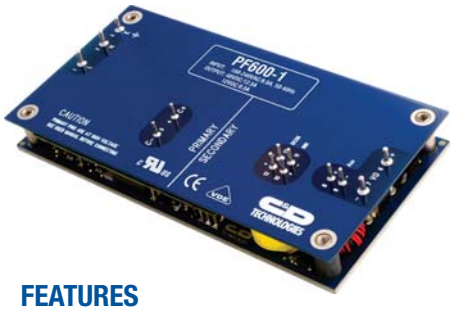
# PF600 SERIES

600W AC/DC Front-End Power Module

Murata Power Solutions




## OBSOLETE PRODUCT

Contact factory for replacement model

## FEATURES

- Compact 2.55"x5"x0.56" package
- 600W power at -10ºC to +100ºC
- Power density >84W per in3
- Up to 89% efficiency
- 90-264Vac global input range
- 12V at 50mA standby output
- DC OK signal
- Temperature monitoring output
- Harmonic correction to EN61000-3-2
- cUL & VDE approved to 60950-1
- Output remote ON/OFF control

## DESCRIPTION

The PF600 AC-DC converter module provides a highly-integrated, high-density solution for the front-end of a 48Vdc distributed power architecture (DPA). This unit delivers the full-rated 600W of output power over the input range of 90-264Vac while providing harmonic correction to EN61000-3-2.

Unlike competitive offerings, the PF600 provides a full-isolated output, permitting implementations with either isolated or non-isolated DC-DC converters.

The wide input voltage range of 85-264Vac facilitates use in products designed for global deployment. The isolated output also permits the user to polarize the output as the specific application may require.

The high-efficiency architecture and baseplate-cooled design simplify thermal management. The low-profile package makes this an ideal choice for 1U and 2U chassis applications where density and efficiency are strategic design considerations.

Proprietary design techniques combined with automated manufacturing in fully ISO-9001 certified facilities results in a compact, reliable, and efficient product that provides a cost-effective solution.

With global safety agency approvals, the PF600 is a comprehensive solution to a complex problem bounded by the competing pressures of development cycle time, efficiency, cost, and packagin

### SELECTION GUIDE

| Model Number | Power | Main Output | Standby Output | Production Status |
|---|---|---|---|---|
| PF600-1 | 600W | 48V@12.5A | 12V@50mA | Consult Factory |

### INPUT CHARACTERISTICS

| Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Input Operating Voltage | All line, load[1] & environmental | 85 | | 264 | Vac |
| Input Frequency | | 47 | | 66 | Hz |
| Input Current | | | | 5.5 | Arms |
| Power Factor | Io>25% | 0.95 | 0.98 | 0.99 | |
| Inrush Current | 240Vac, avg. over 1 cycle | | | 10 | Arms |
| Quiescent Input Power | SB output unloaded, output inhibited, 230Vac | | | 2.5 | W |
| | Output enabled but unloaded | | | 44 | W |

### OUTPUT CHARACTERISTICS

| Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Output Power | 90-264Vac | 0 | | 600 | W |
| Main Output Voltage (Vo) | All line, load, temp, & 90% load step | 36 | 48 | 59 | Vdc |
| | 5%-100% static load, 0-100ºC | 44.5 | 48 | 50.5 | Vdc |
| Main Output Current (Io) | | 0 | | 12.5 | A |
| Standby Output Voltage (Vsb) | | 10 | 12 | 14 | Vdc |
| Standby Output Current (Isb) | | 0 | | 50 | mA |
| PARD (Vo) | 100kHz-20MHz | | 850 | | mVp-p |
| | Low freq ripple | | 2.2 | | Vp-p |
| PARD (Vsb) | 20MHz bandwidth | | | 500 | mVp-p |
| Turn-On Delay (Vo) | | | 1 | 2 | sec |
| Output Holdup Time | Full load, 470uF bulk cap[2] | | 20 | | msec |
| Isolation, Pri-Sec | | 3 | | | kVac |
| Isolation, Pri-Chassis | | 1.5 | | | kVac |
| Isolation, Sec-Chassis | | 500 | | | Vac |

### GENERAL CHARACTERISTICS

| Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Efficiency | 600W load, 90Vac | | 86 | | % |
| | 600W load, 264Vac | | 89 | | % |
| Switching Frequency | | 255 | 300 | 345 | kHz |
| MTBF | MIL-HDBK-217F, 100ºC | 436 | | | khrs |
| Weight | Unpackaged | | 260 | | g |



Notes:
1 Full 600W power available at input voltages above 90Vac; de-rate output to 550W at 85Vac.
2 An external bulk capacitor is connected to terminals C+ and C- (pins 4 & 5) is required for operation. The minimum required capacitance is 100uF; the maximum value is 1000uF. The ripple current rating for this capacitor should exceed 3Arms at 300kHz. The minimum voltage rating for the bulk capacitor is 450Vdc. Additional information on holdup time is available in application note ACAN-10.

| GENERAL CHARACTERISTICS | | | | | |
|---|---|---|---|---|---|
| Parameter | Conditions | Min | Typ | Max | Units |
| Efficiency | Full load, 240Vac | | 79 | 81 | % |
| Switching Frequency | PFC Converter | | 100 | | kHz |
| | Main Converter | | 130 | | kHz |
| MTBF | Calculated per Telcordia SR-332, Issue 1, 50ºC, 250lfm, ground benign | 200 | | | khrs |
| Weight | Unpackaged | | 620 | | g |

| PROTECTION | | | | | |
|---|---|---|---|---|---|
| Parameter | Conditions/Response | Inception | | | Units |
| | | Min | Typ | Max | |
| Output Overload Protection[5] | Vo; output short circuit; automatic recovery[3] | | 16 | 20 | A |
| | Vsb; output short circuit; automatic recovery[4] | | 150 | | mA |
| Thermal Shutdown | Automatic Recovery | 100 | 105 | 125 | ºC |
| Input Undervoltage Protection | No damage will result from operation at voltages below the specified range. Available power will decrease below 90Vac, and at a voltage below 85Vac (typically 82Vac) the main output is switched off. | | 82 | | Vac |
| Input Protection | An input fuse is required external to the PF600 module. Recommended maximum rating is 10A, 250V HBC. | | | 10 | A |

| STATUS & CONTROL SIGNALS | |
|---|---|
| Name | Description |
| Remote ON/OFF | An isolated pair (INH+, pin 10, and INH_, pin 11) provides for the inhibiting or enabling of the main output, Vo. Logic 1 (>3V) or leaving the pins open enables the output; a short between the pair or a logic 0 (<0.5V) inhibits the output. The standby output remains active during the output inhibit. |
| DC OK (DCOK) | An open-drain logic output (DCOK+, pin 12) referenced to the power output return (Vo-, pin 7) monitors the main output voltage(Vo ). During normal operation, this is a logic 0 until the output voltage falls below the minimum threshold (36.0V -39.5V). This signal presents high impedance when the unit is unpowered and until the output voltage has risen above a threshold between 38.0V and 41.5V for a period between 140ms and 460ms. A separate return pin (DCOK-, pin 13) is provided for this signal, with a low-value resistance to the output return. |
| Temperature Monitor | The open circuit voltage present between the inhibit pair (INH+ and INH-, pins 10 & 11) falls as the internal temperature rises. This voltage does not exceed 10V; the converter will be disabled when this voltage falls below approximately 3V. Additional information is available in Application Note ACAN-16. |

| ENVIRONMENTAL CHARACTERISTICS | | | | | |
|---|---|---|---|---|---|
| Parameter | Conditions | Min | Typ | Max | Units |
| AmbientOperatingTemperature | Baseplate temperature | -10 | | 100 | ºC |
| Ambient Storage Temperature | | -55 | | 125 | ºC |
| Operating Humidity | Non-condensing | 10 | | 90 | % |
| Storage Humidity | Non-condensing | 5 | | 90 | % |

Notes:
3. Overload response is hiccup mode with a typical duty cycle of 35ms on and 1600ms off.
4. Overload of the auxiliary output may affect operation fof the PF600.
5. Output current limit inception occurs between 13.1A and 15.6A (115%±10%) at working output voltages. Over the full range of output voltage, the available current will be between 6A and 20A. When the output voltage falls under an overload condition, the output is disabled after a short time (typically 35ms at short circuit) and retries at intervals of about 2 seconds until the overload condition is cleared.

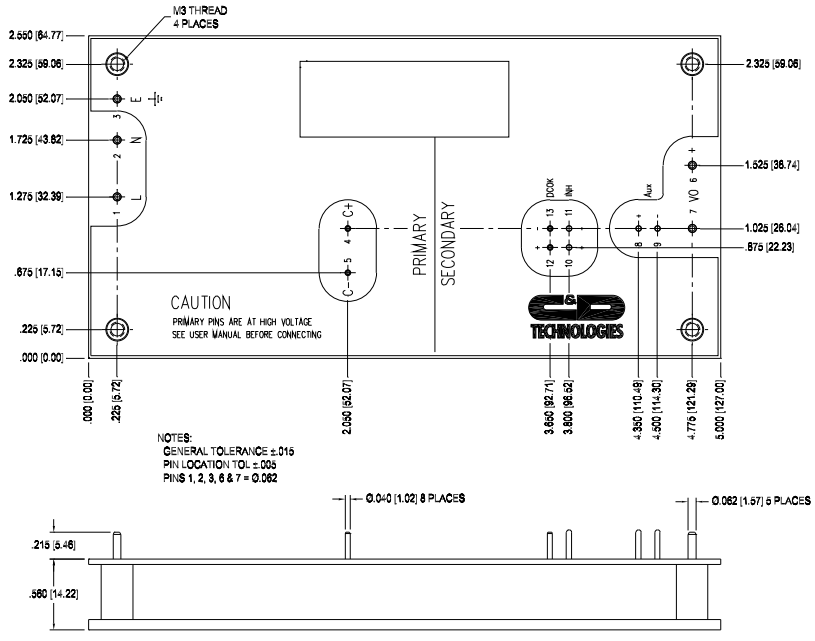
## CERTIFICATIONS

| Agency/Characteristic | Standard |
|---|---|
| UL | UL60950-1 |
| CSA | CSA60950-1 (per cUL) |
| VDE | EN60950-1 |
| CE | LVD Directive; self-certified |
| SELV | Self-Certified |
| Vibration | MIL-STD-810F, Method 514.5, Procedure I; self-certified |
| Shock | MIL-STD-810F, Method 516.5, Procedure I; self-certified |

## TERMINATIONS

| Ref | Name | Function | Pin Dia. | Direction | X pos in. (mm) | Y pos in. (mm) |
|---|---|---|---|---|---|---|
| P1 | L | Input Line | 0.060” | In | | |
| P2 | N | Input Neutral | 0.060” | In | | |
| P3 | E | Input Earth Ground | 0.060” | Baseplate | | |
| P4 | C+ | Capacitor positive | 0.040” | In/Out | | |
| P5 | C- | Capacitor negative | 0.040” | In/Out | | |
| P6 | Vo+ | Positive output | 0.060” | Out | | |
| P7 | Vo- | Negative output | 0.060” | Out | | |
| P8 | Vaux+ | Auxiliary output positive | 0.040” | Out | | |
| P9 | Vaux- | Auxiliary output return (isolated from other pins) | 0.040” | Out | | |
| P10 | INH+ | Inhibit / Temperature Monitor | 0.040” | In/Out | | |
| P11 | INH- | Return for P10 | 0.040” | In/out | | |
| P12 | DCOK+ | Output good signal, negative going | 0.040” | Out | | |
| P13 | DCOK- | Return for P12, connected to P7 via 47Ω resistor | 0.040” | Ref | | |

## MECHANICAL DIMENSIONS



| ELECTROMAGNETIC COMPATABILITY (EMC) | |
|---|---|
| Characteristic | Standard |
| Input Current Harmonics | EN61000-3-2, Class A |
| EMC Susceptibility & Immunity | The PF600 module requires external circuitry to achieve compliance with the various standards for EMC, including but not limited to EN61000-4-x, FCC Part 15, and EN55022. Most notably, a filter and other voltage-limiting circuitry is required at the input when the unit is to be supplied from AC mains. These are necessary not only for EMC compliance, but also to prevent differential transient voltages from being applied between the input terminals of the module that could damage the unit. Additional information on input protection is available in application notes ACAN-12 and ACAN-13. |

| ABSOLUTE MAXIMUM RATINGS | | | | | |
|---|---|---|---|---|---|
| Parameter | Conditions | Inception | | | |
| | | Min | Typ | Max | Units |
| Input Voltage | RMS | | | 280 | Vac |
| | Peak, continuous | | | 400 | V |
| | Peak, single event | | | 500 | V |
| Ambient Temperature | | -55 | | +125 | ºC |
| Signal Inputs & Outputs | Voltage | -0.3 | | 15 | V |
| | Current | -10 | | +10 | mA |

| APPLICATION NOTES | | |
|---|---|---|
| Name | Description | File Location |
| ACAN-09 | Series and Parallel Operation of the PF600 | http://www.murata-ps.com/data/apnotes/acan-09.pdf |
| ACAN-10 | Output Holdup and Ridethrough for the PF600 | http://www.murata-ps.com/data/apnotes/acan-10.pdf |
| ACAN-11 | AC Power Fail Warning Circuit for the PF600 | http://www.murata-ps.com/data/apnotes/acan-11.pdf |
| ACAN-12 | EN61000-4-* Transient Immunity for thePF600 | http://www.murata-ps.com/data/apnotes/acan-12.pdf |
| ACAN-13 | Input Fusing and Inrush Control for the PF600 | http://www.murata-ps.com/data/apnotes/acan-13.pdf |
| ACAN-15 | Thermal Management for the PF600 | http://www.murata-ps.com/data/apnotes/acan-15.pdf |
| ACAN-16 | Temperature Monitoring Function for the PF600 | http://www.murata-ps.com/data/apnotes/acan-16.pdf |
| ACAN-17 | Recommendations for Handling of the PF600 | http://www.murata-ps.com/data/apnotes/acan-17.pdf |
| ACAN-18 | Output Filtering for the PF600 | http://www.murata-ps.com/data/apnotes/acan-18.pdf |
| ACAN-22 | Constraints on the Load Characteristics for the PF600 | http://www.murata-ps.com/data/apnotes/acan-22.pdf |
| ACAN-23 | Load Enable Function for the PF600 in DPA Applications | http://www.murata-ps.com/data/apnotes/acan-23.pdf |
| ACAN-24 | PF600-1 Evaluation Board | http://www.murata-ps.com/data/apnotes/acan-24.pdf |

ISO9001 CERTIFIED

| SAFETY AGENCY RATINGS | |
|---|---|
| Input Voltage | 120/240Vac |
| Input Current | 3A |
| Input Power | 270W |

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01/15/09



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