Murata Power Solutions

D1U54P-W-1500-12-HxxTC Series

54mm 1U Front End AC-DC Power Supply Converter

PRODUCT OVERVIEW

D1U54P-W-1500-12-HxxTC is a series of highly efficient, power factor corrected 1500 watt front-end power supply converters that provide a 12Vdc 100A main output and the choice of a 3.3V, 5V, or 12V standby output.
These power supply converters provide overvoltage, overcurrent, overtemperature fault protection, and include a status indication LED as well as hardware and logic signals.
The comprehensive PMBus™ digital communications bus, and the low profile 35/cubic inch 1U package make these power supplies ideal for delivering reliable, efficient power to servers, workstations, storage systems and other 12V distributed power architectures.

FEATURES

- 1500W continuous output power
- IEC60320-C16 connector for maximized low line operation
- 80 Plus® Certified Platinum, HAxTC models
- 12V main output
- 3.3V; 5V and 12V standby output Options
- 1U height: 2.15" x 12.65" x 1.57"
- > 35 watts per cubic inch density
- N+1 redundancy, hot swap capable; Ishare compatible with DC input series
- active (digital) current sharing on 12V main output; integral ORing /isolation device MOSFET
- internal cooling fan (variable speed) overvoltage, overcurrent, overtemperature protection
- PMBus™/I²C interface with LED status indicators
- RoHS compliant
- Two-year warranty

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

ORDERING GUIDE

Part Number	Power Output Input Voltage (200-240 Vac) 45°C	Power Output Input Voltage (110 / 120 Vac) 45°C	Power Output Input Voltage (100 Vac) 40°C	Main Output	Standby Output	Airflow
D1U54P-W-1500-12-HC4TC	1500W	1400W	1260W	12Vdc	3.3Vdc	Back → Front
D1U54P-W-1500-12-HA4TC					5Vdc	
D1U54P-W-1500-12-HB4TC					12Vdc	
D1U54P-W-1500-12-HC3TC					3.3Vdc	Front →Back
D1U54P-W-1500-12-HA3TC					5Vdc	
D1U54P-W-1500-12-HB3TC					12Vdc	

INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Nom.	Max.	Units
Input Voltage Operating Range		90	100/110/120/200-240	264	Vac
Input Frequency		47	50/60	63	Hz
Turn-on Input Voltage	Ramp up	74		84	Vac
Turn-off Input Voltage	Ramp down	70		80	
Maximum current	Vin = 100 Vac/60Hz; 1260W			15	Arms
Inrush Current	Cold start between 0 to 200msec, 264Vac			50	Apk
Power Factor	At 230Vac, full load		0.99		
Efficiency (230Vac) excluding fan load HaxTC models 80 Plus® Certified Platinum	20% load	90			%
	50% load	94			
	100% load	91			

OUTPUT VOLTAGE CHARACTERISTICS

Output	Parameter	Conditions	Min.	Typ.	Max.	Units
12V	Nominal Output Voltage			12		Vdc
	Output Set Point Accuracy	50% load; Tamb =25°C	-0.5		+0.5	%
	Line and Load Regulation[2]	Measured at remote sense	-1.0		+1.5	
	Ripple Voltage & Noise[1,2]	20MHz Bandwidth			120	mV p-p
	Output Current	1500W; (115-264Vac)	0		125	A
	Output Current	1260W; (90-264Vac)	0		105	
	Load Capacitance				30,000	µF
3.3VSB	Nominal Output Voltage			3.3		Vdc
	Line and Load Regulation		3.14		3.46	
	Ripple Voltage & Noise[1,3]	20MHz Bandwidth			75	mV p-p
	Output Current		0		4	A
	Load Capacitance		0		3000	µF
5VSB	Nominal Output Voltage			5.0		Vdc
	Line and Load Regulation		4.76		5.24	
	Ripple Voltage & Noise[1,3]	20MHz Bandwidth			75	mV p-p
	Output Current		0		4	A
	Load Capacitance		0		3000	µF
12VSB	Nominal Output Voltage			12		Vdc
	Line and Load Regulation		11.7		12.3	
	Ripple Voltage & Noise[1,3]				120	mV p-p
	Output Current		0		2.5	A
	Load Capacitance				1000	µF

[1] Ripple and noise are measured with 0.1 µF of ceramic capacitance and 10 µF of tantalum capacitance on each of the power supply outputs. A short coaxial cable to the scope termination is used.
[2] Minimum Load of 5A.
[3] Minimum Load of 0.25A.

OUTPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Startup Time	AC, ramping up			3	s
Transient Response	12V Main Output: 10% to 60% load step; 1A/µs slew rate	-5		+5	% nom
	VSB Output (3.3/5.0/12V): 10% to 60% load step; 1A/µs				
	Recovery time to within 1% Vnom (all outputs)		2		ms
Current sharing accuracy	At 100% load	-5		+5	%
Hot Swap Transients	All Outputs remain within regulation	-5		+5	%
Holdup Time	110/230Vac in voltage ranges, 100% load (1500W)	12			ms
	110/230Vac in voltage ranges, 900W load	20			ms

ENVIRONMENTAL CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Storage Temperature Range		-40		70	°C
Operating Temperature Range 1500W (180-264Vac)[1]	See Derating Curves	-5		45	
Operating Temperature Range 1260W (90-264Vac)[1]	Continuous	-5		45	
Operating Temperature Range (85-264Vac)	See Derating Curves	-5		40	
Operating Humidity	Noncondensing	5		90	%
Storage Humidity		5		95	
Altitude (without derating at 40°C)[1,2]				3000	m
Shock	30G non-operating				
Operational Vibration	Sine sweep; 5-150Hz, 2G; random vibration, 5-500Hz, 1.11G				
MTBF	Per Telcordia SR-332 M1C1 @40°C	540K			hrs.
Safety Approval Standards	IEC 60950-1:2005, IEC 60950-1:2005/AMD1:2009, IEC 60950-1:2005/AMD2:2013 [CSA] CAN/CSA-C22.2 No. 60950-1-07, Amendment 1:2011, Amendment 2:2014 (MOD) [CSA] ANSI/UL Std. No. 60950-1-2014 - Information Technology Equipment – Safety – Part 1: General Requirements (CSA) EN 60950-1:2006+A11+A1+A12+A2 [TÜV Rheinland] IS 13252(Part 1):2010/ IEC 60950-1 : 2005 [BIS] CNS13438 (095/06/01), CNS14336-1 (099/09/30), CNS 15663 5 (102) [BSMI] GB17625.1-2012, GB4943.1-2011, GB/T9254-2008 (Class A) [CQC] GOST IEC 60950-1-2014 [EAC] K60950-1(2011-12) [KCC] AS/NZS 60950.1:2015, CISPR 32:2015 [RCM] [UkrSEPRO] IEC 62368-1:2014 [CSA, CB] CAN/CSA-C22.2 No. 62368-1:14 [CSA] UL 62368-1 2nd Ed. [CSA] EN 62368-1:2014+A11 [TÜV Rheinland]				
Input Fuse	This power supply converter series includes a single internal 20A/250V fast blow fuse on the AC line input				
Weight	3.15 lbs. (1.43 kg)				

[1] Intake air temperature based on stand-alone power supply module operated in free airflow environment. Airflow conditions imposed by host/system may impact result

[2] Meets the operational safety requirements up to 3,000m

PROTECTION CHARACTERISTICS

Output Voltage	Parameter	Conditions	Min.	Typ.	Max.	Units
	Overtemperature (intake)[1,2,3]	Auto restart	71	75	79	°C
12V	Overvoltage	Latching	13.0		14.5	V
	Short circuit	4 Hiccup then latch	145			A
	Overcurrent At 90-264VVac	4 Hiccup, >500msec each, then latch	132		150	
3.3VSB	Overvoltage	Latching	3.6		4.0	V
	Overcurrent	Hiccup	5.1		6.7	A
5VSB	Overvoltage	Latching	5.4		6.0	V
	Overcurrent	Hiccup	5.1		6.7	A
12VSB	Overvoltage	Latching	13.0		14.5	V
	Overcurrent	Hiccup	3.5		4.5	A

[1] As detected and reported by the PMBus® air intake temperature sensor, operated as a component in free air. Airflow conditions imposed by Host/System may impact results. A gradient between PMBus intake air temperature reported and that of an external thermocouple may be observed due to the difference in sensor locations. Refer to ACAN-66 (PMbus® application noise) for additional details.

[2] Warning indication (PMbus® status register bits, SMB_ALERT and Amber LED status) occurs at 70ºC nominal and recovers at 65ºC nominal as reported by the PMBus® intake air temperature sensor; fault indication and shutdown engages at 75 ºC nominal and recovers at 70ºC nominal

[3] Operating the power supply above the maximum operating temperature (see "ENVIRONMENTAL CHARACTERISTICS") is considered an abnormal condition and may negatively impact power supply life and is not recommended.

ISOLATION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Insulation Safety Rating / Test Voltage	Input to Output - Reinforced	4242			Vdc
	Input to Chassis - Basic	2121			Vdc
Isolation	Output to Chassis	500			Vdc

EMISSIONS AND IMMUNITY

Characteristic	Standard	Compliance
Input Current Harmonics	IEC/EN 61000-3-2	Complies with Class A limits
Voltage Fluctuation and Flicker	IEC/EN 61000-3-3	Complies
Conducted Emissions	FCC 47 CFR Part15/CISPR22/EN55022	Class A with 6dB margin
ESD Immunity	IEC/EN 61000-4-2	±8KV Contact; ±15KV air discharge; Criteria A
Radiated Field Immunity	IEC/EN 61000-4-3	3V/m, 1KHz, 80% AM, 80MHz to 1GHz Criteria A
Electrical Fast Transients/Burst Immunity	IEC/EN 61000-4-4	Level 3 criteria a
Surge Immunity	IEC/EN 61000-4-5	Level 3 criteria B, measured at the power supply input connector
RF Conducted Immunity	IEC/EN 61000-4-6	Level 2 criteria A
Voltage Dips, Interruptions	IEC/EN 61000-4-11	230Vin, 100% load, Phase 0°, Dip 100% Duration 10ms (A) 230Vin, 50% load, Phase 0°, Dip 100% Duration 20ms (VSB:A, V1:B) 230Vin, 100% load, Phase 0°, Dip 100% Duration > 20ms (VSB, V1:B)

STATUS INDICATORS AND CONTROL SIGNALS (BI_COLOUR LED)	GREEN	AMBER
Condition	LED Status (Power)	LED Status (Fault)
Standby - ON; Main output - OFF; AC PRESENT	Blinking green	Off
Standby - ON; Main output - ON	Solid green	Off
Main output overcurrent, undervoltage, overvoltage[1]	Off	On
FAN_FAULT; overtemperature; standby overcurrent, undervoltage[1]	Off	On
No AC Power	Off	Off
Power Supply Warning Event[1]	Off	Blinking

[1] reported also by PMBus Status Register(s) and asserts SMB_Alert

ADDR ADDRESS SELECTION

ADDR pin (A3) resistor to GND (K-ohm)*	Power Supply Main Controller (Serial Communications Slave Address)	Power Supply External EEPROM (Serial Communications Slave Address)
0.82	0xB0	0xA0
2.7	0xB2	0xA2
5.6	0xB4	0xA4
8.2	0xB6	0xA6
15	0xB8	0xA8
27	0xBA	0xAA
56	0xBC	0xAC
180	0xBE	0xAE

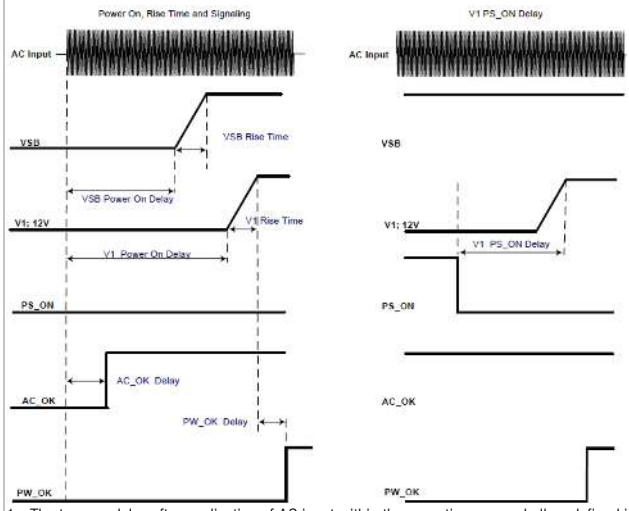
* The resistor shall be +/-5% tolerance

STATUS AND CONTROL SIGNALS			
Signal Name	I/O	Description	Interface Details
INPUT_OK (AC Source)	Output	The signal output is driven high when input source is available and within acceptable limits. The output is driven low to indicate loss of input power. There is a minimum of 1ms pre-warning time before the signal is driven low prior to the PWR_OK signal going low. The power supply must ensure that this interface signal provides accurate status when AC power is lost.	Pulled up internally via 10K to VDD[1]. A logic high >2.0Vdc A logic low <0.8Vdc Driven low by internal CMOS buffer (open drain output).
PW_OK (Output OK)	Output	The signal is asserted, driven high, by the power supply to indicate that all outputs are valid. If any of the outputs fail then this output will be hi-Z or driven low. The output is driven low to indicate that the Main output is outside of lower limit of regulation (11.4Vdc).	Pulled up internally via 10K to VDD[1]. A logic high >2.0Vdc A logic low <0.8Vdc Driven low by internal CMOS buffer (open drain output).
SMB_ALERT (FAULT/WARNING)	Output	The signal output is driven low to indicate that the power supply has detected a warning or fault and is intended to alert the system. This output must be driven high when the power is operating correctly (within specified limits). The signal will revert to a high level when the warning/fault stimulus (that caused the alert) is removed. SMB_Alert and LED Fault / warn status assert together. CML errors do not impact SMB_Alert and LED status.	Pulled up internally via 10K to VDD[1]. A logic high >2.0Vdc A logic low <0.8Vdc Driven low by internal CMOS buffer (open drain output).
PRESENT_L (Power Supply Absent)	Output	The signal is used to detect the presence (installed) of a PSU by the host system. The signal is connected to PSU logic SGND within the power module.	Passive connection to +VSB_Return. A logic low <0.8Vdc
PS_ON (Power Supply Enable/Disable	Input	This signal is pulled up internally to the internal housekeeping supply (within the power supply). The power supply main 12Vdc output will be enabled when this signal is pulled low to +VSB_Return. In the low state the signal input shall not source more than 1mA of current. The 12Vdc output will be disabled when the input is driven higher than 2.4V, or open circuited. Cycling this signal shall clear latched fault conditions.	Pulled up internally via 10K to VDD[1]. A logic high >2.0Vdc A logic low <0.8Vdc Input is via CMOS Schmitt trigger buffer.
PS_KILL	Input	This signal is used during hot swap to disable the main output during hot swap extraction. The input is pulled up internally to the internal housekeeping supply (within the power supply). The signal is provided on a short (lagging pin) and should be connected to +VSB_Return.	Pulled up internally via 10K to VDD[1]. A logic high >2.0Vdc A logic low <0.8Vdc Input is via CMOS Schmitt trigger buffer.
ADDR (Address Select)	Input	An analog input that is used to set the address of the internal slave devices (EEPROM and microprocessor) used for digital communications. Connection of a suitable resistor to +VSB_Return, in conjunction with an internal resistor divider chain, will configure the required address.	DC voltage between the limits of 0 and +3.3Vdc.
SCL (Serial Clock)	Both	A serial clock line compatible with PMBus™ Power Systems Management Protocol Part 1 – General Requirements Rev 1.1. No additional internal capacitance is added that would affect the speed of the bus. The signal is provided with a series isolator device to disconnect the internal power supply bus in the event that the power module is unpowered.	VIL is 0.8V maximum VOL is 0.4V maximum when sinking 3mA VIH is 2.1V minimum
SDA (Serial Data)	Both	A serial data line compatible with PMBus™ Power Systems Management Protocol Part 1 – General Requirements Rev 1.1. The signal is provided with a series isolator device to disconnect the internal power supply bus in the event that the power module is unpowered.	VIL is 0.8V maximum VOL is 0.4V maximum when sinking 3mA VIH is 2.1V minimum
V1_SENSE V1SENSE_RTN	Input	Remote sense connections intended to be connected at and sense the voltage at the point of load. The voltage sense will interact with the internal module regulation loop to compensate for voltage drops due to connection resistance between the output connector and the load. If remote sense compensation is not required then the voltage can be configured for local sense by: 1. V1_SENSE directly connected to power blades 6 to 10 (inclusive) 2. V1_SENSE_RTN directly connected to power blades 1 to 5 (inclusive)	Compensation for up to 0.12Vdc total connection drop (output and return connections).
ISHARE	Bi-Directional Analogue Bus	The current sharing signal is connected between sharing units (forming an ISHARE bus). It is an input and/or an output (bi-directional analog bus) as the voltage on the line controls the current share between sharing units. 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 the voltage on the pin (and the common ISHARE bus would read 8VDC at 100% load (module capability). For two identical units sharing the same 100% load this would read 4VDC for perfect current sharing (i.e. 50% module load capability per unit).	Analogue voltage: +8V maximum; 10K to +12V_RTN

1. VDD is an internal voltage rail derived from VSB and an internal housekeeping rail ("diode ORed") and is compatible with the voltage levels of TTL and CMOS logic families.

TIMING SPECIFICATIONS

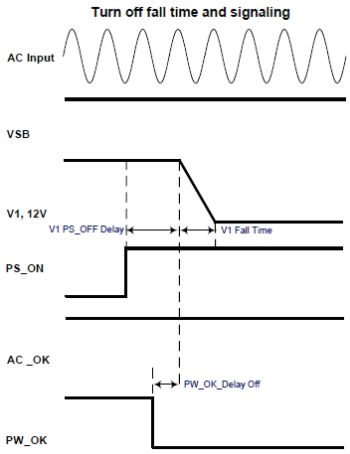
Turn-On Delay & Output Rise Time:



Time	Min	Max
12Vsb Rise time; from 10% to 90% output Vdc nominal	100ms	200ms
3.3Vsb and 5Vsb Rise time; from 10% to 90% output Vdc nominal	1ms	25ms
V1 Rise time; ; from 10% to 90% output Vdc nominal	0.1ms	120ms
Vsb Power-on-delay		2700ms
V1 Power-on-delay		3000ms
V1 PS_ON delay	100ms	150ms
V1 PWOK delay	10ms	40ms
ACOK detect (AC_OK_Delay)	300ms	1,500ms

1. The turn-on delay after application of AC input within the operating range shall as defined in the following tables.
2. The output rise times shall be measured from 10% of the nominal output to the lower limit of the regulation band as defined in the following tables.

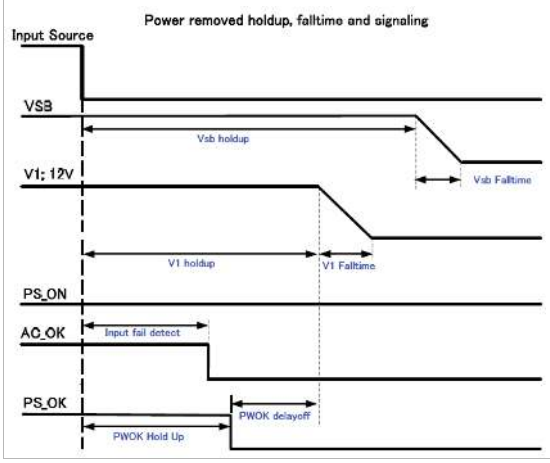
Turn-Off (Shutdown by PS_ON)



Turn-Off Timing	Min	Max	Notes
V1 Fall time	-	-	Must be monotonic
V1 PS_OFF delay	0ms	5ms	
PW_OK delay off	0.5ms		

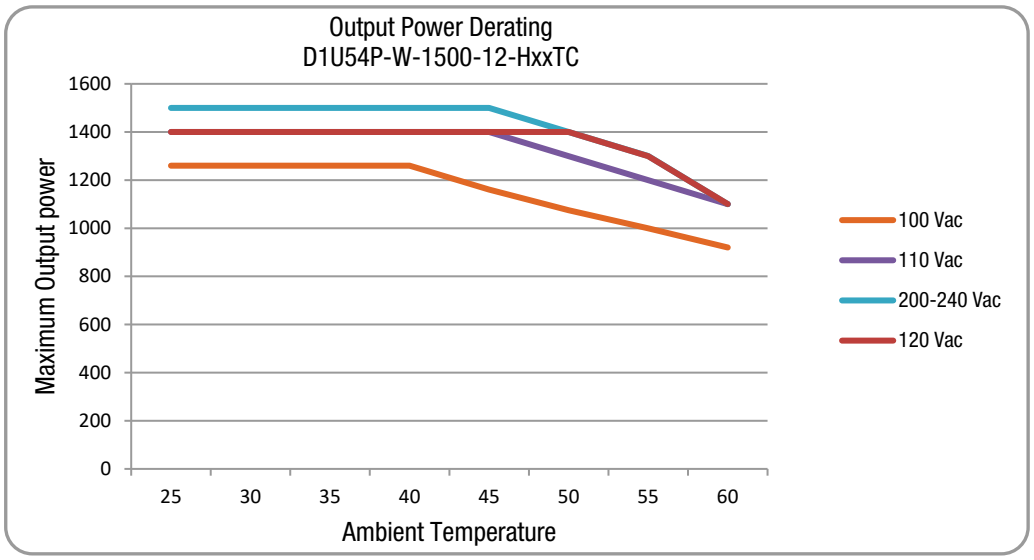
Note this characteristic is applicable for the main 12Vdc output shutdown from PS_ON pulled high (de-asserted).

Power Removal Holdup



Power Removal Timing	Min	Typ.	Max	Notes
Vsb holdup	40ms		-	
V1 holdup	12ms		-	Full load (1500W)
Input fail detect	2ms		-	
PWOK delay off	0.5ms	1.7ms		

DERATING CURVES

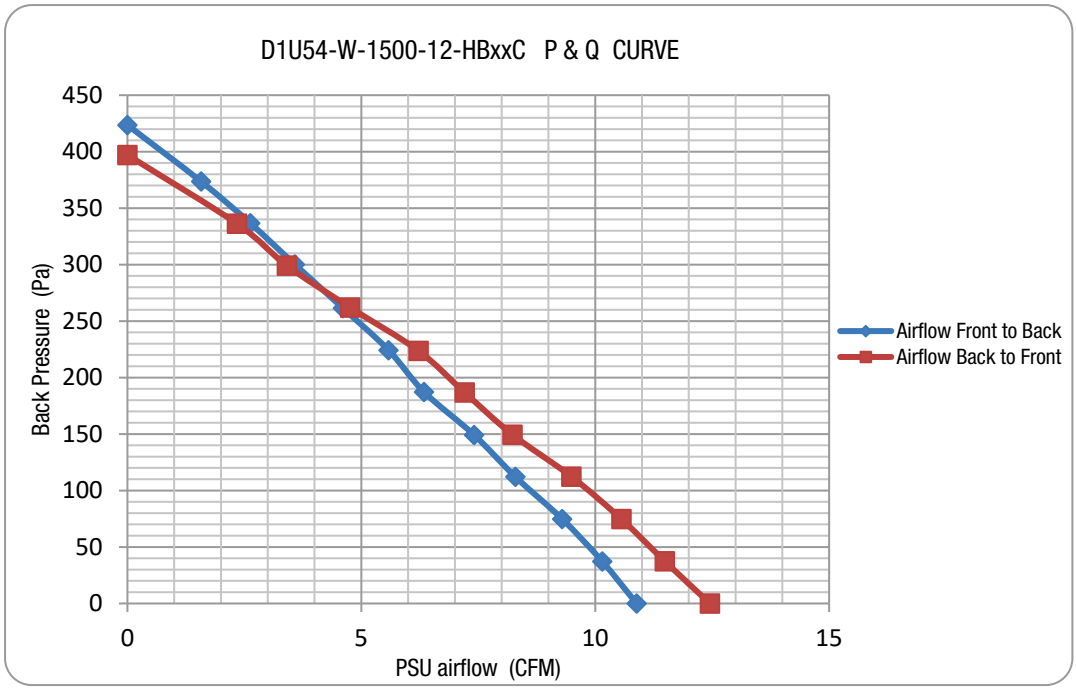


[1] Input current must be limited by end user to 12A for North American certification

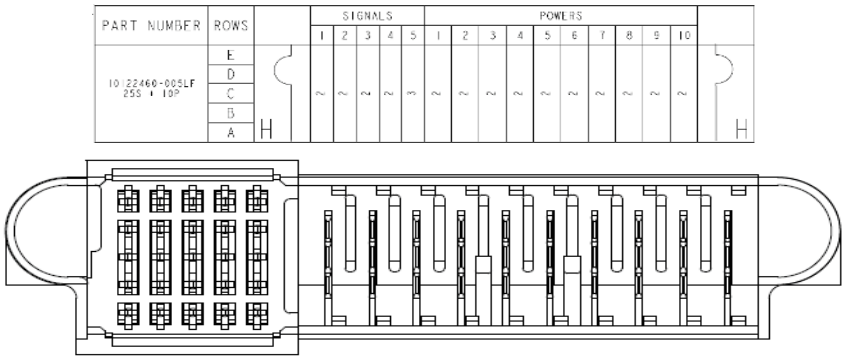
[2] The power supply has no limitation on its output current/power in the respect of meeting the operating conditions shown by the derating limits shown above. It is the responsibility of the end user to ensure operating conditions are maintained within their safety agency certification limits to assure safe and reliable operation

[3] Intake air temperature based on stand-alone power supply module operated in free airflow environment. Airflow conditions imposed by host/system may impact results

AIRFLOW CHARACTERISTICS



OUTPUT CONNECTOR & SIGNAL INTERFACE

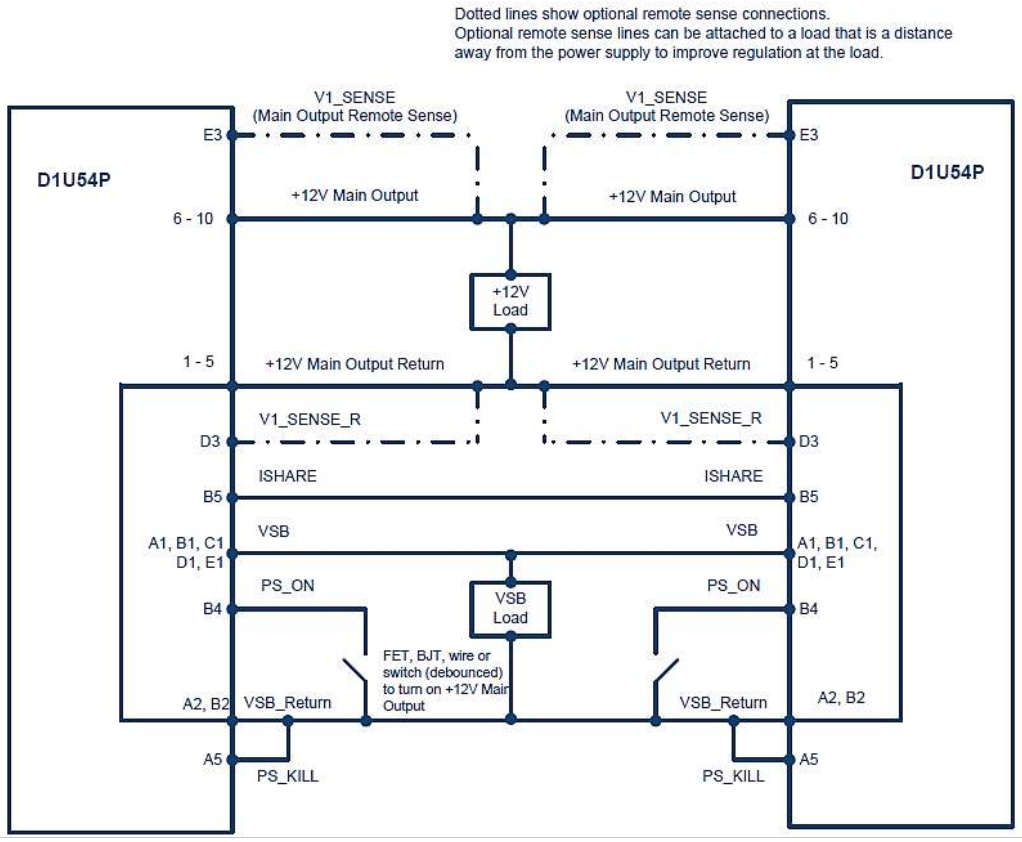


Note: With respect to signals columns 5, “3” refers to the shortest level signal pi; the “shortest” pins are the “last to make, first to break” in the mating sequence.

PIN ASSIGNMENTS - D1U54P-W-1500-12-HxxTC		
FCI PN 10122460-005LF (Power Supply)		
Pin	Signal Name	Comments
6, 7, 8, 9, 10	V1	+ 12V main output
1, 2, 3, 4, 5	PGND	+ 12V main output return
A1	VSB	Standby output
B1	VSB	Standby output
C1	VSB	Standby output
D1	VSB	Standby output
E1	VSB	Standby output
A2	VSB_return	Standby return
B2	VSB_return	Standby return
C2	Unused	No User Connection
D2	Unused	No User Connection
E2	Unused	No User Connection
A3	ADDR	I2C address selection, (select by external pull down resistor)
B3	unused	No User Connection
C3	SDA	I2C data signal line
D3	V1_SENSE_R	- Remote Sense return
E3	V1_SENSE	+ Remote Sense
A4	SCL	I2C clock signal line
B4	PS_ON	Remote On/Off
C4	SMB_ALERT	I2C alert signal
D4	Unused	No User Connection
E4	ACOK	AC input OK
A5	PSKILL	Power supply kill, short pin
B5	ISHARE	Current share bus, short pin
C5	PWOK	Power OK, short pin
D5	Unused	No User Connection
E5	PRESENT_L	Power supply present, short pin

MATING CONNECTOR	
Part Number	Description
Tyco Electronics 2-1926739-5	Right Angle
FCI 10108888-R10253SLF	Right Angle

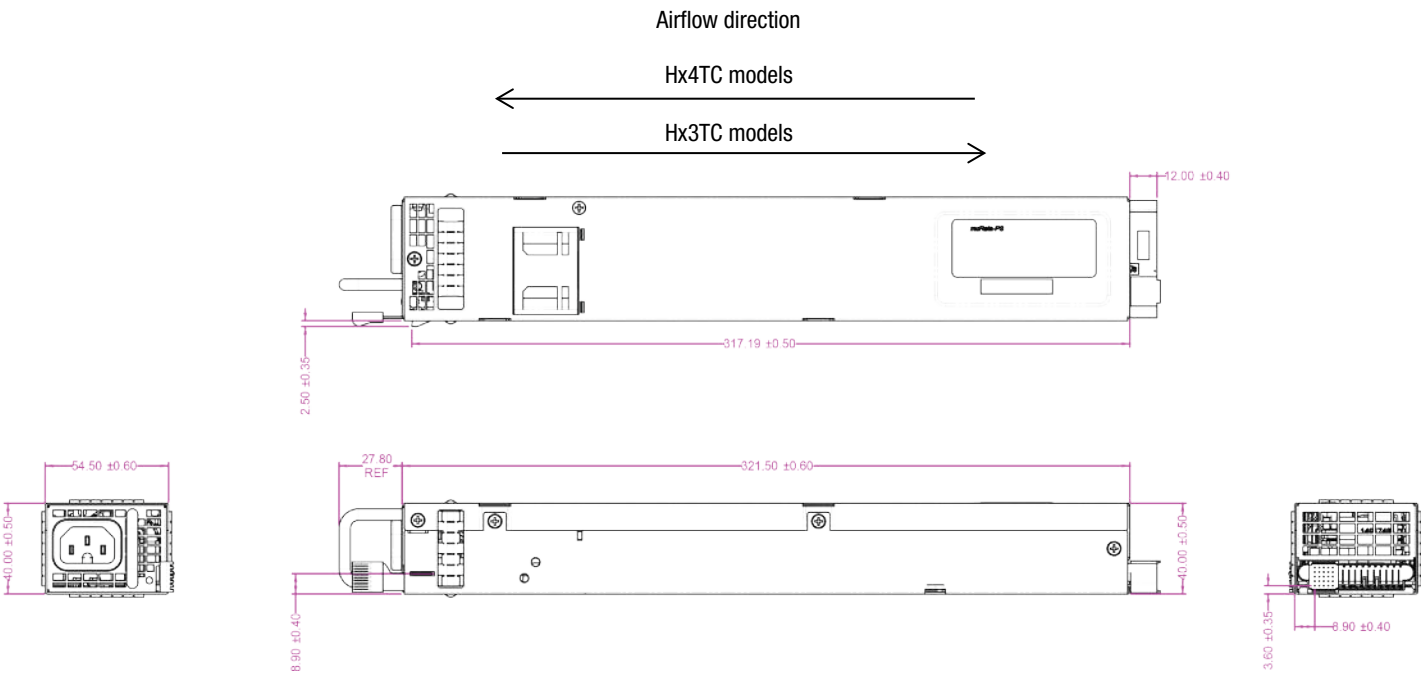
WIRING DIAGRAM



CURRENT SHARING NOTES

1. Main Output: Current sharing is achieved using the active current share method.
2. Current sharing can be achieved with or without the remote (V_SENSE) connected to the common load.
3. +VSB Outputs can be tied together for redundancy but total combined output power must not exceed the rated standby power of a single unit. The +VSB output has an internal ORING MOSFET for additional redundancy/internal short protection.
4. The current sharing pin B5 is connected between sharing units (forming an ISHARE bus). It is an input and/or an output (bi-directional analog bus) as the voltage on the line controls the current share between sharing units. 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 the voltage on the pin (and the common ISHARE bus would read 8VDC at 100% load (power module capability). For two units sharing the same load this would read 4VDC for perfect current sharing (i.e. 50% power capability per unit).
5. The load for both the main 12V and the VSB rails at initial startup shall not be allowed to exceed the capability of a single unit. The load can be increased after a delay of 3sec (minimum), to allow all sharing units to achieve steady state regulation.

MECHANICAL DIMENSIONS



1. AC input connector: IEC 60320-C16
2. This illustration or rendering of an actual power module for the purpose of providing outline dimensions and may not show cosmetic details such as molded part markings such as the visible surface of the fan, output connector, and screw head pattern for example.
3. Dimensions: 54.5mm x 321.5mm x 40.0mm [2.15" x 12.657" x 1.575"]; metric measurements take precedent
4. This drawing is a graphical representation of the product and may not show all fine details.
5. Reference File: D1U54P-W-1500-12-HxxC Drawing for Product Datasheet dated 20180507.dwg

OPTIONAL ACCESSORIES

Description	Part Number
12V D1U54P Output Connector Card	D1U54P-12-CONC

APPLICATION NOTES

Document Number	Description	URL Link
ACAN-64	D1U54P Output Connector Card	Link to: ACAN-64
ACAN-66	D1U54P-W-1500-12-HxxTC PMBus Protocol	Link to: ACAN-66

Murata Power Solutions, Inc.
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ISO 9001 REGISTERED

This product is subject to the following operating requirements and the Life and Safety Critical Application Sales Policy:
Refer to: https://www.murata-ps.com/requirements/