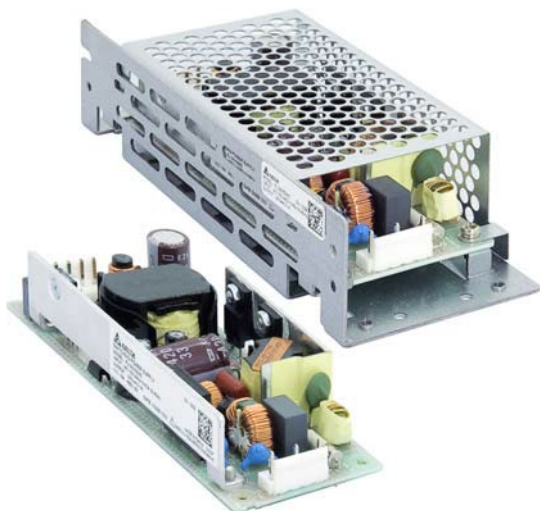


PJ Open Frame Power Supply

24V 50W 1 Phase / PJ-24V50W□NA

PJ



Highlights & Features

- Universal AC input voltage range (85Vac – 264Vac)
- Low Inrush Current / Low Leakage Current
- High efficiency and PF factor to conserve energy
- Conforms to harmonic current IEC/EN 61000-3-2, Class A
- Conformal coating on PCBA to protect against chemical and dust pollutants
- Versatile configuration options: Open Frame, L Frame, Enclosed
- Long life capacitors

Safety Standards



CB Certified for worldwide use

| | |
|--------------------------------|--|
| Model Number: | PJ-24V50W□NA |
| Unit Weight: | Open Frame: 0.16 kg (0.35 lb) Enclosed: 0.28 kg (0.62lb) |
| Dimensions (L x W x D): | Open Frame: 132 x 50 x 26.6 mm (5.20 x 1.97 x 1.05 inch) Enclosed: 162 x 60 x 36 mm (6.38 x 2.36 x 1.42 inch) |

General Description

The PJ series of Open Frame Power Supply comes with universal AC input at 85Vac to 264Vac. Other features include low leakage / Inrush current and conformal coating on the PCBAs to provide protection against dust and chemical pollutants. The built-in active PFC provides PF > 0.97 and fulfills Harmonic Current Emission according to IEC/EN 61000-3-2. The PJ series is certified for EMC standards according to EN 55011 for industrial, scientific and medical (ISM) radio-frequency equipment and EN 55032 for Industrial Technology Equipment (ITE) radio-frequency equipment and EMS according to EN 55024. In addition, the detachable input and output connectors are from JST and only recognized Japanese capacitors are used.

Metal chassis and case cover are available as options for different installation preferences. The PJ series conforms to major international safety standards according to EN/UL 60950-1 standards and are fully compliant with RoHS Directive 2011/65/EU for environmental protection.

Model Information

PJ Open Frame Power Supply

| Model Number | Input Voltage Range | Rated Output Voltage | Rated Output Current |
|--------------|---------------------|----------------------|----------------------|
| PJ-24V50W□NA | 85-264Vac | 24Vdc | 2.10A |

Model Numbering

| | | | | CC Code | |
|-----------|----------------|--------------|---|--|----------------|
| PJ – | 24V | 50W | □ | N | A |
| PJ Series | Output Voltage | Output Power | Product Type B - Open Frame L - L Frame C - Enclosed | Remote ON/OFF Function N - No Remote ON/OFF | Delta Standard |

PJ Open Frame Power Supply

24V 50W 1 Phase / PJ-24V50W□NA

Specifications

Input Ratings / Characteristics

| | |
|--------------------------------------|--|
| Nominal Input Voltage | 100-240Vac |
| Input Voltage Range | 85-264Vac |
| Nominal Input Frequency | 50-60Hz |
| Input Frequency Range | 47-63Hz |
| Input Current | 0.65A typ. @ 100Vac, 0.35A typ. @ 200Vac |
| Efficiency at 100% Load | 84.5% typ. @ 100Vac, 87.0% typ. @ 200Vac |
| Max Inrush Current (Cold Start) | 15A typ. @ 100Vac, 30A typ. @ 200Vac |
| Power Factor Correction at 100% Load | 0.98 typ. @ 100Vac, 0.97 typ. @ 200Vac |
| Leakage Current | 0.1mA @ 100Vac, 0.2mA @ 240Vac |

Output Ratings / Characteristics*

| | |
|--|---|
| Nominal Output Voltage | 24Vdc |
| Factory Set Point Tolerance | 24Vdc \pm 1% (initial set point tolerance from factory) |
| Output Voltage Adjustment Range | 21.6-26.4Vdc |
| Output Current | 2.10A (50.4W max.) |
| Output Power | 50.4W |
| Line Regulation | < 96mV |
| Load Regulation | < 150mV |
| Ripple (20MHz) | < 120mVpp @ 0°C to 50°C, < 160mVpp @ -10°C to 0°C |
| Ripple Noise (20MHz) | < 150mVpp @ 0°C to 50°C, < 180mVpp @ -10°C to 0°C |
| Start-up Time | 500ms typ. @ 100Vac (100% load) |
| Hold-up Time | 20ms typ. @ 100Vac (100% load) |
| Dynamic Response (Overshoot & Undershoot O/P Voltage) | \pm 5% @ 0-50% load and 50-100% load |
| Start-up with Capacitive Loads | 8,000 μ F Max |

*For power de-rating from 50°C to 70°C, see power de-rating on page 3

Mechanical

| | | |
|-----------------------------------|------------------------------------|--|
| Case Cover / Chassis | SGCC | |
| Dimensions | Open Frame | 132 x 50 x 26.6 mm (5.20 x 1.97 x 1.05 inch) |
| | Enclosed | 162 x 60 x 36 mm (6.38 x 2.36 x 1.42 inch) |
| Unit Weight | Open Frame | 0.16kg (0.35 lb) |
| | Enclosed | 0.28 kg (0.62 lb) |
| Indicator | NA | |
| Cooling System | Convection | |
| Terminal | Input | JST B3P5-VH (LF)(SN) |
| | Output | JST B4P-VH (LF)(SN) |
| Wire | AWG 22-18 | |
| Noise (1 Meter from power supply) | Sound Pressure Level (SPL) < 25dBA | |

PJ Open Frame Power Supply

24V 50W 1 Phase / PJ-24V50W□NA

Environment

| | | |
|-----------------------------|---------------|--|
| Surrounding Air Temperature | Operating | -10°C to +70°C |
| | Storage | -25°C to +75°C |
| Power De-rating | | Refer to Engineering Data Fig.1.1~Fig.1.5 on Page7~9 |
| Operating Humidity | | 5 to 95% RH (Non-Condensing) |
| Operating Altitude | | 0 to 5,000 Meters (16,400 ft) |
| Shock Test | Non-Operating | IEC 60068-2-27, 196.1m/S ² (20G),11ms, once along X, Y, and Z axis |
| Vibration | Operating | IEC 60068-2-6, 10Hz to 55Hz @ 19.6m/S ² (2G); 3 min period, 60 min per axis for all X, Y, Z direction |
| Over Voltage Category | | II |
| Pollution Degree | | 2 |

Protections

| | |
|--------------------------|---|
| Overvoltage | 27.6-33.6V, Latch Mode |
| Overload / Overcurrent | > 105% of rated load current, Hiccup Mode, Non-Latching (Auto-Recovery) |
| Over Temperature | Latch Mode |
| Short Circuit | Hiccup Mode, Non-Latching (Auto-Recovery when the fault is removed) |
| Internal Fuse at L pin | T2.5AH |
| Protection Against Shock | Class I with PE* connection |

*PE: Primary Earth

Reliability Data

| | |
|------------------------|---------------------------------------|
| MTBF | > 200,000 hrs. as per JEITA RCR-9102B |
| Expected Cap Life Time | 10 years (115Vac, 50% load @ 40°C) |

Safety Standards / Directives

| | | |
|--------------------------|-------------------|---|
| Safety Entry Low Voltage | | SELV (EN 60950-1) |
| Electrical Safety | TUV Bauart | EN 60950-1 |
| | UL/cUL recognized | UL 60950-1 and CSA C22.2 No. 60950-1 (File No. E131881) |
| | CB scheme | IEC 60950-1 |
| CE | | In conformance with EMC Directive 2014/30/EU and Low Voltage Directive 2014/35/EC |
| Material and Parts | | RoHS Directive 2011/65/EU Compliant |
| Galvanic Isolation | Input to Output | 3.0KVac |
| | Input to Ground | 2.0KVac |
| | Output to Ground | 0.5KVac |

PJ Open Frame Power Supply

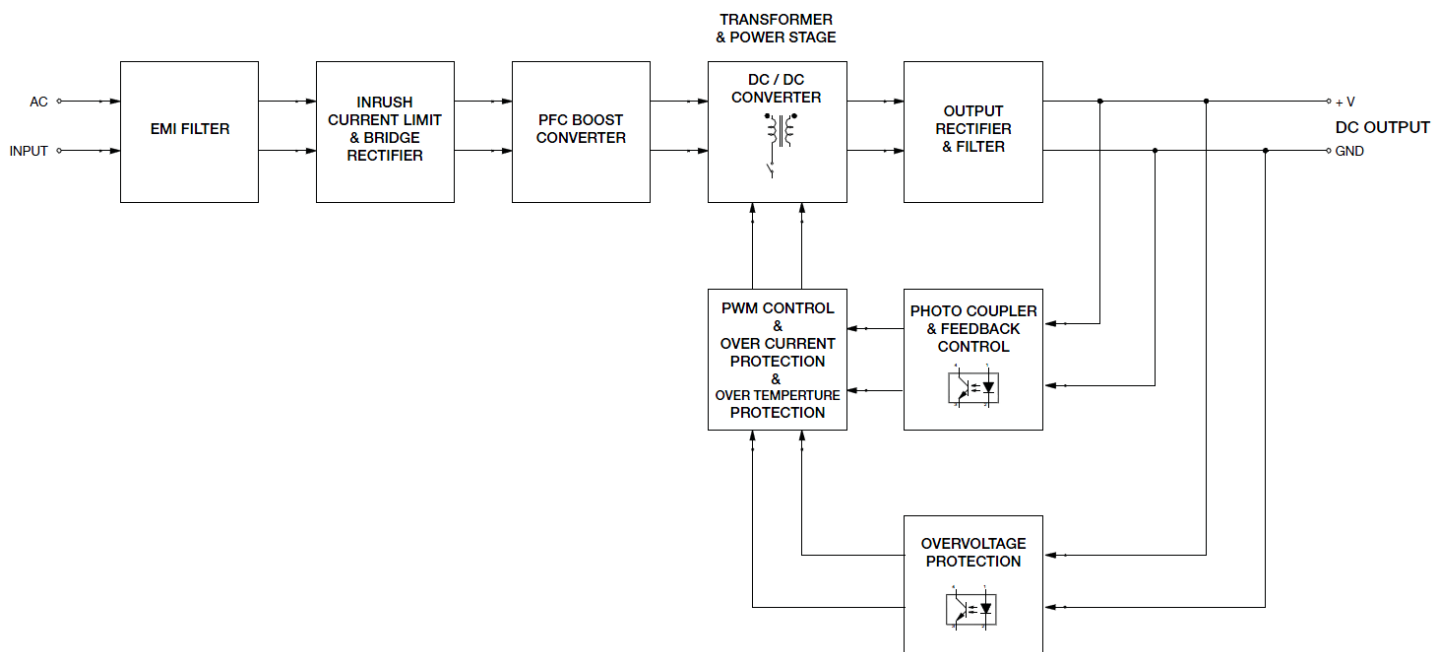
24V 50W 1 Phase / PJ-24V50W□NA

EMC

| | | |
|-----------------------------------|----------------|--|
| Emissions (CE & RE) | | CISPR 32, EN 55032, FCC Title 47: Class B |
| Immunity | | |
| Electrostatic Discharge | IEC 61000-4-2 | Level 4 Criteria A ¹⁾ Air Discharge: 15kV Contact Discharge: 8kV |
| Radiated Field | IEC 61000-4-3 | Level 3 Criteria A ¹⁾ 80MHz-1GHz, 10V/M with 1kHz tone / 80% modulation |
| Electrical Fast Transient / Burst | IEC 61000-4-4 | Level 3 Criteria A ¹⁾ 2kV |
| Surge | IEC 61000-4-5 | Level 3 Criteria A ¹⁾ Common Mode ²⁾ : 2kV Differential Mode ³⁾ : 1kV |
| Conducted | IEC 61000-4-6 | Level 3 Criteria A ¹⁾ 150kHz-80MHz, 10Vrms |
| Power Frequency Magnetic Fields | IEC 61000-4-8 | Criteria A ¹⁾ Magnetic field strength 30A/Meter |
| Voltage Dips and Interruptions | IEC 61000-4-11 | 100% dip; 1 cycle (20ms); Self Recoverable |
| Low Energy Pulse Test (Ring Wave) | IEC 61000-4-12 | Level 3 Criteria A ¹⁾ Common Mode ²⁾ : 2kV Differential Mode ³⁾ : 1kV |
| Harmonic Current Emission | | IEC/EN 61000-3-2, Class A |
| Voltage Fluctuation and Flicker | | IEC/EN 61000-3-3 |

- 1) Criteria A: Normal performance within the specification limits
- 2) Asymmetrical: Common mode (Line to earth)
- 3) Symmetrical: Differential mode (Line to line)

Block Diagram



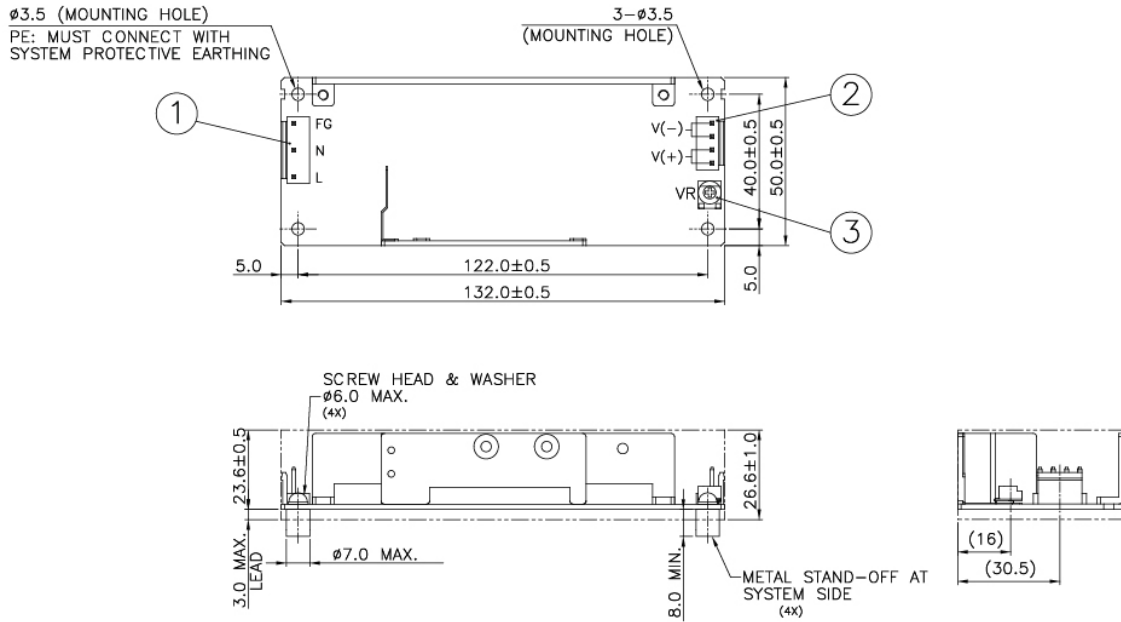
PJ Open Frame Power Supply

24V 50W 1 Phase / PJ-24V50W□NA

Dimensions

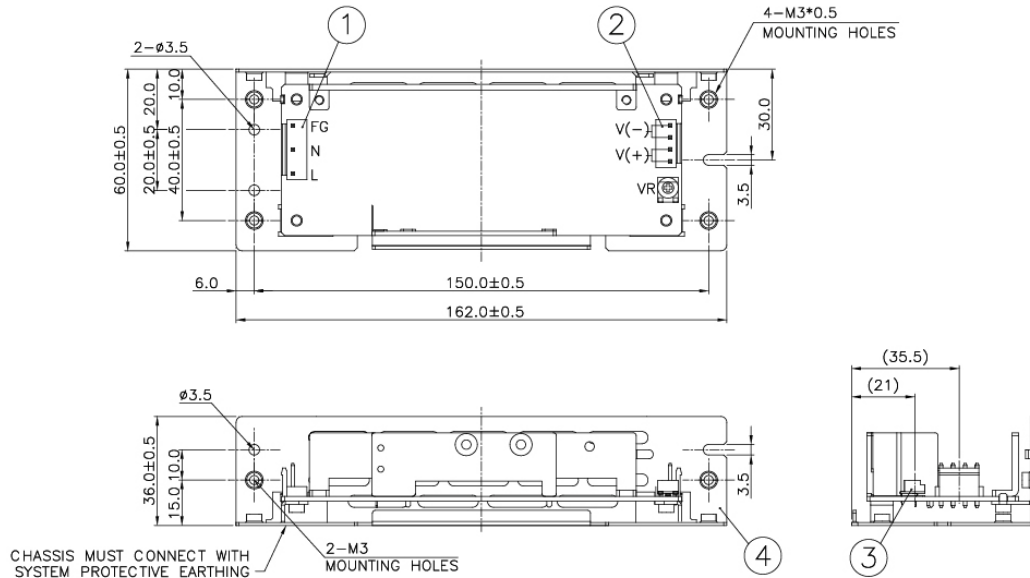
Open Frame

L x W x D: 132 x 50 x 26.6 mm (5.20 x 1.97 x 1.05 inch)



L Frame

L x W x D: 162 x 60 x 36 mm (6.38 x 2.36 x 1.42 inch)



| Item | Device Description |
|------|--------------------|
| 1 | Input Connector |
| 2 | Output Connector |
| 3 | VR |
| 4 | Chassis |

Notes

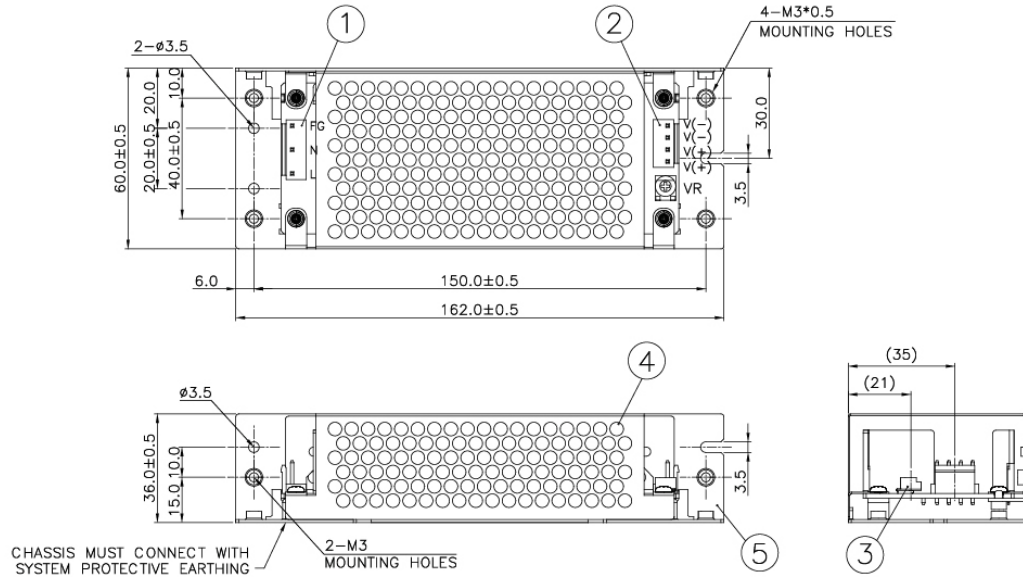
- Dimensions are in mm
- For information on Mounting Torque, and I/O Connector and Housing, please refer to Table 1 (Page 6).
- For L Frame type: There are 6 threaded mounting holes and 5 normal mounting holes.
- For Open Frame type: There are 4 normal mounting holes.

PJ Open Frame Power Supply

24V 50W 1 Phase / PJ-24V50W□NA

Enclosed

L x W x D: 162 x 60 x 36 mm (6.38 x 2.36 x 1.42 inch)



| Item | Device Description |
|------|--------------------|
| 1 | Input Connector |
| 2 | Output Connector |
| 3 | VR |
| 4 | Cover |
| 5 | Chassis |

Notes

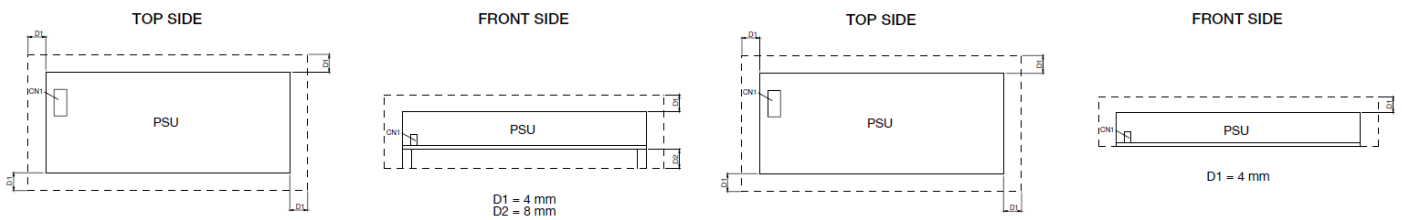
- Dimensions are in mm
- For information on Mounting Torque, and I/O Connector and Housing, please refer to Table 1 (Page 6).
- For Enclosed type: There are 6 threaded mounting holes and 5 normal mounting holes.

Assembly & Installation

Assembly Reference

■ Open Frame

■ L Frame / Enclosed



For safety reasons, please ensure the mounted device is kept at $\geq 4\text{mm}$ (0.16 inch) safety distance at all sides from other components and equipments. **Please insert an insulation sheet between the system and product, if the safety distance is less than 4mm (0.16 inch).**

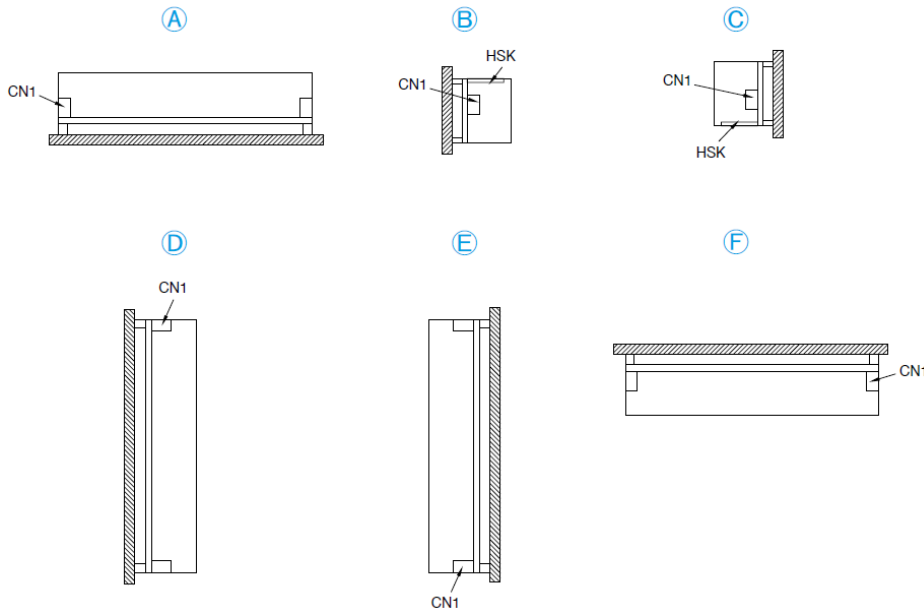
Use flexible cable (stranded or solid) of AWG No. 22-18. Please refer to Table 1 for the recommended Housing and Terminal.

| Table 1 | Connector (Board Mounting) | Housing | Terminal |
|--------------|----------------------------|---------|--------------|
| Input (JST) | B3P5-VH(LF)(SN) | VHR-5N | SVH-21T-P1.1 |
| Output (JST) | B4P-VH(LF)(SN) | VHR-4N | |

PJ Open Frame Power Supply

24V 50W 1 Phase / PJ-24V50W□NA

Mounting Orientation



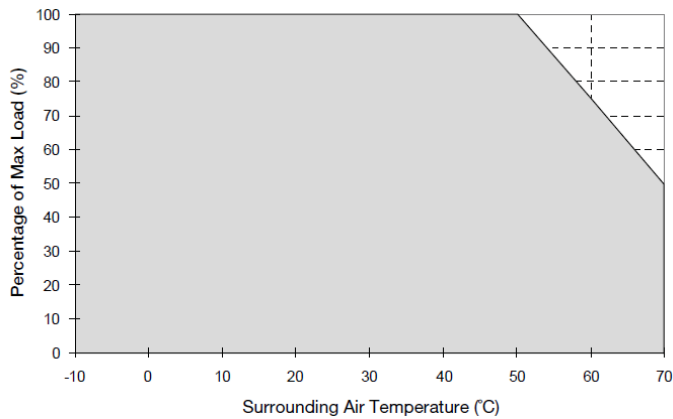
- Any excessive twisting or bending may damage the device's PCB. Please handle the device with care.
- The device is not recommended to be placed on low thermal conductive surfaces. For example, plastics.
- Prevent any foreign metal, particles or conductors from entering the device through the openings during installation. It may cause: -Electric shock; Safety hazard; Product failure.
- **The power supply must be mounted by metal screws onto a grounded metal surface. It is highly recommended that the Earth terminal on the connector be connected to the grounded metal surface.**

Engineering Data

Convection

Output Load De-rating VS Surrounding Air Temperature

■ Open Frame / L Frame



■ Enclosed

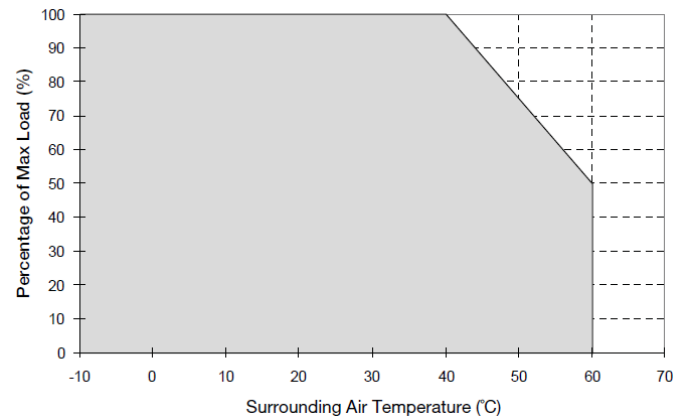


Fig.1.1 De-rating for Mounting Orientation A to F
> 50°C de-rate power by 2.5% / °C

Fig.1.2 De-rating for Mounting Orientation A to F
> 40°C de-rate power by 2.5% / °C

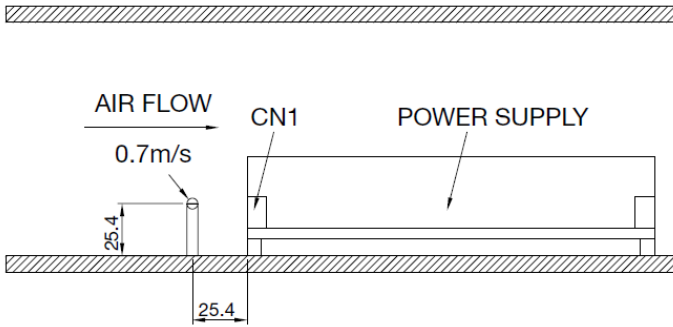
PJ Open Frame Power Supply

24V 50W 1 Phase / PJ-24V50W□NA

Forced Cooling (Air Velocity > 0.7m/s)

Output Load De-rating VS Surrounding Air Temperature

■ Air Flow Direction



■ Open Frame / L Frame

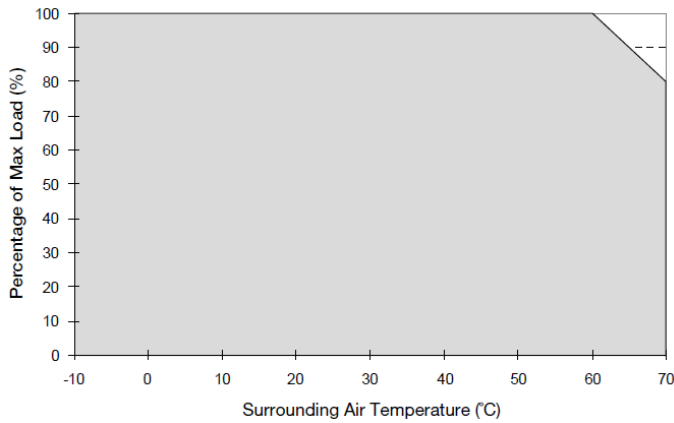


Fig.1.3 De-rating for Mounting Orientation A to F
> 60°C de-rate power by 2% / °C

■ Enclosed

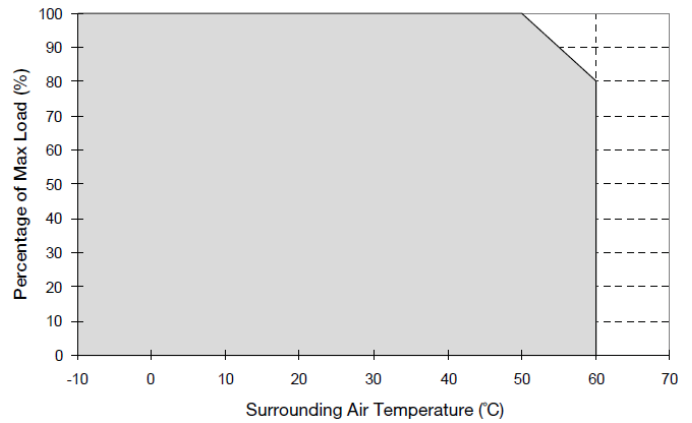


Fig.1.4 De-rating for Mounting Orientation A to F
> 50°C de-rate power by 2% / °C

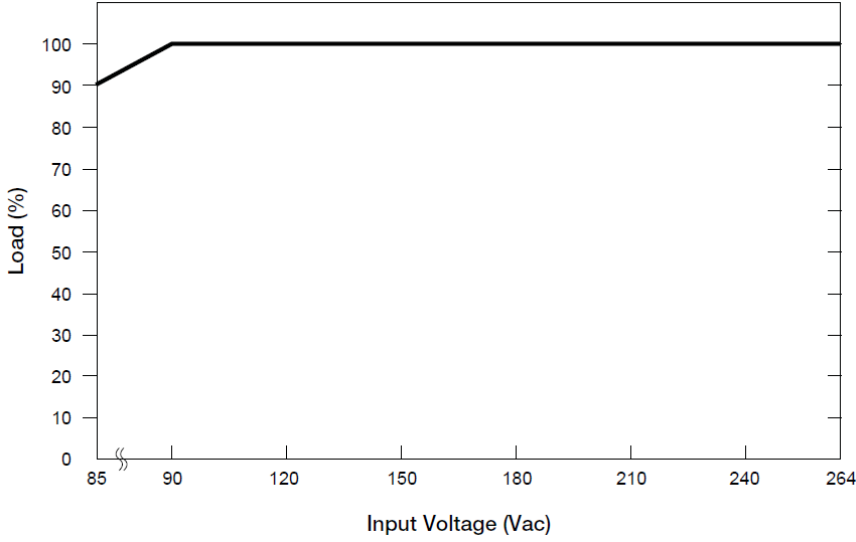
Notes

1. Power supply components may degrade, or be damaged, when the power supply is continuously used outside the shaded region, refer to the graphs shown above.
2. If the output capacity is not reduced when the surrounding air temperature is more than the upper limit temperature, the device will run into Over Temperature Protection. When activated, the output voltage will go into latch mode until the mains is reapplied and the surrounding air temperature drops to its normal operating temperature.
3. Depending on the surrounding air temperature and output load delivered by the power supply, the device housing can be very hot!
4. If the device has to be mounted in any other orientation, please contact info@deltapsu.com for more details.

PJ Open Frame Power Supply

24V 50W 1 Phase / PJ-24V50W□NA

Output Load De-rating VS. Input Voltage



■ No output power de-rating for the input voltage range from 90Vac to 264Vac

Fig.1.5 De-rating for Mounting Orientation A to F
 < 90Vac de-rate power by 2% / V

Functions

Start-up Time

The time required for the output voltage to reach 90% of its final steady state set value, after the input voltage is applied.

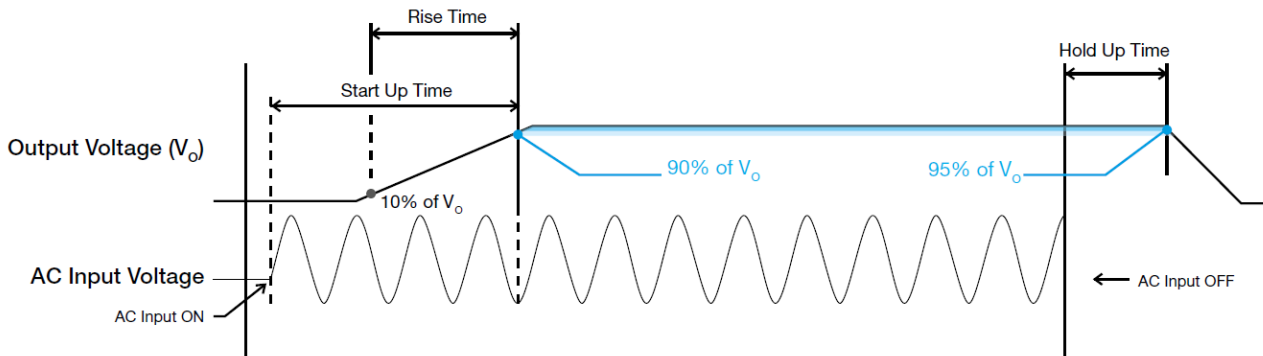
Rise Time

The time required for the output voltage to change from 10% to 90% of its final steady state set value.

Hold-up Time

Time between the collapse of the AC input voltage, and the output falling to 95% of its steady state set value.

■ Graph illustrating the Start-up Time, Rise Time, and Hold-up Time

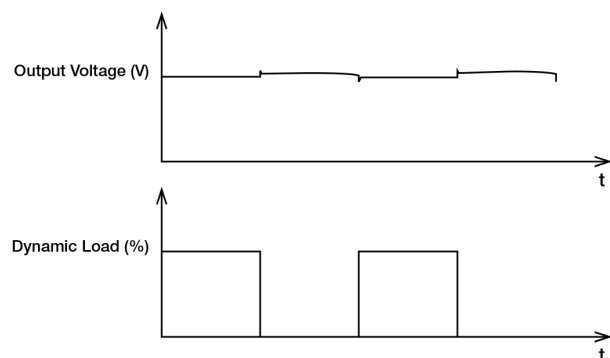


PJ Open Frame Power Supply

24V 50W 1 Phase / PJ-24V50W□NA

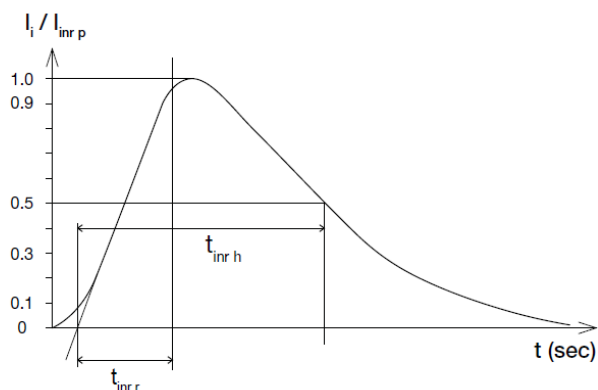
Dynamic Response

The power supply output voltage will remain within $\pm 5\%$ of its steady state value, when subjected to a dynamic load from 0 100% of its rated current.



Inrush Current

Inrush current is the peak, instantaneous, input current measured and, occurs when the input voltage is first applied. For AC input voltages, the maximum peak value of inrush current will occur during the first half cycle of the applied AC voltage. This peak value decreases exponentially during subsequent cycles of AC voltage.



Overvoltage Protection (Latch Mode)

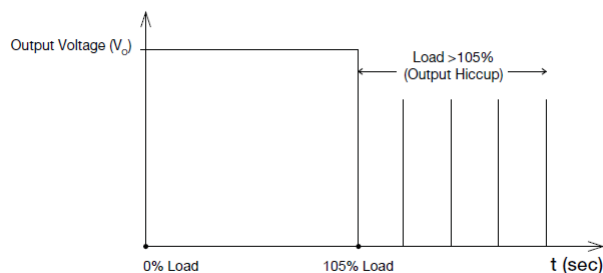
The power supply's overvoltage circuit will be activated when its internal feedback circuit fails. The output voltage shall not exceed its specifications defined on Page 3 under "Protections". Power supply will latch off, and require removal/re-application of input AC voltage in order to restart. **The power supply should be latch.**

Short Circuit Protection (Auto-Recovery)

The power supply's output OLP/OCP function also provides protection against short circuits. When a short circuit is applied, the output current will operate in "Hiccup mode", as shown in the illustration in the OLP/OCP section on this page. The power supply will return to normal operation after the short circuit is removed.

Overload & Overcurrent Protections (Auto-Recovery)

The power supply's Overload (OLP) and Overcurrent (OCP) Protections will be activated when output current exceeds 105% of I_o (Max load). In such occurrence, the V_o will start to droop and once the power supply has reached its maximum power limit, the protection is activated and the power supply will go into "Hiccup mode" (Auto-Recovery). The power supply will recover once the fault condition of the OLP and OCP is removed and I_o is back within the specifications.



Additionally, if the I_o is $< 105\%$ but $> 100\%$ for a prolong period of time (depending on the load), the Over Temperature Protection (OTP) will be activated due to high temperature on critical components. The power supply will then go into latch mode until the fault is removed and the mains is reapplied.

Over Temperature Protection (Latch Mode)

As described in load de-rating section, the power supply also has Over Temperature Protection (OTP). In the event of a higher operating temperature at 100% load; or, when the operating temperature is beyond what is recommended in the de-rating graph, the OTP circuit will be activated. When activated, power supply will latch off, until the surrounding air temperature drops to its normal operating temperature or the load is reduced as recommended in the de-rating graph. Removal/re-application of input AC voltage will then be required in order to restart.

PJ Open Frame Power Supply

24V 50W 1 Phase / PJ-24V50W□NA

Others

Delta RoHS Compliant



Restriction of the usage of hazardous substances

The European directive 2011/65/EU limits the maximum impurity level of homogeneous materials such as lead, mercury, cadmium, chrome, polybrominated flame retardants PBB and PBDE for the use in electrical and electronic equipment. RoHS is the abbreviation for “Restriction of the use of certain hazardous substances in electrical and electronic equipment”.

This product conforms to this standard.

Conformal Coating



The Protective Coating Technology

Delta Electronics Group has designed the perfect dipping technique which penetrates everywhere including under device, and prevents leakage. The conformal coating dipping can be applied to PCBs or circuit board. The coating preserves the performance of precision electronic primarily by preventing ionizable contaminants such as salt from reaching circuit nodes, where the material slumps around sharp edges. This can be a problem especially in highly conversing atmosphere.

Attention

Delta provides all information in the datasheets on an “AS IS” basis and does not offer any kind of warranty through the information for using the product. In the event of any discrepancy between the information in the catalog and datasheets, the datasheets shall prevail (please refer to www.DeltaPSU.com for the latest datasheets information). Delta shall have no liability of indemnification for any claim or action arising from any error for the provided information in the datasheets. Customer shall take its responsibility for evaluation of using the product before placing an order with Delta.

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