

## HHP Series



- 85 V – 305 VAC Input
- MIL Shock & Vibration / Conformal Coating
- -40 °C to +70 °C Operation
- SEMI F47 Compliant
- 6 kV Surge Rating – IEEESTdC62.41
- UL508, UL1604 Class I, Div II
- 3 Year Warranty

## Specification

## Input

Input Voltage	• 80-305 VAC, derate output power 10% <90 VAC
Input Frequency	• 47-63 Hz
Input Current	• 6.5 A typical at 115 VAC, 3.2 A typical at 230 VAC
Inrush Current	• 60 A max at 305 VAC
Power Factor	• >0.9. Complies with EN61000-3-2 Class A
Earth Leakage Current	• 1.5 mA max 305 VAC/60 Hz
Input Protection	• Internal fuse in line

## Output

Output Voltage	• 12-48 VDC (see tables)
Output Voltage Trim	• $\pm 10\%$ V1
Initial Set Accuracy	• $\pm 1\%$ V1, $\pm 5\%$ V3
Minimum Load	• No minimum load required
Start Up Delay	• 500 ms max
Start Up Rise Time	• 50 ms typical
Hold Up Time	• 20 ms minimum at 90 VAC
Drift	• $\pm 0.2\%$ after 20 min warm up
Line Regulation	• $\pm 0.5\%$
Load Regulation	• $\pm 1\%$ V1, $\pm 5\%$ V3
Transient Response	• 4% max. deviation, recovery to within 1% in 500 $\mu$ s for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk V1, 20 MHz bandwidth
Overvoltage Protection	• 115-145% Vnom, recycle input to reset
Overload Protection	• 110-140%, V1 only
Overtemperature Protection	• Auto reset
Short Circuit Protection	• Constant current characteristic
Temp. Coefficient	• 0.05% / °C
Remote Sense	• Compensates for 0.5 V total voltage drop
Remote On/Off	• Uncommitted isolated optocoupler diode, powered diode inhibits V1 and fan supply
Current Share	• Single wire current share

## General

Efficiency	• 85% typical
Isolation	• 3000 VAC input to output, 1500 VAC input to ground, 500 VAC output to ground
Switching Frequency	• PFC 70 kHz, main converter 200 kHz, standby 130 kHz typical
Power Density	• 8.2 W/in <sup>3</sup>
Signals	• DC OK volt free relay, remote on/off, current share
MTBF	• 173 KHrs to MIL-HDBK-217F at 25 °C, GB

## Environmental

Operating Temperature	• -40 °C to +70 °C, derate linearly from +50 °C at 2.5% / °C to 50% at +70 °C, see derating curve.
Cooling	• Forced cooled, via integral dual voltage level fan, which is load dependant.
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes EN60068-2-27, -2-47 & MIL-STD-810F 514.5 cat 4
Vibration	• 2 g rms, 5-500 kHz, 3 axes EN60068-2-6 & MIL-STD-810F 516.5 cat 1

## EMC &amp; Safety

Emissions	• EN55032 class B conducted EN55322 class A radiated
Harmonic Currents	• EN61000-3-2 class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 contact, level 3 air, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A • IEEESTdC62.41-loc cat C1 6kV, 3 kA
Conducted Immunity	• EN61000-4-6, level 3, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B • SEMI F47
Safety Approvals	• IEC60950-1 CB report, CSA 22.2 No. 60950-1, UL60950-1, EN60950-1, UL508, UL1604, CE & UKCA meets all applicable directives & legislation

## Models and Ratings

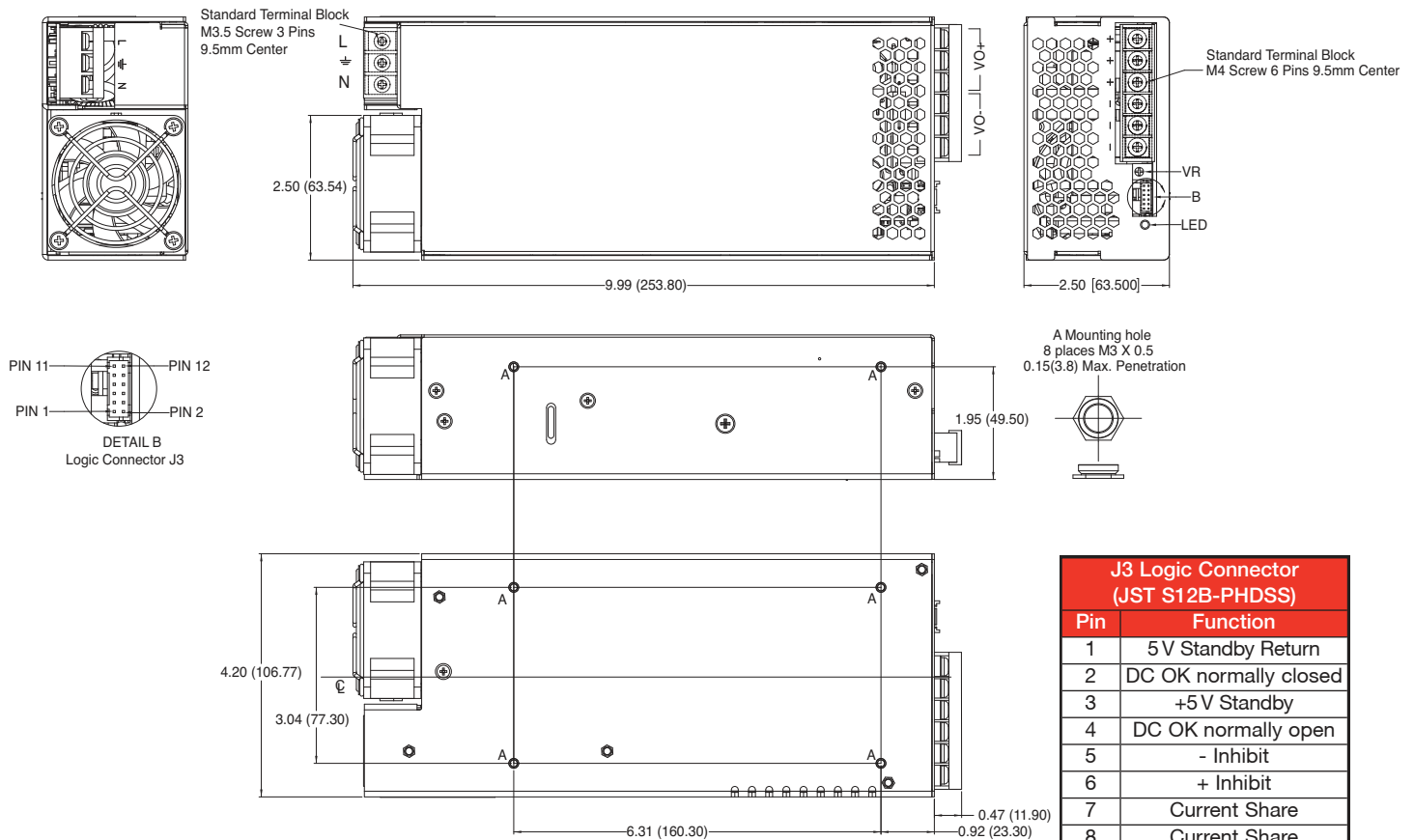
**HHP650 XP**

Output Voltage V1	Output Current V1				Standby Supply	Output Power V1				Model Number
	Nom		Peak <sup>(1)</sup>			Nom		Peak <sup>(1)</sup>		
	<180 V	>180 V	<180 V	>180 V		<180 V	>180 V	<180 V	>180 V	
12 V	50.0 A	-	-	-	5 V / 0.2 A	607 W	-	-	-	HHP650PS12
15 V	40.0 A	-	-	-	5 V / 0.2 A	607 W	-	-	-	HHP650PS15
24 V	27.0 A	32.5 A	33.3 A	41.7 A	5 V / 0.2 A	657 W	780 W	800 W	1000 W	HHP650PS24
28 V	23.0 A	27.9 A	28.6 A	35.7 A	5 V / 0.2 A	651 W	780 W	800 W	1000 W	HHP650PS28
36 V	18.0 A	21.7 A	22.2 A	27.8 A	5 V / 0.2 A	657 W	780 W	800 W	1000 W	HHP650PS36
48 V	13.5 A	16.3 A	16.7 A	20.8 A	5 V / 0.2 A	657 W	780 W	800 W	1000 W	HHP650PS48

### Notes

1. Peak Power available for 10 seconds maximum with a 35% duty cycle. The average power in a period should be equal or less than the nominal power.

## Mechanical Details



J3 Logic Connector (JST S12B-PHDSS)	
Pin	Function
1	5V Standby Return
2	DC OK normally closed
3	+5V Standby
4	DC OK normally open
5	- Inhibit
6	+ Inhibit
7	Current Share
8	Current Share
9	Signal GND
10	DC OK common
11	Signal GND
12	+ Sense

### Notes

1. Dimensions shown in inches (mm).  
2. Weight: 2.8 lb (1.27 kg).

3. J1 Mating Plug: JST part no. PHR-2, contact: JST part no. SPH-002T-P0.5S; J2 Mating Plug: JST part no. PHDR-10VS, contact: 26-22AWG JST part no. SPHD-001T-P0.5

## Derating Curve

