Murata Power Solutions

D1U4-W-1600-12-Hx Series

AC/DC Front End Power Supply

FEATURES

- 1600W (220Vac), 1200W (110Vac) Output Power
- 12V Main Output, 3.3V or 5V Standby Output
- 1U height: 4.0" x 14.0" x 1.6"
- 17.9 Watts per cubic inch density
- N+1 redundancy capable, including hot-docking
- Active Current Sharing on main output
- Overvoltage, Overcurrent, Overtemperature protection
- Internal cooling fans
- I²C Bus Interface with Status Indicators
- Optional 1U x 19" Power-Shelf
- RoHS compliant

PRODUCT OVERVIEW

The D1U4-W-1600-12-Hx is a 1600 Watt, power-factor-corrected (PFC) front-end power supply for hot-swapping redundant systems. The main output is 12V with a standby output of either 5V or 3.3V. Packaged in a 1U low-profile enclosure, it is designed to deliver reliable bulk power to servers, workstations, storage systems or any 12V distributed power architecture systems requiring high power density. The highly efficient electrical and thermal design with internal cooling fans supports reliable operation conditions. The D1U4-W-1600-12-Hx is designed to autorecover from overcurrent and overtemperature faults. Status information is provided with front panel LEDs, logic signals and I²C management interface. Four units can be packaged into an optional 19" 1U power shelf to provide up to 6.4kW of power.

ORDERING GUIDE

Model Number	Power Output High Line AC	Power Output Low Line AC	Main Output	Standby Output	Airflow
D1U4-W-1600-12-HC2C	1600W	1200W	12V	3.3V	Back to front
D1U4-W-1600-12-HA2C	1600W	1200W	12V	5V	Back to front
D1U4-W-1600-12-HC1C	1600W	1200W	12V	3.3V	Front to back
D1U4-W-1600-12-HA1C	1600W	1200W	12V	5V	Front to back

INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Operating Range		90	115/230	264	Vac
Input Frequency		47	55	63	Hz
Turn-on Input Voltage	Ramp up	78.5		86.5	Vac
Turn-off Input Voltage	Ramp down	70.5		78	
Maximum Input Current	Low Line AC 90Vac			15	Arms
	High Line AC 180Vac			10	
Inrush Current	Cold start between 0-1msec			100	Apk
Power Factor	Output load >90%	95%			
	Output load >50%	75%			

OUTPUT VOLTAGE CHARACTERISTICS

Output Voltage	Parameter	Conditions	Min.	Typ.	Max.	Units
12V	Voltage Set Point Accuracy			12.12		Vdc
	Line and Load Regulation		11.75		12.48	
	Ripple Voltage & Noise	20MHz Bandwidth			120	mV p-p
	Output Current		0		131.6	A
	Load Capacitance				40000	µF
3.3Vsb	Voltage Set Point Accuracy			3.3		Vdc
	Line and Load Regulation		3.2		3.4	
	Ripple Voltage & Noise	20MHz Bandwidth			33	mV p-p
	Operating Range		0		6	A
	Load Capacitance				1530	µF
5Vsb	Voltage Set Point Accuracy			5		Vdc
	Line and Load Regulation	20MHz Bandwidth	4.85		5.15	
	Ripple Voltage & Noise				50	mV p-p
	Operating Range		0		4	A
	Load Capacitance				1530	µF

[1] Ripple and noise are measured with 0.1 uF of ceramic capacitance and 2 x 270 uF of OSCON capacitance on each of the power supply outputs. A short coaxial cable with 50ohm scope termination is used. See Ripple Test Setup diagram.

RoHS COMPLIANT

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For full details go to www.murata-ps.com/rohs

C SA US

CE CB

Test Certificate and Test Report

OUTPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Remote Sense			120		mV
Efficiency	220Vac		90.6		%
Output Rise Monotonicity	Overshoot less than 10% for all outputs, no voltage negative between 10% to 95% during ramp up				
Startup Time	AC ramp up		1.5		s
	PS_On activated		150		ms
Transient Response	12V Ramp 1A/ms			±600	mV
	3.3Vsb Ramp 1A/ms			±165	
	5Vsb Ramp 1A/ms			±250	
Current sharing accuracy (up to 6 in parallel)	At 100% load			±10	%
Hot Swap Transients	All outputs remain in regulation				
Holdup Time		20			ms

ENVIRONMENTAL CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Storage Temperature Range	Non-condensing	-40		70	°C
Operating Temperature Range		0		50	
Operating Humidity	Non-condensing	10		90	%
Storage Humidity		5		90	
Shock	30G non operating				
Sinusoidal Vibration	0.5G, 5 – 500 Hz operating				
MTBF	Calculated per Bellcore at Ta=30°C	200K			hrs
	Demonstrated	200K			hrs
Acoustic	ISO 7779-1999			60	dB LpAm
Safety Approvals	CAN/CSA C22.2 No. 60950-1-07, 2nd Ed. UL 60950-1, 2nd Ed. IEC 60950-1:2005 (2nd Edition); EN 60950-1:2006 +A11				
Input Fuse	Power Supply has internal 20A/250V fast blow fuse on the AC line input				
Material Flammability	UL 94V-0				
Switching Frequency	90KHz for Boost PFC Converter 165KHz for Main Output Converter 200KHz for Standby Output Converter				
Weight	4.63lbs (2.1kg)				

PROTECTION CHARACTERISTICS

Output Voltage	Parameter	Conditions	Min.	Typ.	Max.	Units
	Overtemperature	Autorestart	55		65	°C
12V	Overvoltage	Latching	13		14	V
	Overcurrent	Latching	145		165	A
3.3Vsb	Overvoltage	Latching	3.57		4.02	V
	Overcurrent	Latching	6.5		8	A
5Vsb	Overvoltage	Latching	5.6		6	V
	Overcurrent	Latching	5		7	A

ISOLATION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Insulation Safety Rating / Test Voltage	Input to Output - Reinforced	3000			Vrms
	Input to Chassis - Basic	1500			Vrms
Isolation	Output to Chassis				
	Output to Output				
Grounding	Main Output Return and Standby Output Return are connected internally. 100kΩ resistor parallel with 100nF capacitor is connected between Return and power supply chassis. Main Output Return should be connected to the System Chassis				

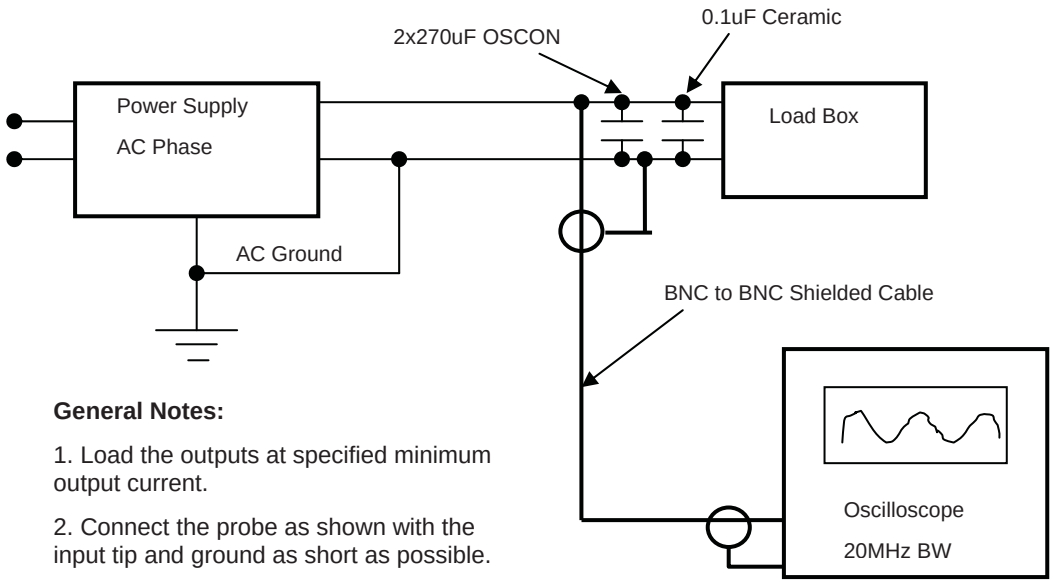
STATUS INDICATORS AND CONTROL SIGNALS

Status	Conditions	Description
LED	Off	No AC input to all PS
	Flashing Yellow	Power Supply Failure
	Flashing Green	Main Output Absent
	Green	Power Supply Good
I^2C Registers	Status	PS-ON, PGOOD, ACOK, PS_BAD, FANFAIL, OT Warning & shutdown, AC Range
	Output Fault	12V OV, 12V UV, 12V OC, Vsb Fail, Fan1 Fail, Fan2 Fail
	12V Output	8 bit scaled output voltage
	12V	8 bit scaled output current
	Fan1 Monitor	8 bit scaled output current
	Fan2 Monitor	8 bit scaled output current

EMISSIONS AND IMMUNITY

Characteristic	Standard	Compliance
Input Current Harmonics	IEC/EN 61000-3-2	Complies
Voltage Fluctuation and Flicker	IEC/EN 61000-3-3	Complies
Conducted Emissions	FCC 47 CFR Part 15/CISPR 22/EN55022	Class A, 6dB margin
Radiated Emissions	FCC 47 CFR Part 15/CISPR 22/EN55022	Class A, 6dB margin
ESD Immunity	IEC/EN 61000-4-2	4kV contact discharge
		8kV operational air discharge
		15kV non-operational air discharge
Radiated Field Immunity	IEC/EN 61000-4-3	Complies
Electrical Fast Transients/Burst Immunity	IEC/EN 61000-4-4	Complies
Surge Immunity	IEC/EN 61000-4-5	1kV/2kV, Performance Criteria A
RF Conducted Immunity	IEC/EN 61000-4-6	3 Vac, 80% AM, 1kHz, Performance Criteria A
Magnetic Field Immunity	IEC/EN 61000-4-8	3 A/m
Voltage dips, interruptions	IEC/EN 61000-4-11	Complies

RIPPLE TEST SETUP



General Notes:

1. Load the outputs at specified minimum output current.
2. Connect the probe as shown with the input tip and ground as short as possible.
3. Take all measurements
4. Repeat the measurements with the outputs at specified maximum output current.

OUTPUT CONNECTOR AND SIGNAL SPECIFICATION

DC and Signal Connector: Tyco Part # 1-6450132-2, or FCI PowerBlade # 51732-021

P1	P2	P3	P4	P5	P6	P7	P8	x1	x2	x3	x4	x5	x6	
V_{OUT}	V_{OUT}	V_{RTN}	V_{RTN}	V_{RTN}	V_{RTN}	V_{OUT}	V_{OUT}	AC_OK	P_GOOD	V_{SB} RETURN	V_{SB} RETURN	V_{SB} +OUT	V_{SB} +OUT	D
								SPARE	SPARE	V_{SB} RETURN	V_{SB} RETURN	V_{SB} +OUT	V_{SB} +OUT	C
								I_SHARE	I^2C ADR0	I^2C ADR1	I^2C ADR2	PS_KILL	PS_ PRESENT	B
								SENSE +	SENSE -	I^2C DATA	I^2C CLOCK	SPARE	PS_ON	A
												mate-last pins		

Pin Assignment	Signal Name	Description	High Level Low Level	I Max
P1, P2, P7, P8	V_{OUT}	Main output voltage		
P3, P4, P5, P6	V_{RTN}	Main output voltage, return		
A1	Sense +	V_{OUT} remote sense, positive node input, connected to the +ve load point		
A2	Sense -	V_{OUT} remote sense, negative node input, connected to the -ve load point		
C5, C6, D5, D6	V_{SB}	Standby voltage output		
C3, C4, D3, D4	V_{SB} Return	Standby voltage, return, tied internally to Output Return		
B1	I_Share	Active load sharing bus	0 – 8V	-4 mA / +5 mA
D1	AC_OK	Input AC Voltage “OK” signal output (Internal pull up is 10kΩ to Vsb)	>2.4V (active, OK) <0.4V	+4 mA -2 mA
D2	P_Good	Power good signal output (Internal pull up is 10kΩ to Vsb)	>2.4V (active, Good) <0.4V	+4 mA -2 mA
B5	PS_Kill	Floating pin will turn off P/S (shorter pin, last-make and first-break contact for hot plugging). This signal overrides PS-On in disabling the Main Output	>2.1V (open, or Vsb) <0.7V (active, PS:On)	N/A
B6	PS_Present	Internally tied to Vsb return	0 V	
A6	PS_On	Internal 1K ohm pull-up to Vsb, (accepts open collector/ drain drive), This signal to be pulled low to turn-on power supply	>2.1V (open, or Vsb) <0.7V (active, PS:On)	-4 mA -1 mA
A3	I^2C Data	I^2C serial data bus	Vsb	
A4	I^2C Clock	I^2C serial clock bus	Vsb	
B2	I^2C Adr0	Address input 0, internal pull-up to Vsb	>2.1V, < Vsb <0.8V	±1 mA
B3	I^2C Adr1	Address input 1, internal pull-up to Vsb	>2.1V, <Vsb <0.8V	±1 mA
B4	I^2C Adr2	Address input 2, internal pull-up to Vsb	>2.1V, <Vsb <0.8V	±1 mA

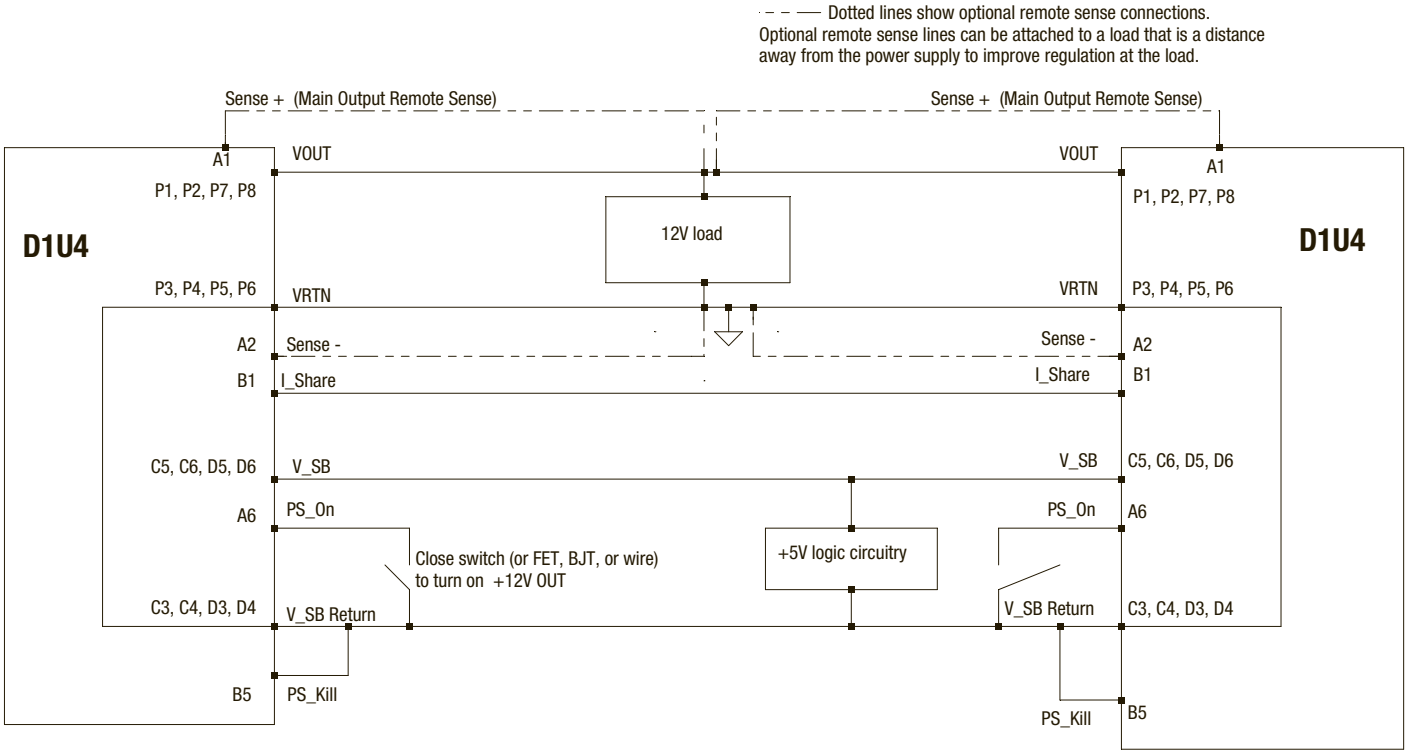
D1U4 MATING CONNECTORS

12V D1U4 mating connector

	Press Fit		Solder [1]	
	Straight	Right Angle	Straight	Right Angle
Murata-PS	N/A	N/A	N/A	36-0430032-0
FCI	51742-10802400CALF	51762-10802400CBLF	51742-10802400AALF	51762-10802400ABLF
Tyco	TBD	TBD	TBD	TBD

1 Solder connector recommended for board thickness of <0.090

WIRING DIAGRAM FOR OUTPUT



CURRENT SHARING NOTES

12V Output: Current sharing is achieved using the active current share method. (See wiring diagram for connection details.)

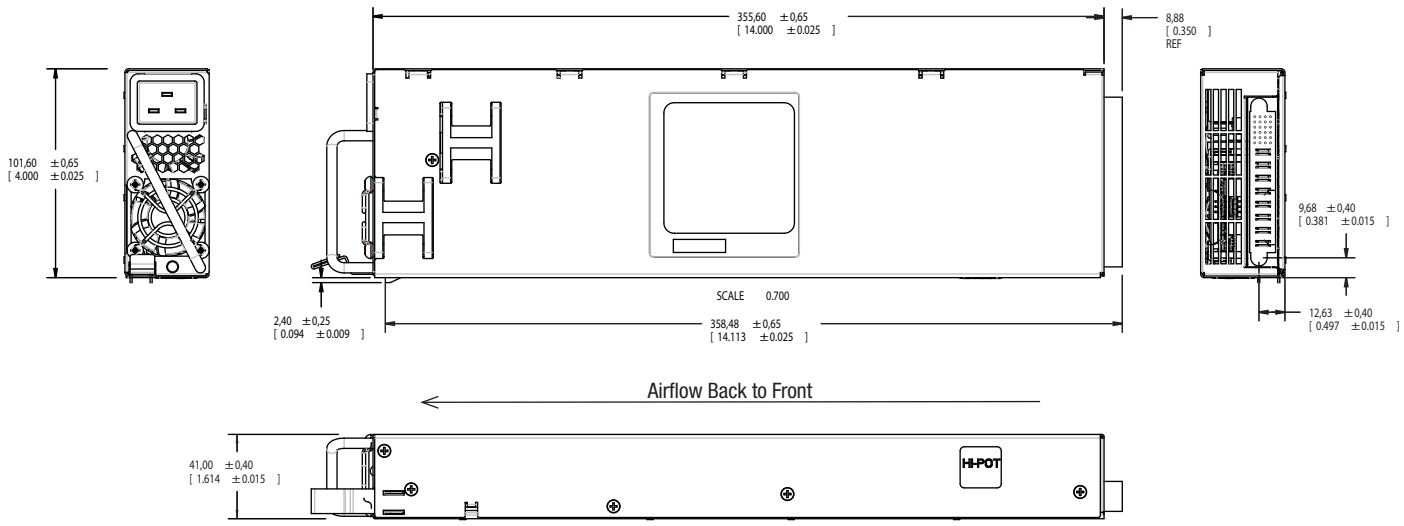
The total combined load must be below 1600W at startup. Current sharing can be achieved with or without remote sense connected to the common load.

V_SB outputs can be tied together for redundancy but total combined output power must not exceed 20W. The V_SB output has internal ORing MOSFET for additional redundancy / internal short protection.

The current share pin B1 is a connection between the two units. It is input and/or output as the voltage on the line controls the current share. A power supply will respond to a change in this voltage but a power supply can also change the voltage depending on the load drawn from it. On a single unit this would read 8V at 100% load. For two units sharing load then this should read 4V for perfect current sharing.

Up to 6 units can be paralleled together. Please consult your Murata sales representative if operation with more than six units in parallel is needed.

MECHANICAL DIMENSIONS - D1U-W-1200-12-Hx



AC Input Connector: The AC input connector is standard IEC C20 20A.

Dimensions: 4.00" x 14.00"x 1.61" [101.6mm x 355.6mm x 40.64mm]

OPTIONAL ACCESSORIES

Description	Part Number
12V D1U-12 output connector card	D1U-12-CONC

APPLICATION NOTES

Document Number	Description	Link
ACAN-27	D1U-12-CONC Output Connector Card	www.murata-ps.com/data/apnotes/acan-27.pdf
ACAN-31	D1U4 Communications Protocol	www.murata-ps.com/data/apnotes/acan-31.pdf

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