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HHP650 Series

AC-DC Power Supplies

XP Power

600/780 Watts

- 85 V - 305 VAC Input
- MIL-STD-810F Shock & Vibration
- -40 °C to +70 °C Operation
- SEMI F47 Compliant
- 6 kV Surge Rating - IEEEStdC62.41
- UL508, ANSI/ISA 12.12.01 Class I, Div II
- Conformal Coating
- 3 Year Warranty



The HHP650 AC-DC power supply provides upto 780 W (1000 W peak) of output power in a robust mechanical fan-cooled package for industrial applications. The unit comprises of a main output with voltages from 12-48 VDC and a 5 VDC standby supply which can be utilitsed with the signals and control features of the unit to provide detection of loss of output and remote on/off control.

Dimensions:

HHP650:
9.99 x 4.20 x 2.50" (253.8 x 106.8 x 63.5 mm)

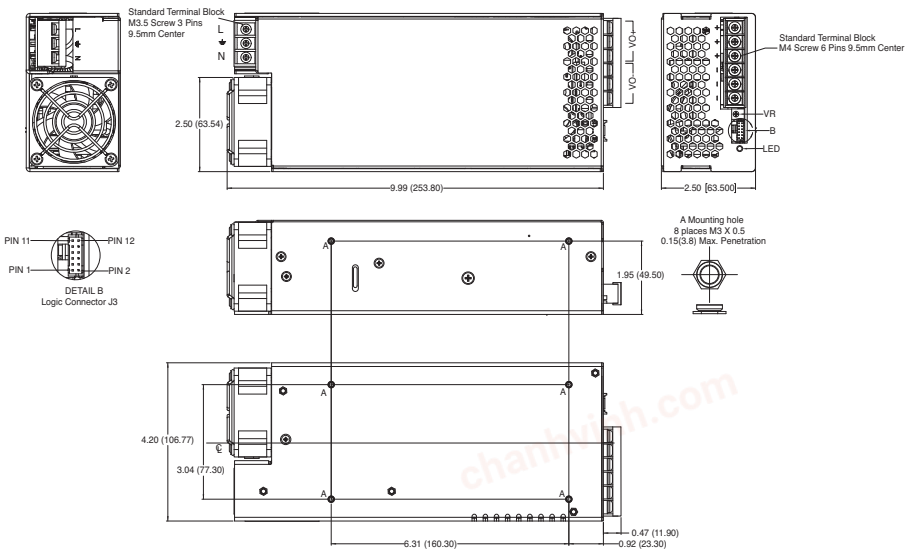
Models & Ratings

Output Voltage V1	Output Current V1				Standby Supply	Output Power V1				Model Number
	Nom		Peak[1]			Nom		Peak[1]		
	<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



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Input

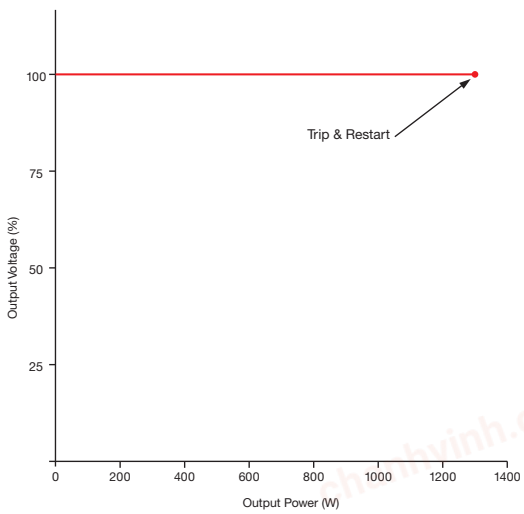
Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage - Operating	85		305	VAC	Derate output power 10% < 90 VAC.
Input Frequency	47	50/60	63	Hz	Agency approval, 47-63 Hz
Power Factor		>0.9			EN61000-3-2 class A compliant
					EN61000-3-2 class C for loads ≥10%
Input Current - Full Load		6.5/3.2		A	115/230 VAC
Inrush Current			60	A	305 VAC cold start, 25 °C
Earth Leakage Current			1.5	mA	305 VAC/60 Hz
Input Protection	T16 A / 250 V internal in-line fuse				

Output

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage - V1	12		48	VDC	See Models and Ratings table
Initial Set Accuracy			±1 (V1), ±5 (V Standby)	%	50% load, 115/230 VAC
Output Voltage Adjustment			±10	%	V1 only. See mechanical details.
Minimum Load	0			A	
Start Up Delay			500	ms	
Hold Up Time	20			ms	90 VAC
Drift			±0.2	%	After 20 min warm up
Line Regulation			±0.5	%	
Load Regulation			±1 (V1), ±5 (V Standby)	%	0-100% load.
Transient Response - V1			4	%	Recovery within 1% in less than 500 µs for a 50-75%-50% load change
Ripple & Noise			1	% pk-pk	V1: 20 MHz bandwidth
Overvoltage Protection	115		145	%	Vnom DC. Output 1 only, recycle input to reset
Overload Protection	110		175	%	Output 1 only, auto reset. See fig 1.
Short Circuit Protection					Trip & restart (hiccup mode)
Overtemperature Protection		100		°C	Auto reset. Input & output stage protection
Temperature Coefficient			0.05	%/°C	
Overtemperature Protection				°C	Protects unit from overtemperature. Auto reset.

Output Overload Characteristics

Figure 1



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General

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		85		%	See fig. 2 & 3
Isolation: Input to Output	3000			VAC	
Input to Ground	2000			VAC	
Output to Ground	500			VAC	
Switching Frequency			70	kHz	PFC
			200	kHz	Main converter
			130	kHz	Standby
Power Density			7.4	W/in³	>180 VAC
Mean Time Between Failure		177		kHrs	MIL-HDBK-217F, +25 °C GB
Weight		2.8 (1.7)		lb (kg)	

Efficiency Vs Load

Figure 2
HHP650PS12

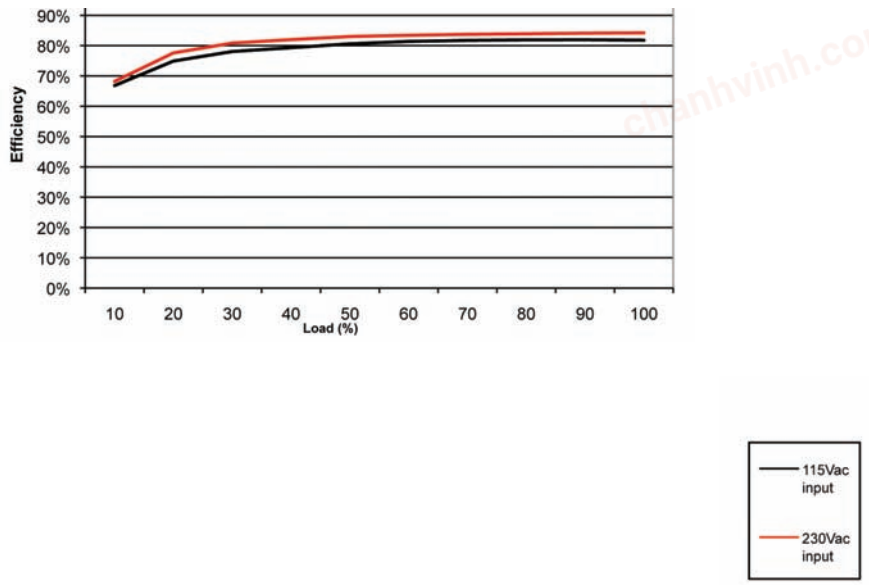
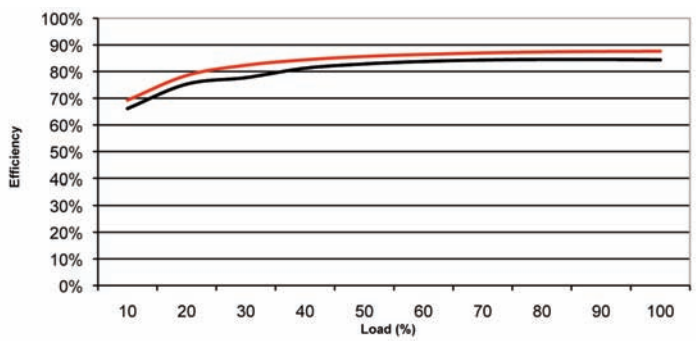


Figure 3
HHP650PS48



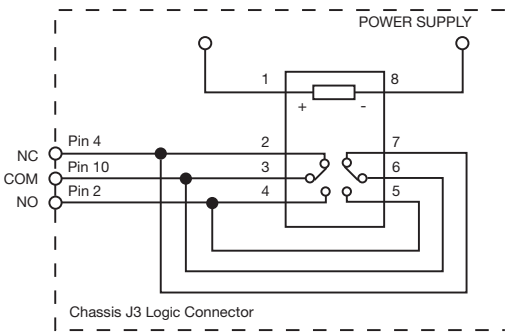
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Signals & Controls

Characteristic	Notes & Conditions
Remote Sense	Compensates for 0.5 V total voltage drop
DC OK	Volt free relay contacts NO/NC (see fig.4)
Remote On/Off (Inhibit/Enable)	Uncommited isolated optocoupler diode, powered diode inhibits both V1 & V2 (fan supply) (see fig.5)
Current Share	When 2 to 5 units (with the same output voltage) are used in parallel to increase output current, the current share pins 7/8 of one unit should be connected to pins 7/8 of the other unit(s). This will force the current to share between the outputs. Similarly pins 9/11 of each unit should also be connected as a ground reference. Units share current within 10% of each other at full load.
Standby Supply	Isolated 5 V/0.2 A supply, always present when AC supplied.

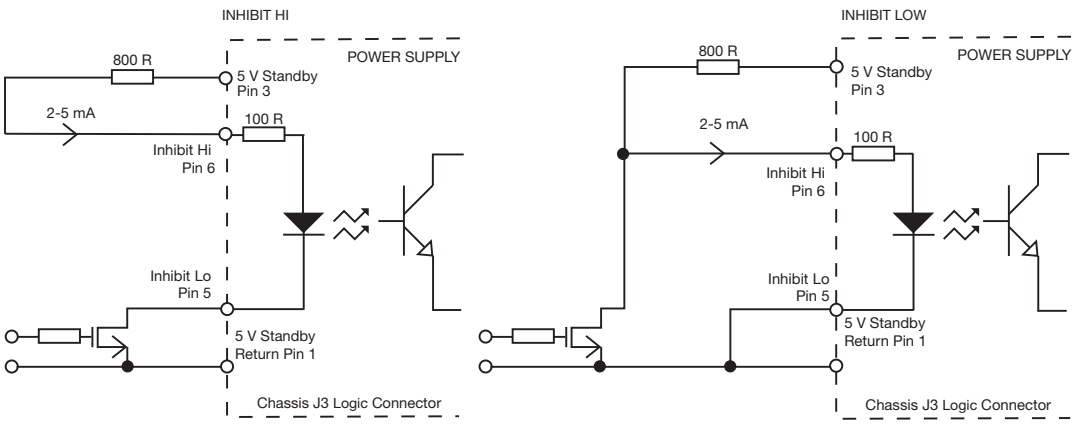
DC OK

Figure 4



Remote On/Off (Inhibit)

Figure 5



Signal High: Power Supply OFF
Low or Floating: Power Supply ON

Signal High: Power Supply ON
Low or Floating: Power Supply OFF

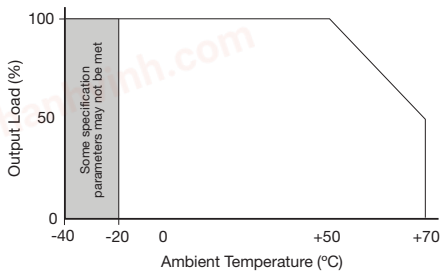
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Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-40		+70	°C	See derating curve, fig.6
Storage Temperature	-40		+85	°C	Some specification parameters maybe exceeded until after 20 minutes warm up period.
Cooling					Forced-cooled via integral dual voltage level fan, which is load dependant. See fig.7
Humidity			95	%RH	Non-condensing
Operating Altitude			5000	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

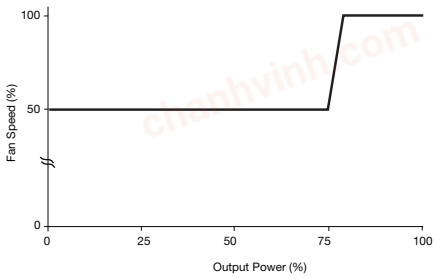
Temperature Derating Curve

Figure 6



Fan Speed Control

Figure 7



EMC: Emissions

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Conducted	EN55011/22	Class B		
Radiated	EN55011/22	Class A		
Harmonic Current	EN61000-3-2	Class A		

EMC: Immunity

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Voltage Fluctuations	EN61000-3-3			
Low Voltage PSU EMC	EN61204-3	High severity level	as below	
ESD Immunity	EN61000-4-2	3	A	
Radiated Immunity	EN61000-4-3	3	A	
EFT/Burst	EN61000-4-4	3	A	
Surges	EN61000-4-5	Installation class 3	A	
	IEEEStdC62.41-loc cat C1	6kV, 3 kA		
Conducted	EN61000-4-6	3	A	
Dips and Interruptions	EN55024 (100 VAC)	Dip >95% (0 VAC), 8.3 ms	A	
		Dip 30% (70 VAC), 416 ms	B	
		Dip >95% (0 VAC), 4160 ms	B	
	EN55024 (240 VAC)	Dip >95% (0 VAC), 10.0 ms	A	
		Dip 30% (70 VAC), 500 ms	B	
		Dip >95% (0 VAC), 5000 ms	B	
	SEMI F47			Compliant

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HHP Series

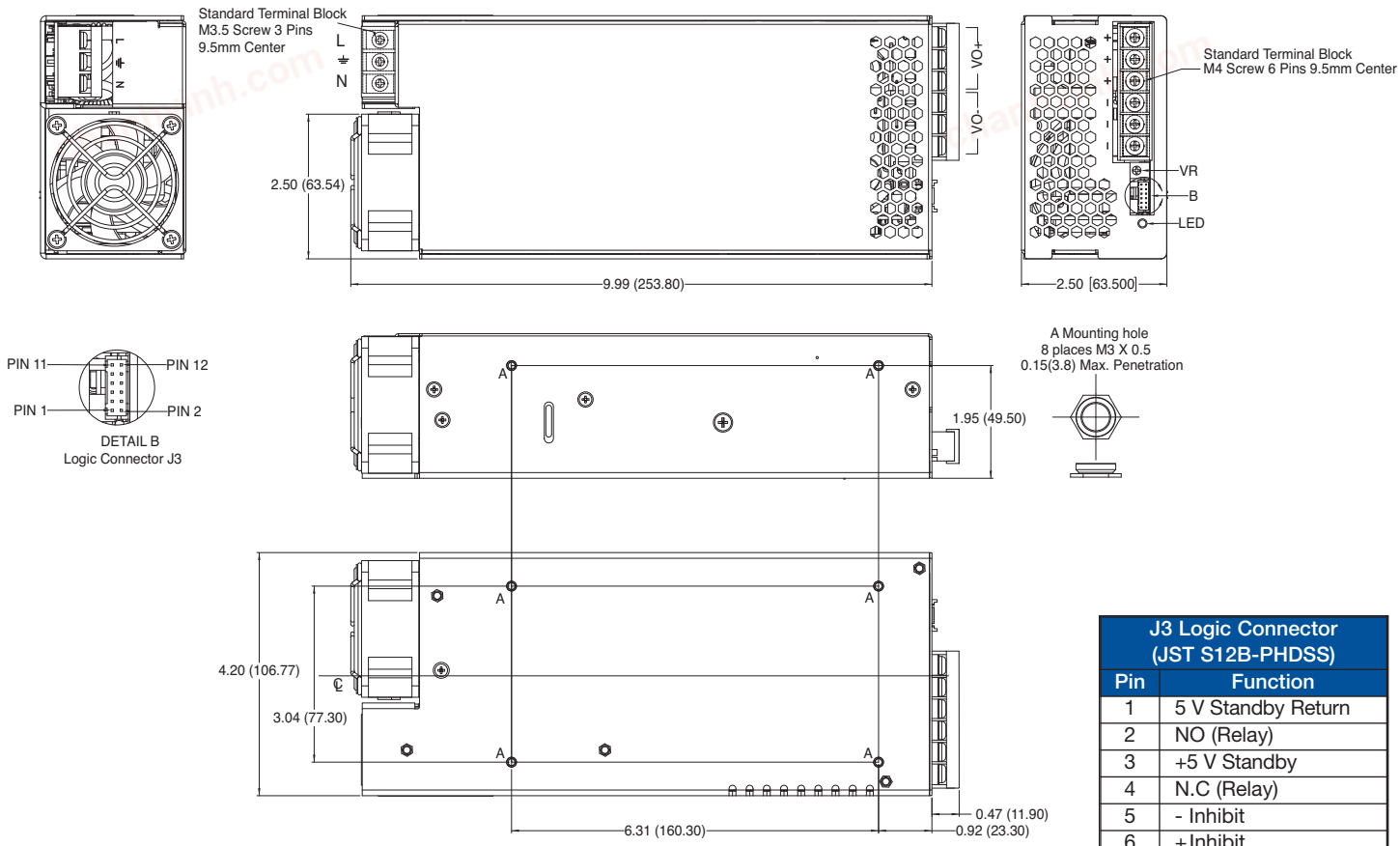
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Safety Approvals

Safety Agency	Safety Standard	Notes & Conditions
CB Report	IEC60950-1:2005 + A1:2009	Information Technology
UL	UL60950-1 (2011), CSA 22.2 No.60950-1	Information Technology
	UL508, CSA 22.2 No. 107.1-01	Industrial Control Equipment
	ANSI/ISA 12.12.01-2000	Hazardous Locations
TUV	EN60950-1 A12:2011	Information Technology
CE	LVD & RoHS	
Equipment Protection Class	Class I	See safety agency conditions of acceptibility for details

Mechanical Details



J3 Logic Connector (JST S12B-PHDSS)	
Pin	Function
1	5 V Standby Return
2	NO (Relay)
3	+5 V Standby
4	N.C (Relay)
5	- Inhibit
6	+Inhibit
7	Current Share
8	Current Share
9	- Sense / Signal GND
10	COM (Relay)
11	- Sense / 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