



SERIES: PSD-1100 | **DESCRIPTION:** DC-DC HOT-SWAP POWER SUPPLY

FEATURES

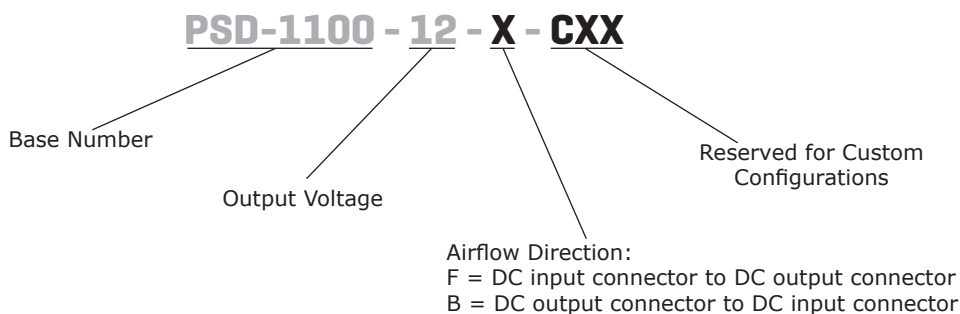
- up to 1100 W continuous power
- 80 PLUS Platinum Efficiency
- 40~72 Vdc input range
- high power density - 25.34 W/in³
- slim line 1U form factor
- PMBus™ communication for monitoring and control
- front to back (-F) and back to front (-B) airflow versions
- 3.3 Vdc or 5 Vdc standby voltage (2 A) options
- redundant (N+1) operation
- blind mate connections for hot-swap
- DROOP current sharing or forced current sharing (optional)



| MODEL | output voltage | output current | output power | ripple and noise ¹ | efficiency ² |
|---------------|----------------|----------------|--------------|-------------------------------|-------------------------|
| | (Vdc) | max (A) | max (W) | max (mVp-p) | typ (%) |
| PSD-1100-12-F | 12 | 92 | 1100 | 120 | 93 |
| PSD-1100-12-B | 12 | 92 | 1100 | 120 | 93 |

Notes: 1. Measured at 20 MHz bandwidth at an oscilloscope jack on the output with 0.1 μF ceramic and 10 μF electrolytic capacitors connected across the tip of the scope probe for the V1 output connector.
 2. At 230 Vac input, 550 W. Meets 80 PLUS platinum efficiency requirements.
 3. All specifications measured at: Ta=25°C and 48 Vdc input voltage unless otherwise specified.

PART NUMBER KEY



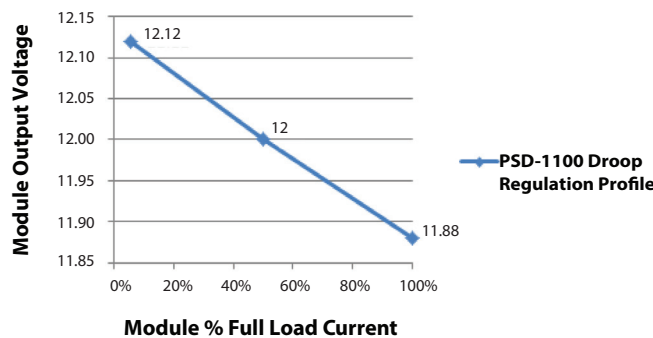
INPUT

| parameter | conditions/description | min | typ | max | units |
|----------------|-----------------------------------|-----|-----|-----|-------|
| voltage | | 40 | 48 | 72 | Vdc |
| current | | | | 34 | A |
| inrush current | ETSI ETS 300-132 V2.1.2 (2003-09) | | | 60 | A |

OUTPUT - V1 (MAIN OUTPUT)

| parameter | conditions/description | min | typ | max | units |
|---|---|-----|------|--------|-------|
| line regulation | | | ±1.5 | | % |
| load regulation | | | ±1.5 | | % |
| load capacitance | | | | 30,000 | µF |
| transient response | 25% step load, between 25% and 100% load, 1A/µs slew rate, recovery to 1% within 1 ms | | | 5 | % |
| start-up time | | | | 3 | s |
| hold-up time | 1100W at 54Vdc input, ETSI TR 100 283 V2.1.1 (2002-07) | 5 | | | ms |
| remote sense | between both output terminals | | 0.3 | | V |
| current share accuracy (Droop) ¹ | over 20% to 100% load | | ±4 | | A |
| LED indicator | DC_IN_OK: "green" to indicate DC above the lower limit that is required to sustain normal operation PWR_OK: "green" to indicate module in normal operating condition | | | | |

Notes: 1. Droop regulation of ±1.0% for an overall combined regulation allowance of ±1.5%

PSD-1100 Droop Regulation Profile

OUTPUT - V2 (STANDBY OUTPUT)

| parameter | conditions/description | min | typ | max | units |
|-------------------------------|---|-----|-------|------|-------|
| output voltage | selectable | | 3.3/5 | | Vdc |
| output current | | 0 | | 2 | A |
| ripple and noise ² | | | | 100 | mVp-p |
| line regulation | | | ±2 | | % |
| load regulation | | | ±2 | | % |
| load capacitance | | | | 2200 | µF |
| transient response | 25% step load, between 25% and 100% load, 1A/µs slew rate, recovery to 1% within 1 ms | | | 5 | % |
| start-up time | | | | 3 | s |

Notes: 2. Measured at 20 MHz bandwidth at an oscilloscope jack on the output with 0.1 µF ceramic and 10 µF electrolytic capacitors connected across the tip of the scope probe for the V2 output connector.

PROTECTIONS

| parameter | conditions/description | min | typ | max | units |
|-----------------------------|--------------------------------|-------------|-----|-------------|----------|
| over voltage protection | V1: latch off V2: latch off | 13.2 110 | | 14.5 125 | Vdc % |
| over current protection | V1: auto recovery V2 | 101.2 | | 128.8 3 | A A |
| over temperature protection | auto recovery | | 55 | | °C |

SAFETY & COMPLIANCE

| parameter | conditions/description | min | typ | max | units |
|--|---|-----------------------|-----|-----|-------------------|
| isolation safety rating / test voltage | input to output input to chassis V2 to chassis/ground (capacitively) | 1,979 1,244 100 | | | Vdc Vdc Vdc |
| grounding | the output signals are referenced to the A2 and B2 return connection | | | | |
| safety approvals | EN60950-1:2006+A11+A1+A12, IEC60950-1:2005+Amd 1, CAN/CSA-C22.2 No.60950-1-07+A1:2011, UL 60950-1:2007 R12.11(NRTL Route), EEC/93/68/LVD | | | | |
| conducted emissions | FCC 15 Sub Part B, EN55022, Class A: 6 dB margin tested with resistive load | | | | |
| radiated emissions | FCC 15 Sub Part B, EN55022, Class A: 6 dB margin tested with resistive load | | | | |
| electrostatic discharge | EN/IEC 61000-4-2, ±8 kV operational air discharge, ±8 kV contact discharge: all parameters to remain within limits, test set up to be defined | | | | |
| RF electro-magnetic field. amplitude modulated | EN/IEC 61000-4-3 80~1000 MHz, 10 V/m, 80% AM Modulation (1 kHz): all parameters to remain within limits, test set up to be defined | | | | |
| immunity to fast transients | EN/IEC 61000-4-4 Power lines: ±1 kV Class 2: all parameters to remain within limits, test set up to be defined | | | | |
| surges (mains) | EN/IEC 61000-4-5 ±0.5 kV line to line, ±1 kV line to earth, Criteria A Class 2: all parameters to remain within limits, test set up to be defined | | | | |
| RF continuous conducted | EN/IEC 61000-4-6 150 kHz~80 MHz 3Vrms 80% AM (1 kHz), Criteria A: all parameters to remain within limits, test set up to be defined | | | | |
| MTBF | as per Telcordia SR-332, Issue 2, Sept 2006 component stress method at Ta=40°C, full load | 500,000 | | | hours |
| RoHS | 2011/65/EU | | | | |
| WEEE | 2012/19/EU | | | | |

ENVIRONMENTAL

| parameter | conditions/description | min | typ | max | units |
|-----------------------|------------------------|-----|-----|-----|-------|
| operating temperature | | 0 | | 50 | °C |
| storage temperature | non-condensing | -40 | | 70 | °C |
| operating humidity | non-condensing | 10 | | 90 | % |
| storage humidity | | 5 | | 90 | % |

ENVIRONMENTAL (CONTINUED)

| parameter | conditions/description | min | typ | max | units |
|------------------------------|--|-----|-----|-----|---------|
| acoustic | ISO 7779-1999 | | | 60 | dB LpAm |
| cold ¹ | IEC 68 Part 2 – 1: at -10°C minimum for 4 hours | | | | |
| dry heat | IEC 68 Part 2 – 2: at 50°C minimum for 4 hours | | | | |
| damp heat, cyclic | IEC 68 Part 2 – 30: at 20~45°C, 30~95 %RH | | | | |
| low air pressure (operating) | IEC 68 Part 2 – 13: at 10,000 feet, 697 mbar | | | | |
| vibration (sinusoidal) | IEC 68 Part 2 – 6: at 10~58 Hz, 0.075 mm; 58~500 Hz, 10 m/s ² , 1 octave/minute, 10 cycles/ main axis | | 1 | | G |
| shock | IEC 68 Part 2 – 27: at 300 m/s ² , 11 ms, half sine wave 3 shocks/main axis | | 30 | | G |
| bump | IEC 68 Part 2 – 29: at 150 m/s ² , 6 ms, half sine wave 900 bumps/main axis | | 15 | | G |

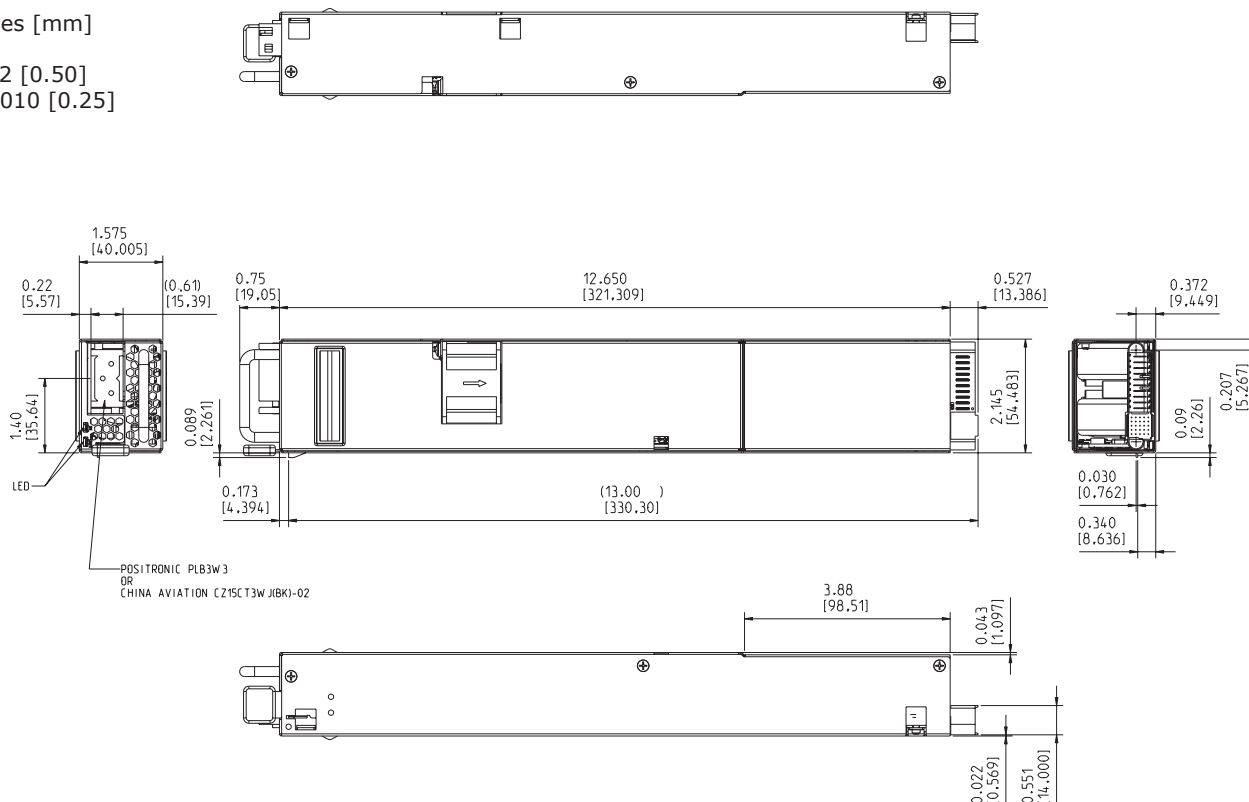
Notes: 1. The module shall start up at -10°C, however it is not required that the full specification is achieved until the operational internal temperature has risen to 0°C.

MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|-----------------------|---|-----|-----|-----|--------|
| dimensions | 12.65 x 2.145 x 1.575 (321.3 x 54.5 x 40.0 mm) | | | | inches |
| weight | | | 1.1 | | kg |
| cooling / airflow | integral fan | | | | |
| material flammability | UL 94V-0 | | | | |
| DC input | Positronic P/N PLB3W3 mates with Positronic P/N PLB3W3F7105A1/AA | | | | |
| DC output | Tyco Electronics P/N 2-1926736-3 mates with Tyco Electronics P/N 2-1926739-5 | | | | |

MECHANICAL DRAWING

units: inches [mm]
tolerance:
X.XX ±0.02 [0.50]
X.XXX ±0.010 [0.25]



DC OUTPUT PIN ASSIGNMENTS

| PIN | | FUNCTION | DESCRIPTION | | HIGH / LOW LEVEL | Imax |
|--------------------|----------------------|---|--|----------------|------------------|---------|
| 1,2,3,4,5 | | 12 V output return | V1 (-VE) main output return | | | |
| 6,7,8,9,10 | | 12 V output | V1 (+VE) main output | | | |
| signal pin row "A" | A1 | Vstandby +VE | positive output of standby (V2) | | | |
| | A2 | signal/logic return | common with V1 & V2 returns | | | |
| | A3 | I ² C address select | I ² C address selection | | | |
| | A4 | SCL | communications clock line | | | |
| | A5 | PSKILL_H | disables power on extraction (recessed pin) | | | |
| | | | pin status | module | | |
| | | | open circuit | "off" | | |
| logic "1" | | | "off" | | | |
| logic "0" | "on" | | | | | |
| signal pin row "B" | B1 | Vstandby +VE | positive output of standby (V2) | | | |
| | B2 | signal/logic return | common with V1 & V2 Returns | | | |
| | B3 | not use | reserved | | | |
| | B4 | PS_ON_L (Remote_ON_L) | internally pulled up to 3.3 V via 3.01 kΩ if PSKILL_H is connected to return | | | |
| | | | open to A2/B2 | short to A2/B2 | | |
| | | | "off" | "on" | | 1.05 mA |
| B5 | Ishare (optional) | active current sharing bus (recessed pin) | | | | |
| signal pin row "C" | C1 | Vstandby +VE | positive output of standby (V2) | | | |
| | C2 | not use | reserved | | | |
| | C3 | SDA | communications data | | | |
| | C4 | SMB_ALERT_L | SMBus interrupt line | | | |
| | | | logic "1" | "good" | >2.1 V | |
| | | | logic "0" | "fault" | <0.4 A | -5 mA |
| | C5 | DC_OK_H | DC OK Signal (recessed pin) | | | |
| logic "1" | | | "good" | >2.1 V | | |
| logic "0" | | | "fault" | <0.4 A | -5 mA | |
| signal pin row "D" | D1 | Vstandby +VE | positive output of standby (V2) | | | |
| | D2 | not use | reserved | | | |
| | D3 | V1 Vsense (-VE) | V1 negative sense line | | | |
| | D4 | not use | reserved | | | |
| | | | reserved | | | |
| D5 | Vstandby_Select (V2) | selects the voltage of V2 recessed pin | | | | |
| | | open circuit | short to A2/B2 | | | |
| | | 3.3 V | 5 V | | | |
| signal pin row "E" | E1 | Vstandby +VE | positive output of standby (V2) | | | |
| | E2 | not use | reserved | | | |
| | E3 | V1 Vsense (+VE) | V1 positive sense line | | | |
| | E4 | DC_IN_OK_H | DC incoming source alarm | | | |
| | | | logic "1" | "good" | > 2.1 V | |
| | logic "0" | "fault" | < 0.4 A | -5 mA | | |
| E5 | PS_Present | active low, recessed pin, passive signal to detect presence of module, host to provide pull up resistor connected to V2 to source maximum of 5 mA when module is inserted | | | | |

APPLICATION NOTES

Digital Interface

The PSD-1100 is provided with a digital communications interface that is based upon a subset of the SMBus™ & PMBus™ Protocols.

The communication interface is a Two Wire Interface (TWI) using devices hardware compatible with I²C.

The interface is based upon the I²C Protocol developed by Philips Semiconductors (now NXP). Reference to the "I²C Bus Specification and User Manual" UM10204 Rev.03 – 19 June 2007 is recommended.

Slave Addresses

The device is selected by setting the Slave Address (Pin A3) either by an external resistor network or by direct connection to logic "high" or "low". Either method interfaced to the appropriate I/O port of the internal I²C device. Therefore the device can be set to respond to all addresses in the range from binary 1011 0000 to 1011 0110 (where the last bit is for read/write that is always set at "0" for initial addressing).

- Connection of Pin A3 to a logic "low" will provide an address of B0 (1011 0000)
- Connection of Pin A3 to a logic "high" (or leaving open circuit) will provide an address of B6 (1011 0110)

To achieve the full range of four potential address combinations Pin A3 requires to be connected to an external resistor that will create an internal analogue voltage that is interpreted by the internal I²C device to derive the following address combinations:

| Possible Module Slave Address Combinations | | | | | | | | | |
|--|---------------|-------|-------|-------|-----------------------|-------|-------|-------|-----|
| External Resistor Value (Ohms) | Fixed Address | | | | Variable Address Bits | | | R/W | HEX |
| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 | |
| 820 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | B0 |
| 2700 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | B2 |
| 5600 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | B4 |
| 8200 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | B6 |

APPLICATION NOTES (CONTINUED)

General Information

Refer to the PMBus™/SMBus specification for details on read/write operations when dealing with Byte, Word or Block process calls. Packet Error Correction (PEC) and Address Resolution Protocol (ARP) are not supported. If the PMBus™ master tries to read more bytes than the length of the data selected by the command code, the additional bytes will be sent as 0xAA. The PMBus™ slave device may apply clock stretching by holding the clock line (SCL) low after a command to indicate that it is busy processing data. A master device on the PMBus™ may attempt to continue with the communications but must first wait until the clock line is released. Clock stretching times will vary depending on the data being processed and/or if there are any higher priority events during the response but shall not exceed 25 ms.

PMBus™ COMMAND SUBSET

The following is subset of commands (extracted from the "PMBus Power System Management Protocol Specification; Part II Command Language; Rev 1.2, 6 September 2010") and apply on a per module basis, (although certain commands could be applied "globally"). For a full definition of the individual command refer to the above referenced PMBus™ specification.

Note: Hex Command 88h, 89h, 8Bh, 8Ch divide decimal value by 100.

| Command (HEX) | Command Name | No. of Bytes | Read / Write | Command Description |
|---------------|--------------------|--------------|--------------|--|
| 01h | OPERATION | 1 | W | The OPERATION command is used to turn the unit on & off in conjunction with the CONTROL (short; last make, first make pin). The unit remains in the commanded mode until the command is toggled or the unit removed from its slot; in which case the CONTROL pin is de-asserted and overrules the OPERATION command. |
| 03h | CLEAR_FAULTS | 0 | W | Clear fault data |
| 78h | STATUS_BYTE | 1 | R | Lower byte returned from the STATUS_WORD |
| 79h | STATUS_WORD | 2 | R | The command returns two bytes of data relating to the unit fault condition. CUI may elect to provide a subset of information. |
| 88h | READ_VIN | 2 | R | Provides the measured input voltage of the power module in volts. |
| 89h | READ_IIN | 2 | R | Provides the measured input current of the power module in Amps. |
| 8Bh | READ_VOUT | 2 | R | Provides the measured output voltage of the power module in volts. |
| 8Ch | READ_IOUT | 2 | R | Provides the measured output current of the power module in Amps. |
| 8Dh | READ_TEMPERATURE_1 | 2 | R | This command shall return a select component temperature used by the power module, in degrees Celsius. |
| 8Eh | READ_TEMPERATURE_2 | 2 | R | This command shall return the prevailing internal ambient of the power module, in degrees Celsius. |
| 90h | READ_FAN_SPEED_1 | 2 | R | Provides the measured fan speed in the power module in RPM. |
| 96h | READ_POUT | 2 | R | This command shall return the calculated output being delivered by the power module, in Watts. |
| 97h | READ_PIN | 2 | R | This command shall return the calculated input being drawn by the power module, in Watts. |
| 98h | PMBUS_REVISION | 1 | R | PMBus™ Revision |
| 99h | MFR_ID | 8 | R | The command returns the ASCII string for manufacturer's ID. |
| 9Ah | MFR_MODEL | 12 | R | The command returns the ASCII string manufacturer's model. |
| 9Bh | MFR_REVISION | 2 | R | The command returns the ASCII string manufacturer's revision (example case "01"). |
| 9Dh | MFR_DATE | 4 | R | The command returns the ASCII string manufacturer's date code (example case "0913"). |
| 9Eh | MFR_SERIAL | 8 | R | The command returns manufacturers serial number. |

APPLICATION NOTES (CONTINUED)

PMBus™ Non-Standard Extended Command Subset

| Command (HEX) | Command Name | No. of Bytes | Read / Write | Command Description |
|---------------|------------------|--------------|--------------|--|
| 16h | SOFTWARE VERSION | 4 | R | Read vendor specific firmware revision (ASCII string). Example case "A100" |

Remote On/Off (PMBus™ Operation Command 0x01)

This command can be used to turn the unit on and off via the PMBus™ interface.

If B4 (REMOTE_ENABLE) is HIGH (enabled) then the PMBus™ Remote On/Off function can turn the unit off and on. If B4 (REMOTE_ENABLE) is LOW (disabled) then the PMBus™ Remote On/Off function cannot turn the unit on or off and can be ignored.

The bit encoding of the data byte of the command is as follows.

| Bits [7:6] | Bits [5:4] | Bits [3:2] | Bits [1:0] | Unit State |
|------------|------------|------------|------------|------------|
| 00 | XX | XX | XX | Off |
| 01 | XX | XX | XX | Off |
| 10 | 00 | XX | XX | On |
| 10 | 01 | 01 | XX | On |
| 10 | 01 | 10 | XX | On |
| 10 | 10 | 01 | XX | On |
| 10 | 10 | 10 | XX | On |

If any other bit pattern is received take no action.

If the power supply is turned off by this command then set the OFF bit (6 of the low byte) of the status word to 1. Otherwise set it to 0.

APPLICATION NOTES (CONTINUED)

Status Word

This command is a two byte structure (High and Low bytes). The PMBus™ specification (Table 15) details the structure and content of the word. Note that unsupported bits shall be set to "0"

Status Word (79h); Low Byte

| Byte | Bit # | PMBus™ Bit Name | Definition |
|------|-------|-------------------|--|
| Low | Bit 7 | BUSY | Not Supported |
| | Bit 6 | OFF | Pulse Width Modulator enable status: 1 = PWM disabled 0 = PWM enabled |
| | Bit 5 | VOUT_OV | Output over voltage fault 1 = OVP has occurred 0 = OVP has not occurred |
| | Bit 4 | IOUT_OC | OCP; the unit has entered overload protection. 1= OCP has occurred 0= OCP has not occurred |
| | Bit 3 | VIN_UV | Incoming DC under voltage: 1 = DC is not OK 0 = DC is OK |
| | Bit 2 | TEMPERATURE | Over Temperature fault 1 = OTP has occurred 0 = OTP has not occurred |
| | Bit 1 | CML | Not Supported |
| | Bit 0 | NONE OF THE ABOVE | Not Supported |

Status Word; High Byte

| Byte | Bit # | PMBus™ Bit Name | Definition |
|------|-------|-----------------|--|
| High | Bit 7 | VOUT | Not Supported |
| | Bit 6 | IOUT/POUT | Not Supported |
| | Bit 5 | INPUT | DC Input Voltage Fault or Warning 1 = Under Voltage (DC is not OK) 0 = No Under Voltage (DC is OK) |
| | Bit 4 | MFR | Not Supported |
| | Bit 3 | POWER_GOOD# | Output Power Good Status 1 = Power is Not Good (DC is not OK) 0 = Power is Good (DC is OK) |
| | Bit 2 | FAN | Fan Failure 1 = Fan has failed 0 = Fan has not failed |
| | Bit 1 | OTHER | Not Supported |
| | Bit 0 | UNKNOWN | Not Supported |

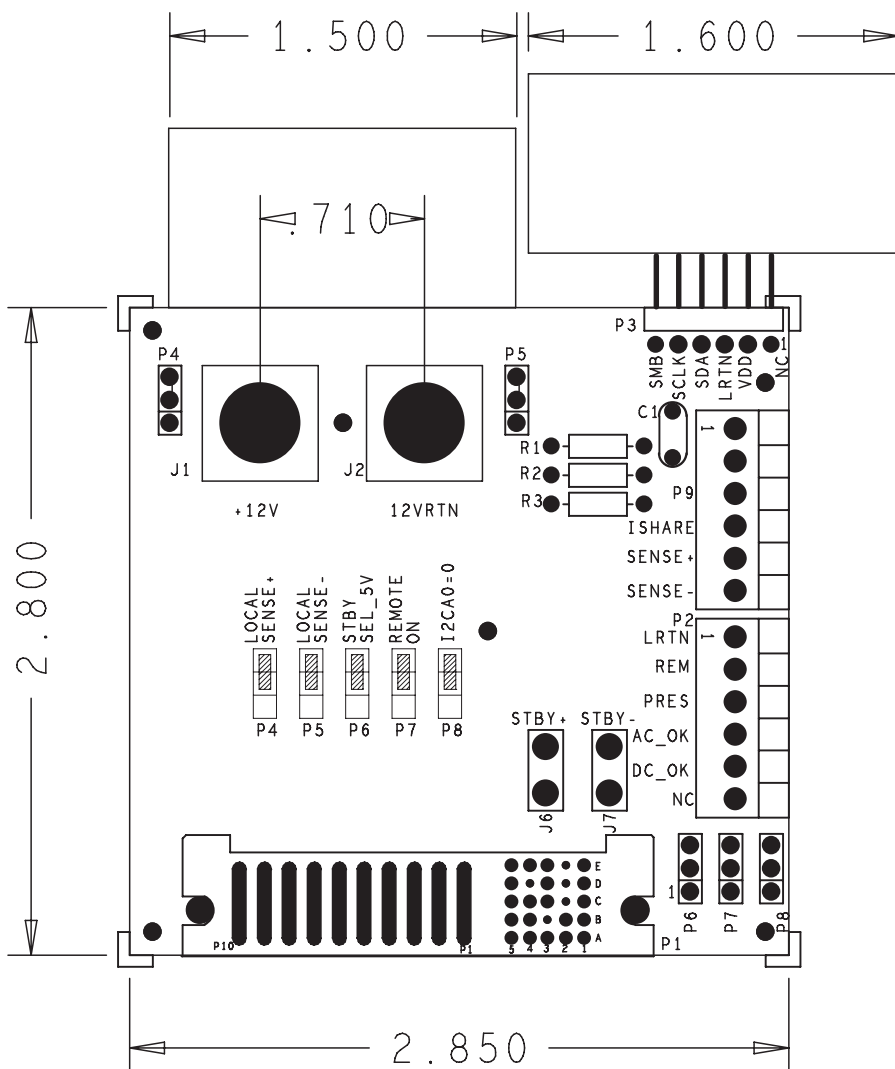
DEMO BOARD

| Accessories | | |
|--------------------------------------|-----------------|-----------------------------|
| Description | CUI Part Number | Vendor/Part Number |
| Demo Board ¹ | 01T-156801-1 | |
| DC Output Mating Connector | 22P-S00065-4 | TEConn 2-1926739-5 |
| I ² C dongle ² | | Microchip DV164122 |
| DC Input Mating connector | 22P-S00068-4 | Positronic PLB3W3F7105A1/AA |

Notes:

- This demo board is intended for user connection to evaluate the power supply in the laboratory by qualified personnel. Please take necessary safety precautions during product evaluation.
- The PICKit Serial Analyzer is a USB-based tool used to direct communication between a PC and an external serial device. The kit comes complete with hardware (supporting I²C™, SMBus, SPI and USART protocols), an easy-to-use GUI (to configure and display communications) and a target demonstration board for out-of-the-box functionality. http://www.microchip.com/stellent/idcplg?IdcService=SS_GET_PAGE&nodeId=1406&dDocName=en028600
- This board is only a lab test vehicle. It is common to both the AC input unit as well as the DC input unit.

| Demo Board Power Connections | |
|------------------------------|-----------------------|
| J1 | +12V Output |
| J2 | 12V Return |
| J6 | + Standby Output |
| J7 | Standby Output Return |



| Demo Board Connections/Settings | |
|---------------------------------|---|
| P1 | DC Output Mating Connector |
| P2 | Control & Status Signals |
| 1 | Logical Return |
| 2 | Remote ON (override by P7) |
| 3 | Present |
| 4 | AC_OK / DC_IN_OK |
| 5 | DC_OK |
| 6 | NC |
| P3 | I ² C Dongle Connection |
| 1 | SMB |
| 2 | SCL |
| 3 | SDA |
| 4 | Logical Return |
| 5 | VDD |
| 6 | NC |
| P4 | Jumper to Local Sense+, remove jumper for remote sense |
| P5 | Jumper to Local Sense-, remove jumper for remote sense |
| P6 | Jumper to Select 5V Standby, remove jumper to set 3.3V Standby |
| P7 | Jumper to ON, remove jumper for Remote ON/OFF |
| P8 | Jumper to set I ² C A0 = 0, remove jumper to set address by host |
| P9 | Control & Status Signals |
| 1 | NC |
| 2 | NC |
| 3 | NC |
| 4 | ISHARE (optional force sharing) |
| 5 | SENSE+ (override by P4) |
| 6 | SENSE- (override by P5) |

REVISION HISTORY

| rev. | description | date |
|------|-------------------|------------|
| 1.0 | initial release | 05/07/2015 |
| 1.01 | updated datasheet | 07/15/2015 |

The revision history provided is for informational purposes only and is believed to be accurate.

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