

650W Fan cooled

AC-DC power supplies

The MHP650 AC-DC power supply provides up to 650W of output power in three mechanical packages to provide installation flexibility in a range of medical applications.

The unit comprises of a main output with voltages from 12V to 48VDC and two peripheral outputs providing a 12VDC 0.5A fan supply and a 5VDC 0.5A standby supply which can be utilised with the signals and control features of the unit to provide detection of loss of AC input and remote on/off control.

Multiple units can be used in parallel via the current share facility, providing higher power solutions. Inherently low earth leakage current, and conducted EMC compliance to Class B also simplify higher power system design.



Features

- ▶ 650W fan cooled
- ▶ Regulated single outputs 12V to 48VDC
- ▶ Input range 80 to 264VAC
- ▶ Medical safety approvals
- ▶ Rugged construction
- ▶ Variable fan speed for noise reduction
- ▶ AC OK, remote On/Off and active current share
- ▶ Screw terminals
- ▶ 5VDC 0.5A standby
- ▶ 12VDC 0.5A fan supply
- ▶ -20°C to +70°C operation
- ▶ 3 year warranty

Applications



Healthcare

Dimensions

End Fan

233.2 x 101.6 x 63.5mm (9.18" x 4.0" x 2.5")

Top Fan

203.2 x 101.6 x 65.5mm (8.0" x 4.0" x 2.58")

U channel

203.2 x 101.6 x 62.5mm (8.0" x 4.0" x 2.46")

Models & ratings

Model number ^(1,2)	Output voltage V1	Output current V1	Fan supply V2 ⁽³⁾	Standby supply V3	Output power ⁽⁴⁾
MHP650PS12-EF	12VDC	50.0A	12VDC 0.5A	5VDC 0.2A	607W
MHP650PS15-EF	15VDC	40.0A	12VDC 0.5A	5VDC 0.2A	607W
MHP650PS24-EF	24VDC	27.0A	12VDC 0.5A	5VDC 0.2A	655W
MHP650PS28-EF	28VDC	23.0A	12VDC 0.5A	5VDC 0.2A	655W
MHP650PS36-EF	36VDC	18.0A	12VDC 0.5A	5VDC 0.2A	655W
MHP650PS48-EF	48VDC	13.5A	12VDC 0.5A	5VDC 0.2A	655W

Notes:

1. For top fan version replace '-EF' in model number with '-TF', e.g. MHP650PS12-TF
2. For U Channel version remove suffix.

3. Not available for '-TF' and '-EF' models as used by integral fan.
4. U Channel models require a minimum of 5.5 m/s airflow from the system.

Input

Characteristic	Minimum	Typical	Maximum	Units	Notes & conditions
Input voltage	80		264	VAC	Derate output power 10% <90VAC, and 20% <85VAC
Input frequency	47		63	Hz	
Power factor		>0.9			
Input current		6.5		A	115VAC typical, 3.2A at 230VAC full load
Inrush current			40	A	264VAC
Earth leakage current			250	μA	264VAC, 60Hz
Input protection	T16 A/250V internal fuse in line and neutral				

Output

Characteristic	Minimum	Typical	Maximum	Units	Notes & conditions
Output voltage	12		48	VDC	
Output voltage trim		±10		%	V1
Initial set accuracy		±1		%	V1, ±5% V3
Minimum load	0			A	No minimum load required
Start up delay			500	ms	
Start up rise time		50		ms	
Hold up time	20			ms	
Drift		±0.2		%	After 20 min warm up
Line regulation		±0.5		%	
Load regulation		±1		%	V1, ±5% V3
Transient response			4	%	Deviation, recovery to within 1% in 500μs for a 50-75-50% load change
Ripple & noise			1	% max pk-pk	24-48VDC models, 20MHz bandwidth
Oversvoltage protection	115		145	%	V1, recycle input to reset
Overtemperature protection	Auto reset				
Overcurrent protection	110		140	%	V1 only
Temperature coefficient			0.05	%/°C	
Short circuit protection	Constant current characteristic				
Remote sense	Compensates for 0.5V total voltage drop				
Remote on/off	Uncommitted isolated optocoupler diode, powered diode inhibits V1 and fan supply				
Current share	Single wire current share				

General

Characteristic	Minimum	Typical	Maximum	Units	Notes & conditions
Efficiency		85		%	
Isolation: Input to output	4000			VAC	2 x MOPP
Input to ground	1500			VAC	1 x MOPP
Output to ground	500			VDC	
Switching frequency		70		kHz	PFC
		200			Main converter, standby 130kHz
Power density			20.8 (8.2)	W/cm ³ (W/in ³)	
MTBF		260		khrs	MIL-HDBK-217F at 25°C, GB

Safety approvals

Certification	Safety standard	Notes & conditions
CB report	IEC60601-1 CB report	
UL	CSA 22.2 No.60601-1, ANSI/AAMI ES60601-1	
EN	EN60601-1	Including risk management
CE	Meets all applicable directives	
UKCA	Meets all applicable legislation	

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & conditions
Operating temperature	-20		+70	°C	Derate linearly from +50°C at 2.5%/°C to 50% load at +70°C
Storage temperature	-40		+85	°C	
Cooling	Forced air cooled, '-TF' & '-EF' models have integral dual voltage level fan, which is load dependant, U Channel requires 5.5 m/s minimum airflow				
Humidity		95		%RH	Non-condensing
Operating altitude			3000	m	
Shock	30g pk, half sine, 6 axes				
Vibration	2g rms, 5Hz to 500kHz, 3 axes				

EMC: emissions

Phenomenon	Standard	Test level	Notes & conditions
Conducted	EN55011/EN55032	B	
Radiated	EN55011/EN55032	A	
Harmonic currents	EN61000-3-2	Class A	Class C for loads $\geq 20\%$
Voltage flicker	EN61000-3-3		

EMC: immunity

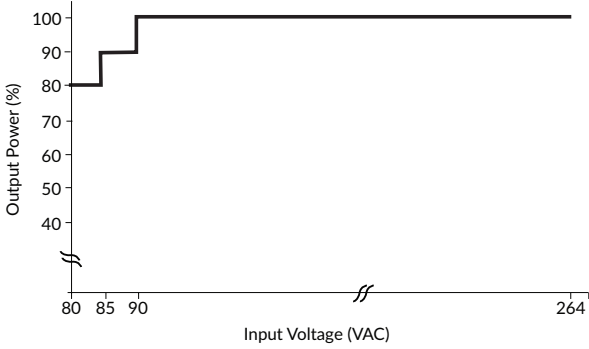
Phenomenon	Standard	Test level	Criteria	Notes & conditions
ESD immunity	EN61000-4-2	3	A	
Radiated immunity	EN61000-4-3	3	A	
EFT/Burst	EN61000-4-4	3	A	
Surge	EN61000-4-5	Installation class 3	A	
Conducted	EN61000-4-6	3	A	
Dips and interruptions	EN61000-4-11	30%, 10ms	A	
		60%, 100ms	B	
		100%, 5000ms	B	
	EN60601-1-2	30%, 500ms	A	
		60%, 100ms	A	
		100%, 10ms	A	
		100%, 5000ms	B	

Signals & controls

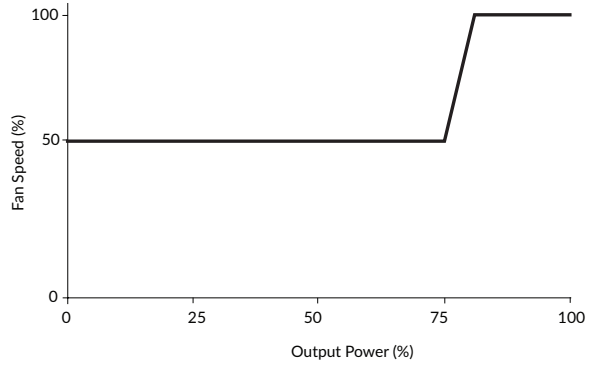
Characteristic	Notes & conditions
Remote Sense	Compensates for 0.5V total voltage drop
AC OK / Power Fail	Open collector referenced to negative sense, transistor normally off when AC is good, AC OK: Provides ≥ 5 ms warning of loss of output from AC failure
Remote On/Off (Inhibit/Enable)	Uncommitted isolated optocoupler diode, powered diode inhibits both V1 & V2 (fan supply)
Current Share	When more than one unit (with the same output voltage) is used in parallel to increase output current, the current share pins 5/6 of one unit should be connected to pins 5/6 of the other unit(s). This will force the current to share between the outputs. Similarly pins 2/4 of each unit should also be connected as a ground reference. Units share current within 10% of each other at full load. See fig 7.
Standby Supply V3	Isolated 5V/0.2 A supply, always present when AC supplied.

Derating curves

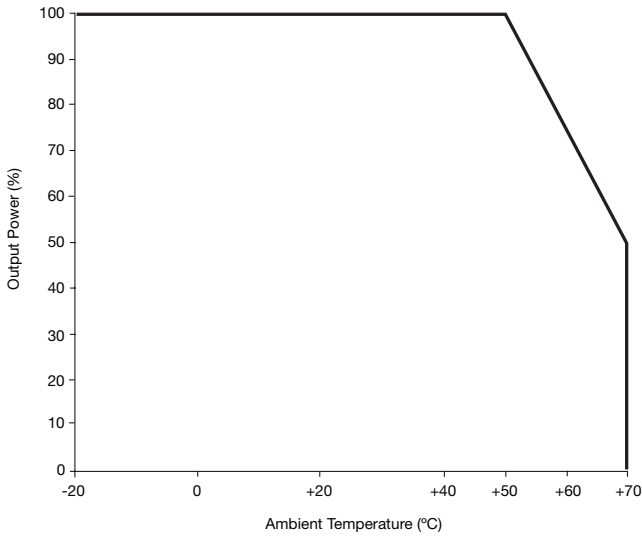
Input Derating Curve



Fan Speed Control

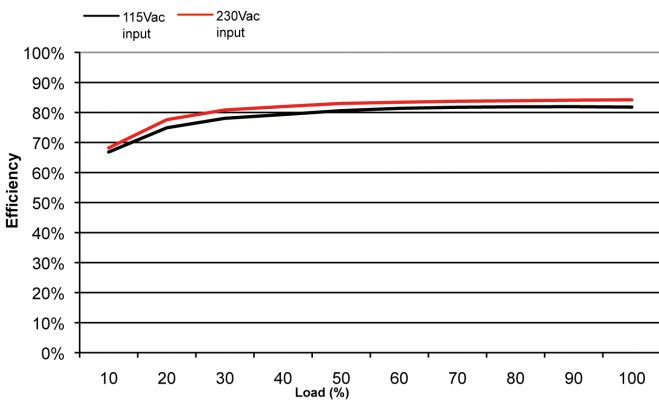


Temperature derating curve

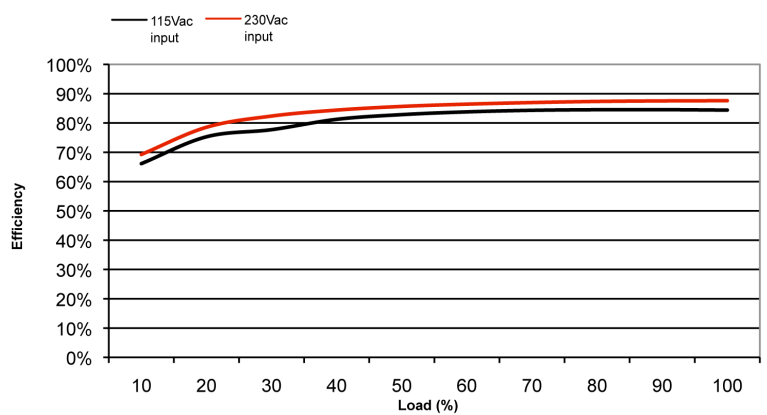


Efficiency vs Load

MHP650PS12

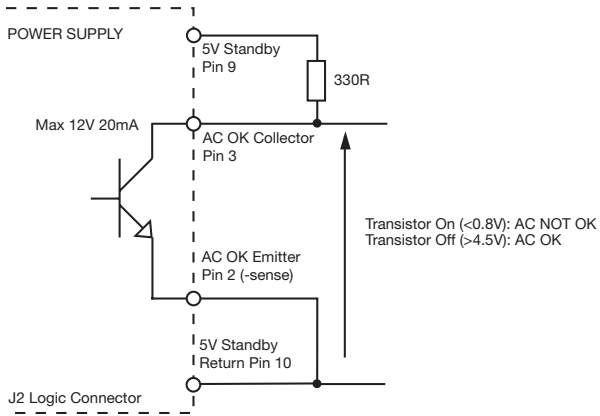


MHP650PS48

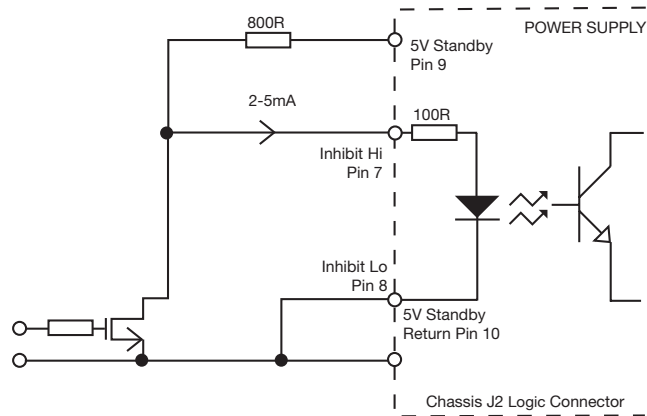
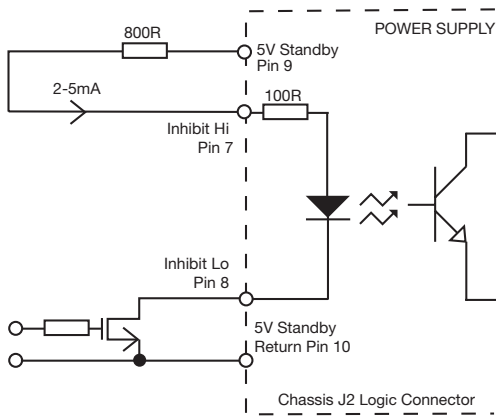


Signals & controls

AC OK/Power Fail

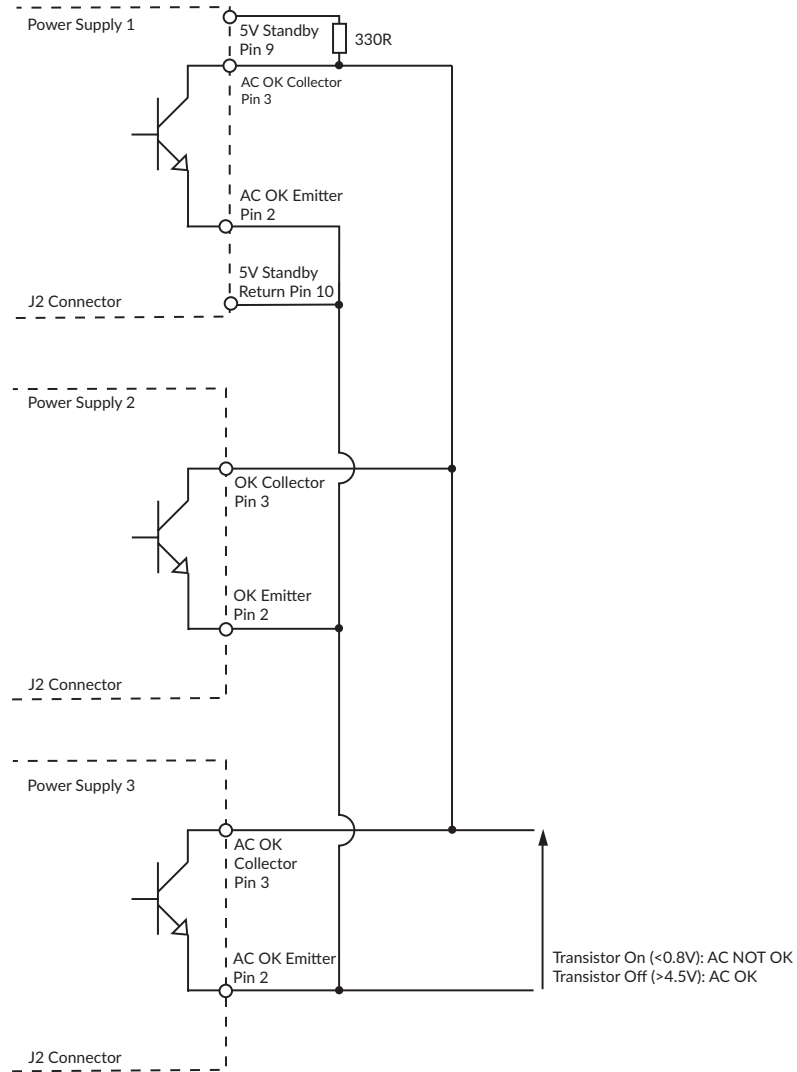


Remote On/Off (Inhibit)

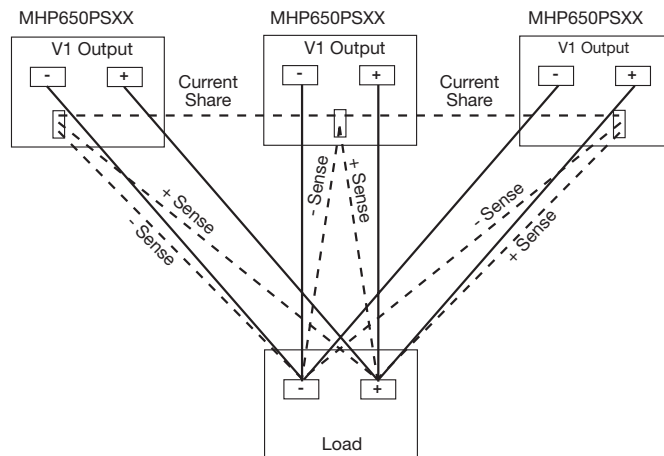


Signals & controls

Parallel AC OK Connection



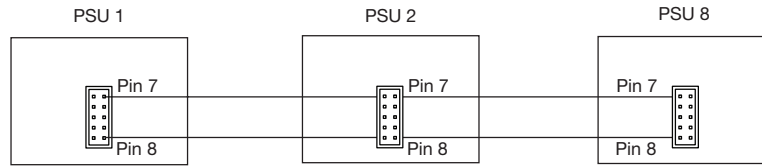
Parallel Load & Current Share Connections



MHP650 series

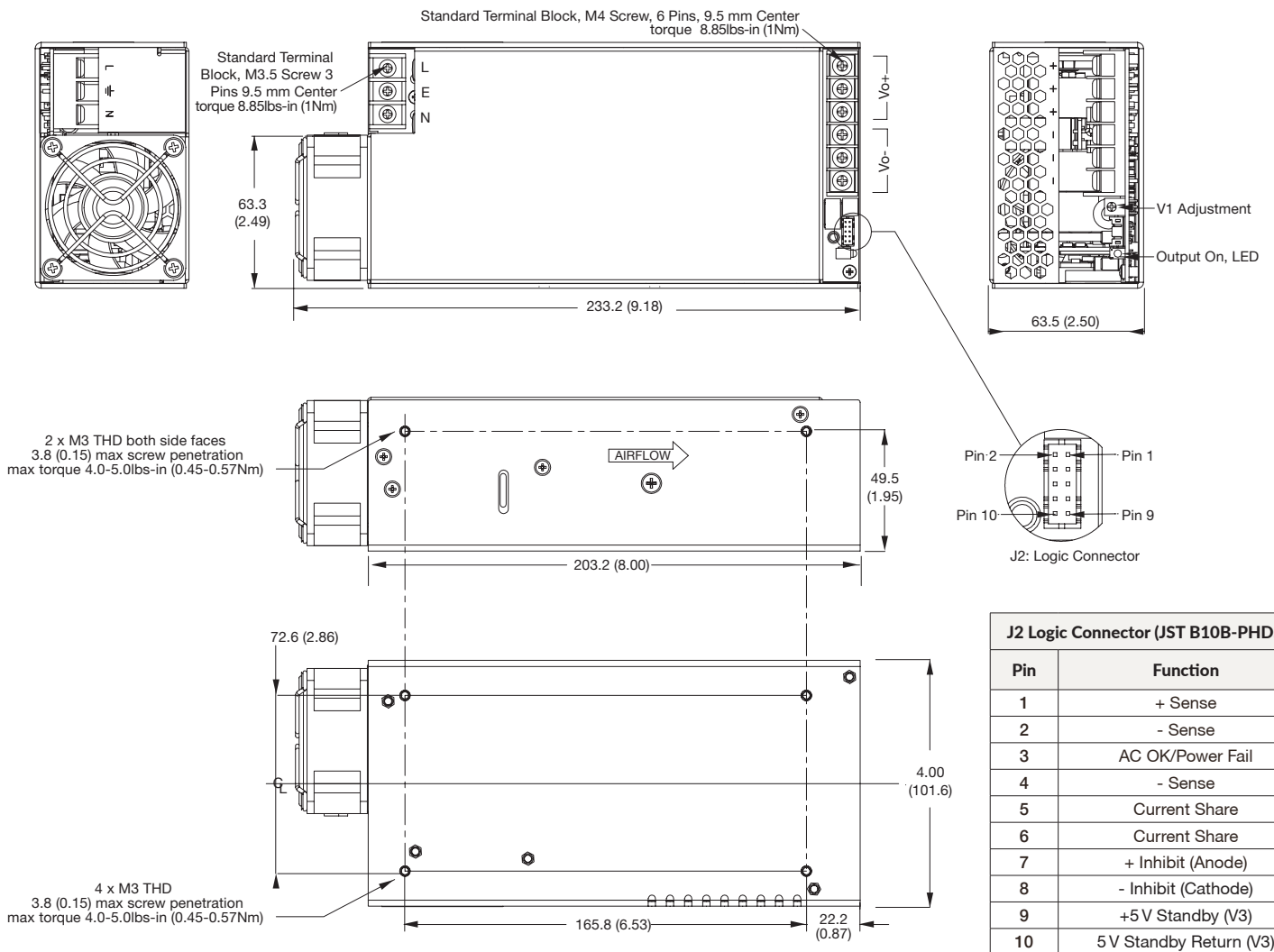
Signals & controls

Parallel Remote Inhibit Connection



Mechanical details

End fan (suffix -EF)



Notes:

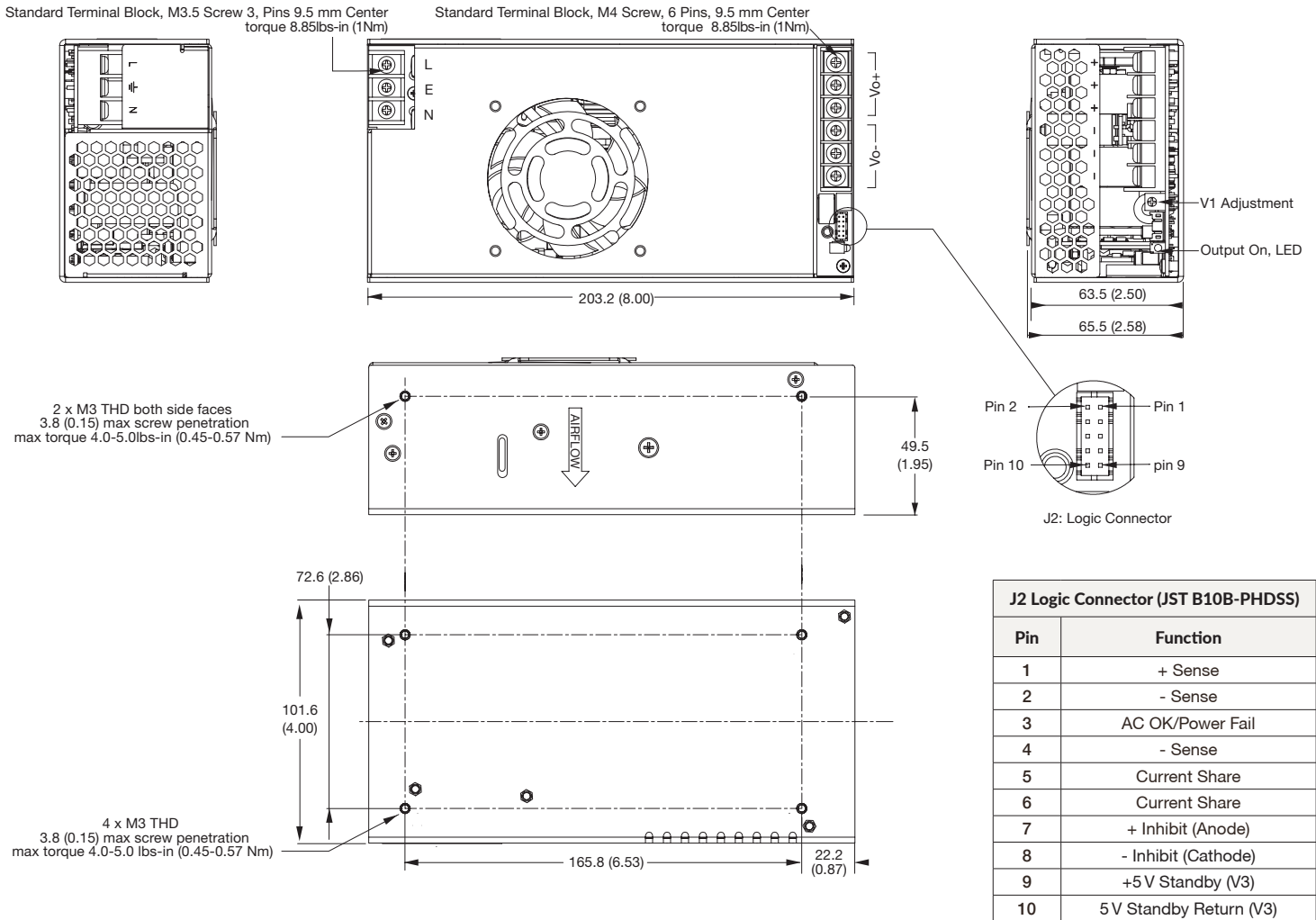
1. Dimensions shown in mm (inches).
2. Weight: 1.27kg (2.8lbs).

3. J2 Mating plug: JST part no. PHDR-10VS, contact: 26-22 AWG JST part no. SPHD-001T-P0.5.

MHP650 series

Mechanical details

Top Fan (Suffix -TF)



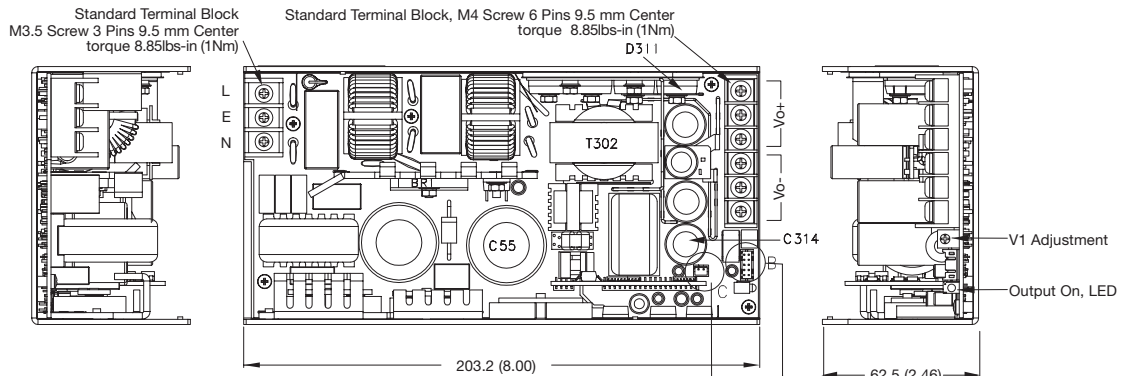
Notes:

1. Dimensions shown in mm (inches).
2. Weight: 1.25kg (2.8lbs).

3. J2 Mating plug: JST part no. PHDR-10VS, contact: 26-22 AWG JST part no. SPHD-001T-P0.5.

Mechanical details

U channel (no suffix)

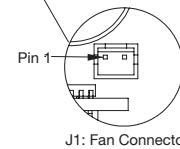
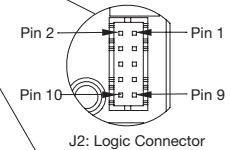
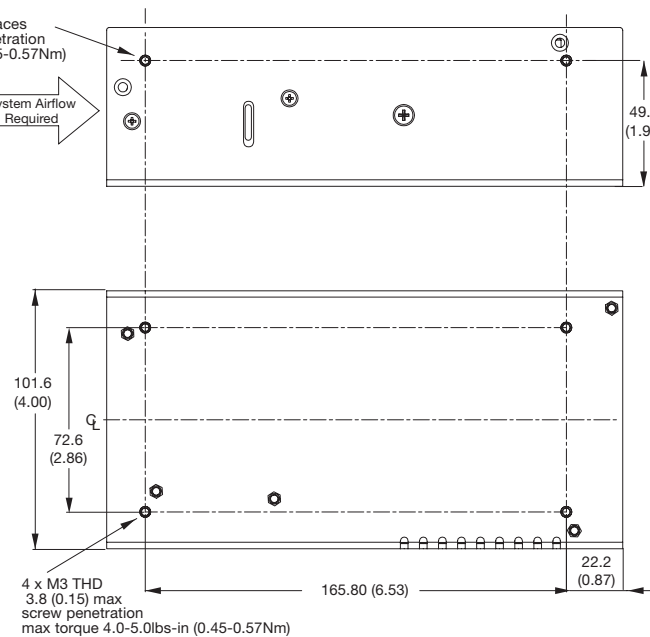


2 x M3 THD both side faces
3.8 (0.15) max screw penetration
max torque 4.0-5.0lbs-in (0.45-0.57Nm)

System Airflow
Required

J1 Fan Connector (JST B2B-PH-KL (LF) (SN))	
Pin	Function
1	+V
2	-V

J2 Logic Connector (JST B10B-PHDSS)	
Pin	Function
1	+ Sense
2	- Sense
3	AC OK/Power Fail
4	- Sense
5	Current Share
6	Current Share
7	+ Inhibit
8	- Inhibit
9	+5V Standby (V3)
10	5V Standby Return (V3)



Thermal Considerations (U Channel)

Temperature Measurements (Ambient $\leq 50^{\circ}\text{C}$)		
Component	Recommended Temperature $^{\circ}\text{C}$	Maximum Temperature $^{\circ}\text{C}$
C55 Capacitor	70	105
T302 Transformer	90	120
C314 Capacitor	70	105
D311 Diode	100	120

In order to ensure reliable operation in the end use application the recommended component temperatures listed should not be exceeded.

Higher temperatures up to the maximum stated can be used but product lifetime may be reduced.

Notes:

- Dimensions shown in mm (inches).
- Weight: 1.1kg (2.4lbs).
- Requires system airflow, see thermal considerations.

- 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: 26-22 AWG JST part no. SPHD-001T-P0.5.

Specification subject to change without notice