



FEATURES

- Industrial SMD Package
- I/O Isolation 1000VDC
- Water Washable Process Available
- Tape & Reel Package Available
- RoHS & REACH Available
- Up to 1 Watt Output Power
- Single or Dual Outputs Available
- High Efficiency
- Short Circuit Protection
- Qualified for Lead-Free Reflow Solder Process According to IPC/JEDEC J-STD-020D.1

DESCRIPTION

The PF series of DC DC converters offers up to 1 watt of output power in a compact SMD package. This series has I/O isolation of 1000VDC and offers single or dual outputs. The PF series is RoHS compliant, has high efficiency, and short circuit protection. This series has water washable process and tape & reel packages available, and it is qualified for lead-free reflow solder process according to IPC/JEDEC J-STD-020D.1

MODEL SELECTION TABLE

Single Output

| Model Number | Input Voltage Range | Output Voltage | Output Current | | Ripple & Noise | Input Current | | Output Power | Load Regulation | Efficiency |
|--------------|-------------------------|----------------|----------------|----------|----------------|---------------|-----------|--------------|-----------------|------------|
| | | | Min Load | Max Load | | No Load | Full Load | | | |
| PF5S33-300 | 5VDC (4.5~5.5VDC) | 3.3VDC | 6mA | 300mA | 120mVp-p | 30mA | 264mA | 1W | 10% | 75% |
| PF5S5-200 | | 5VDC | 4mA | 200mA | | | 250mA | | 10% | 80% |
| PF5S9-110 | | 9VDC | 2mA | 110mA | | | 254mA | | 10% | 78% |
| PF5S12-84 | | 12VDC | 1.5mA | 84mA | | | 252mA | | 8% | 80% |
| PF5S15-67 | | 15VDC | 1mA | 67mA | | | 248mA | | 7% | 81% |
| PF12S33-300 | 12VDC (10.8~13.2VDC) | 3.3VDC | 6mA | 300mA | 120mVp-p | 15mA | 110mA | 1W | 8% | 75% |
| PF12S5-200 | | 5VDC | 4mA | 200mA | | | 103mA | | 8% | 81% |
| PF12S9-110 | | 9VDC | 2mA | 110mA | | | 106mA | | 8% | 78% |
| PF12S12-84 | | 12VDC | 1.5mA | 84mA | | | 104mA | | 5% | 81% |
| PF12S15-67 | | 15VDC | 1mA | 67mA | | | 102mA | | 5% | 82% |
| PF24S33-300 | 24VDC (21.6~26.4VDC) | 3.3VDC | 6mA | 300mA | 120mVp-p | 8mA | 57mA | 1W | 8% | 73% |
| PF24S5-200 | | 5VDC | 4mA | 200mA | | | 53mA | | 8% | 79% |
| PF24S9-110 | | 9VDC | 2mA | 110mA | | | 54mA | | 8% | 77% |
| PF24S12-84 | | 12VDC | 1.5mA | 84mA | | | 53mA | | 5% | 80% |
| PF24S15-67 | | 15VDC | 1mA | 67mA | | | 52mA | | 5% | 80% |

MODEL SELECTION TABLE

Dual Output

| Model Number | Input Voltage Range | Output Voltage | Output Current | | Ripple & Noise | Input Current | | Output Power | Load Regulation | Efficiency |
|--------------|-------------------------|----------------|----------------|----------|----------------|---------------|-----------|--------------|-----------------|------------|
| | | | Min Load | Max Load | | No Load | Full Load | | | |
| PF5D5-100 | 5VDC (4.5~5.5VDC) | ±5VDC | ±2mA | ±100mA | 120mVp-p | 30mA | 267mA | 1W | 10% | 75% |
| PF5D9-55 | | ±9VDC | ±1mA | ±55mA | | | 260mA | | 10% | 76% |
| PF5D12-42 | | ±12VDC | ±0.8mA | ±42mA | | | 255mA | | 8% | 79% |
| PF5D15-33 | | ±15VDC | ±0.7mA | ±33mA | | | 251mA | | 7% | 79% |
| PF12D5-100 | 12VDC (10.8~13.2VDC) | ±5VDC | ±2mA | ±100mA | 120mVp-p | 15mA | 111mA | 1W | 8% | 75% |
| PF12D9-55 | | ±9VDC | ±1mA | ±55mA | | | 109mA | | 8% | 76% |
| PF12D12-42 | | ±12VDC | ±0.8mA | ±42mA | | | 105mA | | 5% | 80% |
| PF12D15-33 | | ±15VDC | ±0.7mA | ±33mA | | | 103mA | | 5% | 80% |
| PF24D5-100 | 24VDC (21.6~26.4VDC) | ±5VDC | ±2mA | ±100mA | 120mVp-p | 9mA | 56mA | 1W | 8% | 74% |
| PF24D9-55 | | ±9VDC | ±1mA | ±55mA | | | 55mA | | 8% | 75% |
| PF24D12-42 | | ±12VDC | ±0.8mA | ±42mA | | | 53mA | | 5% | 79% |
| PF24D15-33 | | ±15VDC | ±0.7mA | ±33mA | | | 52mA | | 5% | 79% |

SPECIFICATIONS

All specifications are based on 25°C, Nominal Input Voltage, and Maximum Output Current unless otherwise noted.
 We reserve the right to change specifications based on technological advances.

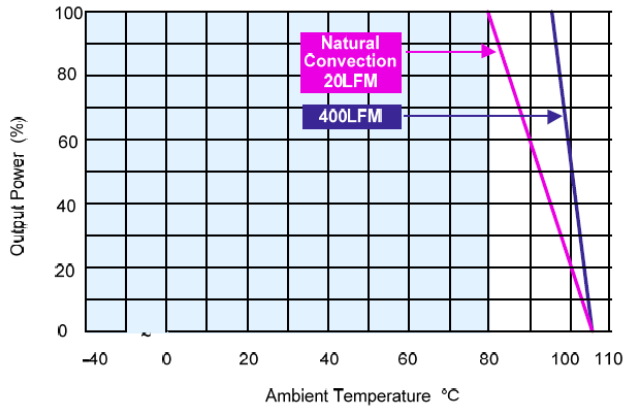
| SPECIFICATION | | TEST CONDITIONS | Min | Typ | Max | Unit |
|-----------------------------------|-----------------------------------|---------------------------|---|-----------|-------|--------|
| INPUT SPECIFICATIONS | | | | | | |
| Input Voltage Range | 5V input models | | 4.5 | 5 | 5.5 | VDC |
| | 12V input models | | 10.8 | 12 | 13.2 | |
| | 24V input models | | 21.6 | 24 | 26.4 | |
| Input Surge Voltage (1 sec. max.) | 5V input models | | -0.7 | | 9 | VDC |
| | 12V input models | | -0.7 | | 18 | |
| | 24V input models | | -0.7 | | 30 | |
| Input Filter | | Internal Capacitor | | | | |
| Reverse Polarity Input Current | Single Output Models | | | | 0.3 | A |
| Internal Power Dissipation | | | | | 450 | mW |
| OUTPUT SPECIFICATIONS | | | | | | |
| Output Voltage | | See Table | | | | |
| Voltage Accuracy | | | | ±1.0 | ±3.0 | %/Vnom |
| Line Regulation | For Vin Change of 1% | | | ±1.2 | ±1.5 | % |
| Load Regulation | Io=20% to 100% | See Model Selection Guide | | | | |
| Output Voltage Balance | Dual Outputs, Balanced Loads | | | ±0.1 | ±1.0 | % |
| Output Power | | See Table | | | | |
| Output Current | | See Table | | | | |
| Maximum Capacitive Load | | | | 33 | | µF |
| Ripple & Noise | 0-20MHz Bandwidth | | | | 120 | mVp-p |
| Temperature Coefficient | | | | ±0.01 | ±0.02 | %/°C |
| PROTECTION | | | | | | |
| Short Circuit Protection | Automatic Recovery | | | | 0.5 | Sec. |
| ENVIRONMENTAL SPECIFICATIONS | | | | | | |
| Operating Ambient Temperature | Natural Convection | | -40 | | +85 | °C |
| Storage Temperature | | | -50 | | +125 | °C |
| Case Temperature | | | | | +90 | °C |
| Humidity | Non-Condensing | | | | 95 | % RH |
| Cooling | | Natural Convection | | | | |
| Lead-free Reflow Solder Process | | IPC/JEDEC JSTD-020D.1 | | | | |
| MTBF (calculated) | MIL-HDBK-217F@25°C, Ground Benign | | | 2,000,000 | | hours |
| GENERAL SPECIFICATIONS | | | | | | |
| Efficiency | | | See Table | | | |
| Switching Frequency | | | 50 | 100 | 140 | KHz |
| Isolation Voltage | 60 Seconds | | 1000 | | | VDC |
| | 1 Seconds | | 1200 | | | |
| Isolation Resistance | 500VDC | | 1000 | | | MΩ |
| Isolation Capacitance | 100KHz, 1V | | | 40 | 100 | pF |
| Moisture Sensitivity Level (MSL) | IPC/JEDEC J-STD-020D.1 | | Level 3 | | | |
| PHYSICAL SPECIFICATIONS | | | | | | |
| Weight | Single Output | 5V & 12V models | 0.053oz (1.5g) | | | |
| | | 24V models | 0.063oz (1.8g) | | | |
| | Dual Output | 5V & 12V models | 0.063oz (1.8g) | | | |
| | | 24V models | 0.078oz (2.2g) | | | |
| Dimensions (L x W x H) | Single Output | 5V & 12V models | 0.50in x 0.31in x 0.27in (12.7mm x8.0mm x 6.8mm) | | | |
| | | 24V models | 0.50in x 0.33in x 0.31in (12.7mm x 8.3mm x 7.8mm) | | | |
| | Dual Output | 5V & 12V models | 0.60in x 0.31in 0.27in (15.24mm x 8.0mm x 6.8mm) | | | |
| | | 24V models | 0.60in x 0.33in x 0.31in (15.24mm x 8.3mm x 7.8mm) | | | |
| Case Material | | | Plastic UL94V-0 Packaging | | | |
| Flammability | | | UL94V-0 | | | |
| SAFETY & EMC CHARACTERISTICS | | | | | | |
| Compliance | | | RoHS, REACH | | | |

NOTES

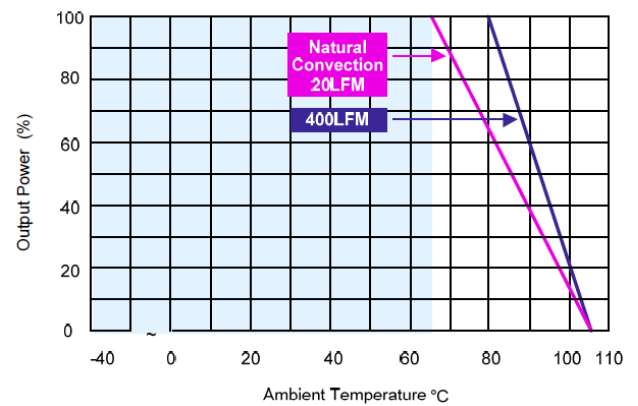
- (1) These power converters require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage these modules; however they may not meet all specifications listed.
- (2) It is recommended to protect converter by a slow blow fuse in the input supply line.
- (3) Other input and output voltages may be available, please contact factory.
- (4) Operation under no-load conditions will not damage these devices.
- (5) Specifications are subject to change without notice.

DERATING CURVES

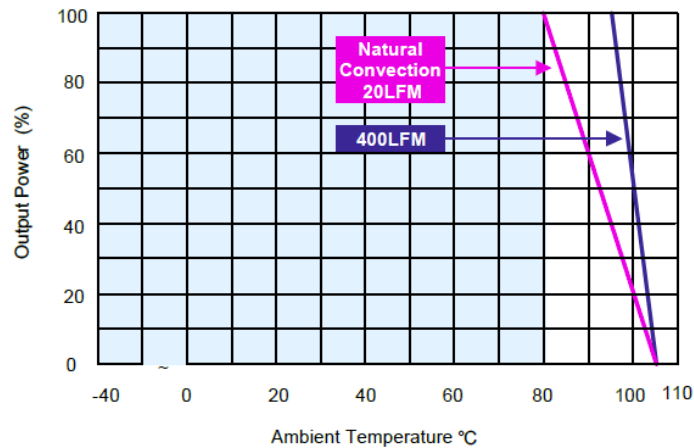
5V & 12V Power Derating Curve, Single Output



24V Power Derating Curve, Dual Output



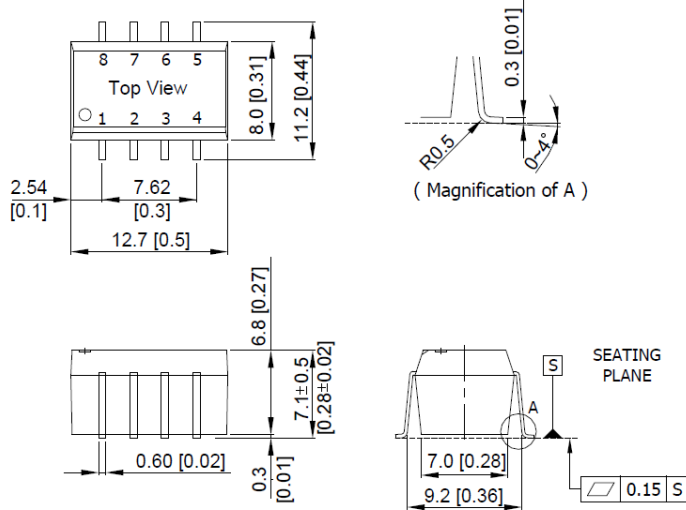
Dual Outputs Power Derating Curve



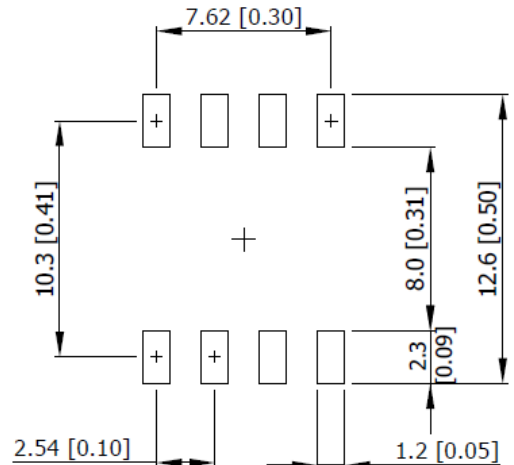
MECHANICAL DRAWINGS

Single Outputs

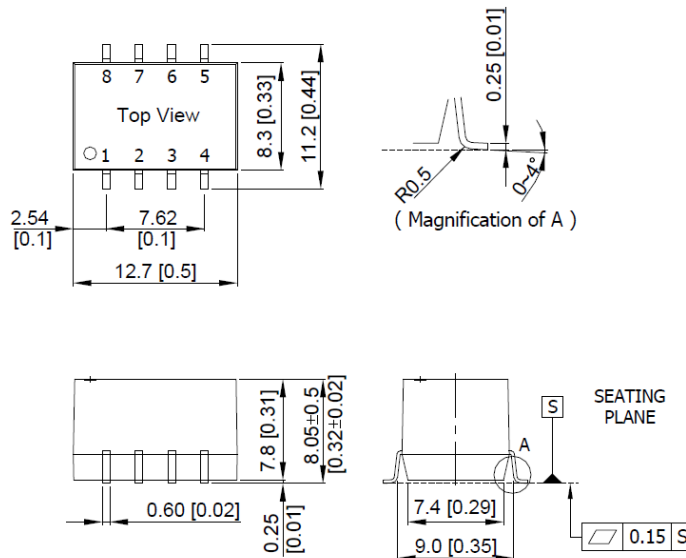
Mechanical Dimensions (5V & 12V)



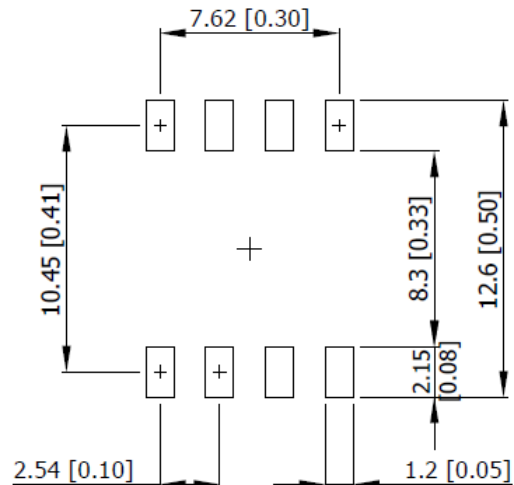
Connecting Pin Patterns



Mechanical Dimensions (24V)



Connecting Pin Patterns



Notes

All dimensions in mm (inches)
Tolerance: X.X±0.25 (X.XX±0.01)
X.XX±0.13 (X.XXX±0.005)
Pins ±0.05 (±0.002)

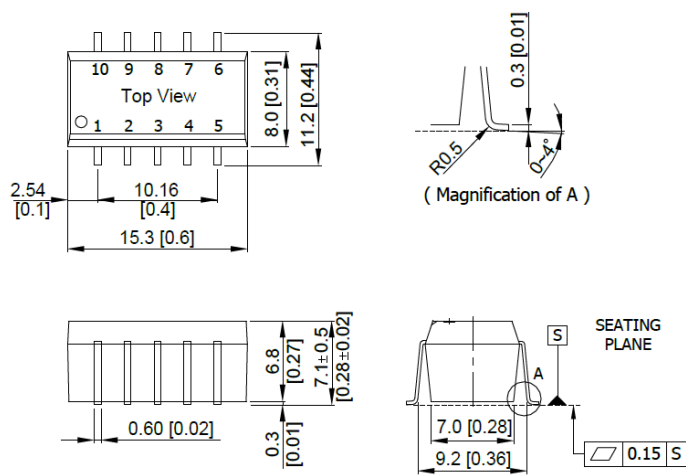
Pin Connections

| PIN | FUNCTION |
|-----|----------|
| 1 | -Vin |
| 2 | +Vin |
| 3 | NA |
| 4 | -Vout |
| 5 | +Vout |
| 6 | NA |
| 7 | NA |
| 8 | NA |

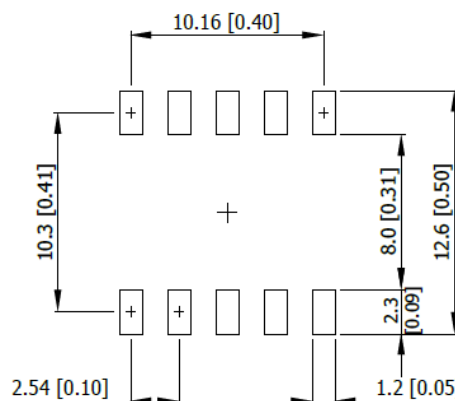
NA: Not Available for Electrical Connection

Dual Outputs

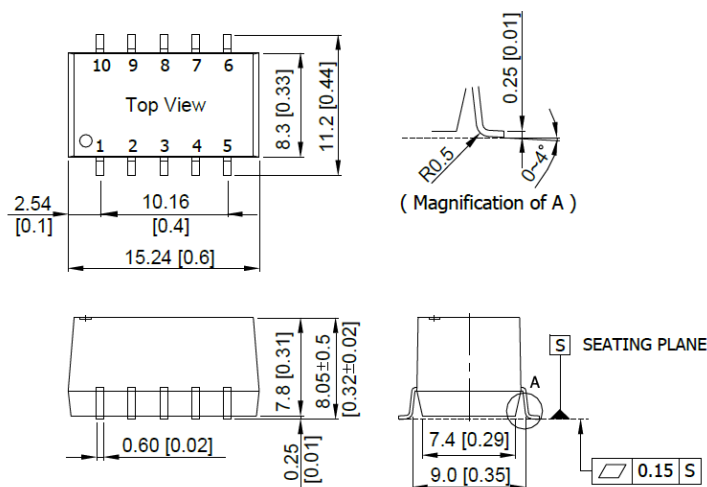
Mechanical Dimensions (5V & 12V)



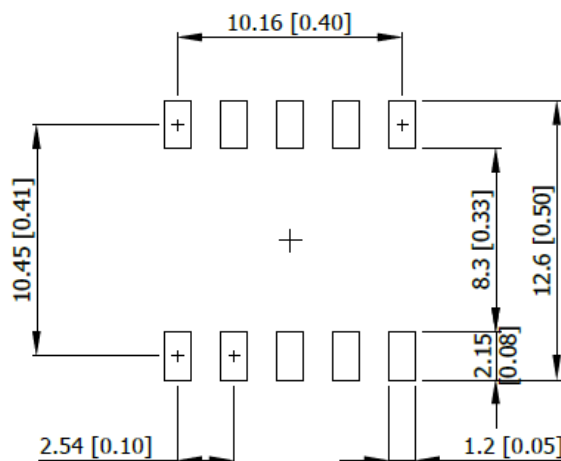
Connecting Pin Patterns



Mechanical Dimensions (24V)



Connecting Pin Patterns



Notes

All dimensions in mm (inches)
Tolerance: X.X±0.25 (X.XX±0.01)
X.XX±0.13 (X.XXX±0.005)
Pins ±0.05 (±0.002)

Pin Connections

| PIN | FUNCTION |
|-----|----------|
| 1 | -Vin |
| 2 | +Vin |
| 3 | NA |
| 4 | Common |
| 5 | -Vout |
| 6 | NA |
| 7 | +Vout |
| 8 | NA |
| 9 | NA |
| 10 | NA |

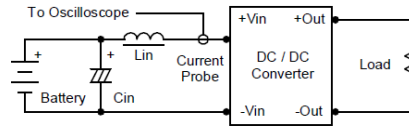
NA: Not Available for Electrical Connection

TEST SETUP

Input Reflected-Ripple Current Test Setup

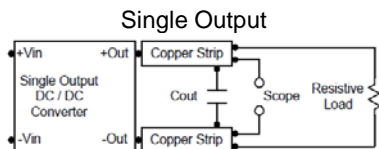
Input reflected-ripple current is measured with an inductor L_{in} (4.7 μ F) and C_{in} (220 μ F, ESR <1.0 Ω at 100KHz) to simulate source impedance. Capacitor C_{in} offsets possible battery impedance.

Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 KHz.

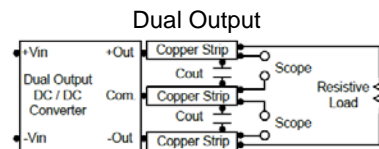


Peak-to-Peak Output Noise Measurement Test

Use a C_{out} 0.33 μ F ceramic capacitor. Scope measurement should be made by using a BNC socket, measured bandwidth is 0-20MHz. Position the load between 50mm and 75mm from the DC/DC converter.



Single Output



Dual Output

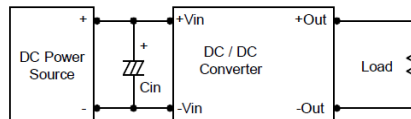
TECHNICAL NOTES

Maximum Capacitive Load

The PF series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. For optimum performance we recommend 33 μ F maximum capacitive load. The maximum capacitance can be found in the data sheet.

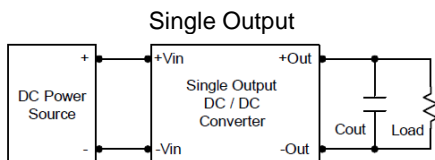
Input Source Impedance

The power module should be connected to a low AC-Impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure a startup. Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality, low Equivalent Series Resistance (ESR <1.0 Ω at 100KHz) capacitor of a 2.2 μ F for the 5V input devices, a 1.0 μ F for the 12V input devices and a 0.47 μ F for the 24V input devices.

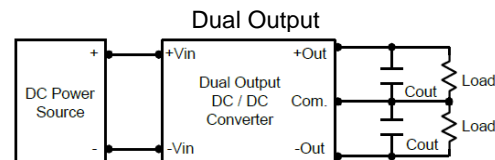


Output Ripple Reduction

A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 0.47 μ F capacitors at the output.



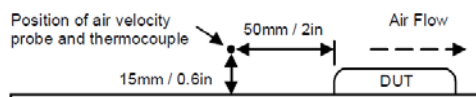
Single Output



Dual Output

Thermal Considerations

Many conditions affect the thermal performance of the power module, such as orientation, airflow over the module and board spacing. To avoid exceeding the maximum temperature rating of the components inside the power module, the case temperature must be kept below 90°C. The derating curves are determined from measurements obtained in a test setup.



COMPANY INFORMATION

Wall Industries, Inc. has created custom and modified units for over 50 years. Our in-house research and development engineers will provide a solution that exceeds your performance requirements on-time and on budget. Our ISO9001-2008 certification is just one example of our commitment to producing a high quality, well-documented product for our customers.

Our past projects demonstrate our commitment to you, our customer. Wall Industries, Inc. has a reputation for working closely with its customers to ensure each solution meets or exceeds form, fit and function requirements. We will continue to provide ongoing support for your project above and beyond the design and production phases. Give us a call today to discuss your future projects.

Contact **Wall Industries** for further information:

Phone: ☎(603)778-2300
Toll Free: ☎(888)597-9255
Fax: ☎(603)778-9797
E-mail: sales@wallindustries.com
Web: www.wallindustries.com
Address: 37 Industrial Drive
Exeter, NH 03833