

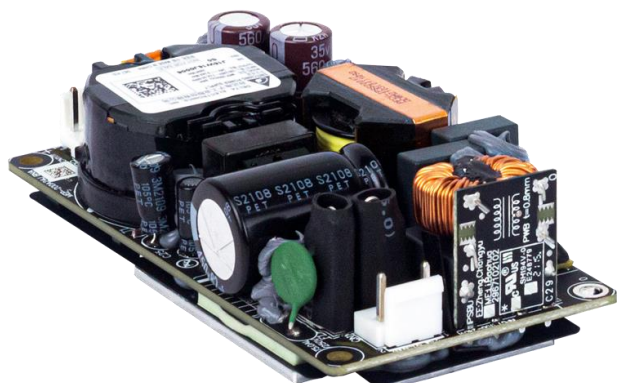
# Medical / Industrial AC-DC Power Supply

## 200 W Convection 2" x 4" / MEP-200A□J BNA

# MEP-200A

### Highlights & Features

- 2" x 4" x 1.12" low profile
- Up to 22.32 W/inch<sup>3</sup> power density
- Up to 200 W output with natural convection cooling
- High efficiency up to 95%
- Up to 70 °C Ambient Operation
- Up to 1000KHrs MTBF
- 2 x MOPP Isolation
- Suited for Type BF Medical Products.
- Class B Conducted and Radiated EMI
- IEC60601-1-2 4<sup>th</sup> Edition Immunity Compliance



### Safety Certifications



**Model Number:** MEP-200A□J BNA  
**Unit Weight:** 0.21 kg (0.463 lb)  
**Dimensions (W x L x H):** 50.8 x 101.6 x 28.5 mm (2.0 x 4.0 x 1.12 inch)

### General Description

The MEP-200A offers 200 W output power and 3 output voltage of 12 V, 24 V and 48 V in a 2" x 4" footprint and low profile design is suitable for space-constrained applications. It supports a wide operating temperature ranging from -30°C to +70°C. Electric shock protection complying with 2 x MOPP, the MEP-200A offers reliable power supply for type BF medical equipment. The MEP-200A is certified with medical, ICT and home appliance safety approvals, including UL/ TUV/ CE/ UKCA and CB certification, as well as EMC approvals to EN 55032 Class B. It is applicable to type BF medical products, IT equipment and household appliances.

### Model Information

Model Name	Input Voltage	Output Voltage	Max Continuous Current
MEP-200A12J BNA	90 - 264 Vac	12 Vdc	16.67 A
MEP-200A24J BNA	90 - 264 Vac	24 Vdc	8.34 A
MEP-200A48J BNA	90 - 264 Vac	48 Vdc	4.17 A

### Model Numbering

						CC Code
<b>MEP –</b>	<b>200</b>	<b>A</b>	<b>□</b>	<b>J</b>	<b>□</b>	<b>BNA</b>
ME: Delta Medical Power Supply	Max Wattage in Product Series	Family Code	Output Voltage (Single Output) 12 – 12V 24 – 24V 48 – 48V	Family Code J: JST connector	Blank	Delta Standard, No conformal coating
P: Open frame	200: 200 W					

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### Specifications

#### Input Ratings / Characteristics

Model Number	MEP-200A12J	MEP-200A24J	MEP-200A48J
Nominal Input Voltage	100 - 240 Vac		
Input Voltage Range	90 - 264 Vac		
Nominal Input Frequency	50 - 60 Hz		
Input Frequency Range	47 - 63 Hz		
Input Current (max.)	2.5 A		
Input Surge Voltage (max.)	300 Vac for 100 ms		
Efficiency @ full load	@ 115 Vac	92.4%	93.8 %
	@ 230 Vac	93.8%	94.7 %
Inrush Current (max.)	60 A at 264 Vac, cold start		
Earth leakage current (max)	0.3 mA at NC, 1.0mA @ SFC <sup>*1</sup>		
Touch current (max)	0.1 mA at NC, 0.5mA @ SFC <sup>*1</sup>		
Power Factor (min.)	0.95 at 115 V & 230 Vac / 50 Hz, full load		

\*1 NC: normal condition, SFC: single fault condition

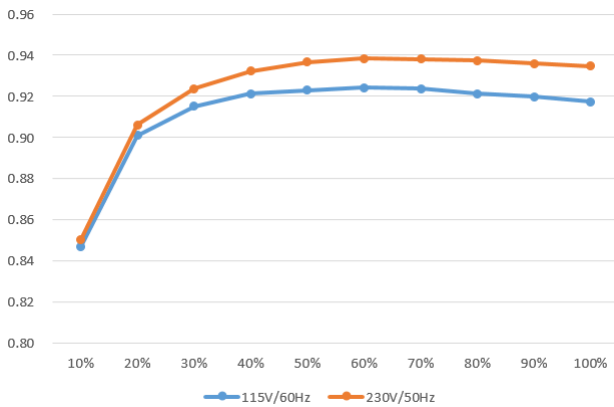


Figure 1. Typical Efficiency Curve for 12 V (max. 200 W)

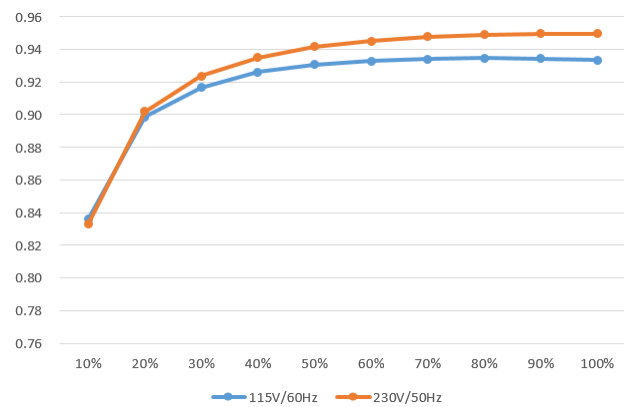


Figure 2. Typical Efficiency Curve for 24 V (max. 200 W)

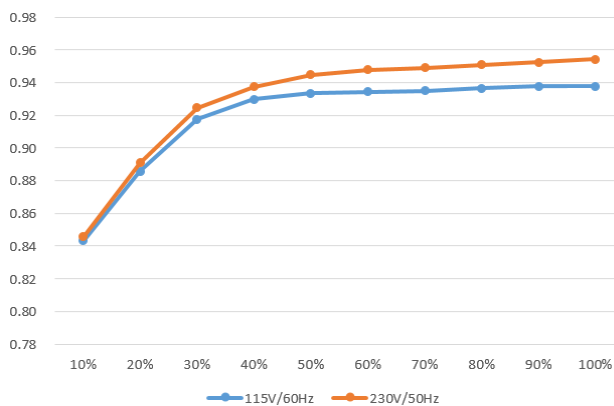


Figure 3. Typical Efficiency Curve for 48 V (max. 200 W)

# Medical / Industrial AC-DC Power Supply

## 200 W Convection 2" x 4" / MEP-200A□J BNA

### Output Ratings / Characteristics

Model Number	MEP-200A12J	MEP-200A24J	MEP-200A48J
Output Power (max.)	200 W		
Total Regulation	± 3 %		
Line Regulation (max.)	1 %		
Load Regulation (max.)	2 %		
PARD <sup>*2</sup> (20 MHz) (typ.)	1 % pk-pk Vrated or 150 mV which is larger at rated load		
Start-up Time (max.)	1,000 ms with AC turn on		
Hold-up Time (min.)	12 ms @ 180 W load, with nominal input range		
Rise Time (max.)	50 ms		
Dynamic Response (overshoot & undershoot O/P voltage)	± 10% @ with 5-100% load change, (50% duty @ 10 Hz & 10 KHz, 0.5 A/us slew rate)		
Capacitive Load (max.)	1,500 uF		

\*2 PARD is measured with an AC coupling mode, and in parallel to end terminal with 0.1 μF ceramic capacitor & 47 μF electrolytic capacitor.  
PSU need to burn in > 5 minutes when AMB ≤ 0°C

### Mechanical

Package	Open frame		
Dimensions (W x L x H)	50.8 x 101.6 x 28.5 mm (2 x 4 x 1.12 inch)		
Unit Weight	0.21 kg (0.463 lb)		
Cooling System	Convection / Force air		
Terminal	Input	JST: B2P3-VH or equivalent	
	Output	JST: B6P-VH-B (LF) (SN) or equivalent	

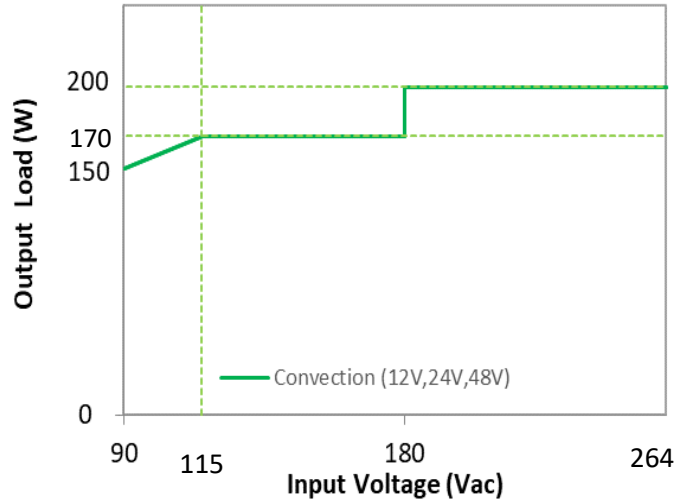
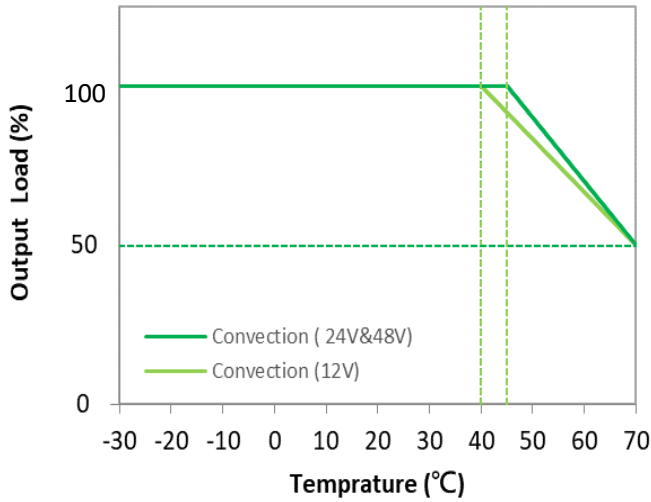
### Environment

Surrounding Air Temperature	Operating	-30 °C to +70 °C
	Storage	-40 °C to +85 °C
Temperature Power De-rating	Linear power derating from 100% load at 45 °C to 50% load at 70 °C with 2 %/°C (24 V / 48 V model) Linear power derating from 100% load at 40°C to 50% load at 70 °C with 2 %/°C (12 V) Note: see power de-rating curves below	
Operating Humidity	5-95 % RH (Non-condensing)	
Operating Altitude	Up to 5,000 meters (up to 16,400 feet or 106-54kPa)	
Non-Operating Altitude	Up to 5,575 meters (up to 18,290 feet or 106-50kPa)	
Shock Test (Non-Operating)	50 G, 11 ms, 3 shocks for each direction	
Vibration (Non-Operating)	5 – 500 Hz, 2 Grms, 15 minute for each three axis	

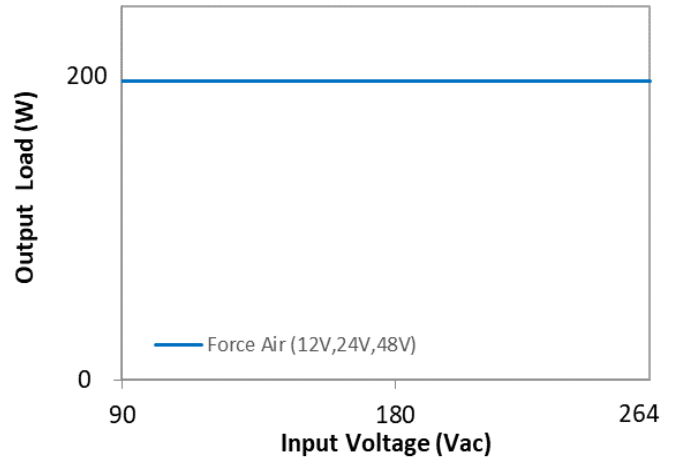
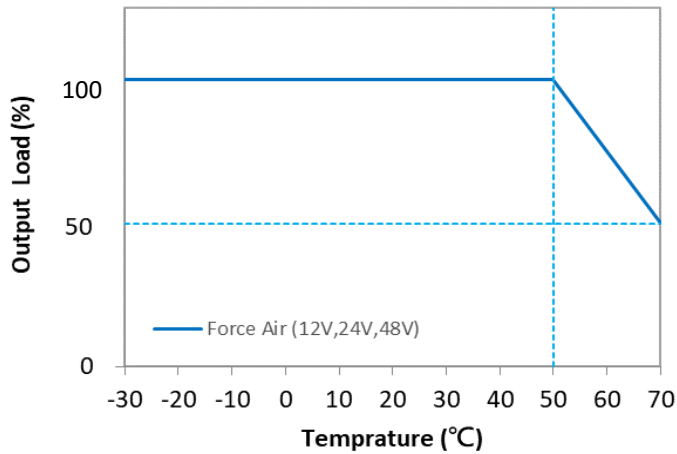
# Medical / Industrial AC-DC Power Supply

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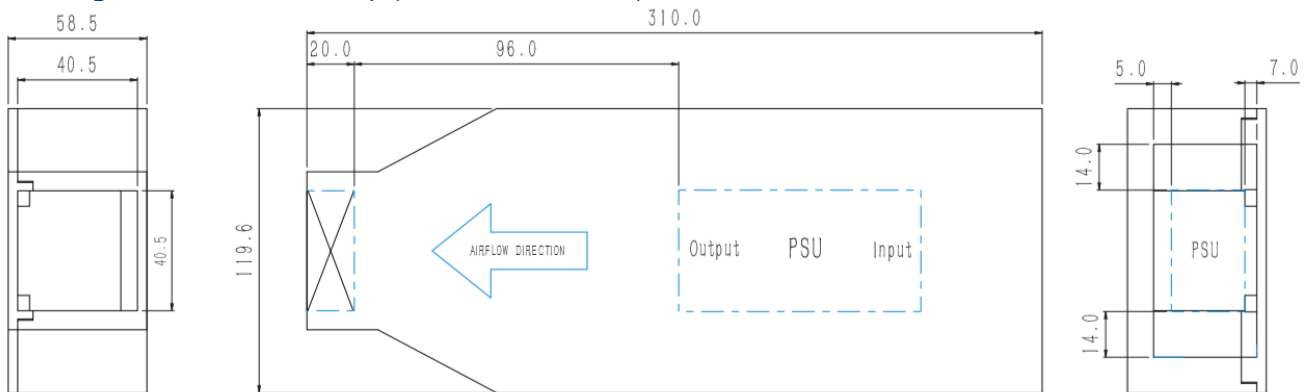
Power De-rating Curve (Convection)



Power De-rating Curve (Force Air)



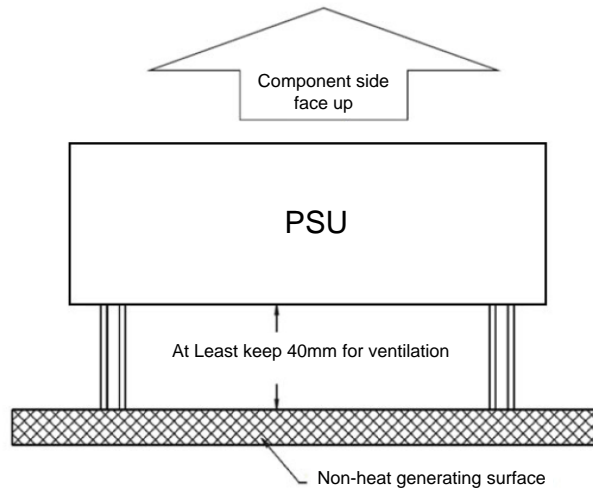
Load De-rating Fixture and Test Setup (FAN: EFB0412VHD)



# Medical / Industrial AC-DC Power Supply

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### Convection Test Setup



#### Notes 1 (For MEP-200A24J BNA/MEP-200A48J BNA):

1. Fan source and box dimensions could be changed or modified to meet air speed: 0.86 m/s
2. Airflow: 5.2 CFM (For reference, air speed should meet 0.86 m/s)
3. Used fan voltage: 7.0 V (For reference, the voltage should be adjusted for every fan to meet air speed: 0.86 m/s)
4. Unit: mm

#### Notes 2 (For MEP-200A12J BNA):

5. Fan source and box dimensions could be changed or modified to meet air speed: 0.99 m/s
6. Airflow: 6.0 CFM (For reference, air speed should meet 0.99 m/s)
7. Used fan voltage: 8.0 V (For reference, the voltage should be adjusted for every fan to meet air speed: 0.99 m/s)
8. Unit: mm

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### Protections

Overvoltage (max)	Main output 125% of rated normal voltage, latch mode
Over Load / Over Current (max)	Main output 140% of rated current, Hiccup Mode
Over Temperature	Latch mode for main output
Short Circuit	Hiccup mode (Non-latching, auto-recovery)
Protection Against Shock <sup>3)</sup>	Class I & II

\*3 Applicable to Class II medical equipment which needs to be evaluated in the end product assembly.

### Reliability Data

MTBF (Minimum) at 115 Vac, 170 W, 35 °C	1,000 Khrs based on Telecordia SR-332
Operating life (Minimum) at 115 Vac, 170 W, 25 °C	26,280 hrs

### Safety Standards / Directives

Medical Safety	IEC60601-1 CB report TUV EN60601-1 ANSI/AAMI ES 60601-1+CAN/CSA-C22.2 No.60601-1						
ITE Safety	IEC60950-1 CB report IEC62368-1 CB report TUV EN 62368-1 UL 62368-1 and CAN/CSA C22.2 No. 62368-1 CCC GB 17625.1; GB 4943.1; GB/T 9254.1						
Household	IEC60335-1 CB report IEC61558-1 & -2-16 CB report TUV EN 60335-1 TUV EN 61558-1 & -2-16						
CE	In conformance with EN 60601-1: 2006 + A11: 2011 + A1: 2013 + A12: 2014 & EN 60601-1-2: 2015						
UKCA	In conformance with Electromagnetic Compatibility Regulations 2016 and Medical Devices Regulations 2002 (UK MDR 2002)						
Galvanic Isolation	<table border="0"> <tr> <td>Input to/Output (2XMOPP)</td> <td>4,000 Vac</td> </tr> <tr> <td>Input to/Ground (1XMOPP)</td> <td>1,500 Vac</td> </tr> <tr> <td>Output to/Ground (1XMOPP)</td> <td>1,500 Vac (Type BF application rated)</td> </tr> </table>	Input to/Output (2XMOPP)	4,000 Vac	Input to/Ground (1XMOPP)	1,500 Vac	Output to/Ground (1XMOPP)	1,500 Vac (Type BF application rated)
Input to/Output (2XMOPP)	4,000 Vac						
Input to/Ground (1XMOPP)	1,500 Vac						
Output to/Ground (1XMOPP)	1,500 Vac (Type BF application rated)						

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## EMC

EMC / Emissions		EN 55011/EN 55032, FCC Title 47: Class B for Class I Note: Class B Radiated Emission for Class II connection without earth connection needs to add EMI filter. Please consult with Delta for detailed information.
Harmonic Current Emissions	IEC 61000-3-2	Meet Class D limit
Voltage Flicker	IEC 61000-3-3	
Immunity to		
Electrostatic Discharge	IEC 61000-4-2	Level 4 criteria A <sup>1) 5)</sup> Air discharge: 15 kV Contact discharge: 8 kV
Radiated Field	IEC 61000-4-3	Criteria A <sup>1)</sup> 80 MHz – 2,700 MHz, 10 V/m AM modulation  Level 2 Criteria A <sup>1) 5)</sup> 385 MHz – 5,785 MHz, 28 V/m pulse mode and other modulation
Electrical Fast Transient / Burst	IEC 61000-4-4	Level 3 Criteria A <sup>1)</sup> : 2 kV
Surge	IEC 61000-4-5	Level 3 Criteria A <sup>1) 5)</sup> Common Mode <sup>3)</sup> : 2 kV Differential Mode <sup>4)</sup> : 1 kV
Conducted	IEC 61000-4-6	Level 2 Criteria A <sup>1) 5)</sup> 150 kHz – 80 MHz, 3 Vrms, 6 Vrms at ISM bands and Amateur radio bands
Power Frequency Magnetic Fields	IEC 61000-4-8	Criteria A <sup>1) 5)</sup> Magnetic field strength 30 A/m
Voltage Dips	IEC 61000-4-11	30% 10 ms Criteria A <sup>1)</sup> 60% 100 ms Criteria B <sup>2)</sup> 100% 5,000 ms Criteria B <sup>2)</sup>
Voltage Dips <sup>5)</sup>	IEC 60601-1-2	Criteria A <sup>1) 5)</sup> 0% U <sub>T</sub> , 0.5 cycle (10 ms), (0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°, 360°) Criteria B <sup>2)</sup> , can meet Criteria A with 120 W or lower load 0% U <sub>T</sub> , 1 cycle (20 ms), 0° Criteria B <sup>2)</sup> 70% U <sub>T</sub> , 25 cycle (500 ms), 0° Criteria B <sup>2)</sup> 0% U <sub>T</sub> , 250 cycle (5,000 ms), 0°

1) Criteria A: Normal performance within the specification limits

2) Criteria B: Irregular output or shut down during test. Automatically restored to normal operation after test.

3) Asymmetrical: Common mode (Line to earth)

4) Symmetrical: Differential mode (Line to line)

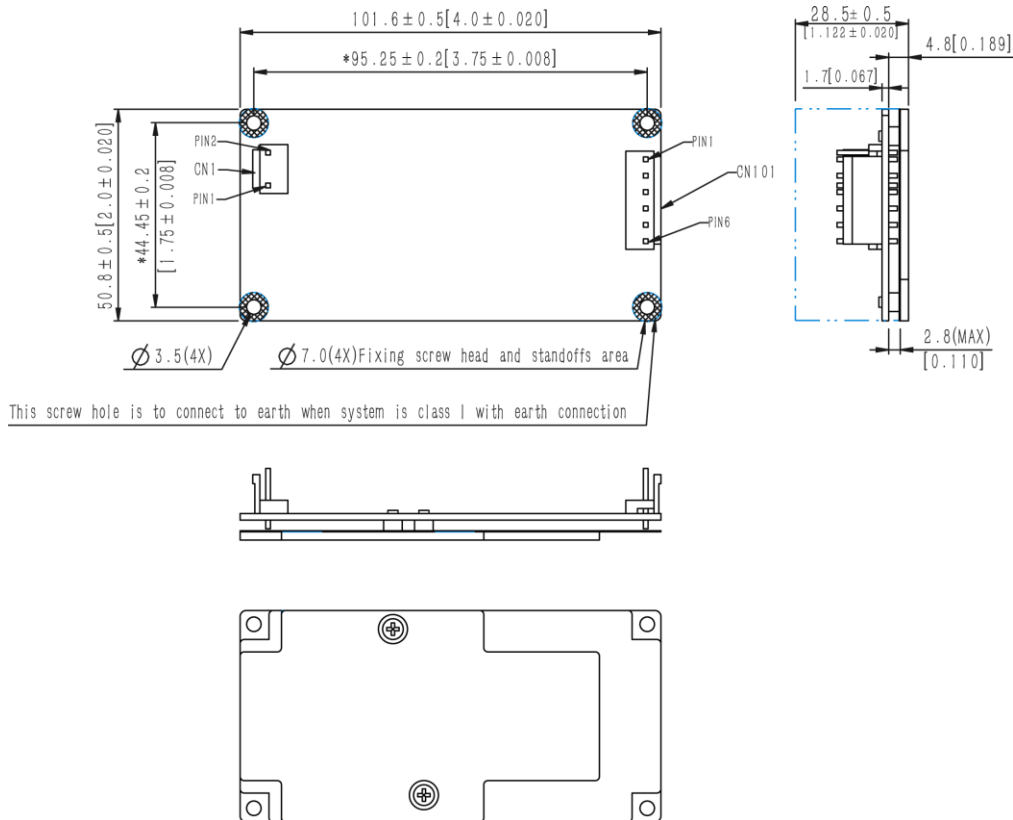
5) Compliant with IEC60601-1-2 (4<sup>th</sup> Edition)

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### Dimensions

W x L x H: 50.8 x 101.6 x 28.5 mm (2 x 4 x 1.12 inch)



- Notes:**
- All dimensions are in millimeters and inches.
  - The base plate is not earth connected just for heating dissipation. Users need to consider safety isolation requirement when assembly the PSU. Please consult with Delta before installation.

### Connector Definition and Pin Assignment

Input Connector CN1	
Pin 1	Neutral
Pin 2	Line
CN1: JST(HEADER): B2P3-VH MATCH WITH JST(HOUSING): VAR-2 JST(CRIMP SOCKET): SVA-41T-P1.	
Output Connector CN101	
PIN1-3	Output +
PIN4-6	Output -
CN101: JST (HEADER): B6P-VH-B (LF) (SN) MATCH WITH JST(HOUSING): VHR-6N JST (CRIMP SOCKET): SVH-21T-P1.1	



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### Functions

#### Start-up Time

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

#### Rise Time

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

#### Hold-up Time

Time between the collapse of the AC input voltage, and the output falling to 90% of its steady state value.

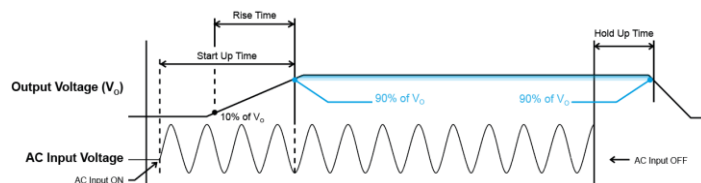


Figure 4. Time Sequence

#### Dynamic Response (Main Output)

The power supply output voltage will remain within  $\pm 5\%$  of its steady state value, when subjected to a dynamic load 50% to 100% of its rated current.

##### ■ 50% to 100% Load

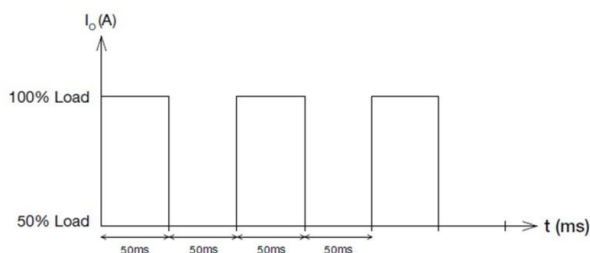


Figure 5. Dynamic Load

#### Inrush Current

Inrush current is the input current that 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

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 5 under "Protections". Power supply will latch off, and require removal/re-application of input AC voltage in order to restart.

#### Overload & Over Current Protections

The power supply's Overload (OLP) and Over current (OCP) Protections will be activated before output current under 130 % of  $I_o$  (max. load). Upon such occurrence,  $V_o$  will start to drop. Once the power supply has reached its maximum power limit, the protection will be activated and the power supply will go into "Hiccup mode" (Auto-Recovery). The power supply will recover once the fault condition causing the OLP and OCP is removed and  $I_o$  is back within the specified limit.

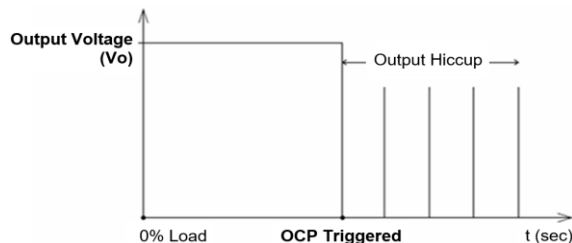


Figure 6. Hiccup at OLP/OCP

Additionally, if the  $I_{out}$  is  $> 100\%$  for a prolonged period of time (depending on the load), the Over Temperature Protection (OTP) may be activated due to high temperature on critical components. The power supply will then go into latch mode.

#### Short Circuit Protection

Output OLP/OCP function also provides protection against short circuits. When a short circuit is applied, the output current will operate in "Hiccup mode". The power supply will return to normal operation after the short circuit is removed.

#### Over Temperature Protection

As mentioned above, the power supply also has Over Temperature Protection (OTP). This is activated when the overload condition persists for an extended duration, and the output current is below the overload trigger point  $> 100\%$  load. In the event of a higher operating temperature condition at 100 % load, the power supply will run into OTP when the surrounding air temperature is higher than the operating temperature. When activated, the output voltage will go into latch mode until the input voltage is removed; then, reapplied, and the surrounding air temperature drops to its normal operating temperature.

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### Certificate



Delta has been certified as meeting the requirement of ISO 13485: 2003 and EN ISO 13485:2012 for the design and manufacture of switching power supply and adaptor for medical device.



In addition to a UL Total Certification Program (TCP) approved client laboratory for IEC60950 and IEC60065. Delta also has participated UL Client Test Data Program (CDTP) for IEC 60601

### 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](http://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.

### Manufacturer and Authorized Representatives Information

#### Manufacturer

##### Thailand

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