

Switching Power Supplies

PS5R-V Series



STANDARDS COMPLIANCE

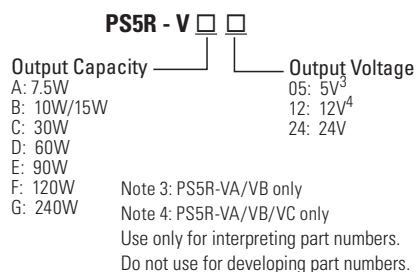
| Applicable Standards | Mark | File No. or Organization |
|--|------|--|
| UL508 UL1310 ¹ ANSI/ISA 12.12.01 CSA C22.2 No.107.1 CSA C22.2 No.213 CSA C22.2 No.223 ¹ | | UL/c-UL Listed File No. E467154, E177168 |
| EN60950-1 EN50178 EN61204-3 EN50581 | | TÜV SÜD ² EU Low Voltage Directive, EMC Directive RoHS Directive |
| SEMI F47 | — | EPRI |

Note 1: PS5R-VA/VB/VC/VD/VE only
Note 2: EN60950-1, EN50178 only

PART NUMBERS

| Output Capacity | Part Number | Input Voltage | Output Voltage | Output Current |
|-----------------|-------------|---|----------------|----------------|
| 7.5W | PS5R-VA05 | 100 to 240V AC (Voltage range: 85 to 264V AC / 100 to 370V DC) | 5V | 1.5A |
| | PS5R-VA12 | | 12V | 0.6A |
| | PS5R-VA24 | | 24V | 0.3A |
| 10W | PS5R-VB05 | | 5V | 2.0A |
| | PS5R-VB12 | | 12V | 1.3A |
| 15W | PS5R-VB24 | | 24V | 0.65A |
| | PS5R-VC12 | | 12V | 2.5A |
| 30W | PS5R-VC24 | | 24V | 1.3A |
| | PS5R-VD24 | | 24V | 2.5A |
| 60W | PS5R-VE24 | | 24V | 3.75A |
| 90W | PS5R-VE24 | 24V | 3.75A | |
| 120W | PS5R-VF24 | 24V | 5.0A | |
| 240W | PS5R-VG24 | 24V | 10.0A | |

Part Number Structure



PRODUCT DESCRIPTION

DIN-rail mount switching power supplies with global approvals for both industrial and hazardous locations

KEY FEATURES

- Compact size preserves panel space
- Slim size (width):
22.5mm (10W/15W/30W)
36mm (60W/90W)
46mm (120W)
60mm (240W)
- Universal Voltage Input:
85-264V AC/100-370V DC
- Wide operating temperature range
- Spring-up terminals accept ring & fork terminals
- Approved for use in Class I Division 2 hazardous locations
- Can be installed in 6 directions
- 10W ~ 90W meet NEC Class 2 output ratings
- Overcurrent protection with auto-reset
- Meets SEMI F47 Sag Immunity (208V AC input)
- RoHS compliant
- Five-year factory warranty



SPECIFICATIONS

| Model | 5V DC output | PS5R-VA05 | PS5R-VB05 | - | - | - | - | - | |
|--|---|---|---|---|--|--|---|------------------------------|------------------------------|
| | 12V DC output | PS5R-VA12 | PS5R-VB12 | PS5R-VC12 | - | - | - | - | |
| | 24V DC output | PS5R-VA24 | PS5R-VB24 | PS5R-VC24 | PS5R-VD24 | PS5R-VE24 | PS5R-VF24 | PS5R-VG24 | |
| Output Capacity | | 7.5W | 15W (5V Model is 10W) | 30W | 60W | 90W | 120W | 240W | |
| Rated Input Voltage (Single-phase two-wire) ¹ | | 100 to 240V AC (Voltage range: 85 to 264V AC/100 to 370V DC) (Load ≤ 80% at 100-105V DC) | | | | | | | |
| Frequency | | 50/60 Hz | | | | | | | |
| Input | Input Current (Typ.) | 100V AC | 5V: 0.20A 12V, 24V: 0.18A | 5V: 0.25A 12V, 24V: 0.35A | 0.7A | 1.3A | 1.1A | 1.4A | 2.7A |
| | | 230V AC | 5V: 0.12A 12V, 24V: 0.10A | 5V: 0.14A 12V, 24V: 0.19A | 0.3A | 0.8A | 0.6A | 0.7A | 1.2A |
| | Inrush Current (Typ.) (Ta=25°C, cold start) | 100V AC | 15A | 18A | | | | | |
| | | 230V AC | 36A | 45A | | | | | |
| | Leakage Current | 120V AC | 0.5mA max. | | | | | | |
| | | 230V AC | 1.0mA max. | | | | | | |
| Efficiency (Typ.) (at rated output) ² | 100V AC | 5V: 74%, 12V: 79%, 24V: 80% | 5V: 77%, 12V: 82%, 24V: 84% | 12V: 83%, 24V: 85% | 86% | 88% | | 89% | |
| | 230V AC | 5V: 73%, 12V: 77%, 24V: 76% | 5V: 73%, 12V: 80%, 24V: 81% | 12V: 85%, 24V: 87% | 86% | 89% | | 90% | |
| Power Factor (Typ.) | 100V AC | — | — | — | — | 0.99 | | — | |
| | 230V AC | — | — | — | — | 0.86 | 0.92 | 0.96 | |
| Rated Voltage/Current | | 5V/1.5A, 12V/0.6A, 24V/0.3A | 5V/2.0A ³ , 12V/1.3A, 24V/0.65A | 12V/2.5A, 24V/1.3A | 24V/2.5A | 24V/3.75A | 24V/5A | 24V/10A | |
| Adjustable Voltage Range | | ±10% | | | | ±5% | | ±10% | |
| Output Holding Time (Typ.) (at rated output) | 100V AC | 45ms | 5V: 53ms, 12V: 34ms, 24V: 36ms | 12V: 13ms, 24V: 15ms | 13ms | 20ms | 30ms | | |
| | 230V AC | 285ms | 5V: 330ms 12V: 215ms 24V: 230ms | 12V: 110ms 24V: 110ms | 105ms | 30ms | 33ms | 40ms | |
| Start Time (at rated input and output) | | 500ms max. | 500ms max. | 600ms max. | 800ms max. | | 700ms max. | 800ms max. | |
| Rise Time (at rated input and output) | | 5V, 12V: 200ms max 24V: 250ms max | 5V, 12V: 200ms max. 24V: 250ms max. | 200ms max. | | | | | |
| Output | Input Fluctuation | | 0.4% max. | | | | | | |
| | Load Fluctuation | | 5V: 2.5% max. 12V, 24V: 1.0% max. | | | 1.0% max. | | | |
| | Temperature Change | | 0.04%/°C max. (-10 to +65°C) | 0.05%/°C max. (-10 to +65°C) | 12V: 0.05%/°C max. (-10 to +50°C) 24V: 0.05%/°C max. (-10 to +55°C) | 0.05%/°C max. (-10 to +55°C) | 0.05%/°C max. (-10 to +50°C) | 0.05%/°C max. (-25 to +55°C) | 0.05%/°C max. (-25 to +50°C) |
| | Regulation | Ripple (including noise) | 5V: 8% p-p max. (-25 to -10°C) 12V: 6% p-p max. (-25 to -10°C) 24V: 4% p-p max. (-25 to -10°C) | 5V: 8% p-p max. (-25 to -10°C) 12V: 6% p-p max. (-25 to -10°C) 24V: 4% p-p max. (-25 to -10°C) | 12V: 6% p-p max. (-25 to -10°C) 24V: 4% p-p max. (-25 to -10°C) | 4% p-p max. (-25 to -10°C) | | | |
| | | | 5V: 5% p-p max. (-10 to +0°C) 12V: 2.5% p-p max. (-10 to +0°C) 24V: 1.5% p-p max. (-10 to +0°C) | 5V: 5% p-p max. (-10 to +0°C) 12V: 2.5% p-p max. (-10 to +0°C) 24V: 1.5% p-p max. (-10 to +0°C) | 12V: 2.5% p-p max. (-10 to +0°C) 24V: 1.5% p-p max. (-10 to +0°C) | 1.5% p-p max. (-10 to +0°C) | | | |
| | | | 5V: 2.5% p-p max. (0 to +65°C) 12V: 1.5% p-p max. (0 to +65°C) 24V: 1% p-p max. (0 to +65°C) | 5V: 2.5% p-p max. (0 to +65°C) 12V: 1.5% p-p max. (0 to +65°C) 24V: 1% p-p max. (0 to +65°C) | 12V: 1.5% p-p max. (0 to +50°C) 24V: 1% p-p max. (0 to +55°C) | 1% p-p max. (0 to +55°C) | 1% p-p max. (0 to +50°C) | 1% p-p max. (0 to +55°C) | 1% p-p max. (0 to +50°C) |
| Overcurrent Protection | | 105% min. (auto reset) | | | | 101% min. (auto reset) | | 105% min. (auto reset) | |
| Operation Indicator | | LED (green) | | | | | | | |
| Dielectric Strength | Between input and output terminals | | 3,000V AC, 1 minute | | | | | | |
| | Between input and ground terminals | | 2,000V AC, 1 minute | | | | | | |
| | Between output and ground terminals | | 500V AC, 1 minute | | | | | | |
| Insulation Resistance | | Between input and output terminals: 100MΩ min. (500V DC megger) Between input and ground terminals: 100MΩ min. (500V DC megger) | | | | | | | |
| Operating Temperature ⁴ (No freezing) | | -25 to +75°C | | -25 to +70°C | | -25 to +65°C | | | |
| Operating Humidity (no condensation) | | 20 to 90% RH | | | | | | | |
| Storage Temperature (No freezing) | | -25 to +75°C | | | | | | | |
| Storage Humidity (no condensation) | | 20 to 90% RH | | | | | | | |
| Vibration Resistance | | 10 to 55Hz, amplitude 0.375mm, 2 hours each in 3 axes (when used with BNL6 end clips) | | | 10 to 55Hz, amplitude 0.33mm, 2 hours each in 3 axes (when used with BNL6 end clips) | | 10 to 55Hz, amplitude 0.375mm, 2 hours each in 3 axes (when used with BNL8 end clips) | | |
| Shock Resistance | | 300 m/s ² (30G), 3 times each in 6 directions | | | | | | | |
| Expected Life ⁵ | | 8 years minimum (at the rated input, 50% load, operating temperature +40°C, standard mounting direction) | | | | | | | |
| EMC | EMI | | EN61204-3 (Class B) | | | | | | |
| | EMS | | EN61204-3 (industrial) | | | | | | |
| Safety Standards | | UL508 (Listing), UL1310 Class 2, ANSI/ISA-12.12.01 CSA C22.2 No. 107.1, 213, 223 EN60950-1, EN50178 | | | | UL508 (Listing) ANSI/ISA-12.12.01 CSA C22.2 No. 107.1, 213 EN60950-1, EN50178 | | | |
| Other Standard | | SEMI F47 (at 208V AC input only) | | | | | | | |
| Degree of Protection | | IP20 (EN60529) | | | | | | | |
| Dimensions (mm) | | 75H × 45W × 70D | 90H × 22.5W × 95D | | 95H × 36W × 108D | | 115H × 46W × 121D | 125H × 60W × 125D | |
| Weight (approx.) | | 130g | 140g | 150g | 260g | 310g | 470g | 960g | |
| Terminal Screw | | M3.5 | | | | | | | |

*At normal temperature and humidity unless otherwise specified.

Note 1: DC input voltage is not subject to safety standards. When using on DC input, connect a fuse to the input terminal for DC input protection.

Note 2: Under stable state.

Note 3: PS5R-VB05 (5V DC/2.0A) is 10W (Up to 3.0A at Ta = 0 to 40°C. Not subject to safety standards above 2.0A.)

Note 4: See the output derating curves.

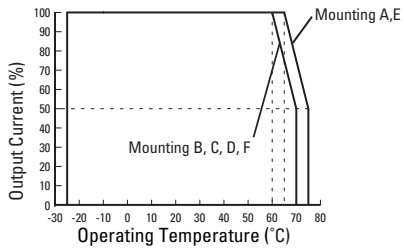
Note 5: Calculation of the expected life is based on the actual life of the aluminum electrolytic capacitor. The expected life depends on operating conditions.

CHARACTERISTICS

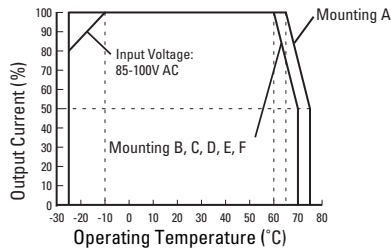
Operating Temperature vs. Output Current (Derating Curves)

Conditions: Natural air cooling (Operating temperature is the temperature around the switching power supply.)

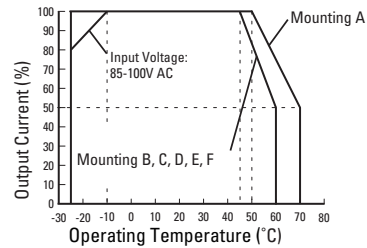
PS5R-VA05, -VA12, -VA24



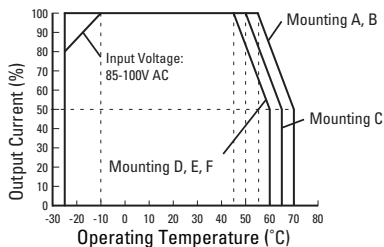
PS5R-VB05, -VB12, -VB24



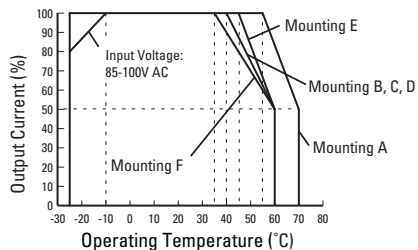
PS5R-VC12



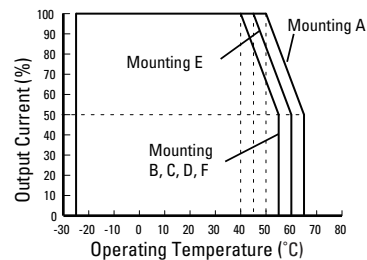
PS5R-VC24



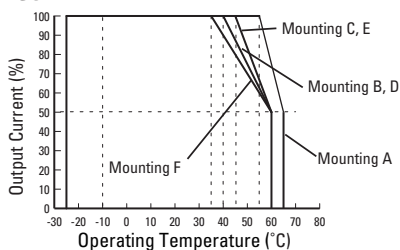
PS5R-VD24



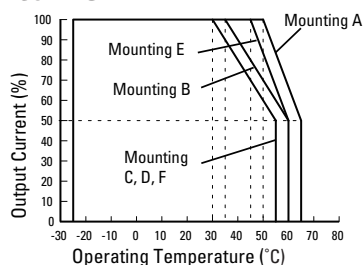
PS5R-VE24



PS5R-VF24

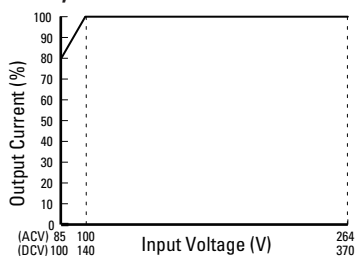


PS5R-VG24

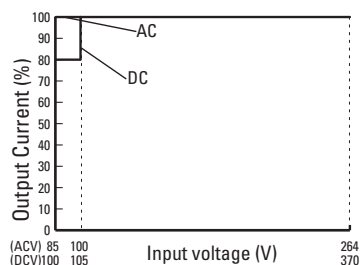


Input Voltage vs. Output Current (Derating Curves) Ta=25°C

PS5R-VB05, -VB12, -VB24, -VC12, -VC24, -VD24, -VE24, -VF24

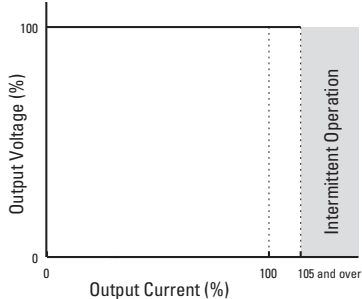


PS5R-VA05, -VA12, -VA24, -VG24

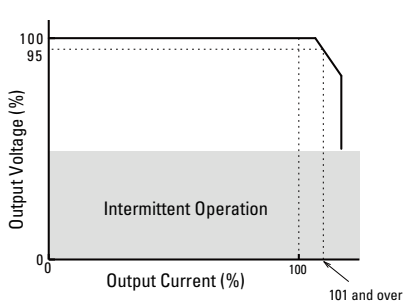


Overcurrent Protection Characteristics

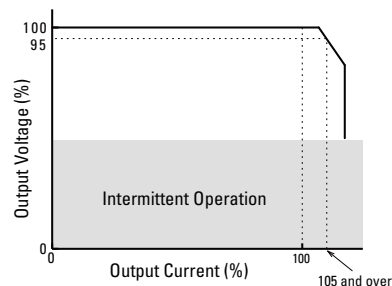
PS5R-VA/VB/VC/VD/VF



PS5R-VE24



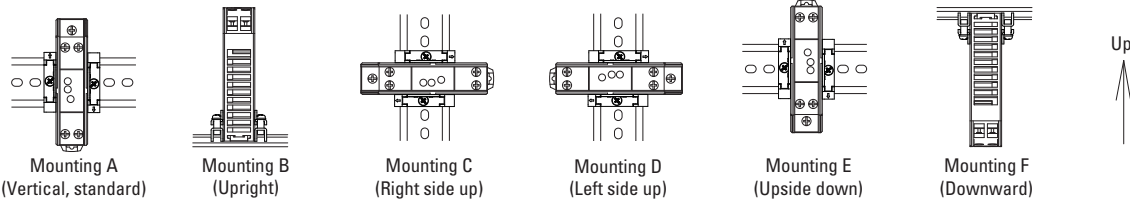
PS5R-VG24



Operating Temperature Approved by Safety Standards

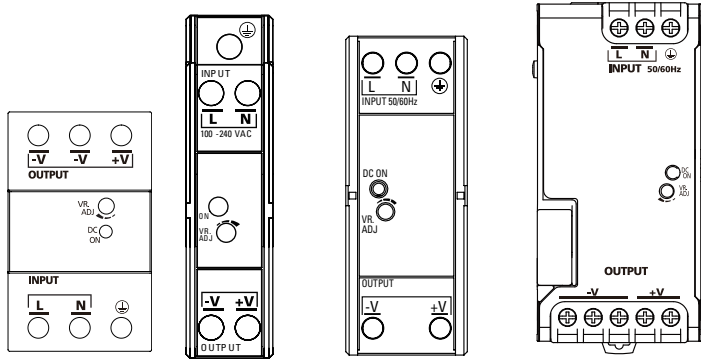
| Part Number | UL508, CSA C22.2 No.107.1, ANSI/ISA12.12.01, EN60950-1, EN50178 | | | | | |
|-------------------------|---|------------|------------|------------|------------|------------|
| | Mounting A | Mounting B | Mounting C | Mounting D | Mounting E | Mounting F |
| PS5R-VA05, -VA12, -VA24 | 65 | 60 | 60 | 60 | 65 | 60 |
| PS5R-VB05, -VB12, -VB24 | 65 | 60 | 60 | 60 | 60 | 60 |
| PS5R-VC12 | 50 | 45 | 45 | 45 | 45 | 45 |
| PS5R-VC24 | 55 | 55 | 50 | 45 | 45 | 45 |
| PS5R-VD24 | 55 | 40 | 40 | 40 | 45 | 35 |
| PS5R-VE24 | 50 | 40 | 40 | 40 | 45 | 40 |
| PS5R-VF24 | 55 | 40 | 45 | 40 | 45 | 35 |
| PS5R-VG24 | 50 | 35 | 30 | 30 | 45 | 30 |

MOUNTING STYLE



Front Panel

PS5R-VA PS5R-VB/VC PS5R-VD/VE/VF PS5R-VG



| Marking | Name | Description |
|---------|-----------------------------|--|
| L, N | AC Input Terminal | Voltage range: 85 to 264V AC/100 to 370V DC |
| ⊕ | Ground Terminal | Be sure to connect this terminal to a proper ground. |
| +V, -V | DC Output Terminals | +V: Positive output terminal -V: Negative output terminal |
| VR.ADJ | Output Voltage Adjustment | Allows adjustment within $\pm 10\%$. (VE = $\pm 5\%$) Turning clockwise increases the output voltage. Turning counterclockwise decreases the output voltage. |
| DC ON | Operation Indicator (green) | Illuminates when the output voltage is on. |

ACCESSORIES

Panel Mounting Bracket²

| Applicable Switching Power Supply | Part Number | Remarks |
|-----------------------------------|-------------|-------------------|
| PS5R-VB | PS9Z-5R1B | — |
| PS5R-VC | PS9Z-5R2B | For side mounting |
| PS5R-VD | PS9Z-5R1C | — |
| PS5R-VE | PS9Z-5R1E | — |
| PS5R-VF | PS9Z-5R1E | — |
| PS5R-VG | PS9Z-6R1F | — |
| | PS9Z-6R2F | For side mounting |

Note 2: Used when installing on a panel directly, PS5R-VA model does not require panel mounting bracket.

DIN Rail (35mm-wide)

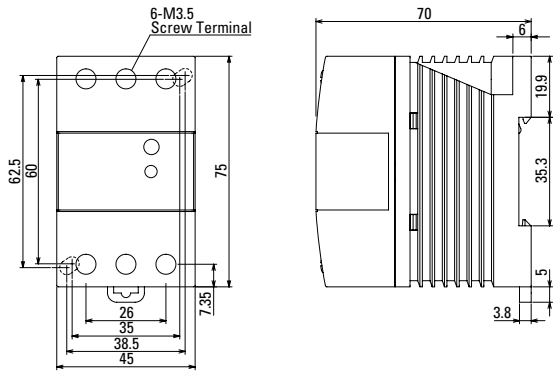
| Length | Part Number | Material |
|--------|-------------|----------|
| 1000mm | BNDN1000 | Aluminum |

End Clip

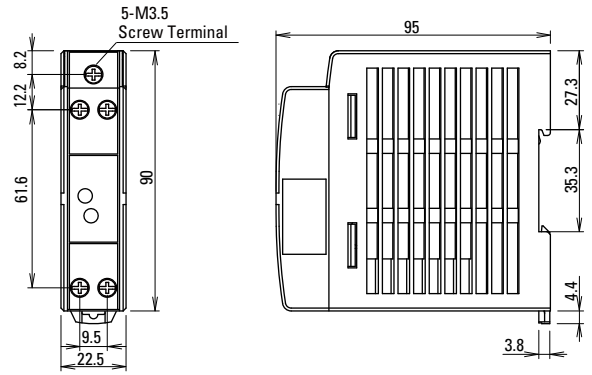
| Part Number |
|-------------|
| BNL6 |
| BNL8 |

DIMENSIONS (MM)

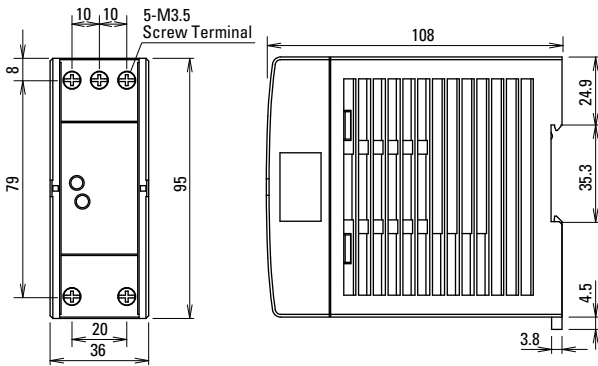
PS5R-VA



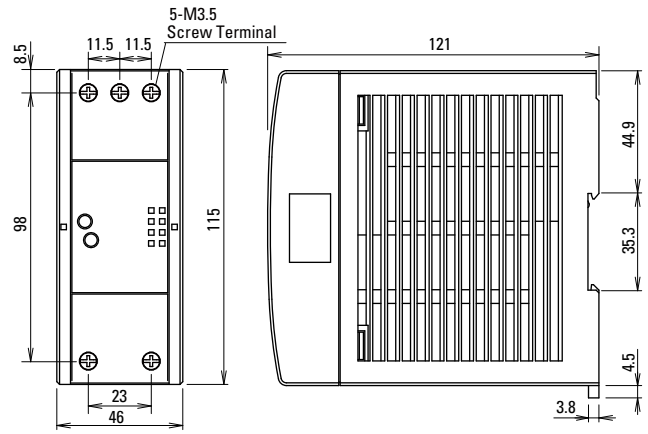
PS5R-VB/VC



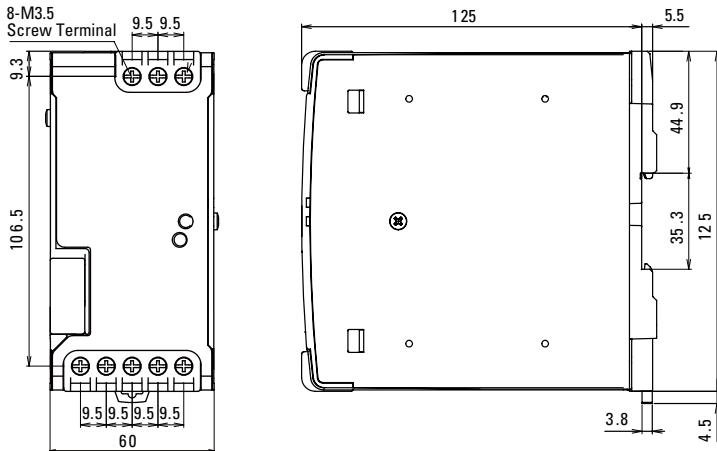
PS5R-VD/VE



PS5R-VF



PS5R-VG



MTBF*

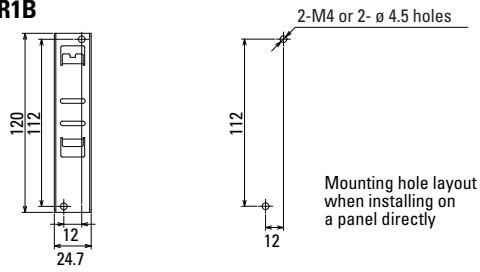
| | |
|----------|--------------------|
| PS5R-VA: | 1,150,000H minimum |
| PS5R-VB: | 900,000H minimum |
| PS5R-VC: | 650,000H minimum |
| PS5R-VD: | 450,000H minimum |
| PS5R-VE: | 380,000H minimum |
| PS5R-VF: | 350,000H minimum |
| PS5R-VG: | 290,000H minimum |

MIL-HDBK-217FN2
(GB, 30°C)

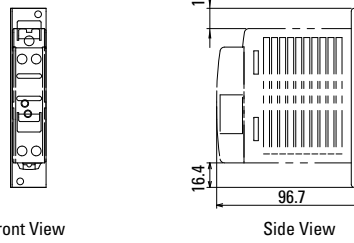
*MTBF stands for Mean Time Between Failure, which is calculated according to statistical device failures, and indicates reliability of a device. It is the statistical representation of the likelihood of the unit to fail and does not necessarily represent the expected life of a product.

Panel Mounting Bracket

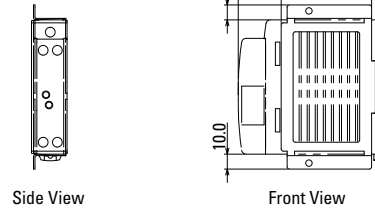
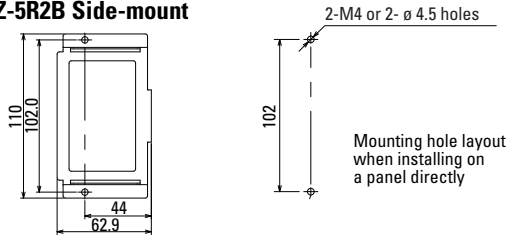
PS9Z-5R1B



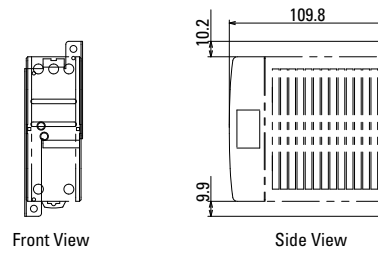
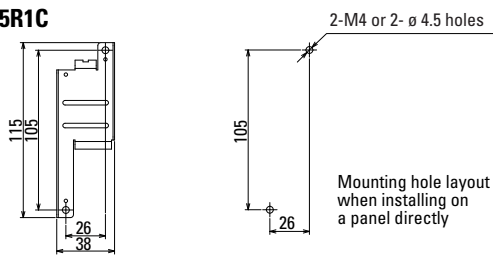
When installed on switching power supply



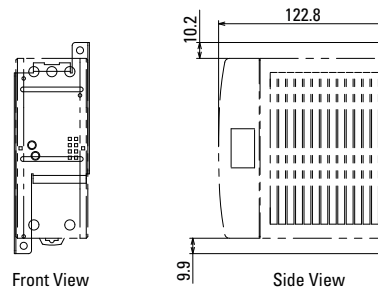
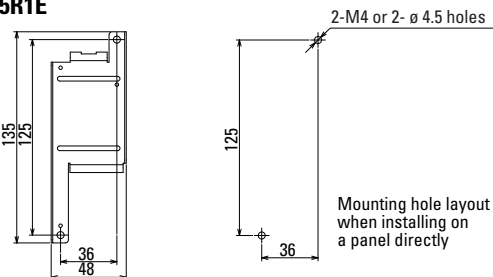
PS9Z-5R2B Side-mount



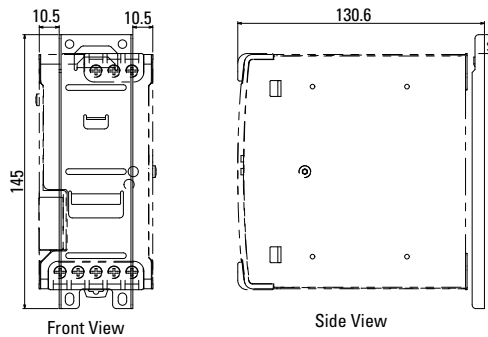
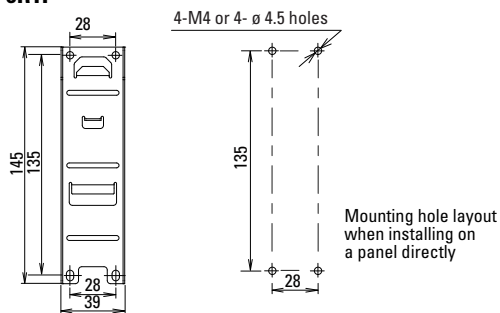
PS9Z-5R1C



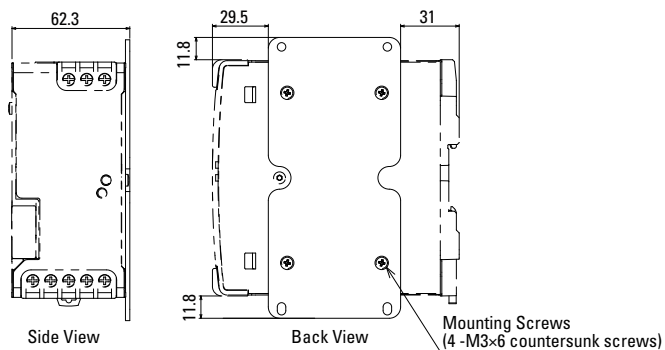
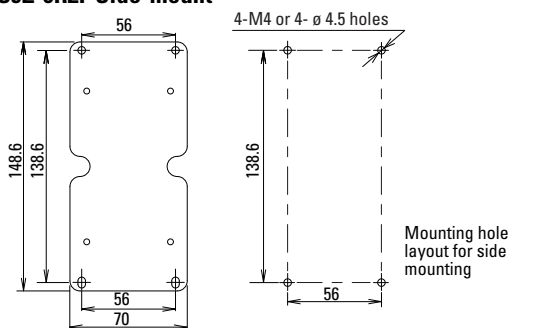
PS9Z-5R1E



PS9Z-6R1F



PS9Z-6R2F Side-mount



SAFETY PRECAUTIONS

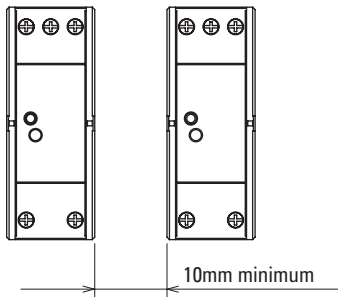
The PS5R-V should be placed in a proper enclosure. It is designed to be used with general electrical equipment and industrial electric devices

- Do not use switching power supplies with electric equipment whose malfunction or inadvertent operation may damage the human body or life directly.
- Make sure that the input voltage and output current do not exceed the ratings. If the input voltage and output current exceed the ratings, electric shock, fire, or malfunction may occur.
- Do not touch the terminals of the switching power supply while input voltage is applied, otherwise electric shock may occur.
- Provide the final product with protection against malfunction or damage that may be caused by malfunction of the switching power supply.
- Operating temperatures should not exceed the ratings. Be sure to note the derating characteristics. If the operating temperature exceeds the ratings, electric shock, fire, or malfunction may occur.
- Blown fuses indicate that the internal circuits are damaged. Contact IDEC for repair. Do not just replace the fuse and reoperate, otherwise electric shock, fire, or malfunction may occur.
- Do not use the switching power supplies to charge rechargeable batteries.
- Do not overload or short-circuit the switching power supply for a long period of time, otherwise the internal elements may be damaged.
- Do not disassemble, repair, or modify the power supplies, otherwise the high voltage internal part may cause electric shock, fire, or malfunction.
- The fuse inside the PS5R-V switching power supply is for AC input. Use an external fuse for DC input.

OPERATING INSTRUCTIONS

Notes for installation

- Do not close the top or bottom openings of the PS5R-V to allow for heat radiation by convection.
- When mounting multiple PS5R-V switching power supplies side by side, maintain a minimum of 10 mm clearance. Observe the derating curves in consideration of the ambient temperature.

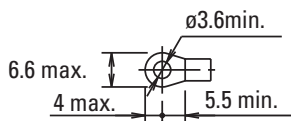


- When the derating voltage may exceed the recommended value, provide forced air-cooling.
- Make sure to wire the ground terminal correctly.
- For wiring, use wires of heat resistance of 60°C or higher (PS5R-VB: 80°C or higher). Use copper wire of the following sizes, according to the rated current.

| Terminal | Wire Size (allowable current) | Wire Type |
|----------|---|-----------------------|
| Input | AWG 18 to 14 | Copper Solid/Stranded |
| Output | AWG18 to 14 (AWG18: 7A, AWG16: 10A, AWG14: 15A) | |

Cross-Sectional are AWG18: 0.82mm², AWG16: 1.31mm², AWG14: 2.0mm²

Applicable crimp terminal (reference)



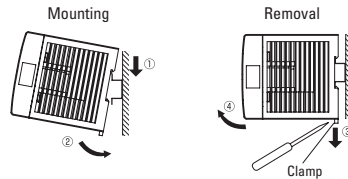
- Recommended tightening torque of the input and output terminals is 1.0 to 1.3Nm (0.8N-m for UL).

Mounting on DIN Rails

- Use a 35mm-wide DIN rail.
- Place the PS5R-V on the DIN rail as shown with input terminal side up (①), and press the PS5R-V towards the DIN rail (②). Make sure that the PS5R-V is installed firmly.
- Use BNL6 end clips to ensure power supplies do not slide off the end of the DIN rail. Use of BNL8 end clips is recommended when excessive vibration or shock is anticipated.

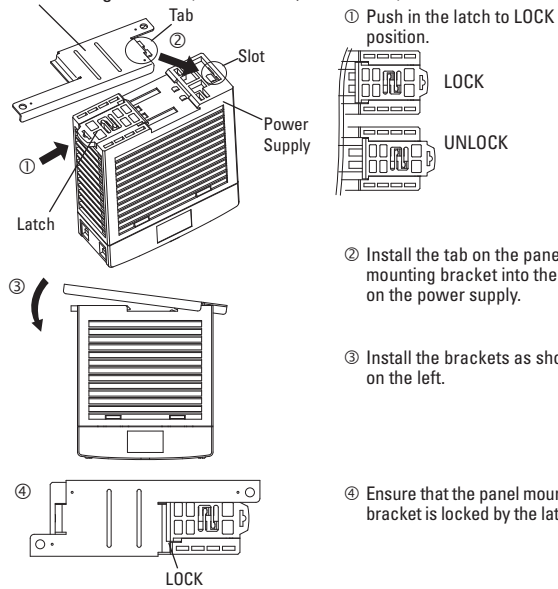
Removal

- Insert a flat screwdriver into the slot in the clamp, and pull out until it clicks (①). The lock mechanism is released and the PS5R-V can be removed (②). When mounting the PS5R-V again, push in the latch first.

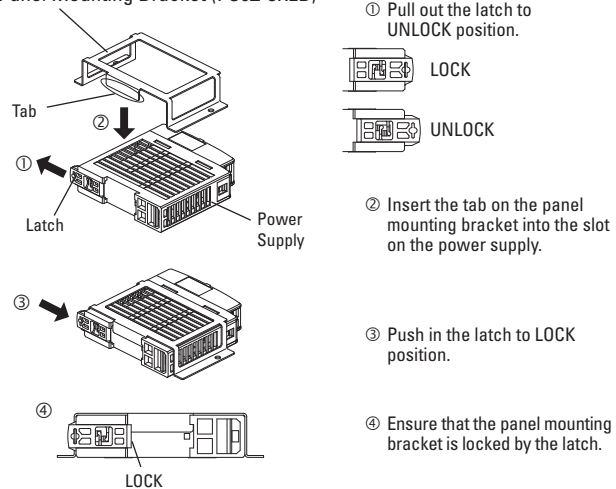


Installing a Panel Mounting Bracket

Panel Mounting Bracket (PS9Z-5R1□, PS9Z-6R1F)

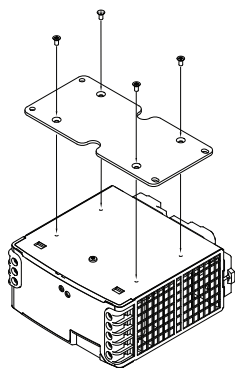


Panel Mounting Bracket (PS9Z-5R2B)



Installing PS9Z-6R2F Side-mount Panel Mounting Bracket

Install the bracket on the switching power supply using four M3 × 6 countersunk screws supplied with the bracket. Recommended tightening torque is 0.5 to 0.6N.m (should be in the center positions)



Adjustment of Output Voltage

The output voltage can be adjusted within ±10% (VE: ±5%) of the rated output voltage by using the VR.ADJ control on the front. Turning the VR.ADJ clockwise increases the output voltage. Turning the VR.ADJ counterclockwise decreases the output voltage.

Overcurrent Protection

The output voltage drops automatically when an overcurrent flows due to an overload or short circuit. Normal voltage is automatically restored when the load returns to normal conditions.

Insulation/Dielectric Test

When performing an insulation/dielectric test, short-circuit the input (between L and N) and output (between +V and -V). Do not apply or interrupt the voltage quickly, otherwise surge voltages may be generated and the PS5R-V may be damaged.

Notes for Operation

- Output interruption may indicate blown fuses. Contact IDEC.
- The PS5R-V switching power supply contains an internal fuse for AC input. When using DC input, install an external fuse. To avoid blown fuses, select a fuse in consideration of the rated current of the internal fuse.

Rated Current of Internal Fuses

| Part Number | Internal Fuse Rated Current |
|---------------|-----------------------------|
| PS5R-VB/VC | 2A |
| PS5R-VD/VE/VF | 4A |
| PS5R-VG | 6.3A |

- Avoid overload and short-circuit for a long period of time, otherwise the internal elements may be damaged.

WARRANTY

IDEC warrants the PS5R-V switching power supply for a period of five years from the date of shipment.

Scope

IDEC agrees to repair or replace the PS5R-V switching power supply if the product has been operated under the following conditions. The maximum value of output capacity is within the range shown in "Operating Temperature vs. Output Current" on page 3.

1. Average operating temperature (ambient temperature of switching power supply) is 40°C maximum.
2. The load is 80% maximum.
3. Input voltage is the rated input voltage.
4. Standard mounting style

- DC input operation is not subject to safety standards.

Rust and Scratches on Metal parts

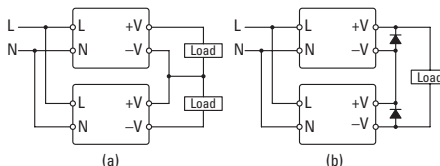
Bonded metal parts are used for the PS5R-V. Rust on the edge and scratches on the surfaces may be developed depending on the storage condition, but the performance of the PS5R-V is not affected.

Noise

Small acoustic noise inside the PS5R-V may be heard depending on the input voltage and load, but the performance of the PS5R-V is not affected.

Series Operation

Series operation is allowed. Connect Schottky barrier diodes D as shown below. Select a Schottky diode in consideration of the rated current. The diode's reverse voltage must be higher than the PS5R-V's output voltage.

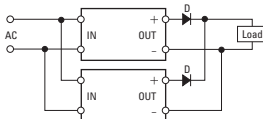


Parallel Operation

Parallel operation is not possible to increase the output capacity, because the internal elements and load may be damaged.

Backup Operation

Backup operation is a connection method of two switching power supplies in parallel for emergency. Normally one switching power supply has a sufficient output. If one switching power supply fails, another one operates to continue the output. Make sure that the sum of power consumption by load and diode is not greater than the rated wattage (rated voltage × rated current) of one switching power supply.



Select a diode in consideration of:

Diode's current must be more than double the PS5R-V's output current. Take heat dissipation into consideration.

IDEC shall not be liable for other damages including consequential, contingent or incidental damages. Warranty does not apply if the PS5R-V switching power supply was subject to:

1. Inappropriate handling, or operation beyond specifications.
2. Modification or repair by other than IDEC.
3. Failure caused by other than the PS5R-V switching power supply.
4. Failure caused by natural disasters.

