

# SMHF SERIES SINGLE AND DUAL 15 WATT

# DC/DC CONVERTERS 28 VOLT INPUT

## FEATURES

- Fully qualified to Class H or K
- Radiation hardened
- -55° to +125°C operation
- 16 to 40 VDC input
- Fully Isolated
- Red hard optocoupler feedback
- Fixed frequency, 550 kHz typical
- Topology – Single Ended Forward
- Transient protection 50 V/120 ms
- Inhibit function
- Sync function
- Indefinite short circuit protection
- Undervoltage lockout
- Up to 84% efficiency



Size (max.): Non flanged 1.460 x 1.130 x 0.330 (37.08 x 28.70 x 8.38 mm)

Flanged 2.005 x 1.130 x 0.330 (50.93 x 28.70 x 8.38 mm)

See Figures 21 through 24 for dimensions.

Weight: 30 grams maximum.

Screening: Standard, Class H, or Class K (MIL-PRF-38534)

Radiation hardness levels O, L, and R

| MODELS     |      |
|------------|------|
| VDC OUTPUT |      |
| SINGLE     | DUAL |
| 3.3        | ±5   |
| 5          | ±12  |
| 12         | ±15  |
| 15         |      |

## DESCRIPTION

The SMHF Series™ of 28 V DC/DC converters offers a wide input voltage range of 16 to 40 volts and up to 15 watts of output power. The units are capable of withstanding short term transients up to 50 volts. The package is a hermetically sealed, seam-welded metal case. Flanged and non-flanged models are available.

## SCREENING AND REPORTS

SMHF converters offer three screening options (Standard, Class H, or Class K) and three levels of radiation hardness (O, L, and R). See Tables 1, 2, and 3 for more information. Detailed reports on product performance are also available and are listed in Table 4.

## CONVERTER DESIGN

The SMHF converters are switching regulators that use a quasi-square wave, single-ended forward converter design with a constant switching frequency of 550 kHz. Isolation between input and output circuits is provided with a transformer in the forward path and a temperature compensated opto-coupler in the feedback control loop. The opto-coupler is radiation hardened and is especially selected for space applications.

For the SMHF dual output models, cross regulation is maintained by tightly coupled output magnetics. Up to 70% of the total output power is available from either output, providing the opposite output is simultaneously carrying 30% of the total output power. Predictable current limit is accomplished by directly monitoring the output load current and providing a constant current output above the overload point.

## HIGHER POWER DENSITY

The SMHF Series offers a new standard of performance for small size and high power density. At just 0.33 inch high and a total footprint of 1.7 in<sup>2</sup>, this low profile package offers a total power density of up to 30 watts per cubic inch.

## LOW NOISE, HIGH AUDIO REJECTION

The SMHF converters' feed-forward compensation system provides excellent dynamic response and noise rejection. Audio rejection is typically 50 dB. Typical output voltage response for a 50% to 100%

step load transient is as low as 1.3% with a 150 msec recovery time. Input ripple current is typically 35 mA p-p with output ripple voltage typically 30 mV p-p.

## INHIBIT FUNCTION

SMHF converters provide an inhibit terminal that can be used to disable internal switching, resulting in no output and very low quiescent input current. The converter is inhibited when a TTL compatible low ( $\leq 0.8$  – output disabled) is applied to the inhibit pin. The unit is enabled when the pin, which is internally connected to a pull-up resistor, is left unconnected or is connected to an open-collector gate. The open circuit output voltage associated with the inhibit pin is 8.5 to 12 VDC. In the inhibit mode, a maximum of 12 mA must be sunk from the inhibit pin at 28 VDC input.

## SYNCHRONIZATION

A synchronization feature is included with the SMHF Series that allows the user to match the switching frequency of the converter to the frequency of the system clock. An external synchronization feature is included that allows the user to adjust the nominally 550kHz operating frequency to any frequency within the range of 500 kHz to 600 kHz. This is initiated by applying a TTL compatible input of the desired frequency to pin 5.

## SHORT CIRCUIT PROTECTION

SMHF Series converters provide short circuit protection by restricting the output current to approximately 115% of the full load output current. The output current is sensed in the secondary stage to provide highly predictable and accurate current limiting, and to eliminate foldback characteristics.

## UNDERVOLTAGE LOCKOUT

Undervoltage lockout prevents the units from operating below approximately 14 VDC input voltage to keep system current levels smooth, especially during initialization or re-start operations.

# SMHF SERIES SINGLE AND DUAL 15 WATT

# DC/DC CONVERTERS

## ABSOLUTE MAXIMUM RATINGS

- Input Voltage**
- 16 to 40 VDC
- Power Dissipation (Pd)**
- 8 W
- Output Power**
- 12 to 15 watts depending on model
- Lead Soldering Temperature (10 sec per lead)**
- 300°C
- Storage Temperature Range (Case)**
- -65°C to +150°C

## RECOMMENDED OPERATING CONDITIONS

- Input Voltage Range**
- 16 to 40 VDC continuous
  - 0 V for up to 50 msec transient
- Case Operating Temperature (Tc)**
- -55°C to +125°C full power
  - -55°C to +135°C absolute
- Derating Output Power/Current (Tc)**
- Linearly from 100% at 125°C to 0% at 135°C

## SYNC AND INHIBIT

- Sync In (500 to 600 kHz)**
- Duty cycle 40% to 60%
  - Logic low 0.8 V max
  - Logic high 4.5 V min, 5 V max
  - Referenced to input common
  - If not used, connect to input common
- Inhibit TTL Open Collector**
- Logic low (output disabled)
    - Logic low voltage  $\leq 0.8$  V max
    - Inhibit pin current 4.0 mA max
  - Referenced to input common
  - Logic high (output enabled)
    - Open collector or unconnected

## TYPICAL CHARACTERISTICS

- Output Voltage Temperature Coefficient**
- 100 ppm/°C typical
  - 150 ppm/°C maximum
- Input to Output Capacitance**
- 60 pF typical
- Undervoltage Lockout**
- 12 V input typical
- Current Limit**
- 115% of full load typical
- Isolation**
- 100 megohm minimum at 500 V
- Audio Rejection**
- 50 dB typical
- Conversion Frequency (°55°C to +125°C Tc)**
- Free run 550 kHz typical
  - 480 kHz min, 620 kHz max
- Inhibit Pin Voltage (unit enabled)**
- 8.5 to 12 V

## Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, radiation level O, unless otherwise specified.

| SINGLE OUTPUT MODELS    |  | SMHF283R3S |     |      | SMHF2805S |     |      | SMHF2812S |     |       | SMHF2815S |     |       |        |
|-------------------------|--|------------|-----|------|-----------|-----|------|-----------|-----|-------|-----------|-----|-------|--------|
| OUTPUT VOLTAGE          | Tc = 25°C  | 3.27       | 3.3 | 3.33 | 4.95      | 5   | 5.05 | 11.88     | 12  | 12.12 | 14.85     | 15  | 15.15 | VDC    |
| OUTPUT CURRENT          | V <sub>IN</sub> = 16 TO 40 VDC                           | —          | —   | 2.4  | —         | —   | 2.4  | —         | —   | 1.25  | —         | —   | 1.00  | A      |
| OUTPUT POWER            | V <sub>IN</sub> = 16 TO 40 VDC                           | 0          | —   | 8    | 0         | —   | 12   | 0         | —   | 15    | 0         | —   | 15    | W      |
| OUTPUT RIPPLE VOLTAGE   | 10 kHz - 2 MHz<br>Tc = -55°C TO +125°C                   | —          | 60  | 160  | —         | 30  | 80   | —         | 60  | 160   | —         | 60  | 75    | mV p-p |
| LINE REGULATION         | V <sub>IN</sub> = 16 TO 40 VDC                           | —          | 5   | 100  | —         | 5   | 100  | —         | 5   | 100   | —         | 5   | 100   | mV     |
| LOAD REGULATION         | NO LOAD TO FULL  | —          | 20  | 50   | —         | 20  | 50   | —         | 20  | 50    | —         | 20  | 50    | mV     |
| INPUT VOLTAGE           | CONTINUOUS   | 16         | 28  | 40   | 16        | 28  | 40   | 16        | 28  | 40    | 16        | 28  | 40    | VDC    |
| NO LOAD TO FULL         | TRANSIENT 120 ms   | 0          | —   | 50   | 0         | —   | 50   | 0         | —   | 50    | 0         | —   | 50    | V      |
| INPUT CURRENT           | NO LOAD  | —          | 25  | 65   | —         | 25  | 40   | —         | 25  | 50    | —         | 25  | 62    | mA     |
|                         | FULL LOAD  | —          | —   | 397  | —         | 560 | 624  | —         | 680 | 752   | —         | 670 | 752   |        |
|                         | INHIBITED  | —          | 5   | 12   | —         | 5   | 12   | —         | 5   | 12    | —         | 5   | 12    |        |
| INPUT RIPPLE CURRENT    | 10k Hz - 10 MHz<br>Tc = -55°C TO +125°C                  | —          | 45  | 80   | —         | 35  | 80   | —         | 35  | 80    | —         | 35  | 80    | mA p-p |
| EFFICIENCY              | Tc = 25°C  | 70         | 73  | —    | 73        | 75  | —    | 78        | 79  | —     | 74        | 80  | —     | %      |
| LOAD FAULT <sup>1</sup> | SHORT CIRCUIT  | —          | 5   | 8    | —         | 3.5 | 8    | —         | 3.5 | 8     | —         | 3.5 | 7     | W      |
|                         | POWER DISSIPATION RECOVERY <sup>2</sup>                  | —          | 7.5 | 30   | —         | 7.5 | 30   | —         | 7.5 | 30    | —         | 7.5 | 30    | ms     |
| STEP LOAD RESPONSE      | 50% -100% -50%<br>TRANSIENT                              | -400       | 150 | 500  | -500      | 150 | 500  | -700      | 150 | 700   | -800      | 200 | 800   | mV pk  |
|                         | RECOVERY <sup>2</sup>                                    | —          | 150 | 300  | —         | 150 | 300  | —         | 150 | 500   | —         | 600 | 1200  | µs     |
| STEP LINE RESPONSE      | 16 TO 40 TO 16 V <sub>IN</sub><br>TRANSIENT <sup>3</sup> | -800       | 550 | 800  | -800      | 550 | 800  | -800      | 550 | 800   | -800      | 550 | 800   | mV pk  |
|                         | RECOVERY <sup>2</sup>                                    | —          | 0.8 | 1.2  | —         | 0.8 | 1.2  | —         | 0.8 | 1.2   | —         | 0.8 | 1.2   | µs     |
| START-UP                | DELAY  | —          | 10  | 25   | —         | 10  | 25   | —         | 10  | 25    | —         | 10  | 25    | µs     |
|                         | 0 TO 28 VIN<br>OVERSHOOT <sup>4</sup>                    | —          | 200 | 300  | —         | 100 | 600  | —         | 200 | 1200  | —         | 200 | 1500  | mV pk  |

### Notes

1. Indefinite short circuit protection not guaranteed above 125°C (case)
2. Recovery time is measured from application of the transient to the point at which V<sub>out</sub> is within regulation.
3. Input step transition time >10µs.
4. Input step transition time <100µs.

# DC/DC CONVERTERS

# SMHF SERIES SINGLE AND DUAL 15 WATT

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, radiation level O, unless otherwise specified.

| DUAL OUTPUT MODELS                             |                                | SMHF2805D |      |      | SMHF2812D |        |       | SMHF2815D |        |       | UNITS  |
|--|--------------------------------|-----------|------|------|-----------|--------|-------|-----------|--------|-------|--------|
| PARAMETER                                      | CONDITIONS                     | MIN       | TYP  | MAX  | MIN       | TYP    | MAX   | MIN       | TYP    | MAX   |        |
| OUTPUT VOLTAGE                                 | +V <sub>OUT</sub>              | 4.95      | 5.00 | 5.05 | 11.88     | 12.00  | 12.12 | 14.85     | 15.00  | 15.15 | VDC    |
|  | -V <sub>OUT</sub>              | 4.92      | 5.00 | 5.08 | 11.82     | 12.00  | 12.18 | 14.78     | 15.00  | 15.23 |        |
| OUTPUT CURRENT <sup>1</sup>                    | V <sub>IN</sub> = 16 to 40 VDC | —         | ±1.2 | 1.68 | —         | ±0.625 | 0.875 | —         | ±0.500 | 0.700 | A      |
| OUTPUT POWER <sup>1</sup>                      | V <sub>IN</sub> = 16 to 40 VDC | —         | —    | 12   | —         | —      | 15    | —         | —      | 15    | W      |
| OUTPUT RIPPLE VOLTAGE ±V <sub>OUT</sub>        | 10 kHz - 2 MHz                 | —         | 60   | 160  | —         | 70     | 175   | —         | 70     | 175   | mV p-p |
|  | Tc = -55°C to +125°C           | —         | 100  | 240  | —         | 100    | 275   | —         | 100    | 275   |        |
| LINE REGULATION<br>Vin = 16 to 40 VDC          | BALANCED +V <sub>OUT</sub>     | —         | 5    | 50   | —         | 5      | 50    | —         | 5      | 50    | mV     |
|  | LOAD -V <sub>OUT</sub>         | —         | —    | 100  | —         | —      | 100   | —         | —      | 100   |        |
| LOAD REGULATION                                | BALANCED +V <sub>OUT</sub>     | —         | 20   | 50   | —         | 20     | 50    | —         | 20     | 50    | mV     |
|  | LOAD -V <sub>OUT</sub>         | —         | —    | 150  | —         | —      | 150   | —         | —      | 150   |        |
| CROSS REGULATION <sup>2</sup>                  | NEGATIVE V <sub>OUT</sub>      | —         | 6    | 7.5  | —         | 3      | 6     | —         | 3      | 6     | %      |
| INPUT VOLTAGE<br>NO LOAD TO FULL               | CONTINUOUS                     | 16        | 28   | 40   | 16        | 28     | 40    | 16        | 28     | 40    | VDC    |
|  | TRANSIENT 50 msec              | —         | —    | 50   | —         | —      | 50    | —         | —      | 50    | V      |
| INPUT CURRENT                                  | NO LOAD                        | —         | 20   | 50   | —         | 25     | 50    | —         | 25     | 50    | mA     |
|  | FULL LOAD                      | —         | 540  | 600  | —         | 645    | 754   | —         | 638    | 754   |        |
|  | INHIBITED                      | —         | 6    | 12   | —         | 5      | 12    | —         | 5      | 12    |        |
| INPUT RIPPLE CURRENT                           | 10 kHz - 10 MHz                | —         | 30   | 80   | —         | 40     | 80    | —         | 40     | 80    | mA p-p |
|  | Tc = -55°C to +125°C           | —         | 60   | 120  | —         | 55     | 120   | —         | 55     | 120   |        |
| EFFICIENCY                                     |                                | 75        | 77   | —    | 74        | 81     | —     | 74        | 82     | —     | %      |
| LOAD FAULT                                     | SHORT CIRCUIT <sup>3</sup>     | —         | —    | —    | —         | —      | —     | —         | —      | —     | —      |
|  | POWER DISSIPATION              | —         | 3    | 8    | —         | 3      | 6     | —         | 3      | 6     | W      |
|  | RECOVERY <sup>4</sup>          | —         | 7.5  | 30   | —         | 7.5    | 50    | —         | 7.5    | 50    | ms     |
| STEP LOAD RESP. <sup>5</sup><br>BALANCED LOADS | 50% - 100% - 50%               | —         | —    | —    | —         | —      | —     | —         | —      | —     | —      |
|  | TRANSIENT +V <sub>OUT</sub>    | -600      | 200  | 600  | -600      | 300    | 600   | -600      | 300    | 600   | mV pk  |
|  | -V <sub>OUT</sub>              | -600      | 150  | 600  | -600      | 100    | 500   | -600      | 100    | 600   |        |
| RECOVERY <sup>4</sup>                          | —                              | 150       | 500  | —    | 200       | 500    | —     | 200       | 600    | µs    |        |
| STEP LINE RESP.<br>± V <sub>OUT</sub>          | 16 - 40 - 40 VDC               | —         | —    | —    | —         | —      | —     | —         | —      | —     | —      |
|  | TRANSIENT <sup>6</sup>         | -800      | 600  | 800  | -750      | 550    | 750   | -750      | 550    | 750   | mV pk  |
| RECOVERY <sup>4</sup>                          | —                              | 0.8       | 1.2  | —    | 0.8       | 1.2    | —     | 0.8       | 1.2    | ms    |        |
| START-UP                                       | DELAY                          | —         | 12   | 30   | —         | 12     | 25    | —         | 12     | 25    | ms     |
|  | OVERSHOOT <sup>7</sup>         | 0         | 100  | 500  | 0         | 200    | 500   | 0         | 200    | 500   | mV pk  |

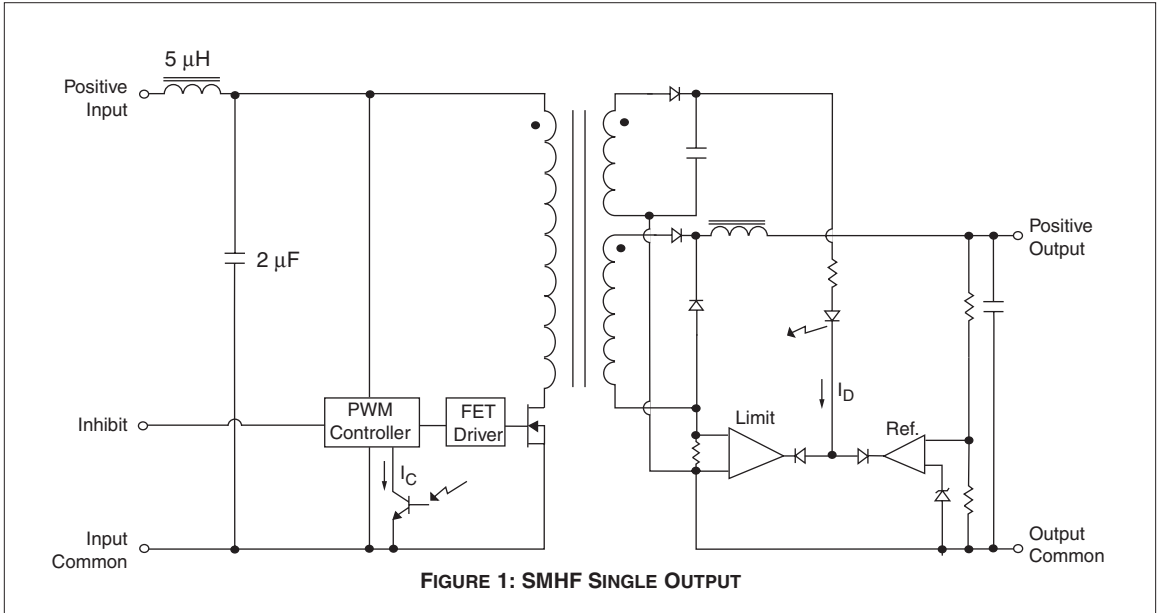
## Notes

- Up to 70% of the total output power is available from either output providing the opposite output is simultaneously carrying 30% of the total output power. Each output must carry a minimum of 30% of the total output power in order to maintain regulation on the negative outputs.
- Effect on -V<sub>out</sub> for the following conditions, percentages are of total power:  
+P<sub>o</sub> = 50% to 10% and -P<sub>o</sub> = 50%  
+P<sub>o</sub> = 50% and -P<sub>o</sub> = 50% to 10%
- Indefinite short circuit protection not guaranteed above 125°C (case)
- Recovery time is measured from application of the transient to point at which V<sub>out</sub> is within regulation.
- Response of either output with the opposite output held at half of the total output power.
- Input step transition time >10µs.
- Input step transition time <100µs.

**SMHF SERIES  
SINGLE AND DUAL  
15 WATT**

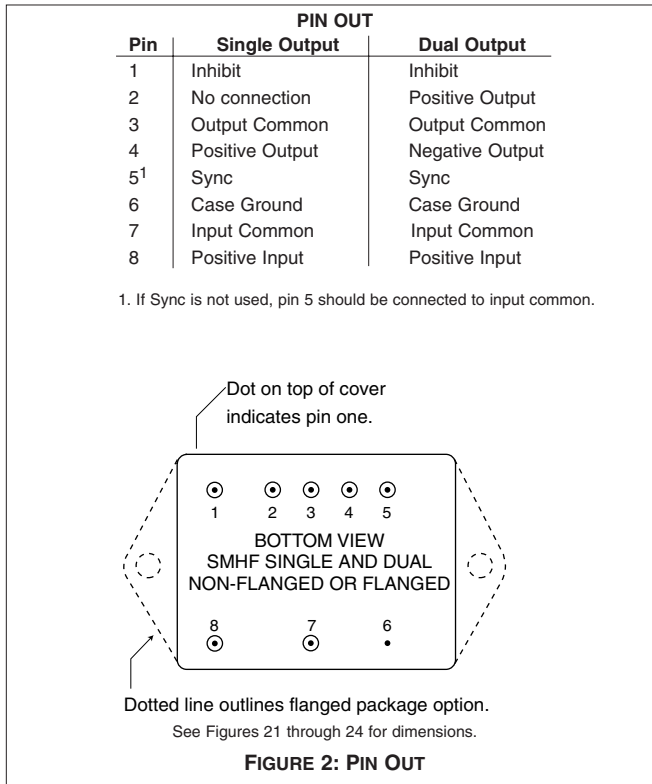
**DC/DC CONVERTERS**

**BLOCK DIAGRAM**



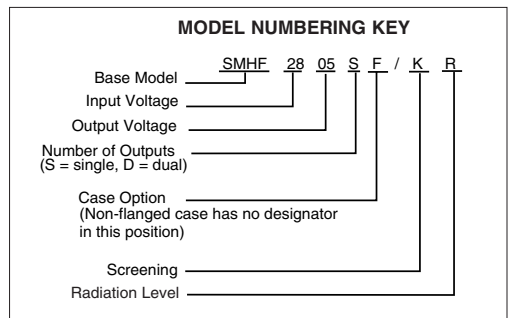
# DC/DC CONVERTERS

# SMHF SERIES SINGLE AND DUAL 15 WATT



| SMD NUMBERS                         |                   |
|-------------------------------------|-------------------|
| STANDARD MICROCIRCUIT DRAWING (SMD) | SMHF SIMILAR PART |
| 5962-9213902HXC                     | SMHF2805S/HO      |
| IN PROCESS                          | SMHF2812S/HO      |
| 5962-9160102HXC                     | SMHF2815S/HO      |
| 5962-9555902HXC                     | SMHF2805D/HO      |
| 5962-9214402HXC                     | SMHF2812D/HO      |
| 5962-9161402HXC                     | SMHF2815D/HP      |

To indicate the flanged case option change the "X" to "Z" in the SMD number. The SMD number shown is for Class H screening, non-flanged, and no Radiation Hardness Assurance (RHA) level. See the SMD for the numbers for other screening and radiation levels. For exact specifications for an SMD product, refer to the SMD drawing. Call your Interpoint representative for status on the SMHF SMD releases which are "in process." SMDs can be downloaded from <http://www.dscc.dla.mil/programs/smcr>



# SMHF SERIES SINGLE AND DUAL 15 WATT

# DC/DC CONVERTERS

Typical Performance Curves: 25°C Tc , 28 VDC Vin, 100% load, free run, unless otherwise specified.

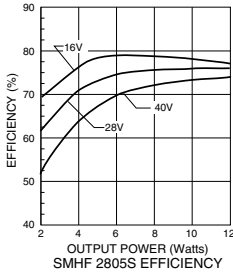


FIGURE 3

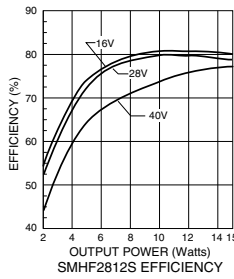


FIGURE 4

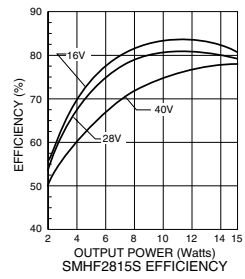


FIGURE 5

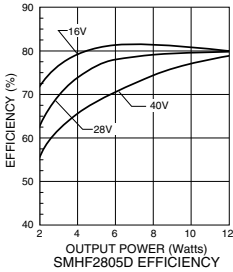


FIGURE 6

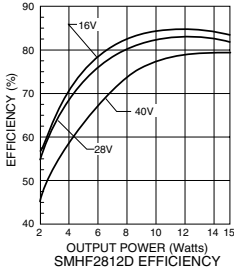


FIGURE 7

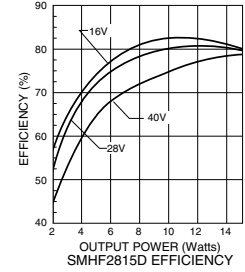


FIGURE 8

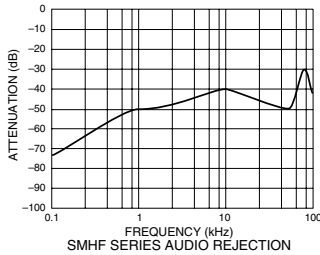


FIGURE 9

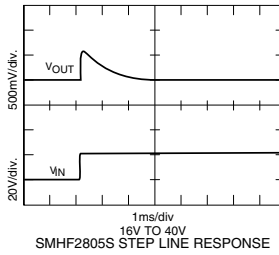


FIGURE 10

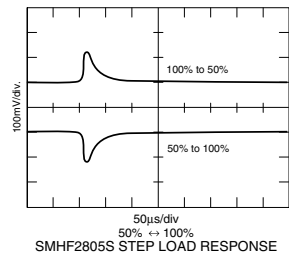
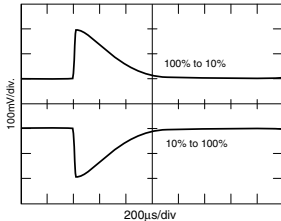


FIGURE 11

# DC/DC CONVERTERS

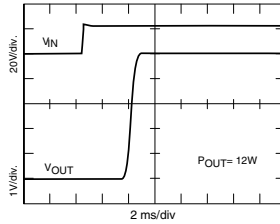
# SMHF SERIES SINGLE AND DUAL 15 WATT

Typical Performance Curves: 25°C Tc , 28 VDC Vin, 100% load, free run, unless otherwise specified.



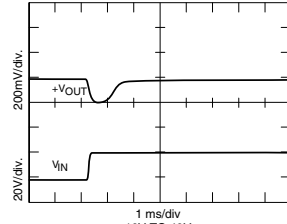
SMHF2805S STEP LOAD RESPONSE

FIGURE 12



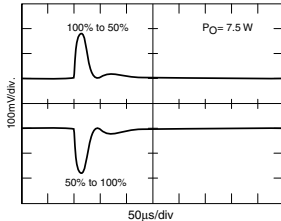
SMHF2805S TURN-ON INTO FULL LOAD

FIGURE 13



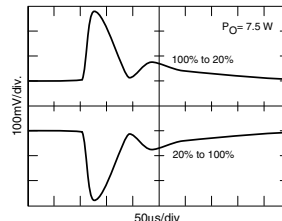
SMHF2815D STEP LINE RESPONSE

FIGURE 14



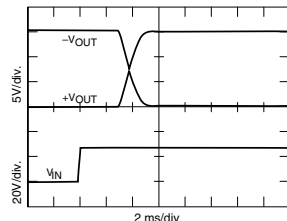
SMHF2805S STEP LOAD RESPONSE

FIGURE 15



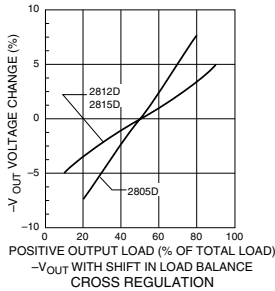
SMHF2815D VOUT STEP LOAD RESPONSE

FIGURE 16



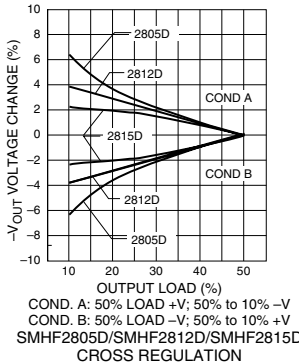
SMHF2815D TURN-ON INTO FULL LOAD

FIGURE 17



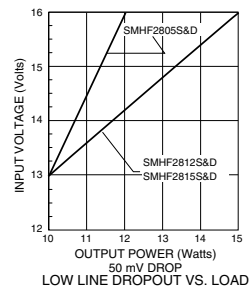
-V<sub>OUT</sub> WITH SHIFT IN LOAD BALANCE  
CROSS REGULATION

FIGURE 18



COND. A: 50% LOAD +V; 50% TO 10% -V  
COND. B: 50% LOAD -V; 50% TO 10% +V  
SMHF2805D/SMHF2812D/SMHF2815D  
CROSS REGULATION

FIGURE 19

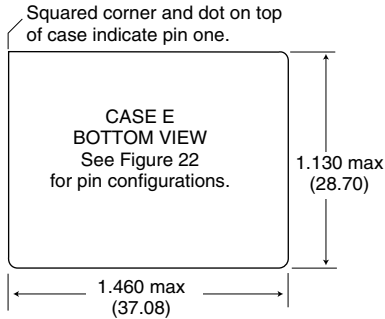


50 mV DROP  
LOW LINE DROPOUT VS. LOAD

FIGURE 20

**SMHF SERIES  
SINGLE AND DUAL  
15 WATT**

**DC/DC CONVERTERS**



**Materials**

- Header Cold Rolled Steel/Nickel/Gold
- Cover Kovar/Nickel (SMHF Series Cold Rolled Steel/Nickel/Gold)
- Pins #52 alloy/Gold compression glass seal

**Case dimensions in inches (mm)**

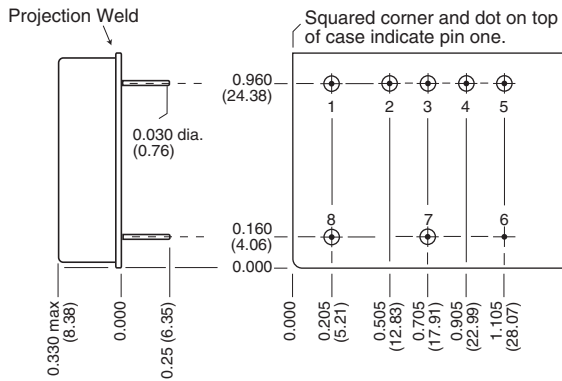
- Tolerance  $\pm 0.005$  (0.13) for three decimal places
- $\pm 0.01$  (0.3) for two decimal places unless otherwise specified

**CAUTION**

Heat from reflow or wave soldering may damage the device. Solder pins individually with heat application not exceeding 300°C for 10 seconds per pin.

**FIGURE 21: CASE E MAXIMUM DIMENSIONS**

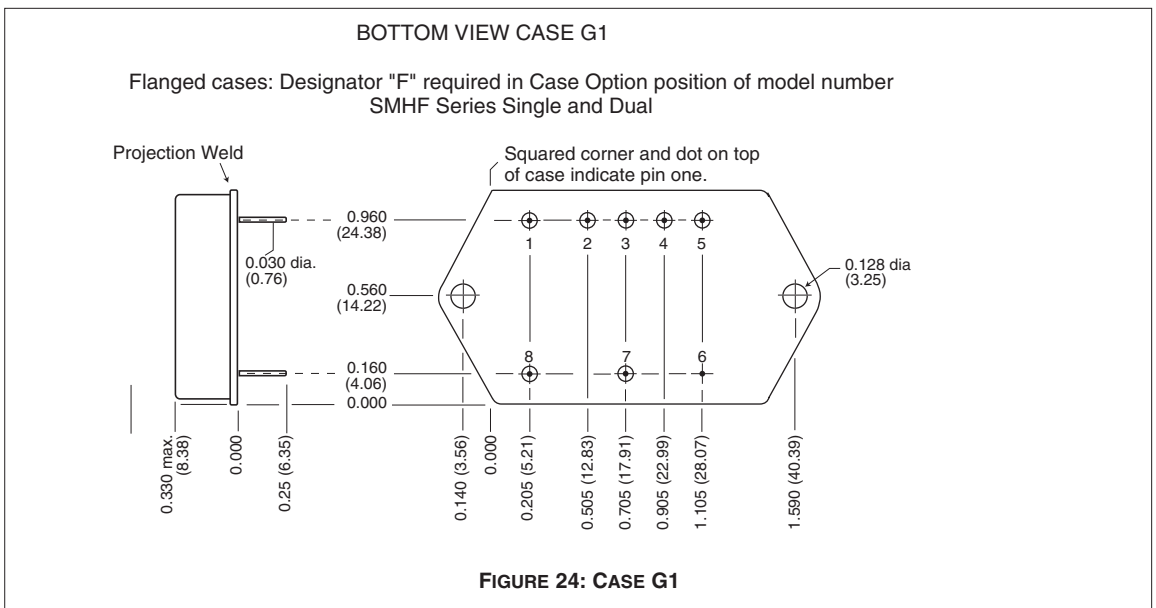
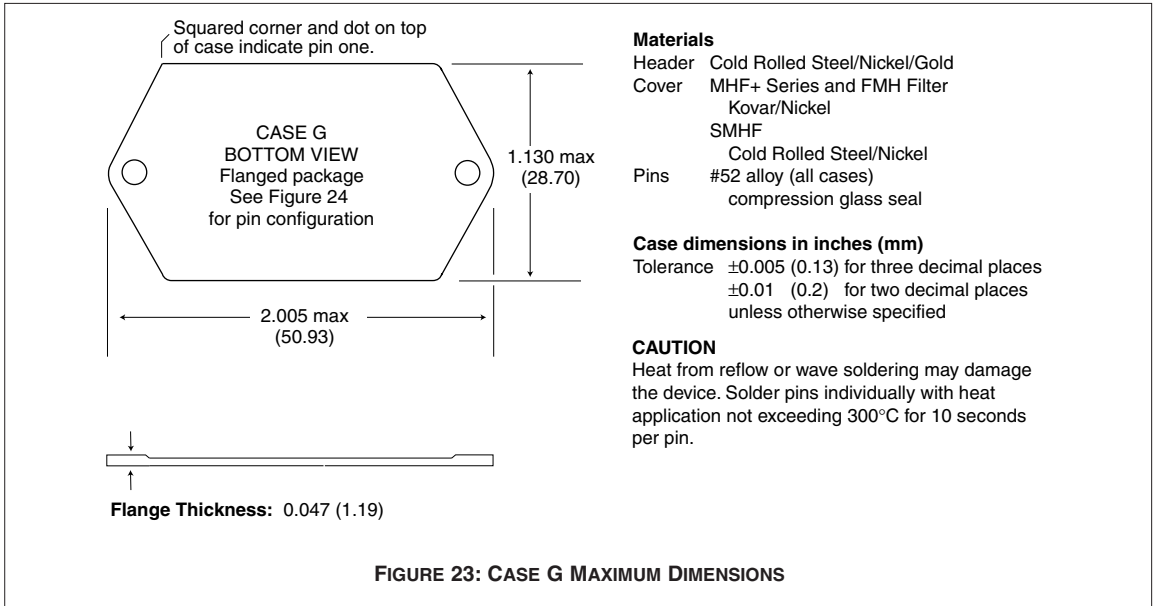
**BOTTOM VIEW CASE E1  
SMHF Series Single and Dual**



**FIGURE 22: CASE E1**

Note: Although every effort has been made to render the case drawings at actual size, variations in the printing process may cause some distortion. Please refer to the numerical dimensions for accuracy.





**SMHF SERIES  
SINGLE AND DUAL  
15 WATT**

**DC/DC CONVERTERS**

**TABLE 1: ELEMENT EVALUATION**

| ELEMENT EVALUATION<br><br>TEST PERFORMED<br>(COMPONENT LEVEL)             | SPACE     |    | CLASS |     | CLASS |     |
|---|-----------|----|-------|-----|-------|-----|
|   | PROTOTYPE |    | H     |     | K     |     |
|   | M/S       | P  | M/S   | P   | M/S   | P   |
| Element Electrical  | yes       | no | yes   | yes | yes   | yes |
| Element Visual  | no        | no | yes   | yes | yes   | yes |
| Internal Visual   | no        | no | yes   | no  | yes   | no  |
| Temperature Cycling   | no        | no | no    | no  | yes   | yes |
| Constant Acceleration   | no        | no | no    | no  | yes   | yes |
| Interim Electrical  | no        | no | no    | no  | yes   | no  |
| Burn-in   | no        | no | no    | no  | yes   | no  |
| Post Burn-in Electrical   | no        | no | no    | no  | yes   | no  |
| Steady State Life   | no        | no | no    | no  | yes   | no  |
| Voltage Conditioning /Aging   | no        | no | no    | no  | no    | yes |
| Visual Inspection   | no        | no | no    | no  | no    | yes |
| Final Electrical  | no        | no | yes   | yes | yes   | yes |
| Wire Bond Evaluation  | no        | no | yes   | yes | yes   | yes |
| SEM   | no        | no | no    | no  | yes   | no  |
| SLAM™/C-SAM:<br>Input capacitors only<br>(Add'l test, not req. by H or K) | no        | no | no    | yes | no    | yes |

**Notes**

- M/S Active components (Microcircuit and Semiconductor Die)
- P Passive components

**Definitions**

Element Evaluation: Component testing/screening per MIL-STD-883 as determined by MIL-PRF-38534

SEM: Scanning Electron Microscopy

SLAM™: Scanning Laser Acoustic Microscopy

C-SAM: C - Mode Scanning Acoustic Microscopy

# DC/DC CONVERTERS

# SMHF SERIES SINGLE AND DUAL 15 WATT

**TABLE 2: PRODUCT ENVIRONMENTAL SCREENING**

| <b>ENVIRONMENTAL SCREENING<br/>TEST PERFORMED<br/>(END ITEM LEVEL)</b> | <b>SPACE<br/>PROTOTYPE<br/>(O)</b> | <b>CLASS<br/>H</b> | <b>CLASS<br/>K</b> |
|--|------------------------------------|--------------------|--------------------|
| Non-destruct bond pull<br>Method 2023                                  | no                                 | no                 | yes                |
| Pre-cap inspection<br>Method 2017, 2032                                | yes                                | yes                | yes                |
| Temperature cycle<br>Method 1010, Cond. C                              | yes                                | yes                | yes                |
| Constant acceleration<br>Method 2001, 3000 g                           | yes                                | yes                | yes                |
| PIND Test<br>Method 2020, Cond. B                                      | no                                 | yes                | yes                |
| Radiography<br>Method 2012   | no                                 | no                 | yes                |
| Pre burn-in test   | yes                                | yes                | yes                |
| Burn-in, Method 1015, 125°C  |                                    |                    |                    |
| 96 hours   | yes                                | no                 | no                 |
| 160 hours  | no                                 | yes                | no                 |
| 2 x 160 hour (includes mid BI test)                                    | no                                 | no                 | yes                |
| Final electrical test<br>MIL-PRF-38534, Group A                        | yes                                | yes                | yes                |
| Hermeticity test   |                                    |                    |                    |
| Fine Leak,<br>Method 1014, Cond. A                                     | yes                                | yes                | yes                |
| Gross Leak,<br>Method 1014, Cond. C                                    | yes                                | yes                | yes                |
| Final visual inspection<br>Method 2009                                 | yes                                | yes                | yes                |

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

**SMHF SERIES  
SINGLE AND DUAL  
15 WATT**

**DC/DC CONVERTERS**

**TABLE 3: RADIATION HARDNESS LEVELS**

| PRODUCT LEVEL AVAILABILITY  | ENVIRONMENTAL SCREENING LEVELS |            |                  |
|---|--------------------------------|------------|------------------|
|   | SPACE<br>PROTOTYPE<br>(O)      | CLASS<br>H | CLASS<br>K       |
| <b>RADIATION HARDNESS LEVELS</b><br><b>O:</b> Standard, no radiation guarantee<br>For system evaluation, electrically<br>and mechanically comparable to<br>H and K level. | OO                             | HO         | Not<br>available |
| <b>R:</b> Radiation hardened – Tested lots<br>Up to 100 k Rads (Si) total dose<br>SEU guarantee up to 40 MeV  | Not<br>available               | HR         | KR               |

R is referenced to MIL-PRF-38534, appendix G, Radiation Hardness Assurance (RHA) levels.

| <b>TABLE 4:<br/>REPORTS INCLUDED WITH PURCHASE OF PRODUCT HR or KR</b> |
|--|
| 1. Radiation Susceptibility Analysis                                   |
| 2. Electrical/Thermal Stress Analysis and Derating Report              |
| 3. MTBF Report   |
| 4. FMEA Report   |
| <b>HO</b> option: Reports 2, 3, and 4 are included with purchase.      |
| <b>OO</b> option: Select reports available as separate purchases.      |

**Contact Information:**

[www.interpoint.com](http://www.interpoint.com)

Interpoint Headquarters USA  
Phone: 1-800-822-8782  
+425-882-3100  
Email: [power@intp.com](mailto:power@intp.com)

Interpoint UK  
Phone: +44-1252-872266  
Email: [poweruk@intp.com](mailto:poweruk@intp.com)

Interpoint France  
Phone: +33-134285455  
Email: [powerfr@intp.com](mailto:powerfr@intp.com)

11921-001-DTS Rev B This revision supercedes all previous releases.  
All technical information is believed to be accurate, but no responsibility is assumed for errors or omissions. Interpoint reserves the right to make changes in products or specifications without notice. SMHF Series is a trademark of Interpoint. Copyright © 1997-2000 Interpoint. All rights reserved.

