

**2XMOPP MEDICAL, 750 W NATURAL CONVECTION, AC-DC POWER SUPPLY**

# MDP1200 UC/PC Free Air Series



**Certifications**



**Applications**



**-PC**

**-UC**

**FEATURES**

- » Universal input voltage range, 85 – 305 V<sub>AC</sub>, MoOP; 85 – 264 V<sub>AC</sub>, MoPP;
- » Input inrush current limiting 750 W rated power (1200 W peak for <10 s);
- » High efficiency up to 94%;
- » Single 24 and 48 V<sub>DC</sub> output voltage available;
- » Active PFC, EN61000-3-2 compliant (Class C, >25% load);
- » Low earth / touch leakage current;
- » Over temperature, OV, OC and SC protections;
- » +12 V, 0.3 A; +5 V, 0.72 A Stand by outputs;
- » Built-in current sharing and OR-ing for parallel operation and N+1 redundancy;
- » Remote On / Off signal;
- » Power good and remote sense signals;
- » All packages fit 1U applications (1.6" profile);
- » Medical safety approval to IEC 60601-1 3rd edition, 2x MoPP rated and BF appliances compatible;
- » IEC 60601-1-2 4th edition EMC compliant;
- » RoHS 3 compliant (Directive EU 2015/863);
- » Up to 4000 m altitude operation (MoPP);
- » PMBus™ digital power-management protocol supported.

**MARKET SEGMENTS AND APPLICATIONS**

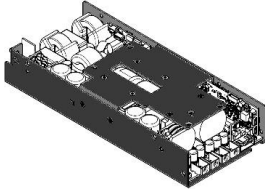
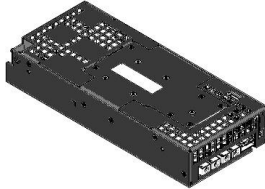
- » X-Ray / CT Scanner;
- » Dental Equipment;
- » Laboratory / Analysis Equipment;
- » Medical Devices / Applications;

**PRODUCT DESCRIPTION**

The medical grade MDP1200 UC and PC series of AC-DC power supplies offer increased embedded power in two (2) compact 1U compatible packages, high energy efficiency and wide versatility being optimised for free-air cooling environment. The series provides a steady 750 W of regulated DC power through 180-305 V<sub>AC</sub> and 600 W through 90-137 V<sub>AC</sub> input voltage ranges in a single output of 24 or 48 V<sub>DC</sub>. The MDP1200 series come in a U-shaped 1.6" high package (UC) and a variant providing protective vented cage on both AC and DC sides (PC), to facilitate system integration. By converting AC power at a 94% typical efficiency rate, the MDP1200 series generates very little heat allowing for optimal thermal management. The series offers a 12 V<sub>DC</sub>, 0.3 A and a 5 V<sub>DC</sub>, 0.7 A stand-by outputs and the full set of protection features including high breaking capacity fuses on both AC lines, input under voltage lockout (IUV), output over-current (OC), output short-circuit (SC), output over-voltage (OV) and over-temperature (OT). The MDP1200 UC and PC series supports digital power management over the PMBus™ communications protocol enabling interoperability with and easy integration into a system. In addition, analogue control signals include Power Good (P\_OK), Remote On / Off (+/-PS\_Inhibit) and Sense terminals (RS+, RS-). Multiple MDP1200 units may be used in parallel mode for redundancy and / or higher power, made possible with the internal OR-ing and current sharing functions. Being the series conceived and optimised to be operated at free-air cooling environment, therefore without any fan, it is particularly suitable for those environment sensitive to acoustical noise. The MDP1200 Free Air series complies with the 3rd edition of the IEC60601-1 and ANSI/AAMI ES/EN 60601-1 safety standards for medical equipment requiring 2x MoPP protection grade. It is suitable for BF rated medical equipment under specific conditions.

The MDP1200 Free Air series meets the EN 60601-1-2 EMC limits of Class B for conducted and radiated emissions as well as the IEC/EN61000-3 for flicker and harmonics content. It also meets the IEC 60601-1-2 4<sup>th</sup> edition for EMC immunity.

## Model Coding and Output Ratings

Model Code	Output Voltages	Packages and Cooling	
Medical Grade: <b>MDP1200</b>	24 V <sub>DC</sub> : <b>-US24-</b>  48 V <sub>DC</sub> : <b>-US48-</b>	 U-Chassis Natural Convection Cooling: <b>-UC</b>	 U-Chassis + Protective Cages Natural Convection Cooling: <b>-PC</b>

Output Parameter	24 V		48 V	
	180-305 V <sub>AC</sub> 163-300 V <sub>DC</sub>	90-137 V <sub>AC</sub> 120-163 V <sub>DC</sub>	180-305 V <sub>AC</sub> 163-300 V <sub>DC</sub>	90-137 V <sub>AC</sub> 120-163 V <sub>DC</sub>
V1 Nom Voltage	24 V <sub>DC</sub>		48 V <sub>DC</sub>	
V1 Adjust Range	±5 % V <sub>NOM</sub>			
V1 Rated Power	750 W	600 W1	750 W	600 W1
V1 Peak Power (<10 s)	1200 W	1000 W	1200 W	1000 W
V1 Rated Current	31.25 A	25 A	15.6 A	12.5 A
V1 Line Regulation	±0.1 %			
V1 Load Line Cross Regulation	±2 %			
V1 Ripple & Noise	1 % Peak-to-peak			
V1 Transient response	±5 %V1 to 25 % load change at 1 A/μs			
V1 Over Current Protection	<46.8 A		<23.4 A	
V1 Over Voltage protection	116 % V <sub>NOM</sub> < V <sub>OUT</sub> < 145 % V <sub>NOM</sub>			
V1 Max Out Capacitance	16000 μF		8000 μF	
12 V <sub>SB</sub> Nominal Voltage	12 V <sub>DC</sub> (stand-by output voltage is referred to the same V1 output voltage return)			
12 V <sub>SB</sub> Rated Current	0.3 A (maximum +12 V <sub>SB</sub> and +5 V <sub>SB</sub> combined output power is 3.6 W)			
12 V <sub>SB</sub> Ripple & Noise	120 mV Peak-to-peak			
12 V <sub>SB</sub> Line Cross Regulation	±5 %			
5 V <sub>SB</sub> Nominal Voltage	5 V <sub>DC</sub> (stand-by output voltage is referred to the same V1 output voltage return)			
5 V <sub>SB</sub> Rated Current	0.72 A (maximum +12 V <sub>SB</sub> and +5 V <sub>SB</sub> combined output power is 3.6 W)			
5 V <sub>SB</sub> Ripple & Noise	50 mV Peak-to-peak			
5 V <sub>SB</sub> Load, line cross Regulation	±5 %			

# Input Specifications

Specification	Test Conditions / Notes	Min.	Nominal	Max.	Units
<b>AC Input Voltage</b>	PPS starts at 85 V <sub>AC</sub> at all load conditions Operating input voltage range MDP1200 is designed to operate with a square or trapezoidal input voltage wave form (i.e. from UPS)	85	100-277	305	V <sub>RMS</sub>
<b>DC Input Voltage</b>	Built in fuses has been safety certified up to 250V <sub>DC</sub> . Operating the MDP1200 above that limit up to 300 V <sub>DC</sub> , does require an external fuse protection. (*)	120	-	300	V <sub>DC</sub>
<b>Input Frequency</b>		47	50/60	63	Hz
<b>Input Current</b>	At 180 V <sub>AC</sub> , 750 W, 50 / 60 Hz At 85 V <sub>AC</sub> , 600 W load, 50 / 60 Hz 163 V <sub>DC</sub> , 750 W 120 V <sub>DC</sub> , 600 W	-	-	5.0 8.7 5.6 6.0	A <sub>RMS</sub>  A
<b>Inrush Current (peak)</b>	At power-on asserted Cold start, 25 °C ambient, full load Any point of the AC input sine  230 V <sub>AC</sub> 277 V <sub>AC</sub>	- -	- -	30 50	A
<b>Fusing<sup>2</sup></b>	High breaking, 16 / 20 A, 277 V <sub>AC</sub> (250 V <sub>DC</sub> ) on each AC lines.	-	-	16 / 20	A
<b>Efficiency</b>	<b>24, 48 V variants:</b>  <b>At 120 V<sub>AC</sub></b> 20% rated load 50% rated load 100% rated load  <b>At 230 V<sub>AC</sub></b> 20% rated load 50% rated load 100% rated load	85 91 92  87 92 94	- - -  - - -	- - -  - - -	    %
<b>Input Power Consumption</b>	At power on, no load, 100-277 V <sub>AC</sub> range UC/PC Stand by, no load, nominal 100-277 V <sub>AC</sub> range	- -	6.0 3.5	- -	W
<b>Power Factor</b>	Any nominal input voltage (except 277 V <sub>AC</sub> ), 50/60 Hz, from 50 to 100% maximum load. At 277 V <sub>AC</sub>	0.95 0.90	- -	- -	-
<b>THDi</b>	From 50 to 100% rated load, 100-277 V <sub>AC</sub> , 50/60 Hz	-	-	20 <sup>2</sup>	%
<b>Harmonic Current Fluctuations and Flicker</b>	Complies with EN 61000-3-2 at 230 V <sub>AC</sub> , 50/60 Hz, Class A, D. Complies with EN 61000-3-2 Class C at 230 V <sub>AC</sub> , 50/60 Hz, >300 W load. Complies with EN 61000-3-3 at nominal voltages and full load.				
<b>Earth Leakage Current</b>	Normal conditions 115 V <sub>RMS</sub> , 60 Hz 230 V <sub>RMS</sub> , 50 Hz 264 V <sub>RMS</sub> , 60 Hz (worst case)	- - -	170 300 -	- - 450	μA
<b>Touch Leakage Current</b>	264 V <sub>RMS</sub> , 60 Hz Normal Condition (NC) Single Fault Condition (SFC)	- - -	- - -	100 500	μA
<b>Patient Leakage Current</b>	264 V <sub>RMS</sub> , 60 Hz Normal Condition (NC) Single Fault Condition (SFC)	- - -	- - -	100 500	μA

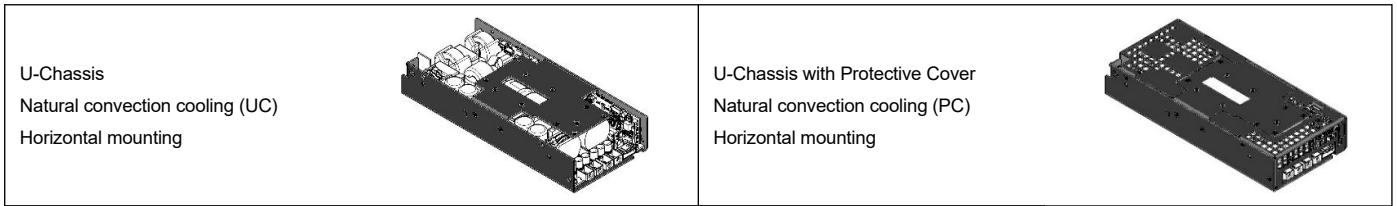
<sup>1</sup> Suggested fuse SIBA 5012434.16 and fuse holder SIBA 5105805.1

<sup>2</sup> 35% max with V1 adjusted between 99.5% to 95% of nominal value

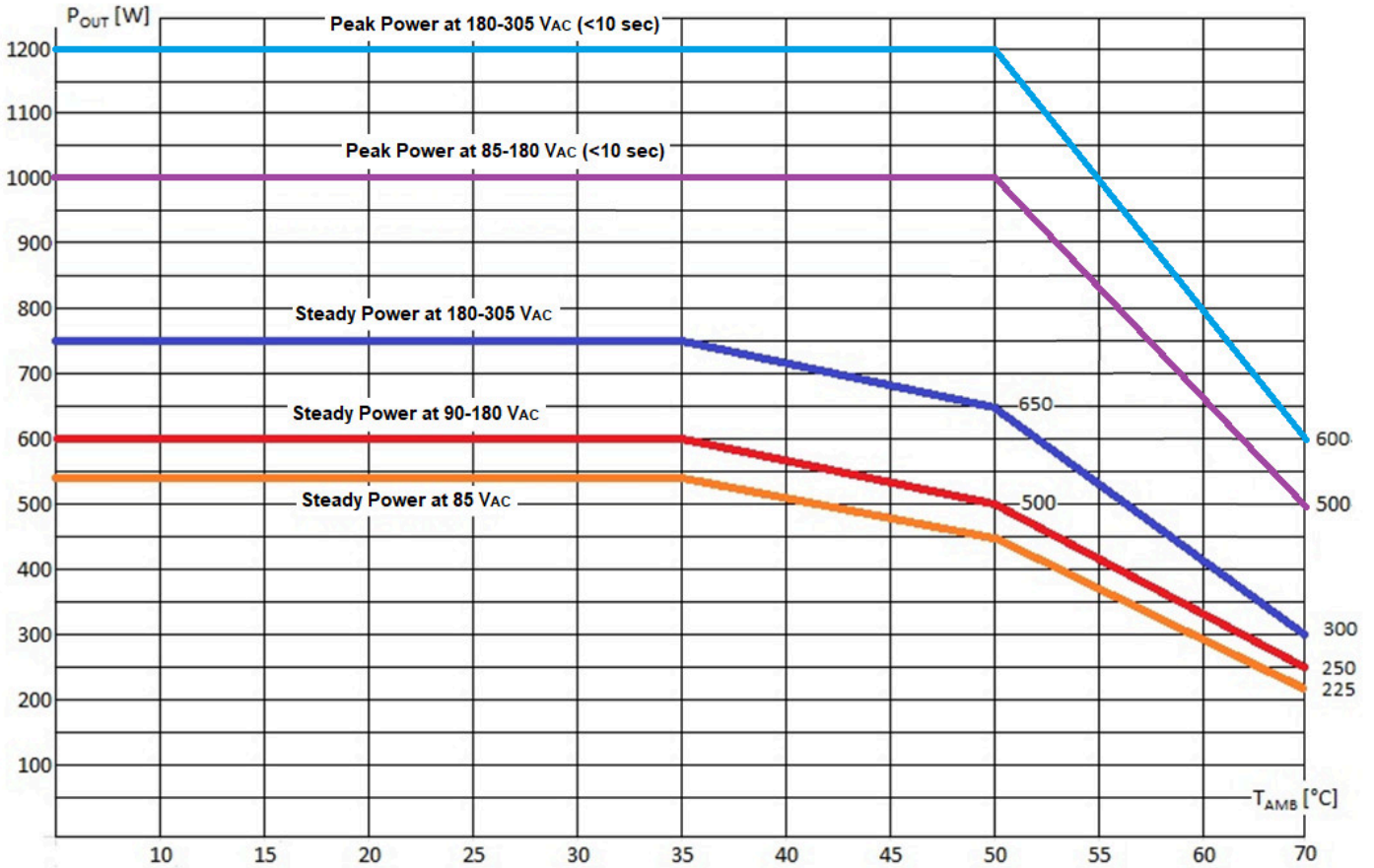
## Output Specifications

Specification	Test Conditions / Notes	Min.	Nom.	Max.	Units
<b>V1 Output Voltages</b>	±0.5% set point accuracy RS+ closed on +V1, RS- closed on V1 RTN, at 6% load.	-	24 48	-	V
<b>V1 Output Power Rating</b>	UC, PC variants at 180-305 V <sub>AC</sub> UC, PC variants at 85 – 90 V <sub>AC</sub> UC, PC variants at 90 – 137 V <sub>AC</sub> Peak, <10 s, after P_Ok asserted high			750 540 600 1200	W
<b>12 V<sub>SB</sub> Output Voltage</b>		-	12	-	V
<b>12 V<sub>SB</sub> Output Current</b>	UC and PC packages up to 70 °C	-	-	0.3	A
<b>5 V<sub>SB</sub> Output Voltage</b>		-	5	-	V
<b>5 V<sub>SB</sub> Output Current</b>	UC and PC packages up to 70 °C	-	-	1.12	A
<b>V1 Voltage Adjustment Range</b>	Manually by push up and down buttons	-	-	±5	%V1
<b>V1 Load-Line-Cross Regulation</b>	V <sub>AC</sub> : 85 – 305 V <sub>RMS</sub> ; I1: 0 – 100%	-	-	±2	%V1
<b>5 V<sub>SB</sub>, 12 V<sub>SB</sub> Load-Line-Cross regulation</b>	V <sub>AC</sub> : 85 – 305 V <sub>RMS</sub> ; ISB: 0 – 100%	-	-	±5	%V <sub>SB</sub>
<b>V1 Line Regulation</b>	V <sub>AC</sub> : 85 – 305 V <sub>RMS</sub>	-	-	±0.1	%V1
<b>Transient Response: V1, 12 V<sub>SB</sub>, 5 V<sub>SB</sub> Voltage Deviation</b>	25% load changes at 1 A/μs 24 V <sub>DC</sub> at 1000 μF load / I <sub>OUT</sub> > 2.5 A 48 V <sub>DC</sub> at 560 μF load / I <sub>OUT</sub> > 1.25 A 12 V <sub>SB</sub> , 5 V <sub>SB</sub> at 0-2200 μF load	-	-	±5	%V1 %V <sub>SB</sub>
<b>V1 Ripple and Noise</b>	Rated load, Peak-to-peak, 20 MHz BW. (100 nF ceramic, 10 μF tantalum at load)	-	-	1	%V1
<b>V1 Start-up Rise Time</b>	85 < V <sub>IN</sub> < 305, any load conditions	10	-	150	ms
<b>Start-up Delay</b>	V1 in regulation after de-asserting PS_Inhibit V1 in regulation after AC is applied (worst case: 85 V <sub>AC</sub> ) 5 V <sub>SB</sub> in regulation after AC is applied (worst case: 85 V <sub>AC</sub> )	-	-	1700 2200 500	ms
<b>Turn-on Overshoot</b>		-	-	10 10	%V1 %V <sub>SB</sub>
<b>V1 Hold-up Time</b>	At nominal V <sub>IN</sub> , full load SEMI F47-0706 compliant at ≥208 V <sub>AC</sub>  50 % sag (104 V) 30 % sag (145 V) 20 % sag (166 V)	20 200 500 1000	- - - -	- - - -	ms
<b>Minimum Load</b>	V1, 12 V <sub>SB</sub> , 5 V <sub>SB</sub>	0	-	-	A
<b>Maximum Load Capacitance</b>	V1: 24 V <sub>DC</sub> V1: 48 V <sub>DC</sub>	- -	- -	16000 8000	μF
<b>V1 Current Sharing Accuracy</b>	Parallel operation up to four units. Two units in parallel at I1 rated load. I-Share signals connected together. RS+, RS- signals connected together and to the load. Max load at start up 750 W, operating 1250 W, 180+305 V <sub>AC</sub> Max load at start up 600 W, operating 1000 W, 85+137 V <sub>AC</sub>	40	-	60	%I1
<b>V1 Remote Sense</b>	RS+ and RS- power path voltage loss compensation	-	-	0.12	V

# Output Power De-Rating Curves



## FEATURES



## PMBus

The MDP1200 does support communication according the PMBus 1.2 protocol via SDA, SCL and #SMBALERT signals as defined in the SMBus Specification version 2.0.

The power supply shall not load the SMBus if it has no input power (SCL & SDA lines should go to High-Z).

The pull-up resistors (2.2 k $\Omega$ ) for these signals shall be external to the power supply and referenced to an external +3.3V bus voltage.

The DSP circuits inside the power supply are powered by the standby output.

The PMBus is active whatever input power is applied to the power supply or a parallel redundant power supply in the system, provided that their 12 V<sub>SB</sub> are connected in parallel.

Maximum speed of SMBus is 100 kHz.

The ADDR0 and ADDR1 signals, are inputs to the power supply that control the PMBus address assigned to the power supply.

On the system side, the ADDR0 and ADDR1 signals will either be connected to return through a 1 k $\Omega$  pull-down resistor or connected to +3.3V external bus voltage through a 1 k $\Omega$  pull-up resistor.

The address shall be derived from the logic of this pin as indicated on Outline Drawing and Connections section.

The power supply is a slave only on SMBus device.

For a comprehensive description of MDP1200 PMBus management, do refer to the application note, "AN\_MDP-DDP1200 PMBus Mgt". Examples of MDP1200 parameters available through communication bus are:

Input voltage status:

- » Input voltage status;
- » Output voltages +V1 measured value;
- » Output current on +V1 measured value;
- » Current sharing status;
- » Thermal health measured value;
- » Power-On / Working hours;
- » Product information;
- » Status information;

Failures shall be reported by PMBus for all failure types:

- » Protections failure (OV, OC, OT)
- » Voltages out of specification.

## Base Signals / Controls

(ACCESSIBLE FROM SIGNAL CONNECTOR P204)

Signal	Notes	Min	Typ	Max	Unit
<b>_+PS_Inhibit (Active High)</b>	Input low voltage ( $I_{IN} = 0 \mu A$ ) Input high voltage ( $I_{IN} = 500 \mu A$ at 5.5 V) V1 disabled when PS_Inhibit is pulled high V1 enabled when PS_Inhibit is floating or low 5 V <sub>SB</sub> and 12 V <sub>SB</sub> not affected by PS_Inhibit	0 2.5	-	0.8 5.5	V
<b>-PS_Inhibit (Active Low)</b>	Input low voltage ( $I_{IN} = -800 \mu A$ at 0 V) Input high voltage ( $I_{IN} = -200 \mu A$ at 2.5 V) ( $I_{IN} = 700 \mu A$ at 5.5 V) V1 disabled when -PS_Inhibit is pulled low V1 enabled when -PS_Inhibit is floating or high 5 V <sub>SB</sub> and 12 V <sub>SB</sub> not affected by -PS_Inhibit	0 2.5	-	0.8 5.5	V
<b>Power_OK<sup>3</sup> (PS_OK)</b>	Logic level low (<10 mA sinking)	-	-	0.7	V
	Logic level high (200 $\mu A$ sourcing)	2.4	-	3.45	V
	Low to high time after V1 in regulation	150	-	350	ms
	Power down warning time	2	-	-	ms
<b>I_Share</b>	The I_SHARE signals shall be daisy chained among power supplies operating in parallel. On a single power supply operating it provides current measurement on V1 output. On multiple power supplies operating in parallel, it provides current measurement on master V1 output.				
<b>SDA, SCL, #SMBALERT, ADDR0, ADDR1</b>	These are signals which support PMBus communication protocol as specified in the application note AN_MDP-DDP1200 PMBus Mgt_Rev00.				
<b>RSVD RX, RSVD TX</b>	Mainly intended for internal Efore use, these RX and TX signals - available at the output signal connector P204 - may be used to access some DSP functions (monitoring, threshold settings, debug functions). These signals work as an UART Rx/Tx port and can also work as a RS-232 Rx/Tx port by building in the "RS-232 LINE DRIVERS/RECEIVERS" IC				
<b>5 V<sub>SB</sub> Output<sup>4</sup></b>	Active and in regulation after an $85 < V_{AC} < 305$ is applied Not affected by PS_Inhibit. Available on P204, pin#4	-	-	500	ms
<b>12 V<sub>SB</sub> Output<sup>5</sup></b>	Active and in regulation after an $85 < V_{AC} < 305$ is applied Not affected by PS_Inhibit. Available on P204, pin#16	-	-	500	ms

<sup>3</sup> When V1 is On, a P\_OK low may indicates V1 under voltage condition. When two MDP1200 operate in parallel, P\_OK low in one unit indicates that it is not sharing the expected amount of current (current sharing fault). A 3.3 k $\Omega$  internal pull up to a 3.3 V internal reference voltage is used; do not add any other external pull up.

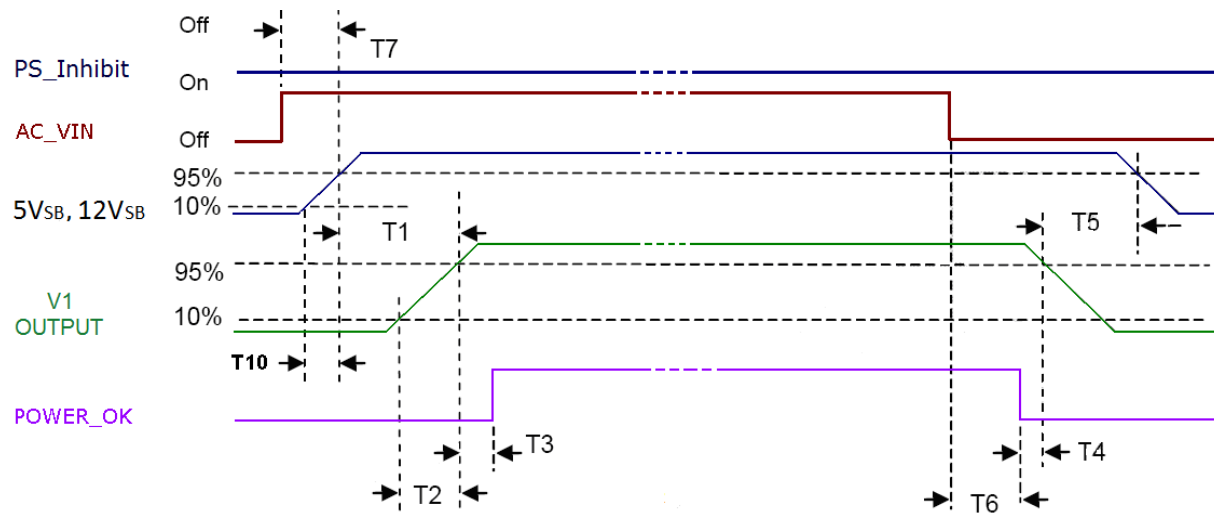
<sup>4</sup> The 5 V<sub>SB</sub> outputs of two or more MDP1200s operating in parallel, cannot be

connected in parallel in turn, since doing so results in power supplies damage.

<sup>5</sup> The 12V<sub>SB</sub> outputs of two or more MDP1200s operating in parallel can be connected in parallel in turn, taking into account that the maximum available power will not be higher of a single operating power supply one.

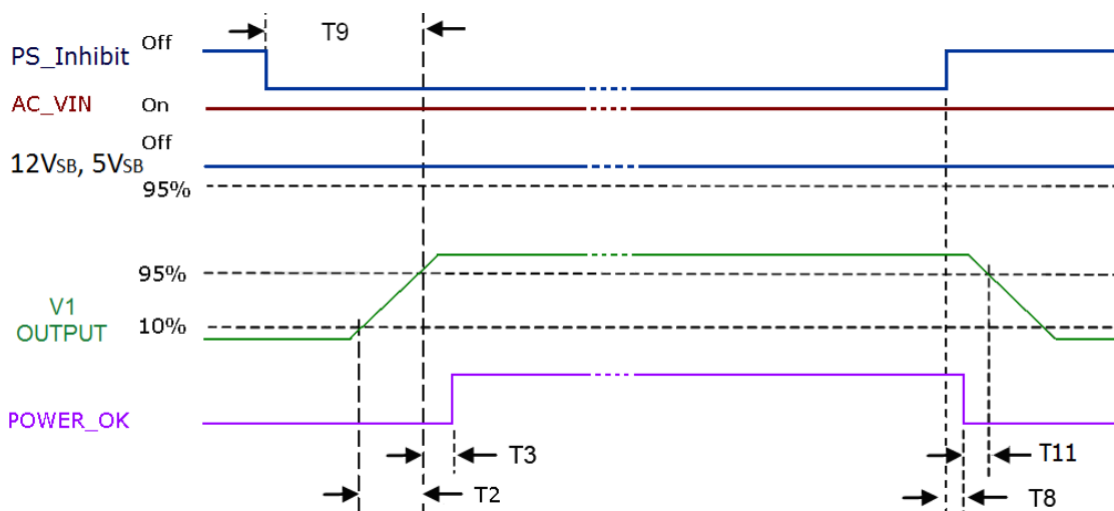
## Base Signals / Controls Timing

### AC/DC INPUT OFF-TO-ON AND ON-TO-OFF TIMINGS:



$12 V_{SB}/5 V_{SB}$ On to V1 On	$250 \text{ ms} \leq T1 \leq 1700 \text{ ms}$
V1 rise time	$10 \text{ ms} \leq T2 \leq 150 \text{ ms}$
$12 V_{SB}/5 V_{SB}$ rise time	$3 \text{ ms} \leq T10 \leq 150 \text{ ms}$
V1 On – POWER_OK delay	$150 \text{ ms} \leq T3 \leq 350 \text{ ms}$
Power down warning	$T4 \geq 12 \text{ ms}$
V1 Off to $12 V_{SB}/5 V_{SB}$ Off	$T5 \geq 0.5 \text{ s}$ (V1 load > 25 W)
AC Off to POWER_OK low	$T6 \geq 8 \text{ ms}$
AC_On to $12 V_{SB}/5 V_{SB}$ On	$T7 \leq 500 \text{ ms}$

### AC/DC INPUT OFF-TO-ON AND ON-TO-OFF TIMINGS:



V1 rise time	$10 \text{ ms} \leq T2 \leq 150 \text{ ms}$
V1 On – POWER_OK delay	$150 \text{ ms} \leq T3 \leq 350 \text{ ms}$
Turn-Off warning	$T1 \geq 1 \text{ ms}$
PS_Inhibit – POWER_OK low delay	$T8 \leq 3 \text{ ms}$
PS_Inhibit – V1 On delay	$T9 \leq 1700 \text{ ms}$

## Protection Features

Specification	Test Conditions / Notes	Min.	Nominal	Max.	Units
Input Under Voltage	Auto-recovering, hiccup mode.	58	75	82	V <sub>AC</sub>
Input Fuse	High breaking, 16 / 20 A, 277 V <sub>AC</sub> (250 V <sub>DC</sub> ) on each AC lines.	-	-	16/20	A
Over Current	At nominal input voltages V1: Hiccup mode, auto-recovering 5 V <sub>SB</sub> : Auto-recovering 12 V <sub>SB</sub> : Hiccup mode, auto-recovering	-	-	150	%I <sub>Rated</sub> A A
Short Circuit	At nominal input voltages V1: Hiccup mode or latch 5 V <sub>SB</sub> : Auto-recovery 12 V <sub>SB</sub> : Hiccup mode, auto-recovering.	-	-	-	
Over Voltage	V1, Power shut down, latch off. 12 V <sub>SB</sub> : Hiccup mode, auto-recovering.	116	-	145	%V <sub>NOM</sub>
Over Temperature (ambient)	Hiccup mode, auto-recovering.	70	-	-	°C
Over Temperature (on secondary side)	Hiccup mode, auto-recovering.	-	-	-	°C
Isolation: Primary-to-Secondary	Reinforced	5660 4000	- -	- -	V <sub>DC</sub> V <sub>AC</sub>
Isolation: Input-to-Earth	Basic Production tested at 2642 V <sub>DC</sub>	2642 1865	- -	- -	V <sub>DC</sub> V <sub>AC</sub>
Isolation: Output-to-Earth	Basic	1500	-	-	V <sub>AC</sub>
Means Of Protection: Primary to secondary	2x MoPP (IEC 60601-1 3rd edition) at 90 – 264 V <sub>AC</sub> , 50/60 Hz (120-300 V <sub>DC</sub> ) up to 4000 m 2x MoOP (IEC 60601-1 3rd edition) at 90 – 305 V <sub>AC</sub> , 50/60 Hz (120-300 V <sub>DC</sub> ) up to 4000 m				
Means Of Protection: Input to Protection Earth	1x MoPP (IEC 60601-1 3rd edition) at 90 – 264 V <sub>AC</sub> , 50/60 Hz (120-300 V <sub>DC</sub> ) up to 4000 m 1x MoOP (IEC 60601-1 3rd edition) at 90 – 305 V <sub>AC</sub> , 50/60 Hz (120-300 V <sub>DC</sub> ) up to 4000 m				
Means Of Protection: Output to Protection Earth	1x MoPP (IEC 60601-1 3rd edition) at 100 – 250 V <sub>AC</sub> , 50/60 Hz up to 4000 m				
Equipment Protection Class	Class I, compatible with BF (Body Floating) ME (Medical Equipment)				

## Environmental Specifications

Specification	Test Conditions / Notes	Min	Nominal	Max	Units
Operating Temperature Range	No de-rating up to 35 °C See de-rating curves above MDP1200 starts at -40 °C upon warm up delay	-20	-	35	°C
Operating Temperature Range with De-rating	See de-rating curves and conditions in the Output Specifications section	-	-	70	°C
Storage Temperature Transportation Temperature	As per IEC/EN 60721-3-1 Class 1K4 As per IEC/EN 60721-3-2 Class 2K4	-40	-	85	°C
Humidity	RH, Non-condensing Operating. Non-operating	-	-	90 95	% %
Operating Altitude	MoPP (90 – 264 V <sub>AC</sub> , 50/60 Hz, 120 – 300 V <sub>DC</sub> ) MoOP (90 – 305 V <sub>AC</sub> , 50/60 Hz) Power de-rating above 1800 m	-	-	4000 4000	 m
Shock	EN 60068-2-27 Operating: Half sine, 30 g, 18 ms, 3 axes, 6x each (3 positive and 3 negative). Non-Operating: Half sine, 50 g, 11 ms, 3 axes, 6x each (3 positive and 3 negative).				
Vibration	EN 60068-2-64 Operating: Sine, 10 – 500 Hz, 1 g, 3 axes, 1 oct/min., 60 min. Random, 5 – 500 Hz, 0.02 g <sup>2</sup> /Hz, 1 gRMS, 3 axes, 30 min. Non-Operating: 5 – 500 Hz, 2.46 gRMS (0.0122 g <sup>2</sup> /Hz), 3 axes, 30 min.				
MTBF	Full load, 25 °C ambient, 100% duty cycle, Full load, 40 °C ambient, 75% duty cycle Telcordia SR-332 Issue 2	430.000 280.000	- -	- -	Hours
Useful Life	Nominal V <sub>IN</sub> , 80% load, 40 °C ambient (IPC 9592)	-	3	-	Years

## Electromagnetic Compatibility (EMC) – Emissions

Phenomenon	Conditions / Notes	Standard	Equipment/Performance Class
Conducted	115, 230 V <sub>RMS</sub> * Maximum load.	EN 60601-1-2 (Medical)	B
Radiated		EN 60601-1-2 (Medical)	B <sup>6</sup>
Line Voltage Fluctuation and Flicker	At 20%, 50% and 100% maximum load. Nominal input voltages	EN 61000-3-3	
Harmonic Current Emission	230 V <sub>AC</sub> input voltage, 50 / 60 Hz 230 V <sub>AC</sub> , 50 / 60 Hz, >300 W load	EN 61000-3-2 EN 61000-3-2	A, D C

<sup>6</sup> Performance referred to the enclosed PC package with additional HF chokes on input, output power and signal cables. In any case, radiated emission relevant to both UC and PC package variants, should be assessed at system level.

## Electromagnetic Compatibility (EMC) – Immunity

Phenomenon	Conditions / Notes	Standard	Test Level	Criteria
	<b>Reference standard for the medical version</b>	<b>EN 60601-1-2, 4th Edition</b>		
ESD	15 kV air discharge, 8 kV contact, at any point of the system.	EN 61000-4-2	4	A
Radiated Field	10 V/m, 20-2700 MHz, 1 KHz, 80% AM.	EN 61000-4-3	3	A
Electric Fast Transient	±2 kV on AC power port for 1 minute	EN 61000-4-4	3	A
Surge	±2 kV line to line; ± 3 kV line to earth on AC power port	EN 61000-4-5	X	A
Conducted RF Immunity	10 V <sub>RMS</sub> , 0,15-80 MHz, 1 kHz, 80% AM	EN 61000-4-6	3	A
Dips and Interruptions	<b>200 – 264 V<sub>AC</sub>:</b>			
	Drop-out to 0% for 10 ms	EN61000-4-11		A <sup>7</sup>
	Dip to 40% for 5 cycles (100 ms)	EN61000-4-11		A (de-rate to 500 W)
	Dip to 70% for 25 cycles (500 ms)	EN61000-4-11		A
	Drop-out to 0% for 5 s	EN61000-4-11		B
	<b>100 – 127 V<sub>AC</sub>:</b>			
	Drop-out to 0% for 10 ms	EN 61000-4-11		A <sup>8</sup>
	Dip to 40% for 5 cycles (100 ms)	EN 61000-4-11		A (de-rate to 240 W)
Dip to 70% for 25 cycles (500 ms)	EN 61000-4-11		A (de-rate to 400 W)	
Drop-out to 0% for 5 s	EN 61000-4-11		B	

## Safety Agencies Approvals

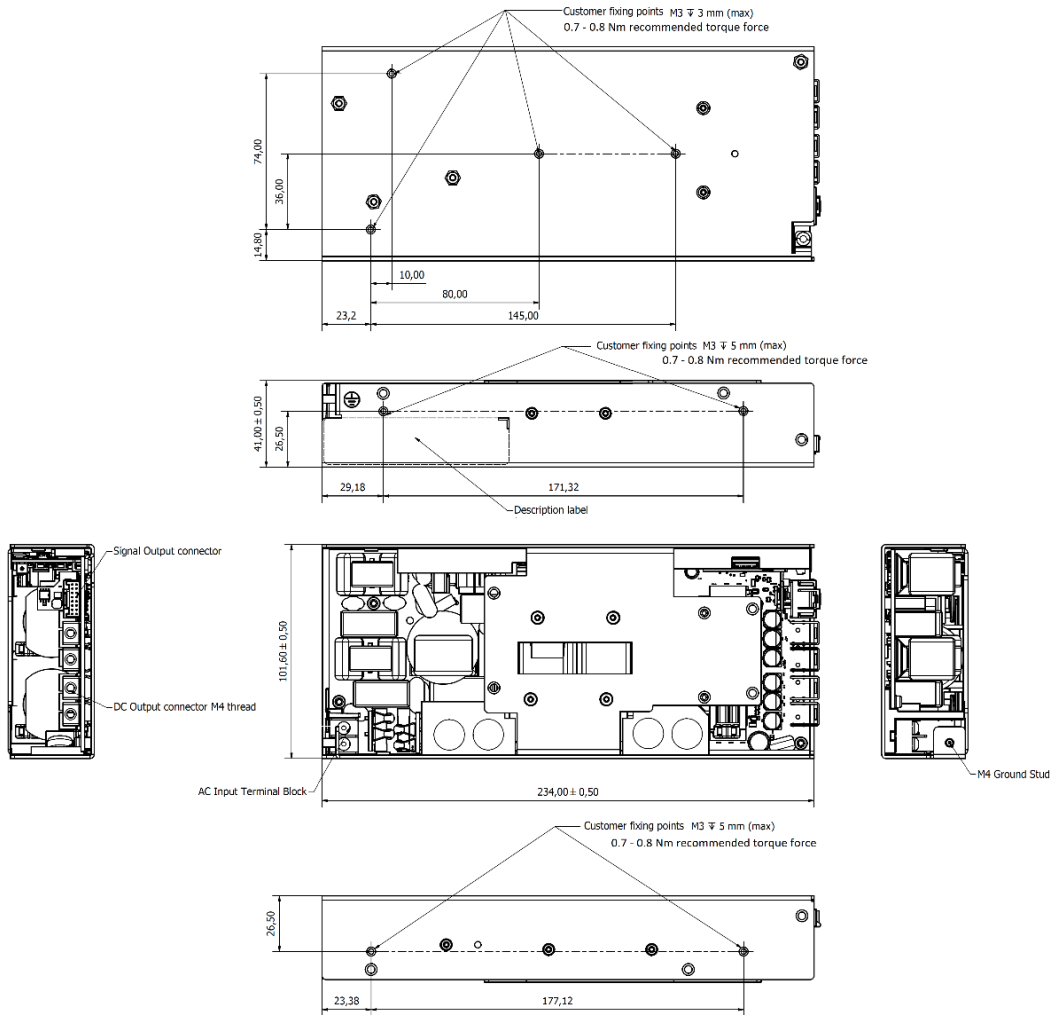
Certification Body	Safety Standards and file numbers	Category
CSA / UL	CSA C22.2 No.60601-1, ANSI/AAMI ES60601-1 3rd Edition + A1	Medical
IEC IECCE CB Certification	IEC/EN 60601-1 3rd edition+A1	Medical
CE	Directive 93/42/CEE: Safety Requirement of the Medical Device	Medical
	Directive 2014/30/EU: Electromagnetic Compatibility (EMC)	
	Directive EU 2015/863: RoHS 3	
Meets all essential requirements of the standard IEC/EN/UL/CSA 61010-1 2nd edition		

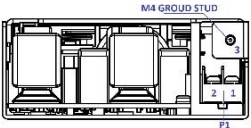
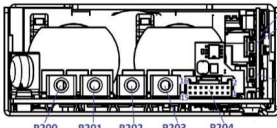
# Outline Drawing and Connections

## OUTLINE DRAWING AND CONNECTIONS - U-CHASSIS (-UC)

OVERALL DIMENSIONS: 101.6 x 234 x 41.0 mm (4.00 x 9.21 x 1.61 in)

WEIGHT: 1087 g (2.40 lb)

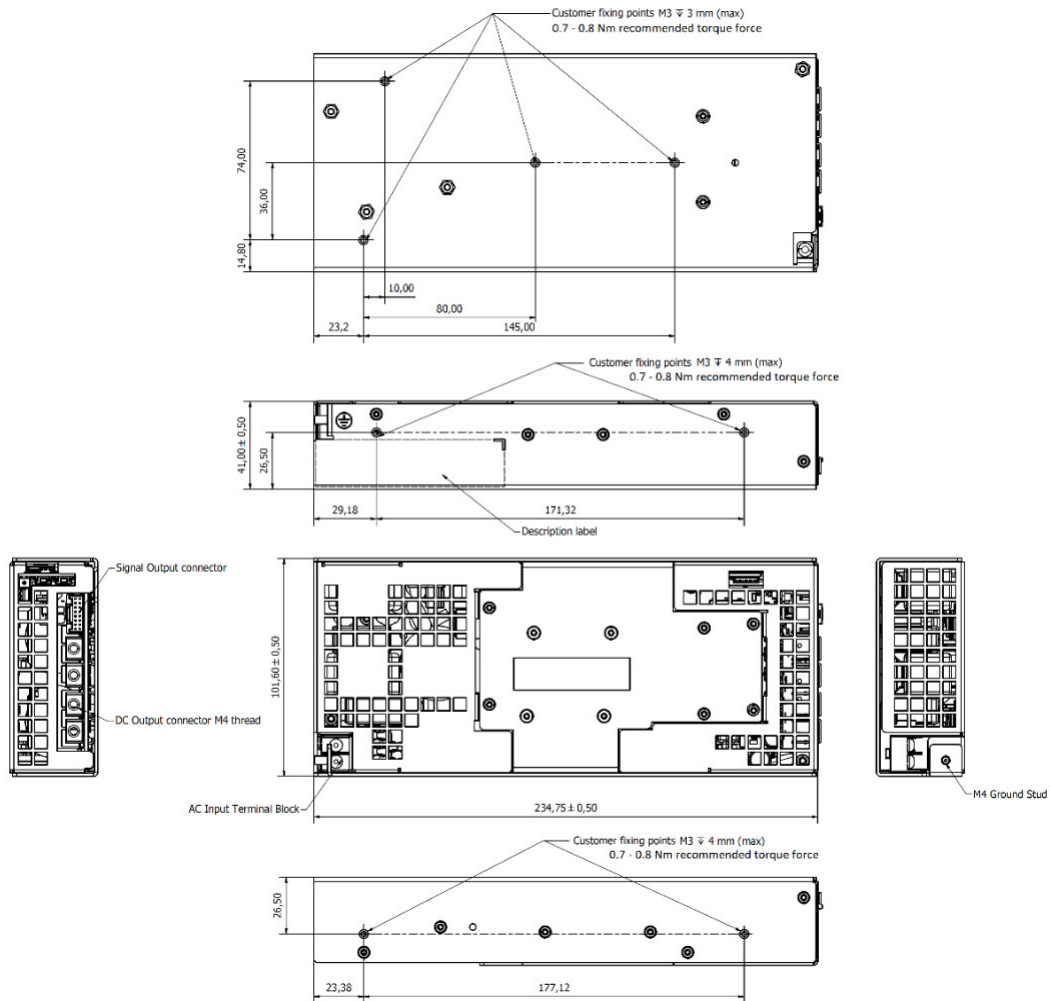


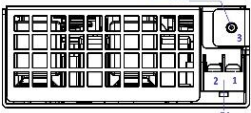
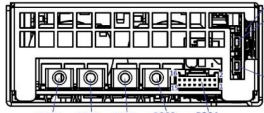

AC INPUT CONNECTIONS		DC OUTPUT CONNECTIONS		SIGNAL CONNECTOR		ADDITIONAL CONTROL FUNCTIONS	
P1: AMTEK TB25C-B02P-13-00A-L M4 GROUND STUD		P200, P201, P202, P203: BRASS M4 THREADED TERMINAL (tight to 0.8-1Nm, max deep screws 7 mm)		P204: MOLEX 501876-1640		SW600, SW601, DL600:	
							
Ref.	Function	Ref.	Function	Ref.	Function	Ref.	Function
1	Line 1		24V Optional 24 / 48V	1	RMT (-)	SW600	V1_ADJ (UP)
2	Line 2			2	RMT (+)		
3	Protection Earth	P200		3	I-SHARE	SW601	V1_ADJ (DOWN)
		P201	-	4	+5VSB		
		P202	V1 RTN V1 RTN	5	PS_INHIBIT	DL600	Bi-colour LED
		P203	V1 RTN -	6	PS_OK	Off	No AC/DC input power provided
				7	SCL		
				8	SDA	Blinking Green	Input power good, standby active, V1 inhibited
				9	#SMBALERT		
				10	ADDR0		
				11	-PS_INHIBIT	Steady Green	V1 Active
				12	ADDR1	Steady or Blinking red	Power Supply Fault
				13	RSVD_RX (OUT)		
				14	RSVD_TX (OUT)		
				15	RTN		
				16	+12V <sub>SB</sub>		

# Outline Drawing and Connections

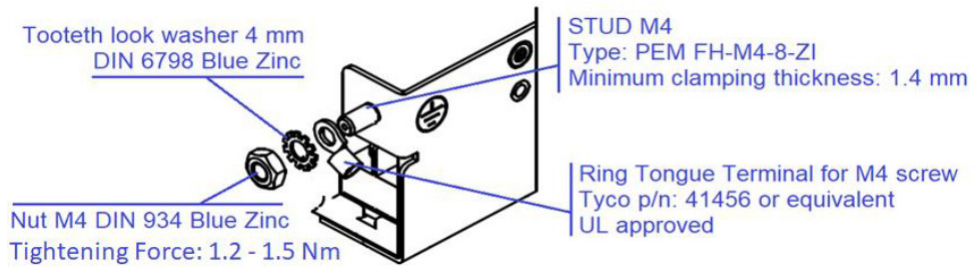
## OUTLINE DRAWING AND CONNECTIONS -U-CHASSIS + PERFORATED COVERS (-PC)

OVERALL DIMENSIONS: 101.6 x 234.7 x 41.0 mm (4.0 x 9.21 x 1.61 in)  
WEIGHT: 1125 g (2.48 lb)



AC INPUT CONNECTIONS		DC OUTPUT CONNECTIONS		SIGNAL CONNECTOR		ADDITIONAL CONTROL FUNCTIONS	
<b>P1: AMTEK TB25C-B02P-13-00A-L</b> <b>M4 GROUND STUD</b>		<b>P200, P201, P202, P203:</b> <b>BRASS M4 THREADED TERMINAL</b> (tight to 0.8-1Nm, max deep screws 7 mm)		<b>P204:</b> <b>MOLEX 501876-1640</b>		<b>SW600, SW601, DL600:</b>	
							
Ref.	Function	Ref.	Function	Ref.	Function	Ref.	Function
1	Line 1		24V Optional	1	RMT (-)	SW600	V1_ADJ (UP)
2	Line 2		24 / 48V	2	RMT (+)		
3	Protection Earth	P200		3	I-SHARE	SW601	V1_ADJ (DOWN)
		P201	-	4	+5V <sub>SB</sub>		
		P202	V1 RTN	5	PS_INHIBIT	DL600	Bi-colour LED
		P203	V1 RTN	6	PS_OK	Off	No AC/DC input power provided
				7	SCL		
				8	SDA		
				9	#SMBALERT	Blinking Green	Input power good, standby active, V1 inhibited
				10	ADDR0		
				11	-PS_INHIBIT	Steady Green	V1 Active
				12	ADDR1	Steady or Blinking red	Power Supply Fault
				13	RSVD_RX (OUT)		
				14	RSVD_TX (OUT)		
				15	RTN		
				16	+12V <sub>SB</sub>		

## Protection Earth Connection Instructions



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