



# DVTR2800D Series

## HIGH RELIABILITY HYBRID DC-DC CONVERTERS

### DESCRIPTION

The DVTR series of high reliability DC-DC converters is operable over the full military (-55 °C to +125 °C) temperature range with no power derating. Unique to the DVTR series are robust and effective input and output filters which provide dramatically reduced input and output noise performance when compared to other manufacturers competing devices. Operating at a nominal fixed frequency of 500 kHz, these regulated, isolated units utilize a high speed magnetic feedback design and well controlled undervoltage lockout circuitry to eliminate slow start-up problems.

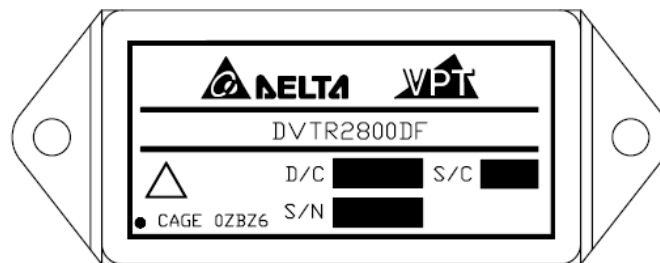
These converters are designed and manufactured in a facility qualified to ISO9001 and certified to MIL-PRF-38534 and MIL-STD-883.

This product may incorporate one or more of the following U.S. patents:

5,784,266  
5,790,389  
5,963,438  
5,999,433  
6,005,780  
6,084,792  
6,118,673

### FEATURES

- High Reliability
- Very Low Output Noise
- Wide Input Voltage Range: 15 to 50 Volts per MIL-STD-704
- Up to 40 Watts Output Power
- Fault Tolerant Magnetic Feedback Circuit
- NO Use of Optoisolators
- Undervoltage Lockout
- Indefinite Short Circuit Protection
- Current Limit Protection
- Industry Standard Pinout
- High Input Transient Voltage: 80 Volts for 1 sec per MIL-STD-704A
- Precision Seam Welded or Solder Seal Hermetic Package
- High Power Density: > 40 W/in<sup>3</sup>
- Custom Versions Available
- Additional Environmental Screening Available
- Meets MIL-STD-461C and MIL-STD-461D EMC Requirements When Used With a DVMC28 EMI Filter
- Flanged and Non-flanged Versions Available.
- MIL-PRF-38534 Element Evaluated Components
- Space Applications should consider VPT's "S" Series of Radiation Tolerant Power Conversion Devices. Contact VPT for details.



**Figure 1** – DVTR2800D / DVTR2800DF DC-DC Converter  
(Exact marking may differ from that shown)

SPECIFICATIONS ( $T_{CASE} = -55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ,  $V_{IN} = +28\text{V} \pm 5\%$ , Full Load<sup>5</sup>, Unless Otherwise Specified)

## ABSOLUTE MAXIMUM RATINGS

|   |                    |   |                 |
|---|--------------------|---|-----------------|
| Input Voltage (Continuous)  | 50 V <sub>DC</sub> | Junction Temperature Rise to Case       | +15°C           |
| Input Voltage (Transient, 1 second)                               | 80 Volts           | Storage Temperature                     | -65°C to +150°C |
| Output Power <sup>1</sup>   | 40 Watts           | Lead Solder Temperature (10 seconds)    | 270°C           |
| Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$ ) | 13 Watts           | Weight (Maximum) (Un-Flanged / Flanged) | (52 / 55) Grams |

| Parameter                                     | Conditions                             | DVTR2805D  |       |      | DVTR2808D |      |      | Units             |                   |
|---|--|--|-------|------|-----------|------|------|-------------------|-------------------|
|   |  | Min  | Typ   | Max  | Min       | Typ  | Max  |                   |                   |
| <b>STATIC</b>                                 |  |  |       |      |           |      |      |                   |                   |
| INPUT Voltage <sup>4</sup>                    | Continuous                             | 15   | 28    | 50   | 15        | 28   | 50   | V                 |                   |
|   | Transient, 1 sec                       | -  | -     | 80   | -         | -    | 80   | V                 |                   |
| Current                                       | Inhibited                              | -  | 4     | 6    | -         | 4    | 6    | mA                |                   |
|   | No Load                                | -  | 60    | 90   | -         | 60   | 90   | mA                |                   |
| Ripple Current                                | Full Load <sup>5</sup> , 20Hz to 10MHz | -  | 30    | 50   | -         | 30   | 50   | mA <sub>p-p</sub> |                   |
| Inhibit Pin Input <sup>4</sup>                |  | 0  | -     | 1.5  | 0         | -    | 1.5  | V                 |                   |
| Inhibit Pin Open Circuit Voltage <sup>4</sup> |  | 9.0  | 11.0  | 13.0 | 9.0       | 11.0 | 13.0 | V                 |                   |
| UVLO Turn On                                  |  | 12.0   | -     | 14.8 | 12.0      | -    | 14.8 | V                 |                   |
| UVLO Turn Off <sup>4</sup>                    |  | 11.0   | -     | 14.5 | 11.0      | -    | 14.5 | V                 |                   |
| OUTPUT Voltage <sup>5</sup>                   | +V <sub>OUT</sub>                      | $T_{CASE} = 25^{\circ}\text{C}$                            | 4.95  | 5.0  | 5.05      | 7.92 | 8.0  | 8.08              | V                 |
|   | +V <sub>OUT</sub>                      | $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 4.925 | 5.0  | 5.075     | 7.88 | 8.0  | 8.12              | V                 |
|   | -V <sub>OUT</sub>                      | $T_{CASE} = 25^{\circ}\text{C}$                            | 4.80  | 5.0  | 5.20      | 7.80 | 8.0  | 8.20              | V                 |
|   | -V <sub>OUT</sub>                      | $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 4.70  | 5.0  | 5.30      | 7.76 | 8.0  | 8.24              | V                 |
| Power <sup>3,6</sup>                          | Total                                  |  | 0     | -    | 30        | 0    | -    | 35                | W                 |
|   | $\pm V_{OUT}$                          | Either Output  | 0     | -    | 21        | 0    | -    | 25                | W                 |
| Current <sup>3,6</sup>                        | $\pm V_{OUT}$                          | Either Output  | 0     | -    | 4.2       | 0    | -    | 3.12              | A                 |
| Ripple Voltage                                | $\pm V_{OUT}$                          | Full Load <sup>5</sup> , 20Hz to 10MHz                     | -     | 30   | 60        | -    | 40   | 60                | mV <sub>p-p</sub> |
| Line Regulation                               | +V <sub>OUT</sub>                      | $V_{IN} = 16\text{V}$ to $40\text{V}$                      | -     | 2    | 20        | -    | 2    | 20                | mV                |
|   | -V <sub>OUT</sub>                      | $V_{IN} = 16\text{V}$ to $40\text{V}$                      | -     | 25   | 200       | -    | 35   | 200               | mV                |
| Load Regulation                               | +V <sub>OUT</sub>                      | No Load to Full Load <sup>5</sup>                          | -     | 5    | 50        | -    | 5    | 50                | mV                |
|   | -V <sub>OUT</sub>                      | No Load to Full Load <sup>5,7</sup>                        | -     | 30   | 200       | -    | 30   | 200               | mV                |
| Cross Regulation                              | -V <sub>OUT</sub>                      | +Load 70%, -Load 30%<br>+Load 30%, -Load 70%               | -     | 360  | 650       | -    | 450  | 650               | mV                |
| EFFICIENCY                                    |  | Full Load <sup>5</sup>                                     | 73    | 79   | -         | 74   | 79   | -                 | %                 |
| LOAD FAULT POWER DISSIPATION                  | Overload <sup>4</sup>                  |  | -     | -    | 16        | -    | -    | 15                | W                 |
|   | Short Circuit                          |  | -     | -    | 16        | -    | -    | 15                | W                 |
| CAPACITIVE LOAD <sup>4</sup>                  |  | Either Output  | -     | -    | 500       | -    | -    | 500               | $\mu\text{F}$     |
| SWITCHING FREQUENCY                           |  |  | 400   | 450  | 550       | 400  | 450  | 550               | kHz               |
| SYNC FREQUENCY RANGE                          |  | $V_H - V_L = 5\text{V}$ , DC = 20-80%                      | 500   | -    | 600       | 500  | -    | 600               | kHz               |
| ISOLATION                                     |  | 500 V <sub>DC</sub> , $T_{CASE} = 25^{\circ}\text{C}$      | 100   | -    | -         | 100  | -    | -                 | M $\Omega$        |
| MTBF (MIL-HDBK-217F)                          |  | AIF @ $T_C = 55^{\circ}\text{C}$                           | -     | 413  | -         | -    | 413  | -                 | kHrs              |

See notes next page.

SPECIFICATIONS ( $T_{CASE} = -55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ,  $V_{IN} = +28\text{V} \pm 5\%$ , Full Load<sup>5</sup>, Unless Otherwise Specified)

## ABSOLUTE MAXIMUM RATINGS

|   |                    |   |                 |
|---|--------------------|---|-----------------|
| Input Voltage (Continuous)  | 50 V <sub>DC</sub> | Junction Temperature Rise to Case       | +15°C           |
| Input Voltage (Transient, 1 second)                               | 80 Volts           | Storage Temperature                     | -65°C to +150°C |
| Output Power <sup>1</sup>   | 40 Watts           | Lead Solder Temperature (10 seconds)    | 270°C           |
| Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$ ) | 13 Watts           | Weight (Maximum) (Un-Flanged / Flanged) | (52 / 55) Grams |

| Parameter                               | Conditions    | DVTR2805D                             |     |     | DVTR2808D |     |     | Units |                  |
|---|---------------|---------------------------------------|-----|-----|-----------|-----|-----|-------|------------------|
|   |               | Min                                   | Typ | Max | Min       | Typ | Max |       |                  |
| <b>DYNAMIC</b>                          |               |                                       |     |     |           |     |     |       |                  |
| Load Step Output Transient              | $\pm V_{OUT}$ | Half Load to Full Load                | -   | 100 | 400       | -   | 100 | 200   | mV <sub>PK</sub> |
| Load Step Recovery <sup>2</sup>         |               |                                       | -   | 100 | 350       | -   | 50  | 100   | $\mu\text{Sec}$  |
| Line Step Output Transient <sup>4</sup> | $\pm V_{OUT}$ | $V_{IN} = 16\text{V}$ to $40\text{V}$ | -   | 300 | 600       | -   | 200 | 550   | mV <sub>PK</sub> |
| Line Step Recovery <sup>2,4</sup>       |               |                                       | -   | 300 | 500       | -   | 250 | 500   | $\mu\text{Sec}$  |
| Turn On Delay                           | $\pm V_{OUT}$ | $V_{IN} = 0\text{V}$ to $28\text{V}$  | -   | 10  | 20        | -   | 10  | 20    | mSec             |
| Turn On Overshoot                       |               |                                       | -   | 0   | 25        | -   | 0   | 25    | mV <sub>PK</sub> |

- Notes:
1. Dependant on output voltage.
  2. Time for output voltage to settle within 1% of its nominal value.
  3. Derate linearly to 0 at 135°C.
  4. Verified by qualification testing.
  5. Half load at +V<sub>OUT</sub> and half load at -V<sub>OUT</sub>.
  6. Up to 70% of the total power or current can be drawn from any one of the two outputs.
  7. 5% Load to Full Load at -55°C.

SPECIFICATIONS ( $T_{CASE} = -55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ,  $V_{IN} = +28\text{V} \pm 5\%$ , Full Load<sup>5</sup>, Unless Otherwise Specified)

## ABSOLUTE MAXIMUM RATINGS

|   |                    |   |                 |
|---|--------------------|---|-----------------|
| Input Voltage (Continuous)  | 50 V <sub>DC</sub> | Junction Temperature Rise to Case       | +15°C           |
| Input Voltage (Transient, 1 second)                               | 80 Volts           | Storage Temperature                     | -65°C to +150°C |
| Output Power <sup>1</sup>   | 40 Watts           | Lead Solder Temperature (10 seconds)    | 270°C           |
| Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$ ) | 13 Watts           | Weight (Maximum) (Un-Flanged / Flanged) | (52 / 55) Grams |

| Parameter                                     | Conditions   | DVTR2812D |      |       | DVTR2815D |      |       | Units             |
|---|--|-----------|------|-------|-----------|------|-------|-------------------|
|   |  | Min       | Typ  | Max   | Min       | Typ  | Max   |                   |
| <b>STATIC</b>                                 |  |           |      |       |           |      |       |                   |
| INPUT Voltage <sup>4</sup>                    | Continuous   | 15        | 28   | 50    | 15        | 28   | 50    | V                 |
|   | Transient, 1 sec   | -         | -    | 80    | -         | -    | 80    | V                 |
| Current                                       | Inhibited  | -         | 4    | 6     | -         | 4    | 6     | mA                |
|   | No Load  | -         | 60   | 90    | -         | 60   | 90    | mA                |
| Ripple Current                                | Full Load <sup>5</sup> , 20Hz to 10MHz                                       | -         | 30   | 50    | -         | 25   | 50    | mA <sub>p-p</sub> |
| Inhibit Pin Input <sup>4</sup>                |  | 0         | -    | 1.5   | 0         | -    | 1.5   | V                 |
| Inhibit Pin Open Circuit Voltage <sup>4</sup> |  | 9.0       | 11.0 | 13.0  | 9.0       | 11.0 | 13.0  | V                 |
| UVLO Turn On                                  |  | 12.0      | -    | 14.8  | 12.0      | -    | 14.8  | V                 |
| UVLO Turn Off <sup>4</sup>                    |  | 11.0      | -    | 14.5  | 11.0      | -    | 14.5  | V                 |
| OUTPUT Voltage <sup>5</sup>                   | +V <sub>OUT</sub> $T_{CASE} = 25^{\circ}\text{C}$                            | 11.88     | 12.0 | 12.12 | 14.85     | 15.0 | 15.15 | V                 |
|   | +V <sub>OUT</sub> $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 11.82     | 12.0 | 12.18 | 14.70     | 15.0 | 15.30 | V                 |
|   | -V <sub>OUT</sub> $T_{CASE} = 25^{\circ}\text{C}$                            | 11.80     | 12.0 | 12.20 | 14.70     | 15.0 | 15.30 | V                 |
|   | -V <sub>OUT</sub> $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 11.64     | 12.0 | 12.36 | 14.55     | 15.0 | 15.45 | V                 |
| Power <sup>3,6</sup>                          | Total  | 0         | -    | 40    | 0         | -    | 40    | W                 |
|   | $\pm V_{OUT}$ Either Output  | 0         | -    | 28    | 0         | -    | 28    | W                 |
| Current <sup>3,6</sup>                        | $\pm V_{OUT}$ Either Output  | 0         | -    | 2.33  | 0         | -    | 1.87  | A                 |
| Ripple Voltage                                | $\pm V_{OUT}$ Full Load <sup>5</sup> , 20Hz to 10MHz                         | -         | 25   | 50    | -         | 25   | 50    | mV <sub>p-p</sub> |
| Line Regulation                               | +V <sub>OUT</sub> $V_{IN} = 16\text{V}$ to $40\text{V}$                      | -         | 2    | 20    | -         | 2    | 20    | mV                |
|   | -V <sub>OUT</sub> $V_{IN} = 16\text{V}$ to $40\text{V}$                      | -         | 25   | 200   | -         | 65   | 200   | mV                |
| Load Regulation                               | +V <sub>OUT</sub> No Load to Full Load <sup>5</sup>                          | -         | 2    | 50    | -         | 2    | 50    | mV                |
|   | -V <sub>OUT</sub> No Load to Full Load <sup>5,7</sup>                        | -         | 20   | 200   | -         | 35   | 200   | mV                |
| Cross Regulation                              | -V <sub>OUT</sub> +Load 70%, -Load 30%<br>+Load 30%, -Load 70%               | -         | 430  | 650   | -         | 420  | 650   | mV                |
| EFFICIENCY                                    | Full Load <sup>5</sup>   | 78        | 84   | -     | 78        | 84   | -     | %                 |
| LOAD FAULT POWER DISSIPATION                  | Overload <sup>4</sup>  | -         | -    | 14    | -         | -    | 14    | W                 |
|   | Short Circuit  | -         | -    | 14    | -         | -    | 14    | W                 |
| CAPACITIVE LOAD <sup>4</sup>                  | Either Output  | -         | -    | 500   | -         | -    | 500   | $\mu\text{F}$     |
| SWITCHING FREQUENCY                           |  | 400       | 450  | 550   | 400       | 450  | 550   | kHz               |
| SYNC FREQUENCY RANGE                          | $V_H - V_L = 5\text{V}$ , DC = 20-80%  | 500       | -    | 600   | 500       | -    | 600   | kHz               |
| ISOLATION                                     | 500 V <sub>DC</sub> , $T_{CASE} = 25^{\circ}\text{C}$                        | 100       | -    | -     | 100       | -    | -     | M $\Omega$        |
| MTBF (MIL-HDBK-217F)                          | AIF @ $T_C = 55^{\circ}\text{C}$   | -         | 413  | -     | -         | 413  | -     | kHrs              |

See notes next page.

SPECIFICATIONS ( $T_{CASE} = -55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ,  $V_{IN} = +28\text{V} \pm 5\%$ , Full Load<sup>5</sup>, Unless Otherwise Specified)

## ABSOLUTE MAXIMUM RATINGS

|   |                    |   |                 |
|---|--------------------|---|-----------------|
| Input Voltage (Continuous)  | 50 V <sub>DC</sub> | Junction Temperature Rise to Case       | +15°C           |
| Input Voltage (Transient, 1 second)                               | 80 Volts           | Storage Temperature                     | -65°C to +150°C |
| Output Power <sup>1</sup>   | 40 Watts           | Lead Solder Temperature (10 seconds)    | 270°C           |
| Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$ ) | 13 Watts           | Weight (Maximum) (Un-Flanged / Flanged) | (52 / 55) Grams |

| Parameter                               | Conditions    | DVTR2812D                             |     |     | DVTR2815D |     |     | Units |                  |
|---|---------------|---------------------------------------|-----|-----|-----------|-----|-----|-------|------------------|
|   |               | Min                                   | Typ | Max | Min       | Typ | Max |       |                  |
| <b>DYNAMIC</b>                          |               |                                       |     |     |           |     |     |       |                  |
| Load Step Output Transient              | $\pm V_{OUT}$ | Half Load to Full Load                | -   | 300 | 450       | -   | 280 | 500   | mV <sub>PK</sub> |
| Load Step Recovery <sup>2</sup>         |               |                                       | -   | 120 | 400       | -   | 100 | 300   | $\mu\text{Sec}$  |
| Line Step Output Transient <sup>4</sup> | $\pm V_{OUT}$ | $V_{IN} = 16\text{V}$ to $40\text{V}$ | -   | 500 | 900       | -   | 500 | 900   | mV <sub>PK</sub> |
| Line Step Recovery <sup>2,4</sup>       |               |                                       | -   | 300 | 500       | -   | 300 | 500   | $\mu\text{Sec}$  |
| Turn On Delay                           | $\pm V_{OUT}$ | $V_{IN} = 0\text{V}$ to $28\text{V}$  | -   | 10  | 20        | -   | 10  | 20    | mSec             |
| Turn On Overshoot                       |               |                                       | -   | 0   | 25        | -   | 0   | 50    | mV <sub>PK</sub> |

- Notes:
1. Dependant on output voltage.
  2. Time for output voltage to settle within 1% of its nominal value.
  3. Derate linearly to 0 at 135°C.
  4. Verified by qualification testing.
  5. Half load at +V<sub>OUT</sub> and half load at -V<sub>OUT</sub>.
  6. Up to 70% of the total power or current can be drawn from any one of the two outputs.
  7. 5% Load to Full Load at -55°C.

SPECIFICATIONS ( $T_{CASE} = -55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ,  $V_{IN} = +28\text{V} \pm 5\%$ , Full Load<sup>5</sup>, Unless Otherwise Specified)

## ABSOLUTE MAXIMUM RATINGS

|   |                    |   |                 |
|---|--------------------|---|-----------------|
| Input Voltage (Continuous)  | 50 V <sub>DC</sub> | Junction Temperature Rise to Case       | +15°C           |
| Input Voltage (Transient, 1 second)                               | 80 Volts           | Storage Temperature                     | -65°C to +150°C |
| Output Power <sup>1</sup>   | 40 Watts           | Lead Solder Temperature (10 seconds)    | 270°C           |
| Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$ ) | 13 Watts           | Weight (Maximum) (Un-Flanged / Flanged) | (52 / 55) Grams |

| Parameter                                     | Conditions   | DVTR2818D |      |       | Units             |
|---|--|-----------|------|-------|-------------------|
|   |  | Min       | Typ  | Max   |                   |
| <b>STATIC</b>                                 |  |           |      |       |                   |
| INPUT Voltage <sup>4</sup>                    | Continuous   | 15        | 28   | 50    | V                 |
|   | Transient, 1 sec   | -         | -    | 80    | V                 |
| Current                                       | Inhibited  | -         | 4    | 6     | mA                |
|   | No Load  | -         | 60   | 90    | mA                |
| Ripple Current                                | Full Load <sup>5</sup> , 20Hz to 10MHz                                       | -         | 30   | 50    | mA <sub>p-p</sub> |
| Inhibit Pin Input <sup>4</sup>                |  | 0         | -    | 1.5   | V                 |
| Inhibit Pin Open Circuit Voltage <sup>4</sup> |  | 9.0       | 11.0 | 13.0  | V                 |
| UVLO Turn On                                  |  | 12.0      | -    | 14.8  | V                 |
| UVLO Turn Off <sup>4</sup>                    |  | 11.0      | -    | 14.5  | V                 |
| OUTPUT Voltage <sup>5</sup>                   | +V <sub>OUT</sub> $T_{CASE} = 25^{\circ}\text{C}$                            | 17.82     | 18.0 | 18.18 | V                 |
|   | +V <sub>OUT</sub> $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 17.64     | 18.0 | 18.36 | V                 |
|   | -V <sub>OUT</sub> $T_{CASE} = 25^{\circ}\text{C}$                            | 17.64     | 18.0 | 18.36 | V                 |
|   | -V <sub>OUT</sub> $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 17.46     | 18.0 | 18.54 | V                 |
| Power <sup>3,6</sup>                          | Total  | -         | -    | 40    | W                 |
|   | $\pm V_{OUT}$ Either Output  | -         | -    | 28    | W                 |
| Current <sup>3,6</sup>                        | $\pm V_{OUT}$ Either Output  | -         | -    | 1.56  | A                 |
| Ripple Voltage                                | $\pm V_{OUT}$ Full Load <sup>5</sup> , 20Hz to 10MHz                         | -         | 25   | 50    | mV <sub>p-p</sub> |
| Line Regulation                               | +V <sub>OUT</sub> $V_{IN} = 16\text{V}$ to $40\text{V}$                      | -         | 2    | 20    | mV                |
|   | -V <sub>OUT</sub> $V_{IN} = 16\text{V}$ to $40\text{V}$                      | -         | 80   | 200   | mV                |
| Load Regulation                               | +V <sub>OUT</sub> No Load to Full Load <sup>5</sup>                          | -         | 2    | 50    | mV                |
|   | -V <sub>OUT</sub> No Load to Full Load <sup>5,7</sup>                        | -         | 45   | 200   | mV                |
| Cross Regulation                              | -V <sub>OUT</sub> +Load 70%, -Load 30%<br>+Load 30%, -Load 70%               | -         | 420  | 650   | mV                |
| EFFICIENCY                                    | Full Load <sup>5</sup>   | 78        | 83   | -     | %                 |
| LOAD FAULT POWER DISSIPATION                  | Overload <sup>4</sup>  | -         | -    | 14    | W                 |
|   | Short Circuit  | -         | -    | 14    | W                 |
| CAPACITIVE LOAD <sup>4</sup>                  | Either Output  | -         | -    | 500   | $\mu\text{F}$     |
| SWITCHING FREQUENCY                           |  | 400       | 450  | 550   | kHz               |
| SYNC FREQUENCY RANGE                          | $V_H - V_L = 5\text{V}$ , DC = 20-80%  | 500       | -    | 600   | kHz               |
| ISOLATION                                     | 500 V <sub>DC</sub> , $T_{CASE} = 25^{\circ}\text{C}$                        | 100       | -    | -     | M $\Omega$        |
| MTBF (MIL-HDBK-217F)                          | AIF @ $T_C = 55^{\circ}\text{C}$   | -         | 413  | -     | kHrs              |

See notes next page.

SPECIFICATIONS ( $T_{CASE} = -55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ,  $V_{IN} = +28\text{V} \pm 5\%$ , Full Load<sup>5</sup>, Unless Otherwise Specified)

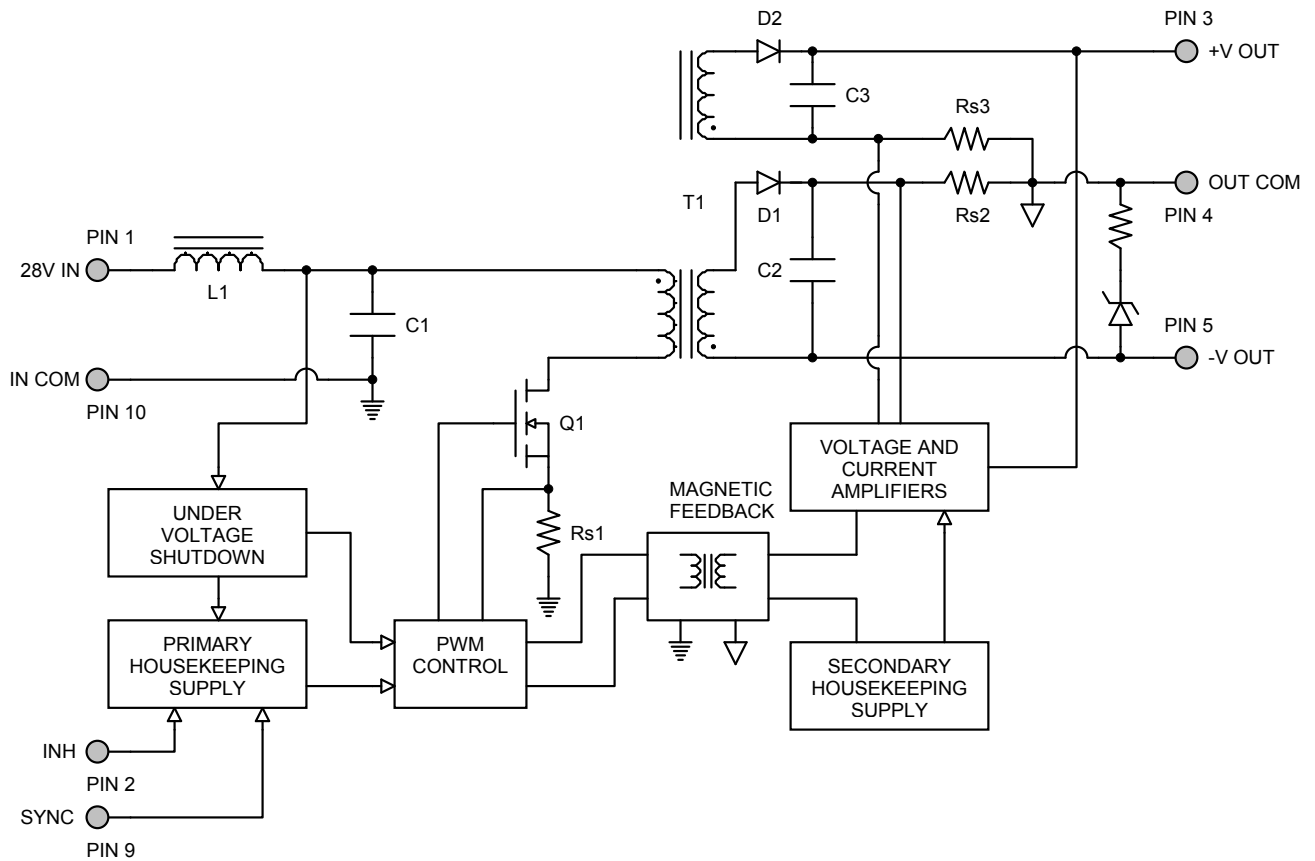
## ABSOLUTE MAXIMUM RATINGS

|   |                    |   |                 |
|---|--------------------|---|-----------------|
| Input Voltage (Continuous)  | 50 V <sub>DC</sub> | Junction Temperature Rise to Case       | +15°C           |
| Input Voltage (Transient, 1 second)                               | 80 Volts           | Storage Temperature                     | -65°C to +150°C |
| Output Power <sup>1</sup>   | 40 Watts           | Lead Solder Temperature (10 seconds)    | 270°C           |
| Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$ ) | 13 Watts           | Weight (Maximum) (Un-Flanged / Flanged) | (52 / 55) Grams |

| Parameter                               | Conditions    | DVTR2818D                             |     |      | Units |                  |
|---|---------------|---------------------------------------|-----|------|-------|------------------|
|   |               | Min                                   | Typ | Max  |       |                  |
| <b>DYNAMIC</b>                          |               |                                       |     |      |       |                  |
| Load Step Output Transient              | $\pm V_{OUT}$ | Half Load to Full Load                | -   | 250  | 500   | mV <sub>PK</sub> |
| Load Step Recovery <sup>2</sup>         |               |                                       | -   | 100  | 250   | $\mu\text{Sec}$  |
| Line Step Output Transient <sup>4</sup> | $\pm V_{OUT}$ | $V_{IN} = 16\text{V}$ to $40\text{V}$ | -   | 1200 | 2200  | mV <sub>PK</sub> |
| Line Step Recovery <sup>2,4</sup>       |               |                                       | -   | 350  | 500   | $\mu\text{Sec}$  |
| Turn On Delay                           | $\pm V_{OUT}$ | $V_{IN} = 0\text{V}$ to $28\text{V}$  | -   | 10   | 20    | mSec             |
| Turn On Overshoot                       |               |                                       | -   | 0    | 50    | mV <sub>PK</sub> |

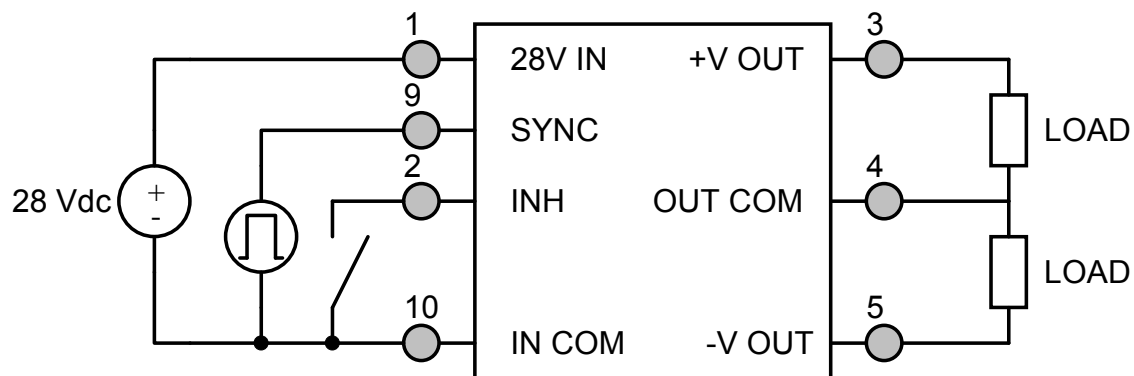
- Notes:
1. Dependant on output voltage.
  2. Time for output voltage to settle within 1% of its nominal value.
  3. Derate linearly to 0 at 135°C.
  4. Verified by qualification testing.
  5. Half load at  $+V_{OUT}$  and half load at  $-V_{OUT}$ .
  6. Up to 70% of the total power or current can be drawn from any one of the two outputs.
  7. 5% Load to Full Load at -55°C.

**BLOCK DIAGRAM**



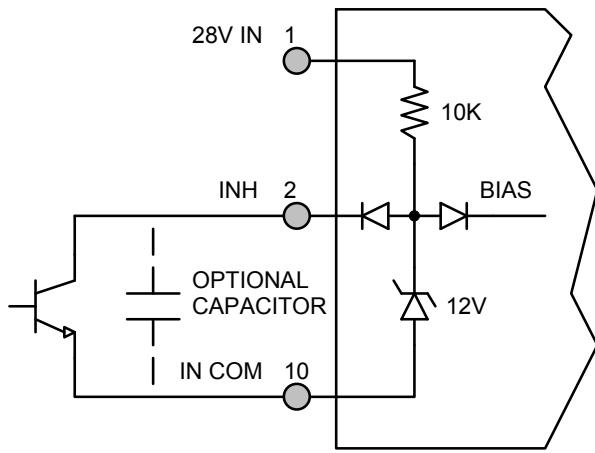
**Figure 2**

**CONNECTION DIAGRAM**

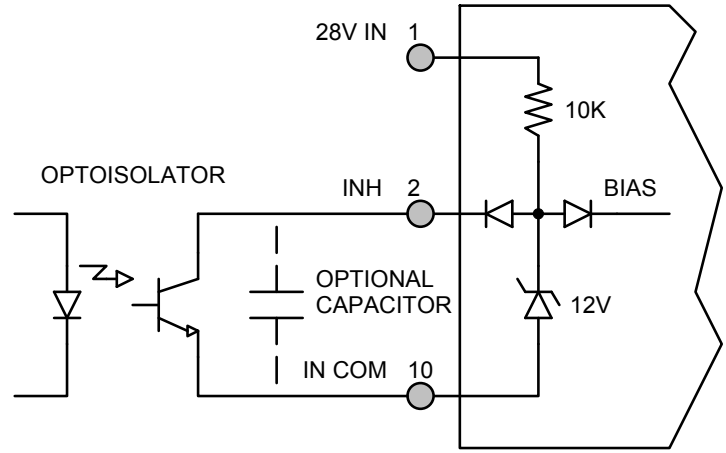


**Figure 3**

INHIBIT DRIVE CONNECTION DIAGRAMS

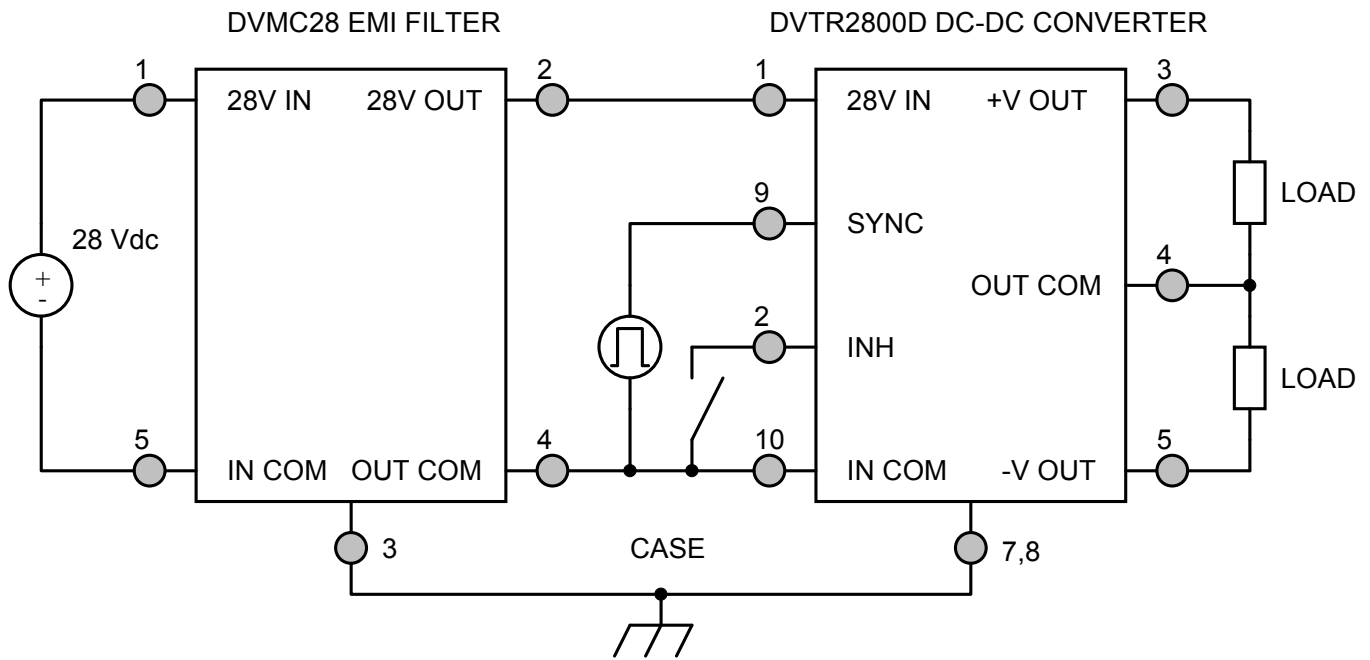


**Figure 4** – Internal Inhibit Circuit and Recommended Drive  
(Shown with optional capacitor for turn-on delay)



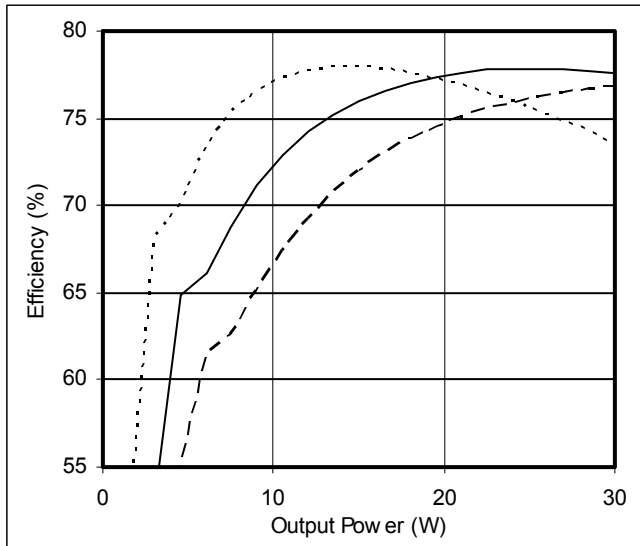
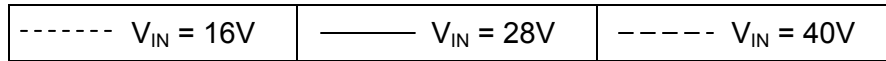
**Figure 5** – Isolated Inhibit Drive  
(Shown with optional capacitor for turn-on delay)

EMI FILTER HOOKUP DIAGRAM



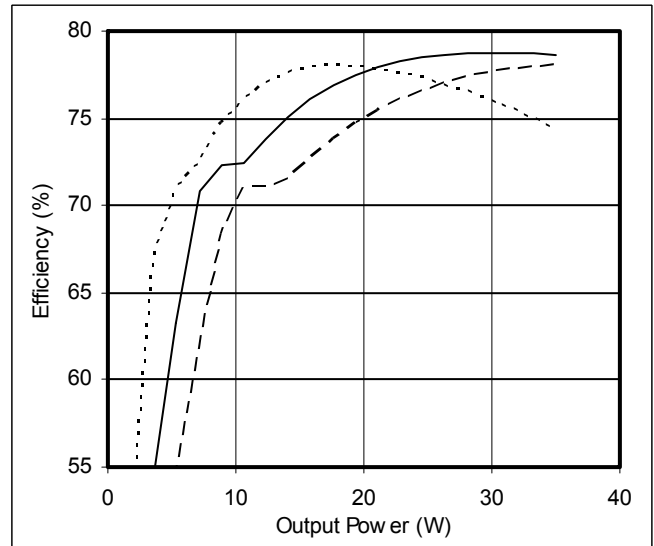
**Figure 6** – Converter with EMI Filter

## EFFICIENCY PERFORMANCE CURVES ( $T_{CASE} = 25^{\circ}C$ , Full Load, Unless Otherwise Specified)



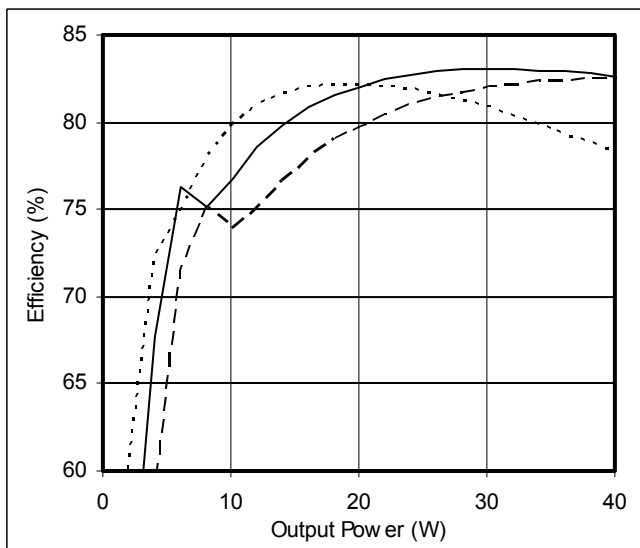
**Figure 7 – DVTR2805D**

Efficiency (%) vs. Output Power (W)



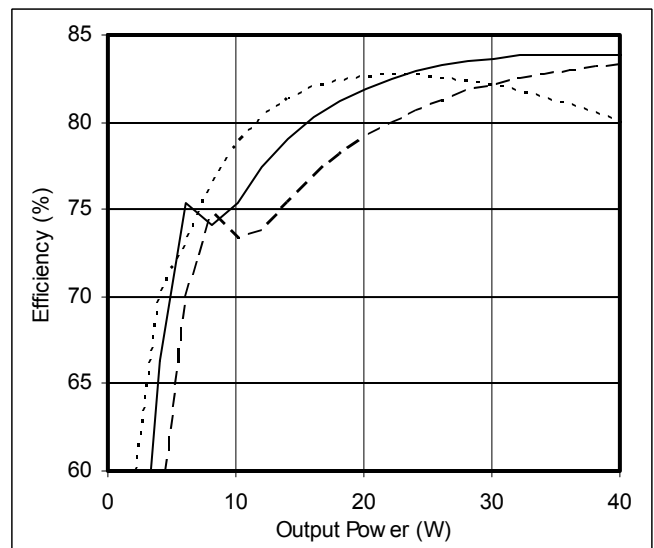
**Figure 8 – DVTR2808D**

Efficiency (%) vs. Output Power (W)



**Figure 9 – DVTR2812D**

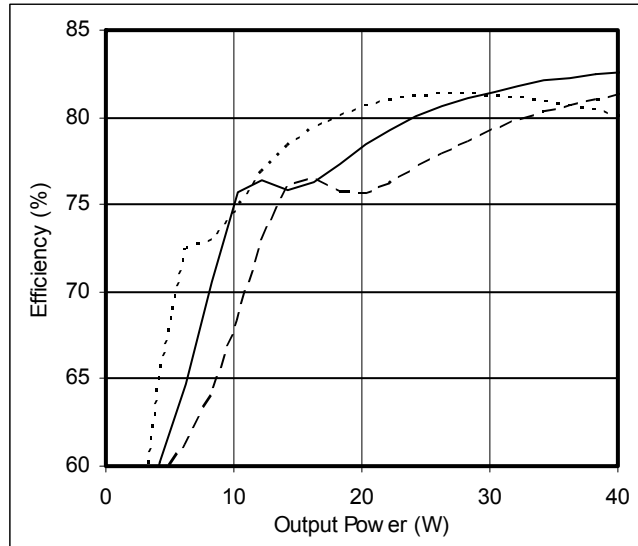
Efficiency (%) vs. Output Power (W)



**Figure 10 – DVTR2815D**

Efficiency (%) vs. Output Power (W)

EFFICIENCY PERFORMANCE CURVES ( $T_{CASE} = 25^{\circ}C$ , Full Load, Unless Otherwise Specified)



**Figure 11 – DVTR2818D**  
Efficiency (%) vs. Output Power (W)

EMI PERFORMANCE CURVES

( $T_{CASE} = 25^{\circ}C$ ,  $V_{IN} = +28V \pm 5\%$ , Full Load, Unless Otherwise Specified)

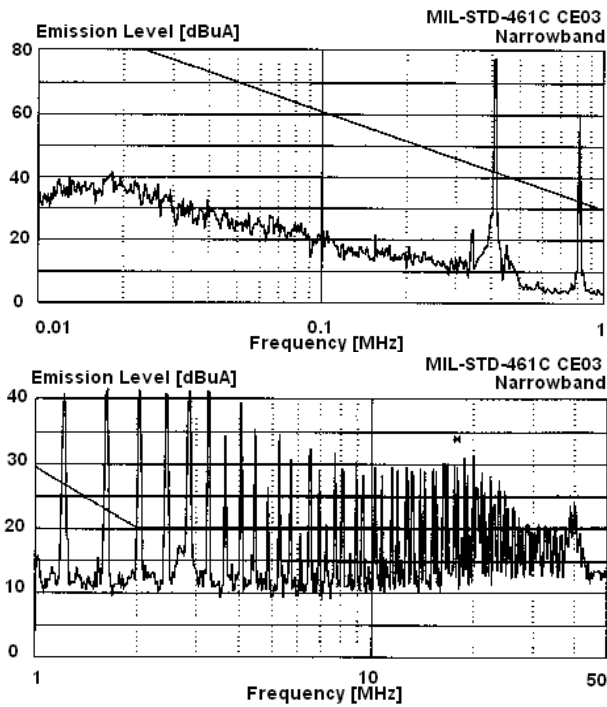


Figure 12 – DVTR2800D without EMI Filter

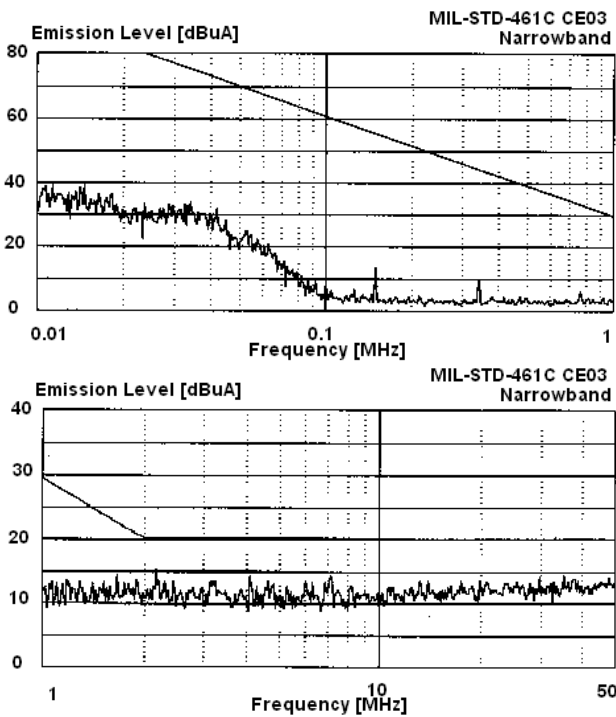
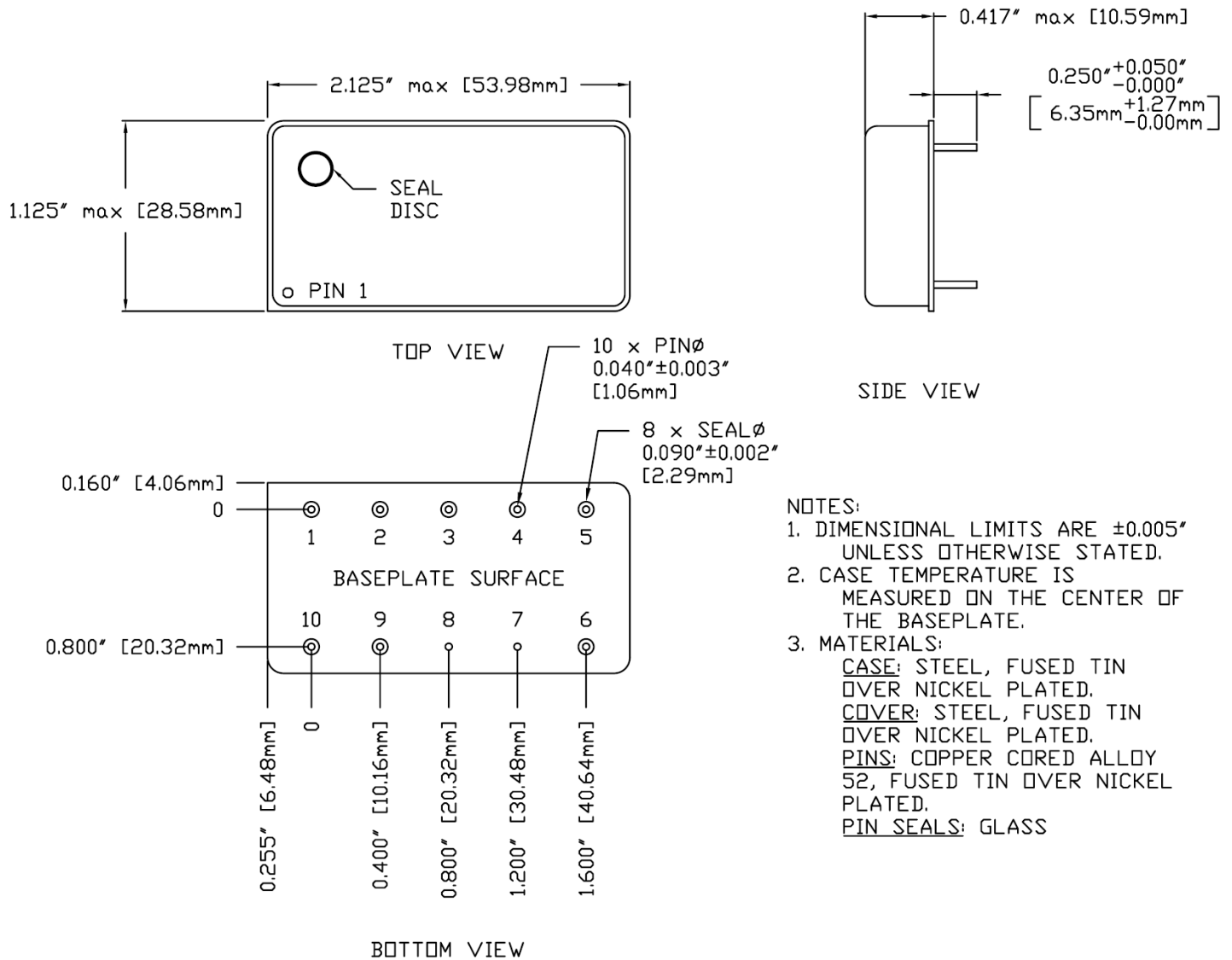


Figure 13 – DVTR2800D with EMI Filter

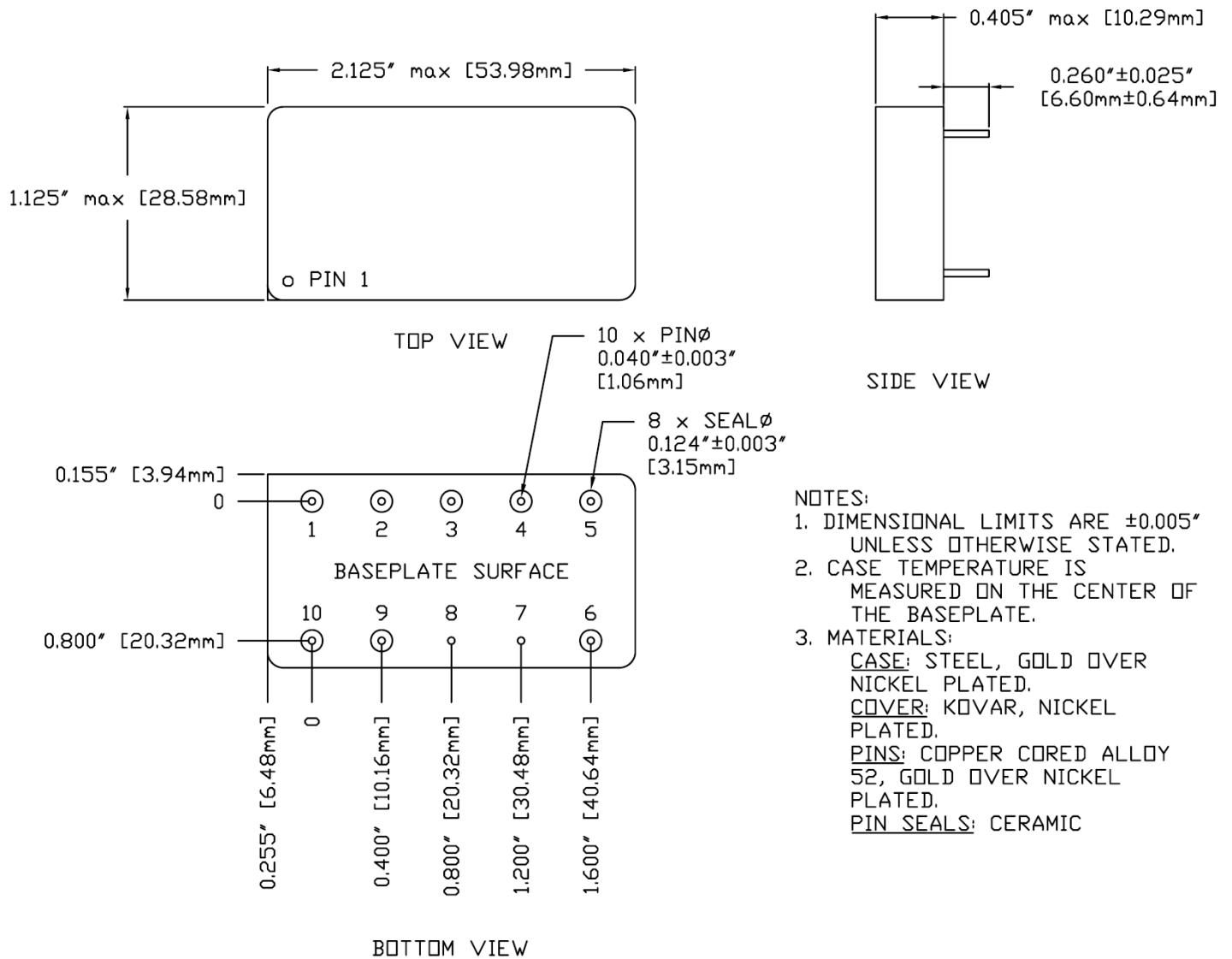
PACKAGE SPECIFICATIONS (NON-FLANGED, SOLDER SEAL)



| PIN | FUNCTION | PIN | FUNCTION |
|-----|----------|-----|----------|
| 1   | 28V IN   | 6   | CASE     |
| 2   | INHIBIT  | 7   | CASE     |
| 3   | +V OUT   | 8   | CASE     |
| 4   | OUT COM  | 9   | SYNC     |
| 5   | -V OUT   | 10  | IN COM   |

Figure 14 – Non-Flanged, Solder Seal Package and Pinout (Not Used for /HB or Higher Screened Products)

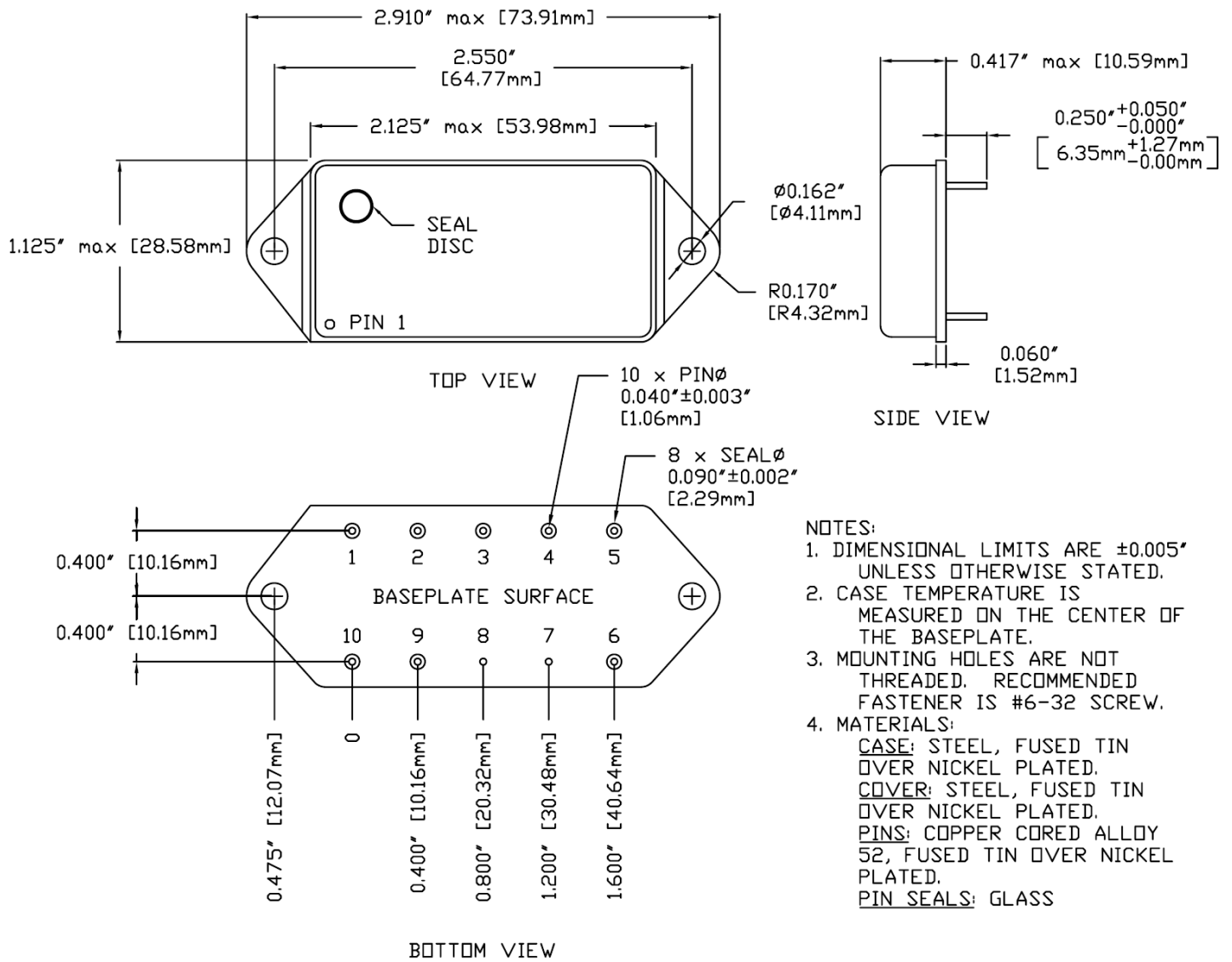
PACKAGE SPECIFICATIONS (NON-FLANGED, SEAM SEAL)



| PIN | FUNCTION | PIN | FUNCTION |
|-----|----------|-----|----------|
| 1   | 28V IN   | 6   | CASE     |
| 2   | INHIBIT  | 7   | CASE     |
| 3   | +V OUT   | 8   | CASE     |
| 4   | OUT COM  | 9   | SYNC     |
| 5   | -V OUT   | 10  | IN COM   |

**Figure 15** – Non-Flanged, Seam Seal Package and Pinout

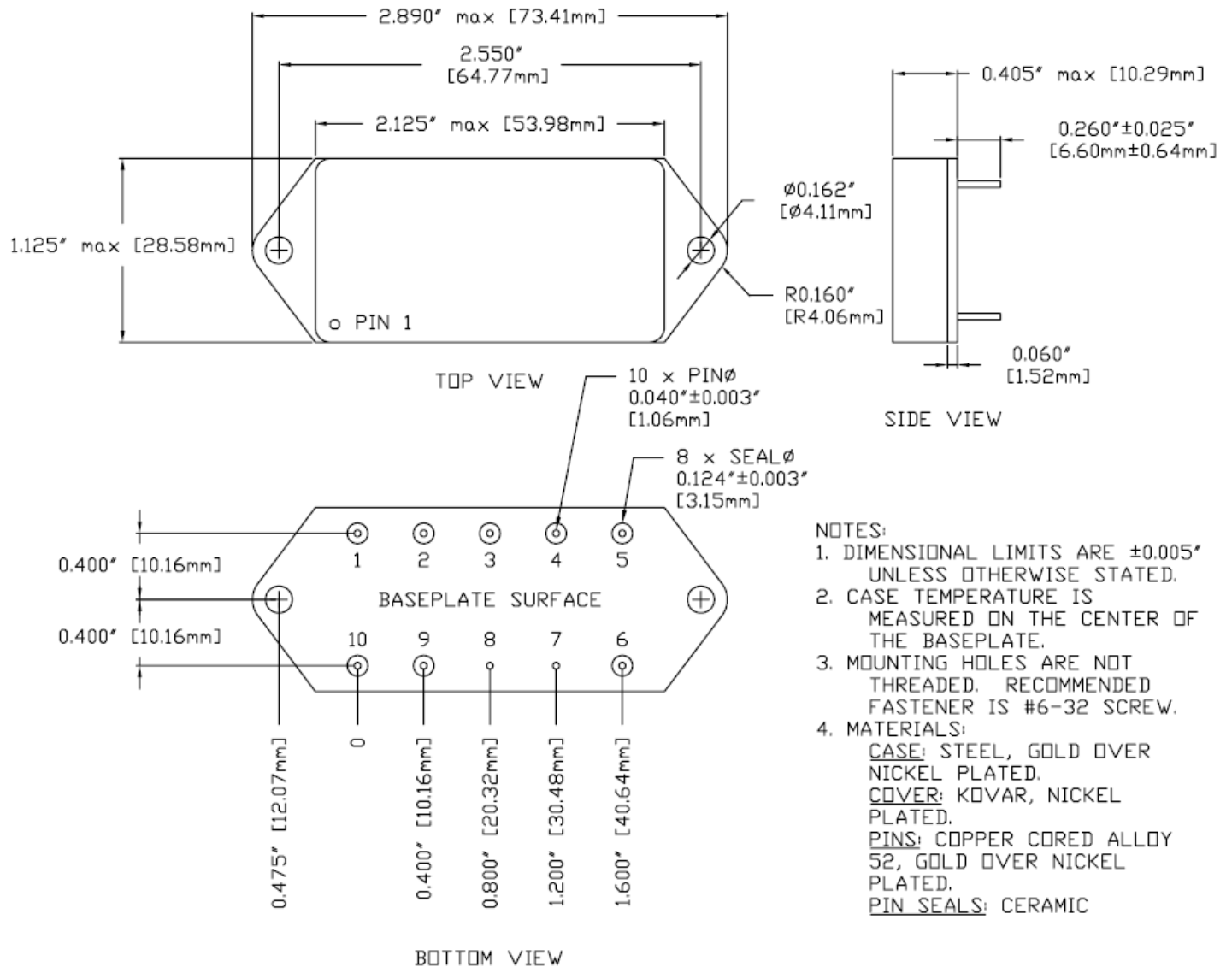
PACKAGE SPECIFICATIONS (FLANGED, SOLDER SEAL)



| PIN | FUNCTION | PIN | FUNCTION |
|-----|----------|-----|----------|
| 1   | 28V IN   | 6   | CASE     |
| 2   | INHIBIT  | 7   | CASE     |
| 3   | +V OUT   | 8   | CASE     |
| 4   | OUT COM  | 9   | SYNC     |
| 5   | -V OUT   | 10  | IN COM   |

Figure 16 – Flanged, Solder Seal Package and Pinout (Not Used for /HB or Higher Screened Products)

PACKAGE SPECIFICATIONS (FLANGED, SEAM SEAL)



| PIN | FUNCTION | PIN | FUNCTION |
|-----|----------|-----|----------|
| 1   | 28V IN   | 6   | CASE     |
| 2   | INHIBIT  | 7   | CASE     |
| 3   | +V OUT   | 8   | CASE     |
| 4   | OUT COM  | 9   | SYNC     |
| 5   | -V OUT   | 10  | IN COM   |

Figure 17 – Flanged, Seam Seal Package and Pinout

## PACKAGE PIN DESCRIPTION

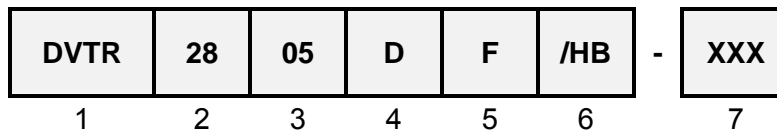
| Pin | Function | Description   |
|-----|----------|---|
| 1   | 28V IN   | Positive Input Voltage Connection   |
| 2   | INHIBIT  | Logic Low = Disabled Output. Connecting the inhibit pin to input common causes converter shutdown.<br>Logic High = Enabled Output. Unconnected or open collector TTL. |
| 3   | +V OUT   | Positive Output Voltage Connection  |
| 4   | OUT COM  | Output Common Connection  |
| 5   | -V OUT   | Negative Output Voltage Connection  |
| 6   | CASE     | Case Connection   |
| 7   | CASE     | Case Connection   |
| 8   | CASE     | Case Connection   |
| 9   | SYNC     | Synchronization Signal  |
| 10  | IN COM   | Input Common Connection   |

## ENVIRONMENTAL SCREENING (100% Tested Per MIL-STD-883 as referenced to MIL-PRF-38534)

| Screening                 | MIL-STD-883  | Standard (No Suffix) | Extended /ES | HB /HB | Class H /H | Class K /K |
|---------------------------|--|----------------------|--------------|--------|------------|------------|
| Non-Destructive Bond Pull | Method 2023  | •                    | •            | •      | •          | •          |
| Internal Visual           | Method 2017, 2032<br>Internal Procedure  | •                    | •            | •      | •          | •          |
| Temperature Cycling       | Method 1010, Condition C<br>Method 1010, -55°C to 125°C  |                      | •            | •      | •          | •          |
| Constant Acceleration     | Method 2001, 3000g, Y1 Direction<br>Method 2001, 500g, Y1 Direction  |                      | •            | •      | •          | •          |
| PIND                      | Method 2020, Condition A <sup>2</sup>  |                      |              |        |            | •          |
| Pre Burn-In Electrical    | 100% at 25°C   |                      |              |        |            | •          |
| Burn-In                   | Method 1015, 320 hours at +125°C<br>Method 1015, 160 hours at +125°C<br>96 hours at +125°C<br>24 hours at +125°C | •                    | •            | •      | •          | •          |
| Final Electrical          | MIL-PRF-38534, Group A <sup>1</sup><br>100% at 25°C  | •                    | •            | •      | •          | •          |
| Hermeticity               | Method 1014, Fine Leak, Condition A<br>Method 1014, Gross Leak, Condition C<br>Dip (1 x 10 <sup>-3</sup> )       | •                    | •            | •      | •          | •          |
| Radiography               | Method 2012 <sup>3</sup>   |                      |              |        |            | •          |
| External Visual           | Method 2009  | •                    | •            | •      | •          | •          |

- Notes:
1. 100% R&R testing at -55°C, +25°C, and +125°C with all test data included in product shipment.
  2. PIND test Certificate of Compliance included in product shipment.
  3. Radiographic test Certificate of Compliance and film(s) included in product shipment.

## ORDERING INFORMATION



| (1)<br>Product Series | (2)<br>Nominal Input Voltage |          | (3)<br>Output Voltage   |  | (4)<br>Number of Outputs |      |
|-----------------------|------------------------------|----------|---|--|--------------------------|------|
| <b>DVTR</b>           | <b>28</b>                    | 28 Volts | <b>05</b><br><b>08</b><br><b>12</b><br><b>15</b><br><b>18</b> | ± 5 Volts<br>± 8 Volts<br>± 12 Volts<br>± 15 Volts<br>± 18 Volts | <b>D</b>                 | Dual |

| (5)<br>Package Option   |                        | (6)<br>Screening Code <sup>1,2</sup>                              |  | (7)<br>Additional Screening Code |
|-------------------------|------------------------|---|--|----------------------------------|
| <b>None</b><br><b>F</b> | Non-Flanged<br>Flanged | <b>None</b><br><b>/ES</b><br><b>/HB</b><br><b>/H</b><br><b>/K</b> | Standard<br>Extended<br>HB<br>Class H<br>Class K | Contact Sales                    |

- Notes:
1. Contact the VPT Inc. Sales Department for availability of Class H (/H) or Class K (/K) qualified products.
  2. VPT Inc. reserves the right to ship higher screened or SMD products to meet lower screened orders at our sole discretion unless specifically forbidden by customer contract.

Please contact your sales representative or the VPT Inc. Sales Department for more information concerning additional environmental screening and testing, different input voltage, output voltage, power requirement, source inspection, and/or special element evaluation for space or other higher quality applications.

## SMD (STANDARD MICROCIRCUIT DRAWING) NUMBERS

| Standard Microcircuit Drawing (SMD) | DVTR2800D Series Similar Part Number |
|-------------------------------------|--------------------------------------|
| *T.B.D.                             | DVTR2805D/H<br>DVTR2805DF/H          |
| *T.B.D.                             | DVTR2808D/H<br>DVTR2808DF/H          |
| *T.B.D.                             | DVTR2812D/H<br>DVTR2812DF/H          |
| *T.B.D.                             | DVTR2815D/H<br>DVTR2815DF/H          |
| *T.B.D.                             | DVTR2818D/H<br>DVTR2818DF/H          |

Do not use the DVTR2800D Series similar part number for SMD product acquisition. It is listed for reference only. For exact specifications for the SMD product, refer to the SMD drawing. SMD's can be downloaded from the DSCC website at <http://www.dscclia.mil/programs/smcr/>. The SMD number listed above is for MIL-PRF-38534 Class H screening, standard gold plated lead finish, and no RHA (Radiation Hardness Assurance) level. Please reference the SMD for other screening levels, lead finishes, and radiation levels. All SMD products are marked with a "Q" on the cover as specified by the QML certification mark requirement of MIL-PRF-38534.

## CONTACT INFORMATION

To request a quotation or place an order please contact your sales representative or the VPT Inc. Sales Department at:

**Phone:** (425) 353-3010  
**Fax:** (425) 353-4030  
**E-mail:** [vptsales@vpt-inc.com](mailto:vptsales@vpt-inc.com)

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