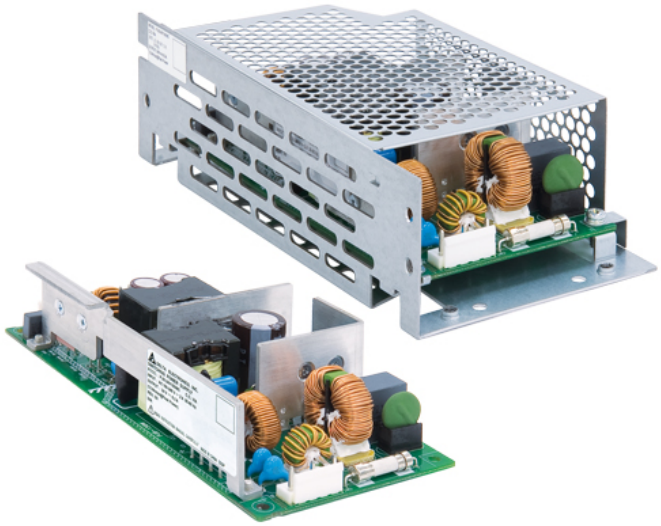
PJB Open Frame Power Supply
24 V 150 W 1 Phase / PJB-24V150W☐☐A



PJB

Highlights & Features

- Universal AC Input (85 Vac – 264 Vac)
- Power Boost of 200% for 10 seconds
- Low Inrush Current / Low Leakage Current
- High efficiency and PF factor to conserve energy
- Conformal coating on PCBA to protect against chemical and dust pollutants
- Remote ON/OFF (Optional)
- No Load power consumption < 0.5 W (Optional)
- Versatile configuration options: Open Frame, L Frame, Enclosed
- Design compliance with Japan PSE (DENAN)*

  * For PJB-24V150WJ☐A/H☐A/G☐A models only

Safety Standards

CB Certified for worldwide use

Model Number: PJB-24V150W☐☐A

Unit Weight: **Open Frame**: 0.31 kg (0.68 lb)
Enclosed: 0.51 kg (2.00 lb)

Dimensions (L x W x H):
Open Frame: 160 x 75 x 37 mm (6.30 x 2.95 x 1.46 inch)
Enclosed: 188 x 85 x 47 mm (7.40 x 3.35 x 1.85 inch)

General Description

The PJB series of Open Frame Power Supply comes with universal AC input at 85 Vac to 264 Vac. Features are including low leakage / Inrush current and conformal coating on the PCBAs to provide protection against dust and chemical pollutants and low power consumption for optional. The built-in active PFC provides PF > 0.97 and fulfills Harmonic Current Emission according to IEC/EN/BS EN 61000-3-2. The feature built-in Power Boost of 200% for 10 seconds enables reserve power to be always available for reliable startup of loads with high inrush current, thus eliminating the need of a more expensive power supply unit at higher power rating. Metal chassis and case cover are available as options for different installation preferences.

Model Information

PJB Open Frame Power Supply

Model Number	Input Voltage Range	Rated Output Voltage	Rated Output Current
PJB-24V150W☐☐A	85-264 Vac	24 Vdc	6.30 A

Model Numbering

				CC Code	
PJB –	**24V**	**150W**	**☐**	**☐**	**A**
PJB Series	Output Voltage	Output Power	Package Type B - Open Frame L - L Frame C - Enclosed J - Open Frame + Green Mode* H - L Frame + Green Mode* G – Enclosed + Green Mode*	Remote ON/OFF Function N - No Remote ON/OFF R - With Remote ON/OFF	Delta Standard

* With safety approvals: IEC/EN/UL 62368-1

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Specifications

Input Ratings / Characteristics

Nominal Input Voltage		100-240 Vac
Input Voltage Range		85-264 Vac
Nominal Input Frequency		50-60 Hz
Input Frequency Range		47-63 Hz
Input Current		1.90 A typ. @ 100 Vac, 0.95 A typ. @ 200 Vac
Efficiency at 100% Load		88.0% typ. @ 100 Vac, 90.5% typ. @ 200 Vac
No Load Power Consumption	Package Type : B、L、C	3.5 W typ.
	Package Type : J、H、G	< 0.5 W @100 Vac & 200 Vac
Max Inrush Current (Cold Start)		15 A typ. @ 100 Vac, 30 A typ. @ 200 Vac
Power Factor Correction at 100% load		0.98 typ. @ 100 Vac, 0.95 typ. @ 200 Vac
Leakage Current		0.2 mA @ 100 Vac, 0.4 mA @ 240 Vac

Output Ratings / Characteristics*

Nominal Output Voltage	24 Vdc
Factory Set point Tolerance	24 Vdc ±1% (initial set point tolerance from factory)
Output Voltage Adjustment Range	21.6-26.4 Vdc
Output Current	6.30 A (continuously operating at 24 V) 12.6 A (Power Boost for 10 seconds at 24 V, refer to the details in the Functions section)
Output Power	151.2 W (continuously operating at 24 V) 302.4 W (Power Boost for 10 seconds at 24 V, refer to the details in the Functions section)
Line Regulation	< 96 mV
Load Regulation	< 150 mV
Ripple Noise (20 MHz)	< 150 mVpp @ 0°C to 50°C, < 180 mVpp @ -10°C to
Start-up Time	500 ms typ. @ 100 Vac (100% load)
Hold-up Time	20 ms typ. @ 100 Vac (100% load)
Dynamic Response (Overshoot & Undershoot O/P Voltage)	± 5% @ 0-50% load and 50-100% load (Slew Rate: 0.1 A/μS)
Start-up with Capacitive Loads	8,000 μF Max

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

Mechanical

Case Chassis/Cover		SGCC
Dimensions	Open Frame	160 x 75 x 37 mm (6.30 x 2.95 x 1.46 inch)
Unit Weight	Open Frame	0.31 kg (0.68 lb)
	Enclosed	0.51 kg (2.00 lb)
Indicator		NA
Cooling System		Convection
Terminal	Input	JST B3P5-VH (LF)(SN)
	Output	V–: JST B7P-VH (LF)(SN), V+: JST B6P-VH (LF)(SN)
Wire		AWG 22-18
Noise (1 Meter from power supply)		Sound Pressure Level (SPL) < 25 dBA

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Environment

Surrounding Air Temperature	Operating	-10°C to +70°C
	Storage	-25°C to +75°C
Power De-rating	Mounting Orientation A	> 50°C de-rate power by 2% / °C < 90Vac de-rate power by 2% / V
Operating Humidity		5 to 90% RH (Non-Condensing)
Operating Altitude		0 to 5,000 Meters (16,400 ft)
Shock Test	Non-Operating	IEC 60068-2-27, Half Sine Wave: 50 G for a duration of 11ms, 3 shocks for each 3 directions
Vibration	Operating	IEC 60068-2-6, Sine Wave: 10 Hz to 55 Hz @ 19.6 m/S² (2 G peak); 10 min per cycle, 60 min per axis for all X, Y, Z direction
Over Voltage Category		2
Pollution Degree		2

Protections

Overvoltage	27.6-33.6 V, Latch Mode
Overload / Overcurrent	> 220% 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)
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 (115 Vac, 50% load @ 40°C)

Safety Standards / Directives

Safety Entry Low Voltage		SELV
Electrical Safety	TUV Bauart UL/cUL recognized CB scheme	For Package type : B / L / C EN 60950-1 UL 60950-1 and CSA C22.2 No. 60950-1 (File No. E131881) IEC 60950-1
	TUV Bauart UL/cUL recognized cTUVus CB scheme	For Package type : J / H / G EN 62368-1 UL 60950-1 and CSA C22.2 No. 60950-1 UL 62368-1 and CSA C22.2 No. 62368-1 IEC 62368-1 Design to meet DENAN at 100 Vac – 240 Vac
CE*		In conformance with EMC Directive 2014/30/EU and Low Voltage Directive 2014/35/EU
UKCA*		In conformance with Electromagnetic Compatibility Regulations 2016 and Electrical Equipment (Safety) Regulations 2016
Galvanic Isolation	Input to Output	3.0 KVac
	Input to Ground	2.0 KVac
	Output to Ground	0.5 KVac

*Only with J / H / G models

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EMC

Emissions (CE&RE)		CISPR 32, EN/BS EN 55032, Comply with FCC Title 47: Class B
Immunity		**EN 61000-6-1 (For Package Type : B、L、C)**
Electrostatic Discharge	IEC 61000-4-2	Criteria A[1)] Air Discharge: 8 kV (Level 3) Contact Discharge: 4 kV (Level 2)
Radiated Field	IEC 61000-4-3	Level 2 Criteria A[1)] 80 MHz-1GHz, 3 V/M with 1 kHz tone / 80% modulation
Electrical Fast Transient / Burst	IEC 61000-4-4	Level 2 Criteria A[1)] 1 kV
Surge	IEC 61000-4-5	Level 3 Criteria A[1)] Common Mode[4)]: 2 kV Differential Mode[5)]: 1 kV
Conducted	IEC 61000-4-6	Level 2 Criteria A[1)] 150 kHz-80 MHz, 3 Vrms
Power Frequency Magnetic Fields	IEC 61000-4-8	Criteria A[1)] Magnetic field strength 1A/Meter
Voltage Dips and Interruptions	IEC 61000-4-11	100% dip; 1 cycle (20 ms); Self Recoverable
Immunity		**EN 61000-6-2 (For Package Type : G、H、J)**
Electrostatic Discharge	IEC 61000-4-2	Level 4 Criteria A[1)] Air Discharge: 15 kV Contact Discharge: 8 kV
Radiated Field	IEC 61000-4-3	Level 3 Criteria A[1)] 80 MHz-1 GHz, 10 V/M with 1 kHz tone / 80% modulation
Electrical Fast Transient / Burst	IEC 61000-4-4	Level 3 Criteria A[1)] 4 kV
Surge	IEC 61000-4-5	Level 4 Criteria A[1)] Common Mode[4)]: 4 kV Differential Mode[5)]: 2 kV
Conducted	IEC 61000-4-6	Level 3 Criteria A[1)] 150 kHz-80 MHz, 10 Vrms
Power Frequency Magnetic Fields	IEC 61000-4-8	Level 4 Criteria A[1)] Magnetic field strength 30 A/Meter
Voltage Dips and Interruptions	IEC 61000-4-11	100% dip; 1 cycle, Criteria B [2)] 40% dip; 10 cycle, Criteria C [3)] 70% dip; 25 cycle, Criteria C [3)] 100% dip; 250 cycle, Criteria C [3)]
Harmonic Current Emission		IEC/EN/BS EN 61000-3-2, Class A
Voltage Fluctuation and Flicker		IEC/EN/BS EN 61000-3-3

1) Criteria A: Normal performance within the specification limits
2) Criteria B: Output out of regulation, or shuts down during test. Automatically restored to normal operation after test.
3) Criteria C: Output out of regulation, shuts down during test (Need to recycle AC power cord to normal operation after test)
4) Asymmetrical: Common mode (Line to earth)
5) Symmetrical: Differential mode (Line to line)

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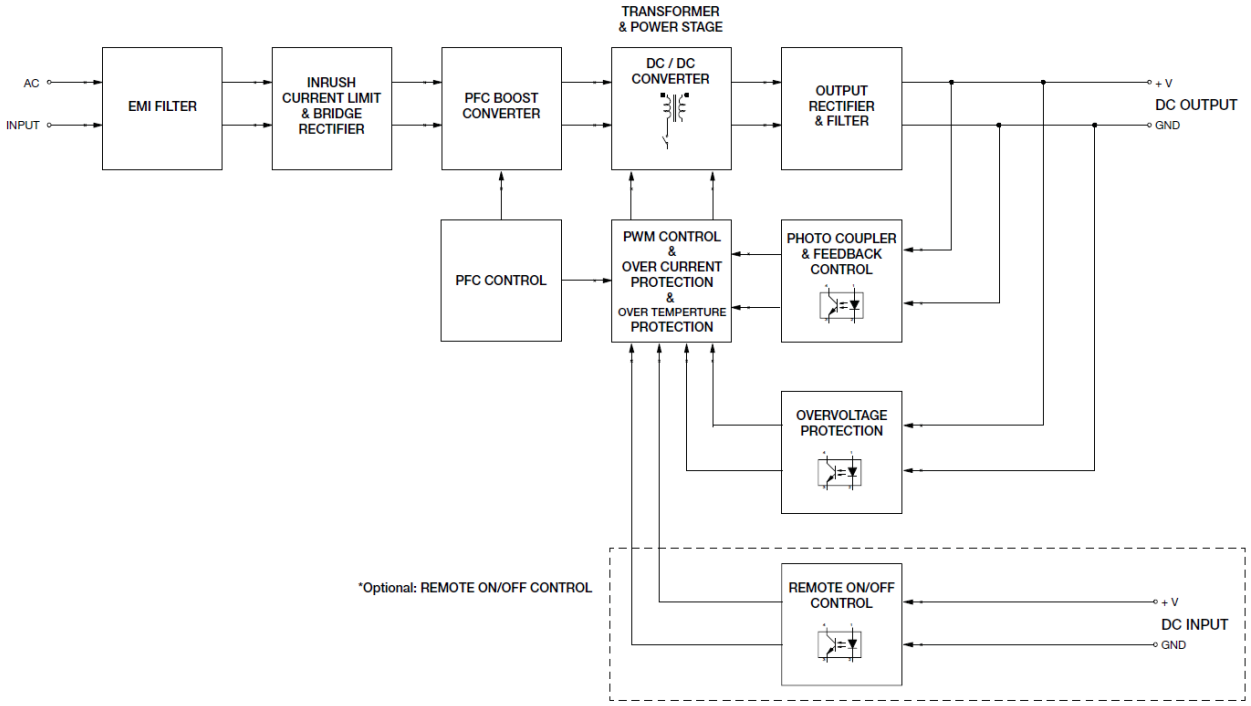
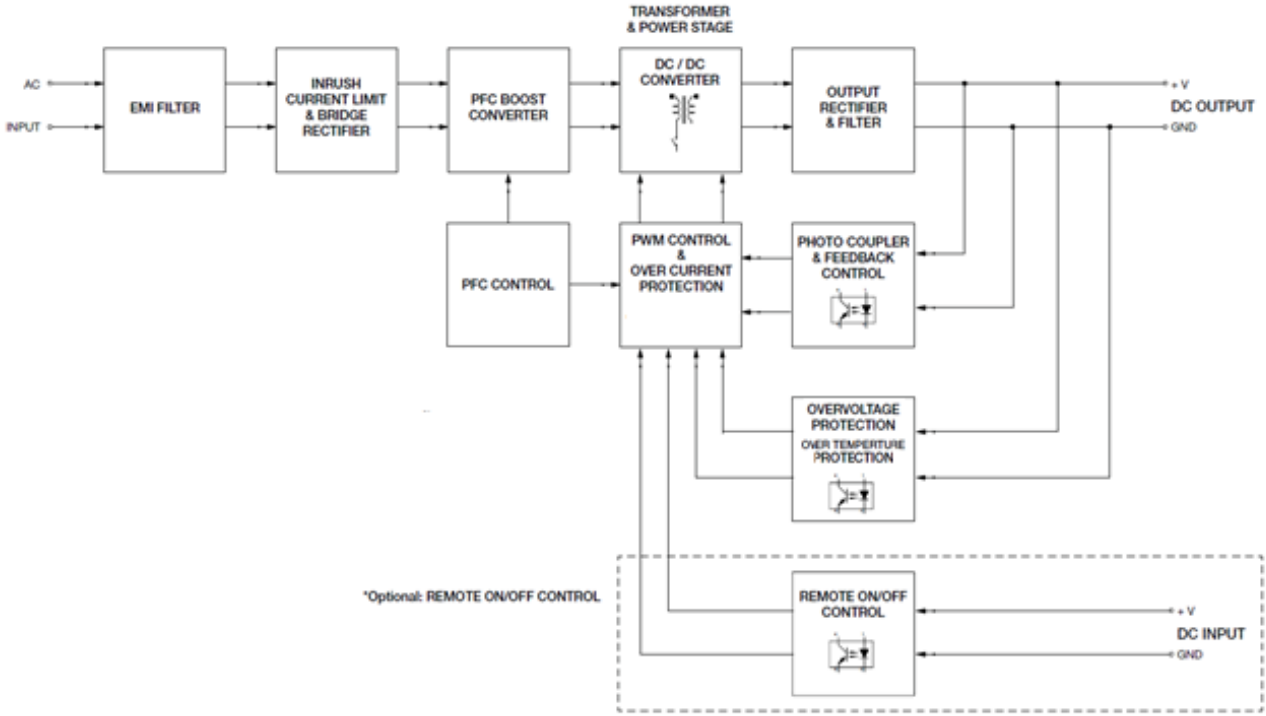
Block Diagram(For Package Type : B、L、C)



Block Diagram(For Package Type : G、H、J)



All parameters are specified at 25°C ambient and AC input unless otherwise indicated.
www.DeltaPSU.com (April 2022, Rev. 11)

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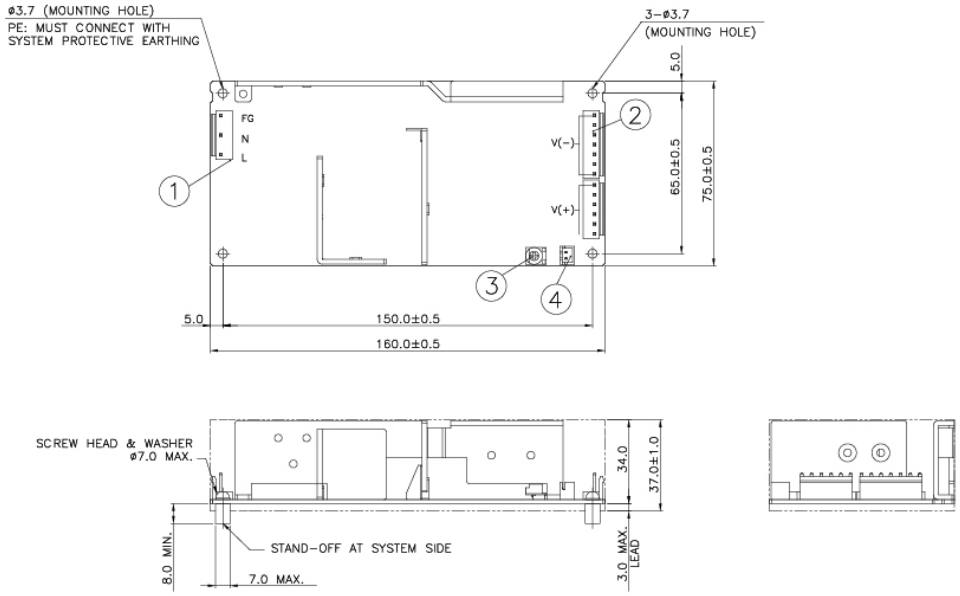
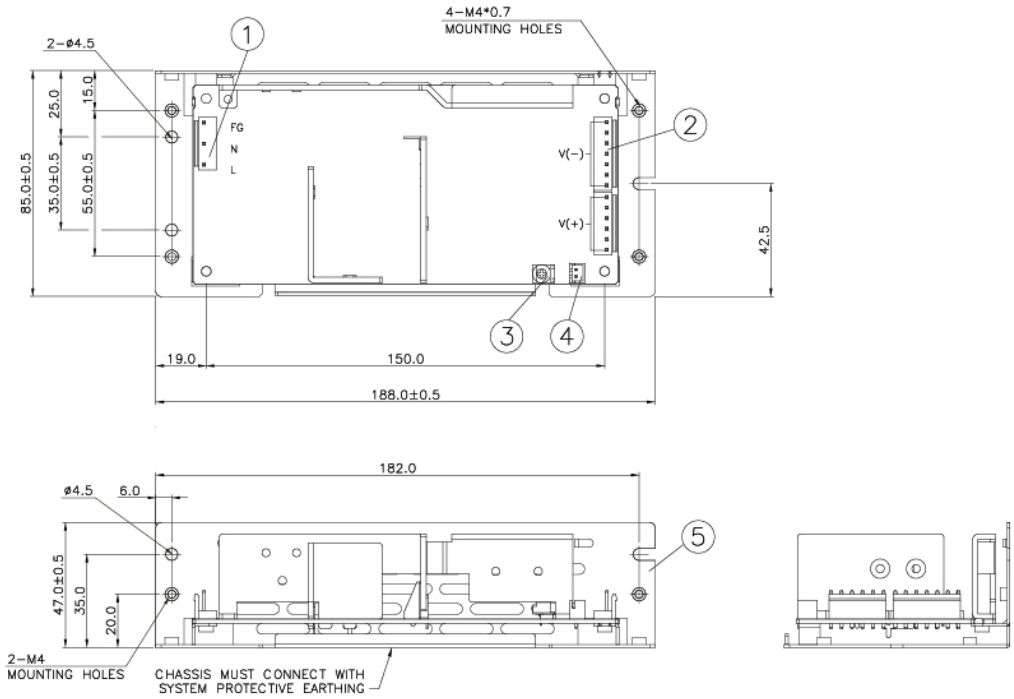
Dimensions

Open Frame
L x W x H: 160 x 75 x 37 mm (6.30 x 2.95 x 1.46 inch)



L Frame
L x W x H: 188 x 85 x 47 mm (7.40 x 3.35 x 1.85 inch)



Item	Device Description
1	Input Connector
2	Output Connector
3	VR
4	Remote ON/OFF (JST B2B-XH-A)
5	Chassis

Notes

- Dimensions are in mm
- For information on Mounting Torque, and I/O Connector and Housing, please refer to the Instruction Manual.
- 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.

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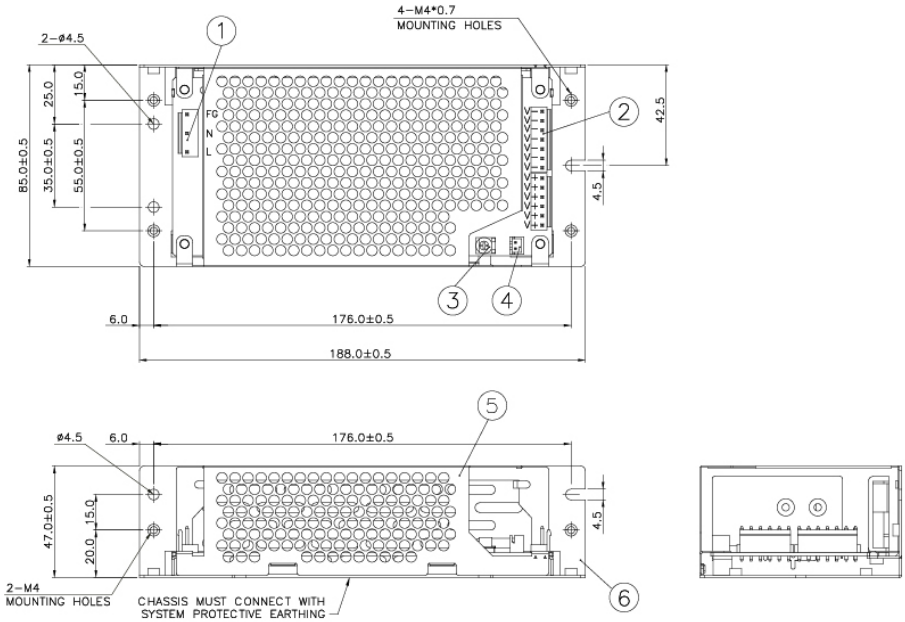
Enclosed
L x W x H: 188 x 85 x 47 mm (7.40 x 3.35 x 1.85 inch)



Item	Device Description
1	Input Connector
2	Output Connector
3	VR
4	Remote ON/OFF (JST B2B-XH-A)
5	Cover
6	Chassis

Notes

- Dimensions are in mm
- For information on Mounting Torque, and I/O Connector and Housing, please refer to the Instruction Manual.
- For Enclosed type: There are 6 threaded mounting holes and 5 normal mounting holes.

PJB Open Frame Power Supply
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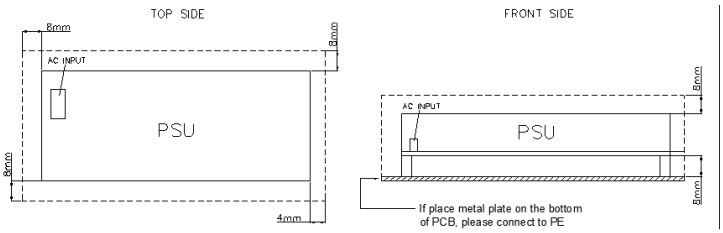
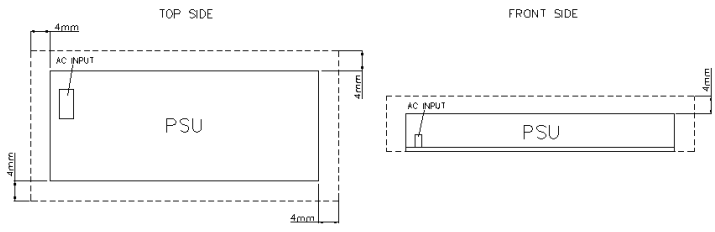
Assembly & Installation

Assembly Reference

■ Open Frame



■ L Frame / Enclosed



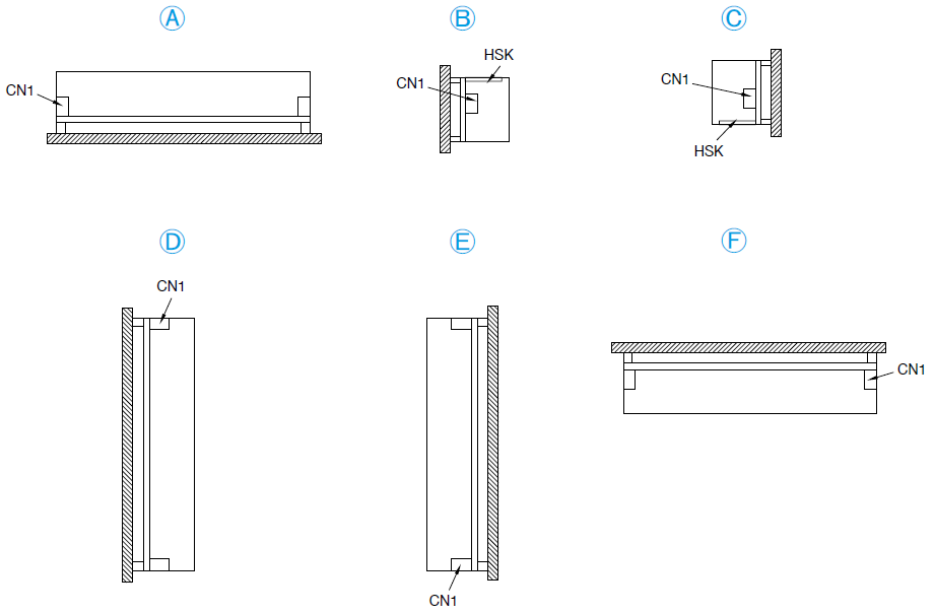
For safety reasons, please ensure the mounted device is kept safety distance as below at all sides from other components and equipments.
a) For Open Frame Type ≥ 8 mm (0.315 inch) from primary side and ≥ 4 mm (0.16 inch) from secondary side.
b) For with Case Type ≥ 4 mm (0.16 inch)

Please insert an insulation sheet between the system and product, if the safety distance is less than 4 mm (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.
- For the Remote ON/OFF function, use flexible cable (stranded or solid) of AWG No. 28-22.

Table 1		Connector (Board Mounting)	Housing	Terminal
Input (JST)		B3P5-VH(LF)(SN)	VHR-5N	SVH-21T-P1.1
Output (JST)	V-	B7P-VH (LF)(SN)	VHR-7N	
	V+	B6P-VH(LF)(SN)	VHR-6N	
Remote ON/OFF Function (Option)		B2B-XH-A(LF)(SN)	XHP-2	SXH-001T-P0.6

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.**

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Engineering Data

Convection

Output Load De-rating VS Surrounding Air Temperature

■ Open Frame / L Frame

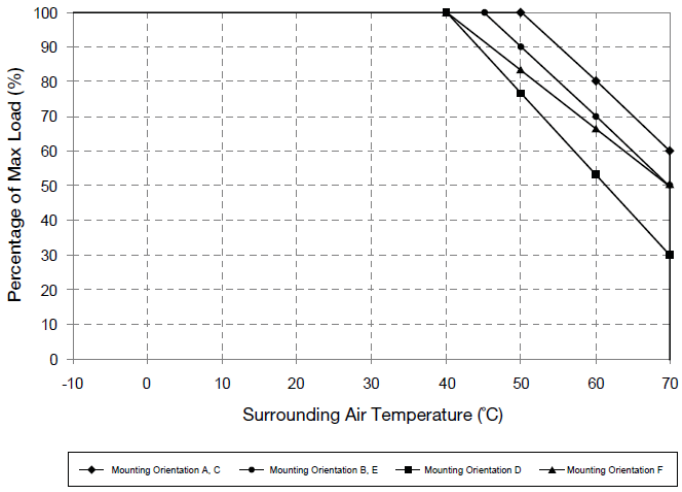


Fig.1.1 De-rating for Mounting Orientation A, C
> 50°C de-rate power by 2% / °C
De-rating for Mounting Orientation B, E
> 45°C de-rate power by 2% / °C
De-rating for Mounting Orientation D
> 40°C de-rate power by 2.33% / °C
De-rating for Mounting Orientation F
> 40°C de-rate power by 1.66% / °C

■ Enclosed

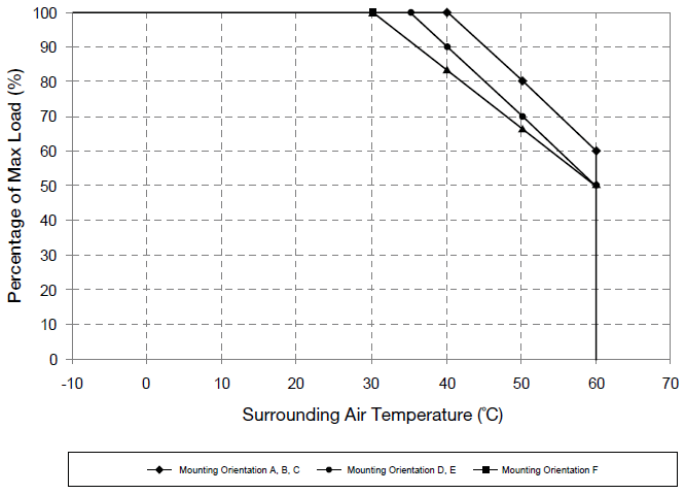
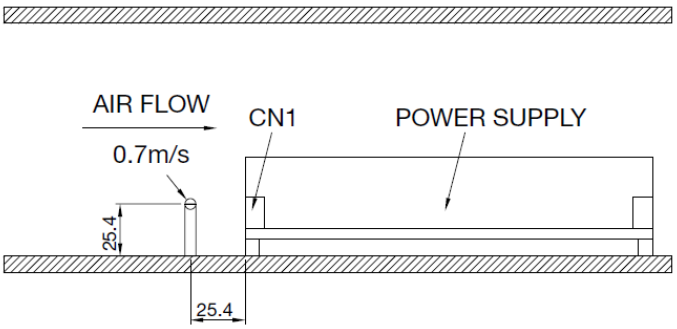


Fig.1.2 De-rating for Mounting Orientation A, B, C
> 40°C de-rate power by 2% / °C
De-rating for Mounting Orientation D, E
> 30°C de-rate power by 1.66% / °C
De-rating for Mounting Orientation F
> 35°C de-rate power by 2% / °C

Forced Cooling (Air Velocity > 0.7m/s)

Output Load De-rating VS Surrounding Air Temperature

■ Air Flow Direction



■ Open Frame / L Frame

■ Enclosed

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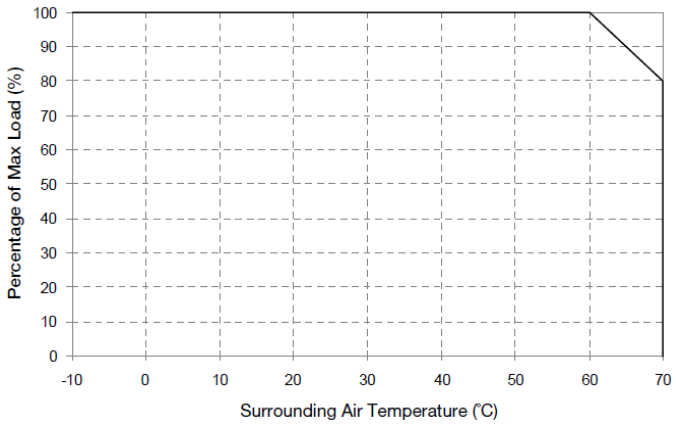


Fig.1.3 De-rating for Mounting Orientation A to F
> 60°C de-rate power by 2% / °C

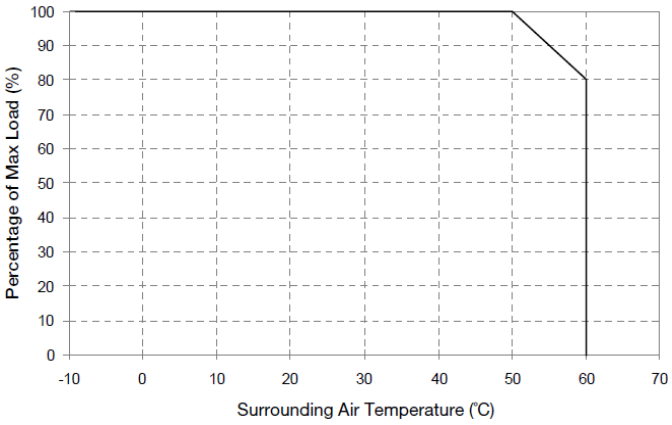
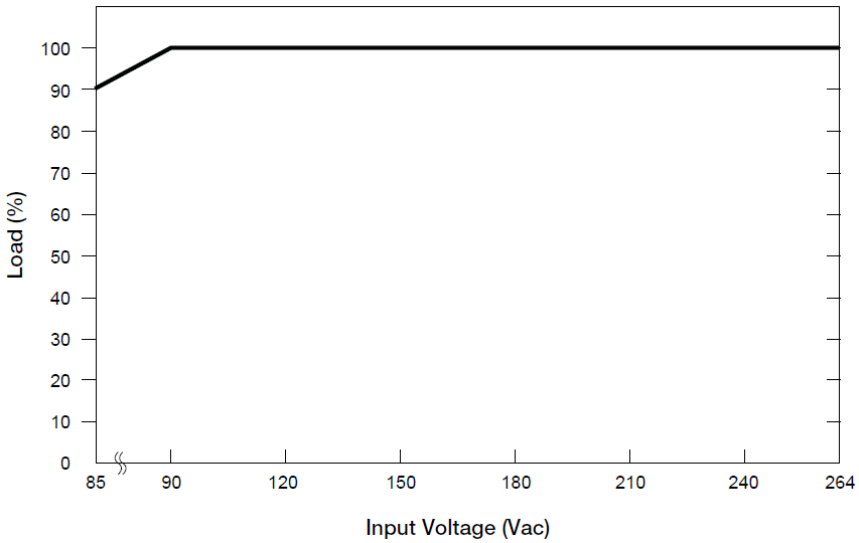


Fig.1.4 De-rating for Mounting Orientation A to F
> 50°C de-rate power by 2% / °C

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 bouncing mode and will recover when the surrounding air temperature is lowered or the load is reduced as far as necessary to keep the device in working condition.
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.

Output Load De-rating VS. Input Voltage



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

PJB Open Frame Power Supply
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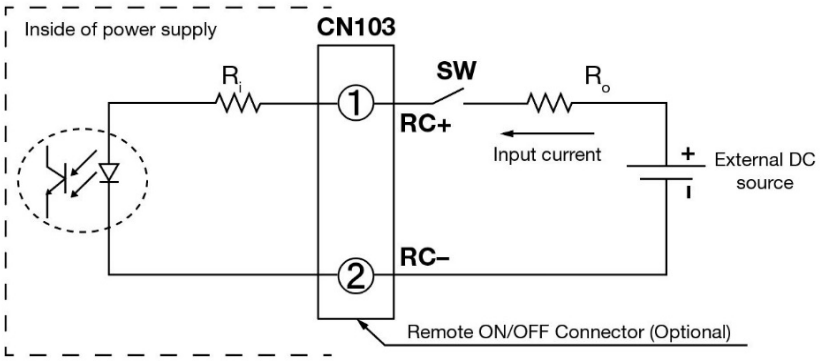
Remote ON/OFF Function



You can remotely control the power supply unit to turn ON/OFF by using an external DC source. Follow the DC power source voltage and current limiting defined in the table below.

Built-in Resistor R_i (ohm)	Voltage Between RC+ and RC- (V)		Input Current (mA)
	Output ON	Output OFF	
1k	5-12.5	0-0.5	20 Max

Notes

1. Remote ON/OFF circuits are isolated from input, output and PE.
2. Please check if the polarity of the wire connector is the same as the external DC source. If not, the power would not turn on and the internal components may be damaged.
3. You do not need an external resistance R_O for current limit while the output voltage of external DC source is within the range of 5-12.5 V. If the output voltage exceeds 12.5 V, please use the following equation for the value of current limit resistance R_O.

$$R_O = \frac{Vcc - (3.5 + 0.006R_i)}{0.006}$$

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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.

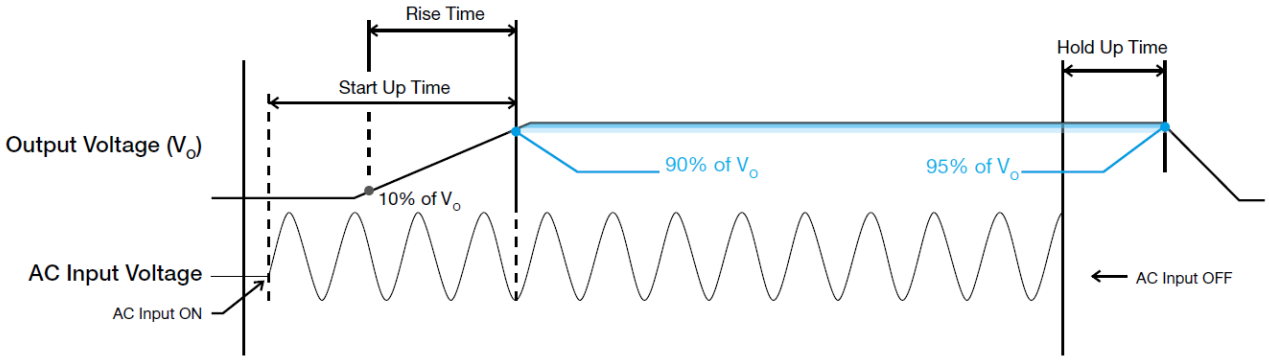
Rise Time

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.

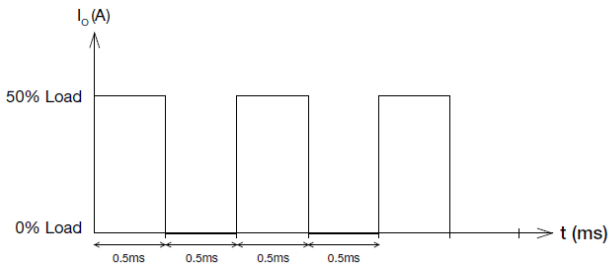
■ **Graph illustrating the Start-up Time, Rise Time, and Hold-up Time**



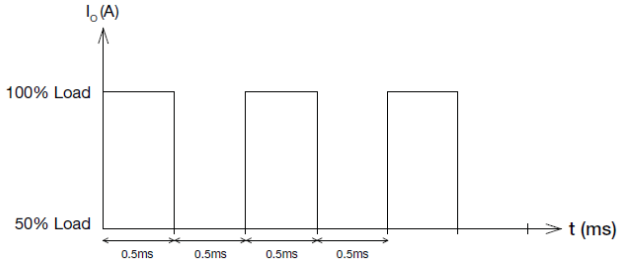
Dynamic Response

The power supply output voltage will remain within ±5% of its steady state value, when subjected to a dynamic load from 0 to 50% and 50 to 100% of its rated current.

■ 0 to 50% Load



■ 50 to 100% Load



PJB Open Frame Power Supply
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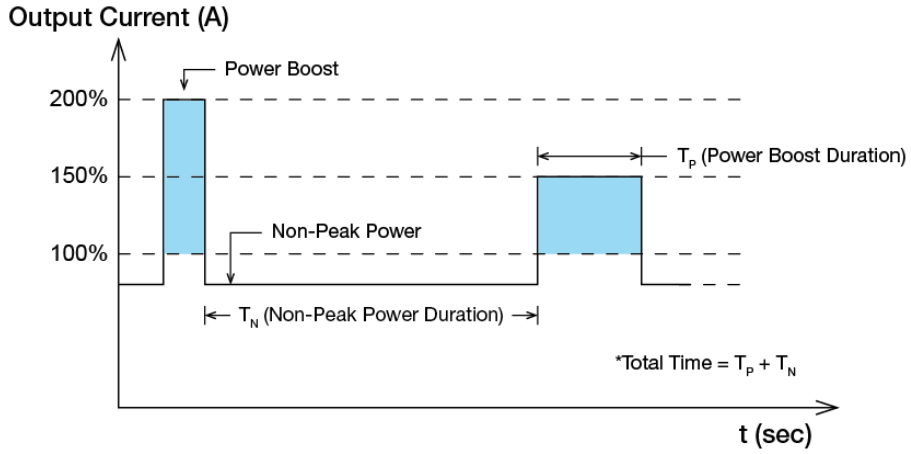
Power Boost

Power Boost is the reserve power available constantly that allows reliable startup to support sudden and short spike of loads with high inrush current typically during turn on to remove the need of more expensive higher rated power supply unit. After the output has reached its steady state set value, the power supply can support surge loads with a higher short-term power demand up to 200% of maximum rated load (I_O Max), for a maximum duration of 10 seconds. The Power Boost is also available to repeatedly basis with according to the condition of an average (R.M.S) output power shall not exceed continuous operating condition or refer to duty cycle calculation below.



$$Duty\ cycle\ (\%) = \frac{T_P}{Total\ Time}\ ;\ (T_P \leq 10\ \text{sec})$$

$$Average\ Output\ Power\ (P_{Avg}) = \frac{(Power\ Boost\ \times T_P) + (Non\text{-}Peak\ Power \times T_N)}{Total\ Time}$$

OR

$$Non\text{-}Peak\ Power = \frac{(P_{Avg} \times Total\ Time) - (Power\ Boost\ \times T_P)}{T_N}$$

■ **An example of Power Boost and Average Output Power**

Power Boost	Peak Power (W_P)	Power Boost Duration (T_P)	Duty Cycle	Non-Peak Power (W_N)	Non-Peak Power Duration (T_N)	Total Time (T)
200%	302.4 W	10 sec	15%	124.52 W	56.67 sec	66.67 sec
200%	302.4 W	5 sec	15%	124.52 W	28.33 sec	33.33 sec
150%	225 W	10 sec	40%	102 W	15 sec	25 sec
150%	225 W	5 sec	40%	102 W	7.5 sec	12.5 sec

It is not recommended to prolong the duration of Power Boost to be longer than the specified duty cycle calculation, this may cause damage to the PSU.

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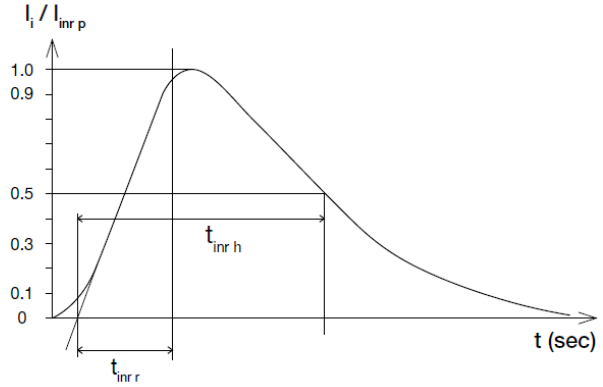
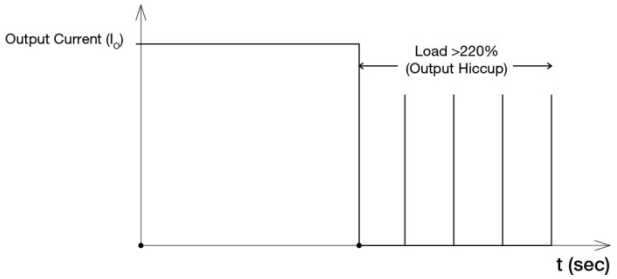
Inrush Current

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.



Overload & Overcurrent Protections (Auto-Recovery)

The power supply's Overload (OLP) and Overcurrent (OCP) Protections will be activated when output current exceeds 220% 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.

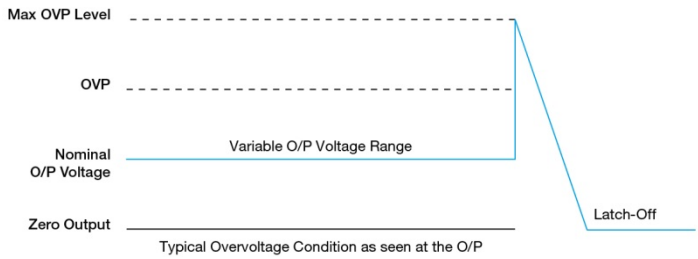


It is not recommended to prolong the duration of I_O when it is <220% but >100%, since it may cause damage to the PSU.

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.



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.

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.

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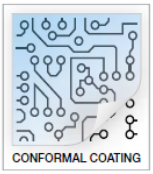
Others

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.

PFC – Norm EN 61000-3-2

Line Current Harmonic content

Typically, the input current waveform is not sinusodial due to the periodical peak charging of the input capacitor. In industrial environment, complying with EN 61000-3-2 is only necessary under special conditions. Complying to this standard can have some technical drawbacks, such as lower efficiency as well as some commercial aspects such as higher purchasing costs. Frequently, the user does not profit from fulfilling this standard, therefore, it is important to know whether it is mandatory to meet this standard for a specific application.

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.

Delta reserves the right to make changes to the information described in the datasheets without notice.

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