



### 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 I<sup>2</sup>C management interface. Four units can be packaged into an optional 19" 1U power shelf to provide up to 8.8kW of power.

### FEATURES

- 2200W (220Vac), 1100W (110Vac) Output Power
- Certified to Climate Savers Computing Initiative<sup>SM</sup> and 80 PLUS<sup>®</sup> 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)
- I<sup>2</sup>C Bus Interface, PSMI compliant
- RoHS compliant
- Optional 1U x 19" Power-Shelf

### 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 <sup>1</sup> | 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 <sup>1</sup> |                 |       |       | 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 <sup>1</sup> |                 |       |       | 50    | mV p-p |
|                | Operating Range                     |                 | 0     |       | 6     | A      |
|                | Load Capacitance                    |                 |       |       | 10000 | 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. The output noise requirements apply over a 0 Hz to 20 MHz bandwidth. A short coaxial cable with 50ohm scope termination is used.



| 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 |
| 12V                        | Overtemperature | Autorestart              | 55   |      | 65   | °C    |
|                            | 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           |
| LED                                   | Off                                | No AC input to all PS |
|                                       | Flashing Green                     | Main Output Absent    |
|                                       | Green                              | Power Supply Good     |
| I <sup>2</sup> C 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 | I <sup>2</sup> C ADRO | I <sup>2</sup> C ADR1 | I <sup>2</sup> C ADR2  | PS_KILL  | PS_PRESENT | B |
|      |      |      |      |      |      |      |      |      |      | SENSE + | SENSE -               | I <sup>2</sup> C DATA | I <sup>2</sup> C 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 3.3V)   | >2.1V<br><0.8V                                 | +4 mA<br>-2 mA |
| D2             | PW_OK/H                | Internal pull up of 10K ohm to 3.3V  | >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:0n)          | N/A            |
| B6             | PS_Present             | Internally tied to 3.3V return   | 0 V  |                |
| A6             | PS_On/L                | Internal 3.3K ohm pull-up to 3.3V, (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:0n) |                |
| A3             | I <sup>2</sup> C Data  | I <sup>2</sup> C serial data bus; internal 4.64K ohm pull-up   | 3.3V   |                |
| A4             | I <sup>2</sup> C Clock | I <sup>2</sup> C serial clock bus; internal 4.64K ohm pull-up  | 3.3V   |                |
| B2             | I <sup>2</sup> C Adr0  | Address input 0, internal 10K ohm pull-up to 3.3V  | >2.1V<br><0.8V                                 | ±1 mA          |
| B3             | I <sup>2</sup> C Adr1  | Address input 1, internal 10K ohm pull-up to 3.3V  | >2.1V<br><0.8V                                 | ±1 mA          |
| B4             | I <sup>2</sup> C Adr2  | Address input 2, internal 10K ohm pull-up to 3.3V  | >2.1V<br><0.8V                                 | ±1 mA          |

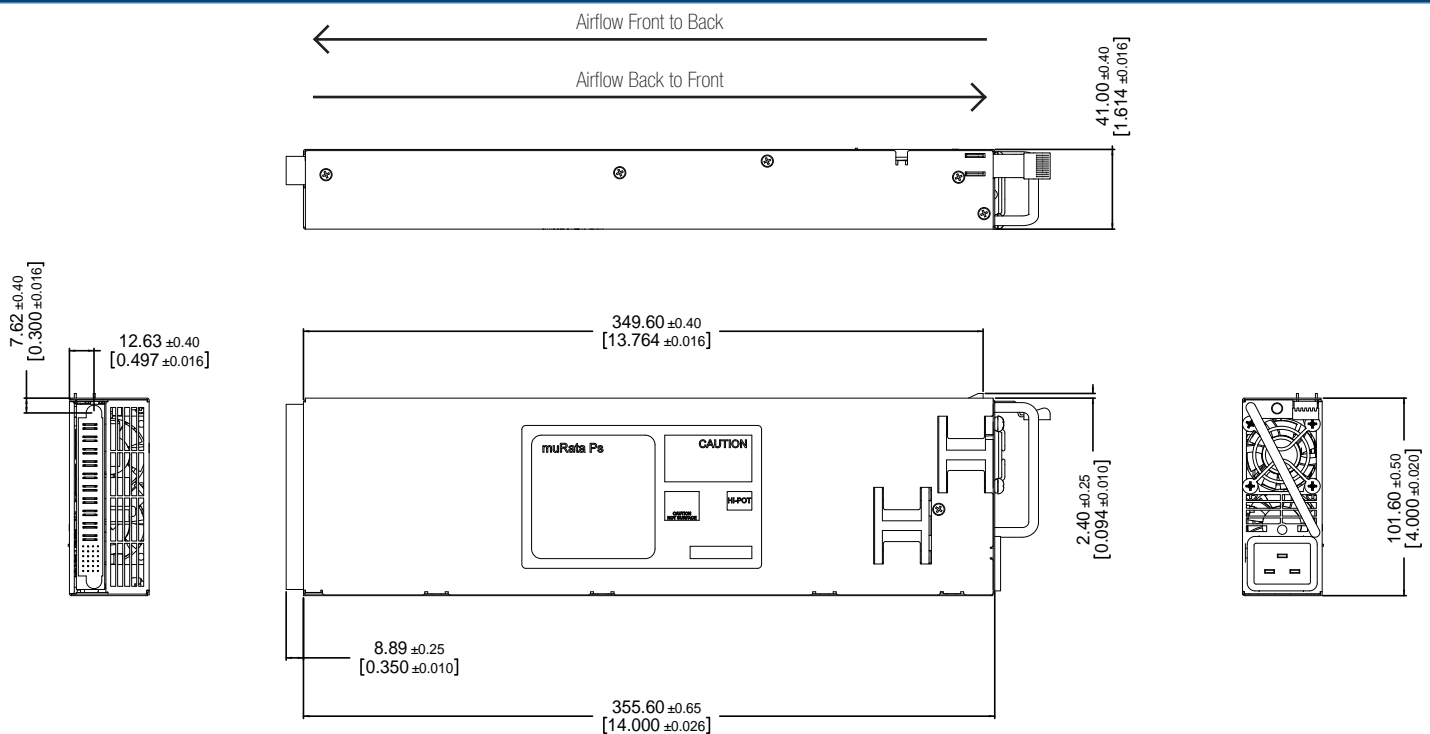
### D1U4CS MATING CONNECTORS

12V D1U4 mating connector

|           | Press Fit          |                    | Solder <sup>1</sup> |             |
|-----------|--------------------|--------------------|---------------------|-------------|
|           | 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         |

<sup>1</sup> Solder connector recommended for board thickness of <0.090

### 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 | <a href="http://www.murata-ps.com/data/apnotes/acan-32.pdf">www.murata-ps.com/data/apnotes/acan-32.pdf</a> |
| ACAN-33         | D1U4CS-W Communication Protocol      | <a href="http://www.murata-ps.com/data/apnotes/acan-33.pdf">www.murata-ps.com/data/apnotes/acan-33.pdf</a> |
| ACAN-37         | D1U4CS-x EEPROM Specification        | <a href="http://www.murata-ps.com/data/apnotes/acan-37.pdf">www.murata-ps.com/data/apnotes/acan-37.pdf</a> |

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