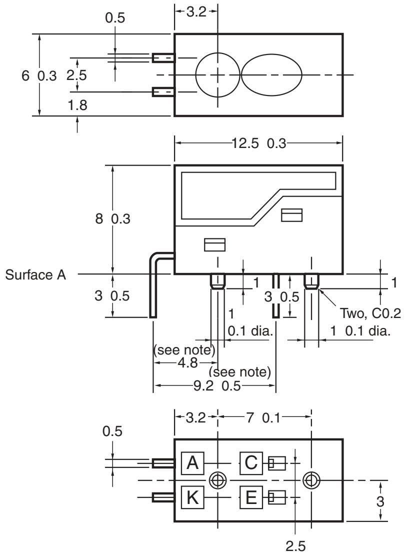
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.85 V typ., 2.3 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 3 V
	Peak emission wavelength	λ_P	660 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	16 μA min., 2,000 μA max.	I_F = 10 mA, V_{CE} = 5 V White paper with a reflection ratio of 90%, d = 4 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 5 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 5 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

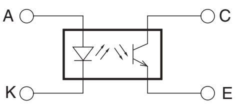
Note: The letter ‘d’ indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Note: These dimensions are for the surface A. Other lead wire pitch dimensions are for the housing surface.

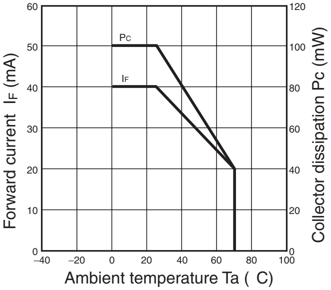
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

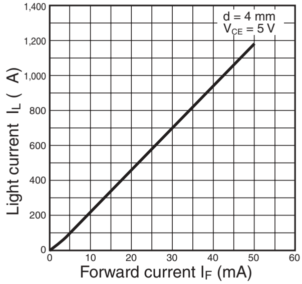
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

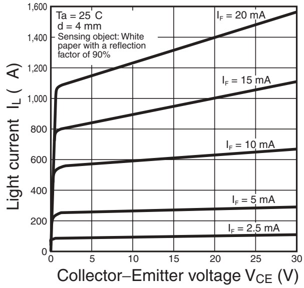
Forward Current vs. Collector Dissipation Temperature Rating



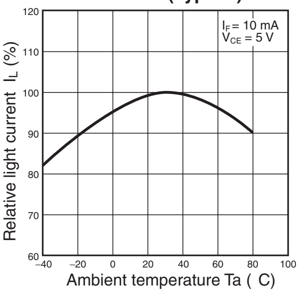
Light Current vs. Forward Current Characteristics (Typical)



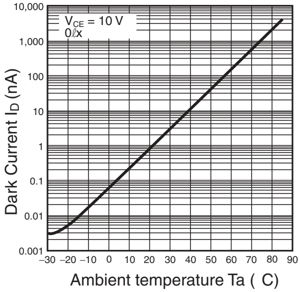
Light Current vs. Collector−Emitter Voltage Characteristics (Typical)



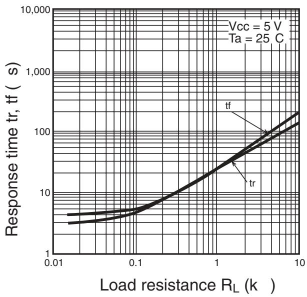
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



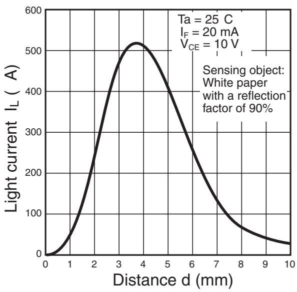
Dark Current vs. Ambient Temperature Characteristics (Typical)



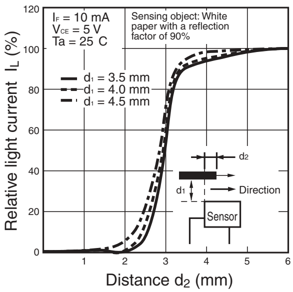
Response Time vs. Load Resistance Characteristics (Typical)



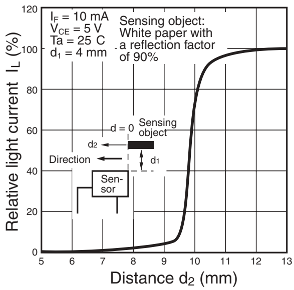
Sensing Distance Characteristics (Typical)



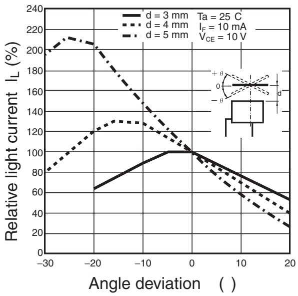
Sensing Position Characteristics (Typical)



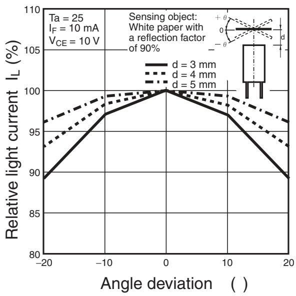
Sensing Position Characteristics (Typical)



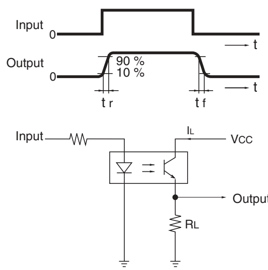
Sensing Angle Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit



Features

■ Compact reflective Photomicrosensor (EE-SY110) with a moulded housing and dust-tight cover.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 80°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100Hz.
3. Complete soldering within 10 seconds.

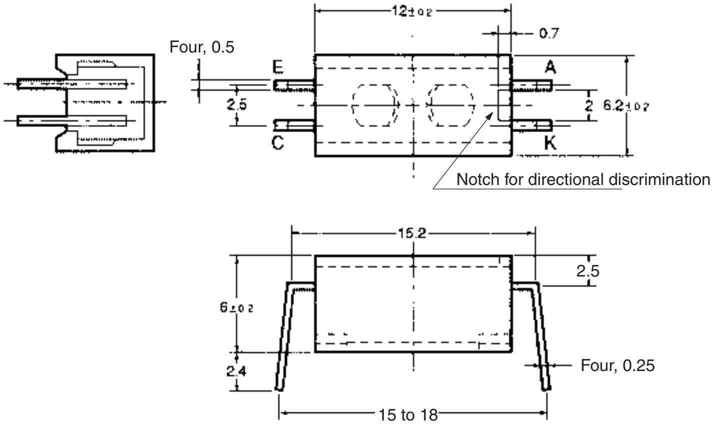
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	160 μA min., 1,600 μA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a reflection ratio of 90%, d = 4.4 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CC} = 10 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

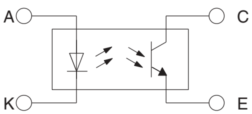
Note: The letter ‘d’ indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



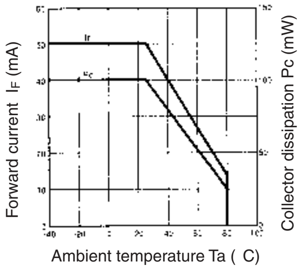
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

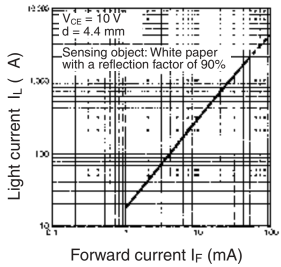
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

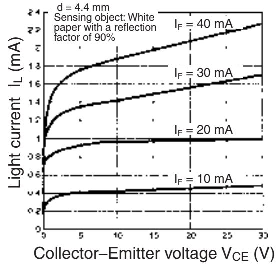
Forward Current vs. Collector Dissipation Temperature Rating



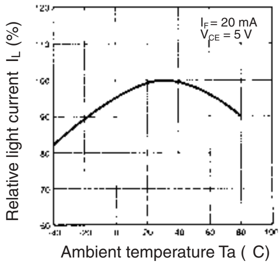
Light Current vs. Forward Current Characteristics (Typical)



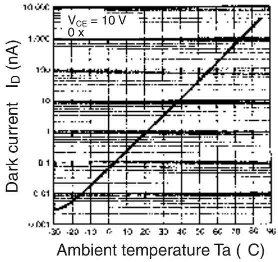
Light Current vs. Collector−Emitter Voltage Characteristics (Typical)



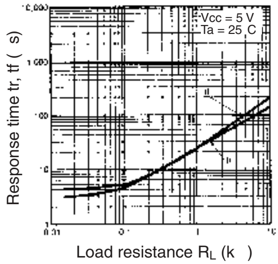
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



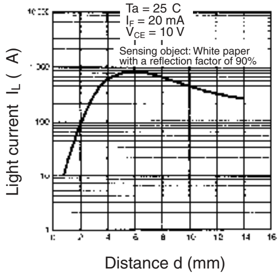
Dark Current vs. Ambient Temperature Characteristics (Typical)



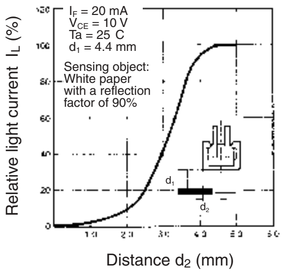
Response Time vs. Load Resistance Characteristics (Typical)



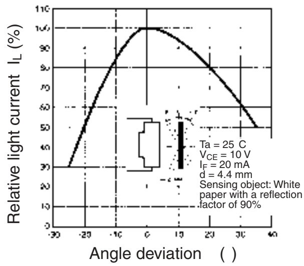
Sensing Distance Characteristics (Typical)



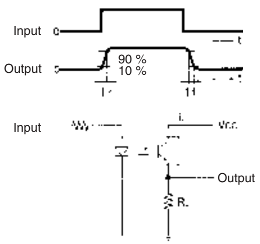
Sensing Position Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit



■ Features

- ■ Incorporates an IC chip with a built-in detector element and amplifier.
- ■ Incorporates a detector element with a built-in temperature compensation circuit.
- ■ Compact reflective Photomicrosensor (EE-SY310/-SY410) with a molded housing and a dust-tight cover.
- ■ A wide supply voltage range: 4.5 to 16 VDC
- ■ Directly connects with C-MOS and TTL.
- ■ Dark ON model (EE-SY313)
- ■ Light ON model (EE-SY413)

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Power supply voltage**	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 65°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

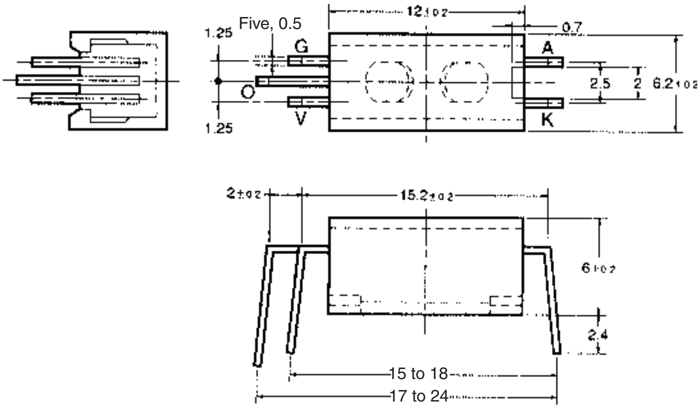
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Electrical and Optical Characteristics (Ta = 25°C)

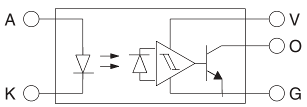
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	**Low-level output voltage**	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, without incident light (EE-SY313), with incident light (EE-SY413) (see notes 1 & 2)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, with incident light (EE-SY313), without incident light (EE-SY413) (see notes 1 & 2)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	10 mA typ., 20 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		$\triangle H$	17% typ.	V_{CC} = 4.5 to 16 V
Response frequency		f	50 pps min.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16mA
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16mA
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



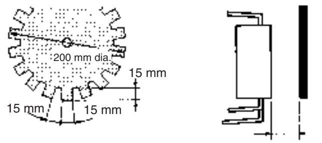
Unless otherwise specified, the tolerances are as shown right.

Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (V_{CC})
O	Output (OUT)
G	Ground (GND)

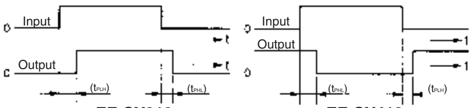
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Note: 1. "With incident light" denotes the condition whereby the light reflected by white paper with a reflection factor of 90% at a sensing distance of 4.4 mm is received by the photo IC when the forward current (I_F) of the LED is 20 mA.

2. Sensing object: White paper with a reflection factor of 90% at a sensing distance of 4.4 mm.
3. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC is turned from ON to OFF and when the photo IC is turned from OFF to ON.
4. The value of the response frequency is measured by rotating the disk as shown below.



5. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EESY413.

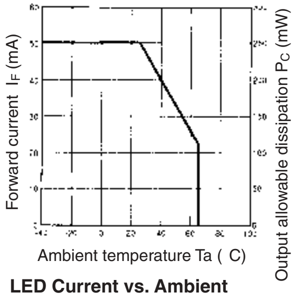


EE-SY313 EE-SY413

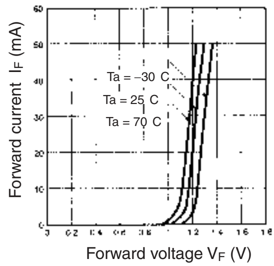
■ Engineering Data

Note: The values in parentheses apply to EE-SY413.

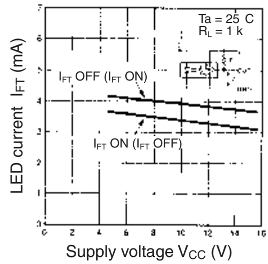
Forward Current vs. Collector Dissipation Temperature Rating



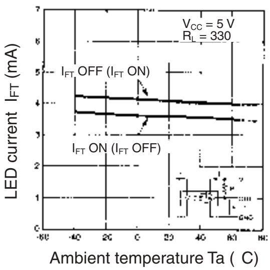
Forward Current vs. Forward Voltage Characteristics (Typical)



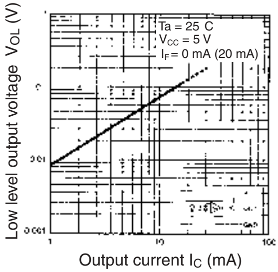
LED Current vs. Supply Voltage (Typical)



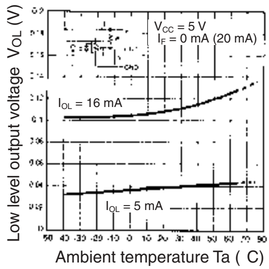
LED Current vs. Ambient Temperature Characteristics (Typical)



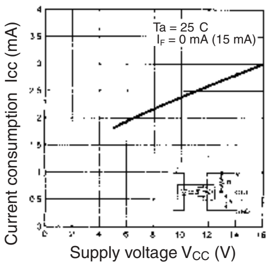
Low-level Output Voltage vs. Output Current (Typical)



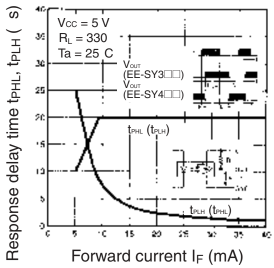
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



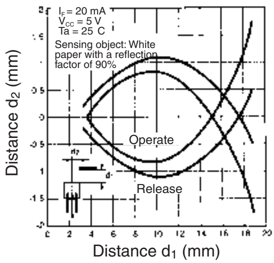
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Sensing Position Characteristics (Typical)



Features

- Dust-tight construction.
- With a visible-light intercepting filter which allows objects to be sensed without being greatly influenced by the light radiated from fluorescent lamps.
- Mounted with M2 screws.
- Model with soldering terminals (EE-SF5).
- Model with PCB terminals (EE-SF5-B).

Specifications

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 80°C
	Storage	Tstg	-30°C to 80°C
Soldering temperature		Tsol	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100Hz.
3. Complete soldering within 10 seconds.

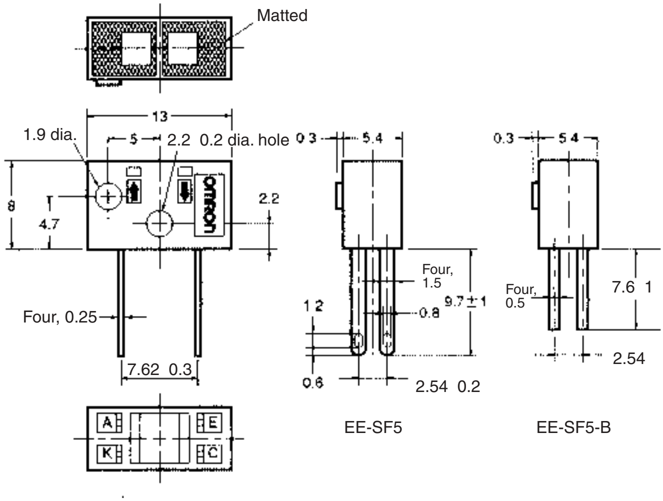
Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	200 μA min., 2,000 μA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a reflection ratio of 90%, d = 5 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CC} = 10 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

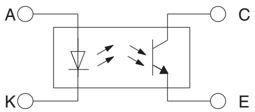
Note: The letter 'd' indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



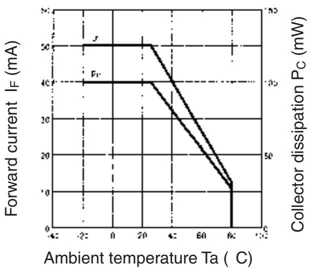
Unless otherwise specified, the tolerances are as shown below.

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

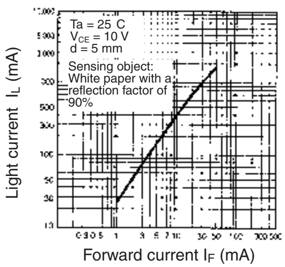
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

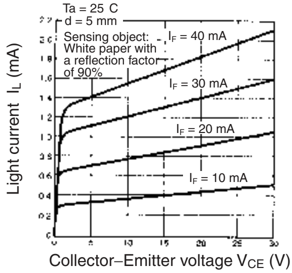
Forward Current vs. Collector Dissipation Temperature Rating



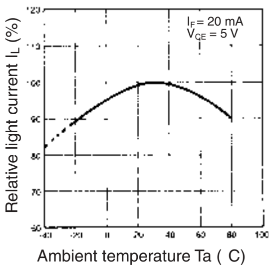
Light Current vs. Forward Current Characteristics (Typical)



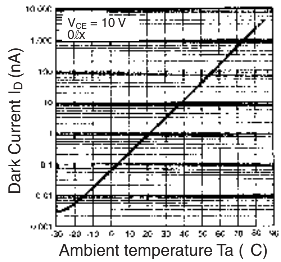
Light Current vs. Collector−Emitter Voltage Characteristics (Typical)



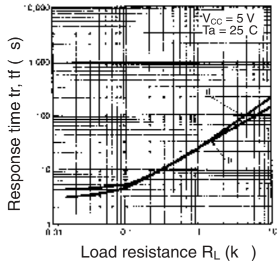
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



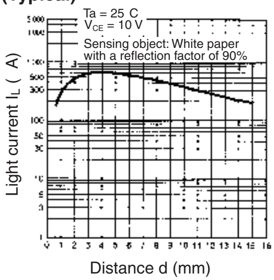
Dark Current vs. Ambient Temperature Characteristics (Typical)



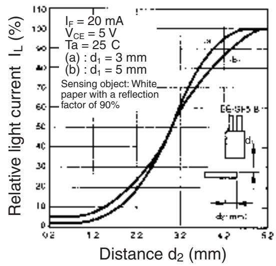
Response Time vs. Load Resistance Characteristics (Typical)



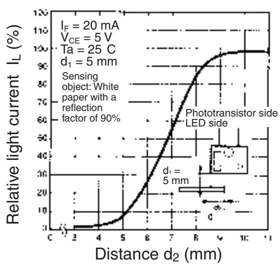
Sensing Distance Characteristics (Typical)



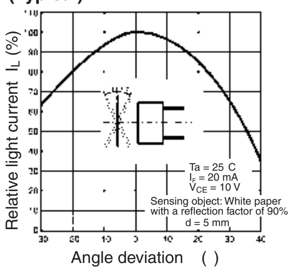
Sensing Position Characteristics (Typical)



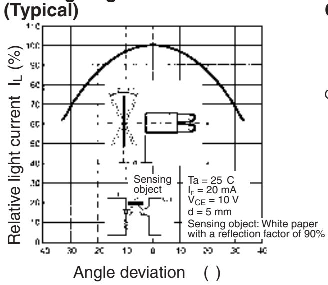
Sensing Position Characteristics (Typical)



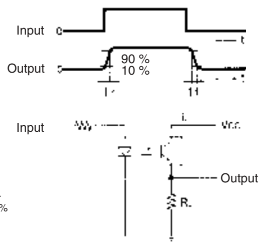
Sensing Angle Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit



Features

■ Compact reflective model with a moulded housing.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 85°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100Hz.
3. Complete soldering within 10 seconds.

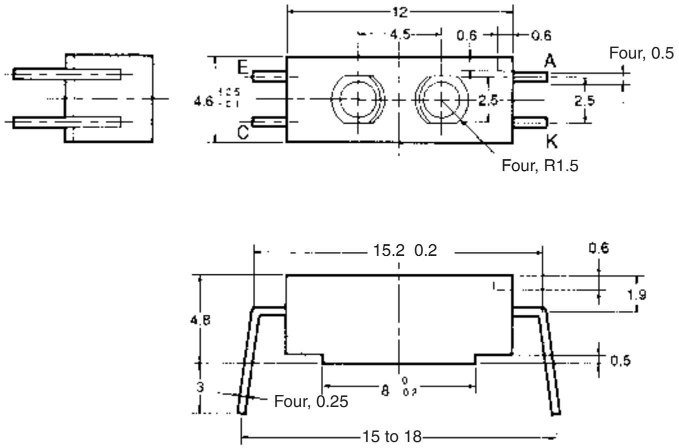
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	200 μA min., 2,000 μA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a reflection ratio of 90%, d = 5 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CC} = 10 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

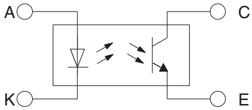
Note: The letter 'd' indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



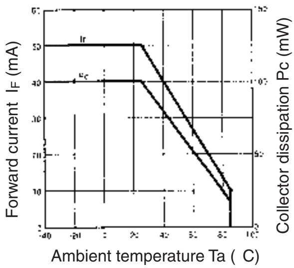
Unless otherwise specified, the tolerances are as shown below.

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

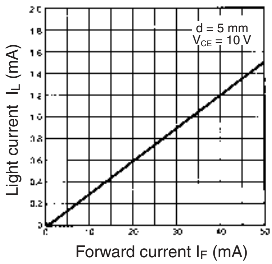
Dimensions	Tolerence
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Engineering Data

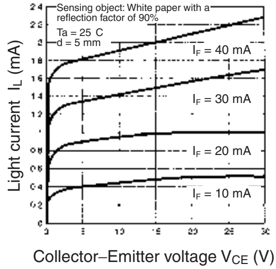
Forward Current vs. Collector Dissipation Temperature Rating



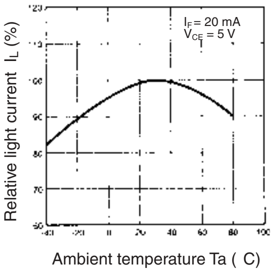
Light Current vs. Forward Current Characteristics (Typical)



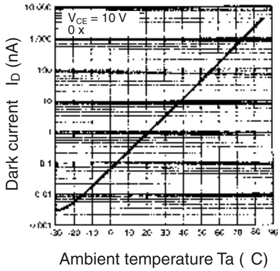
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



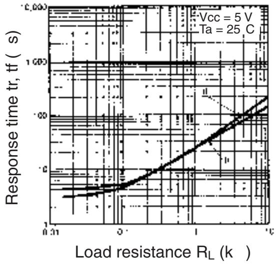
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



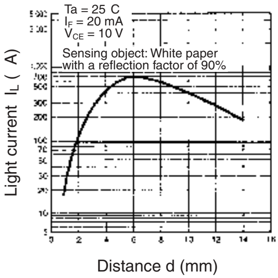
Dark Current vs. Ambient Temperature Characteristics (Typical)



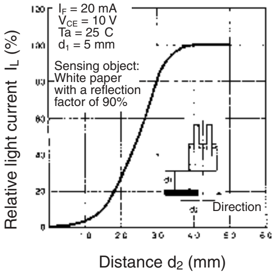
Response Time vs. Load Resistance Characteristics (Typical)



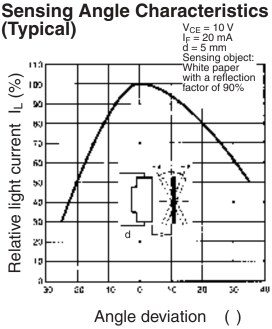
Sensing Distance Characteristics (Typical)



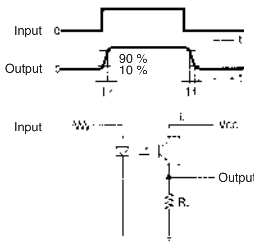
Sensing Position Characteristics (Typical)



Sensing Angle Characteristics (Typical)

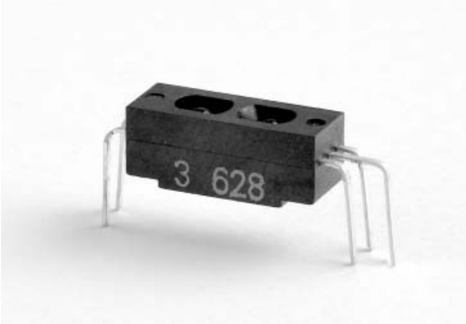


Response Time Measurement Circuit



■ Features

- ■ Incorporates an IC chip with a built-in detector element and amplifier.
- ■ Incorporates a detector element with a built-in temperature compensation circuit.
- ■ Compact reflective model with a molded housing.
- ■ A wide supply voltage range: 4.5 to 16 VDC
- ■ Directly connects with C-MOS and TTL.
- ■ Dark ON model (EE-SY310)
- ■ Light ON model (EE-SY410)



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Power supply voltage**	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

2. The pulse width is 10 μs maximum with frequency of 100 Hz.

3. Complete soldering within 10 seconds.

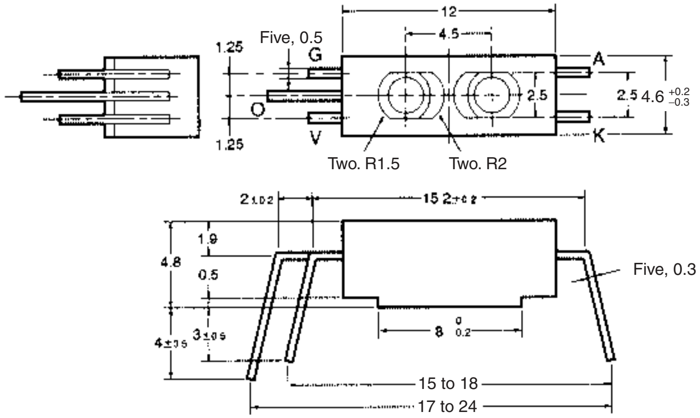
Photomicrosensors

■ Electrical and Optical Characteristics (Ta = 25°C)

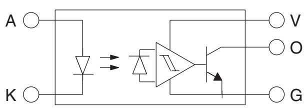
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	**Low-level output voltage**	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, without incident light (EE-SY310), with incident light (EE-SY410) (see notes 1 & 2)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, with incident light (EE-SY310), without incident light (EE-SY410) (see notes 1 & 2)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	6 mA typ., 15 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		△H	17% typ.	V_{CC} = 4.5 to 16 V
Response frequency		f	50 Hz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16mA
Response delay time		t_{PLH} (t_{PHL})	3 μs min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16mA
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



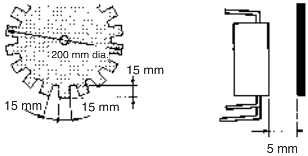
Unless otherwise specified, the tolerances are as shown right.

Terminal No.	Name
A	Anode
K	Cathode
V	Power supply V_{CC}
O	Output (OUT)
G	Ground (GND)

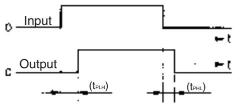
Dimensions	Tolerence
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

Note: 1. “With incident light” denotes the condition whereby thelight reflected by white paper with a reflection factor of 90% at a sensing distance of 5 mm is received by the photo IC when the forward current (I_F) of the LED is 20 mA.

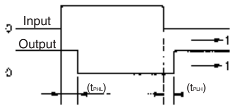
2. Sensing object: White paper with a reflection factor of 90% at a sensing distance of 5 mm.
3. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC is turned from ON to OFF and when the photo IC is turned from OFF to ON.
4. The value of the response frequency is measured by rotating the disk as shown below.



5. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EESY410.



EE-SY310



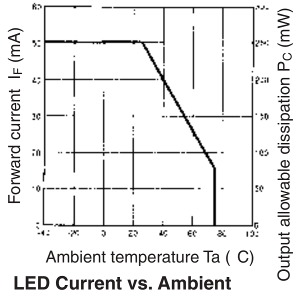
EE-SY410

Photomicrosensors 10

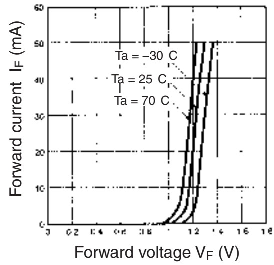
■ Engineering Data

Note: The values in parentheses apply to EE-SY413.

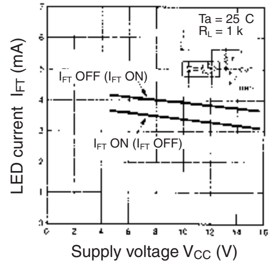
Forward Current vs. Collector Dissipation Temperature Rating



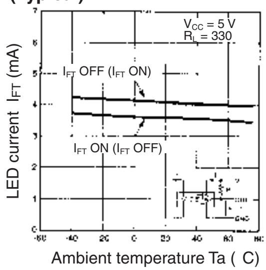
Forward Current vs. Forward Voltage Characteristics (Typical)



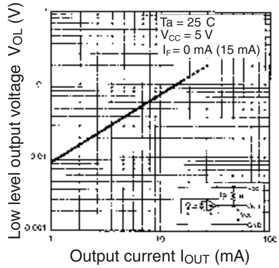
LED Current vs. Supply Voltage (Typical)



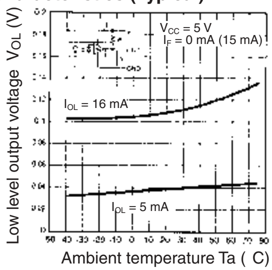
LED Current vs. Ambient Temperature Characteristics (Typical)



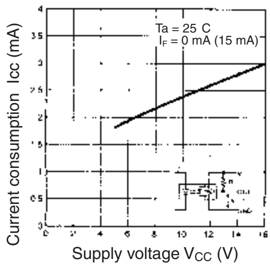
Low-level Output Voltage vs. Output Current (Typical)



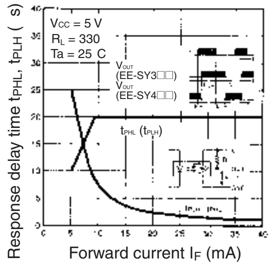
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



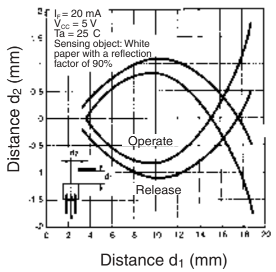
Current Consumption vs. Supply Voltage (Typical)



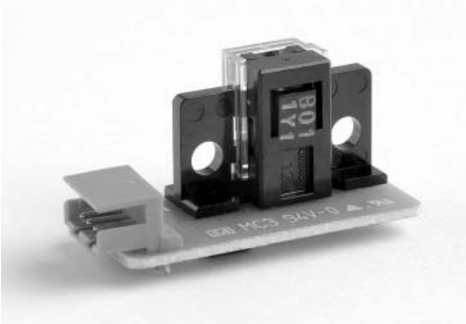
Response Delay Time vs. Forward Current (Typical)



Sensing Position Characteristics (Typical)



■ Features



- ■ Easier control enabled by built-in processor circuit.
- ■ Resolution: ±10 μm.
- ■ Operating area: 6.5±1 mm.
- ■ Adapts well to changes in reflection factor using division processing.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Value	Unit	Features
Supply voltage	V_{CC}	7	VDC	–
LED pulse light emission control signal	PLS	7	VDC	LED
LED light emission pulse	t_{FP}	100	ms	–
Operating temperature	T_{opr}	-10 to 65	°C	No icing or condensation
Storage temperature	T_{stg}	-25 to 80	°C	–

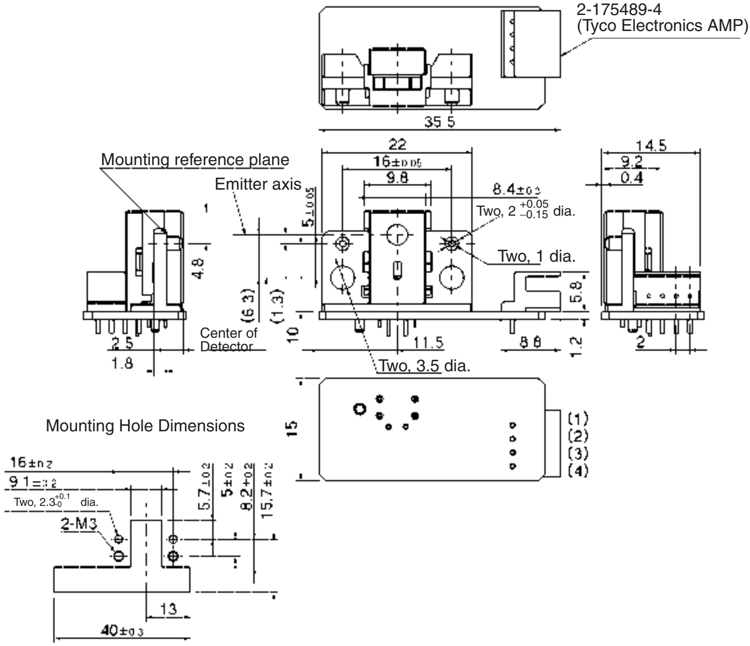
■ Electrical and Optical Characteristics (Ta = -10°C to 65°C)

Item	Symbol	Rated value	Remarks
Supply voltage	V_{CC}	5 VDC±10%	Ripple (p-p): 10 mV p-p max.
Output voltage	OUT	0.2 VDC to (V_{CC}–0.3) V	(see note 1)
Response time	tr	100 μs max.	(see note 2)
LED pulse light emission control signal	PLS	3.5 VDC to V_{CC}	(see note 3)

Note: 1. Load impedance (between OUT-GND) is set at more than 10 kΩ.
2. The time for output voltage to rise from 10% to 90% of the full output range.
3. Apply the voltage ranging from 3.5 V to V_{CC} on the LED pulse light emission control signal terminal. In this case, a maximum of 2 mA (typ.1 mA) current is sunk.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Recommended Mating Connectors:

Tyco Electronics AMP 175778-4 (crimp-type connector)
173977-4 (press-fit connector)

Unless otherwise specified, the tolerances are as shown below.

Pin No.	Remarks
1	PLS
2	V_{CC}
3	OUT
4	GND

Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65
30 < mm ≤ 50	±0.8

■ Characteristics (Ta = -10°C to 65°C)

Object: N8.5 Munsell paper with a reflection factor of 70%.

Pin No.	Remarks
Operating area (see note 1)	6.5 ±1 mm
Sensitivity variation (see note 2)	-1.4 mV/µm±10% max.
Resolution (see note 3)	±10 µm max. (Ta = 25°C)
Linearity (see note 4)	2% F.S. (full scale) max.

Note: 1. Distance from the mounting reference plane.

2. "Sensitivity" is defined as "inclination of divided output line" and the variation value between individual products of fluctuating divided output voltage per unit length.

$$\text{Sensitivity} = \frac{V_2 - V_0}{2000} \text{ (mV/µm)}$$

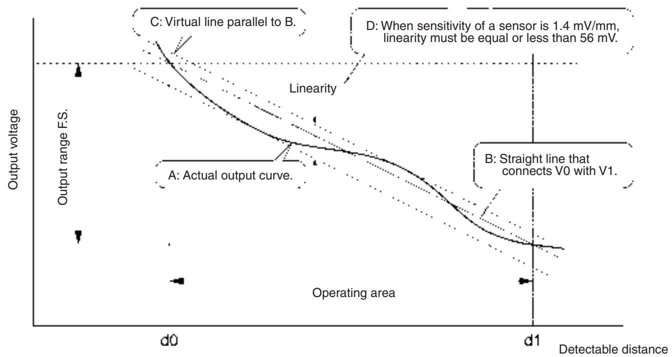
Where V_0: Output voltage when d = 5.5 mm
V_2: Output voltage when d = 7.5 mm
d: Distance from reference mounting plane to an object.

3. Value of electrical noise range of divided output signal converted to distance under the following conditions.

Sensor — Sample and hold circuit — Oscilloscope

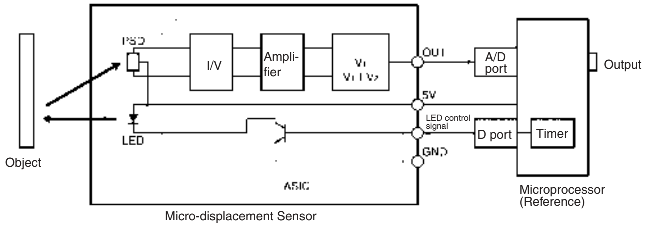
(1) Ripple noise of power supply: 10 mV p-p max.
(2) Sampling time of the sample and hold circuit: 50 µsec
(3) Distance to object: Distance from the reference mounting plane is 6.5 mm±1 mm
** When the testing conditions are deviated from the above conditions, resolution changes.
For details, please consult OMRON sales representative.

4. The peak-to-peak value of the output error from the ideal line.
Calculation, based on a linearity of 2% F.S., is as follows:
(1) The conversion value based on the full scale distance: 2 mm 0.02 = 0.04 mm (40 µm)
(2) The conversion value based on the output voltage: 1.4 mV/µm 40 µm = 56 mV
(When the product sensitivity variation is 1.4 mV/µm)



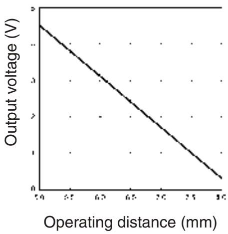
Photomicrosensors

■ Circuit Diagram

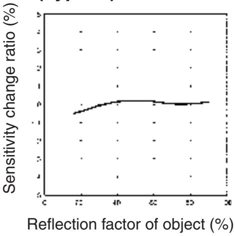


■ Engineering Data

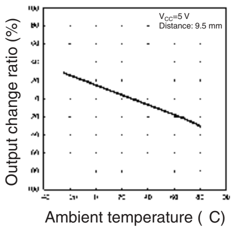
Operating Distance Characteristics (Typical)



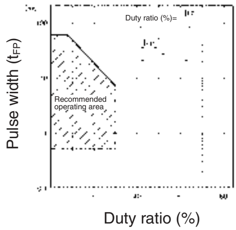
Dependency of Object on Reflection Factor (Typical)



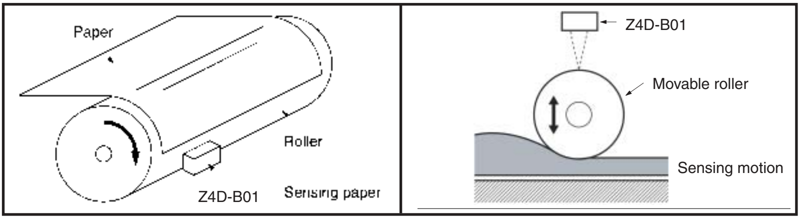
Temperature Characteristics (Typical)



Pulsed Forward Current Rated Curve



■ Paper thickness detection for printers



■ Features

- ■ Easier control enabled by built-in processor circuit.
- ■ Resolution: ±50 µm.
- ■ Operating area: 9.5±3 mm.
- ■ Adapts well to changes in reflection factor using division processing.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Value	Unit	Features
Supply voltage	V_{CC}	7	VDC	–
LED pulse light emission control signal	PLS	7	VDC	LED
LED light emission pulse	t_{FP}	100	ms	–
Operating temperature	T_{opr}	-10 to 65	°C	No icing or condensation
Storage temperature	T_{stg}	-25 to 80	°C	–

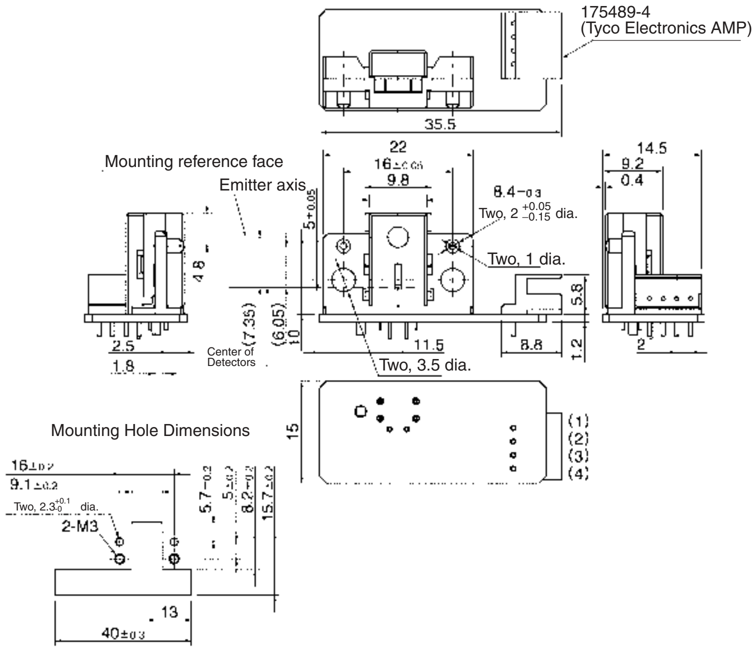
■ Electrical and Optical Characteristics (Ta = -10°C to 65°C)

Item	Symbol	Rated value	Remarks
Supply voltage	V_{CC}	5 VDC±10%	Ripple (p-p): 10 mV p-p max.
Output voltage	OUT	0.2 VDC to (V_{cc}–0.3) V	(see note 1)
Response time	tr	100 µs max.	(see note 2)
LED pulse light emission control signal	PLS	3.5 VDC to V_{cc}	(see note 3)

Note: 1. Load impedance (between OUT-GND) is set at more than 10 kΩ.
2. The time for output voltage to rise from 10% to 90% of the full output range.
3. Apply the voltage ranging from 3.5 V to V_{cc} on the LED pulse light emission control signal terminal. In this case, a maximum of 2 mA (typ.1 mA) current is sunk.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Recommended Mating Connectors:
Tyco Electronics AMP 175778-4 (crimp-type connector)
173977-4 (press-fit connector)

Unless otherwise specified, the tolerances are as shown below.

Pin No.	Remarks
1	PLS
2	V_{CC}
3	OUT
4	GND

Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65
30 < mm ≤ 50	±0.8

■ Characteristics (Ta = -10°C to 65°C)

Object: N8.5 Munsell paper with a reflection factor of 70%.

Pin No.	Remarks
Operating area (see note 1)	9.5 ±3 mm
Sensitivity variation (see note 2)	-0.45 mV/μm±10% max.
Resolution (see note 3)	±50 μm max. (Ta = 25°C)
Linearity (see note 4)	2% F.S. (full scale) max.

Note: 1. Distance from the mounting reference plane.

2. "Sensitivity" is defined as "inclination of divided output line" and the variation value between individual products of fluctuating divided output voltage per unit length.

$$\text{Sensitivity} = \frac{V_2 - V_0}{2000} \ (\text{mV/μm})$$

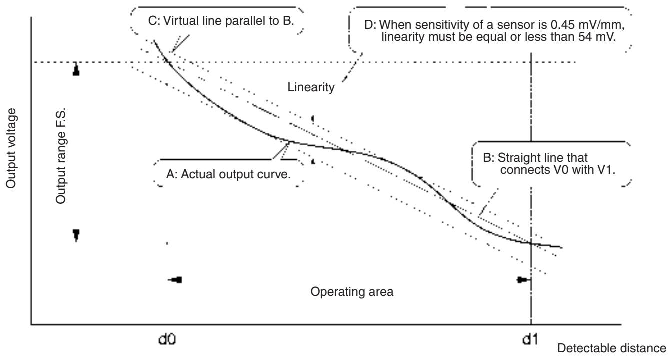
Where V_0: Output voltage when d = 6.5 mm
V_2: Output voltage when d = 12.5 mm
d: Distance from reference mounting plane to an object.

3. Value of electrical noise range of divided output signal converted to distance under the following conditions.

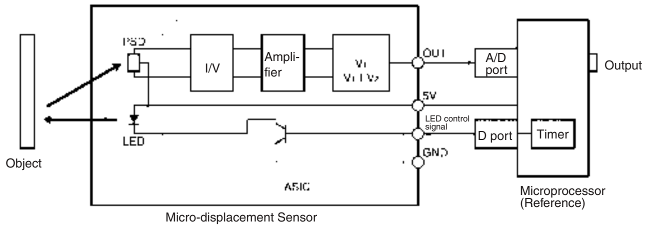
Sensor — Sample and hold circuit — Oscilloscope

(1) Ripple noise of power supply: 10 mV p-p max.
(2) Sampling time of the sample and hold circuit: 50 μsec
(3) Distance to object: Distance from the reference mounting plane is 6.5 mm±1 mm
** When the testing conditions are deviated from the above conditions, resolution changes.
For details, please consult OMRON sales representative.

4. The peak-to-peak value of the output error from the ideal line.
Calculation, based on a linearity of 2% F.S., is as follows:
(1) The conversion value based on the full scale distance: 6 mm 0.02 = 0.12 mm (120 μm)
(2) The conversion value based on the output voltage: 0.45 mV/μm 120 μm = 54 mV
(When the product sensitivity variation is 45 mV/μm)

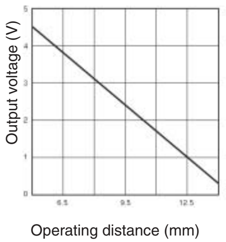


■ Circuit Diagram

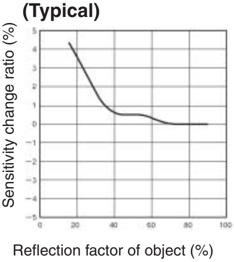


■ Engineering Data

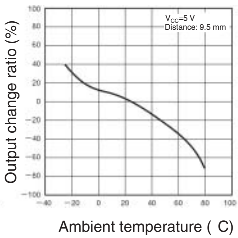
Operating Distance Characteristics (Typical)



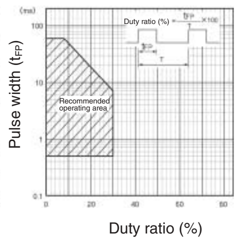
Dependency of Object on Reflection Factor (Typical)



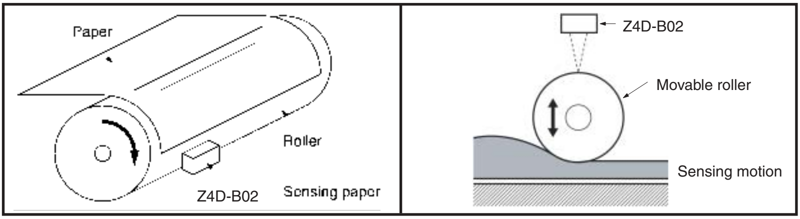
Temperature Characteristics (Typical)



Pulsed Forward Current Rated Curve



■ ■ Paper thickness detection for printers



Features

- Simultaneously senses three objects positioned differently, thus saving space.
- Ensures higher sensitivity and external light interference resistivity than any other photomicrosensor.
- Narrow sensing range ensures stable sensing of a variety of sensing objects.

Application Examples

Sensing of paper sizes.

Specifications

Absolute Maximum Ratings (Ta = 0°C to 65°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Load voltage		V_{OUT}	7 V
Load current		I_{OUT}	10 mA
Ambient temperature	**Operating**	Topr	0°C to 65°C
	Storage	Tstg	-15°C to 70°C

Note: 1. Make sure there is no icing or condensation when operating the sensor.

Electrical and Optical Characteristics (Ta = 25°C)

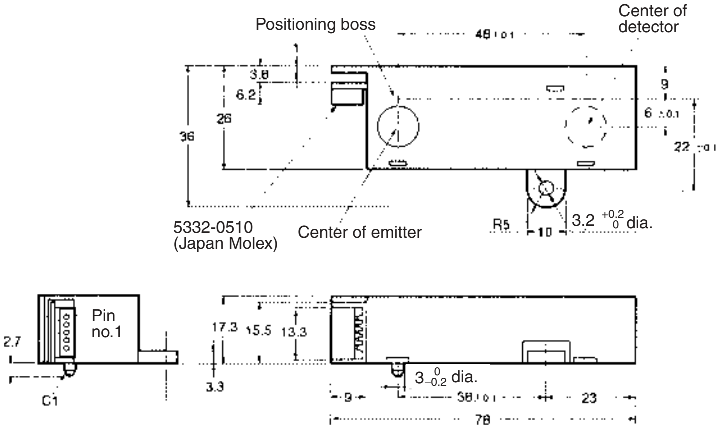
Item	Value	Condition
Power supply voltage	5 V ±5%	–
Current consumption	50 mA max.	V_{CC} = 5 V, $R_L = \infty$
Peak current consumption	300 mA max.	V_{CC} = 5 V, $R_L = \infty$
Low-level output voltage	0.6 V max.	V_{CC} = 5 V, I_{OL} = 4 mA (see note 1)
High-level output voltage	3.5 V min.	V_{CC} = 5 V, R_L = 4.7 kΩ (see note 2)
Response delay time (High to low)	35 ms max.	The time required for the output to become “Lo” after placing sensing object.
Response delay time (Low to high)	20 ms max.	The time required for the output to become “Hi” after removing sensing object.

Note: 1. These conditions are for the sensing of lusterless paper with an OD of 0.6 maximum located at the correct sensing position.

2. These conditions are for the sensing of the paper supporting plate with an OD of 0.05 located using the glass plate without paper.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Recommended Mating Connectors:

Japan Molex 51090-0500 (crimp-type connector)
52484-0510 (press-fit connector)

Pin No.	Remarks	Name
1	O1	Output 1 (OUT1)
2	O2	Output 2 (OUT2)
3	O3	Output 3 (OUT3)
4	V	Power supply (V_{CC})
5	G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65
30 < mm ≤ 50	±0.8
50 < mm ≤ 80	±0.95

■ Characteristics (Paper Table Glass: t = 6 mm max., Transparency Rate: 90% min.) (Ta = 0°C to 65°C)

Item	Characteristic value
Sensing density	Lusterless paper with an OD of 0.6 max. (sensing distance: 125 mm) (see note)
Non-sensing distance	185 mm (from the top of the sensor), OD: 0.05
Paper sensing distance	125 mm (from the top of the sensor)
Ambient illumination	Sunlight: 3,000 ℓx max., fluorescent light: 2,000 ℓx max.

Note: 1. The data shown are initial data.

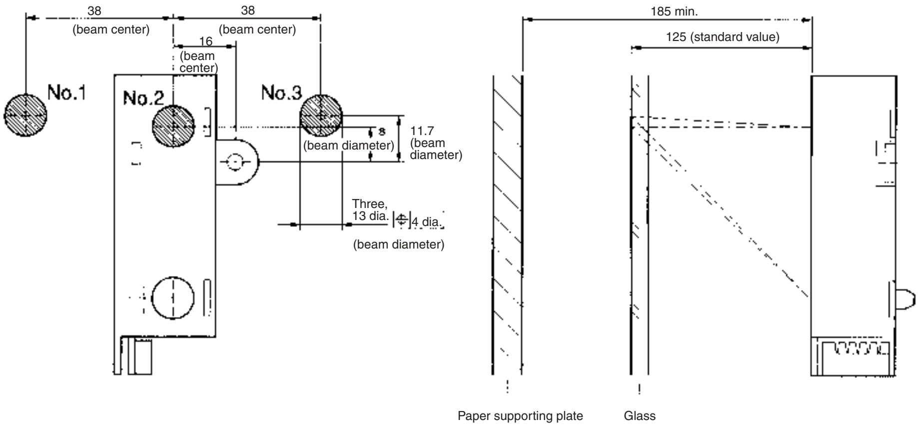
2. Optical darkness (OD) is defined by the following formula:

$$CD = -\log_{10}\left(\frac{P_{OUT}}{P_{IN}}\right)$$

P_{IN} (mW): Light power incident upon the document

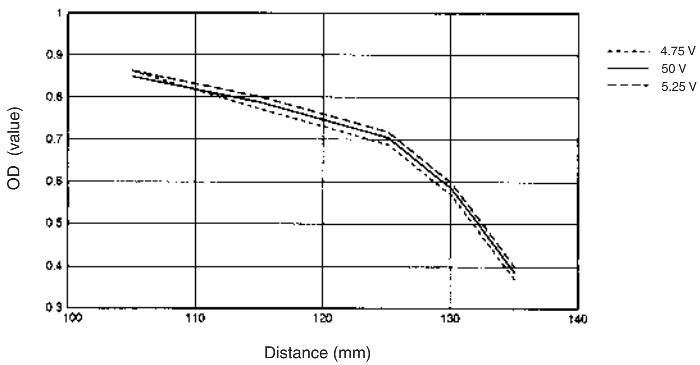
P_{OUT} (mW): Reflected light power from the document

■ Optical Path Arrangement



■ Engineering Data

Distance Characteristics (Estimated Lower-limit Value).



Photomicrosensors

■ Features

- ■ Ensures higher sensitivity and external light interference resistivity than any other photomicrosensor.
- ■ Narrow sensing range ensures stable sensing of a variety of sensing objects.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Load voltage		V_{OUT}	7 V
Load current		I_{OUT}	10 mA
Ambient temperature	**Operating**	Topr	0°C to 65°C
	Storage	Tstg	-15°C to 70°C

Note: Make sure there is no icing or condensation when operating the sensor.

■ Electrical and Optical Characteristics (Ta = 0°C to 65°C)

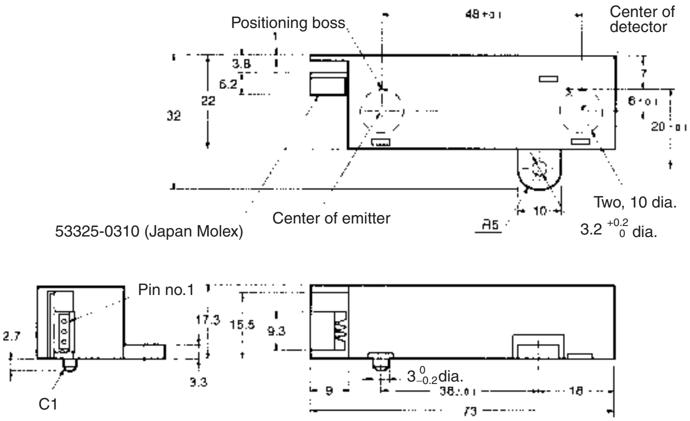
Item	Value	Condition
Power supply voltage	5 V ±5%	–
Current consumption	50 mA max.	V_{CC} = 5 V, $R_L = \infty$
Peak current consumption	200 mA max.	V_{CC} = 5 V, $R_L = \infty$
Low-level output voltage	0.6 V max.	V_{CC} = 5 V, I_{OL} = 4 mA (see note 1)
High-level output voltage	3.5 V min.	V_{CC} = 5 V, R_L = 4.7 kΩ (see note 2)
Response delay time (High to low)	35 ms max.	The time required for the output to become “Lo” after placing sensing object.
Response delay time (Low to high)	20 ms max.	The time required for the output to become “Hi” after removing sensing object.

Note: **1.** These conditions are for the sensing of lusterless paper with an OD of 0.6 maximum located at the correct sensing position of the Sensor.

2. These conditions are for the sensing of the paper supporting plate with an OD of 0.05 located using the glass plate without paper.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Recommended Mating Connectors:

Japan Molex 51090-0300 (crimp-type connector)
52484-0310 (insulation displacement-type connector)

Pin No.	Remarks	Name
1	O	Output (OUT)
2	V	Power supply (V_{CC})
3	G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65
30 < mm ≤ 50	±0.8
50 < mm ≤ 80	±0.95

■ Characteristics (Paper Table Glass: t = 6 mm max., Transparency Rate: 90% min.) (Ta = 0°C to 65°C)

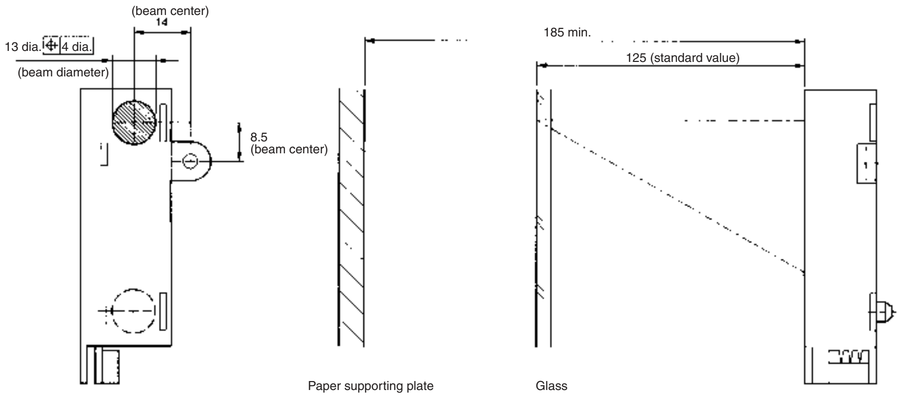
Item	Characteristic value
Sensing density	Lusterless paper with an OD of 0.6 max. (sensing distance: 125 mm) (see note)
Non-sensing distance	185 mm (from the top of the sensor), OD: 0.05
Paper sensing distance	125 mm (from the top of the sensor)
Ambient illumination	Sunlight: 3,000 ℓx max., fluorescent light: 2,000 ℓx max.

Note: 1. The data shown are initial data.
2. Optical darkness (OD) is defined by the following formula:

$$CD = -\log_{10}\left(\frac{P_{OUT}}{P_{IN}}\right)$$

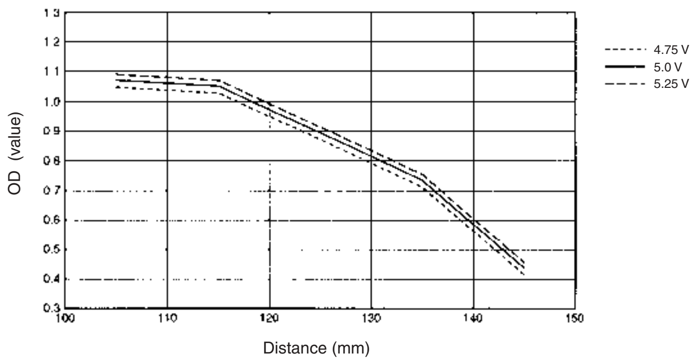
P_{IN} (mW): Light power incident upon the document
P_{OUT} (mW): Reflected light power from the document

■ Optical Path Arrangement



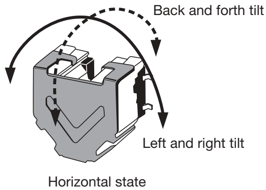
■ Engineering Data

Distance Characteristics (Estimated Lower-limit Value).



Subminiature PCB Mounting Sensor Discriminating Left or Right Tilt

- Detects the inclination of the Sensor within an activated angle range between 45° and 75° (left and right) and a reset angle range between 50° and 20°
- A subminiature SMD PCB mounting model
- A highly reliable solid-state type by Hall IC
- A surprisingly low power consumption with a maximum of 20μA
- Lead-free



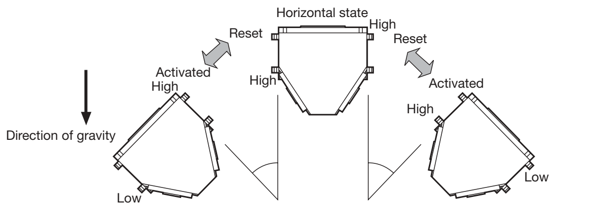
Ordering Information

Output configuration	Model
ON/OFF	D6B-2(P)

Application

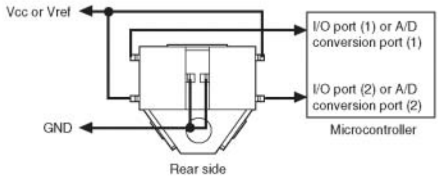
Vertical or horizontal discrimination of digital cameras, PDAs, and cellular phones.

Performance

Operating characteristics	**Activated angle**	45° to 75° (left and right)
	Reset angle	50° and 20° (left and right)
		Note: Characteristic values are provided, on condition that there is no tilt back and forth while the operation speed is 10° per second. 
Output Config.	**Horizontal state**	High-voltage signal output from the terminals on both sides.
	Inclined left or right	Low-voltage signal output only from the terminals on the side of the moving direction.
Electrical characteristics	**Ta = 25° and Vdd = 3V DC**	2.7 to 3.3 V DC
	Power supply voltage range (Vdd)	
	High-voltage output	Vdd-0.5V min.
	Low-voltage output	0.5V DC max.
	Current consumption	20 μA max. (10 μA typical)
	Maximum ratings	-0.1 to 5.0 V
	Power supply voltage (Vdd)	
	Output current (Iout)	± 1mA
Basic specs.	**Ambient temperature (operating)**	-10°C to 60°C (with no condensation)
	Ambient temperature (storage)	-25°C to 70°C (with no condensation)
	Ambient humidity (operating)	25% to 85%

Special Sensors

Electrical Connections



Soldering Condition

1. Recommendation reflow solder condition(infrared rays method)Please set the thermo-couple on the side of the terminal and set the reflow furnace as follows.

***In the case of Sn-Pb eutectic solder**

	Temperature °C	Time(s)
Preheat area	140	90±30
Reflow area	230±5	≥ 20
Peak temperature	max. 240	≥ 5

***In the case of Pb-free solder**

	Temperature °C	Time(s)
Preheat area	160±180	90±30
Reflow area	230±5	≥ 40
Peak temperature	max. 250	≥ 10

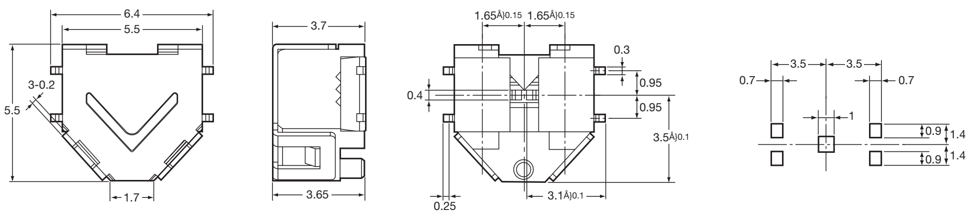
*Reflow times: Less than 2 times

2. Detaching condition by blower
   Please go within the detaching condition temperature 240°C and 5 seconds.

3. Please go for the hand solder at temperature 260°C and 10 second ahead or 350°C and 3 second or less.

4. The conventional solder containing lead can also be used.

External Conditions



Cautions

- The Sensor does not use any materials detrimental to the ozone layer.
- Specifications other than the electrical or mechanical characteristics, external dimensions, or mounting dimensions of the Sensor are subject to change without notice.

■ Handling Precautions

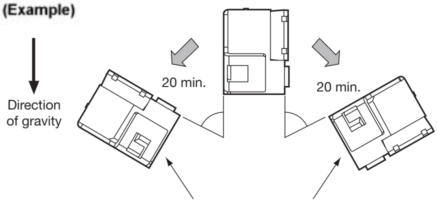
Operating Environment

- The Sensor consists of a Hall IC and a magnet.
  Check that the Sensor in operation will not be influenced by any external magnetic fields.
- Do not install any magnetic materials within 2 mm of the Sensor, else the performance characteristics of the Sensor may not be guaranteeable.
  If there are any objects (e.g., motors and solenoids) generating magnetic fields near the Sensor, operate and test the Sensor before the Sensor comes into actual use.
- Do not apply any voltage exceeding 5V to the Sensor, else the Sensor may break.
- Do not wash the Sensor after the Sensor is soldered.
- Do not mount or dismount the Sensor while power is flowing to the Sensor.
- The Sensor may generate error signals if impacted at a minimum acceleration of 294 m/s^2.
- The Sensor may generate error signals if a vibration at a minimum frequency of 15 Hz and a minimum acceleration of 15m/s^2 is applied to the Sensor.
- Confirm that no static electricity at a maximum voltage of 5kV is applied to the pins, else the Sensor may break.

Operating Characteristics

The present output may be kept if the inclination of the Sensor back and forth is 20 º or over. Under that condition, the output may not change even when the Sensor is leaned left or right.

(Example)



If the Sensor is kept inclined back or forth as shown in the above illustration, the level of output may not change from high to low or low to high when the Sensor inclines left or right.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Air Flow detector specifically to detect clogged conditions in air filters on servers and other types of computer equipment

- Detects the clogged conditions of air filters more efficiently than a conventional time totaling meter
- Adopts a velocity of the wind monitor employing an NTC thermistor to output 0 to 5V analog voltage signals

Ordering Information

Model
D6A-N

Specifications

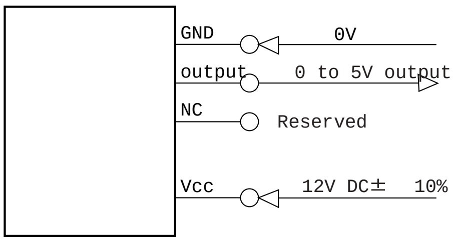
Mounting method	Front secured with nylon rivets (see External Dimensions for the dimensions of the Sensor)
Temperature device	NTC thermistor (epoxy resin coat)
Detection method	Velocity of wind monitor method (80 ˚C own heating type)
Connector	Japan Aviation Electronics Industry's IL-Z Series
Operating temperature	0°C to 45°C (with no icing)
Storage temperature	-25°C to + 65°C
Operating humidity	25 to 85%RH
Storage humidity	25 to 85%RH
Applicable gas	Air
Range of velocity of wind detection	0.5 to 1.5m/sec.
Mounting direction	Mount the Sensor so that the ventilation opening will be located vertical to the wind direction.
Drive power supply	12V DC asd ± 10%
Operating environmental conditions	The Sensor must be free of oil, moisture, and/or dust. Otherwise, the thermal diffusion characteristics of the Sensor will change.

Caution: Judge the degree of clogging condition from a voltage differential based on the initial voltage obtained when the filter is clean. One minute will be required for the stabilization of the Sensor after the Sensor is turned on.

Performance

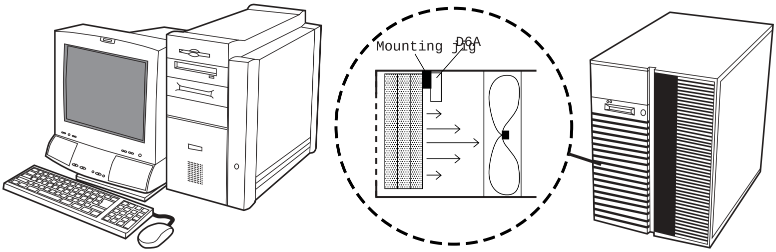
Head	Test Method	Criteria
(1) Output voltage characteristics	• Power supply voltage: 12.0V DC • Load resistance: 1MΩ • Ambient temperature: 25 ± 5 degrees, Relative humidity: 25% to 85% RH	Output range: 0.2 to 5.0V (0 to 1.5m/sec.) [Relative value] Based on output at a velocity of wind of 1.5m/sec. Output at velocity of wind of 1.0m/sec.: -1.80V ± 0.45V Output at velocity of wind of 0.5m/sec.: -4.25V ± 0.75V [Absolute value] (Reference value) • EVelocity of wind of 0.5m/sec.: Output of 0.25V ± 1.2V • EVelocity of wind of 1.0m/sec.: Output of 2.70V ± 1.35V • EVelocity of wind of 1.5m/sec.: Output of 4.50V ± 1.35V
(2) Temperature characteristics	• Power supply voltage: 12.0V DC • Ambient temperature: 0°C to 45°C Relative humidity : 25% to 85% RH	[Relative value] Based on output (at 25 ˚C) at a velocity of wind of 1.5m/sec. Output at velocity of wind of 1.0m/sec.: -1.80V ± 0.55V Output at velocity of wind of 0.5m/sec.: -4.25V ± 0.90V
(3) Max. output voltage	• Power supply voltage: 13.2V DC • Velocity of the wind: 1.5m/sec. • Ambient temperature: 25 ± 5°C • Load resistance: 1MΩ	5.2V max
(4) Current consumption	• Power supply voltage: 13.2V DC • Measured velocity of the wind: 1.5m/sec. • Ambient temperature: 25 ± 5°C • Load resistance: 1MΩ	60mA max.
(5) Insulation resistance	Measure the insulation resistance between the whole terminals and the sensor frame with a 100V DC insulation resistance tester	20MΩ min.
(6) Dielectric strength	Apply 500V AC for one minute between the whole terminals and the sensor frame.	Max. leak current of 1mA

Electrical Connections

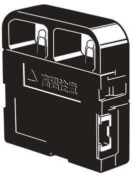


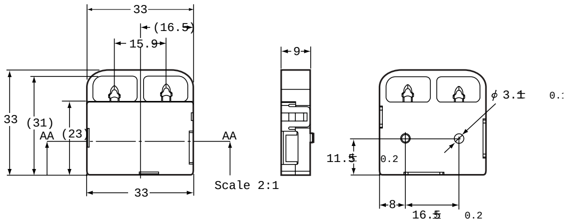
Special Sensors

Appication Example



External Dimensions





Cautions

HANDLING PRECAUTIONS

Storage

Pay the utmost attention as follows when storing the Sensor for long periods of time.

(1) Select a storage venue in consideration of protecting the Sensor from dust and humidity.

(2) Store the Sensor in the original packing materials

Mounting to Store computer

(1) Perform a safety check if the Sensor is dropped.

(2) Connect the Sensor to the connector securely.

(3) Use Kitagawa Industries' NRP-345 nylon rivets to secure the Sensor.

Precautions for Operation

(1) Do not apply a voltage of 13.2V DC or higher to the Sensor.

(2) Keep clean the thermistor during maintenance. The output voltage of the thermistor will drop if there is any oil, moisture, and/or dust on the surface of the thermistor.

(3) Do not bend the terminals of the thermistor while cleaning, otherwise the output voltage of the thermistor will drop.

(4) Check that the PCB is free of water or moistened dust, otherwise the internal circuit will short-circuit.

(5) A maximum of 12V DC is applied to the terminals of the thermistor.

Do not touch them, otherwise an electric shock may be received. When incorporating the Sensor into your product, describe this precaution in the maintenance manual of the product.

(6) When the Sensor is turned on, the thermistor will heat to approximately 80°C. Touching the thermistor may result in burns.

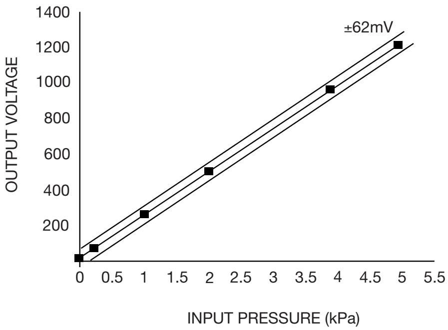
When incorporating the Sensor into your product, describe this precaution in the maintenance manual of the product.

(7) When disposing of the Sensor, be mindful of necessary risk prevention and environmental maintenance.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

- Analogue output
- Pressure range 0 to 4.9kPa
- Current Consumption 2.5mA (supply voltage 2.2±0.01V, load resistance 1MΩ min., supply pressure 4.9kPa)
- Temperature compensated over full range –30° to 70°C
- Supply Voltage 2.2±0.1VDC
- Output resistance 500 Ω
- Protection Structure IP40

Recommended Operating Condition

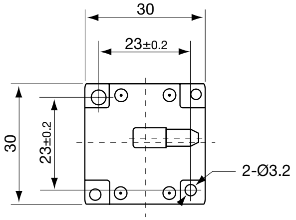


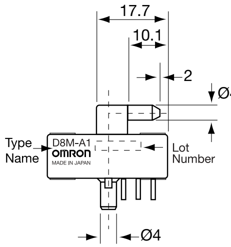
Characteristics

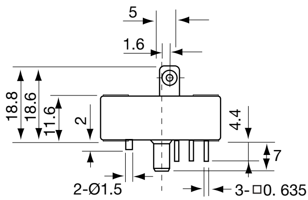
Output Voltage	15 to 1247mV (at the central value)
Repeatability & Hysteresis	±0.5%
Operating Temperature	-30° to 70°C
Storage Temperature	-40° to 80°C
Operating Humidity	25 to 95%
Insulation Resistance	100MzΩ min (250VDC between load terminals and base)
Dielectric Withstand	250VAC 50/60Hz for 1 min
Material	Case: PBT(poly-butylene-teleftaret) Base: PBT(poly-butylene-teleftaret)
Withstand Pressure	0.1MPa (3 minutes)

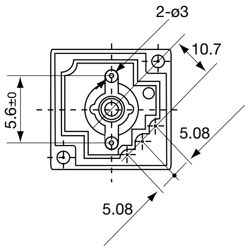
Dimensions

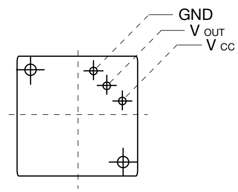
(All dimensions in mm)











TERMINAL ARRANGEMENT
(TOP VIEW)

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

- Digital Output
- High noise immunity
- Pressure range 0 to 4.9kPa
- Current consumption 100mA ± 5% at output 3VDC
- Operating temperature range –10°C to 60°C
- Protection Structure IP40

Characteristics

Model	D8M-D82
Pressure Type	Gauge
Pressure range	0 to 4.9kPa (0 to 0.71 psi)
Withstand pressure	19.6 kPa for 5 minutes
Repeatability/hystersis	± 5% FS
Non-linearity charactertistics	±2% FS max
Response time	1.5 ms (pressure) 30 ms max. (switch) 45 ms (discharge)
Operating temperature	-10°C to 60°C (with no icing or condensation)
Storage temperature	-20°C to 70°C (with no icing or condensation)
Operating humidity	25 to 95%
Degree of protection	IP40
Pressure port	6mm OD
Connection method	Three AWG26 wires, 115mm long
Material	PBT (polybutylene terephthalate)

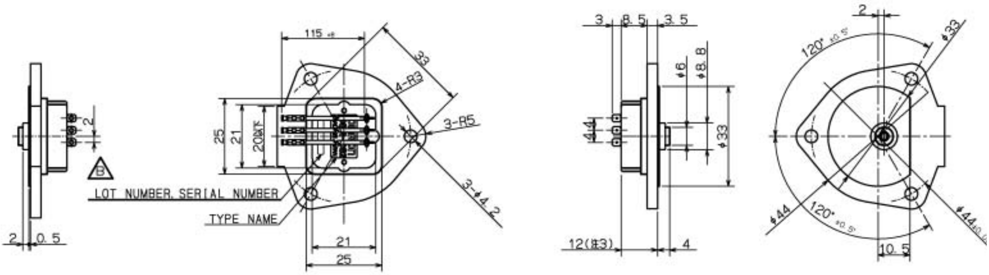
Ratings

Power supply voltage	2.2 to 3.4 VDC with regulator
Current consumption	100mA ±5% at 3VDC
Leakage current	1 mA or less
Output resolution	1 pulse/9.81 Pa
Operating characteristics	0 kPa = 30 pulses 0.15 kPa = 45 ±30 pulses 2 kPa = 204 ±15 pulses 4 kPa = 436 ±46 pulses

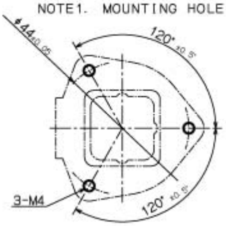
Heading?

T1: Pressure measurement time	1.5ms min.
T2: Response time	30ms max.
T3: Electrical discharge time	45ms min.

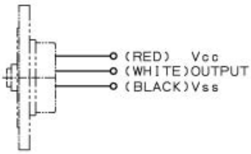
Dimensions



NOTE1. MOUNTING HOLE



NOTE2. LEAD ARRANGEMENT
(LEFT SIDE-VIEW)



High accuracy mass flow sensing

- Small size
- Fast response
- Applicable to air, non-corrosive gas, LNG
- Applications include: Medical equipment
  Analysis apparatus
  Combustion control

Ordering Information

Model	Case	Gsa	Flow Range	Notes
D6F-01A1-110	PPS	Air*	0-1L/min	Integral orifice
D6F-02A1-110			0-2L/min	
D6F-05N2-000	Aluminum	LNG* (13A)	0-5L/min	

Ratings

Absolute Maximum Rating

Item	Symbol	Rating	Unit
Power Supply	V_{CC}	26.4	VDC
Output Voltage	V_{OUT}	6	VDC

Recommendation Condition

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply	V_{CC}	–	10.8	–	26.4	VDC
Operating Temperature	T_{ORR}	–	-10	–	60	°C
Output Voltage (Max.)	V_{OH}	V_{CC} = 12 to 24VDC I_{OH} = 5mA	5	–	5.7	VDC
Output Voltage (Min.)	V_{OL}	V_{CC} = 12 to 24VDC I_{OH} =-5mA	0	–	1	VDC

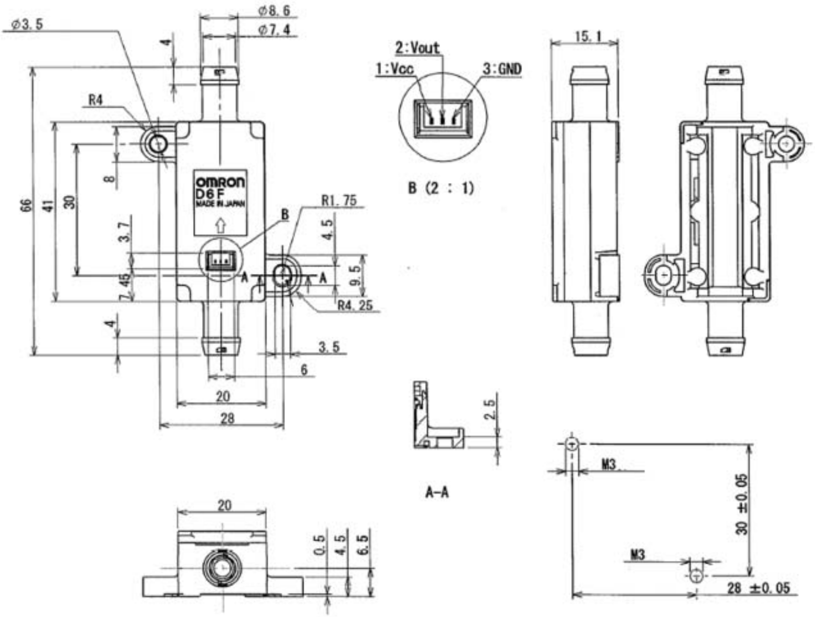
Characteristics

Model	D6F-01A1-110	D6F-02A1-110	D6F-05N2-000
Rated quality range	0-1L/min		0-5L/min
Joint type	Bamboo type (Bamboo min. external diameter: 7.4mm, Bamboo max. external diameter: 8.6mm) (passage diameter: 4mm)		Rc 1/4 Screw
Case material	PPS		Aluminum
Applicable fluid	Air*		LNG*
Withstand pressure	200kPa		
Repeat accuracy	±3% F.S. max		
Operating temperature	-10 to 60 degrees (with no icing or condensation)		
Operating humidity	Under 85% RH (with no icing or condensation)		
Storage temperature	-40 to 80 degrees (with no icing or condensation)		
Storage humidity	Under 85% RH (with no ice or no dew)		
Output signal	Analog Output 1-5 VDC		
Current consumption	No-load V_{CC} = 12 to 24VDC, V_{SS} = 0V 25 deg. C, Max. 15mA		
Insulation resistance	More than 20M Ohm (500VDC, between lead terminal and case)		
Dielectric strength	500VAC, 50/60Hz, for 1 minute. (Leakage current typ < 1mA.) Between the lead terminals and the base		
Orifice	Integral	Integral	Not applicable

Dimensions

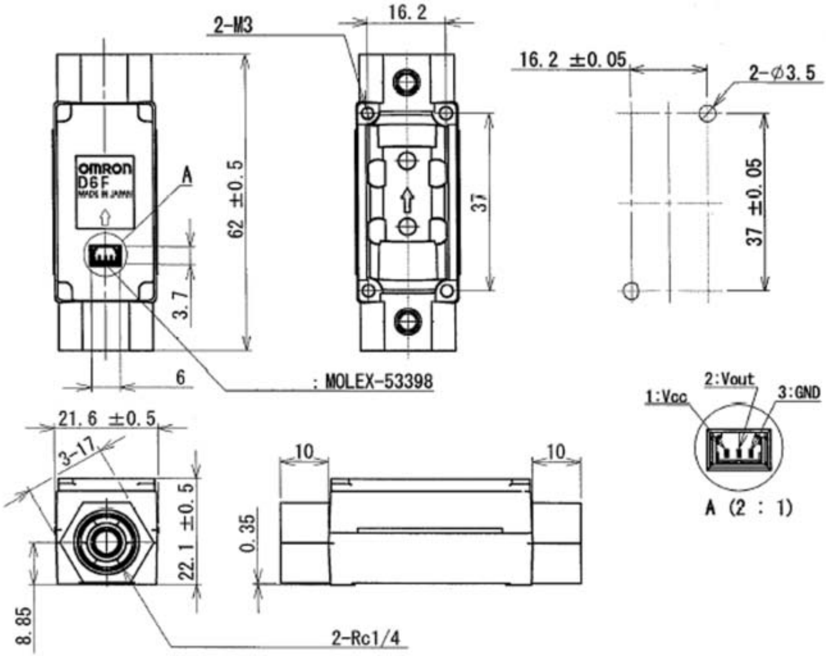
(All dimensions in mm)

D6F-01A-110
D6F-02A-110



(All dimensions in mm)

D6F-05N2-000



- Pure mechanical vibration detector.
- Sealed enclosure.
- Output capacity from 0.1mA at 5VDC to 100mA at 30VDC.

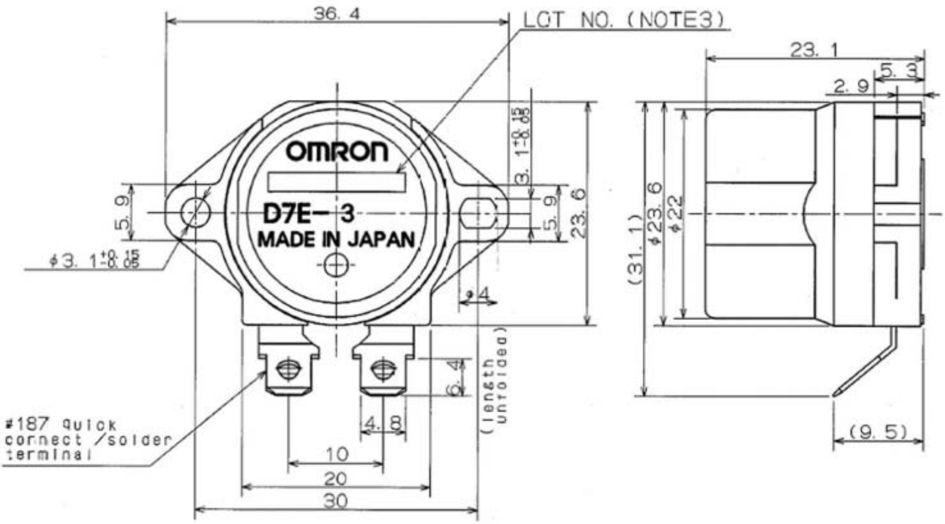
Ordering Information

Model	Operating Angle
D7E-3	50 to 80 degrees

Characteristics

Model	D7E-3
Operating Angle	Tilt of 50 to 80 degrees.
	The value of tilt degree is specified when the switch is tilted gradually (approx. 1 degree/s) from the horizontal.
Returning Angle	Tilt of more than 25 degrees. The value of tilt degree is specified when the switch is tilted gradually (approx. 1 degree/s) from the horizontal
Permissible Mounting Level	1 degree max. from the horizontal
Contact Form	Single pole single throw (NC contact / slow action)
Mounting	Pitch: 30mm 2 screws (M3)
	Height: 5.3mm
Soldering	Soldering iron: temperature 350±10°, 3 sec. MAX
Ratings	5VDC, 0.1mA to 30VDC, 100mA (Resistive load)
Insulation Resistance	100MΩ MIN. (250VDC, between each terminal of the same polarity To measure off condition
Contact Resistance	300m Ohm MAX. (Initial value)
Vibration During Transportation	Condition: Vibration: 200 gal (1cycle: 0.5 sec.) Vibration direction: 2 axial directions Time: Total 50 hours
Shock	Condition: Acceleration: 980 m/s^2 3 times Shock direction: 3 axial directions
Operating temperature and humidity	Temperature: -25 degrees to +60 degrees (with no icing and condensation) Humidity: 45 to 95 % RH
Storage temperature and humidity	Temperature: -25 degrees to +60 degrees (with no icing and condensation) Humidity: 45 to 95 % RH Protection
Protection	IP67

(All dimensions in mm)



■ Precautions – Correct Use

Backlock Types

Do not lock the slider without an FPC inserted. Locking the slider without an FPC inserted will cause a decrease in the dimensions between the contacts and consequently an increase in the force required to insert an FPC.

- When designing the board, be sure to allow locking space for the slider (i.e., space for the slider when it is locked).
- The connector has a double-sided contact structure and so be sure to insert the FPC with the correct orientation.
- When locking the slider, press it down securely with your fingers at both ends.

  Failing to lock the slider properly may result in contact failure.
- Unlocking the Slider

  Unlock the slider manually. Place your index fingers at both ends of the slider and lift it up. Do not apply excessive force when lifting the slider. Doing so may result in the slider being damaged or detached. If the slider becomes detached, it may not be able to hold the FPC and contact failure may result.

All Models

- Insert the FPC right to the back of the connector. Failing to do so may result in a loss of contact reliability.
- After mounting (and locking) the FPC, do not bend or pull it with excessive force. Doing so may result in FPC disconnection.
- When bending the FPC after mounting to the PCB, do not bend it excessively near the place where it enters the connector.

  Doing so may result in a loss of contact reliability.
- In applications where the connector may frequently be exposed to shock or vibration, or where, as part of a mechanism, connected parts may move, secure the FPC and make sure that it is not subjected to a direct load.
- Do not perform reflow or manual soldering with the FPC inserted in the connector. Doing so may result in a loss of contact reliability.
- Unlock the slider before removing the FPC.
- Use an FPC with the structure recommended by OMRON.
- Do not perform reflow or manual soldering with the sliderlocked. Doing so may result in a loss of contact reliability.
- Observe a metal mask thickness of t = 0.12 to 0.15 mm.
- Metal mask open area ratio: 90% of the printed circuit board matching dimensions in the dimensions diagrams.

Recommended Reflow Conditions

	Standard reflow conditions	Reflow conditions for lead-free solder (backlock type only)
Preheating temperature	150 ± 10°C	150 to 180°C
Soldering temperature	200 to 240°C	230 to 250°C
Time (10s max. at the maximum temperature 240°C)	30s max.	30s max.

Storage

1. Do not store in locations subject to dust or high humidity levels.
2. Do not store in locations close to sources of gases such ammonia gas or sulphide gas.

Model Number	XF2H	XF2L	XF2J	XF2E
				
Size mm (WxLxH)	(W) x 8.1 x 2.0	(W) x 3.45 x 1.2	(W) x 2.95 x 4.15	(W) x 5.6 x 1.5
Type	Rear Lock	Slide Lock	Slide Lock	Slide
Contact Type	Dual	Upper or Lower	Upper or Lower	Dual
Rating	0.5A	0.5A	0.5A	0.5A
Contact Resistance	Max. 30Ω	Max. 30Ω	Max. 30Ω	Max. 30Ω
Pitch	0.5mm	0.5mm	0.5mm	0.8mm
Applicable FPC Thickness (mm)	0.3mm	0.3mm	0.3mm	0.3mm
Housing Material	PA 6T	LCP Resin	PA 46	PA 46
Contact Material (Finish)	Copper Alloy (Tin Alloy Plating)	Copper Alloy (Tin Alloy Plating)	Copper Alloy (Tin Alloy Plating)	Copper Alloy (Tin Alloy Plating)
Operating Temperature	-30°C to 85°C	-30°C to 85°C	-30°C to 85°C	-30°C to 85°C
Page No.	998	1000	1003	1005

Model Number	XF2R	XF2B	XF2M	XF2N
				
Size mm (WxLxH)	(W) x 5.5 x 0.9	(W) x 5.4 x 1.2	(W) x 5.9 x 2.0	(W) x 5 x 0.9
Type	Rear Lock	Rear Lock	Rear Lock	Rear Lock
Contact Type	Dual	Dual	Dual	Dual
Rating	0.3A	0.2A	0.5A	0.3A
Contact Resistance	Max. 40 Ω	Max. 50 Ω	Max. 40 Ω	Max. 40 Ω
Pitch	0.3 mm	0.5 mm	0.5 mm	0.5 mm
Applicable FPC Thickness (mm)	0.12 mm	0.2 mm	0.3 mm	0.2 mm
Housing Material	LCP Resin	LCP Resin	LCP Resin	LCP Resin
Contact Material (Finish)	Copper Alloy (Au Plating)	Copper Alloy (Au Plating)	Copper Alloy (Tin Alloy Plating)	Copper Alloy (Au Plating)
Operating Temperature	-30°C to 85°C	-30°C to 85°C	-30°C to 85°C	-30°C to 85°C
Page No.	1007	1009	1011	1013

New rotary – lock concept achieves high reliability and superior work efficiency.

- The unique rotary lock construction significantly improves work efficiency during FPC mounting.
- Double –sided contacts maintain a stable contact force.
- Discrimination between FPC upper and lower contacts is unnecessary.
- Low-profile, protruding only 2 mm on the PCB.

Specifications

Specifications

Rated Current	0.5A
Rated Voltage	50 VDC
Contact resistance	30 mΩ max. (max. 20 mV, max. 100 mA)
Insulation resistance	100 MΩ min. (at 250 VDC)
Withstand voltage	250 VAC 1 min. (leakage current: 1 mA max.)
Insertion tolerance	20 times
Ambient temperature	-30 to +85°C (No condensation at low temperatures.)

Materials/Finish

Housing	PA46 resin (UL94V-0)/natural
Slider	LCP resin (UL94V-0)/black
Contact	Copper-alloy/nickel spring substrate (2μm) plated with tin alloy (2μm)
Hold Down	Spring copper-alloy/fused tin plating (1.5μm)

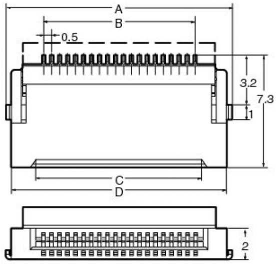
Ordering Information

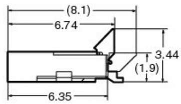
Poles	Model	Poles	Model	Quantity per reel*
10	**XF2H-1015-1LW**	30	**XF2H-3015-1LW**	1,500
12	**XF2H-1215-1LW**	32	**XF2H-3215-1LW**	
13	**XF2H-1315-1LW**	33	**XF2H-3315-1LW**	
14	**XF2H-1415-1LW**	34	**XF2H-3415-1LW**	
18	**XF2H-1815-1LW**	35	**XF2H-3515-1LW**	
20	**XF2H-2015-1LW**	36	**XF2H-3615-1LW**	
21	**XF2H-2115-1LW**	38	**XF2H-3815-1LW**	
22	**XF2H-2215-1LW**	40	**XF2H-4015-1LW**	
24	**XF2H-2415-1LW**	42	**XF2H-4215-1LW**	
25	**XF2H-2515-1LW**	45	**XF2H-4515-1LW**	
26	**XF2H-2615-1LW**	50	**XF2H-5015-1LW**	
28	**XF2H-2815-1LW**	53	**XF2H-5315-1LW**	

*Order an integer multiple of the quantity per reel.

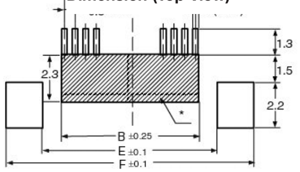
■ Dimensions

XF2H-□□15-1



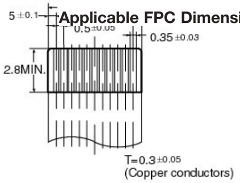


Printed Circuit Board Matching Dimension (Top View)



* Pattern prohibition

Applicable FPC Dimensions



■ Table of Dimensions

Poles	Model	A	B	C	D	E	F
10	**XF2H-1015-1LW**	9.1	4.5	5.6	8.5	6.5	10.1
12	**XF2H-1215-1LW**	10.1	5.5	6.6	9.5	7.5	11.1
13	**XF2H-1315-1LW**	10.6	6	7.1	10	8	11.6
14	**XF2H-1415-1LW**	11.1	6.5	7.6	10.5	8.5	12.1
18	**XF2H-1815-1LW**	13.1	8.5	9.6	12.5	10.5	14.1
20	**XF2H-2015-1LW**	14.1	9.5	10.6	13.5	11.5	15.1
21	**XF2H-2115-1LW**	15.1	10.5	11.6	14.5	12.5	16.1
22	**XF2H-2215-1LW**	15.1	10.5	11.6	14.5	12.5	16.1
24	**XF2H-2415-1LW**	16.1	11.5	12.6	15.5	13.5	17.1
25	**XF2H-2515-1LW**	16.6	12.0	13.1	16.0	14.0	17.6
26	**XF2H-2615-1LW**	17.1	12.5	13.6	16.5	14.5	18.1
28	**XF2H-2815-1LW**	18.1	13.5	14.6	17.5	15.5	19.1
30	**XF2H-3015-1LW**	19.1	14.5	15.6	18.5	16.5	20.1
32	**XF2H-3215-1LW**	20.1	15.5	16.6	19.5	17.5	21.1
33	**XF2H-3315-1LW**	20.6	16.0	17.1	20.0	18.0	21.6
34	**XF2H-3415-1LW**	21.1	16.5	17.6	20.5	18.5	22.1
35	**XF2H-3515-1LW**	21.6	17	18.1	21	19	22.6
36	**XF2H-3615-1LW**	22.1	17.5	18.6	21.5	19.5	23.1
38	**XF2H-3815-1LW**	23.1	18.5	19.6	22.5	20.5	24.1
40	**XF2H-4015-1LW**	24.1	19.5	20.6	23.5	21.5	25.1
42	**XF2H-4215-1LW**	25.1	20.5	21.6	24.5	22.5	26.1
45	**XF2H-4515-1LW**	26.6	22	23.1	26	24	27.6
50	**XF2H-5015-1LW**	29.1	24.5	25.6	28.5	26.5	30.1
53	**XF2H-5315-1LW**	30.6	26.0	27.1	30.0	28.0	31.6

Industry – smallest on-board area and low-profile construction enhance board design freedom.

- Occupies smalles on-board area in the industry.
- Low profile only 1.2 mm max. above the board.
- The connectors on the lower surface do not protrude from the rear of the connector face, achieving highest board-design efficiency in the industry.
- Secure locking

Specifications

Specifications

Rated Current	0.5A
Rated Voltage	50 VDC
Contact resistance	30 mΩ max. (max. 20 mV, max. 100 mA)
Insulation resistance	100 MΩ min. (at 250 VDC)
Withstand voltage	250 VAC 1 min. (leakage current: 1 mA max.)
Insertion tolerance	30 times
Ambient temperature	-30 to +85°C (No condensation at low temperatures.)

Materials/Finish

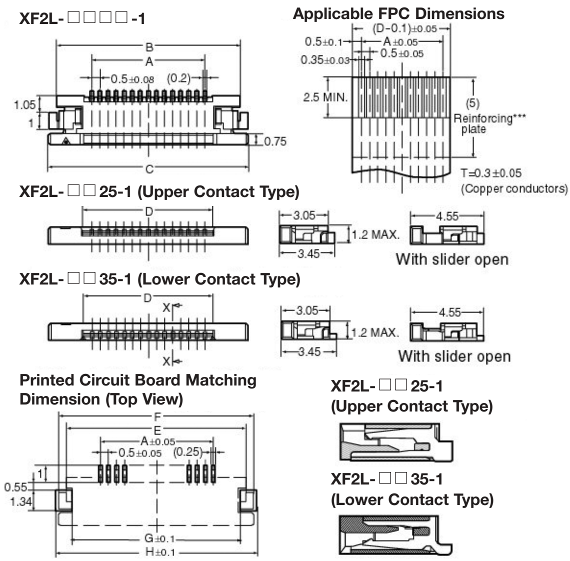
	Upper Contact Type	Lower Contact Type
Housing	LCP Resin (UL94V-0)/natural	LCP Resin (UL94V-0)/natural
Slider	LCP resin (UL94V-0)/black	LCP resin UL94V-0)/brown
Contact	Copper-alloy/nickel spring substrate (2μm) plated with tin alloy (2μm)	
Hold-down	Spring copper-alloy/fused tin plating (1.5μm)	

Ordering Information

Poles	Type	Model	Poles	Type	Model	Quantity per reel*
4	Upper Contact	**XF2L-0425-1**	13	Upper Contact	**XF2L-1325-1**	3,000
5	Lower Contact	**XF2L-0535-1**		Lower Contact	**XF2L-1335-1**	
6	Upper Contact	**XF2L-0625-1**	15	Lower Contact	**XF2L-1535-1**	
	Lower Contact	**XF2L-0635-1**	18	Upper Contact	**XF2L-1825-1**	
7	Upper Contact	**XF2L-0725-1**		Lower Contact	**XF2L-1835-1**	
	Lower Contact	**XF2L-0735-1**	19	Lower Contact	**XF2L-1935-1**	
8	Upper Contact	**XF2L-0825-1**	20	Lower Contact	**XF2L-2035-1**	
	Lower Contact	**XF2L-0835-1**	21	Upper Contact	**XF2L-2125-1**	
9	Upper Contact	**XF2L-0925-1**	22	Lower Contact	**XF2L-2235-1**	
10	Upper Contact	**XF2L-1025-1**	24	Lower Contact	**XF2L-2435-1**	
	Lower Contact	**XF2L-1035-1**	26	Upper Contact	**XF2L-2625-1**	
12	Upper Contact	**XF2L-1225-1**	30	Upper Contact	**XF2L-3025-1**	
	Lower Contact	**XF2L-1235-1**		Lower Contact	**XF2L-3035-1**	

*Order an integer multiple of the quality per reel.

■ Dimensions



■ Table of Dimensions

Upper Contact Type

Poles	Model	A	B	C	D	E	F	G	H
4	**XF2L-0425-1**	1.5	5.9	6.9	2.6	5.88	6.88	5.28	7.28
6	**XF2L-0625-1**	2.5	6.9	7.9	3.6	6.88	7.88	6.28	8.28
7	**XF2L-0725-1**	3.0	7.4	8.4	4.1	7.38	8.38	6.78	8.78
8	**XF2L-0825-1**	3.5	7.9	8.9	4.6	7.88	8.88	7.28	9.28
9	**XF2L-0925-1**	4.0	8.4	9.4	5.1	8.38	9.38	7.78	9.78
10	**XF2L-1025-1**	4.5	8.9	9.9	5.6	8.88	9.88	8.28	10.28
12	**XF2L-1225-1**	5.5	9.9	10.9	6.6	9.88	10.88	9.28	11.28
13	**XF2L-1325-1**	6.0	10.4	11.4	7.1	10.38	11.38	9.78	11.78
18	**XF2L-1825-1**	8.5	12.9	13.9	9.6	12.88	13.88	12.28	14.28
21	**XF2L-2125-1**	10.0	14.4	15.4	11.1	14.38	15.38	13.78	15.78
26	**XF2L-2625-1**	12.5	16.9	17.9	13.6	16.88	17.88	16.28	18.28
30	**XF2L-3025-1**	14.5	18.9	19.9	15.6	18.88	19.88	18.28	20.28

Lower Contact Type

Poles	Model	A	B	C	D	E	F	G	H
5	**XF2L-0535-1**	2.0	6.4	7.4	3.1	6.38	7.38	5.78	7.78
6	**XF2L-0635-1**	2.5	6.9	7.9	3.6	6.88	7.88	6.28	8.28
7	**XF2L-0735-1**	3.0	7.4	8.4	4.1	7.38	8.38	6.78	8.78
8	**X2FL-0835-1**	3.5	7.9	8.9	4.6	7.88	8.88	7.28	9.28
10	**XF2L-1035-1**	4.5	8.9	9.9	5.6	8.88	9.88	8.28	10.28
12	**XF2L-1235-1**	5.5	9.9	10.9	6.6	9.99	10.88	9.28	11.28
13	**XF2L-1335-1**	6.0	10.4	11.4	7.1	10.38	11.38	9.78	11.78
15	**XF2L-1535-1**	7.0	11.4	12.4	8.1	11.38	12.38	10.78	12.78
18	**XF2L-1835-1**	8.5	12.9	13.9	9.6	12.88	13.88	12.28	14.28
19	**XF2L-1935-1**	9.0	13.4	14.4	10.1	13.38	14.38	12.78	14.78
20	**XF2L-2035-1**	9.5	13.9	14.9	10.6	13.88	14.88	13.28	15.28
22	**XF2L-2235-1**	10.5	14.9	15.9	11.6	14.88	15.88	14.28	16.28
24	**XF2L-2435-1**	11.5	15.9	16.9	12.6	15.88	16.88	15.28	17.28
30	**XF2L-3035-1**	14.5	18.9	19.9	15.6	18.88	19.88	18.28	20.28

Top-entry ZIF Connector

- Slider achieves secure locking.
- Low-profile, protruding only 4.15 mm on the PCB.
- Adhesion face on top of the connector suits automatic mounting.

Specifications

Specifications

Rated Current	0.5A
Rated Voltage	50 VDC
Contact resistance	30 mΩ max. (max. 20 mV, max. 100 mA)
Insulation resistance	100 MΩ min. (at 100 VDC)
Withstand voltage	250 VAC 1 min. (leakage current: 1 mA max.)
Insertion tolerance	30 times
Ambient temperature	-30 to +85°C (No condensation at low temperatures.)

Materials/Finish

Housing	PA46 resin (UL94V-0)/natural
Slider	PPS resin (UL94V-0)/black
Contact	Copper-alloy/nickel spring substrate (2µm) plated with tin alloy (2µm)
Hold Down	Copper-alloy/copper substrate (2µm) plated with tin alloy (2µm)

Ordering Information

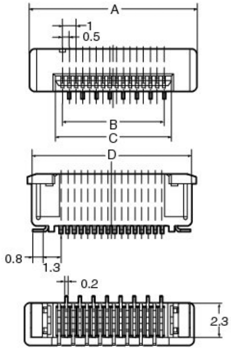
Poles	Model		Quantity per reel*
	Standard Terminal Arrangement	Reverse Terminal Arrangement	
6	**XF2J-0624-11**	**XF2J-0624-12**	1,000
8	**XF2J-0824-11**	**XF2J-0824-12**	
10	**XF2J-1024-11**	**XF2J-1024-12**	
12	**XF2J-1224-11**	**XF2J-1224-12**	
14	**XF2J-1424-11**	–	
16	**XF2J-1624-11**	**XF2J-1624-12**	
18	**XF2J-1824-11**	**XF2J-1824-12**	
20	**XF2J-2024-11**	**XF2J-2024-12**	
22	**XF2J-2224-11**	**XF2J-2224-12**	
24	**XF2J-2424-11**	**XF2J-2424-12**	
26	**XF2J-2624-11**	–	
28	**XF2J-2824-11**	–	
30	**XF2J-3024-11**	–	

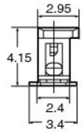
*Order an integer multiple of the quantity per reel.

■ Dimensions

XF2J-□□24-11

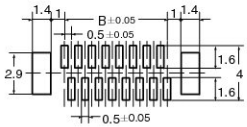
Standard Terminal Arrangement



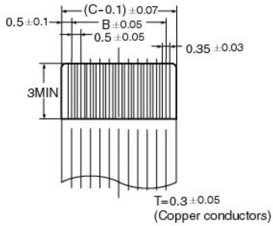


Reverse Terminal Arrangement

Printed Circuit Board Matching Dimensions (Top View)



Applicable FPC Dimensions

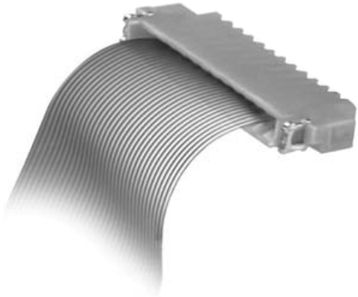


■ Table of Dimensions

Poles	Model		A	B	C	D
	Standard Terminal Arrangement	Reverse Terminal Arrangement				
6	**XF2J-0624-11**	**XF2J-0624-12**	7.5	2.5	3.6	6.9
8	**XF2J-0824-11**	**XF2J-0824-12**	8.5	3.5	4.6	7.9
10	**XF2J-1024-11**	**XF2J-1024-12**	9.5	4.5	5.6	8.9
12	**XF2J-1224-11**	**XF2J-1224-12**	10.5	5.5	6.6	9.9
14	**XF2J-1424-11**	–	11.5	6.5	7.6	10.9
16	**XF2J-1624-11**	**XF2J-1624-12**	12.5	7.5	8.6	11.9
18	**XF2J-1824-11**	**XF2J-1824-12**	13.5	8.5	9.6	12.9
20	**XF2J-2024-11**	**XF2J-2024-12**	14.5	9.5	10.6	13.9
22	**XF2J-2224-11**	**XF2J-2224-12**	15.5	10.5	11.6	14.9
24	**XF2J-2424-11**	**XF2J-2424-12**	16.5	11.5	12.6	15.9
26	**XF2J-2624-11**	–	17.5	12.5	13.6	16.9
28	**XF2J-2824-11**	–	18.5	13.5	14.6	17.9
30	**XF2J-3024-11**	–	19.5	14.5	15.6	18.9

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Optimum low-profile design (SMT Terminal). Ultra-low-profile FPC/FFC connector only 1.5mm above the PCB.



- Side-entry
- Ultra-low-profile only 1.5 mm on the PCB allows mounting in spaces with restricted height.
- 0.8 mm-pitch SMT connectors allow high-density mounting.
- Modified-PA-resin housing is compatible with VPS, IR reflow, etc
- Double-sided contacts maintain a stable contact force.
- Standard tape packing compatible with automatic mounting.

Specifications

Rated Current	0.5A
Rated Voltage	50 VDC
Contact resistance	30 mΩ max. (max. 20 mV, max. 100 mA)
Insulation resistance	100 MΩ min. (at 100 VDC)
Withstand voltage	500 VAC 1 min. (leakage current: 1 mA max.)
Total insertion force	Poles x 2.0 N (200 gf) max.
Total removal force	Poles x 0.3 N (200 gf) max.
Insertion tolerance	10 times
Ambient temperature	-30 to +85°C (No condensation at low temperatures.)

■ Materials/Finish

Housing	Modified PA resin containing glass (UL94V-0)/opal
Contact	Copper-alloy/nickel spring substrate (2μm) plated with tin alloy (2μm)
Hold Down	Copper-alloy/copper substrate (2μm) plated with tin alloy (2μm)

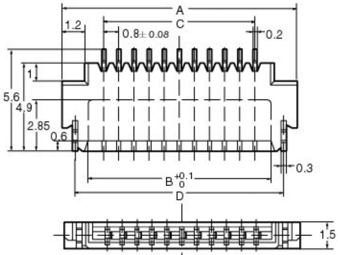
■ Ordering Information

Poles	Model	Poles	Model	Quantity per reel*
5	**XF2E-0515-1**	10	**XF2E-1015-1**	4,000
6	**XF2E-0615-1**	12	**XF2E-1215-1**	
7	**XF2E-0715-1**	15	**XF2E-1515-1**	
8	**XF2H-0815-1**	17	**XF2E-1715-1**	
9	**XF2E-0915-1**	20	**XF2E-1015-1**	

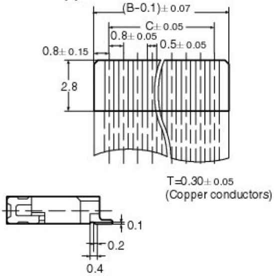
*Order an integer multiple of the quantity per reel.

■ Dimensions

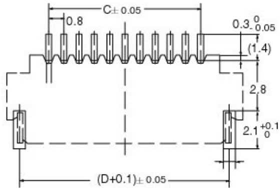
XF2E-□□15-1 (SMT Terminal)



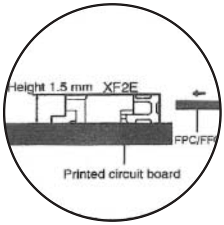
Applicable FPC Dimensions



Printed Circuit Board Matching Dimension (Top View)



■ Mounted Image



■ Table of Dimensions

Poles	Model	A	B	C	D
5	**XF2E-0515-1**	7.6	4.9	3.2	6.2
6	**XF2E-0615-1**	8.4	5.7	4.0	7.0
7	**XF2E-0715-1**	9.2	6.5	4.8	7.8
8	**XF2E-0815-1**	10.0	7.3	5.6	8.6
9	**XF2E-0915-1**	10.8	8.1	6.4	9.4
10	**XF2E-1015-1**	11.6	8.9	7.2	10.2
12	**XF2E-1215-1**	13.2	10.5	8.8	11.8
15	**XF2E-1515-1**	15.6	12.9	11.2	14.2
17	**XF2E-1715-1**	17.2	14.5	12.8	15.8
20	**XF2E-1015-1**	19.6	16.9	15.2	18.2

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

FPC Insertion and Work Efficiency Significantly Improved with 0.9-mm Profile and FPC Guide Section

- FPC Insertion greatly improved with 1.1-mm FPC guide section.
- The effective interface length for terminals has been increased to 1.4 mm to ensure stability in applications with a lot of movement.
- Double-sided (upper and lower) contact structure enables component reductions.
- Applicable FPC thickness, t = 0.12mm. Gold-plated type.
- Use FPCs with the construction recommended by OMRON. (Refer to specifications for details.)

Specifications

Rated Current	0.3A AC/DC
Rated Voltage	50V AC/DC
Contact resistance	40 mΩ max. (max. 20 mV, max. 100 mA max.)
Insulation resistance	100 MΩ min. (at 250 VDC)
Withstand voltage	250V AC 1 min. (leakage current: 1 mA max.)
Insertion tolerance	20 times
Ambient operating temperature	-30 to +85°C (with no icing or condensation)

Materials/Finish

Housing	LCP resin (UL94V-0)/natural
Slider	LCP resin (UL94V-0)/brown
Contact	Spring copper alloy/nickel substrate (1.5µm), gold-plated contacts (0.15 µm)
Hold Down	Spring copper alloy/fused-tin plating (1.5 µm)

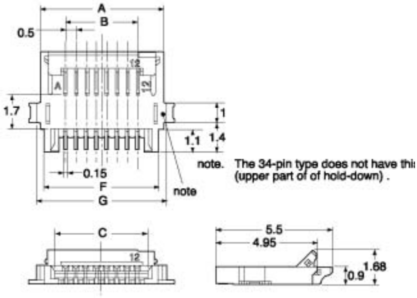
Ordering Information

Pins (See note 1)	Model	Pins (See note 1)	Model	Quantity per reel (See note 2)
6	**XF2R-0615-4A**	24	**XF2R-3415-4A**	3,000
9	**XF2R-0915-4A**	34	**XF2R-3415-4A**	
18	**XF2R-1815-4A**	40	**XF2R-4015-4A**	

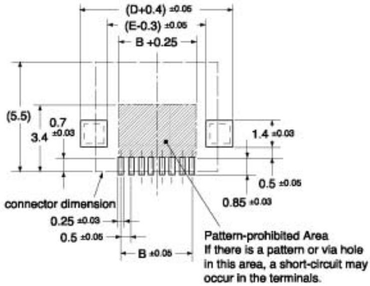
Note 1: Consult your OMRON representative for enquiries related to pin-number specifications.
Note 2: Order an integer multiple of the quantity per reel.

■ Dimensions

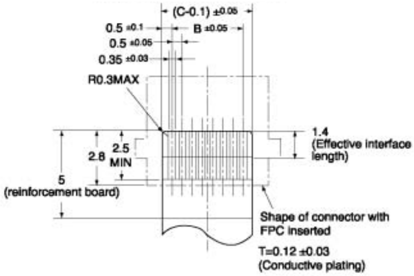
XF2R-□□15-4A



Printed Circuit Board Matching Dimensions (Top View)



Applicable FPC Dimensions

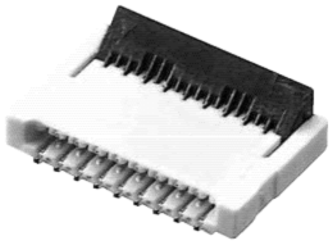


■ Table of Dimensions

Poles	Model	A	B	C	D	E	F	G
6	**XF2R-0615-4A**	5.0	2.5	3.6	6.1	4.1	4.55	5.35
9	**XF2R-0915-4A**	6.5	4.0	5.1	7.6	5.6	6.05	6.85
18	**XF2R-1815-4A**	11.0	8.5	9.6	12.1	10.1	10.55	11.35
24	**XF2R-2415-4A**	14.0	11.5	12.6	15.1	13.1	13.55	14.35
34	**XF2R-3415-4A**	19.0	16.5	17.6	20.1	18.1	18.55	–
40	**XF2R-4015-4A**	22.0	19.5	20.6	23.1	21.1	21.55	22.35

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

■ Rotary backlock mechanism and 0.3mm-pitch design



- ■ Wall provided on reverse side of connector to allow greater freedom of board design.
- ■ Double-sided (upper and lower) contact structure enables component reductions.
- ■ Applicable FPC thickness, t = 0.2mm. Gold-plated type.
- ■ Use FPCs with the construction recommended by OMRON. (Refer to specifications for details.)

Specifications

Rated Current	0.2A AC/DC
Rated Voltage	50V AC/DC
Contact resistance	50 mΩ max. (max. 20 mV, max. 100 mA max.)
Insulation resistance	100 MΩ min. (at 250 VDC)
Withstand voltage	250V AC 1 min. (leakage current: 1 mA max.)
Insertion tolerance	20 times
Ambient temperature	-30 to +85°C (with no icing or condensation)

■ Materials/Finish

Housing	LCP resin (UL94V-0)/natural
Slider	LCP resin (UL94V-0)/black
Contact	Spring copper alloy/nickel substrate (2 μm), gold-plated contacts (0.15 μm)

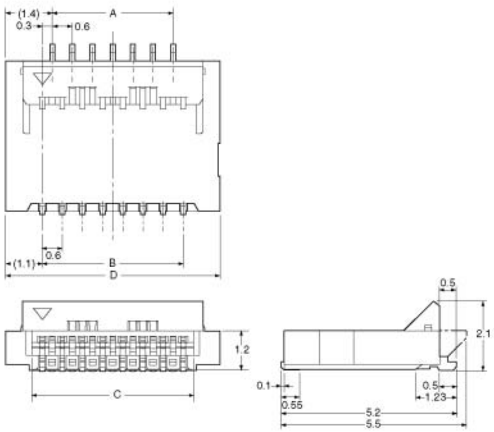
■ Ordering Information

Poles (see note 1)	Model	Quantity per reel (see note 2)
17	**XF2B-1745-31A**	1,500
23	**XF2B-2345-31A**	
31	**XF2B-3145-31A**	
33	**XF2B-3345-31A**	

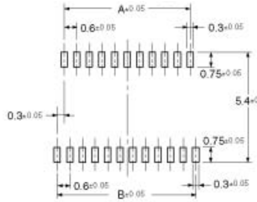
Note 1: Consult your OMRON representative for enquiries related to pin-number specifications.
Note 2: Order an integer multiple of the quantity per reel.

■ Dimensions

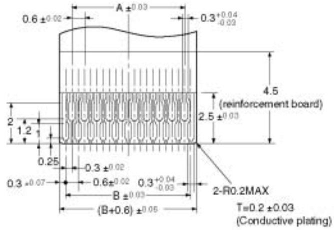
XF2B-□□45-31A



Printed Circuit Board Matching Dimensions (Top View)



Applicable FPC Dimensions



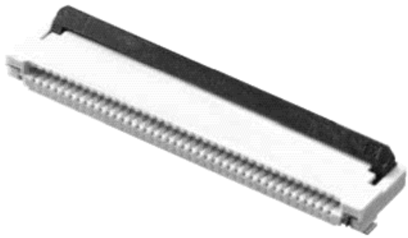
■ Table of Dimensions

Poles	Model	A	B	C	D
17	**XF2B-1745-31A**	4.2	4.8	5.5	7.0
23	**XF2B-2345-31A**	6.0	6.6	7.3	8.8
31	**XF2B-3145-31A**	8.4	9.0	9.7	11.2
33	**XF2B-3345-31A**	9.0	9.6	10.3	11.8

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

■ Reduced-area type requires Approx. 27% less on-board mounting area than the XF2H

- ■ Short body with depth of 5.9mm (with slider closed).
- ■ Environment-friendly type that eliminates lead from solder is available as a standard product.
- ■ Double-sided (upper and lower) contact structure enables component reductions.
- ■ Applicable FPC thickness, t = 0.3mm.



Specifications

Rated Current	0.5A AC/DC
Rated Voltage	50V AC/DC
Contact resistance	40 mΩ max. (max. 20 mV, max. 100 mA max.)
Insulation resistance	100 MΩ min. (at 250 VDC)
Withstand voltage	250V AC 1 min. (leakage current: 1 mA max.)
Insertion tolerance	20 times
Ambient temperature	-30 to +85°C (with no icing or condensation)

■ Materials/Finish

Housing	LCP resin (UL94V-0)/natural
Slider	LCP resin (UL94V-0)/black
Contact	Spring copper alloy/nickel spring substrate (2 µm), tin-alloy plating (1.5 µm)

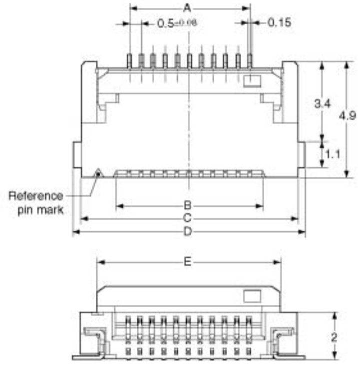
■ Ordering Information

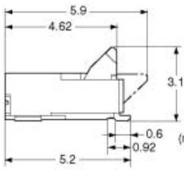
Poles (see note 1)	Model	Quantity per reel (see note 2)
10	**XF2M-1015-1DL**	1500
20	**XF2M-2015-1DL**	
30	**XF2M-3015-1DL**	
32	**XF2M-3215-1DL**	
34	**XF2M-3415-1DL**	
36	**XF2M-3615-1DL**	
40	**XF2M-4015-1DL**	
50	**XF2M-5015-1DL**	

Note 1: Consult your OMRON representative for enquiries related to pin-number and gold-plated contacts specifications.
Note 2: Order an integer multiple of the quantity per reel.

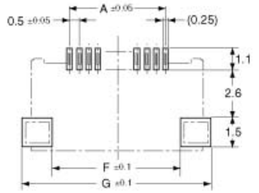
■ Dimensions

XF2M-□□15-1F

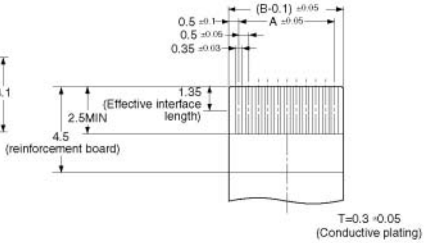




Printed Circuit Board Matching Dimensions (Top View)



Applicable FPC Dimensions



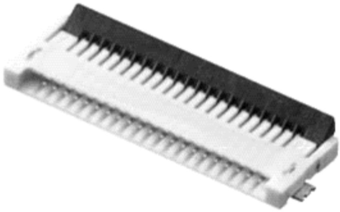
■ Table of Dimensions

Poles	Model	A	B	C	D	E	F	G
10	**XF2M-1015-1F**	4.5	5.6	8.5	9.1	7.1	6.1	9.5
20	**XF2M-2015-1F**	9.5	10.6	13.5	14.1	12.1	11.1	14.5
30	**XF2M-3015-1F**	14.5	15.6	18.5	19.1	17.1	16.1	19.5
32	**XF2M-3215-1F**	15.5	16.6	19.5	20.1	18.1	17.1	20.5
34	**XF2M-3415-1F**	16.5	17.6	20.5	21.1	19.1	18.1	21.5
36	**XF2M-3615-1F**	17.5	18.6	21.5	22.1	20.1	19.1	22.5
40	**XF2M-4015-1F**	19.5	20.6	23.5	24.1	22.1	21.1	24.5
50	**XF2N-5015-1F**	24.5	25.6	28.5	29.1	27.1	26.1	29.5

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

■ Greater Freedom of Board Design with 0.9 mm Profile

- ■ Backlock mechanism makes FPC mounting significantly easier.
- ■ Double-sided (upper and lower) contact structure enables component reductions.
- ■ Applicable FPC thickness, t = 0.2mm. Gold-plated type.
- ■ Use FPCs with the construction recommended by OMRON. (Refer to specifications for details.)



Specifications

Rated Current	0.3A AC/DC
Rated Voltage	50V AC/DC
Contact resistance	40 mΩ max. (max. 20 mV, max. 100 mA max.)
Insulation resistance	100 MΩ min. (at 250 VDC)
Withstand voltage	250V AC 1 min. (leakage current: 1 mA max.)
Insertion tolerance	20 times
Ambient temperature	-30 to +85°C (with no icing or condensation)

■ Materials/Finish

Housing	LCP resin (UL94V-0)/natural
Slider	LCP resin (UL94V-0)/black
Contact	Spring copper alloy/nickel substrate (1.5µm), gold-plated contacts (0.15 µm)
Hold Down	Spring copper alloy/fused-tin plating (1.5 µm)

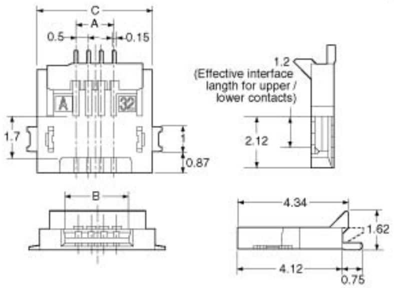
■ Ordering Information

Poles (see note 1)	Model	Quantity per reel (see note 2)
21	**XF2N-2115-3**	3,000
32	**XF2N-3215-3**	

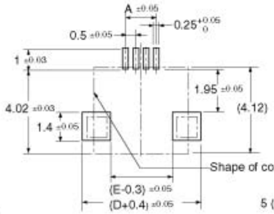
Note 1: Consult your OMRON representative for enquiries related to pin-number specifications.
Note 2: Order an integer multiple of the quantity per reel.

■ Dimensions

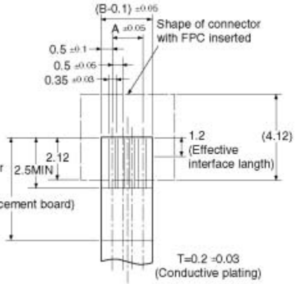
XF2N-□□15-3



Printed Circuit Board Matching Dimensions (Top View)



Applicable FPC Dimensions



■ Table of Dimensions

Poles	Model	A	B	C	D	E
21	**XF2N-2115-3**	10.0	11.1	13.0	13.8	11.8
32	**XF2N-3215-3**	15.5	16.6	18.5	19.3	17.3

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

OMRON
2005 Catalogue