

4500 Watts



- Controllable output voltage
- <40ms slew rate
- 3 Phase 180 to 264VAC input
- High efficiency, up to 90%
- 5V, 1A standby output
- Intelligent fan speed control
- Fully featured signals & controls
- I_C interface
- 0°C to +70°C operating temperature
- SEMI F47 compliant
- Full power to +50°C
- 3 Year Warranty

Dimensions

HPD4K5:

15.0 x 4.25 x 6.5" (381.0 x 107.95 x 165.1 mm)

The HPD4K5 series offers users output voltage programming via a 0-5V external signal in a high efficiency, high power density 4.5 kW chassis mount package. Measuring just 15.0" x 4.25" x 6.5". The HPD4K5 also features remote on/off, current monitor, fault reporting and a power OK signal. The 5V standby output is available whenever the mains supply is present. A PMBus interface is provided for signal & status monitoring.

Models & Ratings

Output Power	Output Voltage V1		Output Current		Standby	Efficiency ⁽¹⁾	Model Number
	Min	Max	Min	Max			
4500 W	5.0 V	25.0 V	0.0 A	188.0 A	5 V/1 A	90%	HPD4K5TS025
4500 W	10.0 V	50.0 V	0.0 A	94.0 A	5 V/1 A	90%	HPD4K5TS050
4500 W	7.5 V	75.0 V	0.0 A	62.5 A	5 V/1 A	90%	HPD4K5TS075
4500 W	15.0 V	150.0 V	0.0 A	31.5 A	5 V/1 A	90%	HPD4K5TS150

Notes

1. Measured with 208 VAC input and full load.

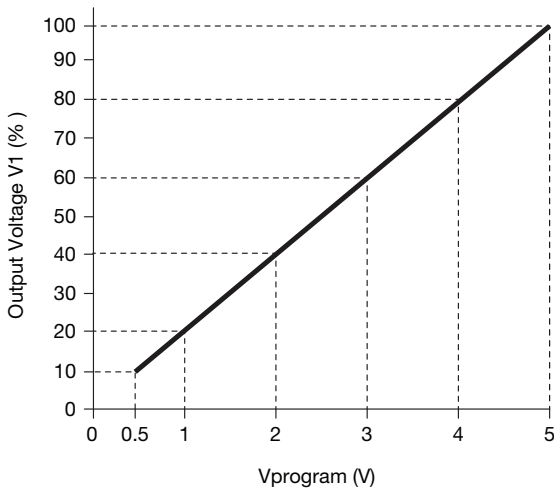
Input

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage	180		264	VAC	3 phase & earth, no neutral
			300	VAC	For 5 s
Input Frequency	47		63	Hz	
Power Factor		0.97			
Total Harmonic Distribution		5		%	10-100% load
Input Current			17.5	A	180 VAC at 100% load
Inrush Current			80	A	264 VAC, 25 °C, cold start
Earth Leakage Current			1.0	mA	264 VAC, 60 Hz
			3.5		264 VAC, 60 Hz, single fault
Input Protection	Requires external protective device rated 20A 250 VAC				

Output

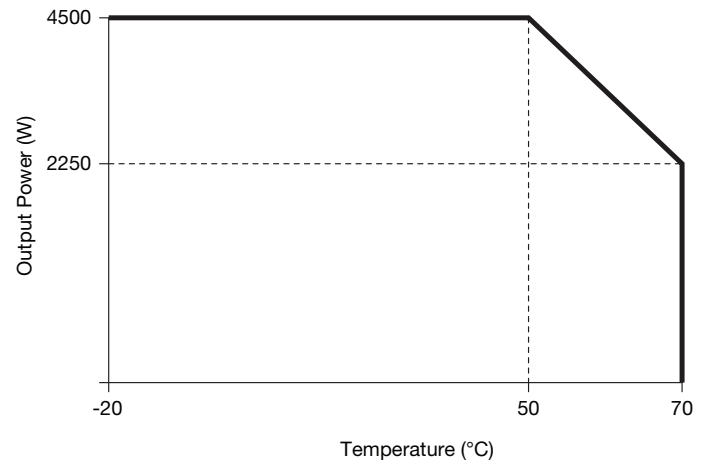
Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage	5		150	VDC	See Models and Ratings table
Output Set Tolerance		±0.5		%	Of maximum voltage irrespective of set voltage.
		±3			5V Standby, 50% load
Output Voltage Program	10/20		100	%	Of maximum (see Models & Ratings), accuracy ±1% slew rate <40 ms Vmin-Vmax-Vmin Max frequency 1Hz
Minimum Load	0			A	No minimum load required
Start Up Delay		1	2	s	Under all load and line conditions
Start Up Rise Time			40	ms	
Hold Up Time	10			ms	180 VAC at 100% load 4500 W
Line Regulation			±0.5	%	Of nominal voltage
			±0.5		5V Standby
Load Regulation			1	%	0-100% or 100-0% load
			3		5V Standby
Transient Response			4	%	Deviation with a 50-75-50% load change. Output returns to within 1% in less than 500 µs
Ripple & Noise			1/2.5	%	Of maximum voltage/5V Standby. Measured with 20 MHz bandwidth limited scope.
Overshoot			2	%	Turn on & turn off
Overvoltage Protection	115		130	%	Of maximum voltage. Restart after 3s. No overvoltage protection for 5V Standby
Overtemperature Protection					Auto resetting thermal protection
Overload Protection	110		140	%	V1, 5V Standby: <5 A max
Short Circuit Protection					Trip & restart / hiccup mode. 5V Standby: Foldback characteristic < 5 A max.
Temperature Coefficient			0.02	%/°C	

Output Voltage Programming



See Models & Ratings table for minimum set voltage

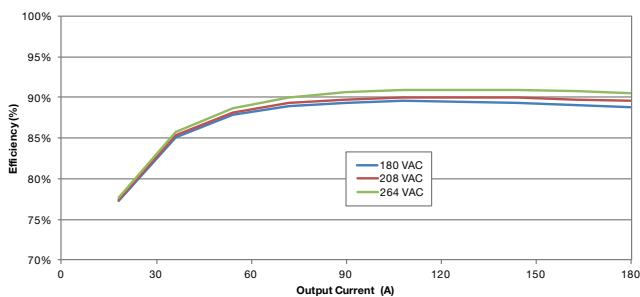
Temperature Derating Curve



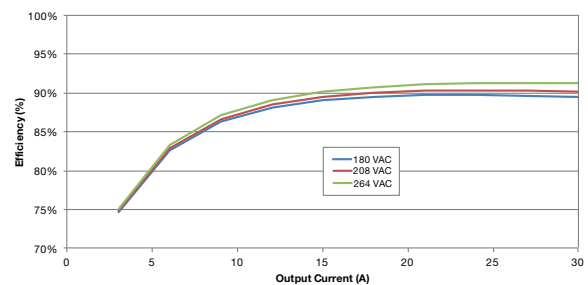
General

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		90		%	See curves below
Isolation: Input to Output Input to Ground Output to Ground	3000			VAC	
	1500			VAC	
	500			VDC	
Switching Frequency		70		kHz	Fixed frequency
		130		kHz	Fixed frequency
Power Density			10.86	W/in ³	
Signals and Controls					V Program, AC OK, DC OK, Temp. Warning, Inhibit, Fan Fail, & Current Monitor
MTBF		70		kHrs	MIL-HDBK-217F, 25 °C GB
Weight		19.5 (8.86)		lb (kg)	

Efficiency Curve - HPD4K5TS025



Efficiency Curve - HPD4K5TS150



Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-20		70	°C	Derate linearly from 50 °C to 50% rated power at 70 °C
Storage Temperature	-40		+85	°C	
Cooling					Force-cooled with intelligent fan speed control
Humidity	5		95	%RH	Non-condensing
Operating Altitude			3000	m	
Transport Altitude			10000	m	
Shock	±3 x 30 g shocks in each plane, total 18 shocks. 30 g = 11 ms (±0.5 ms) half sine. Conforms to EN60068-2-27 & EN60068-2-47				
Vibration	Single axis 10-500 Hz at 2 g sweep and endurance at resonance in all 3 planes. Conforms to EN60068-2-6				

Signals & Controls

Characteristic	Notes & Conditions
Signals & Control	
AC OK	AC OK is an optocoupler transistor, referenced to signal ground, providing a minimum of 2 ms warning of the output falling to 90% of maximum output voltage. The signal is fully isolated and the collector and emitter must be connected externally. The transistor is normally on when AC is healthy. See fig. 6.
DC OK	DC OK is an optocoupler transistor, referenced to signal ground, providing warning of loss of output. The signal is fully isolated and the collector and emitter must be connected externally. The transistor is normally on when output DC is healthy. See fig. 7. DCOK tracks set point and triggers at <95%.
Inhibit	Optocoupler diode referenced to signal ground. Powered diode inhibits the supply. See fig. 8.
Fault	Fault is an optocoupler transistor, referenced to signal ground, providing warning of either power fail, DC fail, overtemperature or Fan Fail. The signal is fully isolated and the collector and emitter must be connected externally. The transistor is normally off when there is no fault. See fig. 9. Under Fan Fail conditions the unit will shutdown.
V Program	The voltage program function allows 10/20% to 100% remote adjustment of V1 via 0-5V signal referenced to return J1 pins 7 & 8. See fig. 10 & Models & Ratings table. If V program is open circuit, output voltage is 0V.
Current Monitor	0-5V signal for 0-100% load. I monitor, J1 pin 6 referenced to return see fig. 11
5V Standby (V2)	5 V/1 A supply, always present when AC supplied
PMBus	The PMBus specification is detailed in the separate document - HPD4K5 Communication, Control & Status Specifications. PMBus signals referenced to return J1 pins 7 & 8

Signals & Controls

AC OK/Power Fail

AC OK is an isolated signal providing a minimum of 3 ms warning of loss of output regulation. The signal is fully isolated and the collector and emitter must be connected externally.

Maximum sink current 2 mA, maximum voltage 20 V.

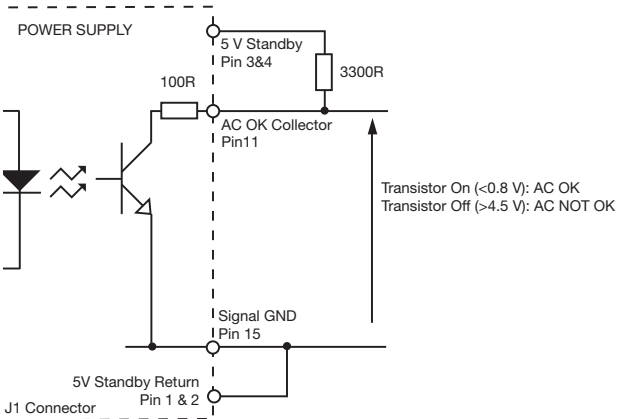


Figure 6

DC OK

DC OK is an isolated signal providing warning that the output voltage has fallen below 90% of nominal. The signal is fully isolated and the collector and emitter must be connected externally.

Maximum sink current 2 mA, maximum voltage 20 V.

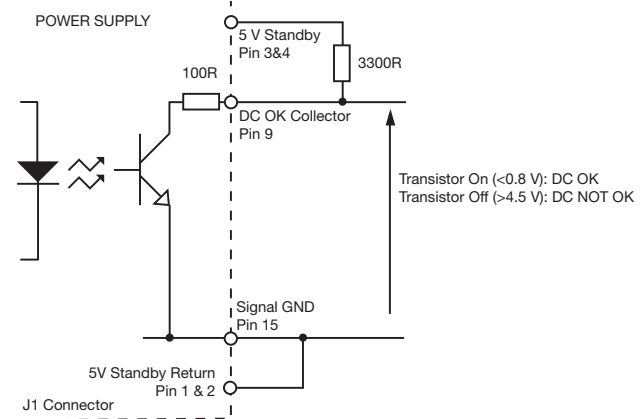


Figure 7

Inhibit

Inhibit is an isolated control signal which can turn the power supply and fans off by supplying 2 to 5mA into the pin.

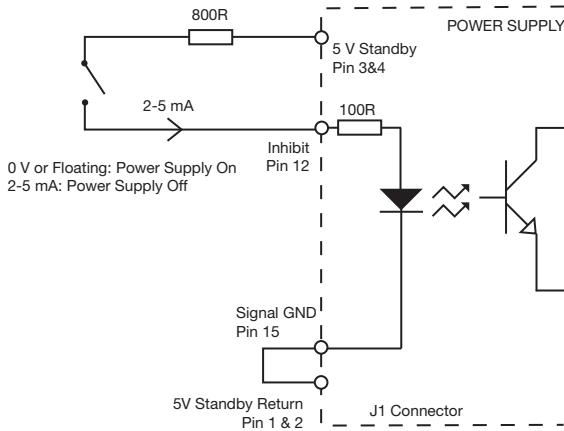


Figure 8

Fault

Fault is an isolated signal providing warning of either Power Fail, DC Fail or Overtemperature. The signal is fully isolated and the collector and emitter must be connected externally. Maximum sink current 2 mA, maximum voltage 20 V.

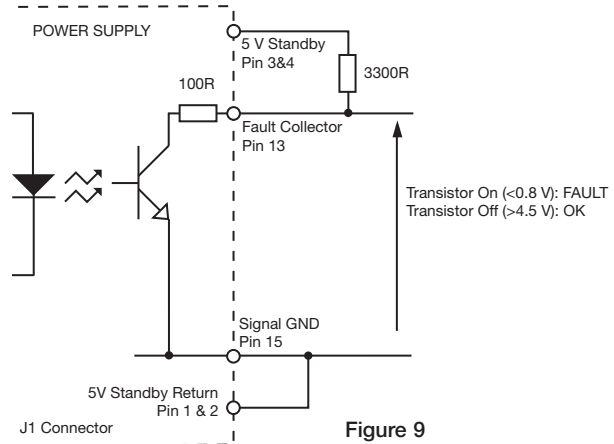


Figure 9

V Program

V Program allows remote voltage adjustment within the range 10/20% to 100%. See Models & Ratings table.

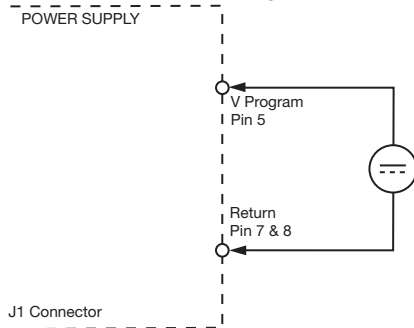


Figure 10

I Monitor

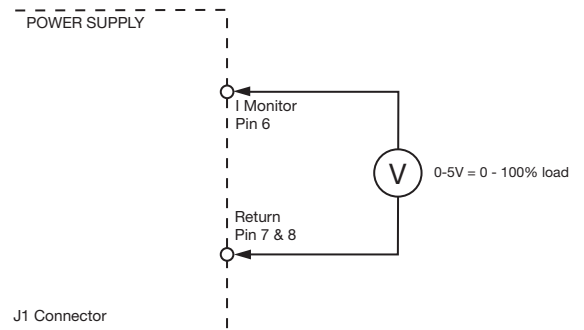


Figure 11

EMC: Emissions

Phenomenon	Standard	Test Level	Notes & Conditions
Conducted	EN55011/EN55032	Class A	
Radiated	EN55011/EN55032	Class A	
Total Harmonic Distortion		<5%	
Voltage Flicker	EN61000-3-3		

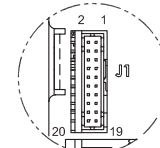
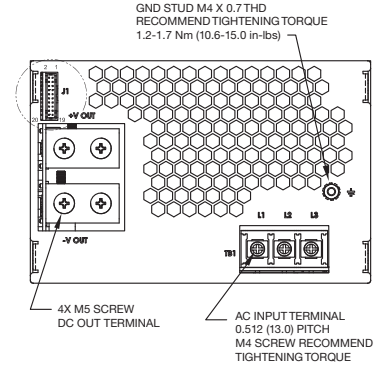
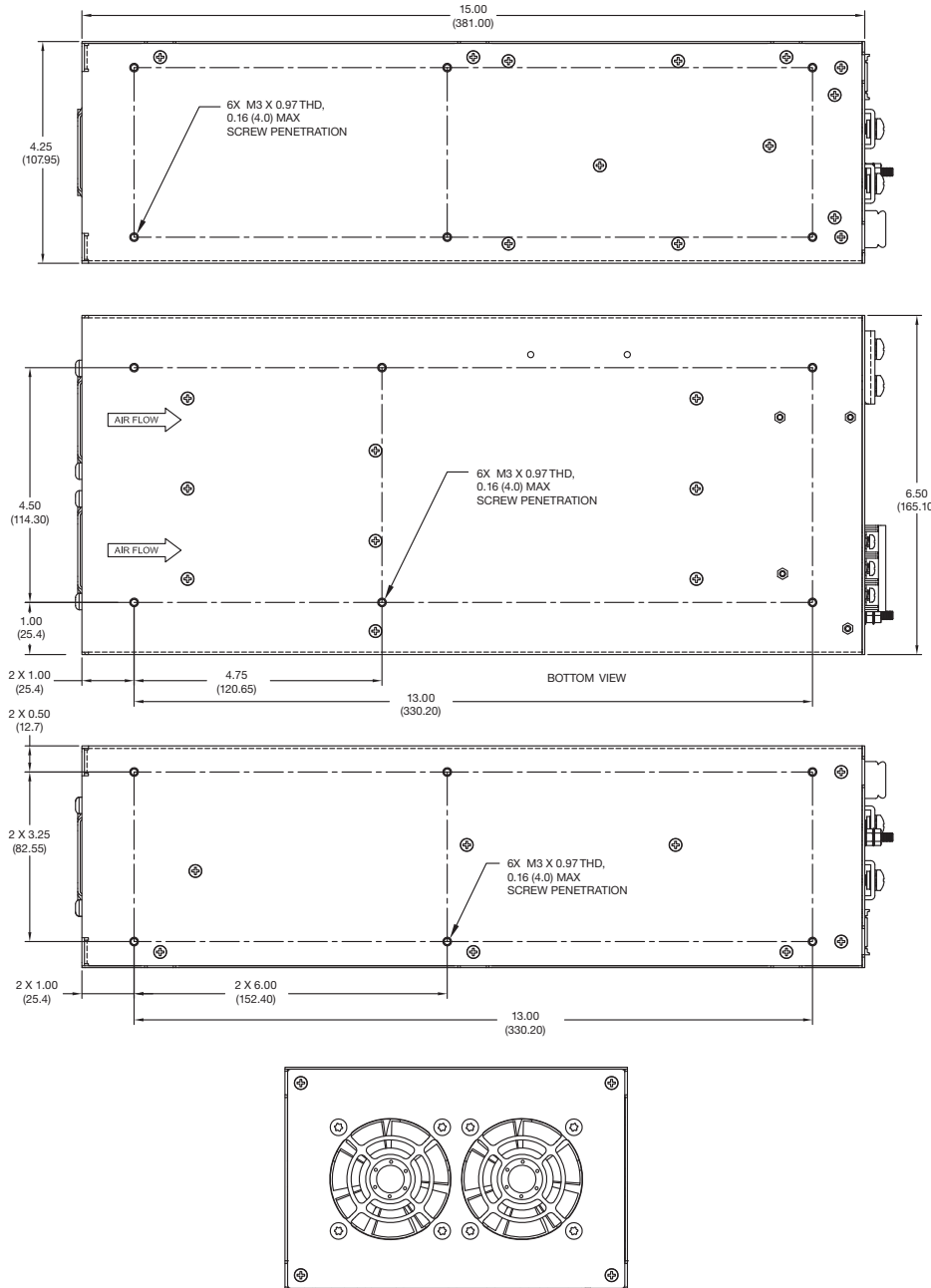
EMC: Immunity

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
ESD Immunity	EN61000-4-2	4	A	±8 kV contact / ±15 kV air discharge
Radiated Immunity	EN61000-4-3	3	A	
EFT/Burst	EN61000-4-4	3	A	
Surge	EN61000-4-5	Installation class 3	A	
Conducted	EN61000-4-6	3	A	
Magnetic Field	EN61000-4-8	3 A/m	A	
Dips and Interruptions	EN61000-4-11 (180 VAC)	Dip 100% (0 VAC), 8.4ms	A	
		Dip 100% (0 VAC), 16.7ms	B	
		Dip 60% (72 VAC), 200ms	B	
		Dip 30% (126 VAC), 500ms	B	
		Dip 20% (144 VAC), 5000ms	A	
		Int 100% (0 VAC), 5000ms	B	
	EN61000-4-11 (208 VAC)	Dip 100% (0 VAC), 10ms	A	
		Dip 100% (0 VAC), 20ms	B	
		Dip 60% (83 VAC), 200ms	B	
		Dip 30% (145 VAC), 500ms	A	
		Dip 20% (166 VAC), 5000ms	A	
	Int 100% (0 VAC), 5000ms	B		
	SEMI F47-0706	208VAC nominal	A	

Safety Approvals

Safety Agency	Safety Standard	Notes & Conditions
CB Report	IEC60950-1:2005 Ed 2	
	IEC62368-1 Ed 2	
UL	UL62368-1, CSA 22.2, No.62368-1	
EN	EN62368-1	
Equipment Protection Class	Class I	See safety agency conditions of acceptability for details
CE	Meets all applicable directives	
UKCA	Meets all applicable legislation	

Mechanical Details



J1 Signal Connector Connections	
Pin	Function
1	5V Standby Return
2	5V Standby Return
3	5V Standby
4	5V Standby
5	V Prog
6	I Monitor
7	Return (RTN)
8	Return (RTN)
9	DC OK
10	Not Used
11	AC OK / Power Fail
12	Inhibit
13	Fault
14	Not Used
15	Signal GND (SGND)
16	I ² C_SCL
17	I ² C_A0
18	I ² C_SDA
19	I ² C_A1
20	I ² C_A2

Signal Connector:
P/N JST S20B-PHDSS-(LF)(SN)
Mates with:
P/N JST PHDR-20VS
Contact:
26-22 AWG P/N JST SPHD-001T-P0.5

Notes

1. All dimensions are in inches (mm).
2. Weight: 19.5 lbs (8.86 kg)