



### FEATURES

- 400W output power
- 12V main output
- 5V standby output of 15W
- 1U height: 2.15"x13.67"x1.58"
- 8.6 Watts per cubic inch density
- Efficiency 85% at full load, 100Vac and 50°C
- N+1 redundancy capable, including hot plugging (up to 4 in parallel)
- Active current sharing on 12V main output, ORing FET
- Overvoltage, overcurrent, overtemperature protection
- Internal cooling fan (variable speed)
- PSMI and SMBus / I2C interface with bicolor LED status indicators
- RoHS compliant

### PRODUCT OVERVIEW

The D1U2-W-400-12-HA4C is a 400 watt, power factor corrected front end supply with a 12V main output and a 5V (15W) standby. It features active current sharing and up to 4 supplies maybe operated in parallel. The supply may be hot plugged, it recovers from overtemperature faults, and has status LEDs on the front panel in addition to logic and PSMI status signals. The supply comes in a low profile 1U package and has >8W/cubic inch power density, making it ideal for delivering reliable, efficient power to servers, workstations, storage systems and other 12V distributed power systems.

### ORDERING GUIDE

| Part Number        | Power Output High Line AC | Power Output Low Line AC | Main Output | Standby Output | Airflow       |
|--------------------|---------------------------|--------------------------|-------------|----------------|---------------|
| D1U2-W-400-12-HA4C | 400W                      | 400W                     | 12V         | 5V             | Back to front |

### INPUT CHARACTERISTICS

| Parameter                              | Conditions                      | Min. | Nom.    | Max. | Units |
|--|---------------------------------|------|---------|------|-------|
| Voltage Operating Range                |                                 | 90   | 115/230 | 264  | Vac   |
| Frequency                              |                                 | 47   | 50/60   | 63   | Hz    |
| Turn-on Voltage                        | Ramp up                         | 85   |         |      | Vac   |
| Turn-off Voltage                       | Ramp down                       |      |         | 85   |       |
| Maximum current at Vin=100Vac          | 400W                            |      |         | 5    | Arms  |
| Inrush Current                         | Cold start between 0 to 200msec |      |         | 30   | Apk   |
| Power Factor                           | At 230Vac, full load            |      | 0.99    |      |       |
| Efficiency (100Vac) including fan load | 35% load                        | 80   |         |      | %     |
|  | 50% load                        | 85   |         |      |       |
|  | 100% load                       | 85   |         |      |       |

### OUTPUT VOLTAGE CHARACTERISTICS

| Output Voltage | Parameter                           | Conditions      | Min. | Typ. | Max.   | Units  |
|----------------|-------------------------------------|-----------------|------|------|--------|--------|
| 12V            | Voltage Set Point                   |                 |      | 12.0 |        | Vdc    |
|                | Line and Load Regulation            |                 | 11.8 |      | 12.2   |        |
|                | Ripple Voltage & Noise <sup>1</sup> | 20MHz Bandwidth |      |      | 120    | mV p-p |
|                | Output Current (230Vac)             |                 | 0    |      | 33.3   | A      |
|                | Load Capacitance                    |                 | 0    |      | 15,000 | µF     |
| 5VSB           | Voltage Set Point                   |                 |      | 5.0  |        | Vdc    |
|                | Line and Load Regulation            |                 | 4.85 |      | 5.15   |        |
|                | Ripple Voltage & Noise <sup>1</sup> | 20MHz Bandwidth |      |      | 50     | mV p-p |
|                | Output Current                      |                 | 0    |      | 3      | A      |
|                | Load Capacitance                    |                 | 0    |      | 500    | 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                                   | AC ramp up                            |      | 1.5  | 2.0  | s     |
| Transient Response                             | 12V, 30-70% load step, 1A/μs di/dt    |      |      | 3    | %     |
|  | 5VSB, 30-70% load step, 0.1A/μs di/dt |      |      | 3    |       |
| Current sharing accuracy (up to 4 in parallel) | At 100% load                          |      |      | ±10  |       |
| Hot Swap Transients                            | All outputs within regulation         |      |      |      |       |
| Holdup Time                                    |                                       | 20   |      |      | ms    |

| ENVIRONMENTAL CHARACTERISTICS       |   |      |      |       |       |
|-------------------------------------|---|------|------|-------|-------|
| Parameter                           | Conditions  | Min. | Typ. | Max.  | Units |
| Storage Temperature Range           |   | -40  |      | 70    | °C    |
| Operating Temperature Range         |   | 0    |      | 50    |       |
| Operating Humidity                  | Noncondensing   | 5    |      | 90    | %     |
| Storage Humidity                    |   | 5    |      | 95    |       |
| Altitude (without derating at 55°C) |   |      |      | 3,000 | m     |
| Shock                               | 30G non operating   |      |      |       |       |
| Operational Vibration               | 0.5G, 5 – 500 Hz  |      |      |       |       |
| MTBF                                | Per Telcordia SR332M1C1 @25°C   | 300K |      |       | hrs   |
| Safety Approvals                    | CSA/UL 60950-1-07-2nd Ed.<br>IEC 60950-1:2005 (2nd Edition) w Am. 1:2009<br>EN 60950-1:2006 +A11:2009 +A1:2010<br>CE Marking per LVD DIRECTIVE 2006/95/EC |      |      |       |       |
| Input Fuse                          | Power Supply has internal 10A/250V fast blow fuse on the AC line input  |      |      |       |       |
| Switching Frequency                 | 90KHz for Boost PFC Converter<br>200KHz for Main Output Converter   |      |      |       |       |
| Weight                              | 2.28lbs (1.034kg)   |      |      |       |       |

| PROTECTION CHARACTERISTICS |                          |              |      |      |      |       |
|----------------------------|--------------------------|--------------|------|------|------|-------|
| Output Voltage             | Parameter                | Conditions   | Min. | Typ. | Max. | Units |
| 12V                        | Overtemperature (intake) | Autorestart  | 65   | 70   | 75   | °C    |
|                            | Overvoltage              | Latching     | 14.0 |      | 14.5 | V     |
|                            | Overcurrent              | Hiccup       | 115  |      | 130  | %     |
| 5VSB                       | Overvoltage              | Latching     | 5.7  |      | 5.9  | V     |
|                            | Overcurrent              | Autorecovery | 4.4  |      | 6.0  | 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            | 500  |      |      | Vrms  |

| CONTROL SIGNALS  |                 |
|--|-----------------|
| Condition  | LED Status      |
| Standby - ON; Main output - OFF; AC PRESENT  | Blinking green  |
| Standby - ON; Main output - ON   | Solid green     |
| Main/standby output overcurrent, undervoltage, overvoltage warning                           | Blinking yellow |
| FAN_FAULT; overtemperature; main/standby output overcurrent, undervoltage, overvoltage fault | Yellow          |

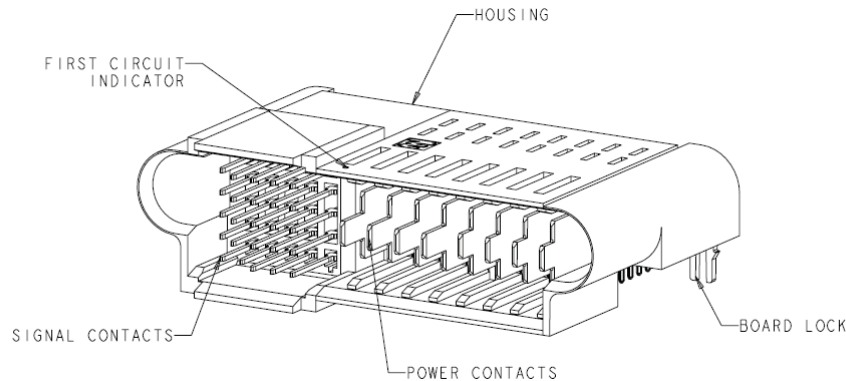
| EMISSIONS AND IMMUNITY                    |                                     |   |
|---|-------------------------------------|---|
| Characteristic                            | Standard                            | Compliance  |
| Input Current Harmonics                   | IEC/EN 61000-3-2                    | Complies  |
| Voltage Fluctuation and Flicker           | IEC/EN 61000-3-3                    | Complies  |
| Conducted Emissions                       | FCC 47 CFR Part 15/CISPR 22/EN55022 | Class B   |
| 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 Transients/Burst Immunity | IEC/EN 61000-4-4                    | Level 3 criteria A  |
| Surge Immunity                            | IEC/EN 61000-4-5                    | Level 3 criteria A  |
| 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  |
| Voltage dips, interruptions               | IEC/EN 61000-4-11                   | 230V <sub>in</sub> , 100% load, Phase 0°, Dip 100% Duration 10ms (A)<br>230V <sub>in</sub> , 50% load, Phase 0°, Dip 100% Duration 20ms (VSB:A, V1:A)<br>230V <sub>in</sub> , 100% load, Phase 0°, Dip 100% Duration > 20ms (VSB, V1:B) |

**DC OUTPUT CONNECTOR AND SIGNALS**

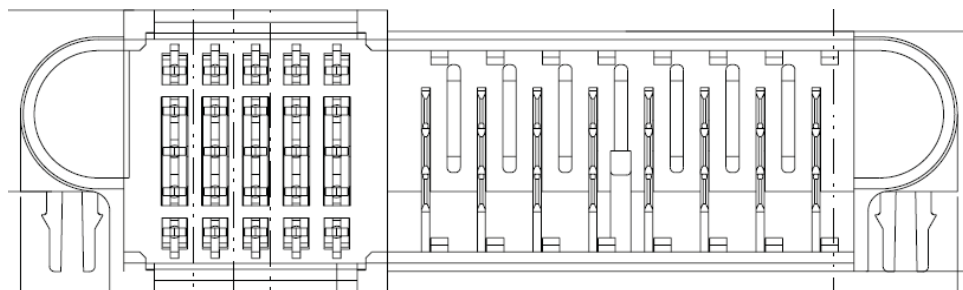
The DC Output Connector is a TYCO MINIPAK HDL Connector **TYCO P/N: 1926734-1**. Mating pin sequencing shall be 12V\_RTN first, 12V second, signals third and PSKILL\_L signal last. PSKILL\_L is the last to mate and first to break and is used as a power supply output enable for the 12V rail.

Mating Part: **TYCO P/N 1-1926739-8**

Power Supply Output Connector Isometric and Front Views



Front Connector View Looking at Blades and Pins (view looking in at rear of power supply)



**DC OUTPUT CONNECTOR AND SIGNALS (continued)**

View into mating face of 25S8P MINIPAK HDL Plug

Column:

|      |   |   |   |   |   |   |   |   |   |   |   |   |   |
|------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Row: | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| e    |   |   |   |   |   |   |   |   |   |   |   |   |   |
| d    |   |   |   |   |   |   |   |   |   |   |   |   |   |
| c    |   |   |   |   |   |   |   |   |   |   |   |   |   |
| b    |   |   |   |   |   |   |   |   |   |   |   |   |   |
| a    |   |   |   |   |   |   |   |   |   |   |   |   |   |

Signal contacts: choice of Level 1 (L1) or Level 2 (L2)

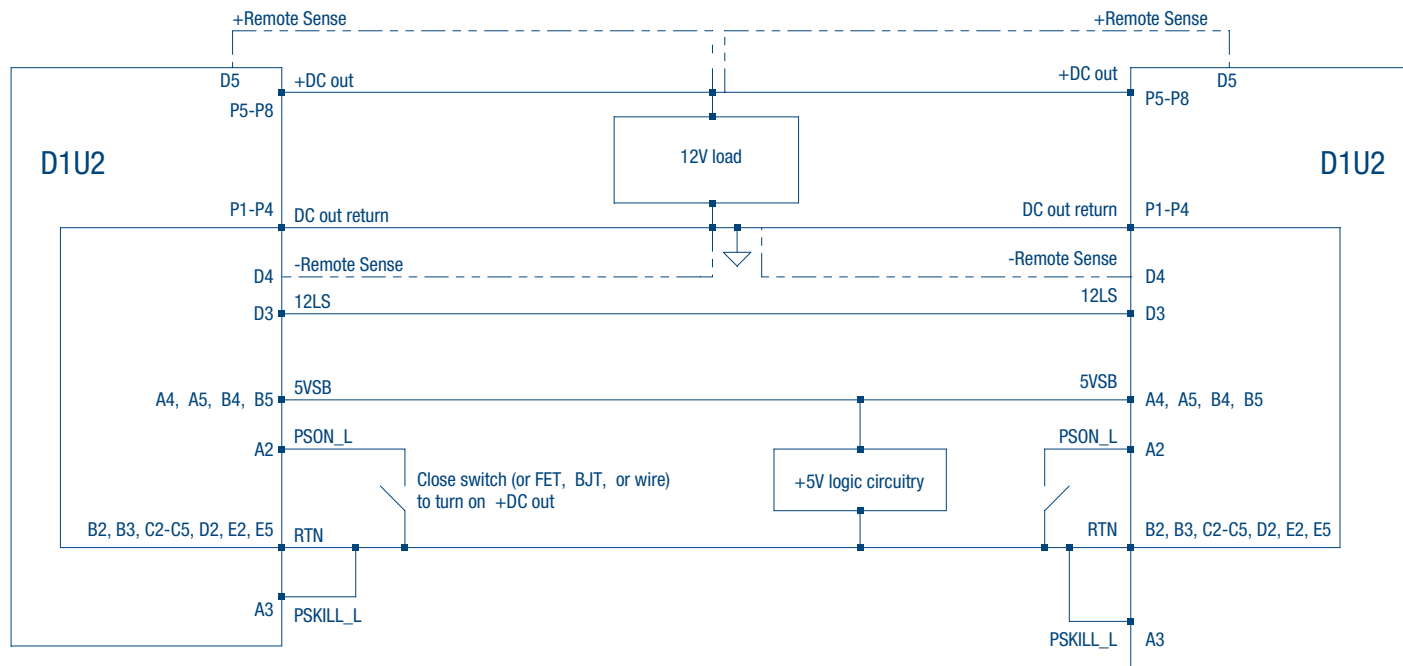
Power contacts: choice of Level 2 (L2) or Level 3 (L3)

**POWER SUPPLY OUTPUT CONNECTOR POWER BLADE AND SIGNAL PIN ALLOCATION**

| Power Blade Number | Signal      | Function                      | Signal Direction | Blade Sequencing |
|--------------------|-------------|-------------------------------|------------------|------------------|
| P1, P2, P3, P4     | RTN         | 12V Return                    | Output           | Level 3 UPM PWR  |
| P5, P6, P7, P8     | 12V         | 12V Output                    | Output           | Level 2 UPM PWR  |
| A1                 | SMB_ALERT_L | I2C Serial Bus Interrupt      | Output           | Level 2 Signal   |
| A2                 | PSON_L      | Power Supply ON               | Input            |                  |
| A3                 | PSKILL_L    | Power Supply Enable           | Input            | Level 1 Signal   |
| A4, A5             | 5VSB        | 5V Standby Voltage            | Output           | Level 2 Signal   |
| B1                 | SMB_SCL     | I2C Serial Bus Clock          | Bi-directional   | Level 2 Signal   |
| B2, B3             | RTN         | Ground                        | Output           |                  |
| B4, B5             | 5VSB        | 5V Standby Voltage            |                  |                  |
| C1                 | SMB_SDA     | I2C Serial Bus Data / Address | Bi-directional   | Level 2 Signal   |
| C2, C3, C4, C5     | RTN         | Ground                        | Output           |                  |
| D1                 | SMB_A1      | I2C Serial Bus Address Bit A1 | Input            | Level 2 Signal   |
| D2                 | RTN         | Ground                        | Output           |                  |
| D3                 | 12LS        | 12V Current Share Line        | Bi-directional   |                  |
| D4                 | 12V_RS-     | 12V Remote Sense Negative     | Input            |                  |
| D5                 | 12V_RS+     | 12V Remote Sense Positive     |                  |                  |
| E1                 | SMB_A0      | I2C Serial Bus Address Bit A0 | Input            | Level 2 Signal   |
| E2                 | RTN         | Ground                        | Output           |                  |
| E3                 | PWOK_H      | Power OK Status Bit           |                  |                  |
| E4                 | FF1_H       | Fan Fail #1 Status Output     |                  |                  |
| E5                 | FF2_H       | Fan Fail #2 Status Output     |                  |                  |

**WIRING DIAGRAM**

--- 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.



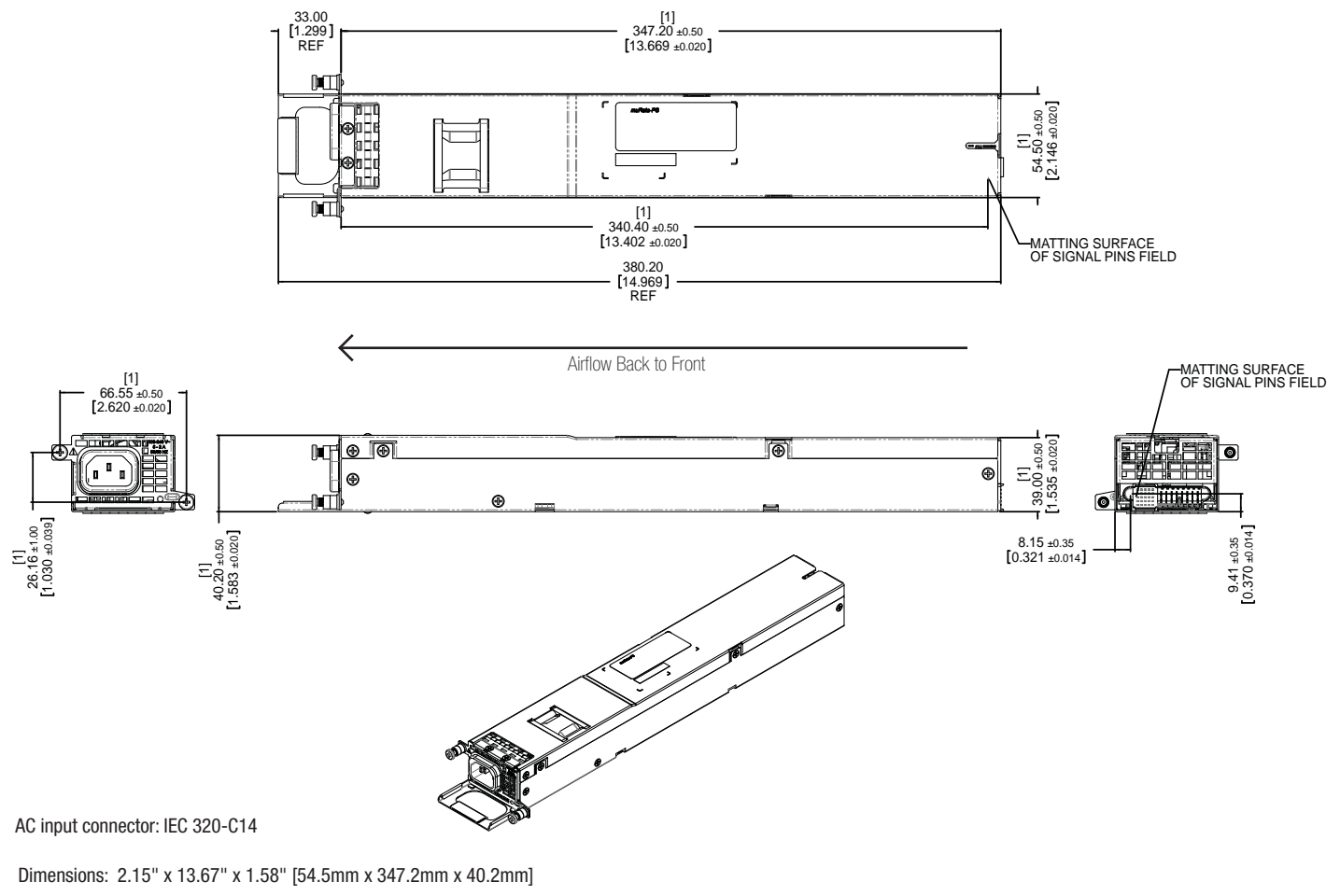
**CURRENT SHARING NOTES**

12V Output: Current sharing is achieved using the active current share method. (See wiring diagram section for connection details.) The total combined load must be below 400W at startup. Startup of parallel power supplies is not internally synchronized. It is recommended that the paralleled power supplies be turned on at the same time (with their PSON\_L signals). Current sharing can be achieved with or without remote sense connected to the common load.

5VSB Output: 5VSB outputs can be tied together for redundancy but total combined output power must not exceed 15W. The 5VSB output has internal ORing MOSFET for additional redundancy / internal short protection.

Up to four units can be paralleled together. Outputs of AC input units (D1U2-W-400) and DC input units (D1U2-D-400) can be paralleled together. Please consult your Murata sales representative if operation with more than four units in parallel is needed.

**MECHANICAL DIMENSIONS**



**OPTIONAL ACCESSORIES**

| Description                    | Part Number  |
|--------------------------------|--------------|
| 12V D1U2 Output Connector Card | D1U2-12-CONC |

**APPLICATION NOTES**

| Document Number | Description                 |
|-----------------|-----------------------------|
| TBD             | D1U2 Output Connector Card  |
| TBD             | D1U2 Communication Protocol |

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 ISO 9001 and 14001 REGISTERED



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