D1U86T-W-1600-12-HBxC Series

86mm 1U Front End AC-DC Power Supply

Murata Power Solutions

FEATURES

- 96% minimum at 50% load (80PLUS® Titanium level 230Vac Internal)
- Cold Redundancy "active standby" capability
- "Black-Box" data-logging capability
- 12Vdc output; output current 133A continuous
- Nominal Dimensions[1]: 86.3mm (W) x 196.5mm (L) x 39.3/40.0mm (H)[1]
- 38.6 Watts per cubic inch density (W/in^3)
- 12VStandby output
- N+1 redundancy, including hot swap capability; up to 4 power modules may be operated in parallel
- Integral ORing MOSFETS, both outputs
- Active current sharing, main output, droop sharing Vstandby
- Overvoltage, overcurrent, over temperature protection
- Single internal cooling fan (variable speed)
- PMBus™ 1.2 digital communications reports status, monitoring and control features
- RoHS2 compliant
- Standard IEC60320 -C14 AC inlet connector
- HVDC input operation (192-288Vdc nominal)[2]

[1]Max height is 40mm dictated by the fan; however the chassis overall height is 39.3mm; see Mechanical Outline for details
[2] Where country regulations permit, i.e. China

PRODUCT OVERVIEW

D1U86T-W-1600-12-HBxC is a series of highly efficient power factor corrected front end power supplies featuring a 12Vdc (Main), and 12Vdc Standby output.

Both model variants provide active current sharing, multifunctional status LED, hardware logic signals and PMBus™ digital communications, and support cold redundant system applications.

The low profile 1U, 38.6W/cubic inch package make this series ideal for delivering reliable, efficient power to servers, workstations, storage systems and other 12V distributed power architectures.

ORDERING GUIDE

Model Number	Murata Part Number	Output power & Nominal Input Voltage		Main Output	Standby Output	Airflow
		100-120Vac	200-240Vac			
D1U86T-W-1600-12-HB3C	MPS8178	1000W	1600W	12.2Vdc	12.2Vdc	F⇨B
D1U86T-W-1600-12-HB4C	MPS8176					B⇨F

INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Nom.	Max.	Units
Input Source Voltage AC Operating Range	High Line	180	200-240	264	Vac
	Low Line	90	100-120	132	Vac
Input Source Voltage DC Operating Range		180	192-288	300	Vdc
Input (AC) Source Frequency		47	50-60	63	Hz
Turn-on Input Voltage	Ramp up	83	85	89	Vac
Turn-off Input Voltage	Ramp down	75	80	83	
Turn-on Input Voltage	Ramp up	152	157	162	Vdc
Turn-off Input Voltage	Ramp down	140	145	149	
Maximum current at Vin = 90Vac/60Hz					Arms
Inrush Current	Cold start @ 264Vac			35	Apk
Power Factor	200/240Vac nominal FL	0.95	0.99		W/VA
Efficiency (230Vac), excluding fan load 80 Plus® Certification planned.	10% load		90		%
	20% load		94		
	50% load		96		
	100% load		91		

OUTPUT VOLTAGE CHARACTERISTICS

Output	Parameter	Conditions	Min.	Typ.	Max.	Units
12V	Output Setpoint	50% load; Tamb =25°C	12.08	12.20	12.32	Vdc
	Line and Load Reg.[2]	Measured at PSU side of connector	11.59	12.20	12.81	Vdc
	Ripple Voltage & Noise[1,2]	20MHz Bandwidth; Min Load Capacitance			120	mV
	Output Current	1600W (180-264Vac) Continuous	1		133	A
		1000W (90-132Vac) Continuous	1		83	
	Load Capacitance		2200		50,000	µF
12VSB	Output Setpoint	50% load; Tamb =25°C	11.95	12.20	12.45	Vdc
	Line and Load Reg.[3]	Measured at PSU side of connector	11.59	12.2	12.81	
	Ripple Voltage & Noise[1,3]	20MHz Bandwidth; Min Load Capacitance			120	mV
	Output Current	12Vdc Main Output Variant	0.1		3.5	
	Load Capacitance		100		3100	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 and minimum output bus capacitance specified in above table.
[2] Minimum Load of 1A to comply with these limits.
[3] Minimum Load of 0.1A to meet these limits

RoHS COMPLIANT

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

Test Certificate and Test Report

https://www.murata-ps.com/support

OUTPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Startup Time	AC ramp up; delay until Main output start			2	s
Dynamic load response	Outputs remain within regulation for the load steps: 50% load step; 1.0A/µs slew rate; 50-10kHz, 10-90% Duty Cycle Step response applicable within the load range10% to 100%.	11.59		12.81	Vdc
Current sharing accuracy	50-100% (of full load per power supply)		±5		%
	20-50% (of full load per power supply)		±10		
Hot Swap Transients	All outputs remain in regulation	-5		+5	
Holdup Time	230-240Vac, 100% load	10			ms
	230-240Vac, 50% full load	20			ms

ENVIRONMENTAL CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Storage Temperature Range		-20		70	°C
Operating Temperature Range (Sea Level)	1600W; B⇨F Airflow	0		55	
	1600W F⇨B Airflow	0		50	
Humidity	Operating; non-condensing	5		85	%
	Operating; non-condensing			95	
Altitude Operating (Derating TBA as applicable)		-50		5000	m
Altitude Non-Operating		-50		15,240	
Shock	non-operating			30	G
Operational Vibration	Sine sweep; 5-150Hz			2	
	Random vibration, 5-500Hz			1.11	
MTBF	Per Telcordia SR-332 Issue 3, M1C3	200K			Hrs.
Safety Approval Standards	UL60950-1, 2nd Edition, 2014-10-14 (Information Technology Equipment – safety - Part 1: General Requirements). CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014-10 (Information Technology Equipment – safety - Part 1: General Requirements). TUV: EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + A2:2013 IEC 62368-1:2014 (CB) BSMI: CNS13438 (95 version), CNS14336-1 (99 version) CQC: GB17625.1-2012, GB4943.1-2011, GB/T9254-2008 (Class A) KC: K60950-1(2.0)(2011-12) BIS: IS 13252 (Part 1): 2010 + A1:2013 + A2:2015/IEC 60950-1:2005 + A1: 2009 + A2:2013				
Input Fuse	Single 16A fast acting fuses; located in the input “line”.				
Weight	1.18kg				

PROTECTION CHARACTERISTICS

Output Voltage	Parameter	Conditions	Min.	Typ.	Max.	Units
	Over temperature (intake)	Shutdown and auto-recovery, main output (B⇨F Airflow)	60	65	70	°C
		Shutdown and auto-recovery, main output (F⇨B Airflow)	55	60	65	°C
Main 12V	Overvoltage	Main 12V Output; latching[1] (12VSB maintains operation)	13.5		15.0	Vdc
	Undervoltage	Latching1, <1ms	10		11	
	Short-circuit	Latching[1]; percentage of full load, immediate shutdown	>160		-	%
	Overcurrent (Low line/ high line)	Latching [1] after 20sec	99.6/159.6		-	A
		Latches [1] after 20ms	116/186.2		-	A
12VSB	Overvoltage	Latching [1] Both outputs	13.3		15.0	Vdc
	Overcurrent	Hiccup for both outputs after 20sec	4.0		4.50	A
		Hiccup for 12VSB after 15mS	4.5		-	
	Under voltage protection	Latching, <1ms	10		11	Vdc

[1] Latch-off requires elimination of fault condition and then recycling either the AC input or PS_ON re-cycle or PMBus “Clear Faults” command to resume operation

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/EN55032	Class A with 6dB margin[3];
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[2]
Electrical Fast Transients/Burst	IEC/EN 61000-4-4	Level 2 (1kV), criteria A[1]
Surge Immunity	IEC/EN 61000-4-5	Level 4 (4kV Line-Earth, 2kV Line-Line), criteria A[1]
RF Conducted Immunity	IEC/EN 61000-4-6	Level 2, 3Vrms, 1KHz, 80% AM, 150kHz to 80MHz criteria A
Magnetic Field Immunity	IEC/EN 61000-4-8	1A/m criteria A
Voltage Dips, Interruptions	IEC/EN 61000-4-11	230Vin, 100% load, Phase 0°, Dip 100% Duration 10ms (Criteria A) 230Vin, 50% load, Phase 0°, Dip 100% Duration 20ms (VSB: Criteria A, V1:Criteria B) 230Vin, 100% load, Phase 0°, Dip 100% Duration > 20ms (VSB, V1: Criteria B)

[1] Measured at power supply's AC input connector
[2] Installed in End User system and contingent upon final system design
[3] Radiated performance designed to meet Class A limits; however contingent on deployment; final qualification and certification testing to be performed by End User in system installation

STATUS INDICATORS AND CONTROL SIGNALS (BI_COLOUR LED)	
STATUS INDICATORS AND CONTROL SIGNALS (BI-COLOUR LED)	
Condition	LED Status (Power)
Output ON and OK	Solid GREEN
No AC power to all power supplies	OFF
AC present / Only 12VSB on (PS off)	0.5Hz Blinking GREEN
Sleep PS in Smart redundant state / Off line mode	2Hz Blinking GREEN
Standby power failed, OCP, SC, OVP and UVP. Auto-recovery when the abnormal condition is removed.	OFF
12V Fault causing a shutdown; failure, (OCP,SC, OVP/UVP), OTP, Fan Fail, Input OVP	Solid AMBER

STATUS AND CONTROL SIGNALS			
Signal Name	I/O	Description	Interface Details
VIN_GOOD	Output	This signal is an output to indicate input source power (AC and HVDC) is present and within operation limits. It shall transition from logic level high to low within 2mS (signal valid only for power dropout of VIN)	Pulled up via 1Kohm to an internal 3.3V rail. A logical level Low, 0-0.4Vdc; Isink =4mA A logical Level High, 2.4-3.46Vdc; Isource =50uA
PWOK (Output OK)	Output	This signal should be asserted high by the power supply to indicate that all outputs are within the allowed regulation limits. Conversely, this signal should be de-asserted to a low state when any of the DC outputs voltage fall below their voltage regulation limits, or when the incoming AC/HVDC source has been removed (i.e. longer than allowable by holdup). This signal must be driven low at least 1ms before any of the outputs go out of regulation. Additionally, the signal shall de-assert as a consequence of any occurrence of the following conditions: • Loss of the AC/HVDC Power Source • Fan Failure • Over Temperature (OTP) In cases of output faults such as OVP/UVP/OCP, the signal shall be driven low immediately together with the output shutdown.	Pulled up internally via 1Kohm to internal an 3.3Vdc rail A logic high 2.4-3.46Vdc; Isource =50uA A logical level Low, 0-0.4Vdc; Isink =4mA
SMB_ALERT (FAULT)	Output	This signal indicates that the power supply is experiencing an issue that the user should investigate; it shall be asserted due to Critical or Warning events. The signal shall activate in the case of critical component temperature reaching a warning threshold, AC/HVDC source loss, general failure(s) such as OCP/OVP/UVP or fan failure. This signal may also indicate the power supply is reaching its end of life or is operating in an environment exceeding the specified limits. This signal is to be asserted in parallel with the LED indicator turning solid Amber and associated Warning/Fault assertion.	Pulled up internally via 10kohm to 3.3Vdc A logic high 2.4-3.46Vdc; Isource =50uA A logical level Low, 0-0.4Vdc; Isink =4mA
PRESENT_L (Power Supply Absent)	Output	This signal pin will be tied to VSTANDBY return through a 100 ohm resistor. The resistor shall not be damaged if connected directly to a 3.3Vdc rail. It shall be a "Last Make, First Break" (LMFB) sequenced signal that indicates the "presence" of the installed power module.	100ohm to VSTANDBY Return The resistor is rated to avoid damage if connected directly to a 3.3Vdc rail.

STATUS AND CONTROL SIGNALS

Signal Name	I/O	Description	Interface Details
PSON (Main Out Enable/Disable)	In	The PS_ON signal is required to remotely turn on/off the power supply. PSON is an active low signal that turns on the Main Output. If this signal is not pulled low by the system, or left open, the Main output remains/turns off. The power supply shall provide an internal pull-up. The power module also provides de-bounce circuitry for PSON to prevent it from oscillating On/Off at startup or when activated by a mechanical switch.	Pulled up internally via 10Kohm to internal an 3.3Vdc rail A logic high 2.0 - 3.46Vdc; Isource =4mA A logical level Low, 0-1.0Vdc; Isink =400µA
PS_KILL	In	The DC main outputs, but not standby, will be disabled when the input is driven high than 2.64V or open circuit. The main outputs will be powered on or off based on PS_ON when PSKILL is low. Provisions for de-bounding will be included in the PS_KILL circuitry to prevent the power supply from oscillating On/Off at startup or when activated by a mechanical switch..	Pulled up via 10K to internal 3.3VDC A logic low <0.8Vdc
SCL (Serial Clock)	Both	A serial clock line compatible with PMBus™ Power Systems Management Protocol Part 1 – General Requirements Rev 1.2. 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.	Pulled up via 5.9K to internal 3.3VDC VIL is 0.8V maximum VOL is 0.4V maximum 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 1.2. 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.	Pulled up via 5.9K to internal 3.3VDC VIL is 0.8V maximum VOL is 0.4V maximum VIH is 2.1V minimum
V1_SENSE & V1SENSE_RTN	In	Analog input/output voltage sense lines to compensate for power path voltage drop. These low level analog signals should be isolated from digital circuit noise. When one or more remote sense lines are opened, regulation measured at the power supply output connector shall maintain the specified regulation window within ± 200mVdc. If the REMOTE SENSE+ is shorted to DC_RETURN, the 12V Main output shall enter protection and the power supply shall shut down.	Compensation for up to 0.2Vdc total connection drop (output and return connections).
ISHARE	Both	This signal is connected between sharing units forming an ISHARE bus. It is a bi-directional analog bus voltage that controls the current share between sharing units. A power module responds to changes in bus voltage but also can change the bus voltage based on the load drawn from it. For single power module, the voltage on the ISHARE signal pin (bus) would read approximately 8Vdc at 100% load. For two identical units sharing the same 100% load this would read approximately 4Vdc for perfect current sharing (i.e. 50% module load capability per unit). This signal is also used by cold redundant enabled power supplies to determine the on/off state of the Main output. Refer to ACAN-xx for details.	Analogue voltage: +8V nominal; 0.06V/A; ISHARE sink = 0.5mA (at 4.00V) ISHARE source = 4.0mA (at 4.00V)
CR_BUS	In	This signal shall be connected together at system board level to implement the cold redundant function. See PMBusTM Communications protocol ACAN-95 & 100 for detail concerning configuration of the cold redundancy feature set	
A0 Address Select	In	A single analog input is provided for the host system to set the address of the internal slave devices (EEPROM and microprocessor) for digital communications. Using this signal it is possible to provide two address combinations for different host system slots.	Pulled up internally via 10K to 3.3Vdc A logic high = 2.4 to 3.57Vdc A logic low = 0 to 0.4Vdc

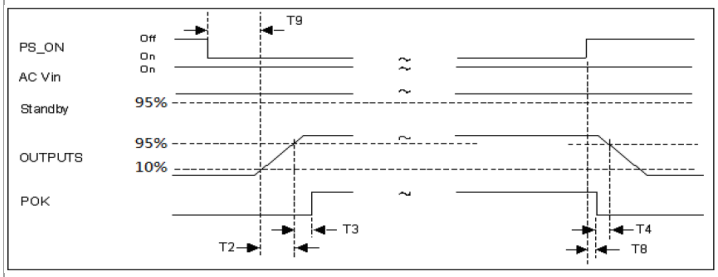
Address options:

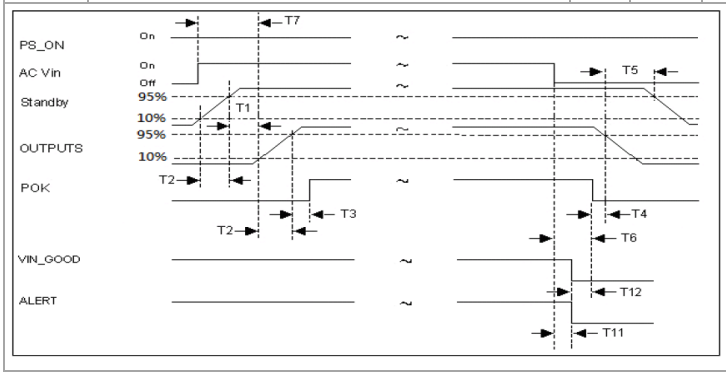
A0 Setting:	Secondary Microprocessor	External EEPROM
LOW	0xB0	0XA0
HIGH	0xB2	0XA2

TIMING SPECIFICATIONS

Time	Description	Min	Max	Unit
T1	Delay from 12VStandby regulation to 12Vdc output turn on.	5	500	ms
T2	Main 12Vdc rise time	2	20	ms
T2	12VStandby rise time	2	20	ms
T3	Delay from Main 12Vdc output within regulation to POK assertion at turn on	100	500	ms
T4	Delay from POK de-assertion to Main 54VDC dropping out of regulation	1		ms
T5	Delay from Main 12VDC out of regulation to 12VSTANDBY turn off.	5		ms

Time	Description	Min	Max	Unit
T6	Delay from loss of AC to PWOK de-assertion	10		ms
T7	Delay from application of AC on to Main 54VDC turn on		2000	ms
T8	PS_ON negation (PSU off) to PWOK negation		2	ms
T9	PS_ON (PSU on) to output established		350	ms
T11	Delay from VIN drop out to VIN_GOOD negation & SMBAlert assertion		2	ms
T12	Delay from VIN GOOD to PWOK	1		ms



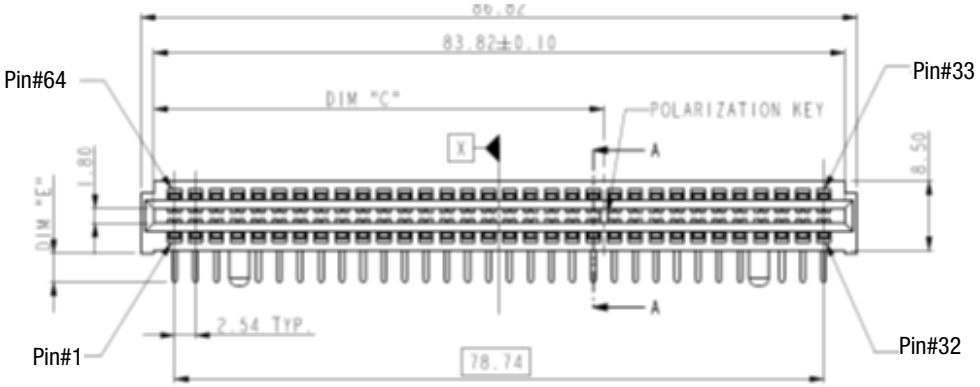


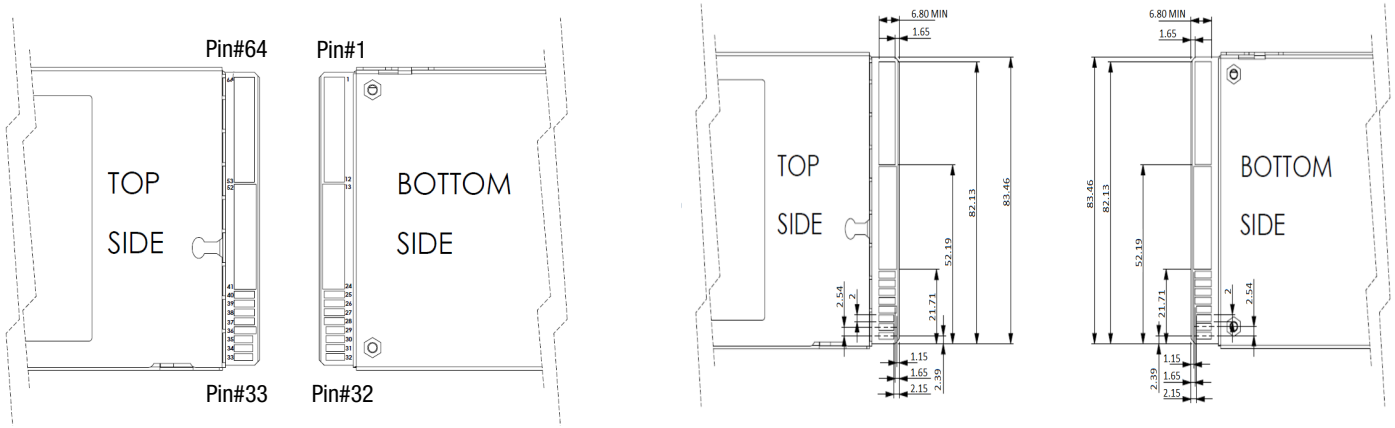
OUTPUT CONNECTOR & SIGNAL INTERFACE PIN ASSIGNMENT

Pin	Pin Name	Pin Type	Mating Sequence	Comments
13-24 41-52	PWR Return	12V Main Output	Long	12V Main and 12VSB Output return
1-12 53-64	12V Output		STD	12V Main Output
Pin	Signal Name	Pin Type		Comments
25	Smart Redundant Bus Signal	I/O	STD	Smart share for system efficiency performance; common bus to all sharing modules
26	Return Sense	Analogue Input	STD	12V main output Remote Sense Return
27	VIN_GOOD	Output	STD	Indicate AC voltage is present and within operational limits.
28	12V Load Share Bus	Bi-Directional I/O	STD	12V Main Output Current Share Signal (analogue bus)
29	PSON	Input	STD	Active low; 12V main output on/off control
30	PS_KILL	Input	Short	Turns power module on/off, short (MLBF) contact.
31	No Connection	---	Short	No End User Connection
32	SMB_Alert	Output	Short	Active low; I²C alert signal (interrupt)
33	SDA	Bi-Directional; I/O	Short	I²C /SMBus/PMBus Data Line
34	PRESENT	Output	Short	Power Supply Present; passive signal to Signal Return
35	SCL	Bi-Directional; I/O	Short	I²C /SMBus/PMBus Clock Line
36	Signal Return	Signal GND	Long	Signal GND; (MFBL) long connection
37	PWOK	Output	STD	Active high; indicates 12V Main is valid and within operational limits
38	A0	Input	STD	PMBus address A0
39	12VSTBY	Aux/Standby Power	STD	12VSTANDBY output
40	+12V Remote Sense	Input	STD	12V Main output remote sense +VE lead; compensates for voltage drops to POL.

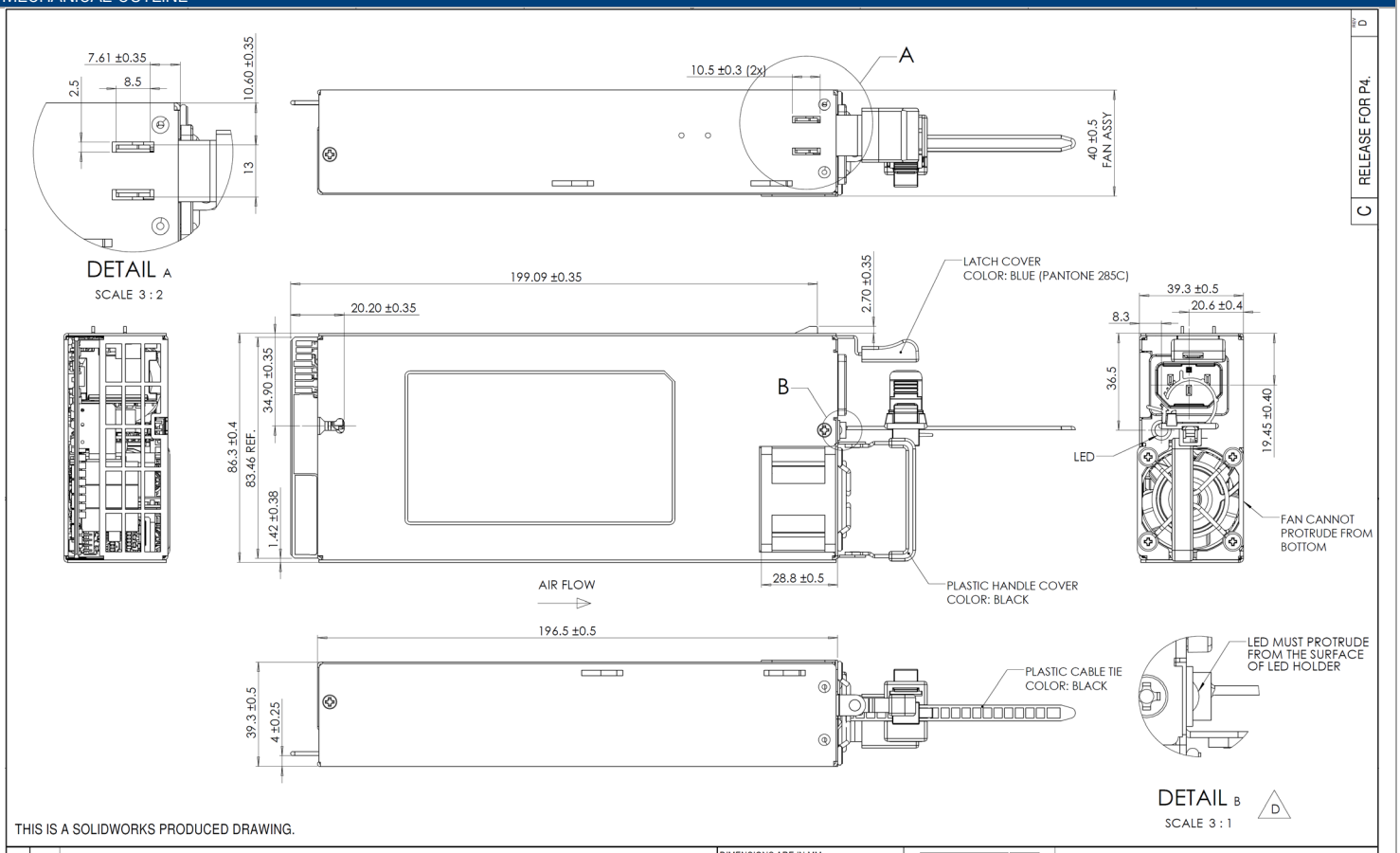
DC OUTPUT & SIGNAL INTERFACE MATING CONNECTOR

Part Number	Description
FCI 10053363-200LF	Right Angle (Without key)
FCI 10046971-001LF	Vertical





MECHANICAL OUTLINE



1. AC input connector: IEC 60320-C14
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.

APPLICATION NOTES

Document Number	Description	Link
ACAN-96	D1U86T Output Connector Card	https://power.murata.com/datasheet?/data/apnotes/acan-96.pdf
ACAN-95	D1U86T Communication Protocol	https://power.murata.com/datasheet?/data/apnotes/acan-95.pdf
ACAN-100	Cold Redundant Application Note	https://power.murata.com/datasheet?/data/apnotes/acan-100.pdf

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ISO 9001 and 14001 REGISTERED

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