D1U74T-W-1600-12-HB4AC

73.5mm CRPS-185 1U Front End AC-DC Power Supply

PRODUCT OVERVIEW

D1U74T-W-1600-12-HB4AC is a 1600W highly efficient Intel® CRPS-185 compliant front-end power supply module that provides a 12Vdc Main Output, capable of active current sharing and a standby output.

This power supply provides robust fault-protection, comprehensive hardware status signals with corresponding LED indication, and a PMBus ™ 1.2 compliant digital communications bus.

The compact 48W/cubic inch low profile packaging make this power supply ideal for deployment in servers, workstations, storage systems and other 12V distributed power architectures that require reliable, efficient power.

FEATURES

- Complies with Intel® CRPS-185 73.5mm x 185.0mm x 40.0mm (2.89" x 7.28" x 1.57")
- Compact Package >48W/IN³: 73.5mm x 185.0mm x 40.0mm (2.89" x 7.28" x 1.57")
- 12V Main Output, 12V standby output:
  - 1600W 200-240Vac/240Vdc[1] Nom.
  - 1000W 100-127Vac Nom.
- IEC60320-C14 AC input connector
- Card Edge DC Output and Signal Interface; CRPS compliant alignment height of 8.5mm
- 0°C +55°C Operating temperature (sea-level) without derating
- ≥96% efficiency at 50% load
- 12Vdc 3A Standby output
- N+1 redundancy; Active current sharing (main 12Vdc)
- Integral ORING isolation devices for both outputs
- Overvoltage, overcurrent, overtemperature fault protection
- Internal cooling fan, variable speed controlled

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

ORDERING GUIDE

Part Number	Total Output Power[1] (Vin Nom.)		Main Output	Standby Output	Airflow Direction
	200-240Vac	100-127Vac			
D1U74T-W-1600-12-HB4AC	1600W	1000W	12Vdc	12Vdc	Back to Front

[1]Includes Standby Output power

INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Nom.	Max.	Units
Input Operating Range	High Line	180	200-240	264	Vac
	Low Line	90	100-127	140	Vac
	HVDC[1]	180	240	300	Vdc
Input Current	High Line (200-240Vac)			9	A
	Low Line (100-127Vac)			11	A
	HVDC (240Vdc)			8	A
Input Source Frequency		47	50-60	63	Hz
Inrush Current	Cold start @ 264Vac[2]			35	Apk
Power Factor[4]	230Vac, 50Hz, 100% Load	0.95	0.99		W/VA
Efficiency, 230Vac Vin, excludes fan load CLEAResult 80 Plus® Certified Titanium[3]	10% load	90			%
	20% load	94			
	50% load	96			
	100% load	91			

[1] Where regional safety regulations permit
[2] Excludes EMI filter capacitors
[3] Planned submission
[4] Complies with Plug Load Solutions 80+ PF requirements for Titanium level

OUTPUT VOLTAGE CHARACTERISTICS

Output	Parameter	Conditions	Min.	Typ.	Max.	Units
12V	Output Set Point Accuracy	50% load; Tamb =25°C	12.08	12.20	12.32	Vdc
	Line and Load Regulation[2]	Measured at power supply module side of connector	11.59	12.20	12.81	Vdc
	Ripple Voltage & Noise[1,2]	10Hz - 20MHz Bandwidth; Min Load Capacitance			120	mVp-p
	Output Current (Continuous)	1600W (180-264Vac)	1		133	A
		1000W (90-140Vac)	1		83	A
	Load Capacitance		2,000		50,000	µF
12VSB	Output Set Point Accuracy	50% load; Tamb =25°C	11.95	12.20	12.45	Vdc
	Line and Load Regulation[3]	Measured at power supply side of connector	11.59	12.20	12.81	
	Ripple Voltage & Noise[1,3]	20MHz Bandwidth; Min Load			120	mVp-p
	Output Current		0.1		3	A
	Load Capacitance		100		3,100	µF

[1] Measured with 0.1µF of ceramic capacitance and 10µF of tantalum capacitance on each of the power supply outputs via a short coaxial cable to the scope input. Minimum output bus capacitance specified is applied. Switching ripple can be reduced further by adding 2,200uF low ESR electrolytic capacitor (or equivalent) in parallel.
[2] Minimum Load of 1A to comply with these limits.
[3] Minimum load of 0.1A to comply with these limits

OUTPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Dynamic load response	60% step load, >5A output load, 2.5A/µs, 1,000µF to 3x 2,200µF output load capacitance	11.59		12.81	Vdc
Current sharing accuracy	50-100% (of full load per power supply; steady state load) 20-50% (of full load per power supply; steady state load)		±5 ±10		%
Hold-up time	70% load	10			ms

PROTECTION CHARACTERISTICS

Output	Parameter	Conditions	Min.	Typ.	Max.	Units
Ambient	Overtemperature[2,3]		60		70	°C
Main 12V	Overcurrent (high line)	Latches[1] after 20 sec		160		A
		Latches[1] after 50-100ms		175.4		A
		Latches[1] after 10-100µs		219		A
	Short-Circuit	Latching[1]; % full load, immediate shutdown	>160			%
	Overvoltage	Latching[1]	13.5		14.5	VDC
12VSB[4]	Overcurrent	Automatic recovery, >10ms after removal of fault condition		3.8		A
	Short-circuit	Immediate shutdown, automatic recovery after removal of fault condition	9			A
	Overvoltage	Automatic recovery after removal of fault condition	13.5		14.5	Vdc
Fuse	Single 20A, 420V fast acting fuse, located in the input “Line” (Hot)					

[1] Latch-off state requires elimination of fault condition and recycling either the AC input or PSON# to resume operation

[2] Operating the power supply above the maximum specified operating temperature is considered an abnormal condition, may negatively impact power supply and is not recommended

[3] As reported by the internal power supply PMBus intake air temperature sensor

[4] A fault on any output other than 12VSB does not cause the 12VSB output to turn off

ENVIRONMENTAL CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Storage Temperature Range		-40		70	°C
Operating Temperature Range[1]	1600W (180-264Vac) Continuous	0		55	
	1000W (90-140Vac) Continuous	0		55	
Humidity	Operating; non-condensing	5		85	%
	Non-operating; non-condensing	5		95	
Altitude Operating	Derate 1°C per 304M to simulate the effects of altitude imposed on the power supply cooling system	-50		3050	M
Altitude Non-Operating		-50		15,200	
Shock	non-operating			30	G
Operational Vibration	Sine sweep; 5-500Hz			0.5	
	Random vibration, 5-500Hz			3.13	G
MTBF	Tamb = 55°C; 75% Load; nominal AC input	250K			Hrs.
Operating Life	Tamb = 55°C; 20% time at 20% load; 80% of the time at 80% load; nominal AC input	5			Years
Weight			1.03		Kg
Input Fuses	Internal (not user replaceable), single, fast-blow axial 16A 420V fuse, in series with input Line (L)				

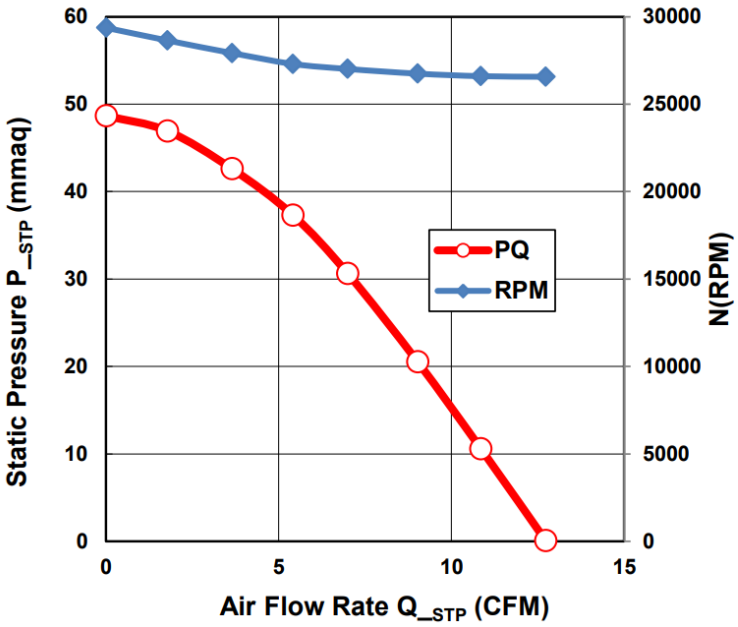
[1] Based testing power supply in free air. Installation within the end user system may produce differing results due to backpressure imposed by the system

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

AIRFLOW CHARACTERISTICS

P-Q Curve



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/EN55032	Class A
ESD Immunity	IEC/EN 61000-4-2	±8KV Contact; ±15KV air discharge; Criteria B[2]
Radiated Field Immunity	IEC/EN 61000-4-3	3V/m, 1KHz, 80% AM, 80MHz to 1GHz Criteria A[2]
Electrical Fast Transients/Burst Immunity	IEC/EN 61000-4-4	Level 3 (2kV), criteria B[1,2]
Surge Immunity	IEC/EN 61000-4-5	Level 3 (2kV Line-Earth, 1kV Line-Line), criteria A[1,2]
RF Conducted Immunity	IEC/EN 61000-4-6	Level 2 (3V/M) criteria A[2]
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)
Safety Approval Standards	UL62368-1: 2014 (2ND Edition) (Information Technology Equipment – safety Part 1: General Requirements) CAN/CSA-C22.2 No.62368-1: 2014 (2nd Edition) (Information Technology Equipment – Safety – Part 1: General Requirements) TUV: EN 62368-1-2014 (2ND Edition) CQC: GB4943.1-2011 BSMI: CNS14336-1 EAC: IEC 60950-1: 2005, AMD1:2009, AMD2:2013 KC: K60950-1 (2011-12) IRAM: IEC 60950-1: 2005, 1:2009, AMD2:2013 BIS: IEC 60950-1:2005, AMD1:2009, AMD2:2013 CB: IEC 60950-1:2005, AMD1:2009, AMD2:2013 CB: IEC 62368-1-2014 (2ND Edition)	

[1] measured at power supply's AC input connector
[2] Installed in system

STATUS LED (SINGLE, BI-COLOUR, AMBER/GREEN)

PSU Status	LED Status
Output on and okay	Green
Input Voltage not present	Off
Standby state; Input voltage present; Main Output off, VSB on	1Hz Blink Green
Power supply is in cold standby state or always standby state as defined in the Cold Redundancy section of CRPS Common Requirement Specification	1Hz Blink Green
NO Input Voltage present, however, Input voltage is applied to a parallel connected power supply	Amber
Power supply critical fault events causing a shutdown: overcurrent, short circuit, overvoltage, fan fault, over temperature	Amber
Power supply warning event where the power supply continues to operate high temperature, high power, high current, slow fan	1 Hz Amber
Power supply firmware updating	2Hz Blink Green

STATUS AND CONTROL SIGNALS

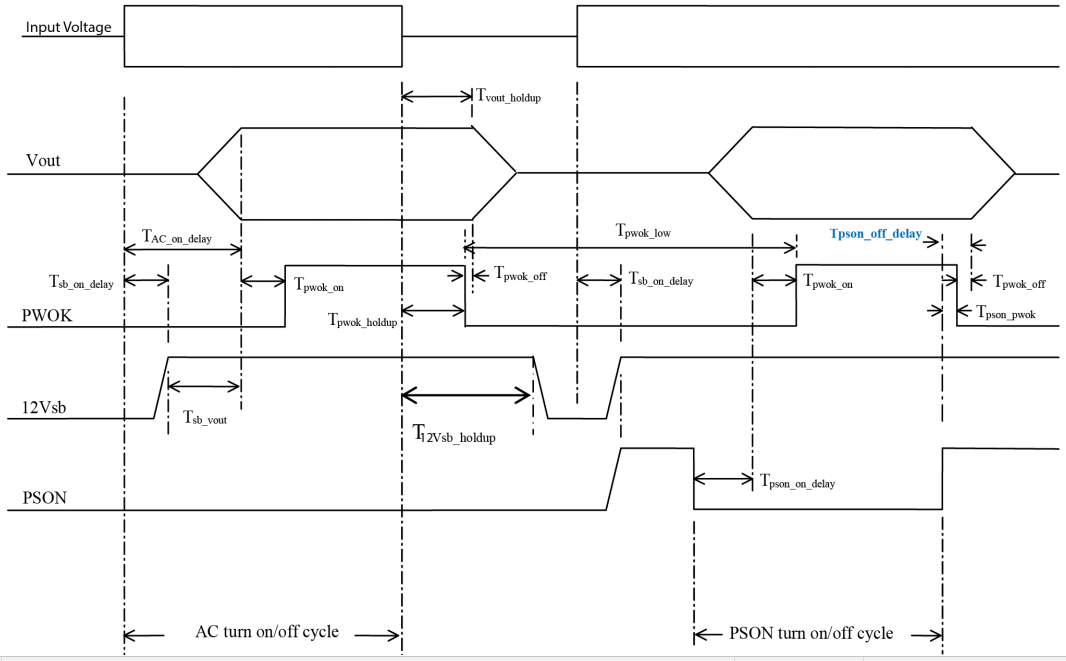
Signal Name	I/O	Description	Interface details
PWOK	O	This signal is pulled high to indicate all the outputs are within the regulation limits.	Open Collector[1,4] Source current: 2mA max. Sink Current: 0.4mA max. Rise/Fall time: 100uS max.
VIN_GOOD	O	This signal is an output that indicates input source power is present and within operating limits	Pull-up: 2K OHM [1,2]
SMBALERT#	O	SMBALERT# is a PMBus™ 1.2 complaint signal driven low to alert the system that a warning/fault[6] occurred.	pull-up: 10k OHM[1,4] Source current: 4mA max. Sink Current: 50uA max. Rise/Fall time: 100uS max.
PRESENT_L	O	Used by the host system to detect the presence of an installed PSU. This signal is connected to GND/+12V RTN within the power supply	
PSON#	I	Provides main 12V output on/off control; "ON" when single is pulled low (≤1Vdc) and "OFF" when not pulled low	pull-up: 10K OHM[1,2] Source current: 4mA max.
A0 & A1	I	Internal slave device address selection settings required for digital communications. Slave Address (hex) PSU µP / EEPROM / A1 pin state / A0 pin state B0h / A0h / Low / Low B2h / A2h / Low / High B4h / A4h / High / Low B6h / A6h / High / High	Each pulled up: 10K OHM[1,5]
SCL	I/O	Serial clock input to PSU compatible with PMBus™ 1.2.	pull-up: 2K OHM[1,2]
SDA	I/O	Bi-directional serial data line compatible with PMBus™ 1.2.	pull-up 2K OHM[1,2]
12VRS + 12VRS -	I	These signal pins can be connected at system side of load to provide up to +/-200mV compensation for Main Output voltage drop due to load connections. PSU will not be damaged by Incorrect polarity connection (however, PSU may shut down to protect itself).	
ISHARE	I/O	This signal is an analogue DC voltage that forms a common ISHARE bus with all parallel connected PSUs within the host system and changes in proportion to load. Each PSU uses this signal to control the PSU bus voltage thereby maintaining current share performance. The DC bus voltage for a single PSU @ 100% high line full load is 8Vdc and 4Vdc for two PSUs sharing the same load equally.	Analogue voltage: 0 to +8V
CR	I/O	CR signals from all load sharing power supply modules can be tied together to form a common "Cold Redundancy" bus and is required for cold redundant operation. Complies with CRPS Common Requirement Specification. This bus functions as follows: • Pull-up bus voltage: Bus pull-up is provided by the single PSU assigned the roll of "COLD_REDUNDANT ACTIVE". Only the PSU assigned this roll provides the pull-up path and is why this PSU is referred to as the "Master". • Each bus connected PSU drives the CR signal low when any fault is detected. • Each bus connected PSU powers on its Main Output rapidly within 100µS after detection of LOW state.	Pulled 680R to internal bias supply voltage of the ACTIVE & MASTER PSU; Pull-Down = 40K OHM.

Signal Related Notes:

1) Pulled up to the 3.3Vdc rail, which is derived from VSB and an internal housekeeping rail ("diode ORed") and is compatible with the voltage levels of TTL and CMOS logic families.
2) Logic high: 2.1Vdc to 3.46Vdc; logic low: 0 to 0.8Vdc
3) Pulled down to VSB return.
4) Logic high 2.4Vdc to 3.46Vdc; A logic low is 0 to 0.4Vdc
5) Logic high 2.4Vdc to 3.57Vdc; A logic low is 0Vdc to 0.4Vdc
6) This product supports "SMBALERT_MASK" providing flexibility for System/Host to configure Fault/Warning bits SMBAERT# supports. Refer to the Intel® CRPS -185 specifications for additional details.

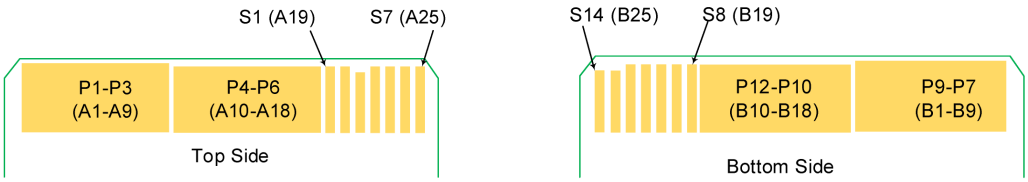
TIMING CHARACTERISTICS

Timing Diagram



ITEM	DESCRIPTION	MIN	MAX	UNITS
Tvout_rise	Output voltage rise time for 12V and 12VSB from 10% to within regulation limits	10	70	ms
Tsb_on_delay	Delay from Input Voltage being applied to 12VSB being within regulation	-	1500	ms
Tac_on_delay	Delay from Input Voltage being applied to all output voltages being within regulation	-	3000	ms
Tvout_holdup	Time that the 12V output voltage remains within regulation after loss of Input Voltage Note: for 70% of rated load only	11	-	ms
Tpwok_holdup	Delay from loss of Input Voltage to de-assertion of PWOK Note: for 70% of rated load only	10	-	ms
Tpson_off_delay	Delay from PSON# de-asserted to power supply turning off	-	5	ms
Tpson_on_delay	Delay from PSON# active to output voltages within regulation limits	5	400	ms
Tpson_pwok	Delay from PSON# deactivate to PWOK de-assertion	-	5	ms
Tpwok_on	Delay from output voltages within regulation limits to PWOK assertion at turn on	100	500	ms
Tpwok_off	Delay from PWOK de-asserted to output voltages dropping out of regulation limits	1	-	ms
Tsb_vout	Delay from 12VSB being in regulation to outputs being in regulation, at turn on of Input Voltage	50	1000	ms
12VSB_holdup	Time the 12VSB output voltage stays within regulation after loss of Input Voltage	70	-	ms

DC OUTPUT POWER AND SIGNAL INTERFACE (POWER MODULE SIDE, CARD EDGE)



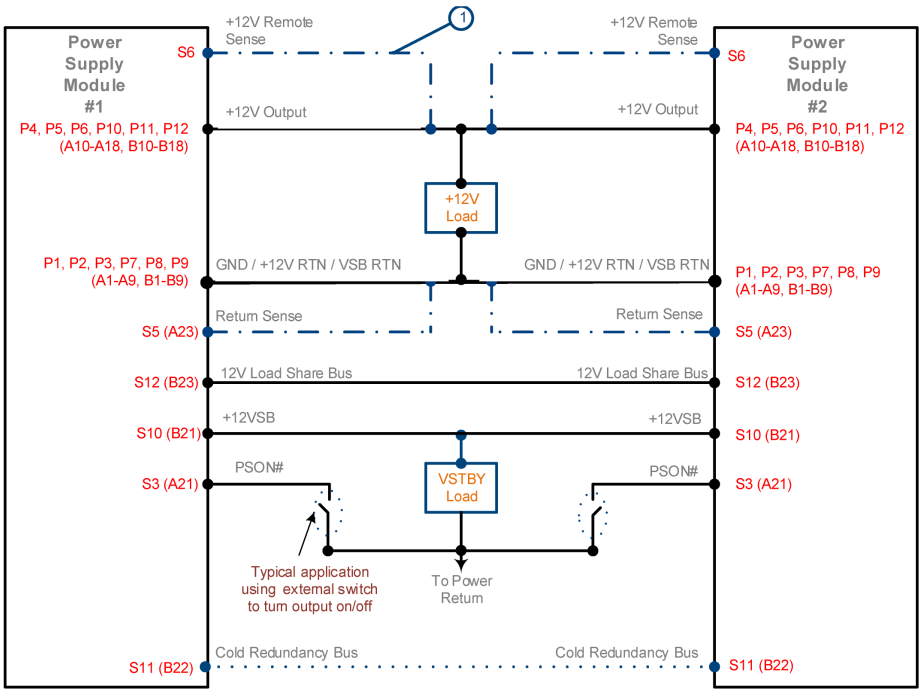
TOP-SIDE:				BOTTOM-SIDE:			
Name	High Pwr conn[2]	Regular Conn[1]	Sequence	Name	High Pwr Conn[2]	Regular Conn1	Sequence
GND/+12V RTN[1]	P1	A1	Long	GND/+12V RTN[3]	P7	B1	Long
GND/+12V RTN		A2		GND/+12V RTN		B2	
GND/+12V RTN		A3		GND/+12V RTN		B3	
GND/+12V RTN	P2	A4	Long	GND/+12V RTN	P8	B4	Long
GND/+12V RTN		A5		GND/+12V RTN		B5	
GND/+12V RTN		A6		GND/+12V RTN		B6	
GND/+12V RTN	P3	A7	Long	GND/+12V RTN	P9	B7	Long
GND/+12V RTN		A8		GND/+12V RTN		B8	
GND/+12V RTN		A9		GND/+12V RTN		B9	
+12V	P4	A10	STD	+12V	P10	B10	STD
+12V		A11		+12V		B11	
+12V		A12		+12V		B12	
+12V	P5	A13	STD	+12V	P11	B13	STD
+12V		A14		+12V		B14	
+12V		A15		+12V		B15	
+12V	P6	A16	STD	+12V	P12	B16	STD
+12V		A17		+12V		B17	
+12V		A18		+12V		B18	
PMBus SDA	S1	A19	STD	A0 (SMBus address)	S8	B19	STD
PMBus SCL	S2	A20	STD	A1 (SMBus address)	S9	B20	STD
PSON#	S3	A21	SHORT	+12VSB	S10	B21	STD
SMBAlert#	S4	A22	STD	Cold Redundancy Bus	S11	B22	STD
Return Sense	S5	A23	STD	12V Load share bus	S12	B23	STD
+12V Remote Sense	S6	A24	STD	PRESENT_L	S13	B24	SHORT
PWOK	S7	A25	STD	VIN_GOOD	S14	B25	SHORT

[1] Regular 50-pin card edge connector FCI-Amphenol model 10035388-102LF SHOWN FOR INFORMATION PURPOSES ONLY included as part of the Intel CRPS-185 specifications. However, the recommended mating connector for this power supply is the High Power Amphenol part note 2 below

[2] High power connector Amphenol model HPG12P14SRT153T

[3] GND/+12V RTN are connected internally to Chassis

WIRING DIAGRAM



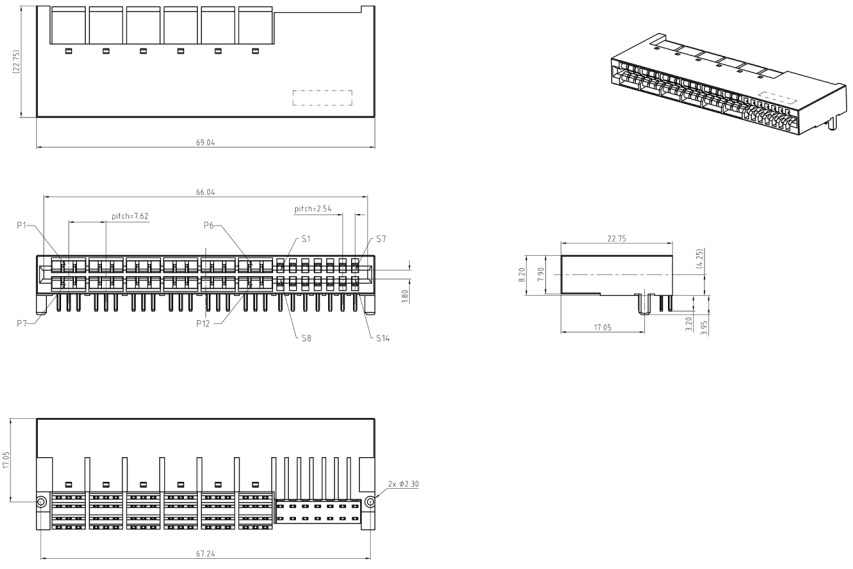
1) Dotted lines show optional remote sense connections. Optional remote sense lines can be attached to a load that is a distance away from the power supply to improve regulation at the load

Current Sharing Notes

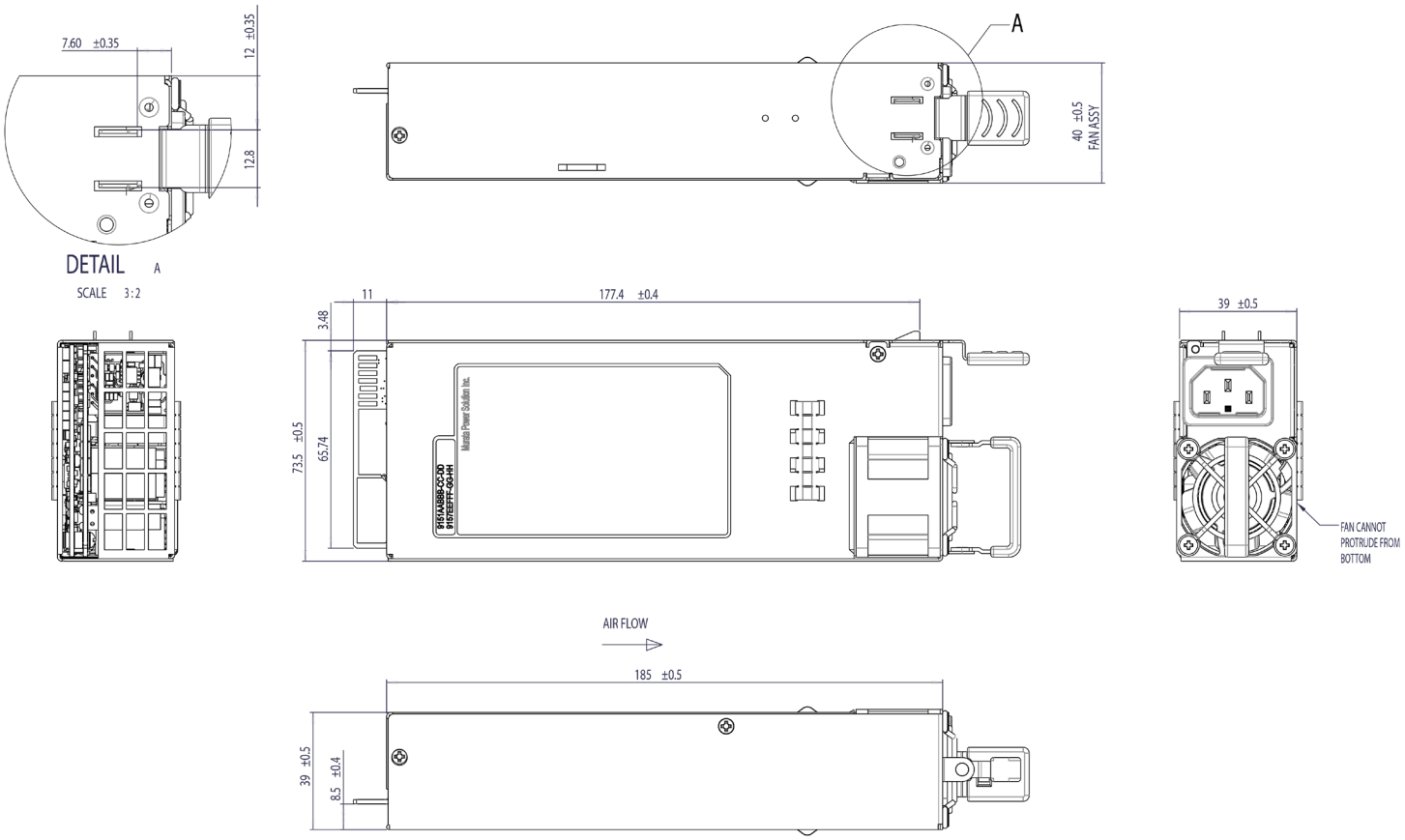
1. Main Output: Current sharing is achieved using the active current share method
2. Current sharing can be achieved with the +12V Remote Sense and Return Sense connected to the common load
3. The 12V Output and 12V STBY output has an internal ORING MOSFET for additional redundancy/internal short protection
4. The current sharing pin is connected between sharing units (forming an ISHARE bus). It is an input and/or an output (bi-directional analogue 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 approximately 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 assertion of PWOK signal, to allow all sharing units to achieve steady state regulation

MATING SIDE OUTPUT CONNECTOR

Compatible With FCI Amphenol HPG12P14SRT153T



MECHANICAL OUTLINE



1. AC input connector: IEC 60320-C14 (Schurter 6100.4110)
2. This drawing is a graphical representation of the product and may not show all fine details. Please contact Murata for 3D model for details
3. Dimensions in mm
4. Subject to change. Contact factory for latest version
5. Reference drawing # D75090058221 rev. 1

OPTIONAL ACCESSORIES

Description	Part Number
D1U74T-12-CONC2.7K	Connector Interface Card

APPLICATION NOTES

Document Number	Description	URL Link to Application Note
ACAN-111	PMBus Protocol	Link to ACAN-111
ACAN-123	D1U74T-12-CONC2.7K Connector Interface Card	Link to ACAN-123

Murata Power Solutions, Inc.
129 Flanders Rd. Westborough,
Ma 01581, USA.
ISO 9001 REGISTERED

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