



DVFL2800D Series

HIGH RELIABILITY HYBRID DC-DC CONVERTERS

DESCRIPTION

The DVFL 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 DVFL 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. The current sharing function allows a maximum of five units to be connected in parallel to boost the total output power to 5 times. The output voltage is trimmable up to +10% or down -20%.

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
- Parallel Up to 5 Units With Current Sharing
- Output Voltage Trim Up +10% or Down -20%
- Wide Input Voltage Range: 16 to 40 Volts per MIL-STD-704
- Up to 120 Watts Output Power
- Fault Tolerant Magnetic Feedback Circuit
- NO Use of Optoisolators
- Undervoltage Lockout
- Indefinite Short Circuit Protection
- Current Limit Protection
- Industry Standard Pinout
- Input Transient Voltage: 50 Volts for 1 second
- Precision Seam Welded Hermetic Package
- High Power Density: > 80 W/in³
- Custom Versions Available
- Additional Environmental Screening Available
- Meets MIL-STD-461 Revisions C, D, E and F EMC Requirements When Used With VPT's EMI Filters
- MIL-PRF-38534 Element Evaluated Components
- Space Applications should consider VPT's "S" Series of Radiation Tolerant Power Conversion Devices. Contact VPT for details.

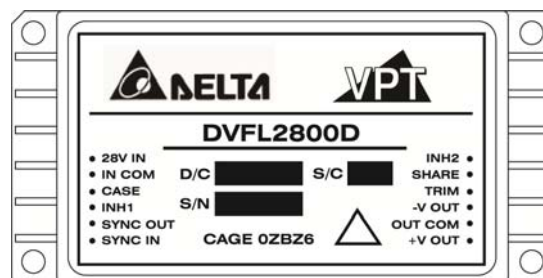


Figure 1 – DVFL2800D DC-DC Converter
(Exact marking may differ from that shown)

SPECIFICATIONS ($T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{IN} = +28\text{V} \pm 5\%$, Full Load⁵, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS

| | | | |
|---|--------------------|--------------------------------------|-----------------|
| Input Voltage (Continuous) | 40 V _{DC} | Junction Temperature Rise to Case | +15°C |
| Input Voltage (Transient, 1 second) | 50 Volts | Storage Temperature | -65°C to +150°C |
| Output Power ¹ | 120 Watts | Lead Solder Temperature (10 seconds) | 270°C |
| Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$) | 40 Watts | Weight (Maximum) (No Pin Extensions) | 90 Grams |
| ESD Rating per MIL-PRF-38543 | 1C | | |

| Parameter | Conditions | DVFL2805D | | | DVFL286R3D | | | Units | |
|--|---|--|-------|------|------------|-------|------|-------------------|-------------------|
| | | Min | Typ | Max | Min | Typ | Max | | |
| STATIC | | | | | | | | | |
| INPUT Voltage ⁴ | Continuous | 16 | 28 | 40 | 16 | 28 | 40 | V | |
| | Transient, 1 sec | - | - | 50 | - | - | 50 | V | |
| Current | Inhibited 1 | - | 1 | 3 | - | 1 | 3 | mA | |
| | Inhibited 2 | - | 40 | 70 | - | 40 | 70 | mA | |
| | No Load | - | 75 | 160 | - | 75 | 160 | mA | |
| Ripple Current | Full Load ⁵ , 20Hz to 10MHz | - | 30 | 80 | - | 35 | 80 | mA _{p-p} | |
| INH1 Pin Input ⁴ | | 0 | - | 1.5 | 0 | - | 1.5 | V | |
| INH2 Pin Input ⁴ | | 0 | - | 1 | 0 | - | 1 | V | |
| INH1 Pin Open Circuit Voltage ⁴ | | 10.5 | - | 15 | 10.5 | - | 15 | V | |
| INH2 Pin Open Circuit Voltage ⁴ | | 4 | - | 12 | 4 | - | 12 | V | |
| UVLO Turn On | | 14.5 | - | 16 | 14.5 | - | 16 | V | |
| UVLO Turn Off ⁴ | | 13.5 | - | 15.5 | 13.5 | - | 15.5 | V | |
| OUTPUT Voltage ⁵ | +V _{OUT} | $T_{CASE} = 25^{\circ}\text{C}$ | 4.95 | 5.00 | 5.05 | 6.237 | 6.3 | 6.363 | V |
| | +V _{OUT} | $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 4.925 | 5.00 | 5.075 | 6.205 | 6.3 | 6.395 | V |
| | -V _{OUT} | $T_{CASE} = 25^{\circ}\text{C}$ | 4.80 | 5.00 | 5.20 | 6.1 | 6.3 | 6.5 | V |
| | -V _{OUT} | $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 4.75 | 5.00 | 5.25 | 6.048 | 6.3 | 6.552 | V |
| Power ^{3,6} | Total | | - | - | 100 | - | - | 100 | W |
| | $\pm V_{OUT}$ | Either Output | - | - | 70 | - | - | 70 | W |
| Current ^{3,6} | $\pm V_{OUT}$ | Either Output | - | - | 14 | - | - | 11.1 | A |
| Ripple Voltage | $\pm V_{OUT}$ | Full Load ⁵ , 20Hz to 10MHz | - | 15 | 80 | - | 20 | 80 | mV _{p-p} |
| Line Regulation | +V _{OUT} | $V_{IN} = 16\text{V}$ to 40V | - | 2 | 20 | - | 2 | 20 | mV |
| | -V _{OUT} | $V_{IN} = 16\text{V}$ to 40V | - | 10 | 200 | - | 10 | 200 | mV |
| Load Regulation | +V _{OUT} | No Load to Full Load ⁵ | - | 10 | 100 | - | 10 | 120 | mV |
| | -V _{OUT} | No Load to Full Load ⁵ | - | 55 | 200 | - | 70 | 200 | mV |
| Cross Regulation | -V _{OUT} | V1+ Load 30% - Load 70% V2+ Load 70% - Load 30% | - | 260 | 450 | - | 300 | 450 | mV |
| Voltage Trim | Full Load | | -20 | - | 10 | -20 | - | 10 | % |
| Share Pin Voltage ⁴ | | | 2 | - | 4 | 2 | - | 4 | V |
| EFFICIENCY | Full Load ⁵ | | 73 | 80 | - | 76 | 81 | - | % |
| LOAD FAULT POWER DISSIPATION | Overload ⁴ | | - | - | 50 | - | - | 50 | W |
| | Short Circuit | | - | - | 50 | - | - | 50 | W |
| CAPACITIVE LOAD ⁴ | | | - | - | 500 | - | - | 500 | μF |
| SWITCHING FREQUENCY | | | 425 | 500 | 600 | 425 | 500 | 600 | kHz |
| SYNC FREQUENCY RANGE | $V_H - V_L = 5\text{V}$ Duty Cycle = 20% - 80% | | 500 | - | 600 | 500 | - | 600 | kHz |
| ISOLATION | 500 V _{DC} , $T_{CASE} = 25^{\circ}\text{C}$ | | 100 | - | - | 100 | - | - | M Ω |
| MTBF (MIL-HDBK-217F) | AIF @ $T_C = 55^{\circ}\text{C}$ | | - | 400 | - | - | 400 | - | kHrs |

SPECIFICATIONS ($T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{IN} = +28\text{V} \pm 5\%$, Full Load⁵, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS

| | | | |
|---|-------------|--------------------------------------|-----------------|
| Input Voltage (Continuous) | 40 V_{DC} | Junction Temperature Rise to Case | +15°C |
| Input Voltage (Transient, 1 second) | 50 Volts | Storage Temperature | -65°C to +150°C |
| Output Power ¹ | 120 Watts | Lead Solder Temperature (10 seconds) | 270°C |
| Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$) | 40 Watts | Weight (Maximum) (No Pin Extensions) | 90 Grams |
| ESD Rating per MIL-PRF-38543 | 1C | | |

| Parameter | Conditions | DVFL2805D | | | DVFL286R3D | | | Units | |
|---|---------------|------------------------------|-----|-----|------------|-----|-----|-------|------------------|
| | | Min | Typ | Max | Min | Typ | Max | | |
| DYNAMIC | | | | | | | | | |
| Load Step Output Transient | $\pm V_{OUT}$ | Half Load to Full Load | - | 130 | 400 | - | 150 | 300 | mV _{PK} |
| Load Step Recovery ² | | | - | 200 | 500 | - | 200 | 500 | μSec |
| Line Step Output Transient ⁴ | $\pm V_{OUT}$ | $V_{IN} = 16\text{V}$ to 40V | - | 300 | 600 | - | 250 | 600 | mV _{PK} |
| Line Step Recovery ^{2, 4} | | | - | 300 | 500 | - | 400 | 700 | μSec |
| Turn On Delay | $\pm V_{OUT}$ | $V_{IN} = 0\text{V}$ to 28V | - | 5 | 20 | - | 5 | 20 | mSec |
| Turn On Overshoot | | | - | 0 | 25 | - | 0 | 25 | mV _{PK} |

- 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.

SPECIFICATIONS ($T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{IN} = +28\text{V} \pm 5\%$, Full Load⁵, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS

| | | | |
|---|--------------------|--------------------------------------|-----------------|
| Input Voltage (Continuous) | 40 V _{DC} | Junction Temperature Rise to Case | +15°C |
| Input Voltage (Transient, 1 second) | 50 Volts | Storage Temperature | -65°C to +150°C |
| Output Power ¹ | 120 Watts | Lead Solder Temperature (10 seconds) | 270°C |
| Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$) | 40 Watts | Weight (Maximum) (No Pin Extensions) | 90 Grams |
| ESD Rating per MIL-PRF-38543 | 1C | | |

| Parameter | Conditions | DVFL289R5D | | | DVFL2812D | | | Units | |
|--|---|--|-------|------|-----------|-------|-------|-------------------|-------------------|
| | | Min | Typ | Max | Min | Typ | Max | | |
| STATIC | | | | | | | | | |
| INPUT Voltage ⁴ | Continuous | 16 | 28 | 40 | 16 | 28 | 40 | V | |
| | Transient, 1 sec | - | - | 50 | - | - | 50 | V | |
| Current | Inhibited 1 | - | 1 | 3 | - | 1 | 3 | mA | |
| | Inhibited 2 | - | 40 | 70 | - | 40 | 70 | mA | |
| | No Load | - | 80 | 160 | - | 90 | 160 | mA | |
| Ripple Current | Full Load ⁵ , 20Hz to 10MHz | - | 30 | 80 | - | 35 | 80 | mA _{p-p} | |
| INH1 Pin Input ⁴ | | 0 | - | 1.5 | 0 | - | 1.5 | V | |
| INH2 Pin Input ⁴ | | 0 | - | 1 | 0 | - | 1 | V | |
| INH1 Pin Open Circuit Voltage ⁴ | | 10.5 | - | 15 | 10.5 | - | 15 | V | |
| INH2 Pin Open Circuit Voltage ⁴ | | 4 | - | 12 | 4 | - | 12 | V | |
| UVLO Turn On | | 14.5 | - | 16 | 14.5 | - | 16 | V | |
| UVLO Turn Off ⁴ | | 13.5 | - | 15.5 | 13.5 | - | 15.5 | V | |
| OUTPUT Voltage ⁵ | +V _{OUT} | $T_{CASE} = 25^{\circ}\text{C}$ | 9.405 | 9.5 | 9.595 | 11.88 | 12.00 | 12.12 | V |
| | +V _{OUT} | $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 9.357 | 9.5 | 9.643 | 11.82 | 12.00 | 12.18 | V |
| | -V _{OUT} | $T_{CASE} = 25^{\circ}\text{C}$ | 9.3 | 9.5 | 9.7 | 11.80 | 12.00 | 12.20 | V |
| | -V _{OUT} | $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 9.12 | 9.5 | 9.88 | 11.52 | 12.00 | 12.48 | V |
| Power ^{3,6} | Total | | - | - | 100 | - | - | 110 | W |
| | $\pm V_{OUT}$ | Either Output | - | - | 70 | - | - | 77 | W |
| Current ^{3,6} | $\pm V_{OUT}$ | Either Output | - | - | 7.4 | - | - | 6.4 | A |
| Ripple Voltage | $\pm V_{OUT}$ | Full Load ⁵ , 20Hz to 10MHz | - | 25 | 80 | - | 25 | 80 | mV _{p-p} |
| Line Regulation | +V _{OUT} | $V_{IN} = 16\text{V}$ to 40V | - | 2 | 20 | - | 2 | 20 | mV |
| | -V _{OUT} | $V_{IN} = 16\text{V}$ to 40V | - | 10 | 200 | - | 10 | 200 | mV |
| Load Regulation | +V _{OUT} | No Load to Full Load ⁵ | - | 2 | 100 | - | 2 | 120 | mV |
| | -V _{OUT} | No Load to Full Load ⁵ | - | 45 | 200 | - | 40 | 200 | mV |
| Cross Regulation | -V _{OUT} | V1+ Load 30% - Load 70% V2+ Load 70% - Load 30% | - | 220 | 450 | - | 220 | 450 | mV |
| Voltage Trim | Full Load | | -20 | - | 10 | -20 | - | 10 | % |
| Share Pin Voltage ⁴ | | | 2 | - | 4 | 2 | - | 4 | V |
| EFFICIENCY | Full Load ⁵ | | 79 | 83 | - | 80 | 86 | - | % |
| LOAD FAULT POWER DISSIPATION | Overload ⁴ | | - | - | 50 | - | - | 50 | W |
| | Short Circuit | | - | - | 50 | - | - | 50 | W |
| CAPACITIVE LOAD ⁴ | | | - | - | 500 | - | - | 500 | μF |
| SWITCHING FREQUENCY | | | 425 | 500 | 600 | 425 | 500 | 600 | kHz |
| SYNC FREQUENCY RANGE | $V_H - V_L = 5\text{V}$ Duty Cycle = 20% - 80% | | 500 | - | 600 | 500 | - | 600 | kHz |
| ISOLATION | 500 V _{DC} , $T_{CASE} = 25^{\circ}\text{C}$ | | 100 | - | - | 100 | - | - | M Ω |
| MTBF (MIL-HDBK-217F) | AIF @ $T_C = 55^{\circ}\text{C}$ | | - | 400 | - | - | 400 | - | kHrs |

SPECIFICATIONS ($T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{IN} = +28\text{V} \pm 5\%$, Full Load⁵, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS

| | | | |
|---|--------------------|--------------------------------------|-----------------|
| Input Voltage (Continuous) | 40 V _{DC} | Junction Temperature Rise to Case | +15°C |
| Input Voltage (Transient, 1 second) | 50 Volts | Storage Temperature | -65°C to +150°C |
| Output Power ¹ | 120 Watts | Lead Solder Temperature (10 seconds) | 270°C |
| Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$) | 40 Watts | Weight (Maximum) (No Pin Extensions) | 90 Grams |
| ESD Rating per MIL-PRF-38543 | 1C | | |

| Parameter | Conditions | DVFL289R5D | | | DVFL2812D | | | Units | |
|---|---------------|---------------------------------------|-----|-----|-----------|-----|-----|-------|------------------|
| | | Min | Typ | Max | Min | Typ | Max | | |
| DYNAMIC | | | | | | | | | |
| Load Step Output Transient | $\pm V_{OUT}$ | Half Load to Full Load | - | 400 | 700 | - | 260 | 500 | mV _{PK} |
| Load Step Recovery ² | | | - | 250 | 500 | - | 140 | 500 | μSec |
| Line Step Output Transient ⁴ | $\pm V_{OUT}$ | $V_{IN} = 16\text{V}$ to 40V | - | 550 | 1000 | - | 600 | 1200 | mV _{PK} |
| Line Step Recovery ^{2, 4} | | | - | 300 | 600 | - | 300 | 500 | μSec |
| Turn On Delay | $\pm V_{OUT}$ | $V_{IN} = 0\text{V}$ to 28V | - | 5 | 20 | - | 5 | 20 | mSec |
| Turn On Overshoot | | | - | 0 | 25 | - | 0 | 50 | mV _{PK} |

- 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.

SPECIFICATIONS ($T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{IN} = +28\text{V} \pm 5\%$, Full Load⁵, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS

| | | | |
|---|--------------------|--------------------------------------|-----------------|
| Input Voltage (Continuous) | 40 V _{DC} | Junction Temperature Rise to Case | +15°C |
| Input Voltage (Transient, 1 second) | 50 Volts | Storage Temperature | -65°C to +150°C |
| Output Power ¹ | 120 Watts | Lead Solder Temperature (10 seconds) | 270°C |
| Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$) | 40 Watts | Weight (Maximum) (No Pin Extensions) | 90 Grams |
| ESD Rating per MIL-PRF-38543 | 1C | | |

| Parameter | Conditions | DVFL2815D | | | Units |
|--|--|-----------|-------|--------|-------------------|
| | | Min | Typ | Max | |
| STATIC | | | | | |
| INPUT Voltage ⁴ | Continuous | 16 | 28 | 40 | V |
| | Transient, 1 sec | - | - | 50 | V |
| Current | Inhibited 1 | - | 1 | 3 | mA |
| | Inhibited 2 | - | 40 | 70 | mA |
| | No Load | - | 110 | 160 | mA |
| Ripple Current | Full Load ⁵ , 20Hz to 10MHz | - | 40 | 80 | mA _{p-p} |
| INH1 Pin Input ⁴ | | 0 | - | 1.5 | V |
| INH2 Pin Input ⁴ | | 0 | - | 1 | V |
| INH1 Pin Open Circuit Voltage ⁴ | | 10.5 | - | 15 | V |
| INH2 Pin Open Circuit Voltage ⁴ | | 4 | - | 12 | V |
| UVLO Turn On | | 14.5 | - | 16 | V |
| UVLO Turn Off ⁴ | | 13.5 | - | 15.5 | V |
| OUTPUT Voltage ⁵ | +V _{OUT} $T_{CASE} = 25^{\circ}\text{C}$ | 14.85 | 15.00 | 15.15 | V |
| | +V _{OUT} $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 14.775 | 15.00 | 15.225 | V |
| | -V _{OUT} $T_{CASE} = 25^{\circ}\text{C}$ | 14.80 | 15.00 | 15.20 | V |
| | -V _{OUT} $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 14.40 | 15.00 | 15.60 | V |
| Power ^{3,6} | Total | - | - | 120 | W |
| | $\pm V_{OUT}$ Either Output | - | - | 84 | W |
| Current ^{3,6} | $\pm V_{OUT}$ Either Output | - | - | 5.6 | A |
| Ripple Voltage | $\pm V_{OUT}$ Full Load ⁵ , 20Hz to 10MHz | - | 30 | 80 | mV _{p-p} |
| Line Regulation | +V _{OUT} $V_{IN} = 16\text{V}$ to 40V | - | 2 | 20 | mV |
| | -V _{OUT} $V_{IN} = 16\text{V}$ to 40V | - | 10 | 200 | mV |
| Load Regulation | +V _{OUT} No Load to Full Load ⁵ | - | 2 | 120 | mV |
| | -V _{OUT} No Load to Full Load ⁵ | - | 30 | 200 | mV |
| Cross Regulation | -V _{OUT} V1+ Load 30% - Load 70% V2+ Load 70% - Load 30% | - | 200 | 450 | mV |
| Voltage Trim | Full Load | -20 | - | 10 | % |
| Share Pin Voltage ⁴ | | 2 | - | 4 | V |
| EFFICIENCY | Full Load ⁵ | 81 | 86 | - | % |
| LOAD FAULT POWER DISSIPATION | Overload ⁴ | - | - | 50 | W |
| | Short Circuit | - | - | 50 | W |
| CAPACITIVE LOAD ⁴ | | - | - | 500 | μF |
| SWITCHING FREQUENCY | | 425 | 500 | 600 | kHz |
| SYNC FREQUENCY RANGE | $V_H - V_L = 5\text{V}$ Duty Cycle = 20% - 80% | 500 | - | 600 | kHz |
| ISOLATION | 500 V _{DC} , $T_{CASE} = 25^{\circ}\text{C}$ | 100 | - | - | M Ω |
| MTBF (MIL-HDBK-217F) | AIF @ $T_C = 55^{\circ}\text{C}$ | - | 400 | - | kHrs |

SPECIFICATIONS ($T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{IN} = +28\text{V} \pm 5\%$, Full Load⁵, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS

| | | | |
|---|--------------------|--------------------------------------|-----------------|
| Input Voltage (Continuous) | 40 V _{DC} | Junction Temperature Rise to Case | +15°C |
| Input Voltage (Transient, 1 second) | 50 Volts | Storage Temperature | -65°C to +150°C |
| Output Power ¹ | 120 Watts | Lead Solder Temperature (10 seconds) | 270°C |
| Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$) | 40 Watts | Weight (Maximum) (No Pin Extensions) | 90 Grams |
| ESD Rating per MIL-PRF-38543 | 1C | | |

| Parameter | Conditions | DVFL2815D | | | Units | |
|---|---------------|---------------------------------------|-----|-----|-------|------------------|
| | | Min | Typ | Max | | |
| DYNAMIC | | | | | | |
| Load Step Output Transient | $\pm V_{OUT}$ | Half Load to Full Load | - | 260 | 500 | mV _{PK} |
| Load Step Recovery ² | | | - | 110 | 500 | μSec |
| Line Step Output Transient ⁴ | $\pm V_{OUT}$ | $V_{IN} = 16\text{V}$ to 40V | - | 600 | 1200 | mV _{PK} |
| Line Step Recovery ^{2, 4} | | | - | 300 | 500 | μSec |
| Turn On Delay | $\pm V_{OUT}$ | $V_{IN} = 0\text{V}$ to 28V | - | 5 | 20 | mSec |
| Turn On Overshoot | | | - | 0 | 50 | mV _{PK} |

- 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.

BLOCK DIAGRAM

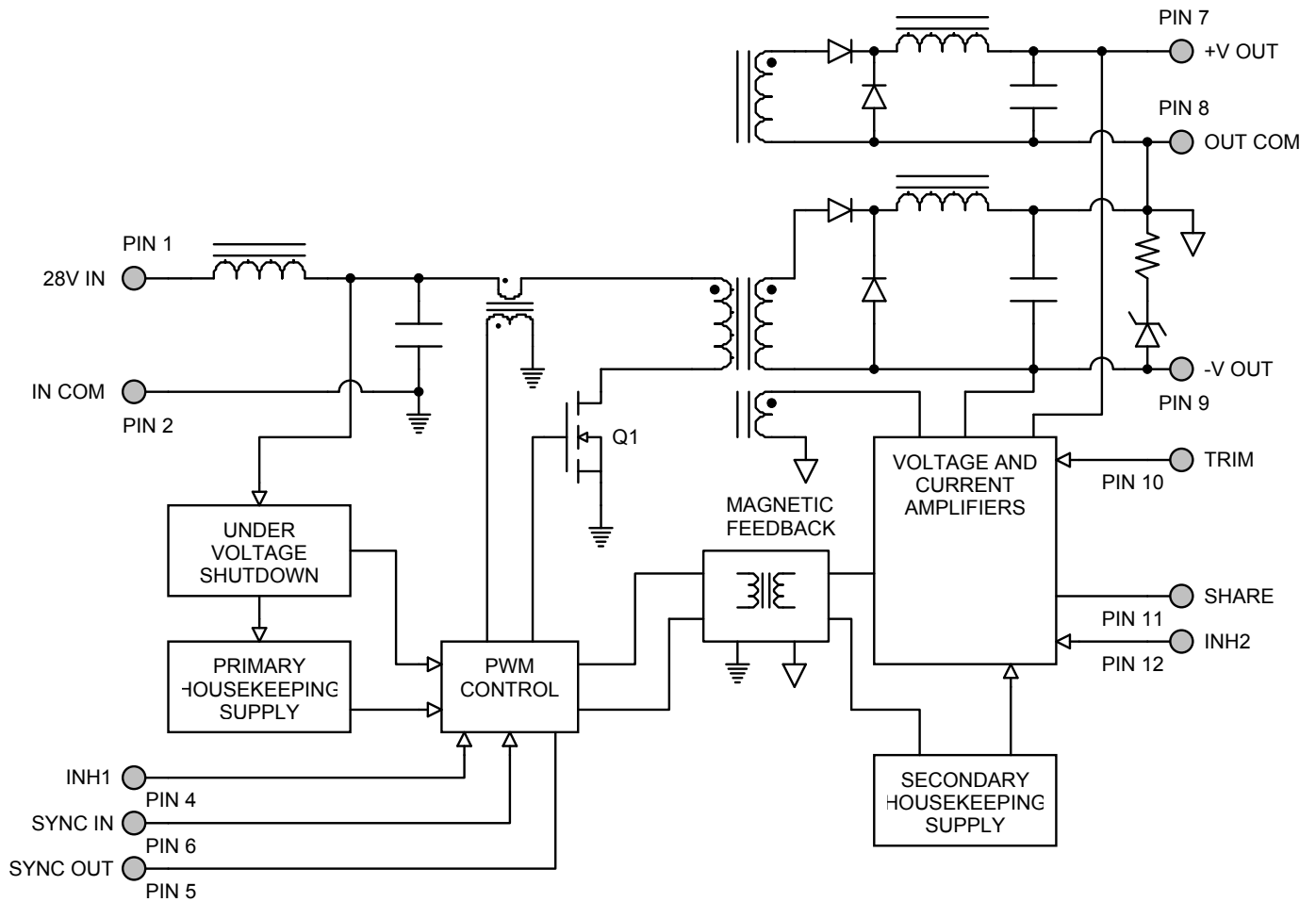


Figure 2

CONNECTION DIAGRAM

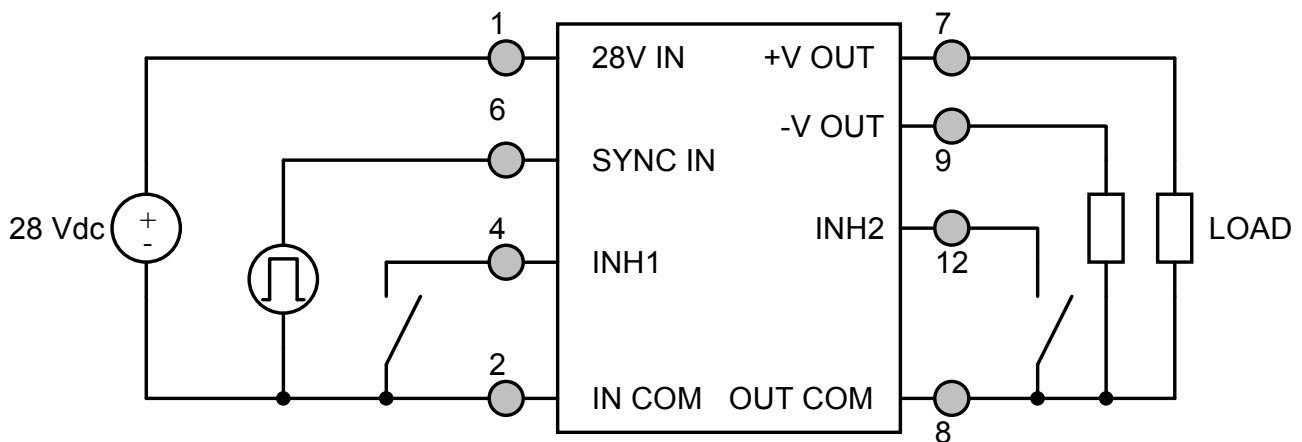


Figure 3

INHIBIT DRIVE CONNECTION DIAGRAM

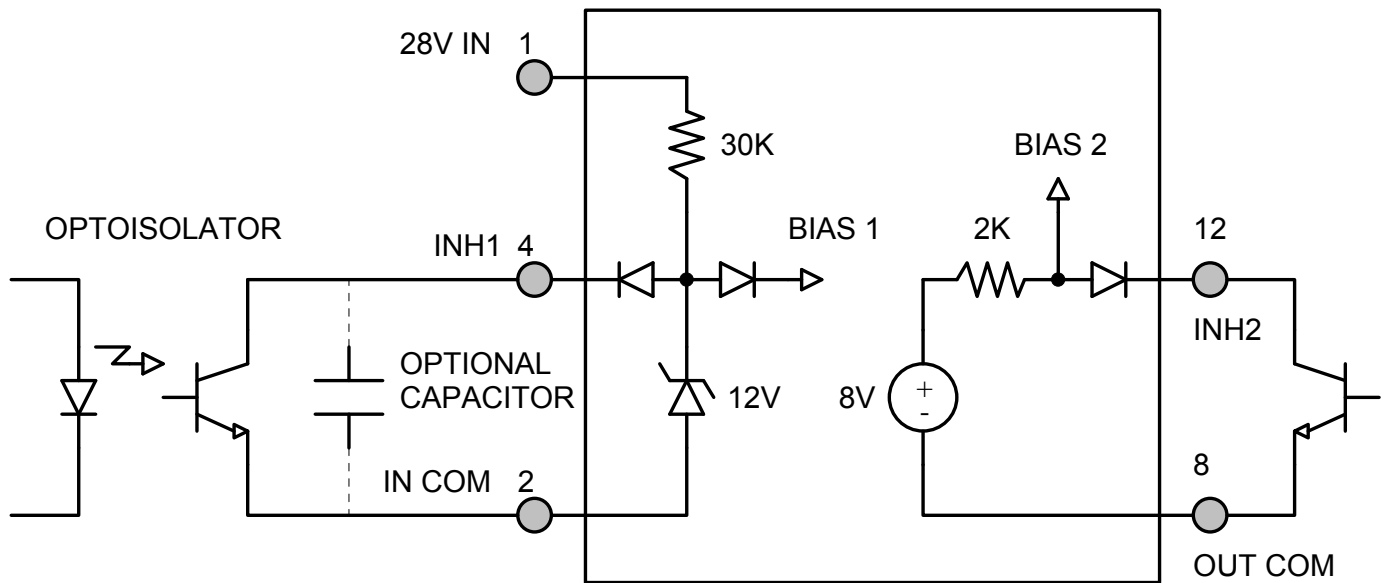


Figure 4 – Isolated Inhibit Drive and Internal Equivalent Circuit
(Shown with optional capacitor for turn-on delay)

EMI FILTER HOOKUP DIAGRAM

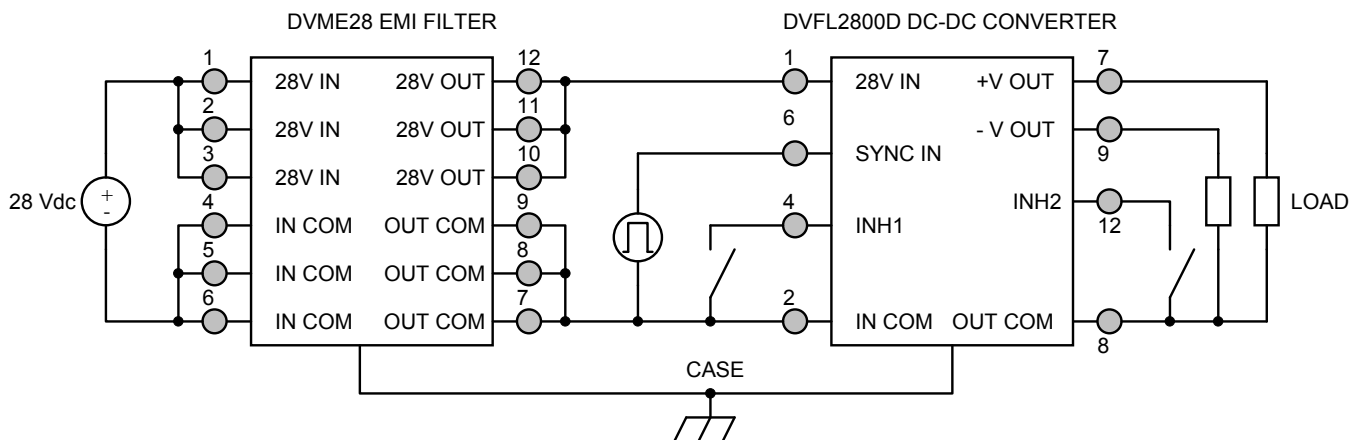


Figure 5 – Converter with EMI Filter

+28 VOLT OUTPUT CONNECTION DIAGRAM

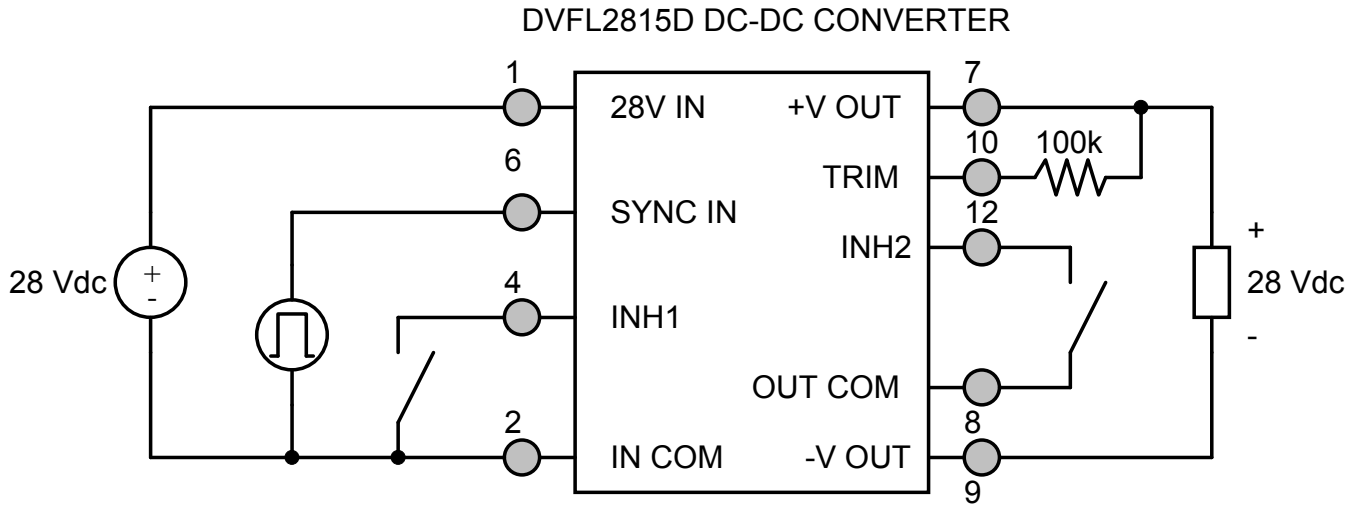


Figure 6: +28 Volt Output Converter Using DVFL2815D Converter

PARALLEL CONNECTION DIAGRAM

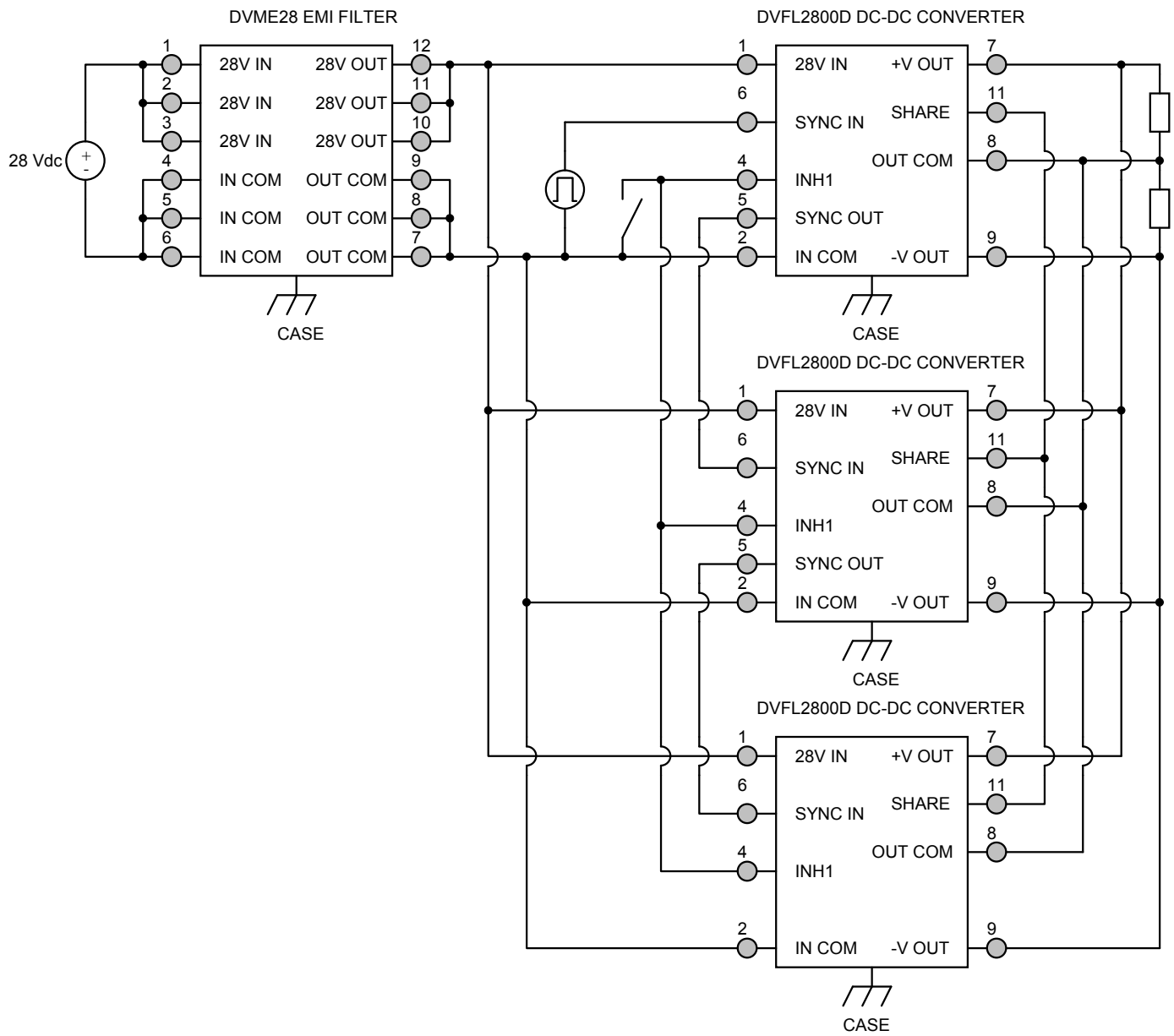
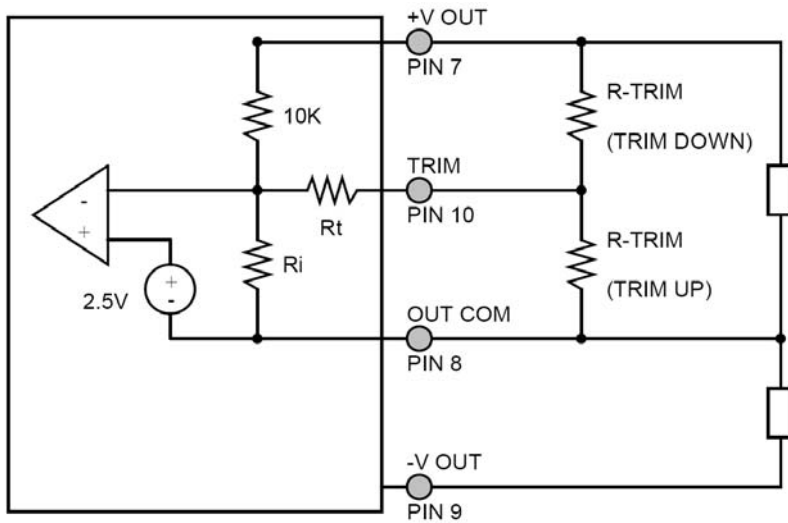


Figure 7 – Current Sharing Parallel Connection for Multiple Converters

OUTPUT VOLTAGE TRIM



The output voltage can be trimmed down by connecting a resistor between the TRIM pin (PIN 10) and the +V OUT pin (PIN 7), or can be trimmed up by connecting a resistor between the TRIM pin (PIN 10) and the OUT COM pin (PIN 8). The maximum trim range is +10% up and -20% down. The appropriate resistor values versus the output voltage are given in the trim table below.

Figure 8 – Output Voltage Trim

| DVFL2805D | | DVFL286R3D | | DVFL289R5D | | DVFL2812D | | DVFL2815D | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| +V _{OUT} (V) | R _{TRIM} (Ω) | +V _{OUT} (V) | R _{TRIM} (Ω) | +V _{OUT} (V) | R _{TRIM} (Ω) | +V _{OUT} (V) | R _{TRIM} (Ω) | +V _{OUT} (V) | R _{TRIM} (Ω) |
| 5.5 | 35.0k | 6.9 | 28.1k | 10.45 | 11.5k | 13.2 | 5.8k | 16.50 | 1.7k |
| 5.4 | 47.5k | 6.8 | 36.7k | 10.3 | 16.5k | 13.0 | 10.0k | 16.25 | 5.0k |
| 5.3 | 68.3k | 6.7 | 49.6k | 10.1 | 27.0k | 12.8 | 16.2k | 16.00 | 10.0k |
| 5.2 | 110k | 6.6 | 71.1k | 9.9 | 48.0k | 12.6 | 26.6k | 15.75 | 18.3k |
| 5.1 | 235k | 6.5 | 114k | 9.7 | 111k | 12.4 | 47.3k | 15.50 | 35.0k |
| 5.0 | - | 6.4 | 243k | 9.5 | - | 12.2 | 109k | 15.25 | 85.0k |
| 4.9 | 225k | 6.3 | - | 9.4 | 681k | 12.0 | - | 15.00 | - |
| 4.8 | 100k | 6.2 | 367k | 9.2 | 210k | 11.8 | 454k | 14.75 | 475k |
| 4.7 | 58.3k | 6.1 | 171k | 9.0 | 116k | 11.6 | 213k | 14.50 | 225k |
| 4.6 | 37.5k | 6.0 | 106k | 8.8 | 75.7k | 11.4 | 134k | 14.25 | 142k |
| 4.5 | 25.0k | 5.9 | 72.9k | 8.6 | 53.3k | 11.2 | 94.0k | 14.00 | 100k |
| 4.4 | 16.7k | 5.8 | 53.2k | 8.4 | 39.1k | 11.0 | 70.1k | 13.75 | 75.0k |
| 4.3 | 10.7k | 5.7 | 40.1k | 8.2 | 29.2k | 10.8 | 54.3k | 13.50 | 58.3k |
| 4.2 | 6.3k | 5.6 | 30.8k | 8.0 | 22.0k | 10.6 | 42.9k | 13.25 | 46.4k |
| 4.1 | 2.8k | 5.5 | 23.8k | 7.8 | 16.4k | 10.4 | 34.4k | 13.00 | 37.5k |
| 4.0 | 0 | 5.4 | 18.3k | 7.6 | 12.1k | 10.2 | 27.8k | 12.75 | 30.6k |
| | | 5.3 | 13.9k | | | 10.0 | 22.5k | 12.50 | 25.0k |
| | | 5.2 | 10.4k | | | 9.8 | 18.2k | 12.25 | 20.5k |
| | | 5.1 | 7.4k | | | 9.6 | 14.6k | 12.00 | 16.7k |

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

----- $V_{IN} = 16V$ ——— $V_{IN} = 28V$ - - - - - $V_{IN} = 40V$

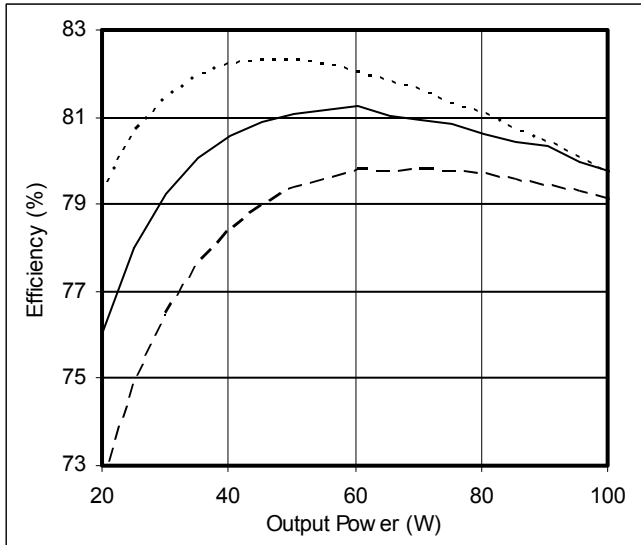


Figure 9 – DVFL2805D
Efficiency (%) vs. Output Power (W)

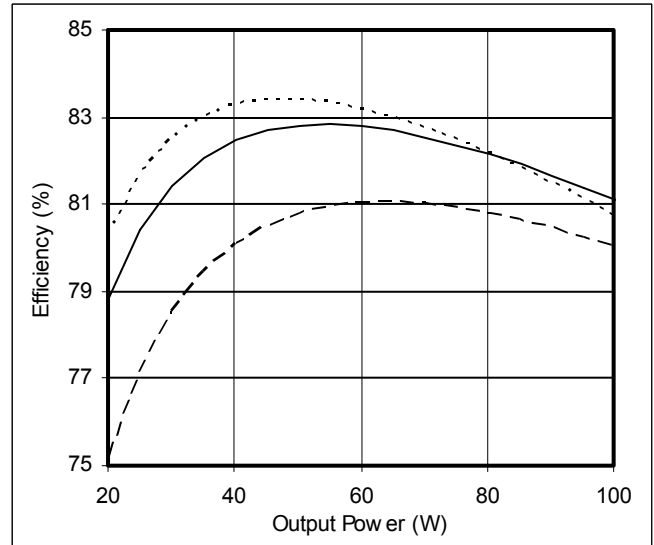


Figure 10 – DVFL286R3D
Efficiency (%) vs. Output Power (W)

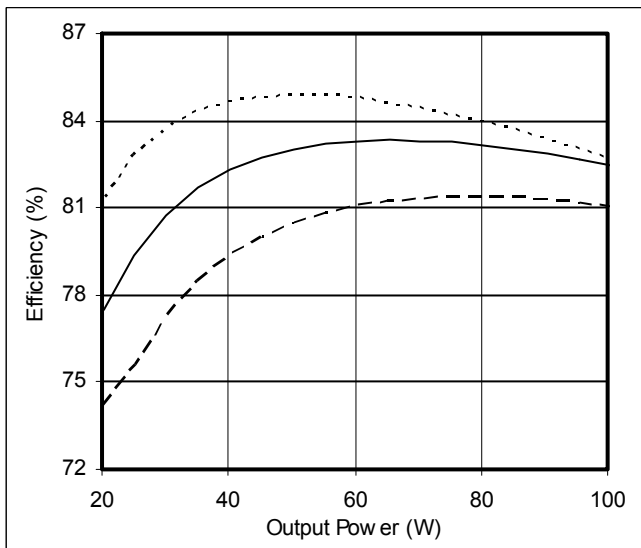


Figure 11 – DVFL289R5D
Efficiency (%) vs. Output Power (W)

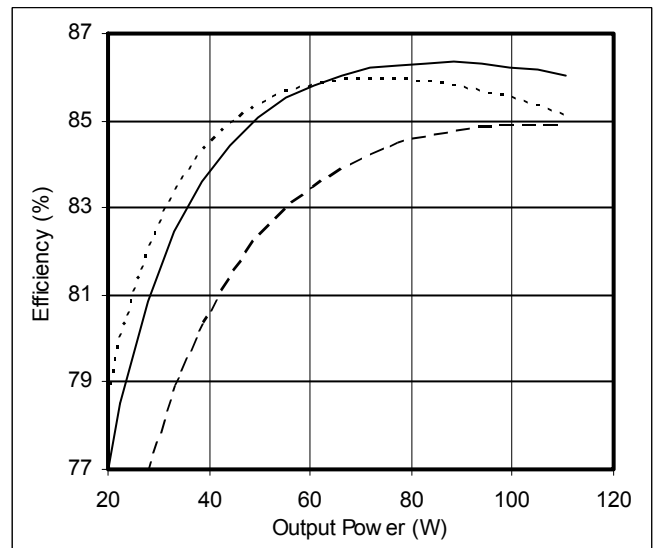


Figure 12 – DVFL2812D
Efficiency (%) vs. Output Power (W)

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

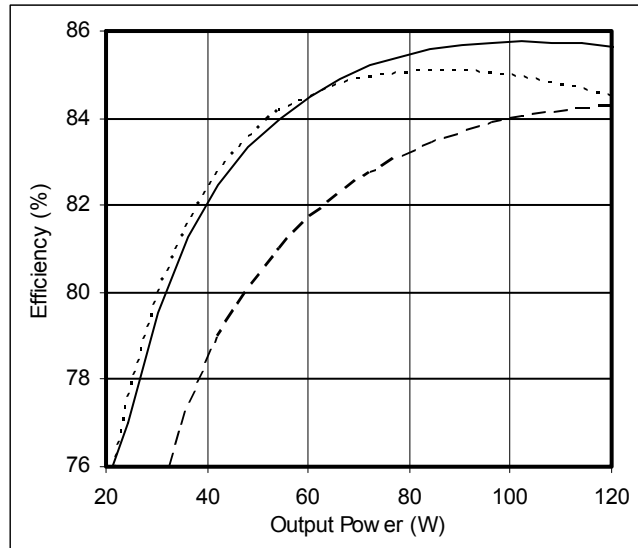


Figure 13 – DVFL2815D
Efficiency (%) vs. Output Power (W)

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

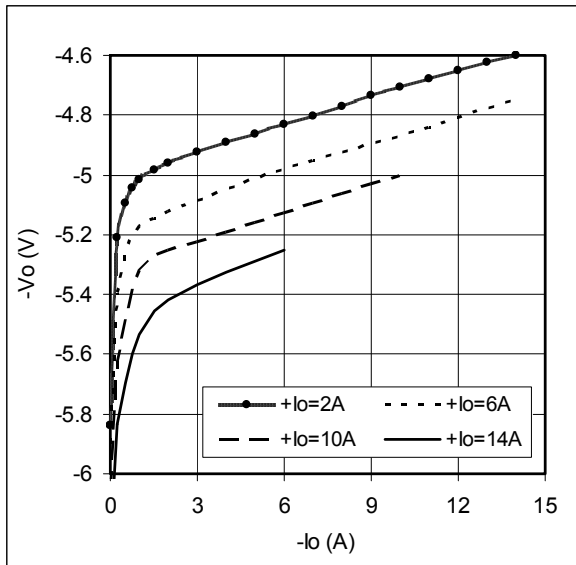
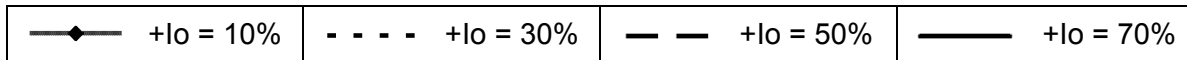


Figure 14 – DVFL2805D
-Vout (V) vs. -Iout (A)

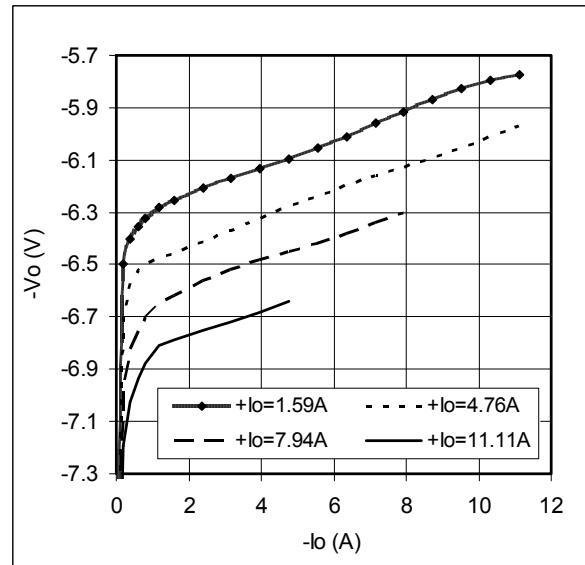


Figure 15 – DVFL286R3D
-Vout (V) vs. -Iout (A)

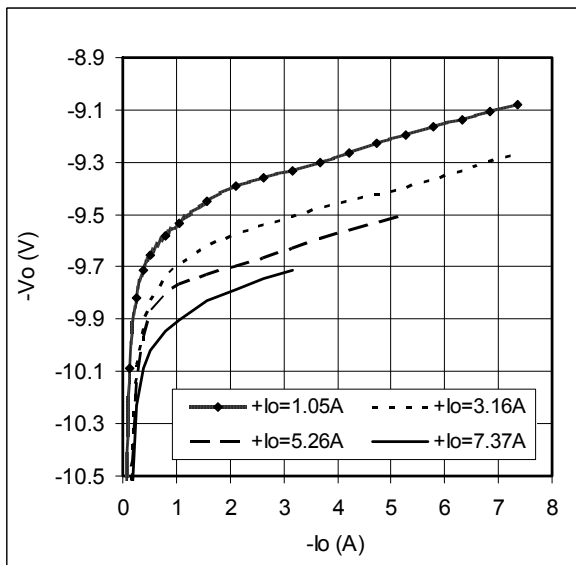


Figure 16 – DVFL289R5D
-Vout (V) vs. -Iout (A)

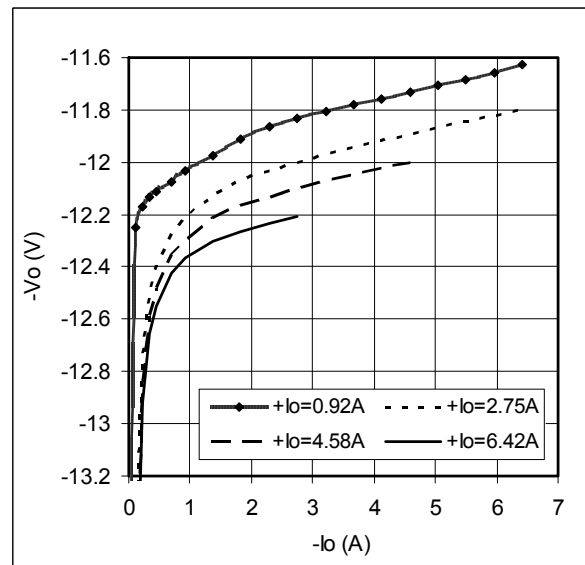


Figure 17 – DVFL2812D
-Vout (V) vs. -Iout (A)

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

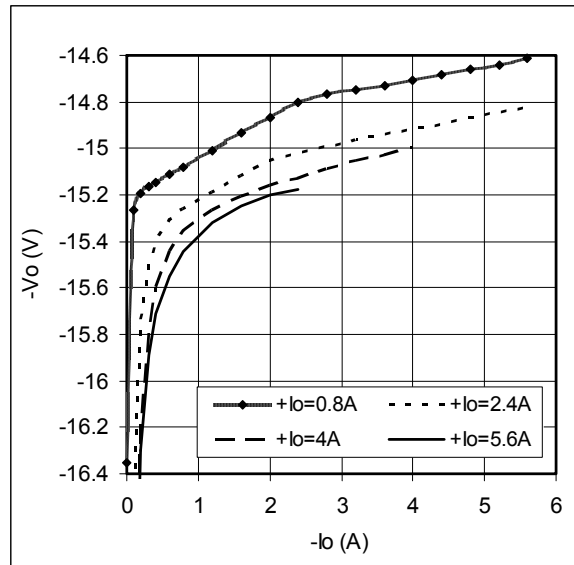
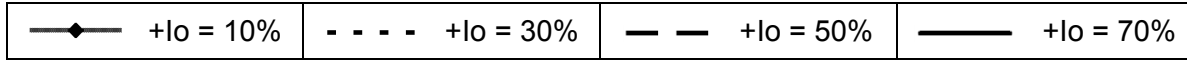


Figure 18 – DVFL2815D

-Vout (V) vs. -Iout (A)

EMI PERFORMANCE CURVES

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

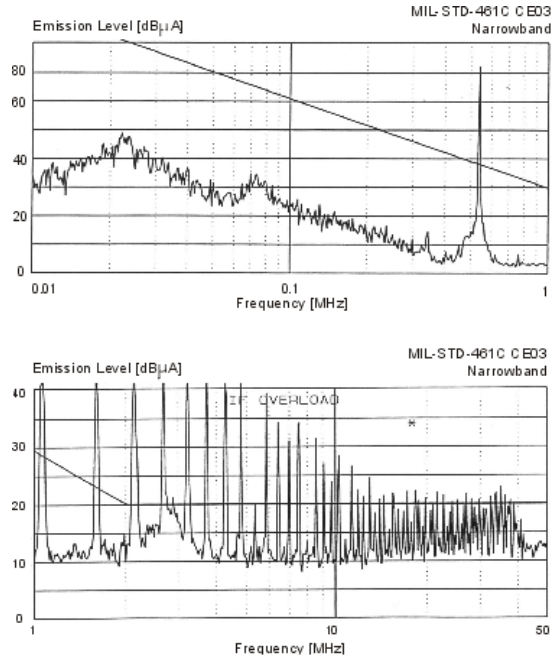


Figure 19 – DVFL2800D without EMI Filter

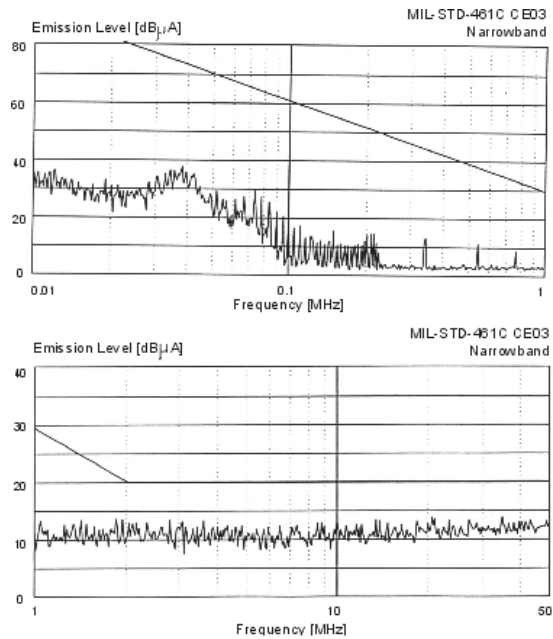
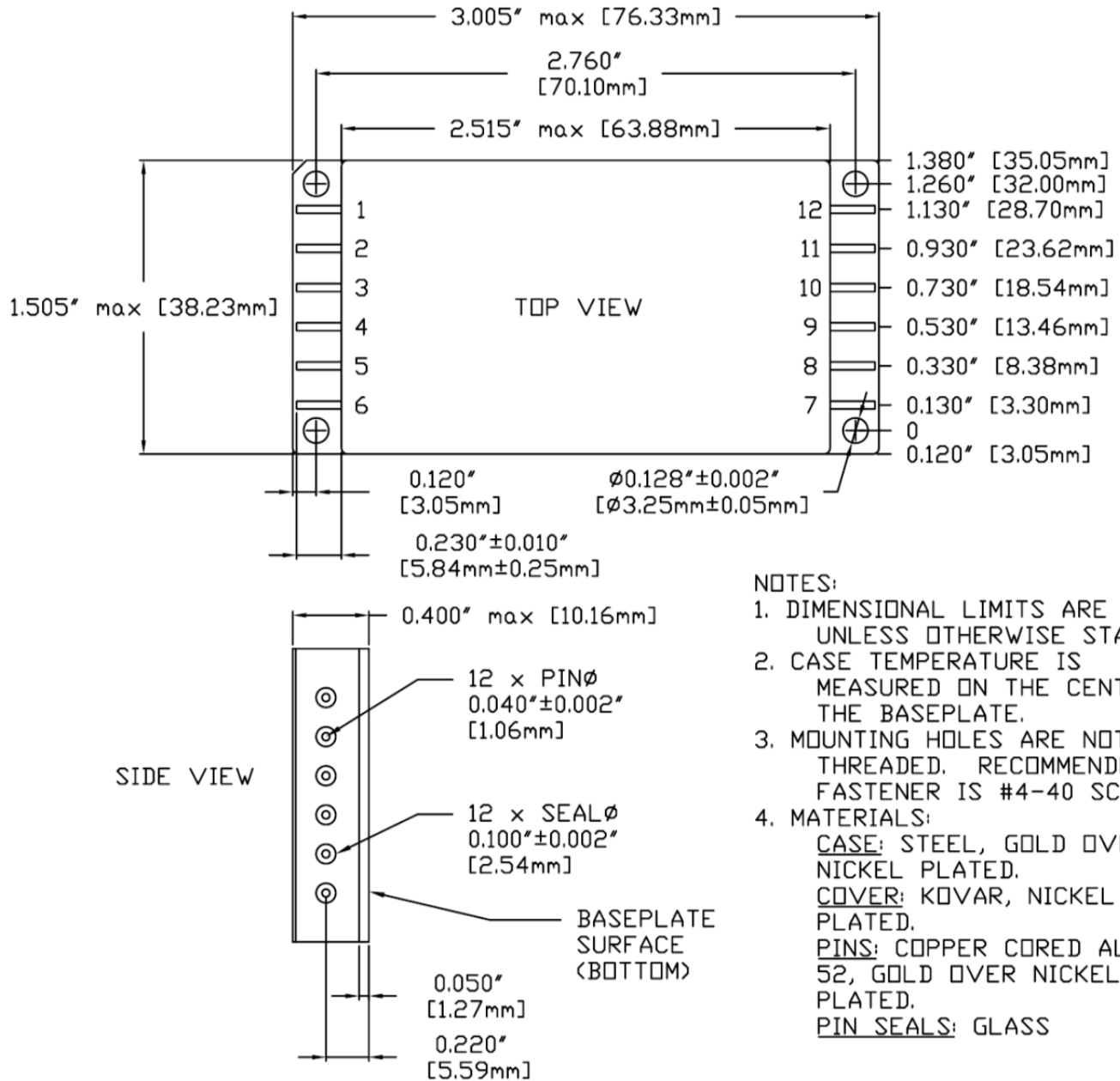


Figure 20 – DVFL2800D with EMI Filter

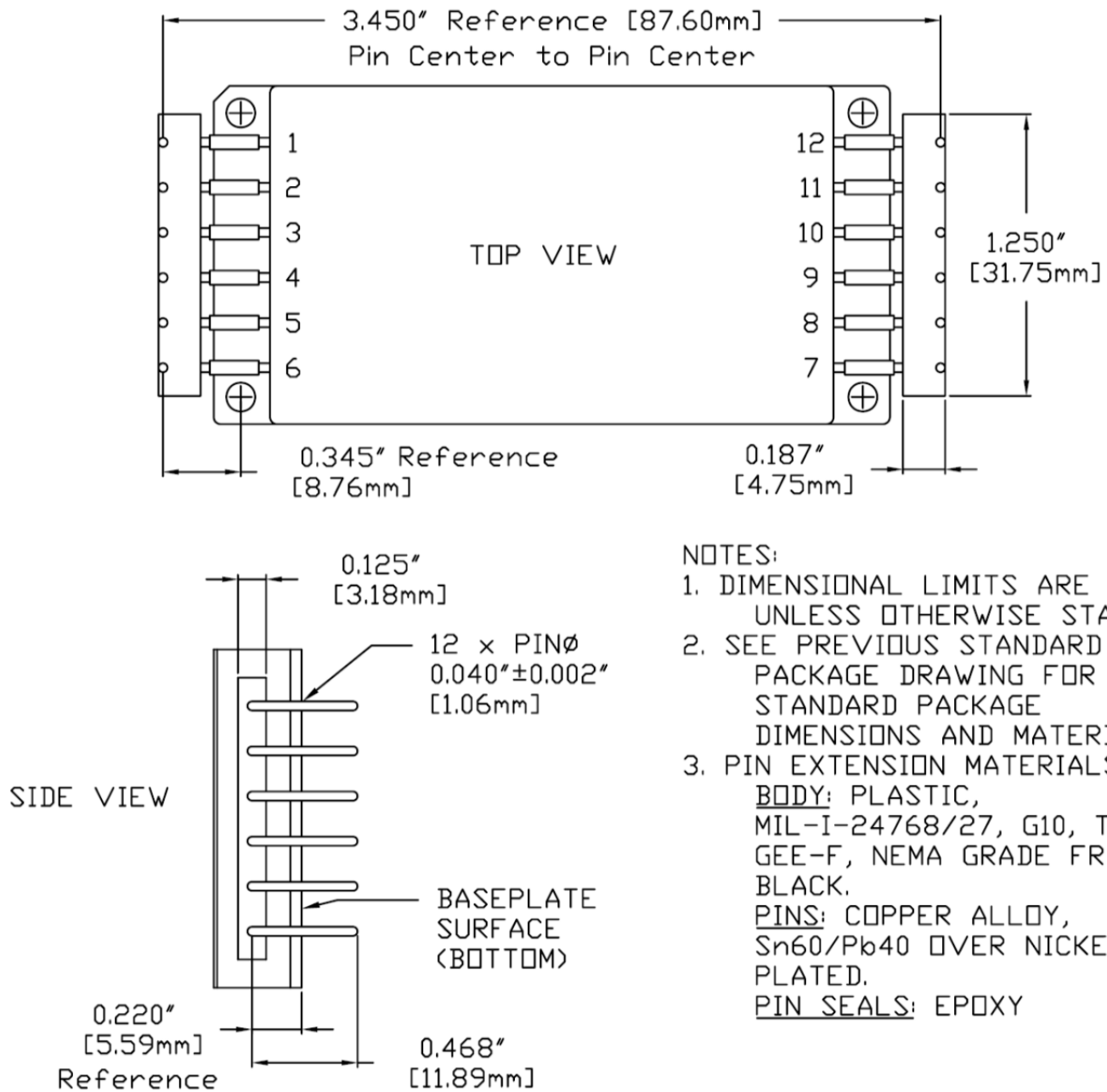
PACKAGE SPECIFICATIONS



| Pin | Function | Pin | Function | Pin | Function | Pin | Function |
|-----|----------|-----|----------|-----|----------|-----|----------|
| 1 | 28V IN | 4 | INH1 | 7 | +V OUT | 10 | TRIM |
| 2 | IN COM | 5 | SYNC OUT | 8 | OUT COM | 11 | SHARE |
| 3 | CASE | 6 | SYNC IN | 9 | -V OUT | 12 | INH2 |

Figure 21 – Package and Pinout

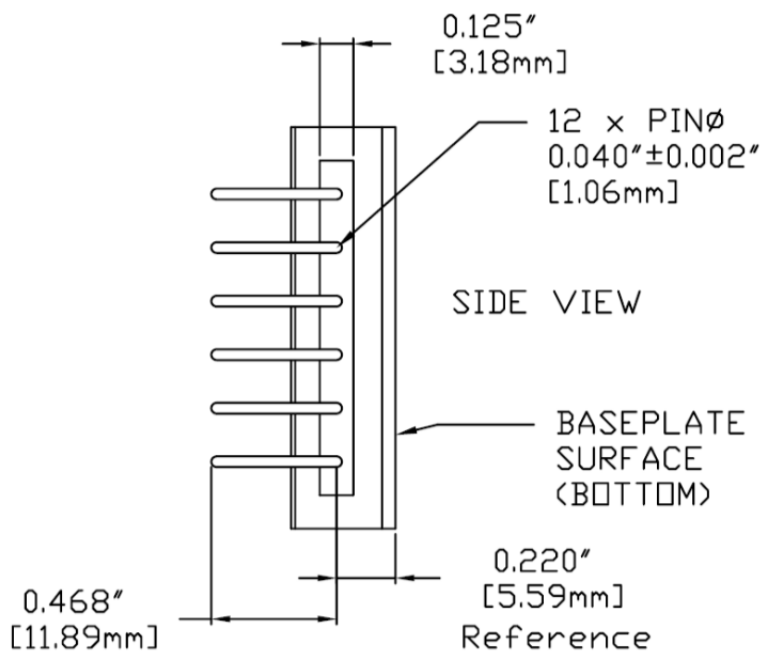
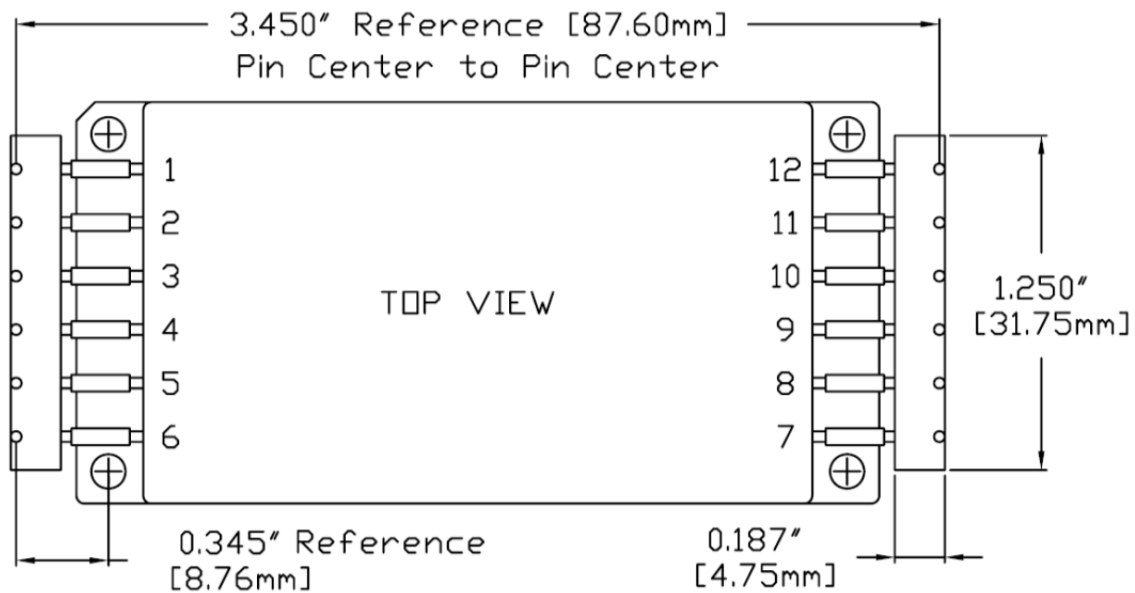
PACKAGE SPECIFICATIONS (DOWN-LEADED)



| Pin | Function | Pin | Function | Pin | Function | Pin | Function |
|-----|----------|-----|----------|-----|----------|-----|----------|
| 1 | 28V IN | 4 | INH1 | 7 | +V OUT | 10 | TRIM |
| 2 | IN COM | 5 | SYNC OUT | 8 | OUT COM | 11 | SHARE |
| 3 | CASE | 6 | SYNC IN | 9 | -V OUT | 12 | INH2 |

Figure 22 – Package and Pinout (With Down-Leaded Pin Extensions Added)

PACKAGE SPECIFICATIONS (UP-LEADED)



NOTES:

1. DIMENSIONAL LIMITS ARE ±0.005" UNLESS OTHERWISE STATED.
2. SEE PREVIOUS STANDARD PACKAGE DRAWING FOR STANDARD PACKAGE DIMENSIONS AND MATERIALS.
3. PIN EXTENSION MATERIALS:
BODY: PLASTIC, MIL-I-24768/27, G10, TYPE GEE-F, NEMA GRADE FR4, BLACK.
PINS: COPPER ALLOY, Sn60/Pb40 OVER NICKEL PLATED.
PIN SEALS: EPOXY

| Pin | Function | Pin | Function | Pin | Function | Pin | Function |
|-----|----------|-----|----------|-----|----------|-----|----------|
| 1 | 28V IN | 4 | INH1 | 7 | +V OUT | 10 | TRIM |
| 2 | IN COM | 5 | SYNC OUT | 8 | OUT COM | 11 | SHARE |
| 3 | CASE | 6 | SYNC IN | 9 | -V OUT | 12 | INH2 |

Figure 23 – Package and Pinout (With Up-Leaded Pin Extensions Added)

PACKAGE PIN DESCRIPTION

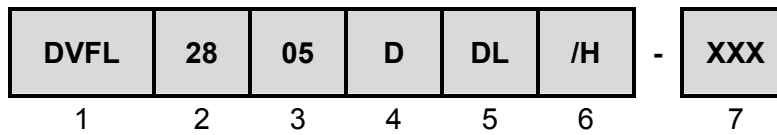
| Pin | Function | Description |
|-----|----------|---|
| 1 | 28V IN | Positive Input Voltage Connection |
| 2 | IN COM | Input Common Connection |
| 3 | CASE | Case Connection |
| 4 | INH1 | Logic Low = Disabled Output. Connecting the inhibit(1) pin to input common causes converter shutdown. Logic High = Enabled Output. Unconnected or open collector TTL. |
| 5 | SYNC OUT | Output Synchronization Signal |
| 6 | SYNC IN | Input Synchronization Signal |
| 7 | +V OUT | Positive Output Voltage Connection |
| 8 | OUT COM | Output Common Connection |
| 9 | -V OUT | Negative Output Voltage Connection |
| 10 | TRIM | Trim Output Voltage to +10%, -20% of Nominal Value |
| 11 | SHARE | Current Share |
| 12 | INH2 | Logic Low = Disabled Output. Connecting the inhibit(2) pin to output common causes converter shutdown. Logic High = Enabled Output. Unconnected or open collector TTL. |

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

| Test | MIL-STD-883 Test Method, Condition | No Suffix (Standard) Non-QML ⑤ | /ES (Extended) Non-QML ⑤ | /HB (HB) Non-QML ⑤ | /H (Class H) ⑩ | /KB (KB) Non-QML ⑤ | /K (Class K) ⑩ |
|---------------------------|---|--------------------------------|--------------------------|--------------------|----------------|--------------------|----------------|
| Non-Destructive Bond Pull | TM2023 | • ④ | • ④ | • ④ | • ④ | • | • |
| Internal Visual | TM2010, TM2017, TM2032 (MIL-STD-750, TM2072, TM2073) | • | • | • | • | • | • |
| Temperature Cycling | TM1010, Condition C -65°C to 150°C, Ambient | | | • | • | • | • |
| | TM1010, Condition B -55°C to 125°C, Ambient | | • | | | | |
| Constant Acceleration | TM2001, 3000g, Y1 Direction | | | • | • | • | • |
| | TM2001, 500g, Y1 Direction | | • | | | | |
| PIND ⑦ | TM2020, Condition A | | | | | • | • |
| Pre Burn-In Electrical | 25°C | | | | | • | • |
| Burn-In | TM1015, 320 hrs, 125°C, Case Typ | | | | | • | • |
| | TM1015, 160 hrs, 125°C, Case Typ | | | • | • | | |
| | 96 hrs, 125°C, Case Typ | | • | | | | |
| | 24 hrs, 125°C, Case Typ | • | | | | | |
| Final Electrical | MIL-PRF-38534, Group A Subgroups 1-6 -55°C, 25°C, 125°C ③ | | | • | • | • | • |
| | MIL-PRF-38534, Group A Subgroups 1 and 4 25°C | • | • | | | | |
| Hermeticity (Seal) | TM1014, Fine Leak, Condition A2 | | • | • | • | • | • |
| | TM1014, Gross Leak, Condition C | | • | • | • | • | • |
| | Gross Leak, Dip (1 x 10 ⁻⁴) | • | | | | | |
| Radiography ⑧ | TM2012 | | | | | • | • |
| External Visual | TM2009 | • | • | • | • | • | • |

- Notes:
- ① Contact Sales for more information concerning additional environmental screening and testing options desired.
 - 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.
 - ③ 100% R&R testing with all test data included in product shipment.
 - ④ Not required per MIL-PRF-38534. Test is performed for additional product quality assurance.
 - ⑤ Non-QML products may not meet all requirements of MIL-PRF-38534.
 - ⑥ Note intentionally not used.
 - ⑦ PIND test Certificate of Compliance included in product shipment.
 - ⑧ Radiographic test Certificate of Compliance and film(s) or data CD included in product shipment.
 - ⑨ Note intentionally not used.
 - ⑩ QML screening levels are not available for products with Up-Leaded or Down-Leaded pin extensions added.

ORDERING INFORMATION



| (1) Product Series | (2) Nominal Input Voltage | | (3) Output Voltage | | (4) Number of Outputs | |
|-----------------------|------------------------------|----------|---|--|--------------------------|------|
| DVFL | 28 | 28 Volts | 05 6.3 9.5 12 15 | ±5 Volts ±6.3 Volts ±9.5 Volts ±12 Volts ±15 Volts | D | Dual |

| (5) Package Option | (6) Screening Code ^{1,2} | | (7) Additional Screening Code |
|---------------------------------------|--------------------------------------|---|--|
| None DL UL | Standard Down-Lead Up-Lead | None /ES /HB /H /KB /K | Standard Extended Class HB Class H Class KB 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) | DVFL2800D Series Similar Part Number |
|-------------------------------------|--------------------------------------|
| 5962-0724401HXC 5962-0724401KXC | DVFL2805D/H DVFL2805D/K |
| *T.B.D. | DVFL286R3D/H DVFL286R3D/K |
| *T.B.D. | DVFL289R5D/H DVFL289R5D/K |
| 5962-0724402HXC 5962-0724402KXC | DVFL2812D/H DVFL2812D/K |
| 5962-0724403HXC 5962-0724403KXC | DVFL2815D/H DVFL2815D/K |

Do not use the DVFL2800D 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 DLA Land and Maritime (Previously known as DSCC) website at <http://www.dsccl.dla.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 orders 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

All information contained in this datasheet is believed to be accurate, however, no responsibility is assumed for possible errors or omissions. The products or specifications contained herein are subject to change without notice.