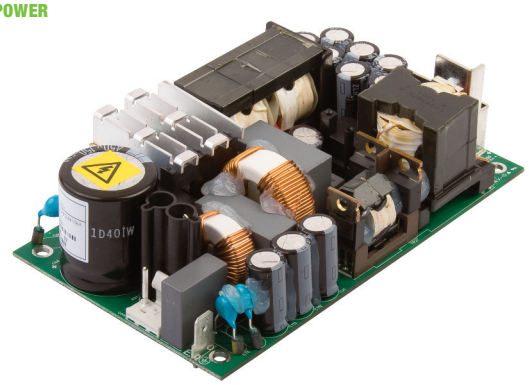
CCB200 Series



- 200 W Convection Cooled at +70 °C
- Industry Standard “3 x 5” Package
- Very Low Heat Loss
- Very High Efficiency up to 95%
- Very Long Capacitor Lifetime
- 1U Form Factor
- <0.5 W Standby Power
- 80 V – 300 VAC Input Operation
- IT & Medical (BF) Safety Approvals
- Remote On/Off & Power Fail Signal as Standard
- 5 V Standby (Optional)
- Covers Available

The CCB200 range of single output AC-DC 200 W power supplies feature industry leading efficiency of up to 95% and absolute minimum efficiency of 93% with 90 VAC input and full load.

This leap in efficiency particularly at low input voltages has been achieved by harmonising digital circuitry with resonant zero current switching techniques.

These techniques coupled with close attention to even the smallest levels of power loss within the unit, have resulted in a convection cooled power supply packaged in a 3” (76.2mm) x 5” (127mm) x 1.43” (36mm) open frame design unequalled in the market today.

System designers can easily integrate the CCB200 into a wide variety of end use applications due to the very low levels of heat dissipated from the supply. This low dissipation results in lower component temperatures and extended lifetime by as much as four times when compared to other convection cooled products with similar power density.

The 200W of power is available without derating over the full input (90V – 264V AC) and temperature range (-20°C to +70°C).

The five standard models cover the voltage range from 12V - 56V, have dual input fusing and are compliant with IEC60601-1 Medical (BF) and IEC62368-1 IT safety approvals.

Models and Ratings - Convection-cooled

Output Power	Output Voltage V1	Output Current V1	5 V Standby (Optional)	Model Number
200 W	12.0 V	16.7 A	5 V/0.5 A	CCB200PS12
200 W	15.0 V	13.3 A	5 V/0.5 A	CCB200PS15
200 W	24.0 V	8.3 A	5 V/0.5 A	CCB200PS24
200 W	28.0 V	7.1 A	5 V/0.5 A	CCB200PS28
200 W	48.0 V	4.2 A	5 V/0.5 A	CCB200PS48
200 W	56.0 V	3.6 A	5 V/0.5 A	CCB200PS56

1. Add suffix -C for covered version, e.g. CCB200PS12-C.
2. Add suffix -A for 5 V standby option, or -AC for standby and cover options combined.

Input Characteristics

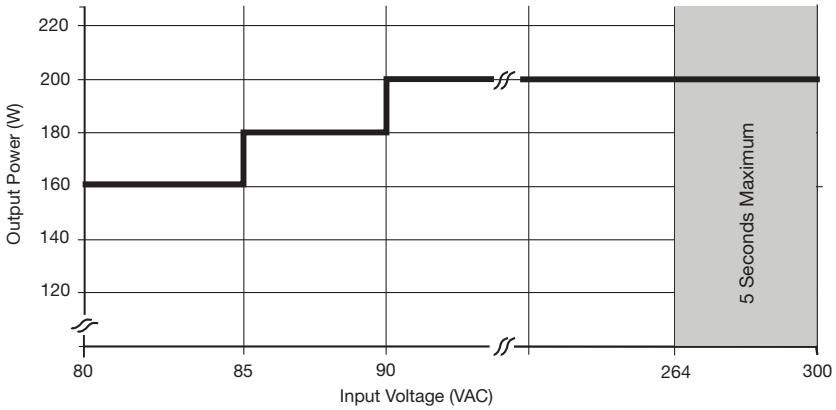
Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage - Operating	80	115/230	300	VAC	Derate output power <90 VAC. See fig 1. Power fail signal cannot be used <90 VAC.
Input Frequency	47	50/60	63	Hz	
Power Factor		>0.9			EN61000-3-2 class A compliant
Input Current - Full Load		1.8/0.9		A	115/230 VAC
Inrush Current			40	A	230 VAC, 25 °C
No Load Input Power			0.5	W	Under inhibit condition
Earth Leakage Current		75/145	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		56	VDC	See Models and Ratings table
Initial Set Accuracy			±0.5	%	50% load, 115/230 VAC
Output Voltage Adjustment	-4		+5	%	V1 only via potentiometer. See mech. details (page 8).
Minimum Load	0			A	
Start Up Delay		0.5		s	230 VAC full load
Hold Up Time	20			ms	90 VAC full load
Drift			±0.2	%	After 20 min warm up
Line Regulation			±0.5	%	90-264 VAC
Load Regulation			±1	%	0-100% load.
Transient Response - V1			4	%	Recovery within 1% in less than 500 µs for a 50-75% and 75-50% load step
Ripple & Noise			1	% pk-pk	20 MHz bandwidth
Overvoltage Protection	115		140	%	Vnom DC. Output 1 only, recycle input to reset
Overload Protection	110		150	% I nom	Output 1 only, auto reset (see fig.2)
Short Circuit Protection					Continuous, trip & restart (hiccup mode) all outputs
Temperature Coefficient			0.05	%/°C	
Overtemperature Protection				°C	Not Fitted
Patient Leakage Current		75	100	µA	264 VAC/60 Hz

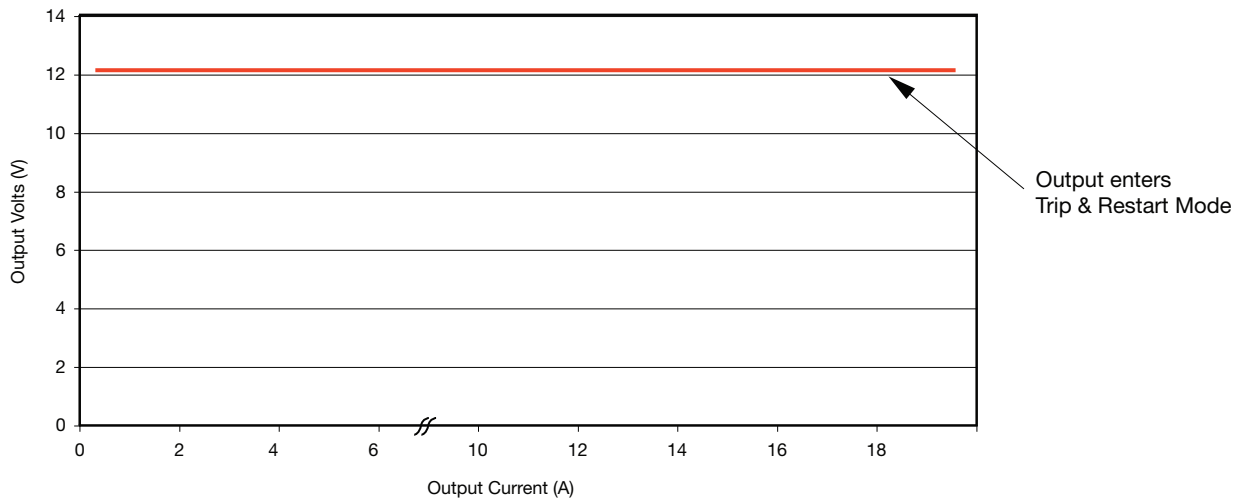
Input Voltage Derating

Figure. 1



Output Overload Characteristic

Figure 2
Typical V1 Overload
Characteristic
(CCB200PS12 shown)



General Specifications

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		94		%	Full load (see fig.3 & 4)
Isolation: Input to Output	4000			VAC	
Input to Ground	1500			VAC	
Output to Ground	1500			VAC	
Switching Frequency		40-100/ 28.35/ 56-70		kHz	PFC / Boost / Main Converter.
Power Density			9.3	W/in^3	
Mean Time Between Failure		230		kHrs	MIL-HDBK-217F, Notice 2 +25 °C GB
Weight		0.88 (400)		lb (g)	CCB200PSxx Models
		1.36 (618)			CCB200PSxx-C Models

Efficiency Versus Load

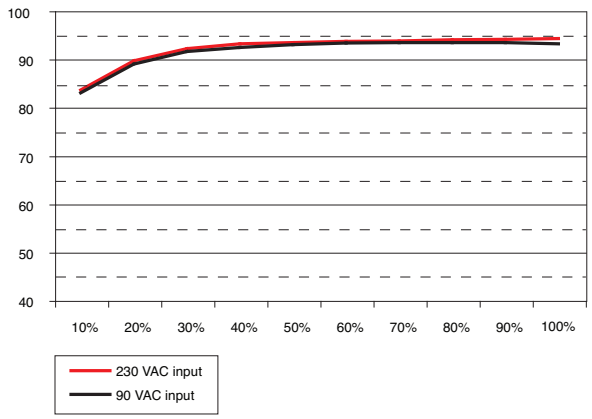


Figure 3
CCB200PS12

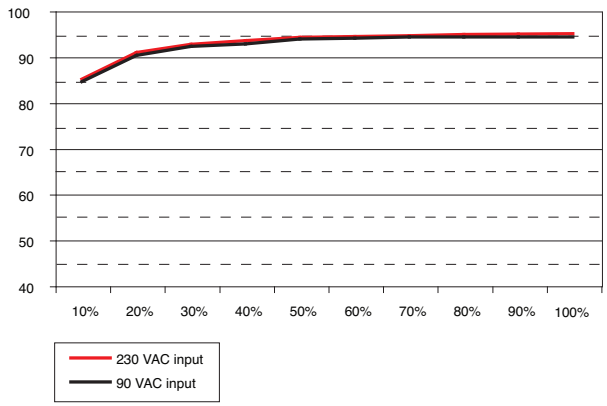


Figure 4
CCB200PS48

Waste Heat & System Lifetime

The amount of waste heat a system designer has to deal with is a big issue. The CCB200 class leading efficiency, particulary under low AC line conditions, allows a component density such that a full 200W of convection power can be fitted into this industry standard 3" x 5" package and significantly reduces the waste heat dumped into the system.

To demonstrate the performance of the CCB200, we compared its thermal profile to several of our competitors products in this power density and found our average component temperatures to be some 10-20 °C lower, extending some components lifetime by upto four times.

Characteristic	Notes & Conditions
Signals	
Power Fail	Uncomitted opto isolated transistor, normally off when AC is good (see fig.5) Provides 5 - 15ms warning of loss of output from AC failure
Remote On/Off (Inhibit/Enable)	Uncommited isolated optocoupler diode, powered diode inhibits the supply (see fig.6 &7)
5 V Standby (Optional -A)	5 V/0.5 A Supply, always present when AC applied

Signals

Power Fail

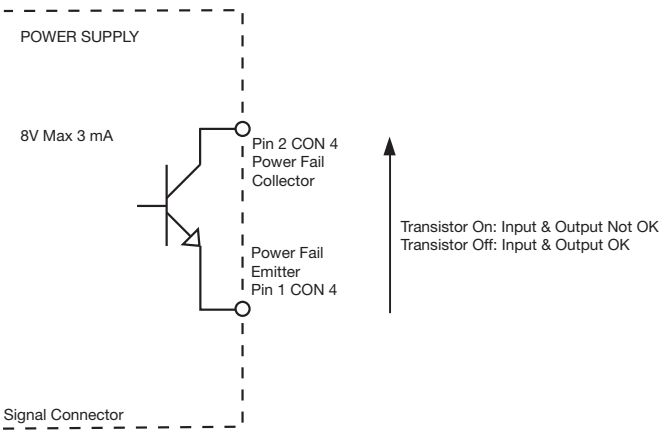


Figure 5

Remote On/Off (Inhibit/Enable)

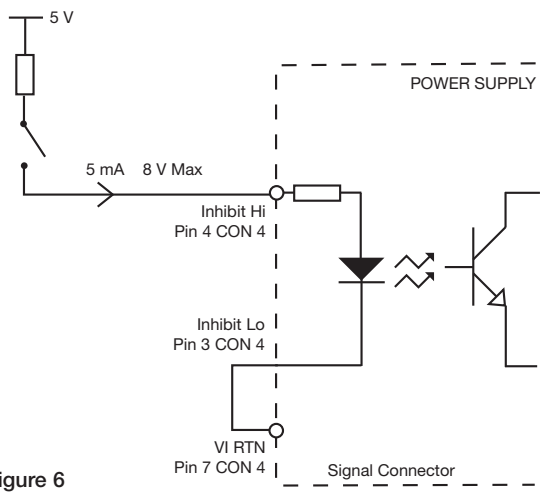


Figure 6
Inhibit (Hi)

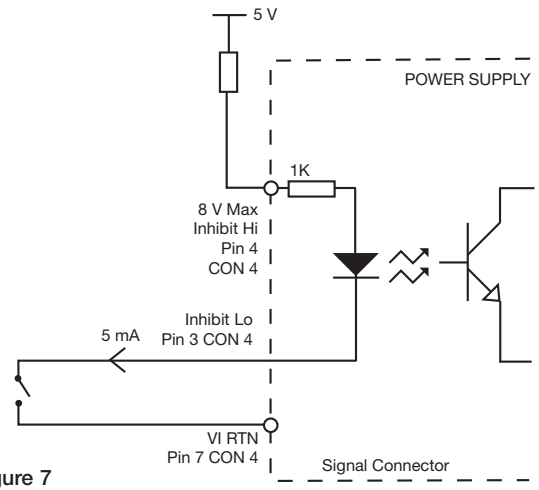


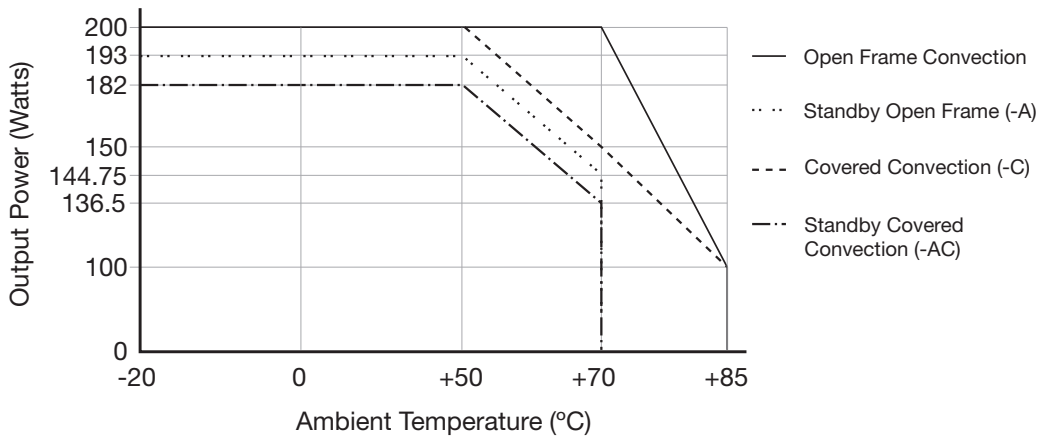
Figure 7
Inhibit (Lo)

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-20		+85	°C	See fig.8 & Thermal Considerations, p.7.
Storage Temperature	-40		+85	°C	
Cooling					Convection cooled. See fig.8 & Thermal Considerations, p.7.
Humidity	5		95	%RH	Non-condensing
Operating Altitude			5000	m	
Shock					±3 x 30g shocks in each plane, total 18 shocks. 30g = 11ms (+/-0.5msec), half sine. Conforms to EN60068-2-27 & EN60068-2-47
Vibration					Single axis 10 - 500 Hz at 2g sweep and endurance at resonance in all 3 planes. Conforms to EN60068-2-6

Derating Curve

Figure 8



Thermal Considerations

In order to ensure safe operation of the PSU in the end-use equipment, the temperature of the components listed in the table below must not be exceeded. Temperature should be monitored using K type thermocouples placed on the hottest part of the component (out of any direct air flow). See Mechanical Details for component locations.

Temperature Measurements (Ambient ≤ 50 ° C)	
Component	**Max Temperature ° C**
T1	120 °C
L3	120 °C
C64	105 °C
C53	105 °C

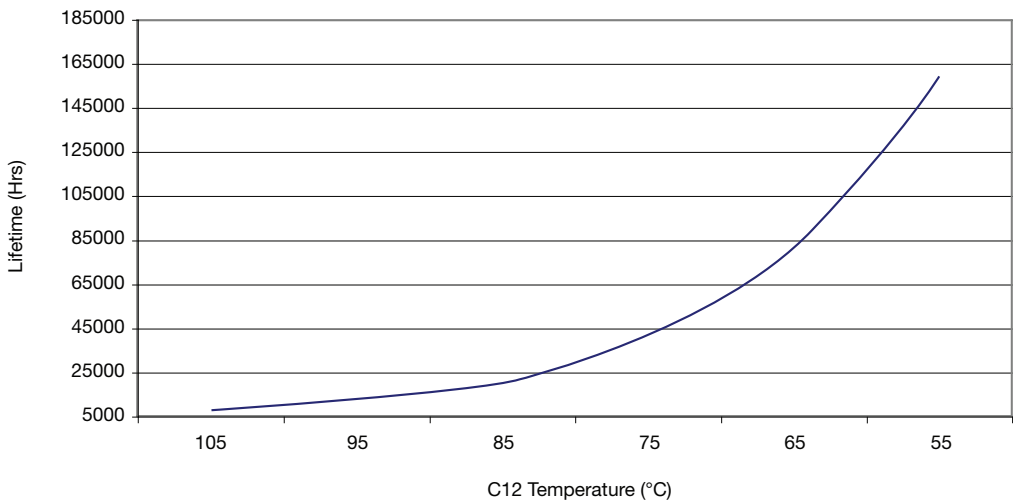
Service Life

The estimated service life of the CCB200 is determined by the cooling arrangements and load conditions experienced in the end application. Due to the uncertain nature of the end application this estimated service life is based on the actual measured temperature of a key capacitor within the product when installed in the end application.

The graph below expresses the estimated lifetime for a given component temperature and assumes continuous operation at this temperature.

Estimated Service Life vs Component Temperature

Figure 9



Electromagnetic Compatibility - Emissions

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Conducted	EN55011/32	Class B		
Radiated	EN55011/32	Class A		
		Class B		AC input cable fitted with Würth Elektronik Ferrite Core. See EMC report for details.
Voltage Fluctuations	EN61000-3-3			

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	EN55024 (100 VAC)	Dip >95% (0 VAC), 8.3ms	B	
		Dip 30% (70 VAC), 416ms	B	
		Dip >95% (0 VAC), 4160ms	B	
	EN55024 (240 VAC)	Dip >95% (0 VAC), 10.0ms	B	
		Dip 30% (168 VAC), 500ms	B	
		Dip >95% (0 VAC), 5000ms	B	
	EN60601-1-2 (100 VAC)	Dip >95% (0 VAC), 10.0ms	A	
		Dip 60% (40 VAC), 100ms	A	Derate Output Power to 90 W
		Dip 30% (70 VAC), 500ms	A	
		Dip >95% (0 VAC), 5000ms	B	
	EN60601-1-2 (240 VAC)	Dip >95% (0 VAC), 10.0ms	A	
		Dip 60% (96 VAC), 100ms	A	
		Dip 30% (168 VAC), 500ms	A	
		Dip >95% (0 VAC), 5000ms	B	

Safety Agency Approvals

Safety Agency	Safety Standard	Category
CB Report	IEC60950-1 & IEC62368-1	Information Technology
UL	UL62368-1	Information Technology
TUV	EN62368-1	Information Technology
CE	LVD	

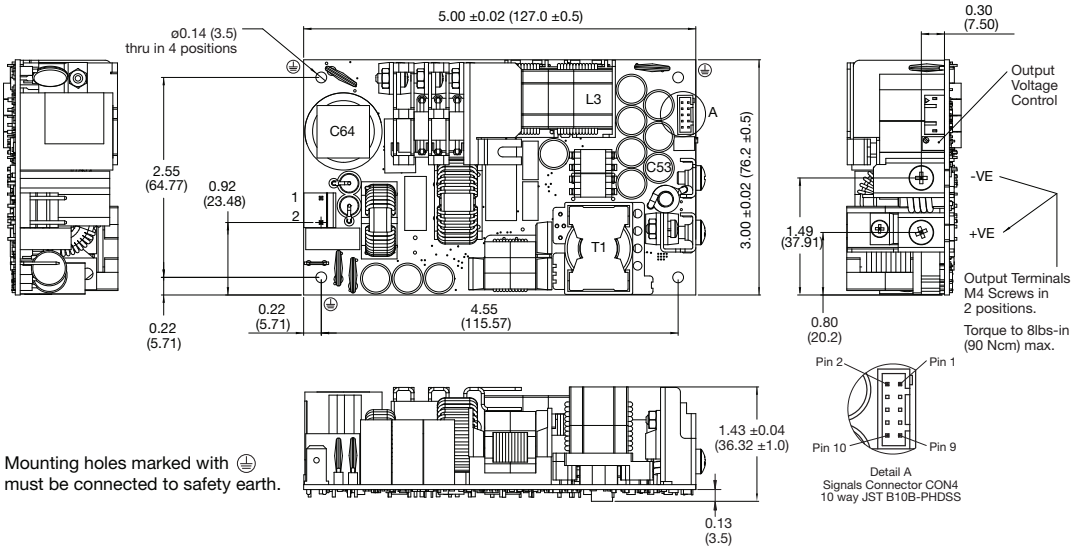
Safety Agency	Safety Standard	Category
CB Report	IEC60601-1 Including Risk Management Medical	Medical
UL	UL ANSI/AAMI ES 60601-1 & CSA C22.2 No. 60601-1	Medical
TUV	EN60601-1	Medical

Means of Protection		Category
Primary to Secondary	2 x MOPP (Means of Patient Protection)	IEC60601-1 Ed 3
Primary to Earth	1 x MOPP (Means of Patient Protection)	
Secondary to Earth	1 x MOPP (Means of Patient Protection)	

Equipment Protection Class	Safety Standard	Notes & Conditions
Class I & BF	IEC62368-1 & IEC60601-1	See safety agency conditions of acceptability for details

Mechanical Details

CCB200PSxx Models



Mounting holes marked with ⏚ must be connected to safety earth.

Input Connector CON 1	
1	Line
2	Neutral

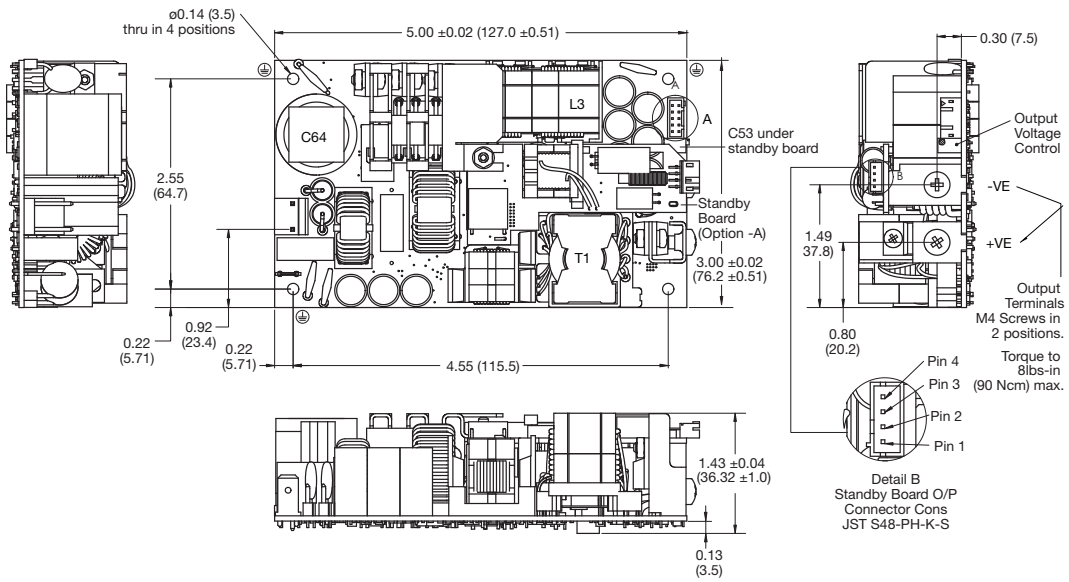
Mates with Molex housing 09-50-1031 and Molex series 5194 crimp terminals.

Output Connector CON 3	
1	+V1
2	V1 RTN

Signals Connector CON 4	
1	Power Fail (Emitter)
2	Power Fail (Collector)
3	Inhibit (Cathode)
4	Inhibit (Anode)
5	N/C
6	N/C
7	- VE Sense
8	- VE Sense
9	+VE Sense
10	+VE Sense

Mates with JST PHDR-10VS housing and JST SPHD-001T-P0.5 crimp terminals

CCB200PSxx-A Models



Standby Output (Option -A)	
1	+5 V
2	+5 V
3	0 V
4	0 V

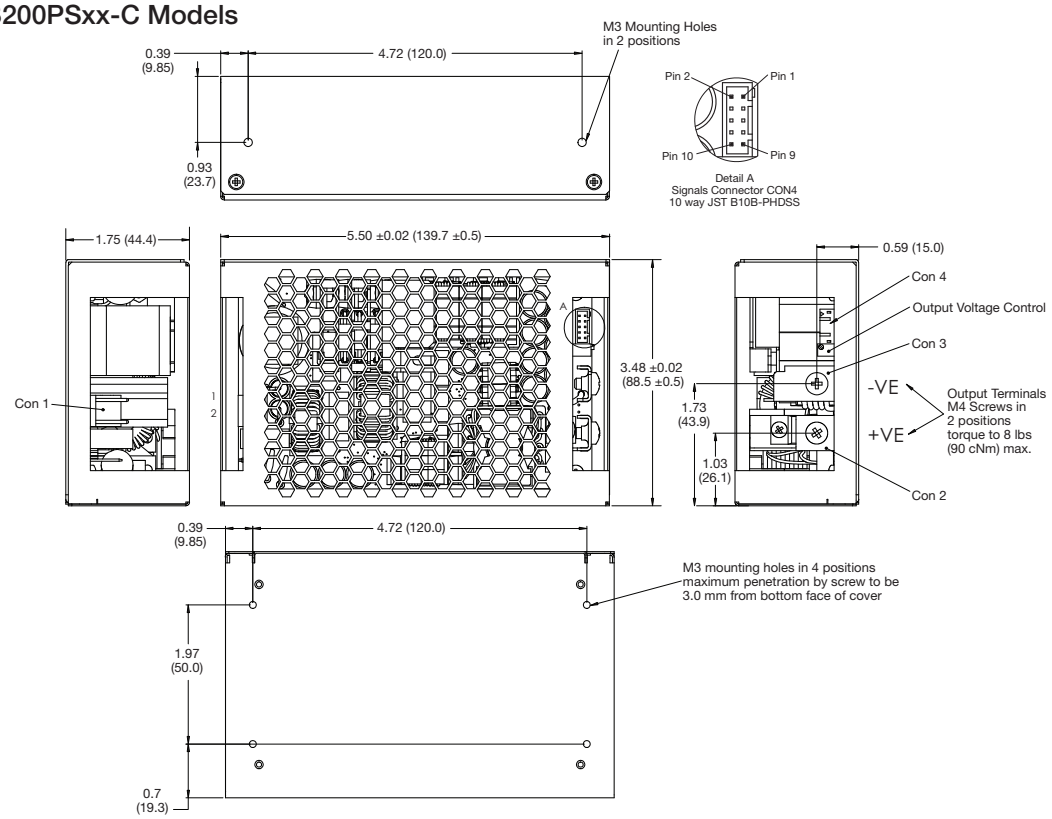
Mates with JST PHDR-4 housing and JST SPH-002T-P0.5L crimp terminals

Notes

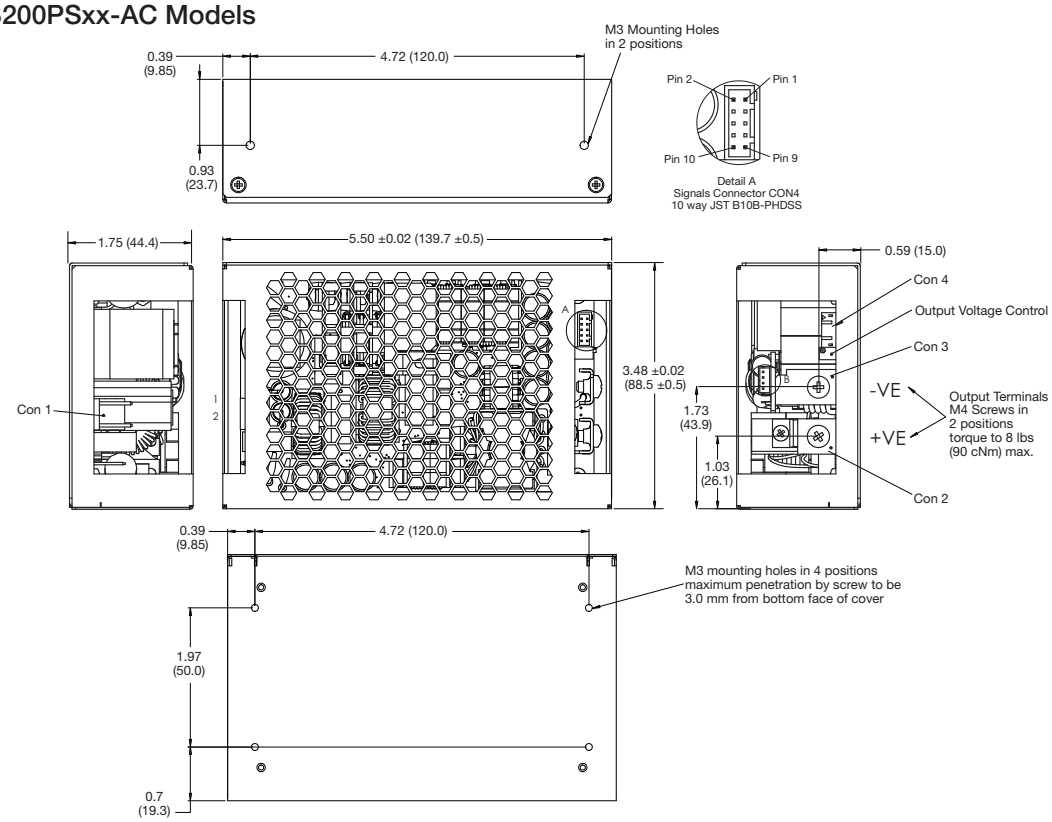
1. All dimensions in inches (mm).
2. Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
3. Weight: 0.88 lb (400 g) approx

Mechanical Details

CCB200PSxx-C Models



CCB200PSxx-AC Models



Input Connector CON 1	
1	Line
2	Neutral

Mates with Molex housing 09-50-1031 and Molex series 5194 crimp terminals.

Output Connector CON 3	
1	+V1
2	V1 RTN

Signals Connector CON 4	
1	Power Fail (Emitter)
2	Power Fail (Collector)
3	Inhibit (Cathode)
4	Inhibit (Anode)
5	N/C
6	N/C
7	- VE Sense
8	- VE Sense
9	+VE Sense
10	+VE Sense

Mates with JST PHDR-10VS housing and JST SPHD-001T-P0.5 crimp terminals

Standby Output (Option -A)	
1	+5 V
2	+5 V
3	0 V
4	0 V

Mates with JST PHDR-4 housing and JST SPH-002T-P0.5L crimp terminals

Notes

1. All dimensions in inches (mm).
2. Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
3. Weight: 1.36 lb (618 g) approx

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