**FEATURES**

- **Fully qualified to Class H or K**
- **Radiation hardened**
- **–55° to +125°C operation**
- **16 to 40 VDC input**
- Fully Isolated
- Magnetic feedback
- Fixed frequency, 600 kHz typical
- Topology – Single Ended Forward
- Inhibit function
- Sync function
- Indefinite short circuit protection
- Up to 30 watts output power
- Trim function on single output models
- Up to 81% efficiency

# DC/DC CONVERTERS 28 VOLT INPUT

# SMTR SERIES 30 WATT




**MODELS**

**VDC OUTPUT**

| SINGLE | DUAL |
|---|---|
| 3.3 | ±5 |
| 5 | ±12 |
| 12 | ±15 |
| 15 | |

Size (max.): Non-flanged Case: H2 2.125 x 1.125 x 0.400 inches (53.98 x 28.58 x 10.16 mm)
Flanged Case: K3 2.910 x 1.125 x 0.400 inches (73.79 x 28.58 x 10.16 mm)
See Figures 22 through 25 for dimensions.
Weight: Non-flanged 52 grams max., flanged 55 grams max.
Screening: Space prototype, Class H, or Class K (MIL-PRF-38534)
Radiation hardness levels O or R

## DESCRIPTION

The SMTR Series™ of 28 volt DC/DC converters offers up to 30 watts of output power from single or dual output configurations. The operate over the full military temperature range of –55°C to +125°C with up to 84% efficiency. SMTR converters are packaged in hermetically sealed metal enclosures, making them ideal for use in military, aerospace and other high reliability applications.

### SCREENING AND REPORTS

SMTR converters offer three screening options (Standard, Class H, or Class K) and two levels of radiation hardness (O or 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 SMTR converters are constant frequency, pulse-width modulated switching regulators which use a quasi-square wave, single ended, forward converter design. Tight load regulation is maintained by using a wide bandwidth magnetic feedback and, on single output models, through use of remote sense. On dual output models, the positive output is independently regulated and the negative output is cross regulated through the use of tightly coupled magnetics.

Indefinite short circuit protection and overload protection are provided by a constant current-limit feature. This protective system senses current in the converter's secondary stage and limits it to approximately 115% of the maximum rated output current.

SMTR converters are provided with internal filtering capacitors that help reduce the need for external components in normal operation. For systems that require compliance with MIL-STD-461C's CE03 standard, Interpoint offers filter/transient suppression modules (including the FMC-461, FMD-461 and FM-704A series filters) which will result in compliance. For the lowest noise performance, connection of the case to input common is recommended. The connection can be hard-wired or AC coupled with a small ceramic bypass capacitor.

### SYNCHRONIZATION

Synchronizing the converter with the system clock allows the designer to confine switching noise to clock transitions, minimizing interference and reducing the need for filtering. In sync mode, the converter will run at any frequency between 500 kHz and 675 kHz. The sync control operates with a quasi-TTL signal at any duty cycle between 40% and 60%. The sync pin should be connected to input common pin when not in use.

### WIDE VOLTAGE RANGE

SMTR converters are designed to provide full power operation over a full 16 to 40 Vdc voltage range. Operation below 16 volts, including MIL-STD-704D emergency power conditions is possible with derated power.

### IMPROVED DYNAMIC RESPONSE

The SMTR Series feed-forward compensation system provides excellent dynamic response and noise rejection. Audio rejection is typically 50 dB. The min. to max. step line transient response is typically less than 4%.

### INHIBIT FUNCTION

SMTR 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 (≤0.8V) 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 9 to 11 Vdc. In the inhibit mode, a maximum of 8 mA must be sunk from the inhibit pin.

# DC/DC CONVERTERS

### ABSOLUTE MAXIMUM RATINGS

**Input Voltage**
- 16 to 40 VDC

**Output Power**
- 25 to 30 watts depending on model

**Lead Soldering Temperature (10 sec per pin)**
- 300°C

**Storage Temperature Range (Case)**
- –65°C to +135°C

### RECOMMENDED OPERATING CONDITIONS

**Input Voltage Range**
- 16 to 40 VDC continuous
- 50 V for 50 msec transient

**Case Operating Temperature (Tc)**
- –55°C to +125°C full power
- –55°C to +135°C absolute

**Derating Output Power/Current**
- Linearly from 100% at 125°C to 0% at 135°C

### SYNC AND INHIBIT

**Sync (500 to 675 kHz)**
- Duty cycle 40% min, 60% max
- 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)
  Voltage ≤0.8 V
  Inhibit pin current 8.0 mA max
- Referenced to input common
- Logic high (output enabled)
  Open collector

### TYPICAL CHARACTERISTICS

**Output Voltage Temperature Coefficient**
- 100 ppm/°C typical single and dual outputs
- 200 ppm/°C main, 300 ppm/°C aux triple output

**Input to Output Capacitance**
- 50 pF typ (100 pF typ triple outputs)

**Current Limit**
- 115% of full load typical

**Isolation**
- 100 megohm minimum at 500 V

**Audio Rejection**
- 40 dB typ (50 dB typ triple output)l

**Conversion Frequency**
- Free run 550 min, 600 typ, 650 max kHz
- External sync 500 to 675 kHz

**Inhibit Pin Voltage (unit enabled)**
- 9 to 11 V

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

| SINGLE OUTPUT MODELS | | SMTR283R3S | | | SMTR2805S | | | SMTR2812S | | | SMTR2815S | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PARAMETER** | **CONDITION** | **MIN** | **TYP** | **MAX** | **MIN** | **TYP** | **MAX** | **MIN** | **TYP** | **MAX** | **MIN** | **TYP** | **MAX** | **UNITS** |
| OUTPUT VOLTAGE | | 3.27 | 3.30 | 3.33 | 4.95 | 5.00 | 5.05 | 11.88 | 12.00 | 12.12 | 14.85 | 15.00 | 15.15 | VDC |
| OUTPUT CURRENT[1] | $V_{IN}$ = 16 to 40 VDC | 0 | — | 5.45 | 0 | — | 5.0 | 0 | — | 2.5 | 0 | — | 2.0 | A |
| OUTPUT POWER[1] | $V_{IN}$ = 16 to 40 VDC | 0 | — | 18 | 0 | — | 25 | 0 | — | 30 | 0 | — | 30 | W |
| OUTPUT RIPPLE | 10 kHz – 2 MHz | — | 15 | 40 | — | 35 | 40 | — | 25 | 40 | — | 25 | 40 | mV p-p |
| VOLTAGE | Tc = –55°C TO +125°C | — | — | 50 | — | 50 | 90 | — | 40 | 90 | — | 40 | 90 | |
| LINE REGULATION[2] | Vin = 16 to 40 VDC | | | | | | | | | | | | | |
| | Tc = –55°C TO +125°C | — | — | 20 | — | 15 | 50 | — | 15 | 50 | — | 15 | 50 | mV |
| LOAD REGULATION | NO LOAD TO FULL | | | | | | | | | | | | | |
| | Tc = –55°C TO +125°C | — | — | 20 | — | 15 | 50 | — | 15 | 50 | — | 15 | 50 | mV |
| INPUT VOLTAGE[1] | CONTINUOUS | 16 | 28 | 40 | 16 | 28 | 40 | 16 | 28 | 40 | 16 | 28 | 40 | VDC |
| NO LOAD TO FULL | TRANSIENT 50 ms | — | — | 50 | — | — | 50 | — | — | 50 | — | — | 50 | V |
| INPUT CURRENT[1] | NO LOAD | — | 30 | 75 | — | 35 | 75 | — | 35 | 75 | — | 35 | 75 | mA |
| | FULL LOAD | — | 0.94 | — | — | 1.15 | — | — | 1.30 | — | — | 1.25 | — | A |
| | INHIBITED | — | 7 | 8 | — | 3 | 8 | — | 3 | 8 | — | 3 | 8 | mA |
| INPUT RIPPLE | 10 kHz – 10 MHz | | | | | | | | | | | | | |
| CURRENT[3] | Tc = –55°C TO +125°C | — | 25 | 50 | — | 20 | 50 | — | 20 | 50 | — | 20 | 50 | mA p-p |
| EFFICIENCY | | 74 | 76 | — | 74 | 78 | — | 78 | 83 | — | 79 | 84 | — | % |
| LOAD FAULT[4] | SHORT CIRCUIT | | | | | | | | | | | | | |
| | POWER DISSIPATION | — | — | 10 | — | — | 10 | — | — | 10 | — | — | 10 | W |
| | RECOVERY[1, 5] | — | 1.4 | 6 | — | 1.4 | 5 | — | 1.4 | 5 | — | 1.4 | 5 | ms |
| STEP LOAD RESP. | 50% – 100% – 50% | | | | | | | | | | | | | |
| | TRANSIENT | — | ±125 | ±250 | — | ±200 | ±300 | — | ±250 | ±400 | — | ±350 | ±500 | mV pk |
| | RECOVERY[5] | — | — | 200 | — | 60 | 200 | — | 60 | 200 | — | 60 | 200 | µs |
| STEP LINE RESP. | 16 – 40 – 16 VDC | | | | | | | | | | | | | |
| | TRANSIENT[6] | — | — | ±300 | — | ±200 | ±300 | — | ±400 | ±500 | — | ±500 | ±600 | mV pk |
| | RECOVERY[5] | — | — | 300 | — | — | 300 | — | — | 300 | — | — | 300 | µs |
| START-UP[1] | DELAY | — | 1.4 | 5 | — | 1.4 | 5 | — | 1.4 | 5 | — | 1.4 | 5 | ms |
| | OVERSHOOT | | | | | | | | | | | | | |
| | FULL LOAD | — | 0 | 50 | — | 0 | 50 | — | 0 | 120 | — | 0 | 150 | mV pk |
| | NO LOAD | — | 33 | 150 | — | 50 | 250 | — | 120 | 600 | — | 150 | 750 | |

Notes
1. Tc = –55°C to +125°C
2. Operation is limited below 16V (see Figure 21).
3. Tested with 3300 pF ceramic bypass capacitors connected externally from input common to case and output common to case.
4. Indefinite short circuit protection not guaranteed above 125°C case.
5. Recovery time is measured from application of the transient to point at which Vout is within 1% of final value.
6. Transition time ≥10 µs.



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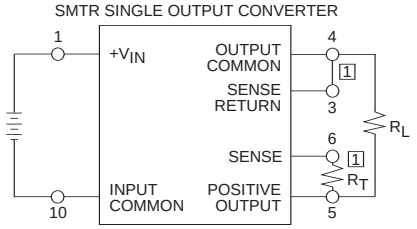
**Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, radiation level O, unless otherwise specified.**

| DUAL OUTPUT MODELS | | | SMTR2805D | | | SMTR2812D | | | SMTR2815D | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PARAMETER** | **CONDITIONS** | | **MIN** | **TYP** | **MAX** | **MIN** | **TYP** | **MAX** | **MIN** | **TYP** | **MAX** | **UNITS** |
| OUTPUT VOLTAGE | | $+V_{OUT}$ | 4.95 | 5.00 | 5.05 | 11.88 | 12.00 | 12.12 | 14.85 | 15.00 | 15.15 | VDC |
| | | $-V_{OUT}$ | 4.92 | 5.00 | 5.08 | 11.82 | 12.00 | 12.18 | 14.77 | 15.00 | 15.23 | |
| OUTPUT CURRENT[1, 2] | $V_{IN}$ = 16 TO 40 VDC | | 0 | 2.5 | 4.5 | 0 | 1.25 | 2.25 | 0 | 1.0 | 1.8 | A |
| OUTPUT POWER[1, 2] | $V_{IN}$ = 16 TO 40 VDC | | 0 | — | 25 | 0 | — | 30 | 0 | — | 30 | W |
| OUTPUT RIPPLE | 10 kHz - 2 MHz | | — | 20 | 50 | — | 30 | 80 | — | 25 | 80 | mV p-p |
| VOLTAGE +/– $V_{OUT}$ | Tc = –55°C TO +125°C | | — | 40 | 80 | — | 40 | 120 | — | 40 | 120 | |
| LINE REGULATION[3] | Tc = –55°C | $+V_{OUT}$ | — | 10 | 50 | — | 10 | 50 | — | 10 | 50 | mV |
| $V_{IN}$ = 16 TO 40 VDC | TO +125°C | $-V_{OUT}$ | — | 50 | 100 | — | 50 | 150 | — | 50 | 180 | |
| LOAD REGULATION | Tc = –55°C | $+V_{OUT}$ | — | 5 | 50 | — | 15 | 50 | — | 15 | 50 | mV |
| NO LOAD TO FULL | TO +125°C | $-V_{OUT}$ | — | 25 | 100 | — | 30 | 180 | — | 30 | 180 | |
| CROSS REGULATION | SEE NOTE 4 | | — | 7 | 12 | — | 4 | 8.3 | — | 3 | 8 | % |
| EFFECT ON $-V_{OUT}$ | SEE NOTE 5 | | — | 4 | 6 | — | 4 | 6 | — | 4 | 6 | |
| INPUT VOLTAGE[1] | CONTINUOUS | | 16 | 28 | 40 | 16 | 28 | 40 | 16 | 28 | 40 | VDC |
| NO LOAD TO FULL | TRANSIENT 50 ms | | 0 | — | 50 | 0 | — | 50 | 0 | — | 50 | V |
| INPUT CURRENT | NO LOAD | | — | 35 | 75 | — | 50 | 75 | — | 50 | 75 | mA |
| | FULL LOAD | | — | 1.10 | — | — | 1.34 | — | — | 1.29 | — | A |
| | INHIBITED | | — | 3 | 8 | — | 3 | 8 | — | 3 | 8 | mA |
| INPUT RIPPLE CURRENT[1, 6] | 10 kHz - 10 MHz | | — | 15 | 50 | — | 20 | 50 | — | 20 | 50 | mA p-p |
| EFFICIENCY | | | 74 | 76 | — | 77 | 80 | — | 78 | 81 | — | % |
| LOAD FAULT[7] | POWER DISSIPATION SHORT CIRCUIT[1] | | — | — | 10 | — | — | 10 | — | — | 10 | W |
| | RECOVERY | | — | 1.4 | 5.0 | — | 1.4 | 5.0 | — | 1.4 | 5.0 | ms |
| STEP LOAD RESPONSE ± $V_{OUT}$ | 50 – 100 – 50% BALANCED TRANSIENT | | — | ±200 | ±300 | — | ±150 | ±300 | — | ±200 | ±400 | mV pk |
| | RECOVERY[8] | | — | 100 | 200 | — | 100 | 200 | — | 100 | 200 | µs |
| STEP LINE RESPONSE ± $V_{OUT}$ | 16 – 40 – 16 $V_{IN}$ TRANSIENT[9] | | — | ±200 | ±400 | — | ±200 | ±400 | — | ±400 | ±500 | mV pk |
| | RECOVERY[8] | | — | — | 300 | — | — | 300 | — | — | 300 | µs |
| START–UP[1] | DELAY | | — | 1.4 | 5 | — | 1.4 | 5 | — | 1.4 | 5 | ms |
| | OVERSHOOT FULL LOAD | | — | 0 | 180 | — | 0 | 120 | — | 0 | 150 | mV pk |
| | NO LOAD | | — | 50 | 250 | — | 120 | 600 | — | 150 | 750 | |

Notes

1. Tc = –55°C to +125°C.
2. Up to 90% of the total output current/power is available from either output providing the positive output is carrying at least 10% of the total output power.
3. Operation is limited below 16 V (see Figure 21).
4. Effect on the negative output under the following conditions: $+P_{out}$ 20% to 80%; $-P_{out}$ 80% to 20%
5. Effect on the negative output under the following conditions: $+P_{out}$ 50%; $-P_{out}$ 10% to 50%
6. Tested with 3300 pF ceramic bypass capacitors connected externally from input common to case and output common to case
7. Indefinite short circuit protection not guaranteed above 125°C case.
8. Recovery time is measured from application of the transient to point at which Vout is within 1% of final value.
9. Transition time ≥ 10 µs.

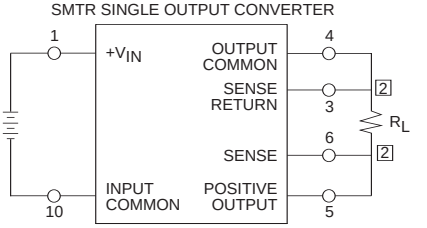
## TRIM AND REMOTE SENSE (AVAILABLE ON SINGLE OUTPUT MODELS ONLY)




EXTERNAL TRIM CONNECTION

[1] Make connections at converter.

**FIGURE 1: TRIM CONNECTION[1, 2, 3]**




REMOTE SENSE CONNECTION

[2] Make connections at load.

**FIGURE 2: REMOTE SENSE[2, 3]**

Trim Formulas

Vout = desired output voltage; Rt = trim resistor

$$3.3V: \quad Rt = \frac{1300 * Vout - 4304}{1.2475}$$

$$5V: \quad Rt = \frac{1300 * Vout - 6512}{1.2475}$$

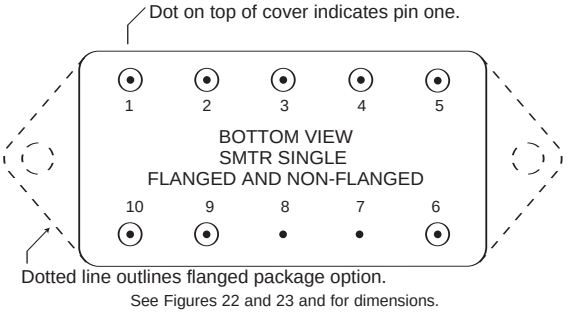
$$12V: \quad Rt = \frac{1300 * Vout - 15631}{1.2475}$$

$$15V: \quad Rt = \frac{1300 * Vout - 19498}{1.2475}$$

Notes for Remote Sense and Trim

1. When trimming output voltage and/or remote sensing, the total output voltage increase must be less than 0.6 volts at the converters pins to maintain specified performance.
2. If neither voltage trim nor remote sense will be used, connect pin 3 to pin 4 and pin 5 to pin 6 or the output voltage will increase by 1.2 volts.
3. CAUTION: The converter will be permanently damaged if the positive remote sense (pin 6) is shorted to ground. Damage may also result if the output common or positive output is disconnected from the load with the remote sense leads connected to the load.

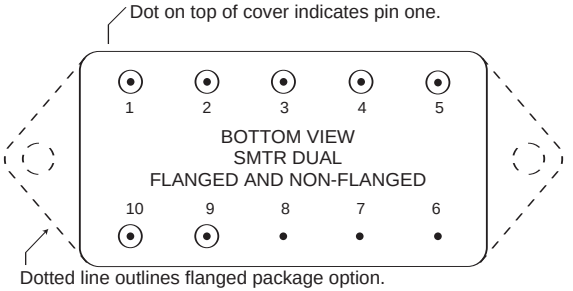
## PIN OUT




See Figures 22 and 23 and for dimensions.

**FIGURE 3: PIN OUT SINGLE OUTPUT MODELS**

| Pin | Single Output | Dual Output |
|---|---|---|
| 1 | Positive Input | Positive Input |
| 2 | Inhibit | Inhibit |
| 3 | Sense Return | Positive Output |
| 4 | Output Common | Output Common |
| 5 | Positive Output | Negative Output |
| 6 | Positive Sense | Case Ground |
| 7 | Case Ground | Case Ground |
| 8 | Case Ground | Case Ground |
| 9 | Sync | Sync |
| 10 | Input Common | Input Common |




See Figures 24 and 25 for dimensions.

**FIGURE 4: PIN OUT DUAL OUTPUT MODELS**



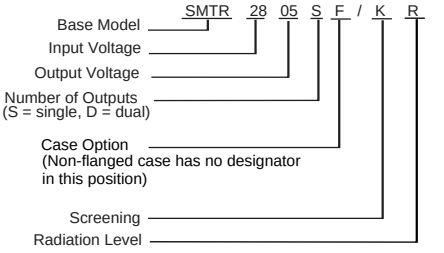
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**SMD NUMBERS**

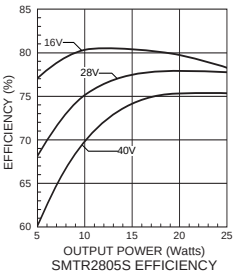
| STANDARD MICROCIRCUIT DRAWING (SMD) | MTR SERIES SIMILAR PART |
|---|---|
| 5962-0150102HXC | SMTR283R3S/HO |
| 5962-9306802HXC | SMTR2805S/HO |
| 5962-9306902HXC | SMTR2812S/HO |
| 5962-9307002HXC | SMTR2815S/HO |
| IN PROCESS | SMTR2805D/HO |
| IN PROCESS | SMTR2812D/HO |
| IN PROCESS | SMTR2815D/HO |

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 SMTR SMD releases which are "in process." SMDs can be downloaded from http://www.dscc.dla.mil/programs/smcr

**MODEL NUMBERING KEY**

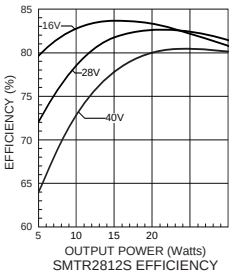



**Typical Performance Curves: 25°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.**



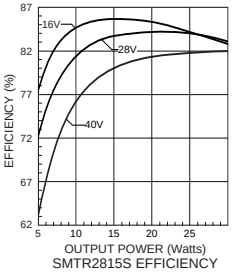
SMTR2805S EFFICIENCY

FIGURE 5



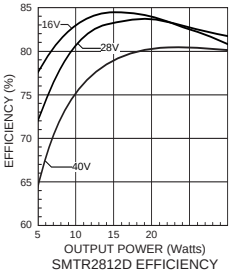
SMTR2812S EFFICIENCY

FIGURE 6



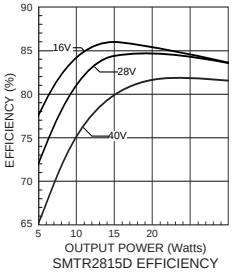
SMTR2815S EFFICIENCY

FIGURE 7



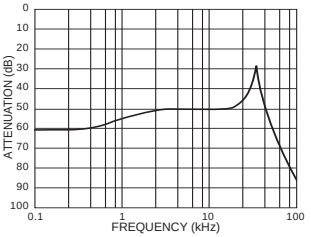
SMTR2812D EFFICIENCY

FIGURE 8



SMTR2815D EFFICIENCY

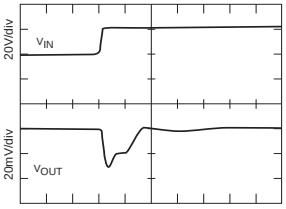
FIGURE 9



AUDIO REJECTION, SMTR SERIES

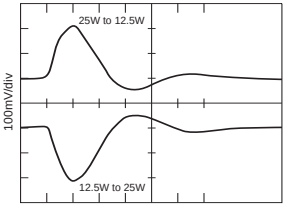
FIGURE 10

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



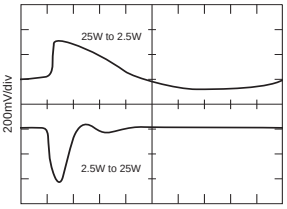

SMTR2805S STEP LINE RESPONSE

**FIGURE 11**



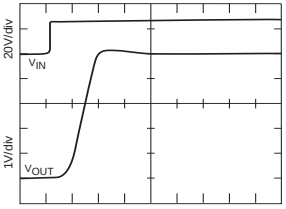

SMTR2805S STEP LOAD RESPONSE

**FIGURE 12**



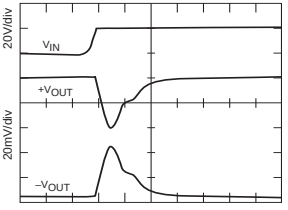

SMTR2805S STEP LOAD RESPONSE

**FIGURE 13**



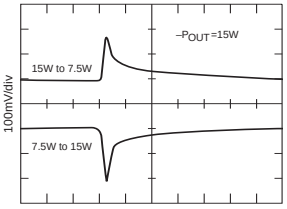

SMTR2805S TURN-ON INTO NO LOAD

**FIGURE 14**



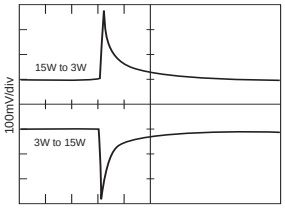

SMTR2815D STEP LINE RESPONSE

**FIGURE 15**



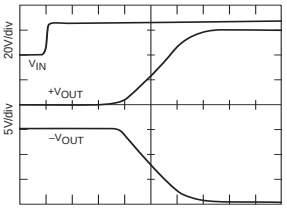

SMTR2815D $+V_{OUT}$ STEP LOAD RESPONSE

**FIGURE 16**



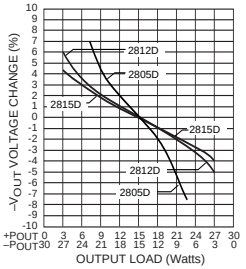

SMTR2815D $+V_{OUT}$ STEP LOAD RESPONSE

**FIGURE 17**



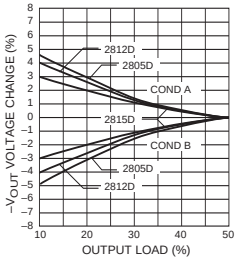

SMTR2815D TURN-ON INTO NO LOAD

**FIGURE 18**



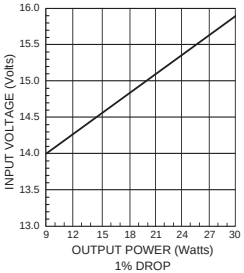

10% to 90% LOAD +V
90% to 10% LOAD –V
CROSS REGULATION

**FIGURE 19**




COND. B: 50% LOAD +V, 50% to 10% –V
COND. A: 50% LOAD –V, 50% to 10% +V
CROSS REGULATION

**FIGURE 20**

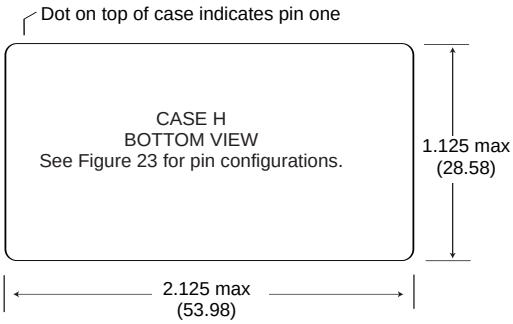



1% DROP
SMTR SINGLES AND DUALS
LOW LINE DROPOUT

**FIGURE 21**



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**Materials**

Header Cold Rolled Steel/Nickel/Gold
case H2
Cold Rolled Steel/Nickel/Tin
case H4

Cover Kovar/Nickel
case H2
Cold Rolled Steel/Nickel/Tin
case H4

Pins #52 alloy
ceramic seal
case H1
compression glass seal
case H4

**Case dimensions in inches (mm)**

Tolerance ±0.005 (0.13) for three decimal places
±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 300ϒCfor 10 seconds per pin.

**FIGURE 22: CASE H MAXIMUM DIMENSIONS**

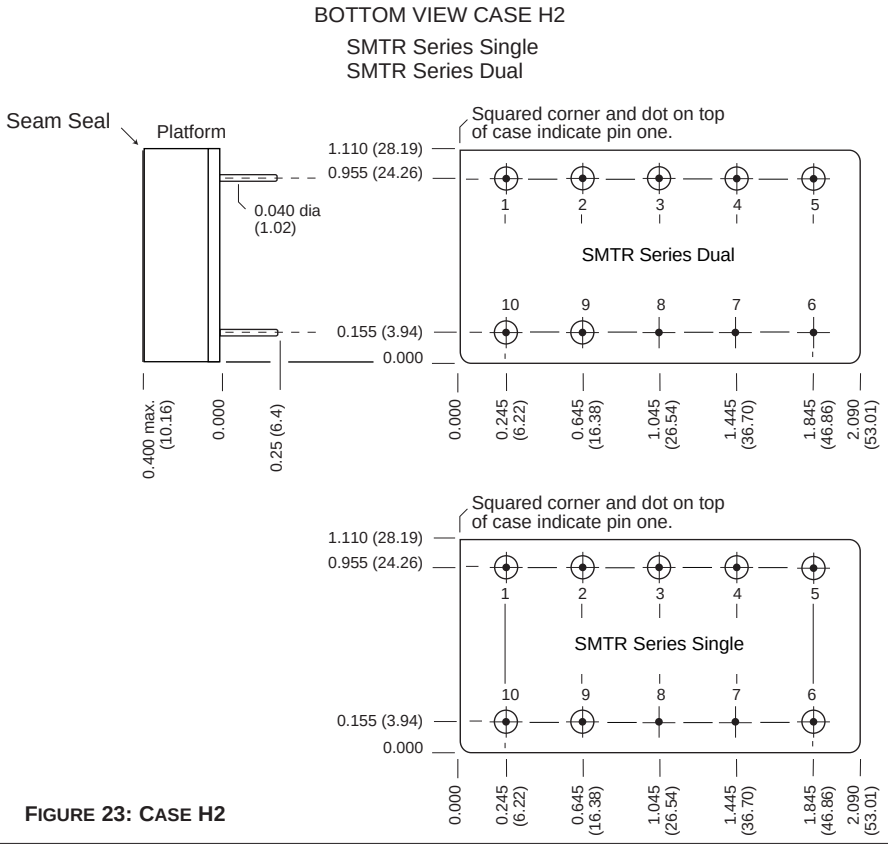
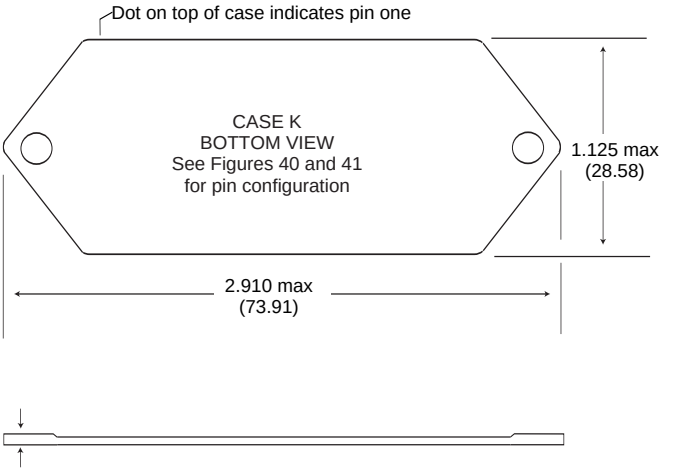



**FIGURE 23: CASE H2**

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.




**Flange Thickness:**
Case K3 0.060 (1.52)
Case K5 0.067 +0.005/-0.007 (1.70 +0.13/-0.8)

**Materials**

| | | |
|---|---|---|
| Header | Case K3 | |
| | | Cold Rolled Steel/Nickel/Gold |
| | Case K8 | |
| | | Cold Rolled Steel/Nickel/Tin |
| Cover | Case K3 | |
| | | Kovar/Nickel |
| | Case K8 | |
| | | Cold Rolled Steel/Nickel/Tin |
| Pins | #52 alloy (all cases) | |
| | Case K3 | |
| | | ceramic seal |
| | Case K8 | |
| | | compression glass seal |

**Case dimensions in inches (mm)**
Tolerance ±0.005 (0.13) for three decimal places
±0.01 (0.2) 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 24: CASE K MAXIMUM DIMENSIONS**



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BOTTOM VIEW CASE K3

Flanged cases: Designator "F" required in Case Option position of model number.
SMTR Series Single
SMTR Series Dual

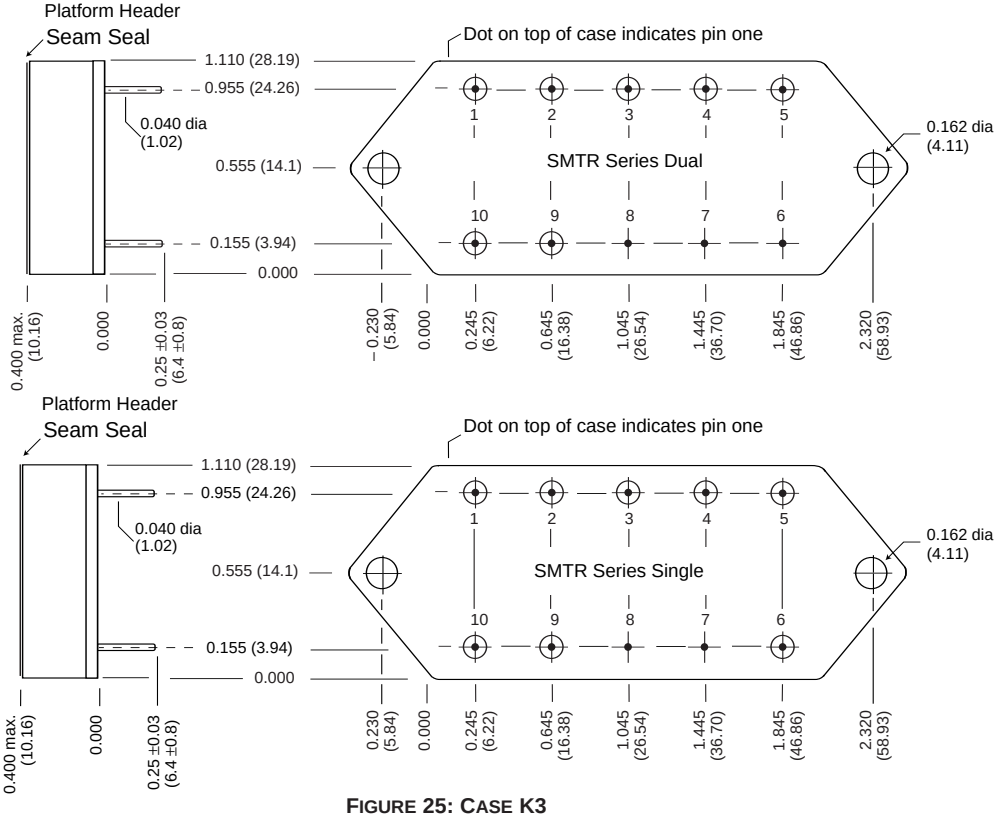



**FIGURE 25: CASE K3**

**TABLE 1: ELEMENT EVALUATION**

| ELEMENT EVALUATION<br><br>TEST PERFORMED<br>(COMPONENT LEVEL) | SPACE PROTOTYPE (O)<br>M/S | <br>P | CLASS H<br>M/S | <br>P | CLASS K<br>M/S | <br>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



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**TABLE 2: PRODUCT ENVIRONMENTAL SCREENING**

| ENVIRONMENTAL SCREENING TEST PERFORMED (END ITEM LEVEL) | SPACE PROTOTYPE (O) | CLASS H | CLASS K |
|---|---|---|---|
| Non-destruct bond pull | | | |
| Method 2023 | no | no | yes |
| Pre-cap inspection | | | |
| Method 2017, 2032 | yes | yes | yes |
| Temperature cycle | | | |
| Method 1010, Cond. C | yes | yes | yes |
| Constant acceleration | | | |
| Method 2001, 3000 g | yes | yes | yes |
| PIND Test | | | |
| Method 2020, Cond. B | no | yes | yes |
| Radiography | | | |
| 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 | | | |
| MIL-PRF-38534, Group A | yes | yes | yes |
| Hermeticity test | | | |
| Fine Leak, | | | |
| Method 1014, Cond. A | yes | yes | yes |
| Gross Leak, | | | |
| Method 1014, Cond. C | yes | yes | yes |
| Final visual inspection | | | |
| Method 2009 | yes | yes | yes |

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

**TABLE 3: RADIATION HARDNESS LEVELS**

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

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

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