Solid State Relays (Single-phase)
G3PB

Compact, Slim-profile SSR with Heat Sink, Offering Heater Control for 480-VAC Rated Loads

- Compact design achieved by optimizing heat sink shape.
- DIN-rail mounting possible in addition to screw mounting.
- Conforms to CE Marking, EN (VDE approval), CSA, and VDE standards.
  (UL pending)

Note: Refer to *Precautions* on page H-41.

Model Number Structure

■ Model Number Legend

G3PB-□□□-□□-□
1 2 3 4 5 6 7

1. **Basic Model Name**
   G3PB: Solid State Relay
2. **Rated Load Power Supply Voltage**
   5: 480 VAC
3. **Rated Load Current**
   15: 15 A
   25: 25 A
   35: 35 A
   45: 45 A
4. **Terminal Type**
   B: Screw terminals
5. **Number of Elements**
   Blank: Single-phase models
6. **Construction**
   Blank: DIN-rail mounting and built-in heat sink
7. **Certification**
   VD: Certified by CSA and VDE

Ordering Information

■ List of Models

Isolation method	Zero cross function	Operation indicator	Rated input voltage	Rated output load (See note.)	Model number
Phototriac coupler	Yes	Yes (yellow)	12 to 24 VDC	15 A, 200 to 480 VAC	G3PB-515B-VD 12 to 24 VDC
				25 A, 200 to 480 VAC	G3PB-525B-VD 12 to 24 VDC
				35 A, 200 to 480 VAC	G3PB-535B-VD 12 to 24 VDC
				45 A, 200 to 480 VAC	G3PB-545B-VD 12 to 24 VDC

Note: The applicable load current varies depending on the ambient temperature. For details, refer to *Load Current vs. Ambient Temperature* in Engineering Data.

■ Accessories (Order Separately)

Mounting DIN-rail	50 cm (1) x 7.3 mm (t)	PFP-50N
	1 m (1) x 7.3 mm (t)	PFP-100N
	1 m (1) x 16 mm (t)	PFP-100N2

Specifications

■ Ratings (at an Ambient Temperature of 25°C)

Input

Item	Common
Rated voltage	12 to 24 VDC
Operating voltage range	9.6 to 30 VDC
Rated input current	7 mA max.
Must operate voltage	9.6 VDC max.
Must release voltage	1 VDC min.

Output

Item	G3PB-515B-VD	G3PB-525B-VD	G3PB-535B-VD	G3PB-545B-VD
Rated load voltage	200 to 480 VAC (50/60 Hz)			
Load voltage range	180 to 528 VAC (50/60 Hz)			
Applicable load current (See note.)	0.1 to 15 A (at 40°C)	0.1 to 25 A (at 40°C)	0.5 to 35 A (at 25°C)	0.5 to 45 A (at 25°C)
Inrush current resistance (peak value)	150 A (60 Hz, 1 cycle)	220 A (60 Hz, 1 cycle)	440 A (60 Hz, 1 cycle)	
Permissible I^2t (half 60-Hz wave)	128 A^2s	1,350 A^2s		6,600 A^2s
Applicable load (with Class-1 AC resistive load)	6 kW max. (at 400 VAC)	10 kW max. (at 400 VAC)	14 kW max. (at 400 VAC)	18 kW max. (at 400 VAC)

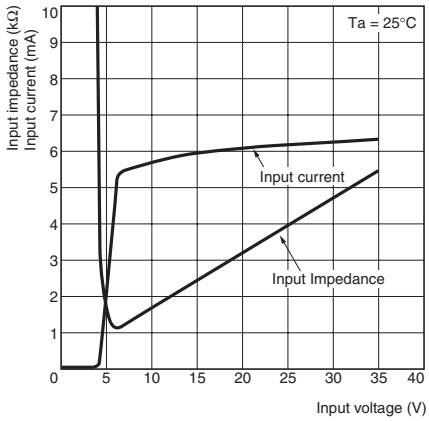
Note: The applicable load current varies depending on the ambient temperature. For details, refer to *Load Current vs. Ambient Temperature* in Engineering Data.

■ Characteristics

Item	G3PB-515B-VD	G3PB-525B-VD	G3PB-535B-VD	G3PB-545B-VD
Operate time	1/2 of load power source cycle + 1 ms max.			
Release time	1/2 of load power source cycle + 1 ms max.			
Output ON voltage drop	1.8 V (RMS) max.			
Leakage current	20 mA max. (at 480 VAC)			
Insulation resistance	100 MΩ min. (at 500 VDC)			
Dielectric strength	2,500 VAC, 50/60 Hz for 1 min			
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.375-mm single amplitude (0.75-mm double amplitude) (Mounted to DIN-rail)			
Shock resistance	Destruction: 294 m/s^2 (DIN-rail mounting)			
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%			
Certified standards	CSA22.2 No. 14 EN60947-4-3			
EMC	Emission — EN55011 Group 1 Class B Immunity — ESD — IEC947-4-3, EN61000-4-2: 4 kV contact discharge, 8 kV air discharge Immunity — Electromagnetic — IEC947-4-3, EN61000-4-3: 10 V/m (80 MHz to 1 GHz) Immunity — EFT — IEC947-4-3, EN61000-4-4: 2 kV AC power-signal line Immunity — Surge transient — IEC947-4-3, EN61000-4-5: Normal mode ±1 kV, Common mode ±2 kV Immunity — RF disturbance — IEC947-4-3, EN61000-4-6: 10 V (0.15 to 80 MHz) Immunity — Dips — IEC947-4-11			
Weight	Approx. 240 g		Approx. 400 g	

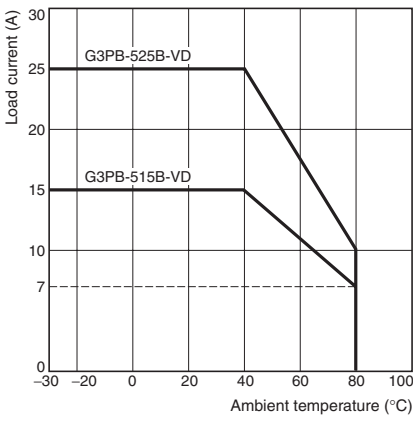
Engineering Data

Input Voltage vs. Input Impedance and Input Voltage vs. Input Current

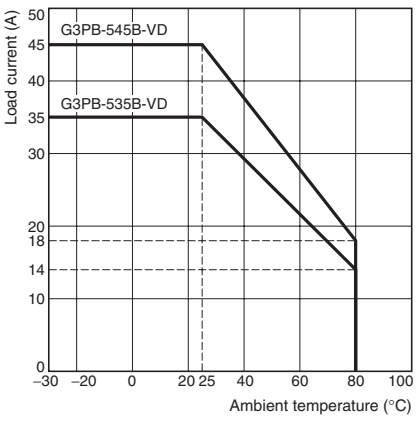


Load Current vs. Ambient Temperature

G3PB-515B-VD, G3PB-525B-VD



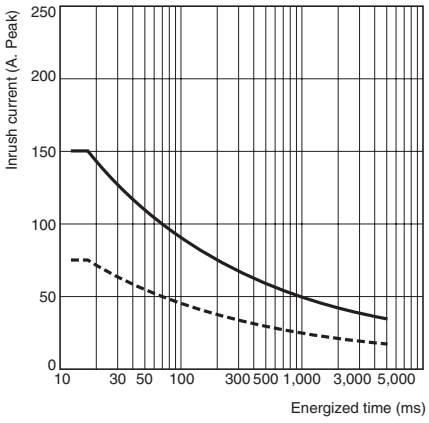
G3PB-535B-VD, G3PB-545B-VD



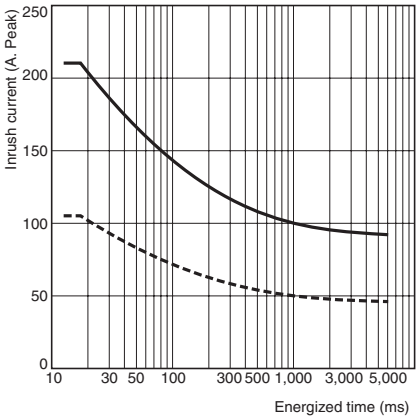
One Cycle Surge Current: Non-repetitive

Keep the inrush current to below the inrush current resistance value (i.e., below the broken line) if it occurs repetitively.

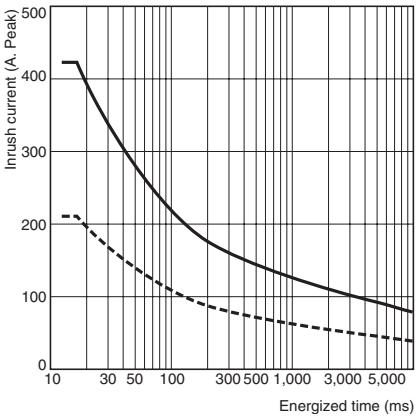
G3PB-515B-VD



G3PB-525B-VD

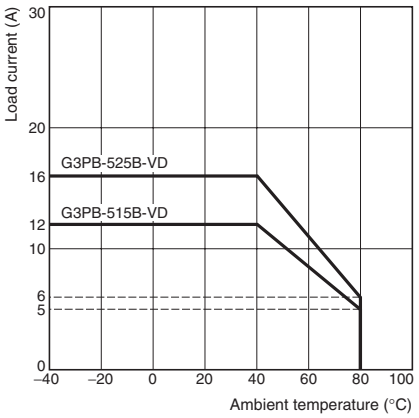


G3PB-535B-VD, G3PB-545B-VD

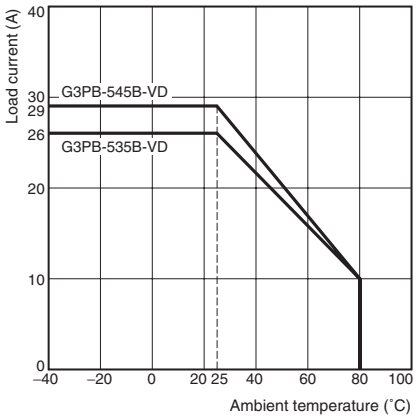


Close Mounting (8 Relays)

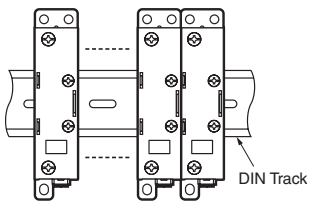
G3PB-515B-VD, G3PB-525B-VD



G3PB-535B-VD, G3PB-545B-VD



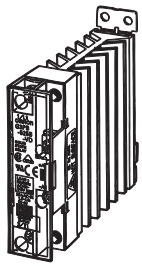
Close Mounting Example

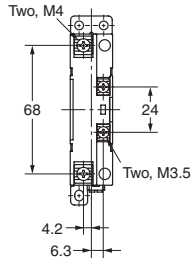


Dimensions

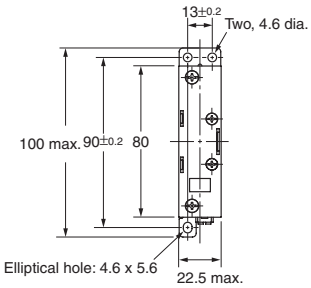
Note: All units are in millimeters unless otherwise indicated.

G3PB-515B-VD
G3PB-525B-VD

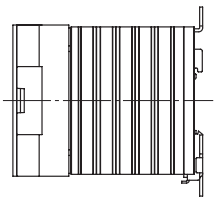




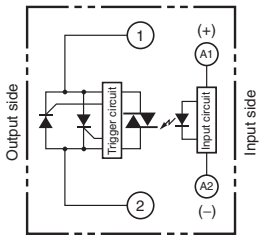
Note: Without terminal cover.



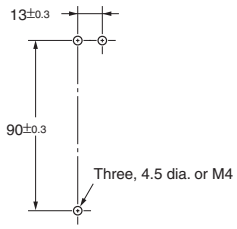
Note: With terminal cover.

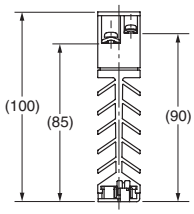


Terminal Arrangement/ Internal Circuit Diagram

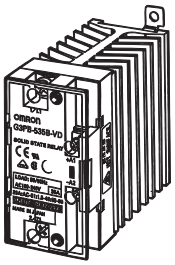


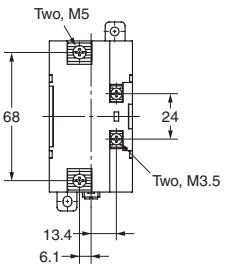
Mounting Holes



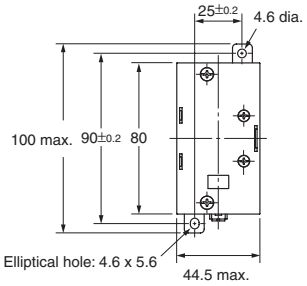


G3PB-535B-VD
G3PB-545B-VD

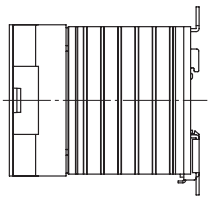




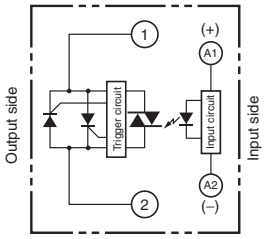
Note: Without terminal cover.



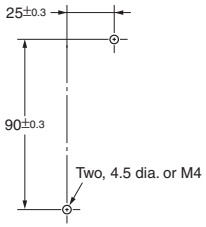
Note: With terminal cover.

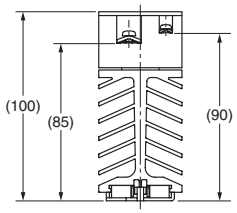


Terminal Arrangement/ Internal Circuit Diagram



Mounting Holes

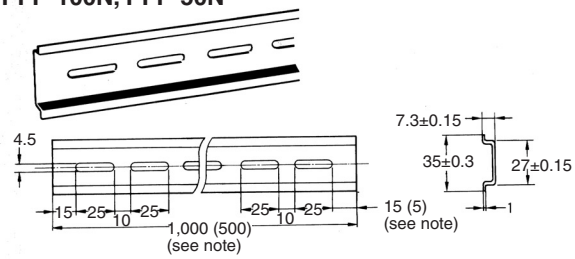




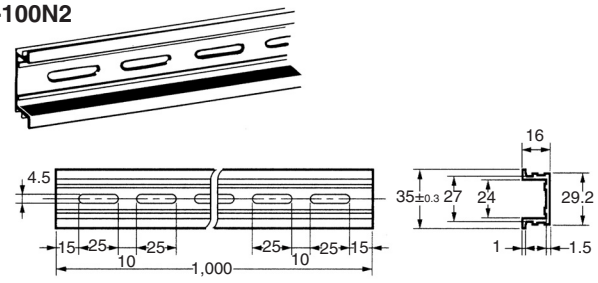
Accessories (Order Separately)

Mounting Tracks

PFP-100N, PFP-50N



PFP-100N2



Note: Values in parentheses indicate dimensions for the PFP-50N.

Safety Precautions

⚠ CAUTION

Touching the charged section may occasionally cause minor electric shock. Do not touch the G3PB terminal section (the charged section) when the power supply is ON. Be sure to attach the cover before use.

The G3PB and heat sink will be hot and may occasionally cause minor burns. Do not touch the G3PB or the heat sink either while the power supply is ON, or immediately after the power is turned OFF.

The internal snubber circuit is charged and may occasionally cause minor electric shock. Do not touch the G3PB's main circuit terminals immediately after the power is turned OFF.

Be sure to conduct wiring with the power supply turned OFF, and always attach the terminal cover after completing wiring. Touching the terminals when they are charged may occasionally result in minor electric shock.

Do not apply a short-circuit to the load side of the G3PB. The G3PB may rupture. To protect against short-circuit accidents, install a protective device, such as a quick-burning fuse, on the power supply line.

■ Precautions for Safe Use

Although OMRON continuously strives to improve the quality and reliability of our relays, the G3PB contains semiconductors, which are generally prone to occasional malfunction and failure. Maintaining safety is particularly difficult if a relay is used outside of its ratings. Always use the G3PB within the rated values. When using the G3PB, always design the system to ensure safety and prevent human accidents, fires, and social damage even in the event of G3PB failure, including system redundancy, measures to prevent fires from spreading, and designs to prevent malfunction.

1. Do not apply voltage or current above the rated values to the G3PB terminals. Doing so may cause G3PB malfunction or fire damage.

2. Heat Dissipation

- Do not obstruct the airflow to the G3PB or heat sink. Heat generated from an G3PB error may occasionally cause the output element to short, or cause fire damage.
- Be sure to prevent the ambient temperature from rising due to the heat radiation of the G3PB. If the G3PB is mounted inside a panel, install a fan so that the interior of the panel is fully ventilated.
- Be sure to install the G3PB using the specified mounting direction. Otherwise, heat generated from a G3PB error may cause the output element to short or burn.
- Do not use the G3PB if heat dissipation fins have been bent as a result of, for example, dropping the G3PB. If used in this state, the SSR may be damaged due to the decreased heat dissipation capacity.
- When installing the G3PB directly into a control panel, use a panel material with low thermal resistance, such as aluminum or steel. If a material with high thermal resistance, such as wood, is used, heat generated by the G3PB may cause fire or burning.

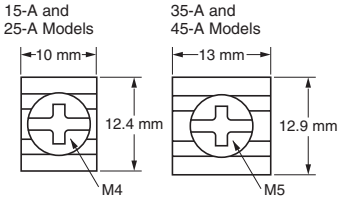
3. Perform wiring and tighten screws correctly, according to the following precautions. If wiring is incorrect or screws are not tightened sufficiently, the G3PB may be damaged by abnormal heat generated when the power is turned ON.

- Make sure that all lead wires are appropriate for the load current. Heat generated by a wiring error may result in burning.
- Do not operate if the screws on the output terminal are loose. Heat generated by a terminal error may result in fire damage.

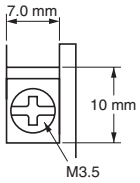
Wiring

- When using crimp terminals, refer to the terminal clearances shown below.

Output Terminal Section (Single-phase Models)



Input Terminal Section



- Output terminals are charged even when the Relay is turned OFF. Touching the terminals may result in electric shock. To isolate the Relay from the power supply, install an appropriate circuit breaker between the power supply and the Relay.

Tightening Torque

Section	Screw terminal diameter	Tightening torque
Input terminal	M3.5	0.59 to 1.18 N·m
Output terminal	M4	0.98 to 1.47 N·m
	M5	1.47 to 2.45 N·m

- Make sure that non-conducting materials are not caught when tightening the terminal screws. Otherwise, the heat generated from a terminal error may result in burning.
- Be sure to use M5 crimp terminals that are an appropriate size for the wire diameter when wiring G3PB with a load current of 35 A min.
- Do not use wires with a damaged sheath. Doing so may result in electric shock or a short circuit.
- Do not wire power lines or high-tension lines along with the lines of the G3PB in the same conduit or duct. Doing so may result in damage or malfunction due to induction.
- Use wires of an appropriate length. Wires of insufficient length may result in malfunction, failure, or burning due to induction.
- Mount the DIN-rail securely. Not doing so may cause the DIN-rail to fall.
- Make sure that the G3PB clicks securely into place when it is mounted to the DIN-rail. Not doing so may cause the G3PB to fall.
- Do not install the G3PB using hands that are dirty with oil or metal dust. Doing so may result in a malfunction.
- Tighten the heat sink screws securely to a tightening torque of 0.98 to 1.47 N·m.

4. Usage Conditions

- Select a load within the rated values. Not doing so may result in malfunction, failure, or burning.
- Use a power supply within the rated frequency range. Not doing so may result in malfunction, failure, or burning.

5. Do not transport the G3PB under the following conditions. Doing so may result in malfunction, failure, or deterioration of performance characteristics.

- When the G3PB is wet.
- During high temperatures or high humidity.
- When the G3PB is not packaged.

6. Operating and Storage Locations
Do not use or store the G3PB in the following locations. Doing so may result in damage, malfunction, or deterioration of performance characteristics.

- Do not use or store in locations subject to direct sunlight.
- Do not use in locations subject to ambient temperatures outside the range −30 to 80°C.
- Do not use in locations subject to relative humidity outside the range 45% to 85% or locations subject to condensation as the result of severe changes in temperature.
- Do not store in locations subject to ambient temperatures outside the range −30 to 100°C.
- Do not use or store in locations subject to corrosive or flammable gases.
- Do not use or store in locations subject to dust (especially iron dust) or salts.
- Do not use or store in locations subject to shock or vibration.
- Do not use or store in locations subject to exposure to water, oil, or chemicals, or in locations subject to rain or water drops.
- Do not use or store in locations subject to high temperatures or high humidity.
- Do not use or store in locations subject to static electricity or noise.
- Do not use or store in locations subject to strong electric or magnetic fields.
- Do not use or store in locations subject to radioactivity.

■ Precautions for Correct Use

Before Actual Operation

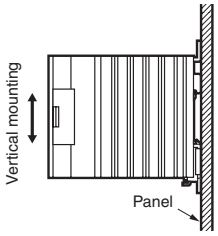
1. The G3PB in operation may cause an unexpected accident. Therefore it is necessary to test the G3PB under the variety of conditions that are possible. For example, the characteristics of the G3PB must always be considered in terms of the differences in characteristics between individual G3PBs.

2. Unless otherwise indicated, the rated values in this catalog have all been tested according to JIS C5442 standards in a temperature range between 15°C and 30°C, a relative humidity range between 25% and 85%, and an atmospheric pressure range between 88 and 106 kPa. To confirm the ratings of specific G3PBs, the same operating environment conditions must be provided in addition to the load conditions.

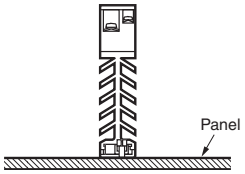
Mounting Method

Mount the DIN-rail-mounting G3PBs firmly to the DIN-rail and secure End Plates on both sides to prevent the G3PB falling due to its heavy weight. Also mount direct-mounting G3PBs securely in the panel.

Vertical Mounting



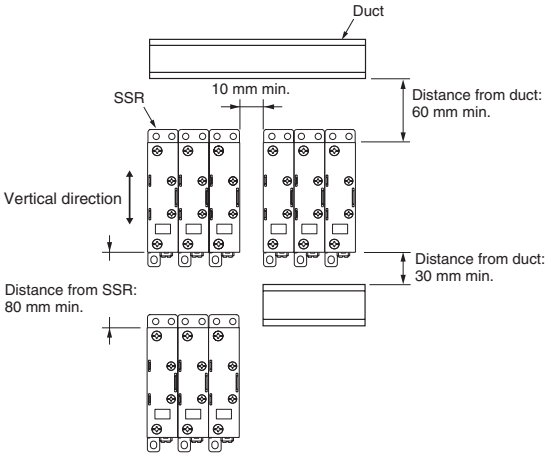
Horizontal Mounting



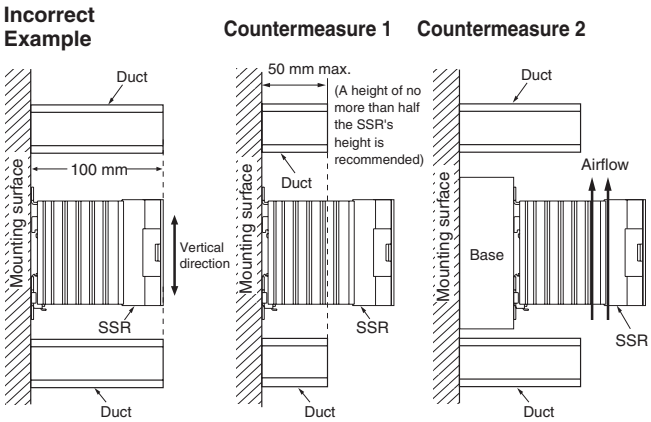
Note: Make sure that the load current is 50% of the rated load current when the G3PB is mounted horizontally. For details on close mounting, refer to the related information under performance characteristics.

SSR Mounting Pitch

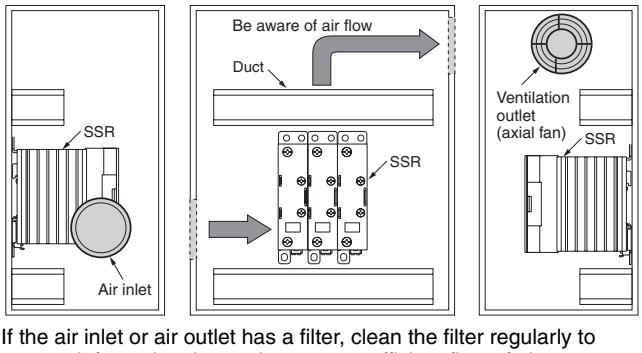
Panel Mounting



Relationship between SSRs and Ducts



Ventilation Outside the Control Panel



If the air inlet or air outlet has a filter, clean the filter regularly to prevent it from clogging and ensure an efficient flow of air.

Do not locate any objects around the air inlet or air outlet, otherwise the objects may obstruct the proper ventilation of the control panel.

A heat exchanger, if used, should be located in front of the SSR Units to ensure the efficiency of the heat exchanger.

Please reduce the ambient temperature of SSRs.

The rated load current of an SSR is measured at an ambient temperature of 25°C or 40°C.

An SSR uses a semiconductor in the output element. This causes the temperature inside the control panel to increase due to heating resulting from the passage of electrical current through the load. To restrict heating, attach a fan to the ventilation outlet or air inlet of the control panel to ventilate the panel. This will reduce the ambient temperature of the SSRs and thus increase reliability. (Generally, each 10 °C reduction in temperature will double the expected life.)

Load current (A)	15 A	25 A	35 A	45 A
Required number of fans per SSR	0.23	0.39	0.54	0.70

Example: For 10 SSRs with load currents of 15 A,
$0.23 \times 10 = 2.3$
Thus, 3 fans would be required.

Size of fans: 92 mm^2, Air volume: 0.7 m^3/min,
Ambient temperature of control panel: 30°C

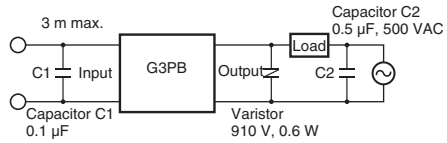
If there are other instruments that generate heat in the control panel other than SSRs, additional ventilation will be required.

Operating Conditions

- Do not apply currents exceeding the rated current otherwise, the temperature of the G3PB may rise excessively.
- Be sure to install protective devices on the power supply side, such as fuses and non-fuse breakers, as protection against accidents due to short-circuiting.
- Do not apply overvoltages to input or output circuits. Doing so may cause Relay failure or burning.

EMC Directive Compliance

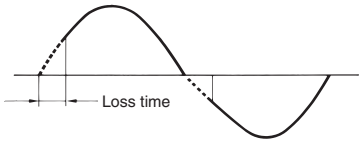
The G3PB complies with EMC Directives when capacitors and varistors are used, as shown in the following diagram.



- The capacitor C1 must be connected between the input terminals for G3PBs with DC inputs.
- The capacitor C2 must be connected to the load power supply outputs.
- C1 and C2 must not be electrolytic capacitors.
- The varistor must be connected between the output terminals of the G3PB.
- The input cable must be no longer than 3 m.

Loss Time

If the load power supply is used under a low voltage or current, the loss time will increase. Before operating the G3PB, make sure that this loss time will not cause problems.



Precautions on Operating and Storage Environments

1. Operating Ambient Temperature

The rated value for the ambient operating temperature of the G3PB is for when there is no heat build-up. For this reason, under conditions where heat dissipation is not good due to poor ventilation, and where heat may build up easily, the actual temperature of the G3PB may exceed the rated value resulting in malfunction or burning.

When using the G3PB, design the system to allow heat dissipation sufficient to stay below the Load Current vs. Ambient Temperature characteristic curve. Note also that the ambient temperature of the G3PB may increase as a result of environmental conditions (e.g., climate or air-conditioning) and operating conditions (e.g., mounting in an airtight panel).

2. Transportation

Do not drop the G3PB or subject the G3PB to abnormal vibration or shock during transport and installation. Doing so may result in malfunction, failure, or deterioration of performance characteristics.

3. Vibration and Shock

Do not subject the G3PB to excessive vibration or shock. Otherwise the SSR may malfunction and internal components may be damaged.

To prevent the G3PB from abnormal vibration, do not install the SSR in locations or by means that will subject it to vibration from other devices, such as motors.

4. Solvents

Do not allow the G3PB to come in contact with solvents, such as thinners or gasoline. Doing so will dissolve the markings on the G3PB.

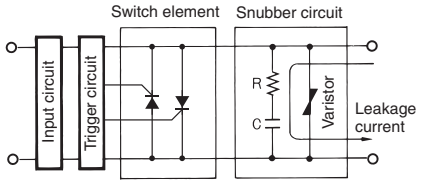
5. Oil

Do not allow the SSR terminal cover to come in contact with oil. Doing so will cause the cover to crack and become cloudy.

Operation

1. Leakage Current

A leakage current flows through a snubber circuit in the G3PB even when there is no power input. Therefore, always turn OFF the power to the input or load and check that it is safe before replacing or wiring the G3PB.



2. Screw Tightening Torque

Tighten the G3PB terminal screws to the rated torque. If the screws are not tightened sufficiently, the G3PB may be damaged by heat generated when the power is ON.

3. Installation

Do not install the G3PB using hands that are dirty with oil or metal dust. Doing so may result in a malfunction.

4. Do Not Drop

Be careful not to drop the product during installation, mounting, or otherwise handling the G3PB.

Warranty and Application Considerations

Read and Understand this Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

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Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Disclaimers

PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON *Warranty and Limitations of Liability.*

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased product.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. J152-E2-01A

In the interest of product improvement, specifications are subject to change without notice.