# D1U4CS-W-2200-12-HxxC Series

## AC/DC Front End Power Supply

Murata Power Solutions

## FEATURES

- 2200W (220Vac), 1100W (110Vac) Output Power
- Certified to Climate Savers Computing Initiative℠ and 80 PLUS® Gold efficiency
- 12V Main Output, 3.3V or 5V Standby Output
- 1U height: 4.0" x 14.0" x 1.6"
- 24.5 Watts per cubic inch density
- N+1 redundancy capable, including hot plugging (up to 4 in parallel)
- Active Current Sharing on main output; ORing FET
- Overvoltage, Overcurrent, Overtemperature protection
- Internal cooling fans (variable speed)
- I²C Bus Interface, PSMI compliant
- RoHS compliant
- Optional 1U x 19" Power-Shelf

## PRODUCT OVERVIEW

**The D1U4CS-W-2200-12-HxxC** is a 2200 Watt, power-factor-corrected (PFC) front-end power supply for hot-swapping redundant systems. The main output is 12V with a standby output of 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 D1U4CS-W-2200-12-HxxC is designed to autorecover from overtemperature fault. Status information is provided with front panel LEDs, logic signals and an I²C management interface. Four units can be packaged into an optional 19" 1U power shelf to provide up to 8.8kW of power.

### ORDERING GUIDE

| Model Number | Power Output High Line AC | Power Output Low Line AC | Main Output | Standby Output | Airflow |
|---|---|---|---|---|---|
| D1U4CS-W-2200-12-HC4C | 2200W | 1100W | 12.12V | 3.3V | Back to front |
| D1U4CS-W-2200-12-HC3C | 2200W | 1100W | 12.12V | 3.3V | Front to back |
| D1U4CS-W-2200-12-HA4C | 2200W | 1100W | 12.12V | 5V | Back to front |
| D1U4CS-W-2200-12-HA3C | 2200W | 1100W | 12.12V | 5V | Front to back |

### INPUT CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Input Voltage Operating Range | | 90 | 115/230 | 264 | Vac |
| Input Frequency | | 47 | 60 | 63 | Hz |
| Turn-on Input Voltage | Ramp up | 81 | | 89 | Vac |
| Turn-off Input Voltage | Ramp down | 70.5 | | 78 | |
| Maximum Input Current | Low Line AC 90Vac | | | 13 | Arms |
| | High Line AC 180Vac | | | 13 | |
| Inrush Current | Cold start between 0-1msec | | | 16.5 | Apk |
| Power Factor | Output load >90% | 0.95 | | | |
| | Output load >50% | 0.95 | | | |

### OUTPUT VOLTAGE CHARACTERISTICS

| Output Voltage | Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| 12V | Voltage Set Point Accuracy | | | 12.12 | | Vdc |
| | Line and Load Regulation | | 11.76 | | 12.48 | |
| | Ripple Voltage & Noise[1] | 20MHz Bandwidth | | | 120 | mV p-p |
| | Output Current | | 9 | | 180 | A |
| | Load Capacitance | | | | 30000 | µF |
| 5Vsb | Voltage Set Point Accuracy | | | 5 | | Vdc |
| | Line and Load Regulation | 20MHz Bandwidth | 4.85 | | 5.15 | |
| | Ripple Voltage & Noise[1] | | | | 50 | mV p-p |
| | Operating Range | | 0 | | 5 | A |
| | Load Capacitance | | | | 10000 | µF |
| 3.3Vsb | Voltage Set Point Accuracy | | | 3.3 | | Vdc |
| | Line and Load Regulation | 20MHz Bandwidth | 3.2 | | 3.4 | |
| | Ripple Voltage & Noise[1] | | | | 50 | mV p-p |
| | Operating Range | | 0 | | 6 | A |
| | Load Capacitance | | | | 10000 | µF |

1 Ripple and noise are measured with 0.1 uF of ceramic capacitance and 10 uF of tantalum capacitance on each of the power supply outputs. The output noise requirements apply over a 0 Hz to 20 MHz bandwidth. A short coaxial cable with 50ohm scope termination is used.

RoHS COMPLIANT

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

CB Test Certificate and Test Report

80 PLUS GOLD

## OUTPUT CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Remote Sense | | | 120 | | mV |
| Efficiency (230V) excluding fan load | 20% load | 88 | 89.1 | | % |
| | 50% load | 92 | 93.0 | | |
| | 100% load | 88 | 92.2 | | |
| 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/µs | | | ±360 | mV |
| | 5Vsb Ramp 1A/µs | | | ±150 | |
| | 3.3Vsb Ramp 1A/µs | | | ±100 | |
| Current sharing accuracy (up to 4 in parallel) | At 100% load | | | ±7 | % |
| Hot Swap Transients | All outputs remain in regulation | | | 5 | % |
| Holdup Time | 100% load | 12 | | | ms |

## ENVIRONMENTAL CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Storage Temperature Range | Non-condensing | -40 | | 70 | °C |
| Operating Temperature Range | D1U4CS-W-2200-12-HC4C and D1U4CS-W-2200-12-HA4C models | 0 | | 50 | |
| | D1U4CS-W-2200-12-HC3C and D1U4CS-W-2200-12-HA3C models | 0 | | 40 | |
| 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 | 400K | | | hrs |
| | Demonstrated | 400K | | | hrs |
| Acoustic | ISO 7779-1999 | | | 60 | dB LpAm |
| Safety Approvals | CAN/CSA C22.2 No 60950-1-07, Am.1:2011<br>UL 60950-1-2011, 2nd Ed.<br>UL 60950-1, 2nd Ed.<br>IEC60950-1:2005 (2nd Ed.) w A1:2009, EN 60950-1:2006+A11:2009 +A1:2010 +A12:2011 | | | | |
| Input Fuse | Power Supply has internal 20A/250V fast blow fuse on the AC line input | | | | |
| Material Flammability | UL 94V-0 | | | | |
| Switching Frequency | TBD | | | | |
| Weight | 4.5lbs (2.1kg) | | | | |

## PROTECTION CHARACTERISTICS

| Output Voltage | Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| | Overtemperature | Autorestart | 55 | | 65 | °C |
| 12V | Overvoltage | Latching | 13.1 | | 14.1 | V |
| | Overcurrent | Latching | 197 | | 225 | A |
| 5Vsb | Overvoltage | Latching | 5.6 | | 6.2 | V |
| | Overcurrent | Brick wall, autorecovery | 5.5 | | 6.2 | A |
| 3.3Vsb | Overvoltage | Latching | 3.5 | | 4.0 | V |
| | Overcurrent | Brick wall, autorecovery | 6.5 | | 8.0 | 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 |
|---|---|---|
| LEDs | Off | No AC to all Power Supply |
| | Flashing Green | Main Output Absent |
| | Flashing Amber | Calibration Mode; not a normal operating condition |
| | Solid Amber | PW Fail or PWOK Low.<br>Note: The LED will also show Solid Amber if the power module is:<br>1. Not correctly installed within its slot (in the host system shelf) with PS_KILL (Pin B5) correctly terminated.<br>2. Operated externally (as a standalone power module) and is not connected to an Output Connector Card ACAN-32 (see Optional Accessories) that correctly terminates PS_KILL (Pin B5). |
| | Solid Green | Power Supply Good |
| $I^2C$ Registers | Refer to Application Note #ACAN-33 | |

## 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 |

## OUTPUT CONNECTOR AND SIGNAL SPECIFICATION

DC and Signal Connector: FCI PowerBlade # 51732-048LF

| P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 | x1 | x2 | x3 | x4 | x5 | x6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VOUT | VOUT | VOUT | VOUT | VOUT | VRTN | VRTN | VRTN | VRTN | VRTN | AC_OK/H | PW_OK/H | Vsb RETURN | Vsb RETURN | Vsb +OUT | Vsb +OUT | D |
| | | | | | | | | | | SPARE | SMB/ Alert | Vsb RETURN | Vsb RETURN | Vsb +OUT | Vsb +OUT | C |
| | | | | | | | | | | I_SHARE | I²C ADR0 | I²C ADR1 | I²C ADR2 | PS_KILL | PS_ PRESENT | B |
| | | | | | | | | | | SENSE + | SENSE - | I²C DATA | I²C CLOCK | SPARE | PS_ON/L | A |
| | | | | | | | | | | | | | | mate-last pins | | |

| Pin Assignment | Signal Name | Description | High Level<br>Low Level | I Max |
|---|---|---|---|---|
| P1 to P5 | VOUT | Main output voltage | | |
| P6 to P10 | VRTN | Main output voltage, return | | |
| A1 | Sense + | VOUT remote sense, positive node input, connected to the +ve load point | | |
| A2 | Sense - | VOUT remote sense, negative node input, connected to the -ve load point | | |
| C5, C6, D5, D6 | Vsb | Standby voltage output | | |
| C3, C4, D3, D4 | Vsb 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/H | Input AC Voltage “OK” signal output (Internal pull up is 10kΩ to Vsb) | >2.1V<br><0.8V | +4 mA<br>-2 mA |
| D2 | PW_OK/H | Internal pull up of 10KΩ to Vsb | >2.1V<br><0.8V | +4 mA<br>-2 mA |
| C2 | SMB/Alert | SMB/Alert signal output (open collector) | | |
| 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)<br><0.8V (active, PS:On) | N/A |
| B6 | PS_Present | Internally tied to Vsb Return | 0 V | |
| A6 | PS_On/L | Internal 3.3KΩ pull-up to Vsb (accepts open collector/ drain drive). This signal to be pulled low to turn-on power supply | >2.1V (open, or 3.3V)<br><0.8V (active, PS:On) | |
| A3 | I²C Data | I²C serial data bus; internal 4.64KΩ pull-up to Vsb | | |
| A4 | I²C Clock | I²C serial clock bus; internal 4.64KΩ pull-up to Vsb | | |
| B2 | I²C Adr0 | Address input 0, internal 10KΩ pull-up to Vsb | >2.1V<br><0.8V | ±1 mA |
| B3 | I²C Adr1 | Address input 1, internal 10KΩ pull-up to Vsb | >2.1V<br><0.8V | ±1 mA |
| B4 | I²C Adr2 | Address input 2, internal 10KΩ pull-up to Vsb | >2.1V<br><0.8V | ±1 mA |

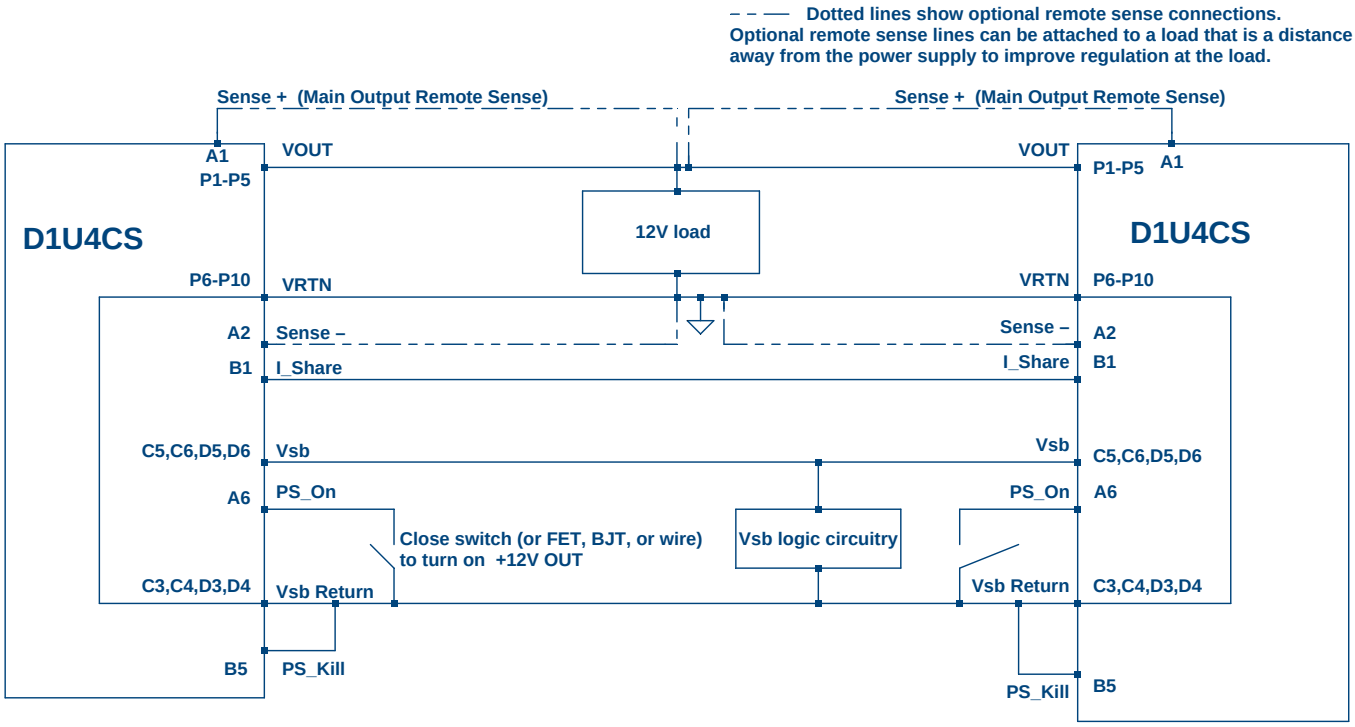
## D1U4CS MATING CONNECTORS

12V D1U4 mating connector

| | Press Fit | | Solder [1] | |
|---|---|---|---|---|
| | Straight | Right Angle | Straight | Right Angle |
| Murata-PS | N/A | 4321-01454-0 | N/A | N/A |
| FCI | 51742-11002400AALF | 51762-11002400ABLF | N/A | N/A |

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.)

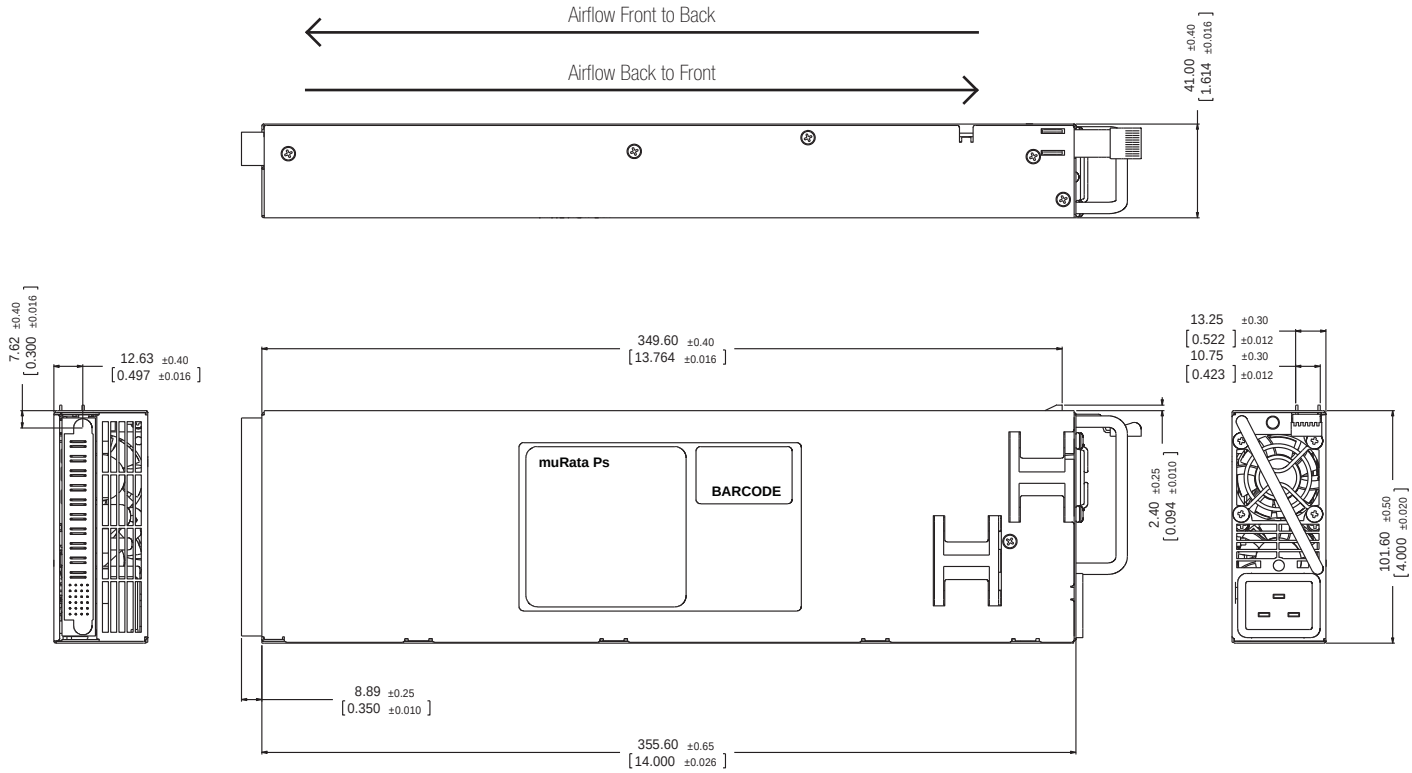
The total combined load must be below 2200W at startup. Current sharing can be achieved with or without remote sense connected to the common load.

VSB outputs can be tied together for redundancy but total combined output power must not exceed 25W. The VSB 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 - D1U4CS-W-2200-12-HxxC




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 41.0mm]

## OPTIONAL ACCESSORIES

| Description | Part Number |
|---|---|
| 12V D1U4CS-12 output connector card | D1U4CS-12-CONC |

## APPLICATION NOTES

| Document Number | Description | Link |
|---|---|---|
| ACAN-32 | D1U4CS-12-CONC Output Connector Card | www.murata-ps.com/data/apnotes/acan-32.pdf |
| ACAN-33 | D1U4CS-W Communication Protocol | www.murata-ps.com/data/apnotes/acan-33.pdf |
| ACAN-37 | D1U4CS-x EEPROM Specification | www.murata-ps.com/data/apnotes/acan-37.pdf |

Murata Power Solutions, Inc.
11 Cabot Boulevard, Mansfield, MA 02048-1151 U.S.A.
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