



### FEATURES

- 1600W output power
- 93% efficiency at half load
- 12V main output
- 12V standby output of 30W
- 1U height: 3.4" x 7.75" x 1.59"
- 38.6 Watts per cubic inch density
- N+1 redundancy, including hot plugging (up to 8 in parallel)
- Current sharing on 12V main output, ORing FET
- Overvoltage, overcurrent, overtemperature protection
- Internal cooling fan (variable speed)
- PMBus™ / I<sup>2</sup>C interface monitoring and control
- RoHS compliant

### PRODUCT OVERVIEW

The D1U86P-D-1600-12-HxxDC series are highly efficient 1600 watt, DC input front end supplies with a 12V main output and a 12V (30W) standby. They have current sharing and up to 8 supplies may be operated in parallel. The supplies may be hot plugged, they recover from overtemperature faults, and have logic and PMBus monitoring and control. Their low profile 1U package and >38.6W/cubic inch power density make them ideal for delivering reliable, efficient power to servers, workstations, storage systems and other 12V distributed power systems.

### ORDERING GUIDE

Part Number	Power Output	Main Output	Standby Output <sup>1</sup>	Airflow
D1U86P-D-1600-12-HB4DC	1600W	12Vdc	12Vdc	Back to front
D1U86P-D-1600-12-HB3DC				Front to back

### INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Nom.	Max.	Units
Input Voltage Operating Range		-40	-48	-72	Vdc
Turn-on Voltage	Ramp up	-43	-43.5	-44	Vdc
Turn-off Voltage	Ramp down	-38.5	-39	-39.5	
Maximum Current at Vin = -40Vdc	1600W			47	Adc
DC Line Inrush Peak Current	Cold start between 0 to 200msec	40		50	Apk
		72		100	
Efficiency (48V)	20% load		92		%
	50% load		93		
	100% load		89		

### OUTPUT VOLTAGE CHARACTERISTICS

Output Voltage	Parameter	Conditions	Min.	Typ.	Max.	Units
12V	Voltage Set Point	50% load	12.17	12.20	12.23	Vdc
	Line and Load Regulation		11.4		12.6	
	Droop			3.10		mV/A
	Ripple Voltage & Noise <sup>1</sup>	20MHz Bandwidth			120	mV p-p
	Output Current		0		133.3	A
	Load Capacitance		0		10000	μF
12VSB	Voltage Set Point	50% load	11.97	12.0	12.03	Vdc
	Line and Load Regulation		11.4		12.6	
	Droop			120		mV/A
	Ripple Voltage & Noise <sup>1</sup>	20MHz Bandwidth			120	mV p-p
	Output Current		0		2.5	A
	Load Capacitance		0		350	μF

<sup>1</sup> 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 with 50Ω scope termination is used.



Available now at  
[www.murata-ps.com/en/3d/acdc.html](http://www.murata-ps.com/en/3d/acdc.html)



OUTPUT CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Output Rise Monotonicity	No voltage excursion				
Startup Time	DC ramp up		1.5	3	s
Transient Response	12V, 50% load step, 1.0A/μs di/dt		600		mV
	12VSB, 50% load step, 1.0A/μs di/dt		600		
Current sharing accuracy (up to 8 in parallel) <sup>2</sup>	At 100% load			±5	%
Hot Swap Transients	All outputs remain in regulation			5	%
Holdup Time	At full load (48V input)	1			ms

ENVIRONMENTAL CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Storage Temperature Range		-40		85	°C
Operating Temperature Range		0		55	
Operating Humidity	Noncondensing	5		90	%
Storage Humidity		5		95	
Altitude (without derating at 45°C)		3000			m
Shock	30G non operating				
Operational Vibration	1G, 10-500Hz, 1.6G (non-operational)				
MTBF	Per Telcordia SR-322 M1C1@ 40°C	500K			hrs
Safety Approvals	CSA/UL 60950-1-07-2nd Ed. IEC 60950-1:2005 (2nd Edition) w Am. 1:2009 CE Marking per LVD DIRECTIVE 2006/95/EC				
Input Fuse	Power Supply has internal 60A/170VDC fast blow fuse on the DC line input				
Weight	1.108kg (2.44lbs)				

<sup>2</sup> The load current of 100% refers to each power module max load connected in an N+1 configuration; therefore the total load will be "N" x 100% load of each module. The share accuracy of ±5% is a fixed percentage irrespective of the total loading and number of units connected in parallel.

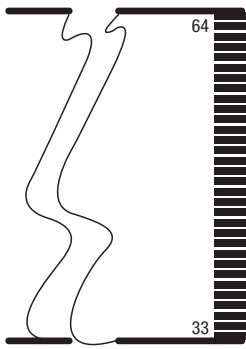
PROTECTION CHARACTERISTICS						
Output Voltage	Parameter	Conditions	Min.	Typ.	Max.	Units
	Overtemperature (intake)	An OTP warning will be issued via the PMBus interface when the air inlet exceeds 70°C; however the power module shall not shut down until critical internal hotspot temperatures are exceeded.		70		°C
	Overtemperature (hotspots)	The unit will shut down when internal hot spot exceed the derating guide lines and automatically recovers when the unit is cooled down. The unit will shut down due to hot spot at ambient temperature between 55°C-60°C with main 12V at full load.		55-60		
12V	Overvoltage	Latching	13.2		14.4	V
	Overcurrent	For overloads (slow) over current events a 147A nominal constant current will be sustained until the output voltage drops below 3VDC. At this point the unit shall shut down after a 1sec period and remain in that condition for 10secs. The cycle will then repeat. For severe (short circuit) over current events the unit shall shut down within 1ms and remain in this condition for 200ms before attempting a re-start. the unit shall attempt 10 shutdown/re-start cycles before permanently latching off. It will then be necessary to either recycle the DC input or toggle the PSON# input.	137		154	
12VSB	Overvoltage	Latching	13.2		14.4	V
	Overcurrent	Autorecovery	2.75	TBD	3.0	A

ISOLATION CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Insulation Safety Rating / Test Voltage	Input to Output - Basic	1500			Vdc
	Input to Chassis - Basic	1500			Vdc
Isolation	Output to Chassis	500			Vdc

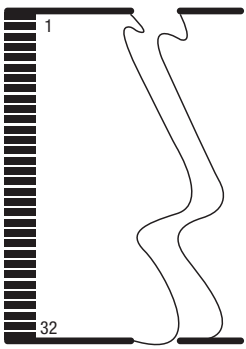
EMISSIONS AND IMMUNITY		
Characteristic	Standard	Compliance
Conducted Emissions	FCC 47 CFR Part 15/CISPR 22/EN55022	Class A, 6dB margin
ESD Immunity	IEC/EN 61000-4-2	Level 3 criteria A
Radiated Field Immunity	IEC/EN 61000-4-3	Level 3 criteria B
Electrical Fast Transient Immunity	IEC/EN 61000-4-4	Level 3 criteria A
Surge Immunity	IEC/EN 61000-4-5	Level 2 criteria B
Radiated Field Conducted Immunity	IEC/EN 61000-4-6	Level 3 criteria A
Magnetic Field Immunity	IEC/EN 61000-4-8	3 A/m criteria B

STATUS INDICATORS AND CONTROL SIGNALS		
Signal	Description	
PSON#	Low = main output on; PSON# can be permanently tied to GND within the host system.	
PRESENT#	Short pin pulled down on p/s; pulled up to either 3.3V or 12V (max) in the host system. For 3.3V use a 5.11KΩ resistor; for 12V use a 21KΩ resistor.	
PS INTERRUPT	Open drain PMBus signal; can be left open if not used.	
ADDR	PMBus Address; ADDR can be grounded or left open if not used. If grounded, the address will be 000, if it is open, the default address will be 111.	
ISHARE	Analog representation of main output current; can be left open if not used.	
PSOK <sup>3</sup>	Three level signal based on DC input and DC output status; can be left open if not used.	
I2C CLOCK	I <sup>2</sup> C clock	
I2C DATA	I <sup>2</sup> C data	
LED State	Mode	Operating Condition
1. Off	Input Turn-off	DC Input is below minimum power-supply turn-on specification
2. Green – blinking 1Hz	Standby	Power supply standby output is operating within normal parameters and main output is disabled
3. Green – solid	Power-good	Power supply standby & main outputs are operating within normal parameters and delivering power
4. Yellow – blinking 1Hz	Warning	Warning condition in power supply has been detected
5. Yellow – solid	Fault	Fault condition in power supply has been detected.

OUTPUT CONNECTOR AND SIGNAL SPECIFICATION			
Pin#	Function	Pin Type	Description
14-26, 39-51	RTN	Power Ground	Power and Standby Return
1-13, 52-64	12V	Power	12V Output
37	12VSB	Power	12V Standby Output
38	PSINTERRUPT	Output	Active low; interrupt line for power supply fault & warning detection as per PMBus spec
36	PRESENT#	Input	Power Supply Present Signal (shortest pin)
35	PSOK <sup>3</sup>	Analog output	Combination of there power supply output indicator signals: 1. DC input OK 2. Power Good 3. Power Supply Fault
34	ISHARE	Analog I/O	Analog representation of main output current. Typical analog voltage shall be 60.15mV/Amp of main output current.
33	PSON#	Input	Power Supply on/off control signal
32	SCL	Input	SMBus/PMBus Clock
31	SDA	I/O	SMBus/PMBus Data
30	GND	Analog I/O	Power Supply Signal Ground
29	N/A	N/A	Reserved; no User connection
28	N/A	N/A	Reserved; no User connection
27	ADDR	Analog input	PMBus Address



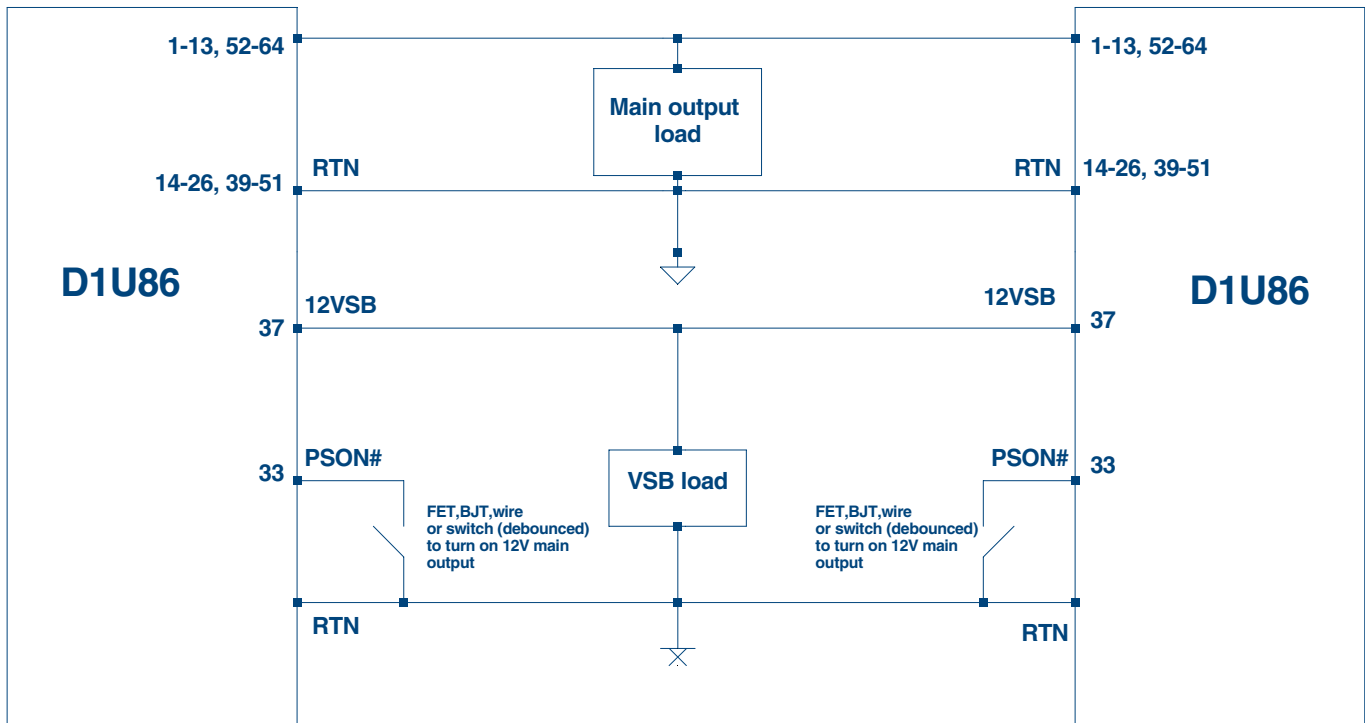
PCB Top Side



PCB Bottom Side

CONNECTOR AND SIGNAL SPECIFICATION <sup>3</sup> PSOK TRUTH TABLE VS. ANALOG OUTPUT					
DC_OK_H	PWR_GOOD_H	PS_FAULT_L	PSOK		OPERATION MODE
0	0	1	< 0.1Vdc	VDD = 3.3Vdc	No DC Input
0	1	1	(1/3) VDD		Invalid
1	0	1	(2/3) VDD		Standby
1	1	1	VDD		Power Good
X	X	0	0.2-0.4Vdc		PS Fault

**WIRING DIAGRAM FOR OUTPUT**

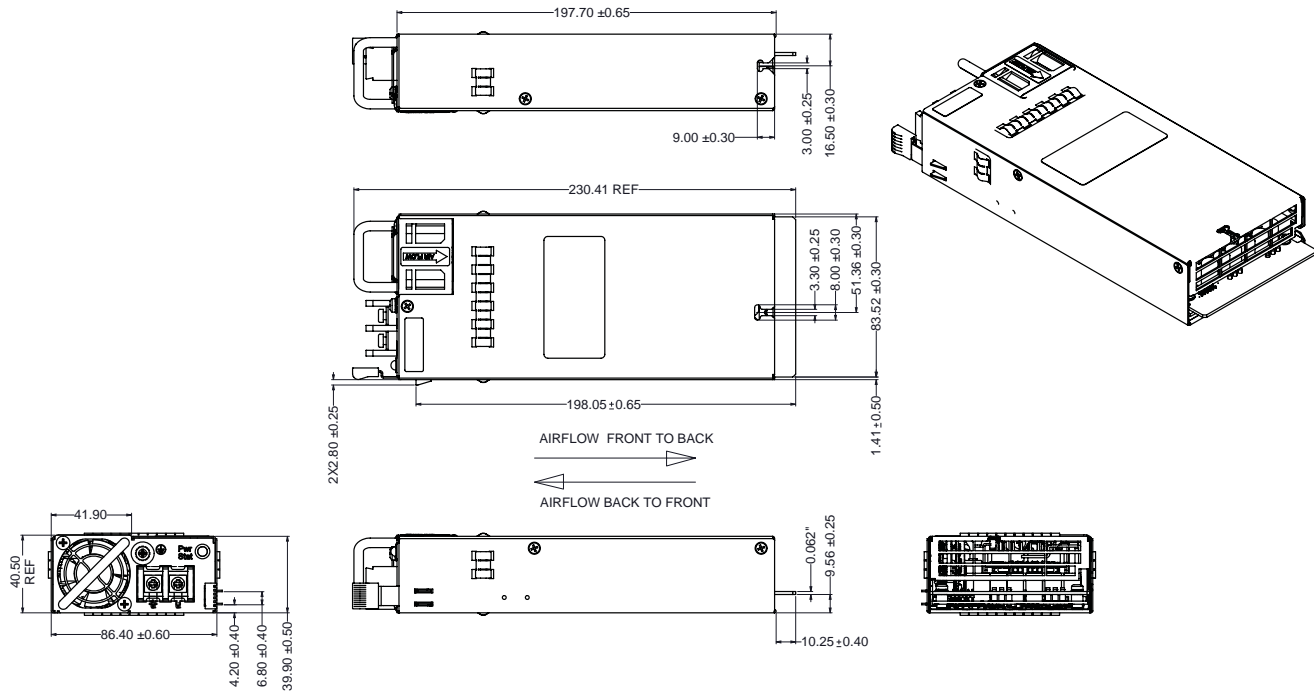


**CURRENT SHARING NOTES**

Main Output: Current share is achieved using the droop method. Nominal output voltage (12.20V) is achieved at 50% load and output voltage changes at a rate of 3.10mv per amp. Startup of parallel power supplies is not internally synchronized. If more than 1600W combined power is needed, start-up synchronization must be provided by using a common PS\_ON signal. To account for  $\pm 5\%$  full load current sharing accuracy and the reduction in full load output voltage due to droop, available output power must be derated by 10% when units are operated in parallel. Internal ORing FETs are provided.

Standby output can be tied together for redundancy but total combined output power must not exceed 30W; Internal MOSFET ORing devices are used.

**MECHANICAL DIMENSIONS**



DC input connector: Terminal Block, Dinkle Enterprise: Part No. DT-7C-B14W-02

Dimensions: 3.4" x 7.75" x 1.59" [86mm x 196.85mm x 39.9mm]

**MATING CONNECTOR**

Part Number	Description
FCI 10053363-200LF	Right Angle
FCI 10046971-008LF	Vertical

**OPTIONAL ACCESSORIES**

Description	Part Number
12V D1U86P Output Connector Card	D1U86P-12-CONC

**APPLICATION NOTES**

Document Number	Description
ACAN-50	D1U86P Output Connector Card
ACAN-54	D1U86P Communication Protocol

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