

# MPO-350MS Series

## Compact, Open Frame 350W, Medical Approved AC/DC Power Supplies



### Key Features:

- 350W Output Power
- Compact 5" x 3" Size
- UL 60601 Approval
- UL 62368 Approval
- Insulation 2 x MOPP
- Suitable For BF Apps
- Meets EN 55032 B
- Meets EN 60335
- Meets EN 61558
- <0.1mA Leakage Current
- Active PFC



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### Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

| Input Parameter                      | Conditions   | Min.                  | Typ.                   | Max. | Units   |
|--------------------------------------|--|-----------------------|------------------------|------|---------|
| Input Voltage Range                  |  | 90                    |                        | 264  | VAC     |
| Input Frequency                      |  | 127                   |                        | 373  | VDC     |
|                                      |  | 47                    |                        | 63   | Hz      |
| Input Current                        | 115 VAC  |                       |                        | 4.0  | A       |
|                                      | 230 VAC  |                       |                        | 2.0  |         |
| Leakage Current                      | 240 VAC  | <0.1 mA; Single Fault |                        |      | <0.5 mA |
| Inrush Current, Cold Start           | 115 VAC  |                       | 50                     |      | A Pk    |
|                                      | 230 VAC  |                       | 75                     |      |         |
| Power Factor                         | 115 VAC  | 0.98                  |                        |      | ---     |
|                                      | 230 VAC  | 0.95                  |                        |      |         |
| Output Parameter                     | Conditions   | Min.                  | Typ.                   | Max. | Units   |
| Output Voltage Accuracy, 0-100% Load | 12V/15V Output                                     |                       | ±3.0                   |      | %       |
|                                      | All Other Models                                   |                       | ±2.0                   |      |         |
| Line Regulation                      | At Rated Load                                      |                       | ±0.5                   |      | %       |
|                                      | 0 - 100% Load                                      |                       | ±1.0                   |      | %       |
| Ripple & Noise (20 MHz), See Note 1  | 12V, 15V Output                                    |                       |                        | 120  | mV      |
|                                      | 24V Output   |                       |                        | 150  |         |
|                                      | 27V Output   |                       |                        | 200  |         |
|                                      | 48V Output   |                       |                        | 250  |         |
|                                      | Air Cooling  | 12                    | 14                     |      | mSec    |
| Hold-Up Time, 230 VAC                | 20.5 CFM   | 6                     | 8                      |      |         |
|                                      |  |                       | ±0.03                  |      | %/°C    |
| Temperature Coefficient              |  |                       |                        | 0.50 | W       |
| Standby Power Consumption            |  |                       |                        |      | %IOUT   |
| Over Current Protection              | Self Recovery                                      | 110                   |                        |      |         |
| Fan Power                            | 27V Output   |                       | 12V (+15%/-25%) @ 0.5A |      |         |
|                                      | All Other Models                                   |                       | 12V (±15%) @ 0.25A     |      |         |
| Short Circuit Protection, See Note 2 | Continuous (Autorecovery)                          |                       |                        |      |         |
| General Parameter                    | Conditions   | Min.                  | Typ.                   | Max. | Units   |
| Isolation Voltage, See Note 3        | Input to Output                                    | 4,000                 |                        |      | VAC     |
|                                      | Input to Ground                                    | 2,000                 |                        |      |         |
|                                      | Output to Ground                                   | 1,500                 |                        |      |         |
| Insulation Resistance                | See Note 4   | 50                    |                        |      | MΩ      |
|                                      | Input to Output                                    |                       | 2 x MOPP               |      |         |
| Isolation Level                      | Input to Ground                                    |                       | 1 x MOPP               |      |         |
|                                      | Output to Ground                                   |                       | 1 x MOPP               |      |         |
| Switching Frequency                  |  | 70                    |                        | 110  | kHz     |
| Environmental Parameter              | Conditions   | Min.                  | Typ.                   | Max. | Units   |
| Operating Temperature Range          | Ambient  | -40                   | +25                    | +70  | °C      |
| Storage Temperature Range            |  | -40                   |                        | +85  | °C      |
| Cooling                              | Free Air Convection (See Derating Curves)          |                       |                        |      |         |
|                                      | Operating  | 20                    |                        | 90   | %       |
| Humidity, RH, Non-condensing         |  | 10                    |                        | 95   |         |
|                                      | Storage  |                       |                        |      |         |
| Physical                             | See Mechanical Drawing (Page 4)                    |                       |                        |      |         |
| Size and Weight                      | See Mechanical Drawing (Page 4)                    |                       |                        |      |         |
| Reliability Specifications Parameter | Conditions   | Min.                  | Typ.                   | Max. | Units   |
| MTBF                                 | MIL HDBK 217F, 25°C, Gnd Benign                    | 300                   |                        |      | kHours  |
| Safety Standards                     | UL/cUL 60601-1 recognition (UL certificate)        |                       |                        |      |         |
|                                      | UL/cUL 62368-1 recognition (UL certificate)        |                       |                        |      |         |
|                                      | EN60335  |                       |                        |      |         |
| Safety Class                         | Class I (with PE connected), Class II (without PE) |                       |                        |      |         |

## Model Selection Guide

| Model Number | Cooling Method          | Output        |                   |        |           | Over Voltage Protection (VDC) See Note 6 | Max Output Capacitance (μF) | Efficiency @ 230 VAC (% Typ) |    |
|--------------|-------------------------|---------------|-------------------|--------|-----------|--|-----------------------------|------------------------------|----|
|              |                         | Voltage (VDC) | Current (A) Rated | % Min. | Power (W) |  |                             |                              |    |
| MPO-350MS-12 | Air Cooling<br>20.5 CFM | 12.0          | 15.00             | 0.00   | 180       | 11.4 - 12.6                              | 15.0                        | 6,000                        | 92 |
|              |                         |               | 25.00             |        | 300       |  |                             |                              |    |
| MPO-350MS-15 | Air Cooling<br>20.5 CFM | 15.0          | 12.00             | 0.00   | 180       | 14.25 - 15.75                            | 18.5                        | 5,000                        | 92 |
|              |                         |               | 21.67             |        | 325       |  |                             |                              |    |
| MPO-350MS-24 | Air Cooling<br>20.5 CFM | 24.0          | 8.33              | 0.00   | 199.9     | 22.8 - 25.2                              | 30.0                        | 3,200                        | 93 |
|              |                         |               | 14.60             |        | 350.4     |  |                             |                              |    |
| MPO-350MS-27 | Air Cooling<br>20.5 CFM | 27.0          | 7.40              | 0.00   | 199.8     | 25.65 - 28.35                            | 33.5                        | 2,600                        | 93 |
|              |                         |               | 13.00             |        | 351       |  |                             |                              |    |
| MPO-350MS-48 | Air Cooling<br>20.5 CFM | 48.0          | 4.17              | 0.00   | 200.1     | 45.6 - 50.4                              | 59.5                        | 2,000                        | 94 |
|              |                         |               | 7.30              |        | 350.4     |  |                             |                              |    |

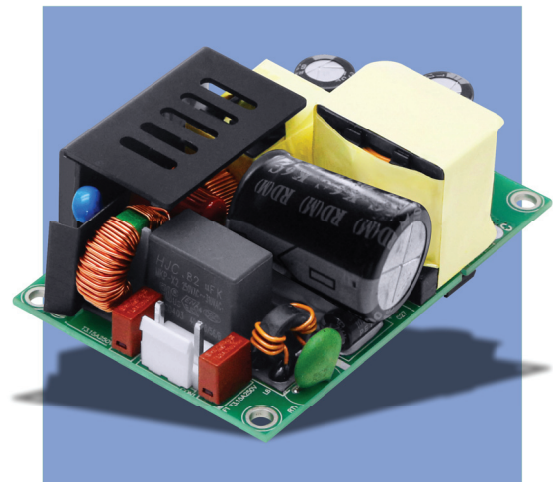
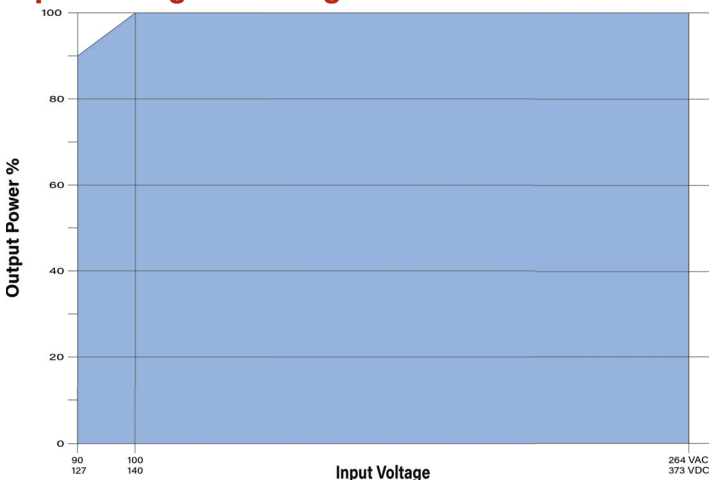
- Notes:**
- Output ripple is measured at 20 MHz bandwidth using 0.1 μF and 10 μF capacitors connected in parallel as close to the power supply terminals as possible.
  - Output short circuit protection is provided by a "hiccup mode" circuit. The unit recovers <3 seconds after the fault condition is removed.
  - Input-output, input-ground and output-ground isolation are tested for 60 seconds with a leakage current of <5 mA.
  - Insulation resistance is tested at an ambient temperature of 25°C ± 5°C, at a relative humidity of <95%RH (no condensation) with a test voltage of 500 VDC. It is given for input to output, input to ground and output to ground.
  - Transient power is specified for a period of 10S. The unit cannot exceed the transient power limit.
  - After an overvoltage fault, the unit power must be recycled for the unit to recover.
  - After an overtemperature fault, the unit power must be recycled for the unit to recover.
  - All units include an on-board slow blow fuse.
  - For use in harsh environments such as exposure to a salt or chemical spray or high humidity the unit is available conformally coated. For more information, contact the factory.

## EMC Characteristics

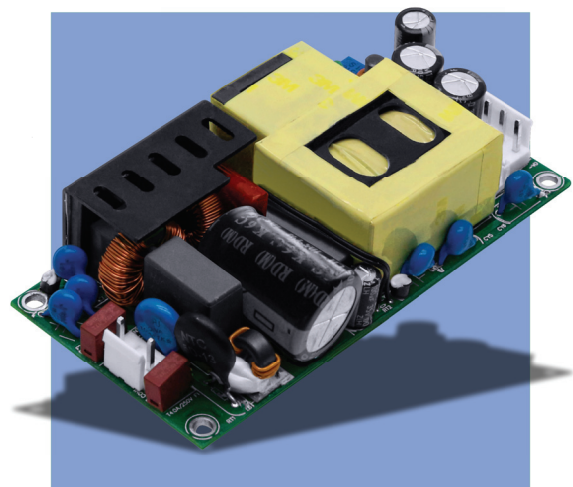
| Parameter           | Conditions    | Criteria | Level                 |
|---------------------|---------------|----------|-----------------------|
| Conducted Emissions | EN 55032      |          | Class B               |
| Radiated Emissions  | EN 55032      |          | Class B (Category I)  |
|                     |               |          | Class A (Category II) |
| Harmonic Current    | EN 61000-3-2  |          | Class A               |
| ESD                 | EN 61000-4-2  | A        | ±15 kV Air            |
|                     |               |          | ±8 kV Contact         |
| RS                  | EN 61000-4-3  | A        | 10V/m                 |
| EFT                 | EN 61000-4-4  | A        | ±4 kV                 |
| Surge               | EN 61000-4-5  | A        | ±2 kV Line to Line    |
|                     |               |          | ±4 kV Line to Gnd     |
| CS                  | EN 61000-4-6  | A        | 10V rms               |
| Dips                | EN 61000-4-11 | B        | 0%, 70%               |

- Notes:**
- All EMC tests are conducted on a metal plate measuring 360 x 360 mm with a thickness of 1mm. Contact the factory for more information.

## Input Voltage Derating



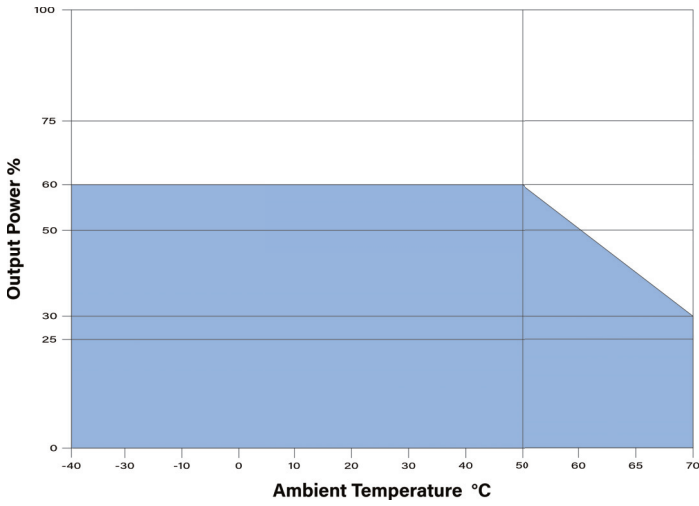
MPO-120MS



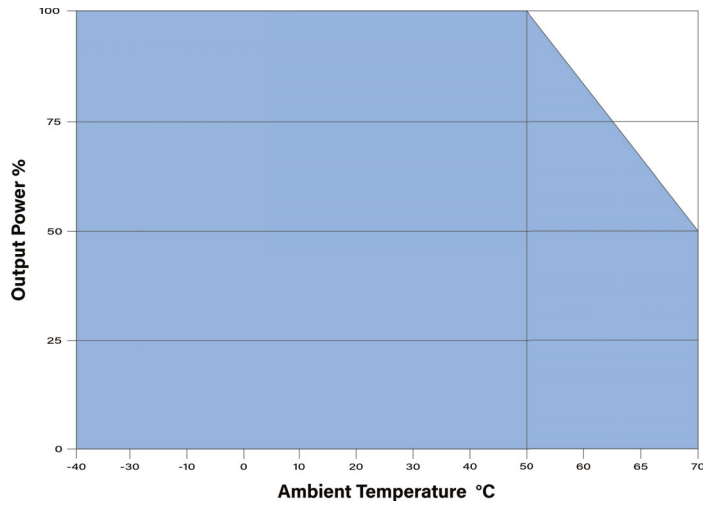
MPO-225MS

MPD also offers 120W and 225W units in this series of compact, high performance medical power supplies. All models are available as open frame or enclosed units. Call today or see our website for full information.

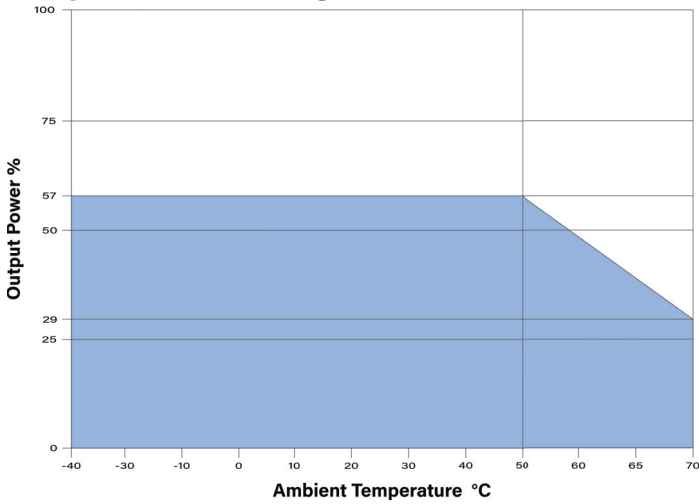
Temperature Derating, 12 VIN Convection Cooling



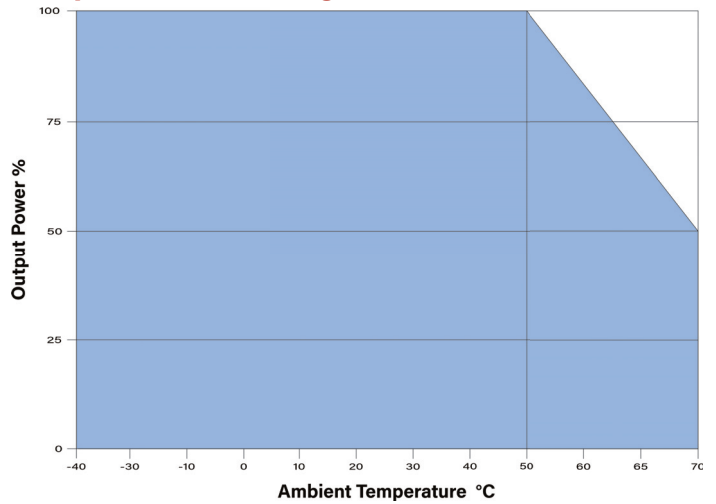
Temperature Derating, 12 VIN Forced Air



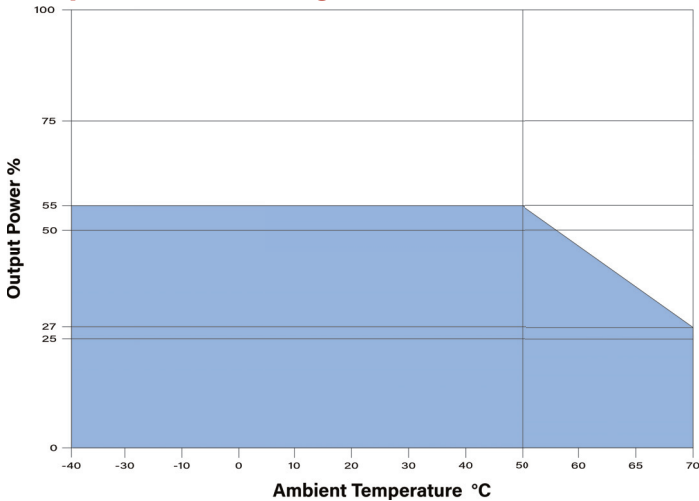
Temperature Derating, 15 VIN Convection Cooling



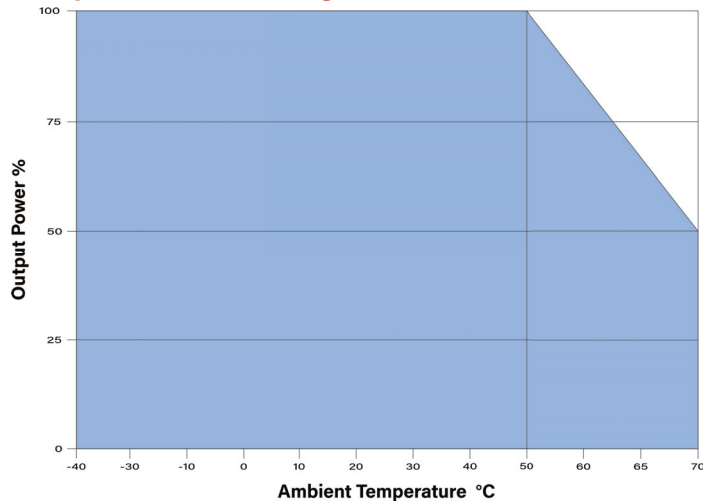
Temperature Derating, 15 VIN Forced Air



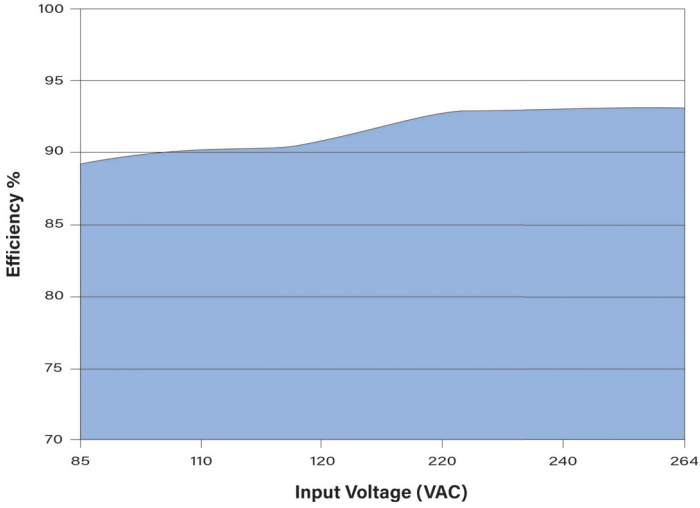
Temperature Derating, Other Models Convection Cooling



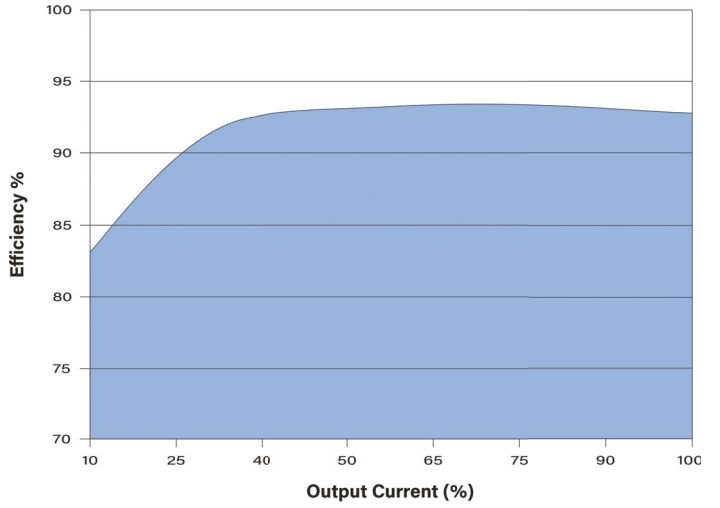
Temperature Derating, Other Models Forced Air



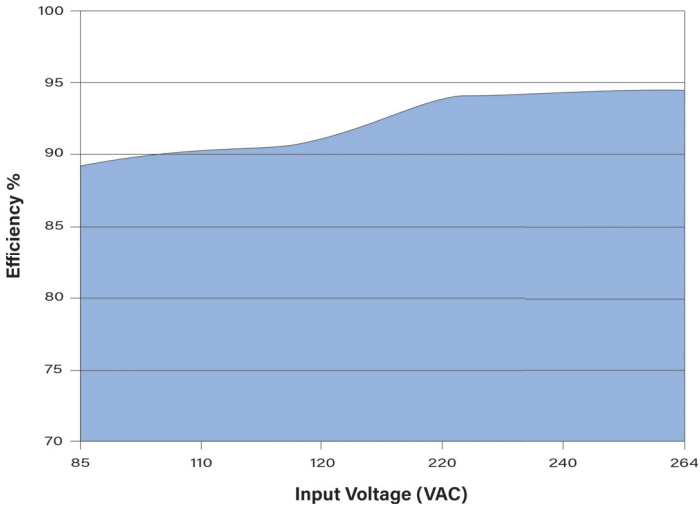
Efficiency vs Input Voltage: 12 V<sub>OUT</sub>



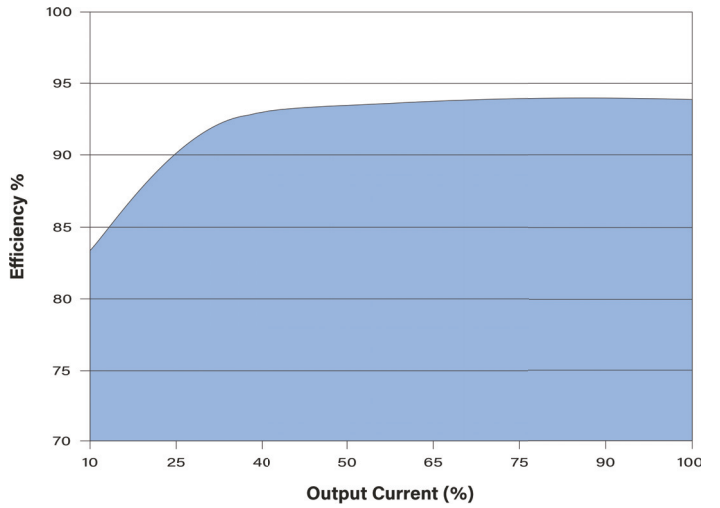
Efficiency vs Output Load: 12 V<sub>OUT</sub>



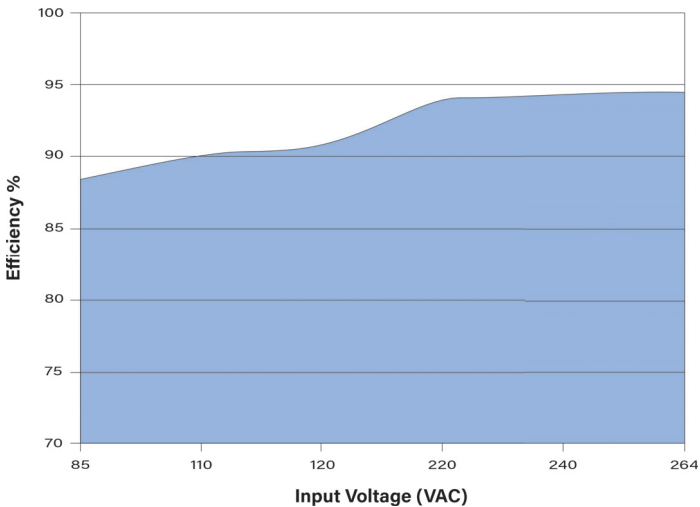
Efficiency vs Input Voltage: 24 V<sub>OUT</sub>



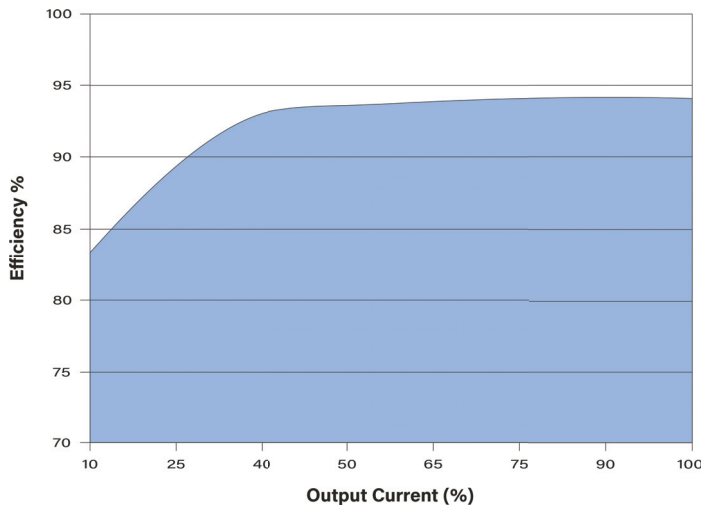
Efficiency vs Output Load: 24 V<sub>OUT</sub>



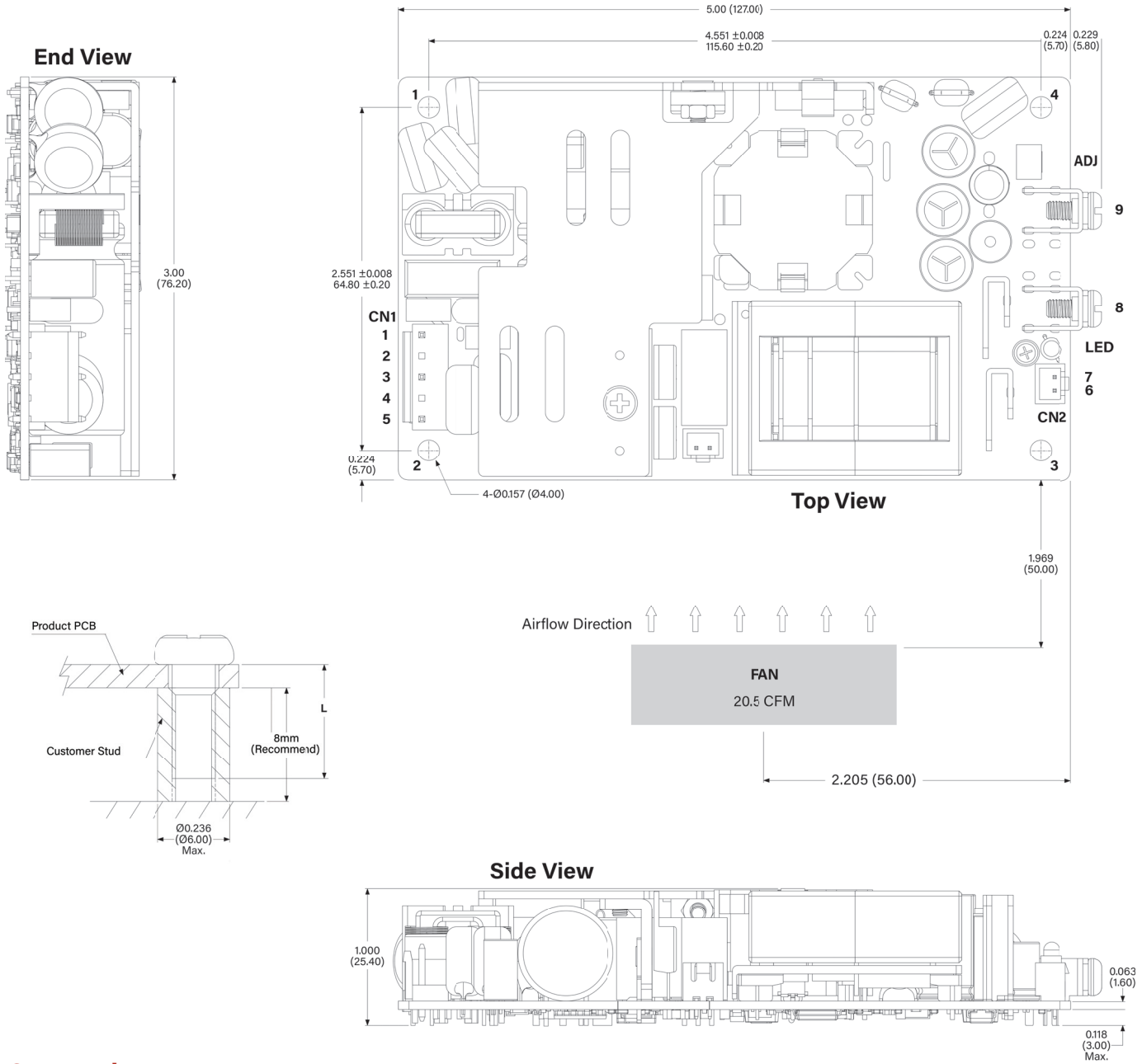
Efficiency vs Input Voltage: 48 V<sub>OUT</sub>



Efficiency vs Output Load: 48 V<sub>OUT</sub>



**Mechanical Dimensions**



**Connections**

**Input Connector (CN1):**

- JST-B5P-VH or equivalent
- Mating Terminal: JST VHR or equivalent
- Contact: JST SVH-21T-P1.1

| Pin | Function      |
|-----|---------------|
| 1   | AC-Neutral    |
| 2   | No Connection |
| 3   | AC-Line       |
| 4   | No Connection |
| 5   | Ground        |

**Fan Connector (CN2):**

- Kangdao 2.5XHS-2A
- Mating Terminal: Kangdao 2.5XHS-2Y (shipped with unit)

| Pin | Function |
|-----|----------|
| 6   | -Fan     |
| 7   | +Fan     |

**Output Connection:**

- Screw Terminals

| Pin | Function          |
|-----|-------------------|
| 8   | -V <sub>OUT</sub> |
| 9   | +V <sub>OUT</sub> |

**Unit Mounting Screws:**

| Position   | Screw | Max L | Max Torque |
|------------|-------|-------|------------|
| 1, 2, 3, 4 | M3    | 6 mm  | 0.4N•m     |

1. For class I systems, points 1, 2 & 4 must be connected to earth grd.
2. For class II systems, points 1, 2 & 4 must be connected together

**Notes:**

- All dimensions are typical in inches (mm)
- General Tolerance = ±0.039 (±1.0)
- Weight (Typ) = 10.4 Oz (295g)
- A minimum of 10 mm should be maintained between the power supply and any other components
- The unit uses double pole, neutral fusing. Disconnect the mains before servicing.



**MicroPower Direct**

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