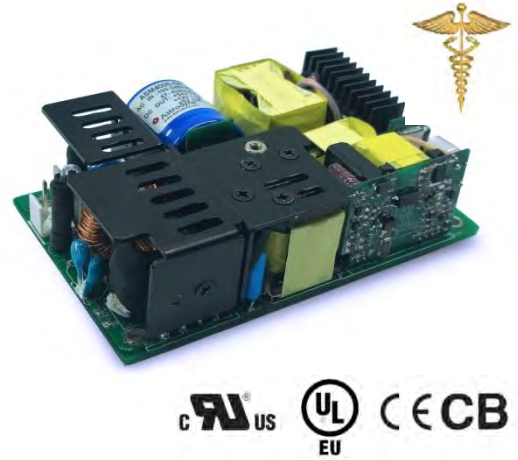


**400W High Density Medical/Industrial Grade Open Frame Power Supplies ASM400S/BSM400S**

- ☑ Medical Safety Approval – 60601-1 3<sup>rd</sup> Edition Amendment 1 – 2 MOPP – RoHS Compliant
- ☑ Class 2 for home use medical applications (BSM400)
- ☑ Single output with 5V Auxiliary and 12V fan output
- ☑ 400 Watts in compact 3"x 5"x 1.4" footprint
- ☑ High Efficiency, up to 92% @ 230Vac
- ☑ High Power Density up to 19W/Inch<sup>3</sup>
- ☑ Universal 90-264 VAC INPUT, 50/60 Hz
- ☑ 230W rating with natural convection



**PRODUCT DESCRIPTION**

The Astrodyne ASM and BSM 400 Series are miniature open frame power supplies designed for medical applications. The ASM400 is Class 1 and BSM400 is Class 2 with 2 MOPP (method of patient protection) isolation and BF leakage current and have been certified by Underwriters Laboratories for compliance with the latest edition of the international medical safety standard, IEC 60601-1 3<sup>rd</sup> Edition using the CB reporting scheme. They are also certified to be compliant with the collateral standard 60601-1-2 for EMC and bear the UL Recognized component marks for North America and the EU and the CE mark.

These products operate over the input voltage range of 90 to 264 VAC and 50, 60Hz frequency and produce 400 Watts of regulated DC output power in a standard 3 x 5 (inch) form factor that is 1U height compatible.

**ORDERING INFORMATION — SEE PAGE 6**

Model	Output Voltage	Output Current, A		5V Aux, A		12V Fan, A		Efficiency, typ. 230/115VAC
		Forced/Natural Convection	Forced/Natural Convection	Forced/Natural Convection	Forced/Natural Convection			
A(B)SM400S-12	12 VDC	33.3/16.7	2A/1A	1A/0.5A	90/86			
A(B)SM400S-15	15 VDC	26.7/13.3	2A/1A	1A/0.5A	90/86			
A(B)SM400S-19	19.6VDC	21.1/10.5	2A/1A	1A/0.5A	91/86			
A(B)SM400S-24	24 VDC	16.7/8.3	2A/1A	1A/0.5A	91/88			
A(B)SM400S-28	28 VDC	14.3/7.1	2A/1A	1A/0.5A	91/88			
A(B)SM400S-36	36 VDC	11.1/5.5	2A/1A	1A/0.5A	91/88			
A(B)SM400S-48	48 VDC	8.3/5.2	2A/1A	1A/0.5A	91/88			
A(B)SM400S-54	54 VDC	7.4/4.6	2A/1A	1A/0.5A	91/88			

## 400W High Density Medical/Industrial Grade Open Frame Power Supplies **ASM400S/BSM400S**

### INPUT SPECIFICATIONS

Input Voltage Range	90-264 VAC
Range of Nominal	100-240 VAC
Input Voltages	
Input Frequency	47-63 Hz (50/60 Hz Nom.)
Input Current	4.5 A Max at 115VAC 2.5A Max at 230VAC
Inrush Current	30A Max at 115VAC, 60 Hz 60A Max at 230VAC, 50 Hz
Earth Leakage Current ASM400S	300uA Max at 264VAC, 50Hz
Patient Leakage Current BSM400S	100uA Max at 264VAC, 50Hz BF rating
Input Fusing	8A fuse in both L and N lines
Power Factor	0.95 min., 230VAC 50Hz

### MAIN OUTPUT SPECIFICATIONS

Output Voltage	12V, 15V, 19, 20V, 24V, 28V, 36V, 48V or 54V nominal
Output Power	400 W Continuous – See temp. & Airflow derating curves
Minimum Load	No minimum load required
Set Point Accuracy	± 1%
Load Regulation	± 1% Max, 0 to Full Load
Line Regulation	± 0.5% Max, 90 to 264 VAC
Temp. Drift	± 0.025 %/°C
Transient Response Excursion	Less than ± 5% 50 to 100% Load Step 1A/us Slew Rate
Transient Response Recovery Time	2ms Max 50 to 100% Load Step 1A/us Slew Rate
Ripple and Noise	1% pk-pk Max. 20MHz BW Measured with 47uF Alum and 0.1uF Ceramic at output

### OVERALL SPECIFICATIONS

Efficiency	Refer to Ordering Information table
Standby Power	<1W 230 VAC
Start-up Delay	2s maximum
Start-up Rise Time	50ms maximum

### OVERALL SPECIFICATIONS (cont.)

Hold-up Time	16ms typ. Full Load, 115VAC
Power Density	19 W/in <sup>3</sup>
Switching Frequency	200 KHz typ.
MTBF	100K hrs. (typ.) per MIL- HDBK-217F

### ISOLATION SPECIFICATIONS

Input to Output	4000VAC, 2 MOPP
Input to Earth	1500VAC, 1 MOPP
Output to Earth	500VAC

### PROTECTION

Over Current Inception	105 to 135% Rated Current
Short Circuit	Hiccup Mode, Automatic recovery
Over Voltage Protection	130% Vo max. Latching, Recycle Input to Reset
Over Temperature Protection	Automatic recovery

### MECHANICAL SPECIFICATIONS

Size	See Outline Drawings for mechanical options
Weight	1lbs. (453.6g)
Input Connector	Molex 41791
Input Mating Connector	Housing Molex 2139 Contact 2478
Output Connector	See Outline Drawings for mechanical options
Output Mating Connector	See Outline Drawings for mechanical options

### ENVIRONMENTAL SPECIFICATIONS

Operating Temp. Range	-20 to +40°C at Full Load with derating
Storage Temp. Range	-40 to +85°C
Humidity	0 to 95%, non-condensing

**400W High Density Medical/Industrial Grade Open Frame Power Supplies ASM400S/BSM400S**

**ENVIRONMENTAL SPECIFICATIONS (cont.)**

Altitude	0 to 10,000 ft. 0 to 3048 m
Shock	30G pk. Half sine, 6 axis
Vibration	2 G RMS, 5 Hz to 500 Hz 3 axis, 30 min

**SAFETY CERTIFICATIONS**

UL/cUL	AAMI ES60601-1: 2005 A1 2012/CSA 22.2 60601-1 2014
UL EU	EN60601-1: 2006 3 <sup>rd</sup> Edition A1 2013 CB Scheme IEC 60601-1: 2005 A1 2012

**EMC CERTIFICATIONS**

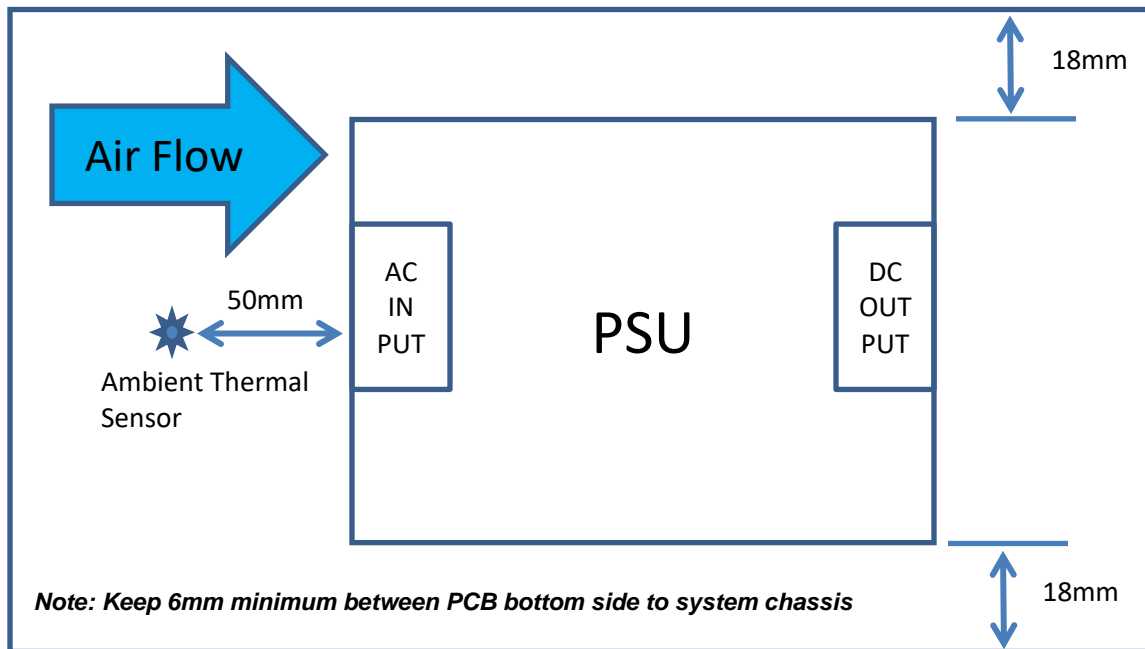
Conducted Emissions	EN60601-1-2 Class B EN55011/A1 Class B
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**EMC CERTIFICATIONS (cont.)**

Radiated Emissions	EN60601-1-2 Class B EN55011/A1 Class B
ESD Susceptibility Air Discharge	EN61000-4-2 Criteria A Level 3
ESD Susceptibility Contact Discharge	EN61000-4-2 Criteria A Level 2
Radiated Susceptibility	EN61000-4-3 Criteria A Level 2
EFT/Burst	EN61000-4-4 Criteria A Level 3
Surge	EN61000-4-5 Criteria A Level 2
Conducted Susceptibility	EN61000-4-6 Criteria A Level 2

*All Specifications are typical at nominal input, full load, 25°C unless specified otherwise.*

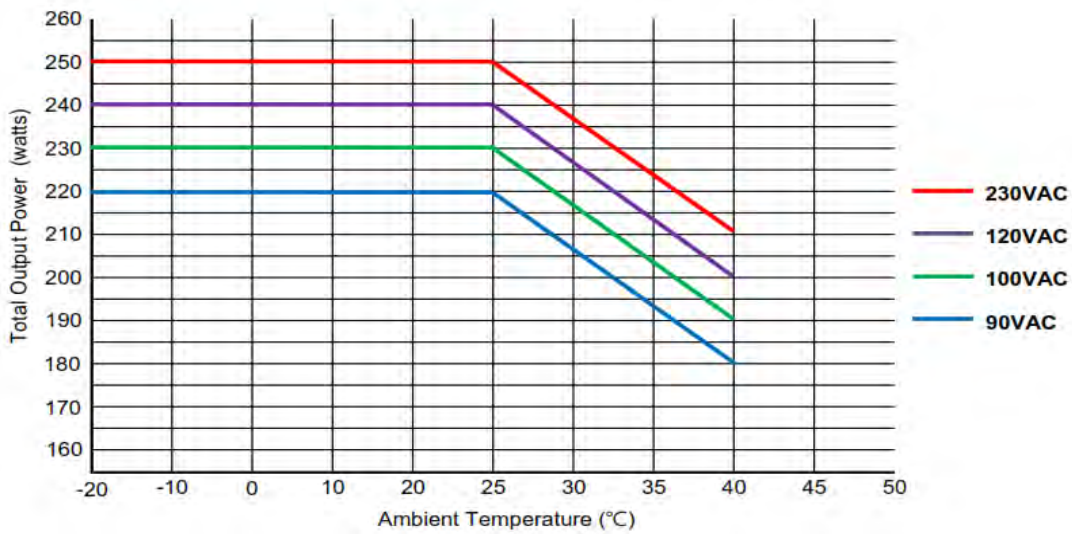
- For EMC Compliance, electrically bond 4 mounting holes to a conductive surface.



**OUTPUT DERATING**

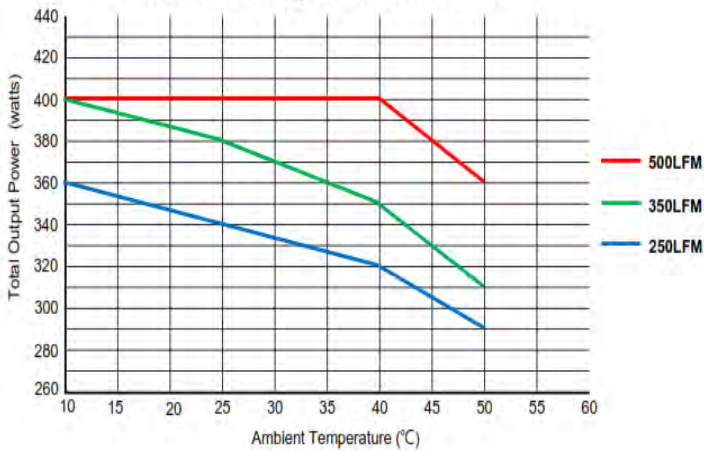
**Output Power Derating Information**

**Natural Convection - Output Power vs. Ambient Temperature and Input Voltage for all models:**

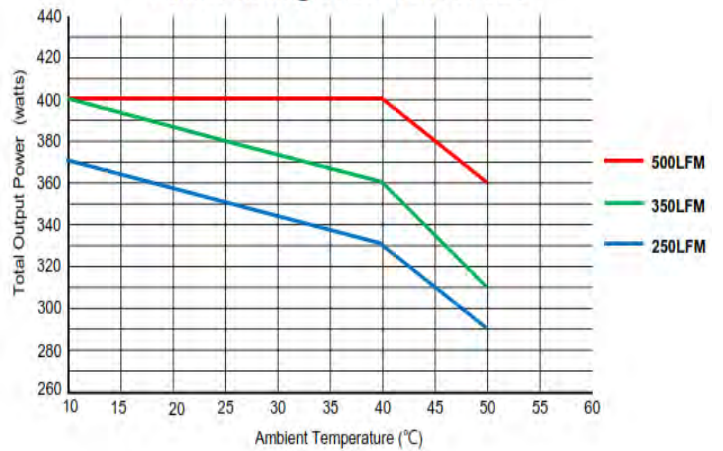


**Forced Convection - Output Power vs. Ambient Temperature, Airflow and Input Voltage:**

**Power Rating at 90Vac for 12V**

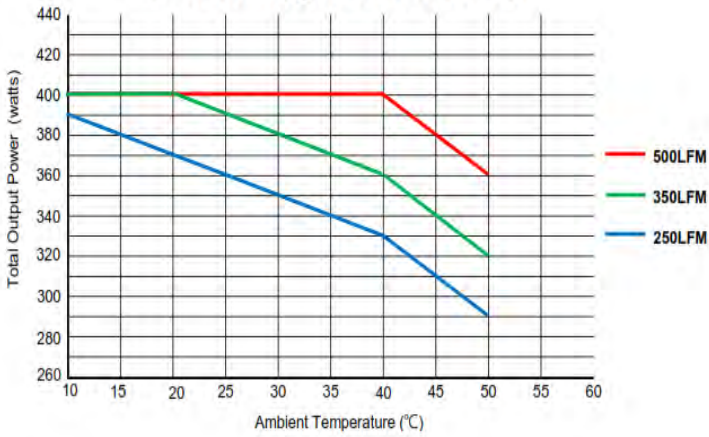


**Power Rating at 100Vac for 12V**

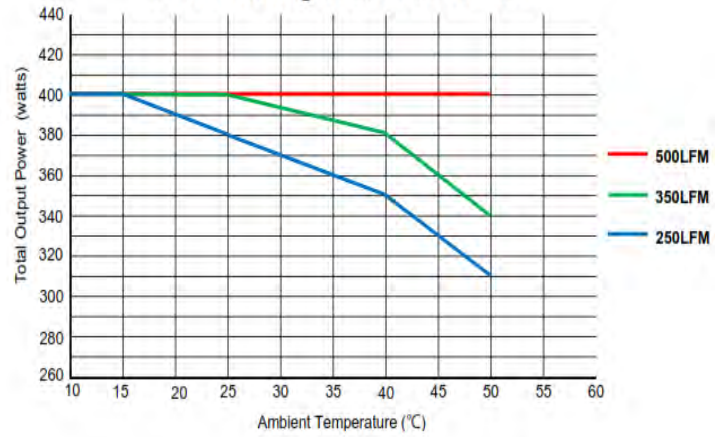


## 400W High Power Density Medical Grade Open Frame Power Supplies **ASM400S/BSM400S**

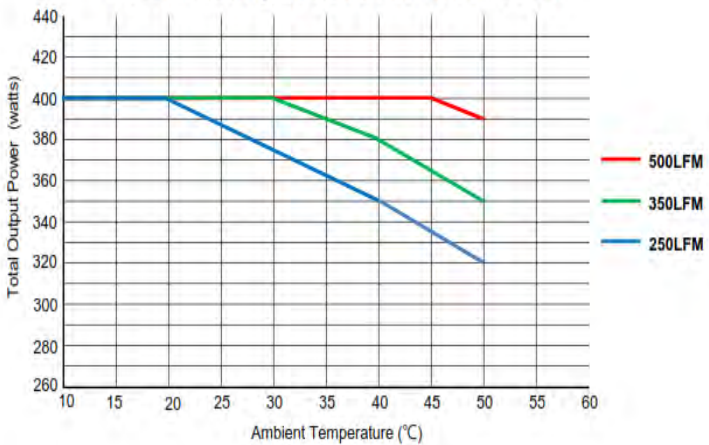
**Power Rating at 120Vac for 12V**



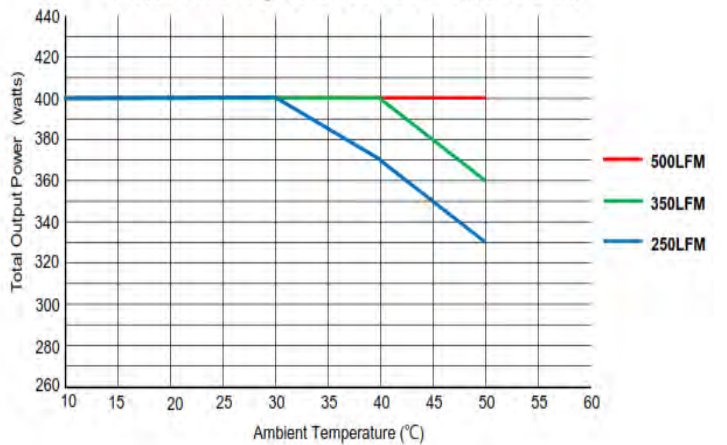
**Power Rating at 230Vac for 12V**



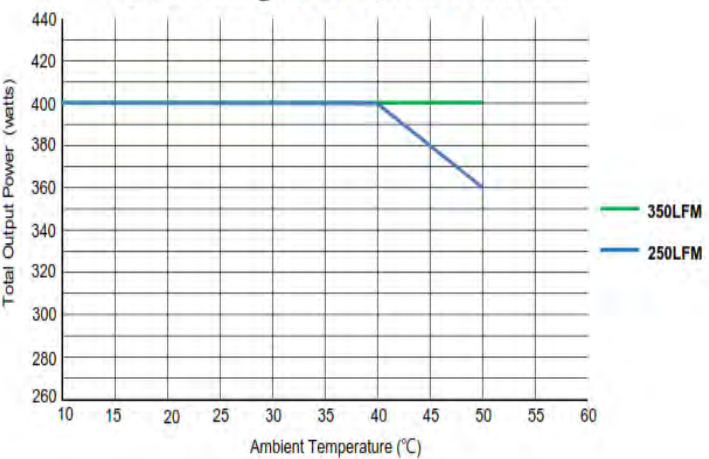
**Power Rating at 90Vac for 24V & 54V**



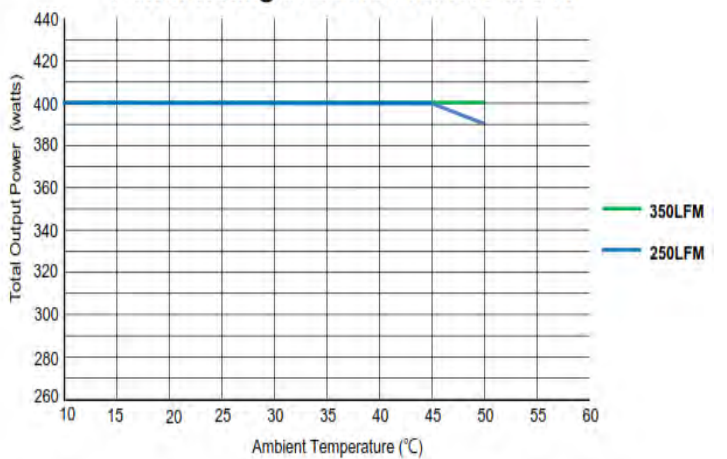
**Power Rating at 100Vac for 24V & 54V**



**Power Rating at 120Vac for 24V & 54V**



**Power Rating at 230Vac for 24V & 54V**



**PART NUMBERING INFORMATION:**

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**Input Class/Product Family (A or B)**

A: ASM Class I Input  
B: BSM Class II Input

SM400S –

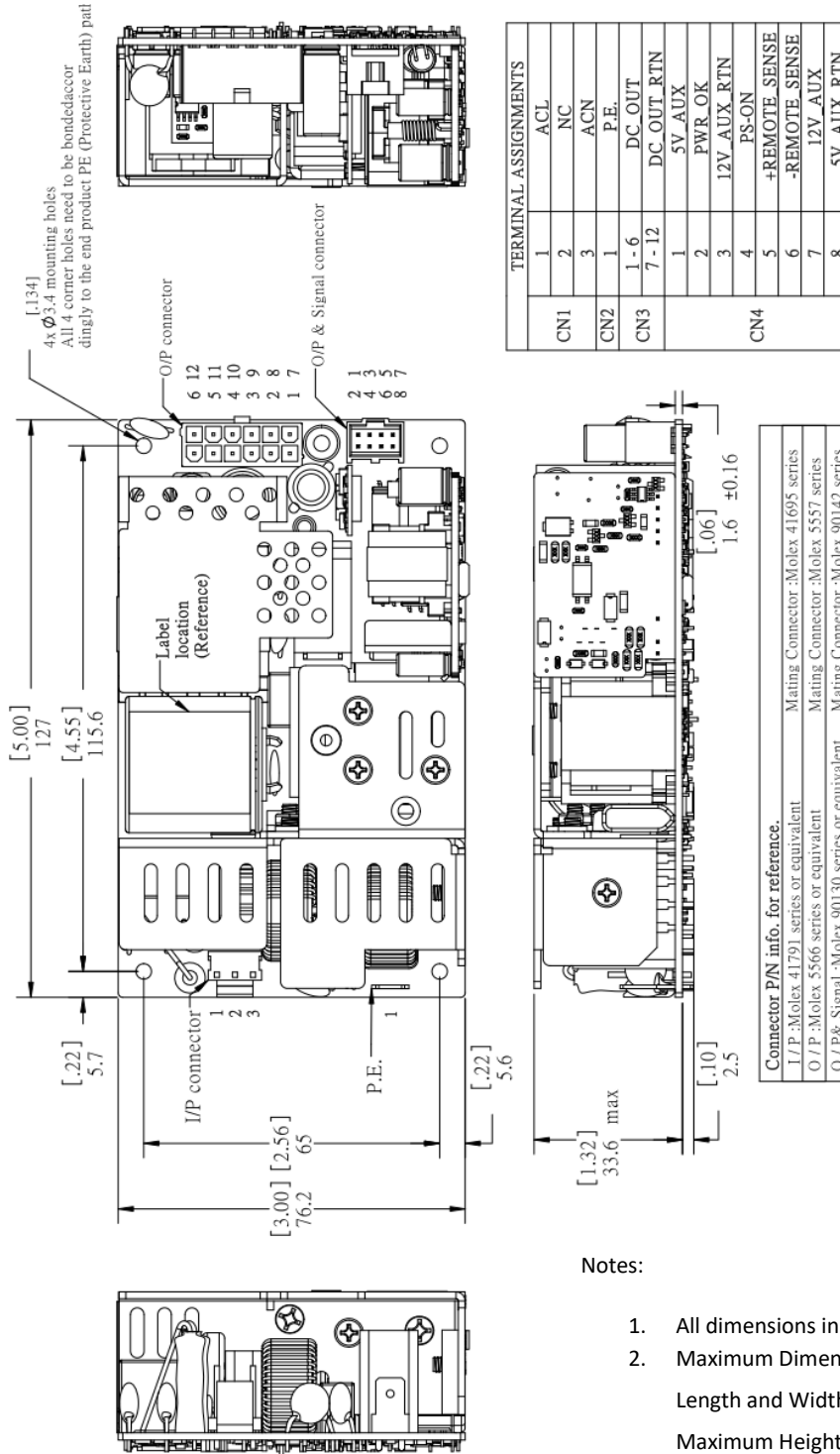
**DC Output (2 characters)**

12: 12V      19: 20V  
24: 24V      54: 54V

**Note:**

- 1. PS-ON:** Connect this signal to DC\_OUT\_RTN to enable the main and FAN outputs. The 5V\_AUX output is on when AC is applied.  
(Place a jumper across pins 3 and 4 on connector CN4)
- 2. PWR\_OK:** Open collector logic goes to high 160ms (typ.) after main output is in regulation.

### MECHANICAL DRAWING



Notes:

1. All dimensions in mm (in.)
2. Maximum Dimensions:  
 Length and Width Tolerance is  $\pm 0.2$  (0.008)  
 Maximum Height: 36.1 (1.42)