# PS3L Series
## Metal Frame Switching Power Supplies

**Key features of the PS3L series include:**

- Metal frame
- Wide power range: 10W-300W
- Universal input:
  10W-30W: 85-264V AC/105-370V DC
  50W-300W: 85-264V AC/105-350V DC
- Screw terminals, IP20 (fingersafe)
- Power Factor Protection
  EN61000-3-2
  EN61000-3-3 (50W to 300W models)
- Overcurrent/overvoltage protection
- Voltage +10% adjustment
- DIN rail or panel surface mount
- Approvals:
  CE marked
  UL508 listed
  EN50178 compliant
  EMC Directives
  EN50081-2
  EN61000-6-2
  LVD EN60950:2000

UL508 Listed
File #E177168

| Item | Watts | Rated Voltage | Rated Current | Part Number |
|---|---|---|---|---|
| | 10 | 5V DC | 2A | PS3L-A05AFF |
| | | 12V DC | 0.9A | PS3L-A12AFF |
| | | 24V DC | 0.5A | PS3L-A24AFF |
| | 15 | 5V DC | 3A | PS3L-B05AFF |
| | | 12V DC | 1.4A | PS3L-B12AFF |
| | | 24V DC | 0.7A | PS3L-B24AFF |
| | 30 | 5V DC | 6A | PS3L-C05AFF |
| | | 12V DC | 2.5A | PS3L-C12AFF |
| | | 24V DC | 1.3A | PS3L-C24AFF |
| | 50 | 12V DC | 4.3A | PS3L-D12AFF |
| | | 24V DC | 2.2A | PS3L-D24AFF |

| Item | Watts | Rated Voltage | Rated Current | Part Number |
|---|---|---|---|---|
| | 100 | 12V DC | 8.5A | PS3L-E12AFF |
| | | 24V DC | 4.5A | PS3L-E24AFF |
| | 150 | 12V DC | 13A | PS3L-F12AFF |
| | | 24V DC | 6.5A | PS3L-F24AFF |
| | 300 | 24V DC | 12.5A | PS3L-G24AFF |

## Specifications

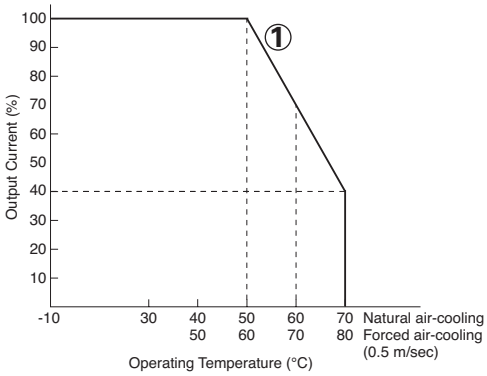
| Type | | | PS3L-A (10W) | PS3L-B (15W) | PS3L-C (30W) | PS3L-D (50W) | PS3L-E (100W) | PS3L-F (150W) | PS3L-G24 (300W) |
|---|---|---|---|---|---|---|---|---|---|
| Input | Input Voltage (Single-phase two-wire) | | 100 to 240V AC (Voltage range: 85 to 264V AC/105 to 370V DC) | | | 100 to 240V AC (Voltage range: 85 to 264V AC/105 to 350V DC) | | | |
| | Frequency (AC input only) | | 47 to 63Hz | | | | | | |
| | Input Current (Typical) | 100V | 0.25A | 0.37A | 0.68A | 0.68A | 1.4A | 2.0A | 3.8A |
| | | 200V | 0.16A | 0.23A | 0.45A | 0.34A | 0.65A | 0.95A | 2.0A |
| | Inrush Current (Cold start) | 100V | 20A max. | 20A max. | 20A max. | 30A max. | 30A max. | 30A max. | 30A max. |
| | | 200V | 40A max. | 40A max. | 40A max. | 60A max. | 60A max. | 60A max. | 60A max. |
| | Leakage Current | | 0.75 mA max. (60Hz; UL, CSA, VDE) | | | | | | |
| | Power Factor (Typical) | | — | | | 0.99 (100V AC input, rated output), 0.95 (200V AC, rated output) | | | |
| | Efficiency (Typical) | | 5V DC: 70%<br>12V DC: 74%<br>24V DC: 78% | 5V DC: 73%<br>12V DC: 75%<br>24V DC: 78% | 5V DC: 75%<br>12V DC: 77%<br>24V DC: 79% | —<br>12V DC: 76%<br>24V DC: 79% | —<br>12V DC: 78%<br>24V DC: 81% | —<br>12V DC: 80%<br>24V DC: 83% | —<br>—<br>24V DC: 81% |
| Output | Rated Voltage/Current | | 5V/2A<br>12V/0.9A<br>24V/0.5A | 5V/3A<br>12V/1.4A<br>24V/0.7A | 5V/6A<br>12V/2.5A<br>24V/1.3A | —<br>12V/4.3A<br>24V/2.2A | —<br>12V/8.5A<br>24V/4.5A | —<br>12V/13A<br>24V/6.5A | —<br>—<br>24V/12.5A |
| | Adjustable Voltage Range | | ±10% (V.ADJ control on front) | | | | | | |
| | Output Holding Time | | 20msec minimum (at the rated input and output) | | | | | | |
| | Start Time | | 200msec maximum (at the rated input and output) | | | 500msec maximum (at the rated input and output) | | | |
| | Rise Time | | 100msec maximum (at the rated input and output) | | | 200msec maximum (at the rated input and output) | | | |
| | Regulation | Input Fluctuation | 5V: 20mV maximum, 12V: 48mV maximum, 24V: 96mV maximum | | | | | | |
| | | Load Fluctuation | 5V: 40mV maximum, 12V: 100mV maximum, 24V: 150mV maximum | | | | | | |
| | | Temperature Change (–10 to +50°C) | 5V 50mV maximum<br>12V: 120mV maximum<br>24V: 240mV maximum | | | 5V: 60mV maximum<br>12V: 150mV maximum<br>24V: 290mV maximum | | | |
| | | Ripple Voltage –10 to 0°C | 5V: 160mV maximum, 12V/24V: 180mV maximum [1] | | | | | | 200 mV maximum [1] |
| | | Ripple Voltage 0 to +50°C | 5V: 120mV maximum, 12V/24V: 150mV maximum [1] | | | | | | |
| Supplementary Functions | Overcurrent Protection | | 105% (Typical), Automatic reset [2] | | | | | | |
| | Overvoltage Protection | | 120% min. [3] | Output off at 120%, reset when input voltage is restored. [4] | | | | | |
| | Operation Indicator | | LED (green) | | | | | | |
| Dielectric Strength | | | Between input and output terminals: 3,000V AC, 1 minute<br>Between input terminal and housing: 2,000V AC, 1 minute<br>Between output terminal and housing: 500V AC, 1 minute | | | | | | |
| Insulation Resistance | | | Between input and output terminals: 100MW minimum (500V DC megger)<br>Between input terminal and housing: 100MW minimum (500V DC megger) | | | | | | |
| Operating Temperature [5] | | | –10° to +70°C | | | | –10° to +60°C | | –10° to +65°C |
| Storage Temperature | | | –30° to +75°C | | | | | | |
| Operating Humidity | | | 20 to 90% RH (no condensation, no freezing) | | | | | | |
| Vibration Resistance | | | 10 to 55Hz, 20m/s$^2$ constant, sweep cycle 1 minute, 2 hours each in 3 axes | | | | | | |
| Shock Resistance | | | 200m/s$^2$, 11ms, 1 shock each in 3 axes | | | | | | |
| Dimensions H X W X D (mm) | | | 97 x 35 x 86 | 97 x 35 x 86 | 96 x 35 x 114.5 | 97 x 37 x 147.5 | 97 x 54 x 200 | 97 x 62 x 200 | 158 x 63 x 230 |
| Weight (Approx.) | | | 240g | 250g | 340g | 350g | 630g | 730g | 1550g |
| Terminal Screw | | | M4 slotted-Phillips head screw (screw terminal type) | | | | | | |

1. Including noise. Measured at the terminal block according to EIAJ.
2. Protection against short-circuit and overcurrent of 30 seconds maximum. Overload for 30 seconds or longer may damage the internal elements.
3. Zener limiter method
4. Turn the input off and after one minute, turn the input on again.
5. Refer to the derating characteristics. No freezing. The maximum temperature is the temperature at 100% output current (natural air-cooling) in the derating characteristics.

## Characteristics

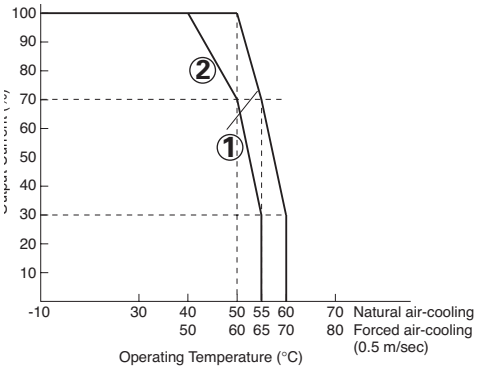
### Operating Temperature vs. Output Current Characteristics (Derating Curves)

#### PS3L-A/B/C/D



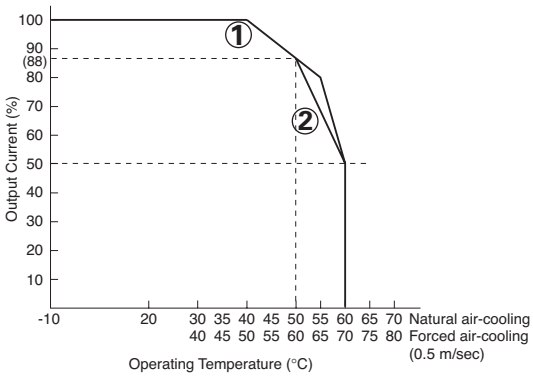

Conditions: At rated input/output (operating temperature is the temperature around the power supply)
① Mounting Directions A and B

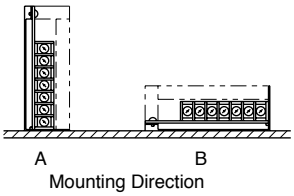
#### PS3L-E/F




Conditions: At rated input/output (operating temperature is the temperature around the power supply)
① Mounting Direction A
② Mounting Direction B

#### PS3L-G

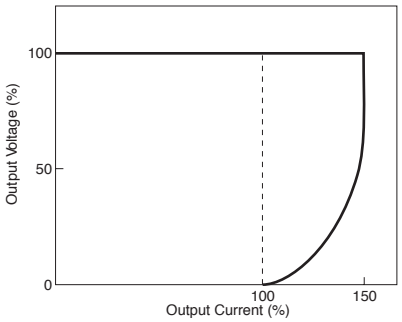


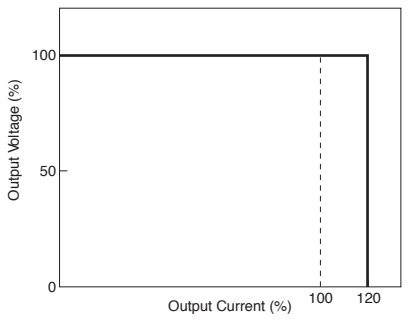

Conditions: At rated input/output (operating temperature is the temperature around the power supply)
① Mounting Direction A
② Mounting Direction B

### Overcurrent Protection Characteristics

#### PS3L-A/B

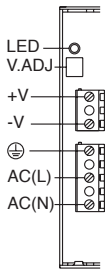



#### PS3L-C/D/E/F/G

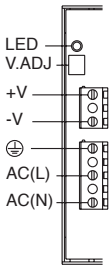


## Terminal Markings

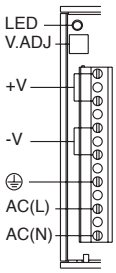
### PS3L-A/B



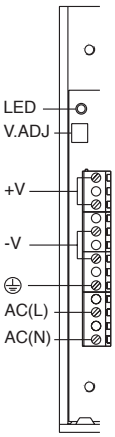

### PS3L-C/D




### PS3L-E/F




### PS3L-G




| Marking | Name | Description |
|---|---|---|
| V.ADJ | Output Voltage Adjustment | Allows adjustment within ±10%. Turning clockwise increases the output voltage. |
| LED | Operation Indicator (Green) | Lights when the output voltage is on. |
| +V<br>–V | DC Output Terminals | +V: Positive output terminal<br>–V: Negative output terminal |
| ⏚ | Ground Terminal | Grounding the terminal reduces high-frequency currents caused by switching. |
| AC | Input Terminal | Accepts a wide range of voltage and frequency.<br>Polarity is irrelevant when using a DC input. |

# Accessories

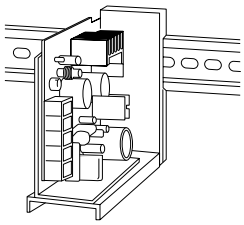
## Mounting Bracket (Optional)

| Model | Mounting Plate | L-shaped Bracket (wide) | L-shaped Bracket (narrow) | Dimensions |
|---|---|---|---|---|
| PS3L-A/B | PS9Z-3E1B | PS9Z-3E2B | PS9Z-3E3B | See page 124 |
| PS3L-C | PS9Z-3E1C | PS9Z-3E2C | PS9Z-3E3C | |
| PS3L-D | PS9Z-3E1D | PS9Z-3E2D | PS9Z-3E3D | |
| PS3L-E | PS9Z-3L1F | PS9Z-3E2E | PS9Z-3E3E | |
| PS3L-F | PS9Z-3L1F | PS9Z-3E2F | PS9Z-3E3F | |
| PS3L-G | PS9Z-3L1G | — | — | |

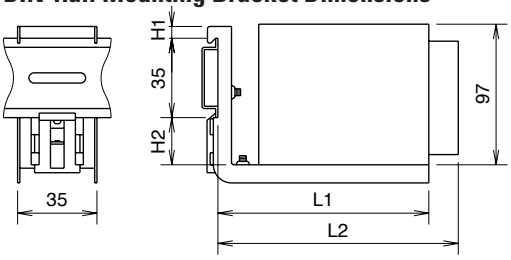
## DIN-Rail Mounting Bracket (Optional)

| Model | Part Number |
|---|---|
| PS3L-A | PS9Z-3E4C |
| PS3L-B | |
| PS3L-C | |
| PS3L-D | PS9Z-3E4D |
| PS3L-E | PS9Z-3E4F |
| PS3L-F | |

DIN-rail mounting brackets are ordered separately from switching power supplies.



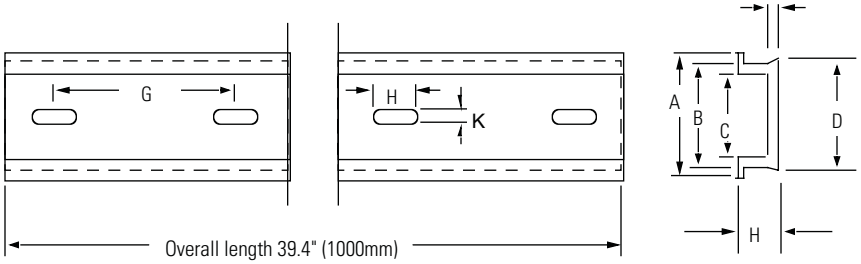
## DIN-Rail Mounting Bracket Dimensions

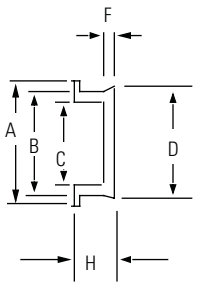



| Part Number | Model | L1 (mm) | L2 (mm) | L3 (mm) | H1 (mm) | H2 (mm) |
|---|---|---|---|---|---|---|
| PS9Z-3E4C | PS3L-A | 134 | 117 | 35 | 5.2 | 20.8 |
| | PS3L-B | | | | | |
| | PS3L-C | | 156 | 35 | 5.2 | 20.8 |
| PS9Z-3E4D | PS3L-D | 186 | 178.8 | 39.5 | 5.2 | 20.8 |
| PS9Z-3E4F | PS3L-E | 216.8 | 230.8 | 65 | 11.2 | 20 |
| | PS3L-F | | | | | |

## DIN Rail (Optional)

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



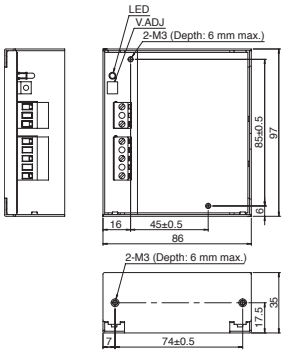

| | Length in Inches (mm) |
|---|---|
| A | 1.4" (35mm) |
| B | 1.14" (29mm) |
| C | 0.78" (23mm) |
| D | 1.2" (31mm) |
| F | 0.11" (3mm) |
| G | 2" (51mm) |
| H | 0.47" (12mm) |
| K | 0.16" (4mm) |

## End Clip (Optional)

| Item | Package No. |
|---|---|
| DIN Rail End Clip | BNL5 |

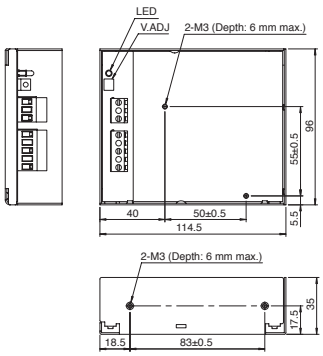
## Dimensions
**(tolerance ±1mm)**

### PS3L-A/B (10/15W)



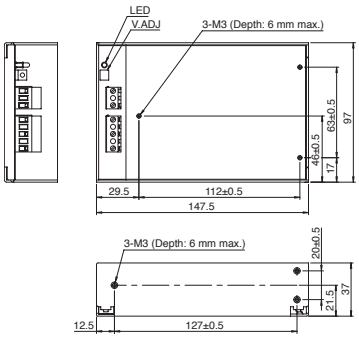

Height 97.0mm
Width 35.0mm
Depth 86.0mm

### PS3L-C (30W)



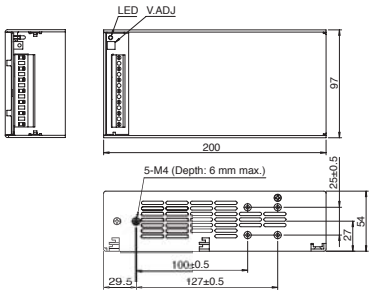

Height 96.0mm
Width 35.0mm
Depth 114.5mm

### PS3L-D (50W)



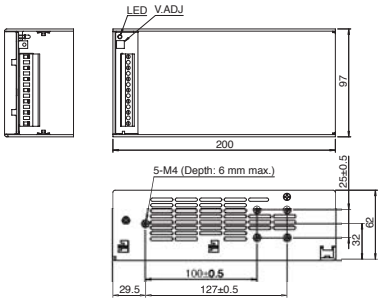

Height 97.0mm
Width 37.0mm
Depth 147.5mm

### PS3L-E (100W)



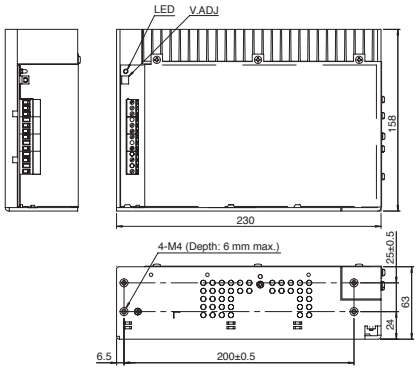

Height 97.0mm
Width 54.0mm
Depth 200.0mm

### PS3L-F (150W)




Height 97.0mm
Width 62.0mm
Depth 200.0mm

### PS3L-G (300W)

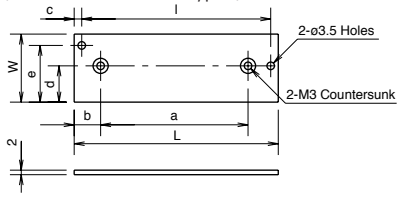



Height 158.0mm
Width 63.0mm
Depth 230.0mm

# Mounting Bracket Dimensions
## (PS9Z-3E1/PS9Z-3E2/PS9Z-3E3/PS9Z-3L)

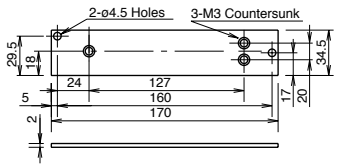
## Mounting Plate

### PS9Z-3E1B/3E1C
(For 10W/15W/30W Types)

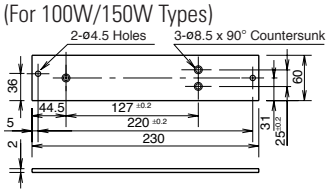



| Part Number | Dimensions (mm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | W | L | l | a | b | c | d | e |
| PS9Z-3E1B | 35 | 101 | 94 | 74 | 14.5 | 3.5 | 17.5 | 30 |
| PS9Z-3E1C | 33 | 138.5 | 128.5 | 83 | 32 | 5 | 17.5 | 26 |

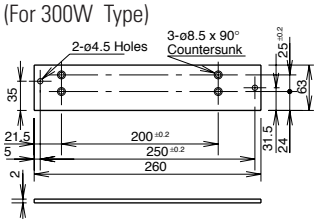
### PS9Z-3E1D
(For 50W Type)

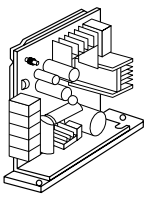



### PS9Z-3L1F
(For 100W/150W Types)

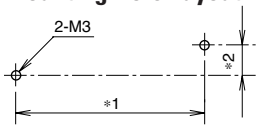



### PS9Z-3L1G
(For 300W Type)



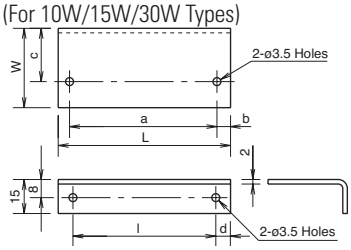
### Mounting Hole Layout




| | *1 | *2 |
|---|---|---|
| PS9Z-3E1B: | 94 | 12.5 |
| PS9Z-3E1C: | 128.5 | 8.5 |
| PS9Z-3E1D: | 160 | 12.5 |
| PS9Z-3L1F: | 220 | 5 |
| PS9Z-3L1G: | 250 | 3.5 |

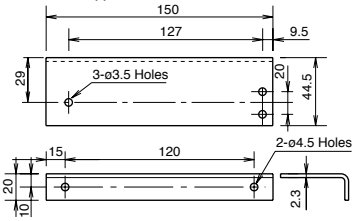
## L-shaped Bracket (wide)

### PS9Z-3E2B/3E2C
(For 10W/15W/30W Types)

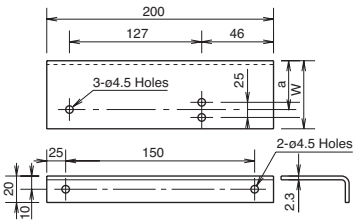



| Part Number | Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | W | L | l | a | b | c | d |
| PS9Z-3E2B | 36 | 95.5 | 80.5 | 74 | 9.5 | 18.5 | 7.5 |
| PS9Z-3E2C | 38 | 118.5 | 104 | 83 | 15 | 20.5 | 7.5 |

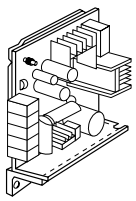
### PS9Z-3E2D
(For 50W Type)



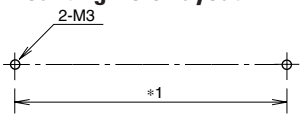

### PS9Z-3E2E/3E2F
(For 100W/150W Types)




| Part Number | Dimensions (mm) | |
|---|---|---|
| | W | a |
| PS9Z-3E2E | 59 | 34.5 |
| PS9Z-3E2F | 70 | 40 |



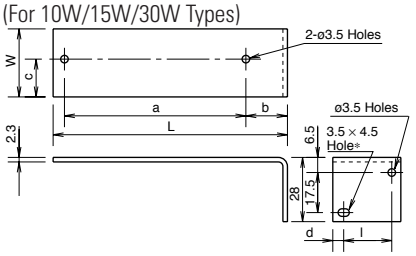
### Mounting Hole Layout




| | *1 |
|---|---|
| PS9Z-3E2B: | 80.5 |
| PS9Z-3E2C: | 104 |
| PS9Z-3E2D: | 120 |
| PS9Z-3E2E : | 150 |
| PS9Z-3E2F : | 150 |

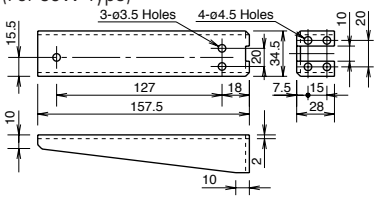
## L-shaped Bracket (narrow)

### PS9Z-3E3B/3E3C
(For 10W/15W/30W Types)

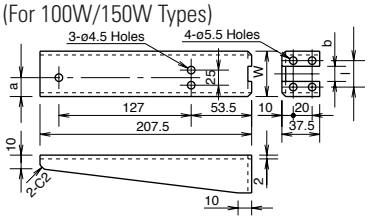



| Part Number | Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | W | L | l | a | b | c | d |
| PS9Z-3E3B | 31 | 103 | 22.5 | 74 | 18 | 13.5 | 4.5 |
| PS9Z-3E3C | 33 | 126 | 25 | 83 | 21 | 15.5 | 4 |

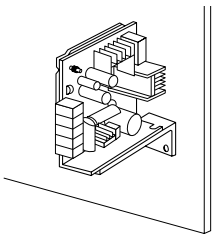
### PS9Z-3E3D
(For 50W Type)



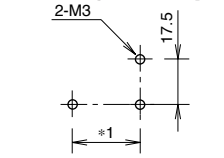

### PS9Z-3E3E/3E3F
(For 100W/150W Types)




| Part Number | Dimensions (mm) | | | |
|---|---|---|---|---|
| | W | l | a | b |
| PS9Z-3E3E | 54 | 32.5 | 27 | 12.5 |
| PS9Z-3E3F | 65 | 40 | 32.5 | 20 |



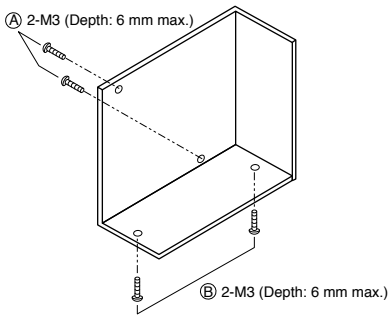
### Mounting Hole Layout



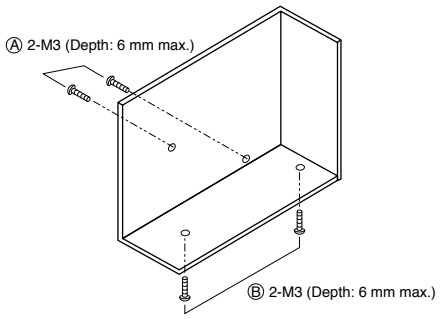

| | *1 | *2 | *3 |
|---|---|---|---|
| PS9Z-3E3B: | 22.5 | | |
| PS9Z-3E3C: | 25 | | |
| PS9Z-3E3D: | 20 | 20 | 15 |
| PS9Z-3E3E: | 32.5 | 20 | 20 |
| PS9Z-3E3F: | 40 | 20 | 20 |

## Direct Mount Installation

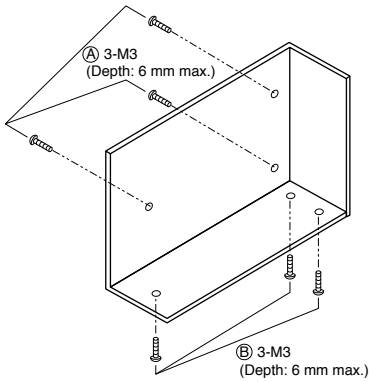
### PS3L-A/B



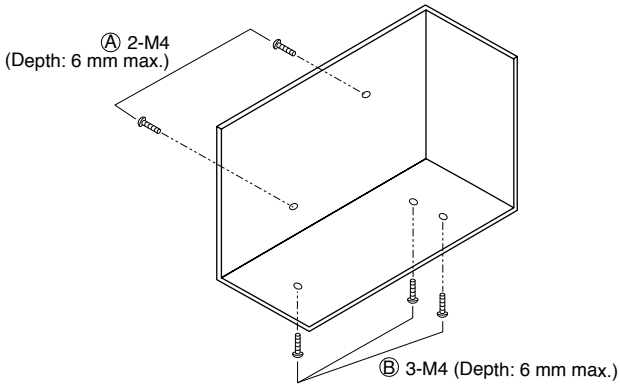

### PS3L-C



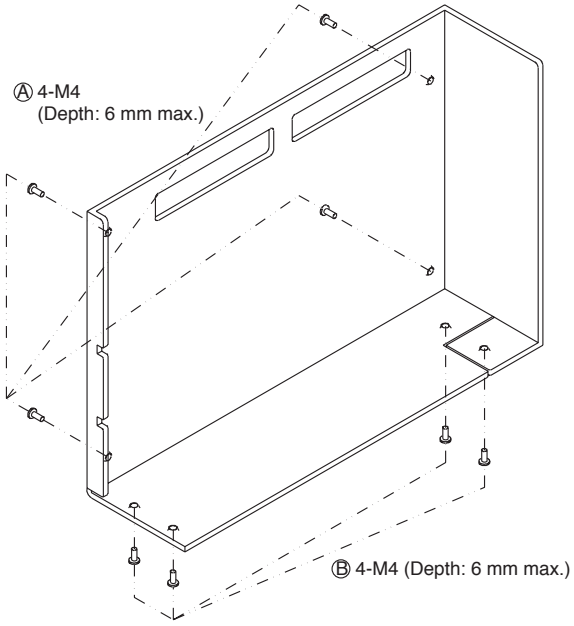

### PS3L-D



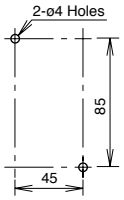
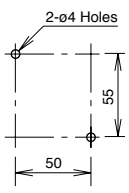
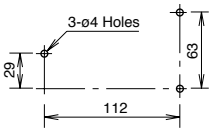
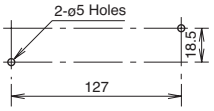
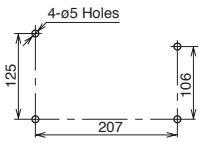
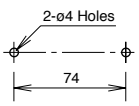
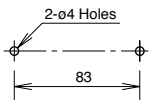
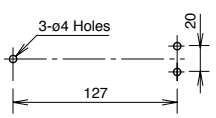
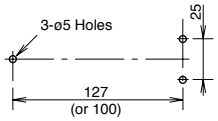
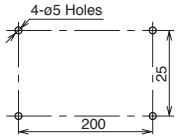

### PS3L-E/F




### PS3L-G



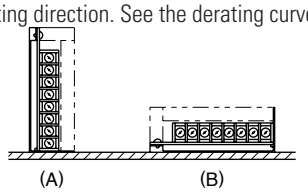

The figures above show the frames only. PC board and parts are omitted for illustration purposes.
Mounting screws NOT supplied with power supplies.

| Installation | Mounting Hole Layout | | | | |
|---|---|---|---|---|---|
| | PS3L-A/B | PS3L-C | PS3L-D | PS3L-E/F | PS3L-G |
| A Side Mounting (screw from the back) |   |   |   |   |   |
| B Side Mounting (screw from the back) |   |   |   |   |   |

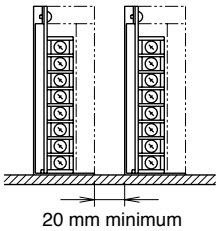
# Instructions

## Notes for Installation

1. PS3L switching power supplies can be installed in either (A) or (B) directions as shown below. For PS3L-E/F/G types, the operating temperature vs. output current characteristics vary with the mounting direction. See the derating curves 120.




2. Mount the switching power supply on a metallic surface that provides adequate heat dissipation. Be sure to prevent heat build-up around power supplies.




3. Maintain 20 mm clearance between the power supplies.
4. Use mounting screws of a proper length so that screws do not penetrate into the housing of the switching power supply 6 mm or more.
5. Mounting screws cannot be fastened on a PC board. Be sure to fasten the screws on the chassis side.

## Adjustment of Output Voltage

The output voltage can be adjusted within ±10% of the rated output voltage by using the V.ADJ control on the front. Turning the V.ADJ clockwise increases the output voltage. When using a higher output voltage, reduce the output current to make sure that the output capacity is within the rating. Note that overvoltage protection may work when increasing 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.

## Overvoltage Protection (PS3L-A)

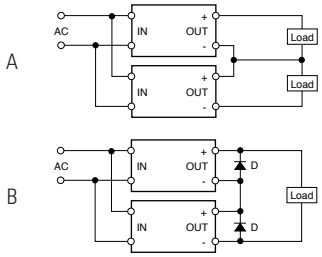
The PS3L-A uses a Zener diode for overvoltage protection. Do not apply an external overvoltage to the output terminal.

## (PS3L-B/C/D/E/F/G)

The output is turned off by overvoltage protection when an overvoltage is applied. When the output voltage has dropped due to an overvoltage (120% or more), turn the input off, and after one minute, turn the input on again.

## Series Operation

The following series operations are allowed.




For series operation (B), insert Schottky diodes D as shown in the figure. Select a Schottky diode in consideration of the rated current.

## Notes for Operation

1. Output interruption may indicate blown fuses.
2. The internal fuse inside the power supply is for AC input. When using with DC input, install an external fuse for DC input.
   To avoid blown fuses, select fuses in consideration of the rated current of internal fuses.

### Rated Current of Internal Fuses

| Part Number | Rated Fuse Current |
|---|---|
| PS3L-A | 2A |
| PS3L-B | |
| PS3L-C | 3.15A |
| PS3L-D | 2A |
| PS3L-E | 4A |
| PS3L-F | |
| PS3L-G | 6.3A |

3. Avoid overload and short-circuit for a long period of time, otherwise the internal elements may be damaged.
4. **Not suitable for parallel operation.**
5. DC input operation is not subject to safety standards.

## Insulation/Dielectric Test

When conducting an insulation/dielectric test, short-circuit the input (between AC) and output (between + and –). Do not apply or interrupt the voltage suddenly, otherwise the surge voltage may be generated and the power supply may be damaged.

# Safety Precautions

- 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 disassemble, repair, or modify the power supplies.
- Do not touch the switching power supplies 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 the malfunction of switching power supplies.
- 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. 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.**