

CCM250 Series



- 250 W Convection Cooled
- 300 W Peak Rating 500 ms
- Very High Efficiency up to 95%
- Class B Conducted & Radiated Emissions
- 1U Form Factor
- 5 V Standby Rail
- 80 V - 275 VAC Input Operation
- IT, Industrial & Medical Safety Approvals
- Remote On/Off & Power Fail Signal as Standard

The CCM250 range of single output AC-DC 250 W nominal, 300 peak power supplies feature industry leading efficiency of 95% and absolute minimum efficiency of 90% with 90 VAC input and full load. This leap in efficiency has been achieved with full resonant ZCS topology and careful consideration to every aspect of power loss resulting in a convection cooled power supply packaged in a 6" (153mm) x 4" (102mm) x 1.5" (38mm) chassis which can be easily installed into the end application due to a 70% reduction in the dissipated heat, associated with other power supplies in this power range.

The six standard models cover the voltage range from 12V - 48V , have dual input fusing and are compliant with IEC60601-1 Medical and IEC60950-1 IT safety approvals.

The CCM250 series also boasts low earth leakage current of typically 90 μ A at 115V and 160 μ A at 230V, class B conducted and radiated emissions 5V standby rail, power fail signal and remote on / off.



T H E X P E R T S I N P O W E R

Models and Ratings - Convection-cooled

Output Power		Output Voltage V1	Output Current V1		Standby Supply	Model Number
P nom	P peak ⁽¹⁾		I nom	I peak ⁽¹⁾		
250 W	300 W	12.0 VDC	20.8 A	25 A	5.0 V/0.5 A	CCM250PS12
250 W	300 W	15.0 VDC	16.7 A	20 A	5.0 V/0.5 A	CCM250PS15
250 W	300 W	24.0 VDC	10.4 A	12.5 A	5.0 V/0.5 A	CCM250PS24
250 W	300 W	28.0 VDC	8.9 A	10.7 A	5.0 V/0.5 A	CCM250PS28
250 W	300 W	36.0 VDC	6.9 A	8.3 A	5.0 V/0.5 A	CCM250PS36
250 W	300 W	48.0 VDC	5.2 A	6.25 A	5.0 V/0.5 A	CCM250PS48

Notes:

1. Peak duration is 500 ms max, average power must not exceed 250 W.

Input Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage - Operating	80	115/230	275	VAC	Derate output power <90 VAC. See fig 1. Power fail signal cannot be used <90 VAC.
Input Frequency	47	50/60	63	Hz	
Power Factor		>0.9			EN61000-3-2 class A compliant
Input Current - No Load		0.13/0.17		A	115/230 VAC
Input Current - Full Load		2.4/1.2		A	115/230 VAC
Inrush Current			30	A	230 VAC, 25 °C
Earth Leakage Current		90/160	250	µA	115/230 VAC/50 Hz (Typ.), 264 VAC/60 Hz (Max.)
Input Protection	T5.0A/250 V internal fuse in both line and neutral				

Output Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage - V1	12		48	VDC	See Models and Ratings table
Initial Set Accuracy			±0.5 ^(v1) , ±5 ^(v2)	%	50% load, 115/230 VAC
Output Voltage Adjustment	±3			%	V1 only via potentiometer. See mech. details (page 11).
Minimum Load	0			A	
Start Up Delay		0.5		s	230 VAC full load (see fig.2)
Hold Up Time	20	40		ms	90 VAC full load (see fig.3)
Drift			±0.2	%	After 20 min warm up
Line Regulation			±0.5	%	90-264 VAC
Load Regulation			±1 ^(v1) , ±5 ^(v2)	%	0-100% load.
Transient Response - V1			4	%	Recovery within 1% in less than 500 µs for a 50-75% and 75-50% load step
Over/Undershoot - V1			5	%	
Ripple & Noise			1 ^(v1) , 2 ^(v2)	% pk-pk	20 MHz bandwidth (see fig.4 & 5)
Overvoltage Protection	115		140	%	Vnom DC. Output 1 only, recycle input to reset
Overload Protection	125		165	% I nom	Output 1 only, auto reset (see fig.6)
Short Circuit Protection					Continuous, trip & restart (hiccup mode) all outputs
Temperature Coefficient			0.05	%/°C	
Overtemperature Protection		110		°C	Auto recovery - temperature of main transformer

Input Voltage Derating

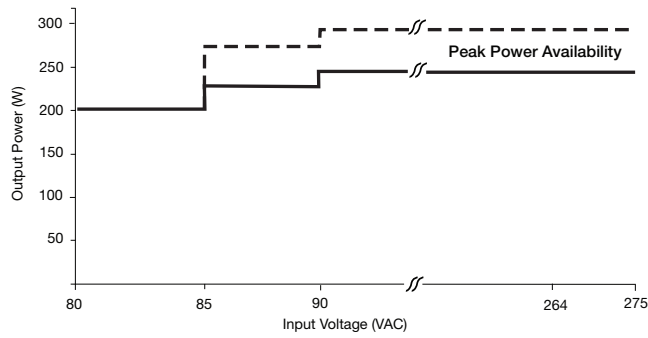


Figure. 1

Start Up Delay From AC Turn On

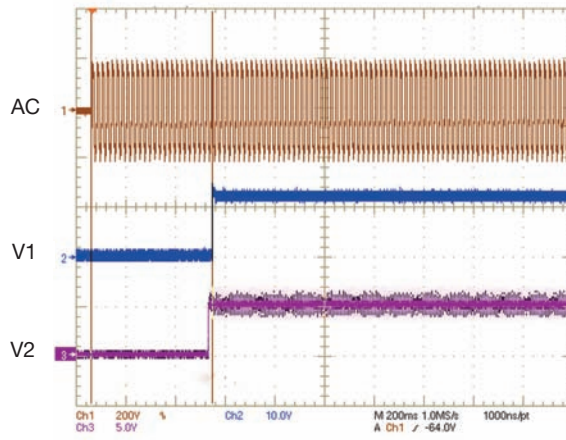


Figure. 2
V1 & V2 start up example from AC turn on (490 ms)

Hold Up Time From Loss of AC

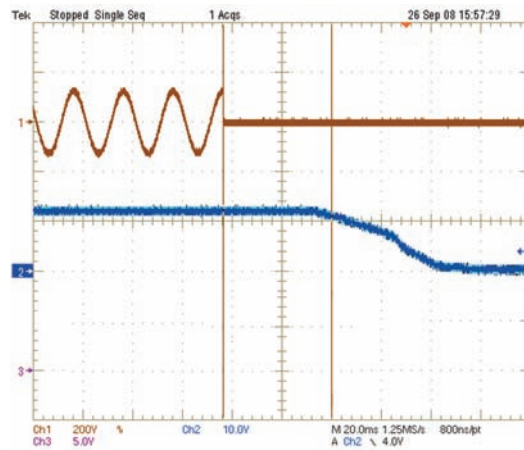


Figure 3
V1 hold up example at 250 W load with 90 VAC input (43 ms)

Output Ripple & Noise

Figure 4
V1 CCM250PS12 (full load)
86 mV pk-pk ripple. 20 MHz BW

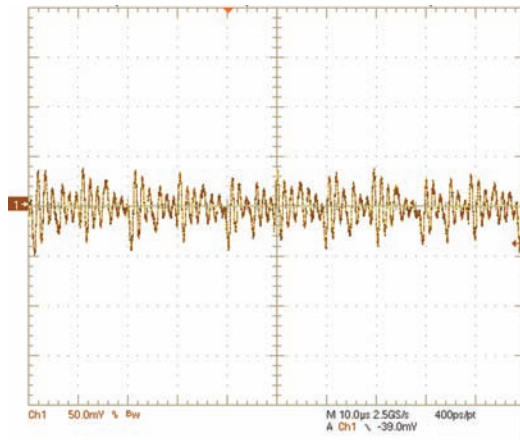
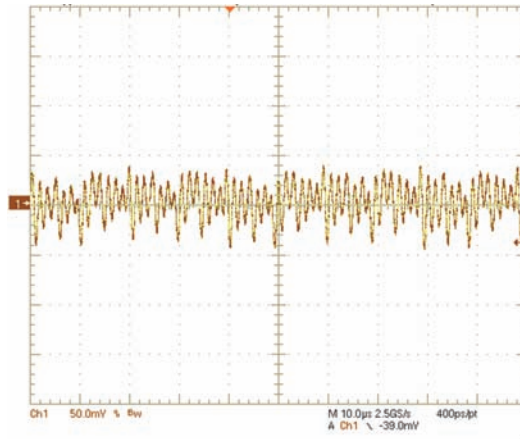
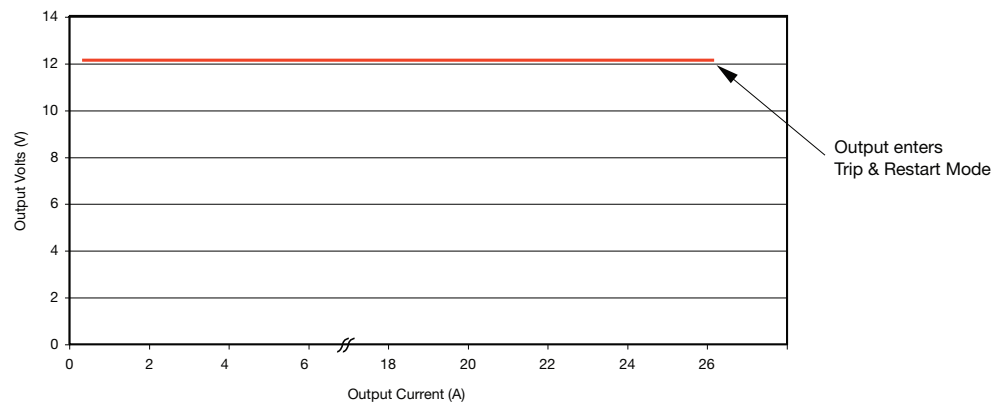


Figure 5
V1 CCM250PS24 (full load)
84 mV pk-pk ripple. 20 MHz BW



Output Overload Characteristic

Figure 6
Typical V1 Overload
Characteristic
(CCM250PS12 shown)



General Specifications

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		93	95	%	Full load (see fig.7 & 8)
Isolation: Input to Output Input to Ground Output to Ground	4000			VAC	
	1500			VAC	
	500			VAC	
Switching Frequency		30-500 / 25.6 / 51.2		kHz	PFC / Boost / Main Converter.
Power Density			6.9	W/in ³	
Mean Time Between Failure		365		kHrs	MIL-HDBK-217F, Notice 2 +25 °C GB
Weight		1.7 (780)		lb (g)	

Efficiency Versus Load

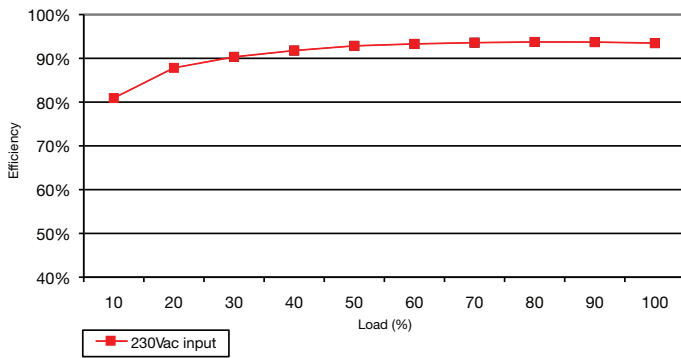


Figure 7
CCM250PS12

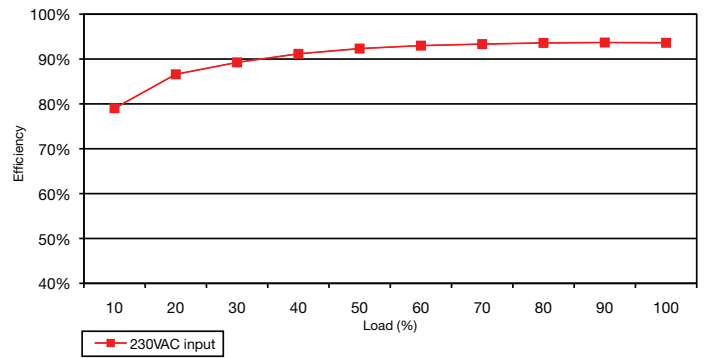


Figure 8
CCM250PS24

Power Loss

Waste heat creates a big headache for system designers. The industry leading efficiency achieved by the CCM250 is 5-10% above existing topologies used in this power area. This can result in a 70% reduction in generated heat as shown below and enables the overall system to run much cooler and more reliably.

Example 1

	Conventional Products	CCM250
Efficiency	85 %	95 %
Generated Heat	44.1 W	13.1 W
% Losses	100 %	30 %

Example 2

	Conventional Products	CCM250
Efficiency	90 %	95 %
Generated Heat	27.8 W	13.1 W
% Losses	100 %	47 %

Characteristic	Notes & Conditions
Signals	
Power Fail	Uncommitted opto isolated transistor, normally off when AC is good (see fig.9 - 11) Provides ≥ 5 ms (typically 20-30ms) warning of loss of output from AC failure
Remote On/Off (Inhibit/Enable)	Uncommitted isolated optocoupler diode, powered diode inhibits the supply (see fig.12-17)
Standby Supply V2	Isolated 5 V/0.5 A supply, always present when AC supplied.

Signals

Power Fail

Figure 9

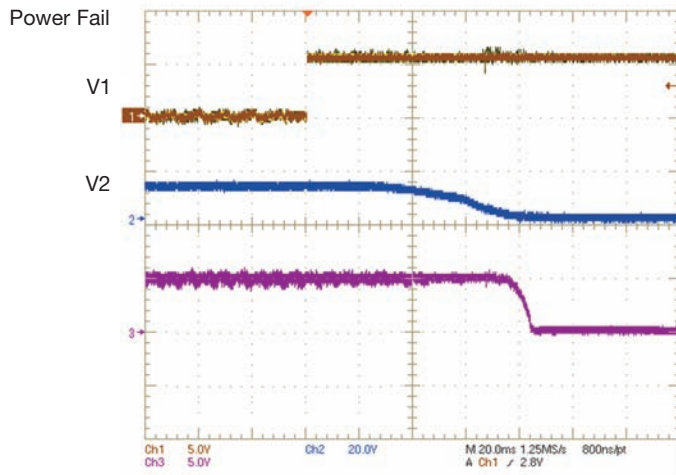
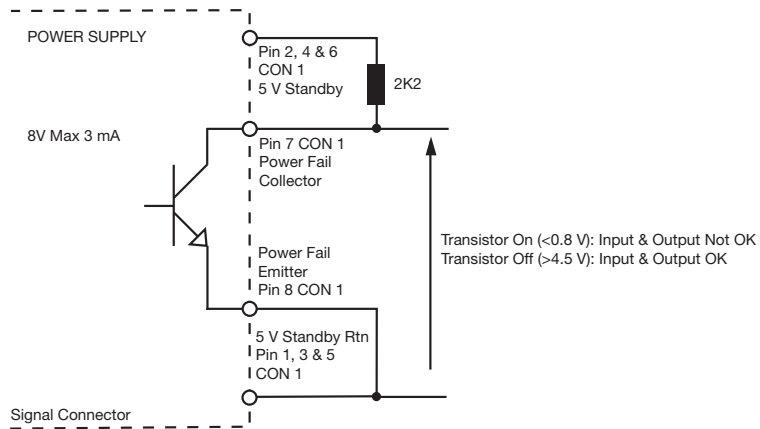


Figure 10
Power Fail signal example
at AC switch off

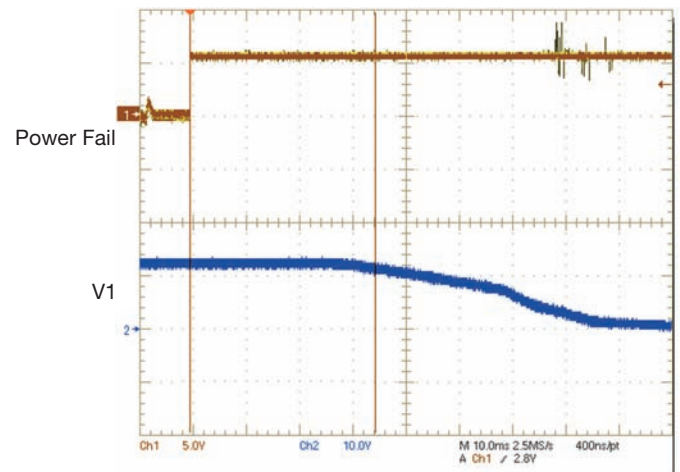


Figure 11
V1 warning time example at Power Fail signal 230
VAC 250 W load (35 ms)

Signals

Remote On/Off (Inhibit/Enable)

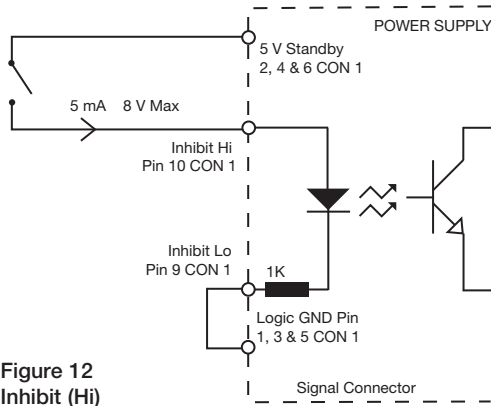


Figure 12
Inhibit (Hi)

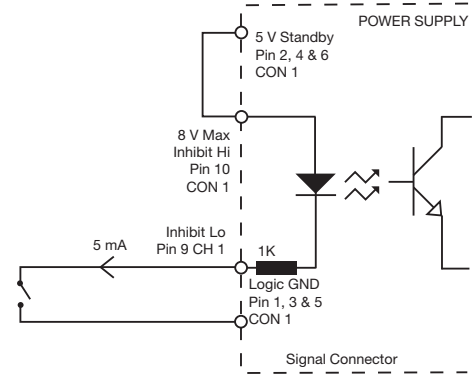


Figure 13
Inhibit (Lo)

Figure 14
Example of outputs switching off when Inhibit (Lo) configuration used & switch closed

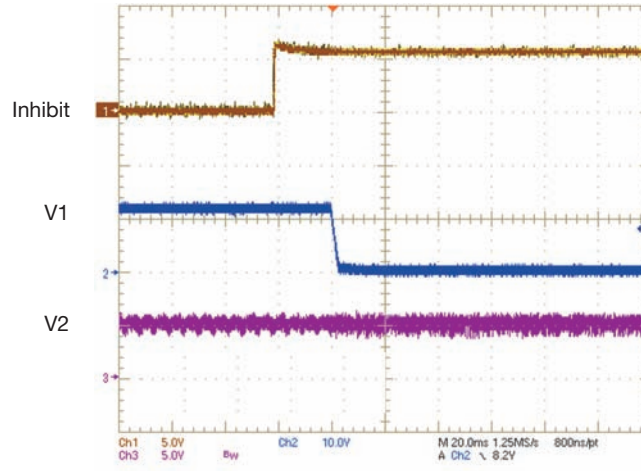
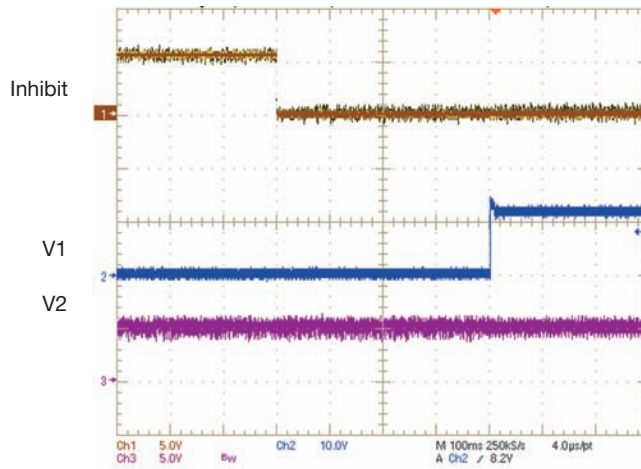


Figure 15
Example of outputs switching on when Inhibit (Lo) configuration used & switch open



Signals

Remote On/Off (Inhibit/Enable)

Figure 16
Enable (Hi)

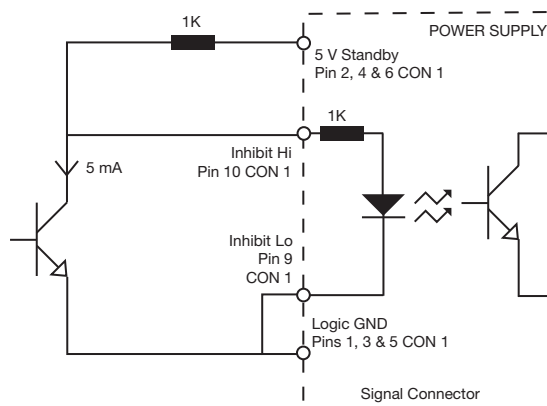
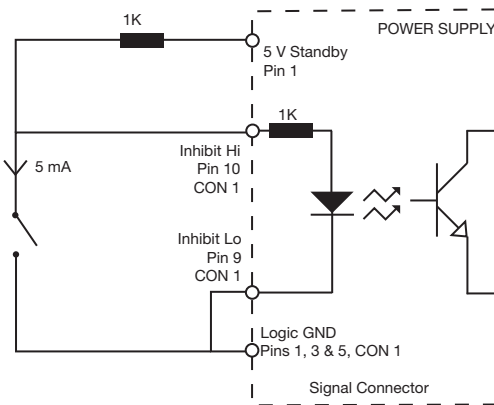


Figure 17
Enable (Lo)



Notes

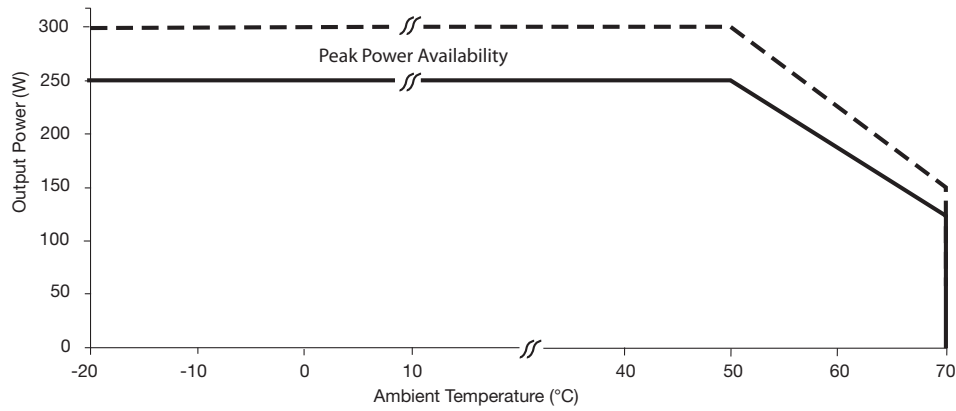
1. At AC switch on the output (V) may momentarily rise when the unit is disabled using the 5 V standby in conjunction with the Remote On/Off function.

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-20 (-40)		+70	°C	Derate linearly from +50 °C at 2.5%/°C to 50% at 70 °C. See fig.18 & Thermal Considerations, p.11. (-40 °C consult sales)
Warm up Temperature		20		Minutes	
Storage Temperature	-40		+85	°C	
Cooling					Convection cooled. See fig.18 & Thermal Considerations, p.11.
Humidity	5		95	%RH	Non-condensing
Operating Altitude			3000	m	
Shock					3 x 30 g/11 ms shocks in both +ve & -ve directions along the 3 orthogonal axis, total 18 shocks.
Vibration					Single axis 10-500 Hz at 2 g x 10 sweeps

Derating Curve

Figure 18



Electromagnetic Compatibility - Immunity

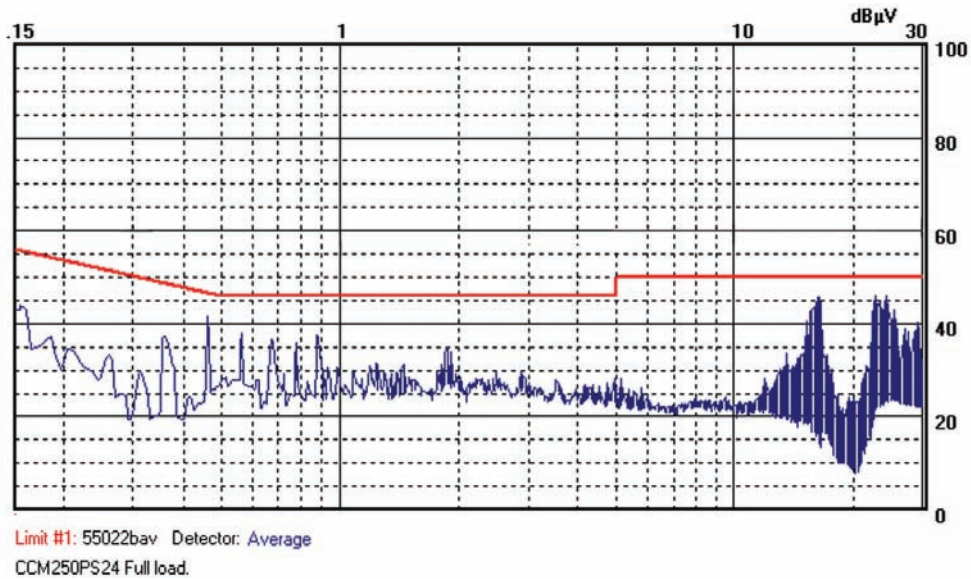
Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Low Voltage PSU EMC	EN61204-3	High severity level	as below	
Harmonic Current	EN61000-3-2	Class A		
Radiated	EN61000-4-3	3	A	
EFT	EN61000-4-4	3	A	
Surges	EN61000-4-5	Installation class 3	A	
Conducted	EN61000-4-6	3	A	
Dips and Interruptions	EN61000-4-11	Dip: 30% 10 ms	A	
		Dip: 60% 100 ms	B	
		Dip: 100% 5000 ms	B	
	EN60601-1-2 (EN61000-4-11)	Dip: 30% 500 ms	A	
		Dip: 60% 100 ms	A	Requires load derating to approx 80% with 115 VAC input.
		Dip: 100% 10 ms	A	
		Int.: >95% 5000 ms	B	

Electromagnetic Compatibility - Emissions

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Conducted	EN55022	Class B		See fig. 19
Radiated	EN55022	Class B		
	RTCA D0160D 21.4	Cat. M		
Voltage Fluctuations	EN61000-3-3			

Typical EMC Plot

Figure 21
Typical conducted noise plot



Safety Agency Approvals

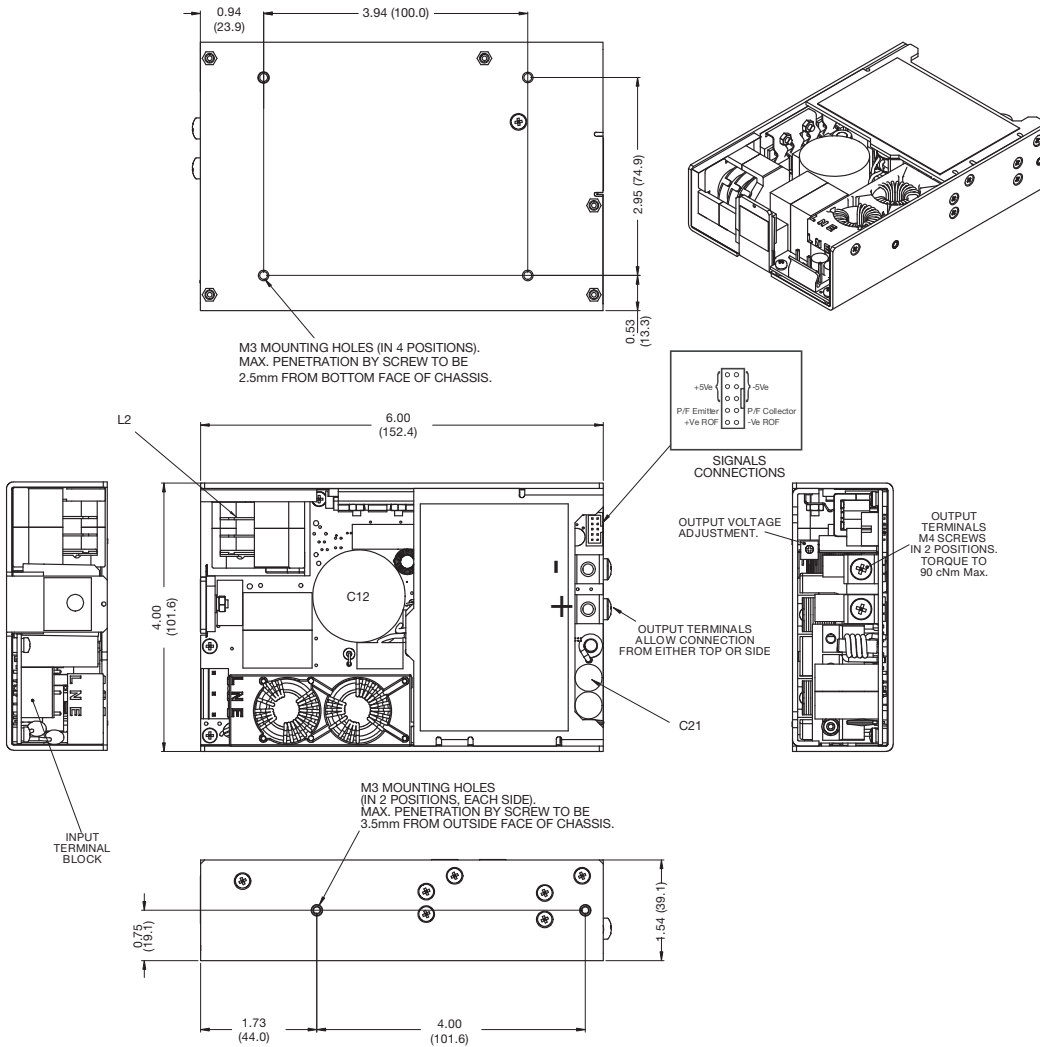
Safety Agency	Safety Standard	Category
CB Report	NEMKO certificate #NO50564 IEC60950-1 Ed 2	Information Technology
CSA	CSA certificate #2124603 CSA C22.2 No, 60950-1-07	Information Technology
TUV	Pending	Information Technology
CE	LVD	

Safety Agency	Safety Standard	Category
CB Report	NEMKO certificate #NO50564 IEC60601-1	Medical
CSA	CSA certificate #2124603 CSA C22.2 No, 601.1-M90	Medical
TUV	TUV certificate #B08 03 45240 009 EN60601-1	Medical

Safety Agency	Safety Standard	Category
CB Certificate	NEMKO certificate #NO50564 IEC61010-1:2001 Ed 2	Measurement, Control & Laboratory

Equipment Protection Class	Safety Standard	Notes & Conditions
Class I	IEC60950-1:2005 Ed 2	

Mechanical Details



Input Connector CON 4	
Pin 1	Line
Pin 2	Neutral
Pin 3	Earth

CON 4 mates with Molex housing 09-50-1051 and Molex series 5194 crimp terminals.

Output Connector CON 3	
1	+V1
2	V 1 RTN

Signals Connector CON 1	
1	5 V Standby Return
2	5 V Standby
3	5 V Standby Return
4	5 V Standby
5	5 V Standby Return
6	5 V Standby
7	Power Fail (Collector)
8	Power Fail (Emitter)
9	Remote On / Off (Cathode)
10	Remote On / Off (Anode)

CON 1 mates with JST housing PHDR-10VS with contact SPHD-001T-P0.5

Notes

- All dimensions in inches (mm).
Tolerance .xx = ±0.02 (0.50);
.xxx = ±0.01 (0.25)

Weight 1.7 lb (780 g) approx

Thermal Considerations

In order to ensure correct and reliable operation of the PSU in the most adverse conditions permitted in the end-use equipment, the temperature of the components listed in the table below must not be exceeded. See drawing above component locations. Temperature should be monitored using K type thermocouples placed on the hottest part of the component.

Temperature Measurements (Ambient ≤ 50 ° C)	
Component	Max Temperature ° C
L2	120 °C
C12	100 °C
C21	100 °C

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