

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

- ☑ Medical Safety Approval – 60601-1 3rd 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/Inch³
- ☑ 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 3rd 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	
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

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INPUT SPECIFICATIONS

Input Voltage Range	90-264 VAC
Range of Nominal Input Voltages	100-240 VAC
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 ³
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

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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 rd Edition A1 2013 CB Scheme IEC 60601-1: 2005 A1 2012

EMC CERTIFICATIONS

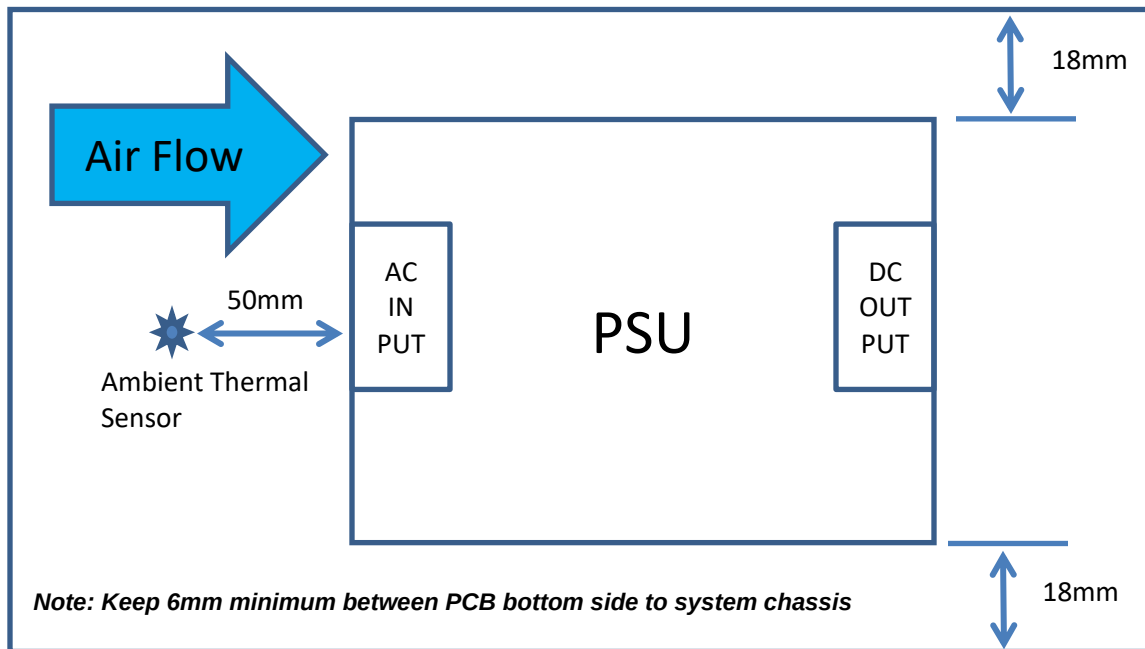
Conducted Emissions	EN60601-1-2 Class B EN55011/A1 Class B
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EMC CERTIFICATIONS (cont.)

Radiated Emissions	EN60601-1-2 Class B EN55011/A1 Class B
ESD Susceptibility	EN61000-4-2 Criteria A
Air Discharge	Level 3
ESD Susceptibility	EN61000-4-2 Criteria A
Contact Discharge	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.

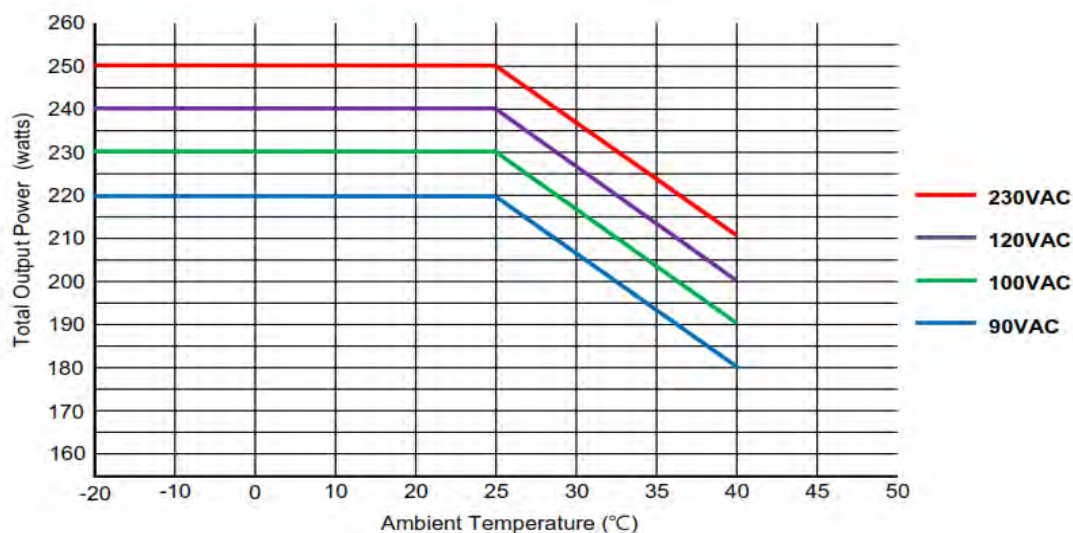
- For EMC Compliance, electrically bond 4 mounting holes to a conductive surface.



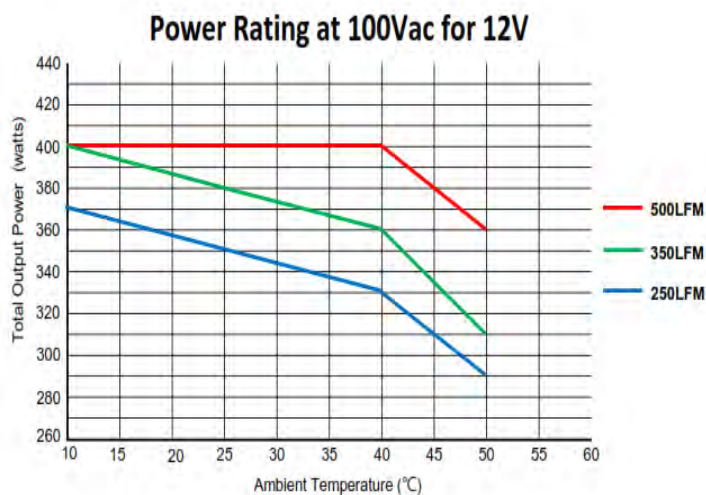
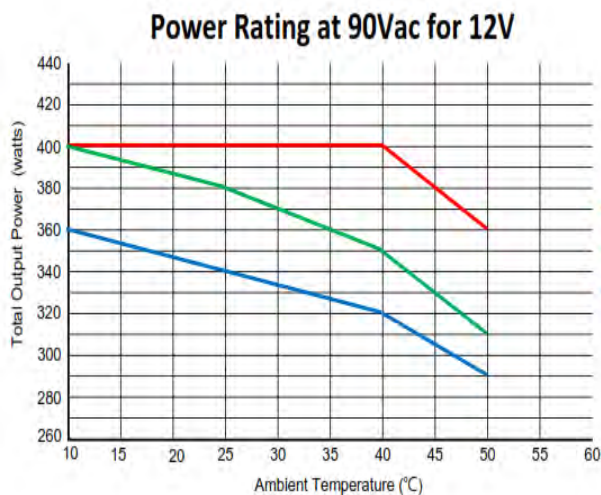
OUTPUT DERATING

Output Power Derating Information

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

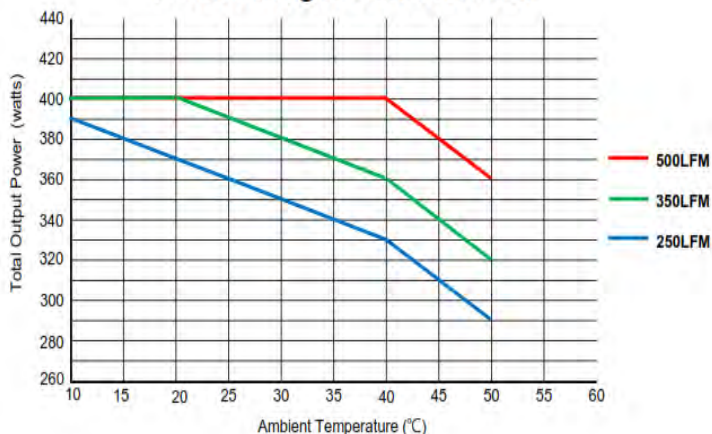


Forced Convection - Output Power vs. Ambient Temperature, Airflow and Input Voltage:

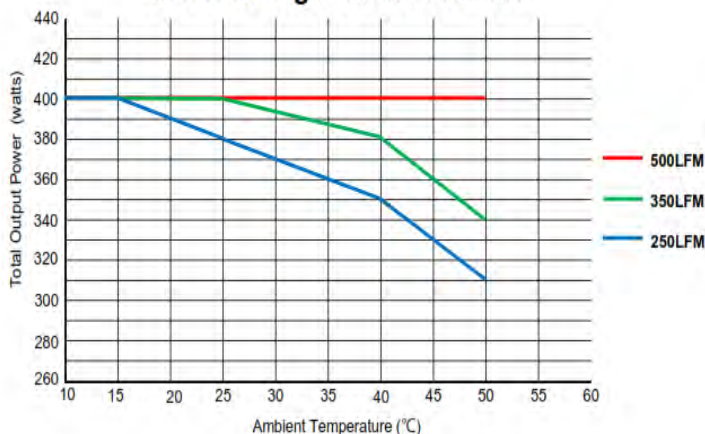


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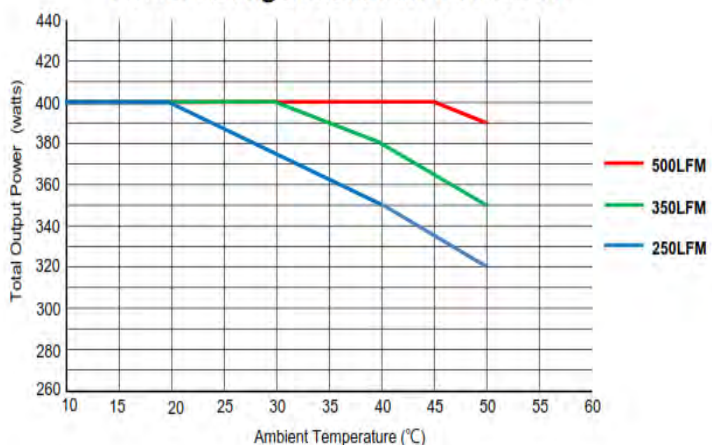
Power Rating at 120Vac for 12V



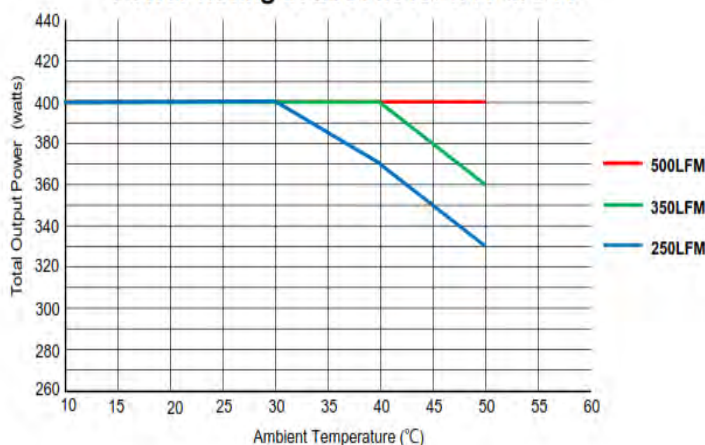
Power Rating at 230Vac for 12V



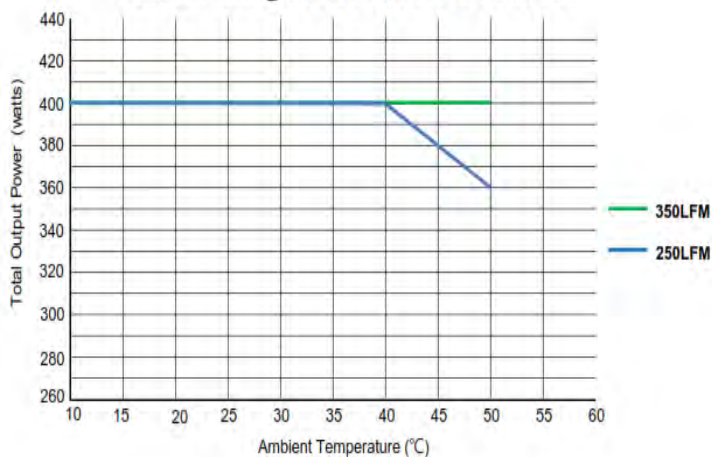
Power Rating at 90Vac for 24V & 54V



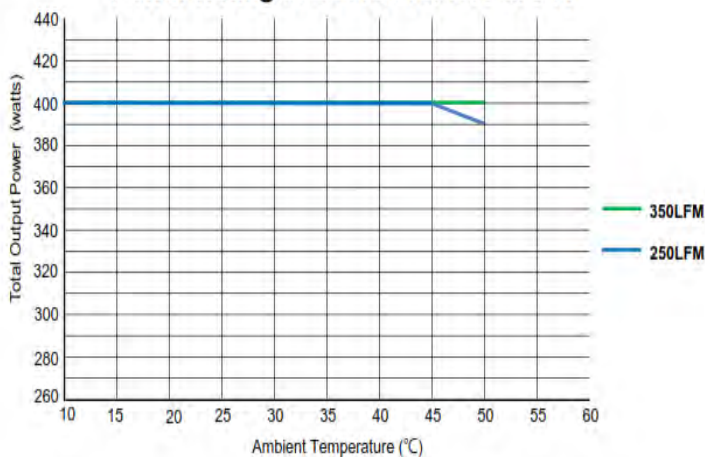
Power Rating at 100Vac for 24V & 54V



Power Rating at 120Vac for 24V & 54V



Power Rating at 230Vac for 24V & 54V



PART NUMBERING INFORMATION:

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

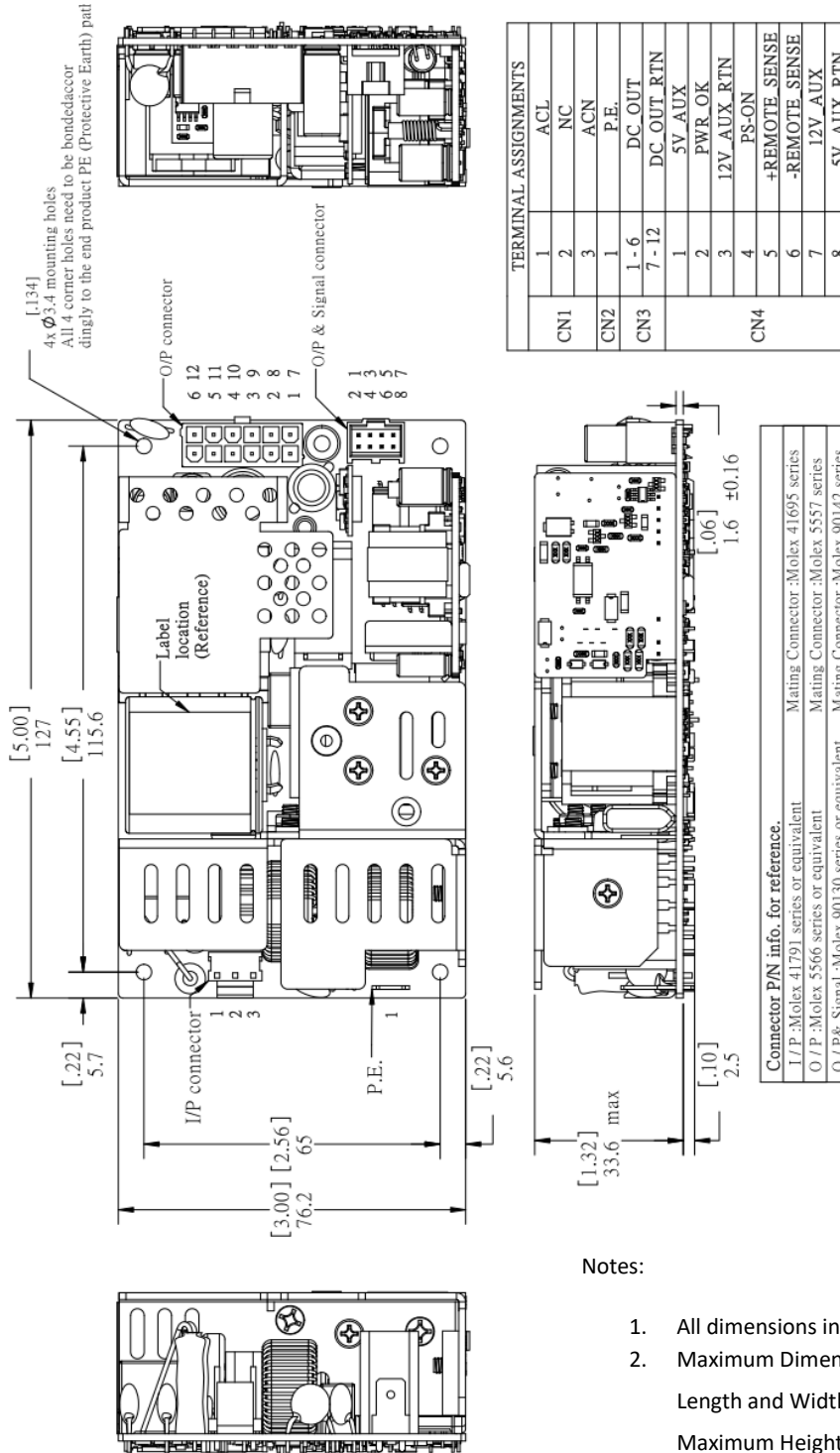
24: 24V

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 ± 0.2 (0.008)
Maximum Height: 36.1 (1.42)