

**VPT**

Power Your Critical Mission Today

VPT15-2800D SERIES

HIGH RELIABILITY COTS DC-DC CONVERTERS

Models Available

Input: 15 V to 50 V continuous, 80 V transient
15 W, dual outputs of 5 V, 12 V, 15 V
-55 °C to 100 °C Operation

1.0 DESCRIPTION

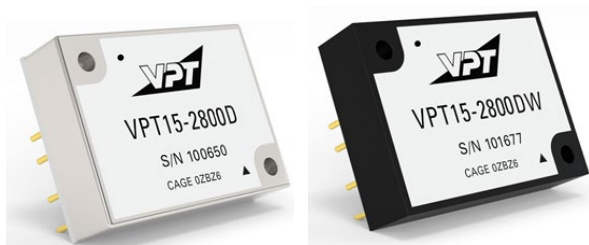
The VPT15 series of isolated COTS DC-DC converters is a cost effective solution for many demanding high reliability applications. A wide input voltage range accommodates nominal 28V inputs including avionics, mobile, ground systems, and other applications. Low input and output ripple, fixed operating frequency, and companion EMI filters simplify system design and compliance. A proven design heritage, no optoisolators and a rugged all metal or optional epoxy encapsulated package ensure long term reliability.

The VPT15 series is intended for harsh environments including severe vibration, shock and temperature cycling. Testing is to JESD22, MIL-STD-810, and MIL-STD-883.

These converters are designed and manufactured in a facility certified to ISO9001, J-STD-001 and IPC-A-610.

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



1.1 FEATURES

- High Reliability at Low Cost
- 15 Watts Output Power
- Wide Input Voltage Range: 15 to 50 Volts per MIL-STD-704 and MIL-STD-1275
- High Input Transient Voltage: 80 Volts for 1 sec per MIL-STD-704A
- Input Undervoltage Lockout
- Fixed Frequency
- Output Soft Start
- Current Limit Protection
- Short Circuit Protection
- Magnetic Feedback, no Optoisolators
- Wide Temperature Range, -55 °C to 100 °C
- Internally Conformal Coated
- Standard Six Sided Non-Hermetic Rugged Metal Package
- Optional Six Sided Rugged Epoxy Encapsulated V-SHIELD® Package with Integral Metalized EMI shield that is fully compatible with aqueous cleaning processes.

1.2 COMPLIANCE

- MIL-STD-1275
- MIL-STD-704
- Meets MIL-STD-461 C-G when used with an appropriate VPT EMI filter

1.3 PACKAGING

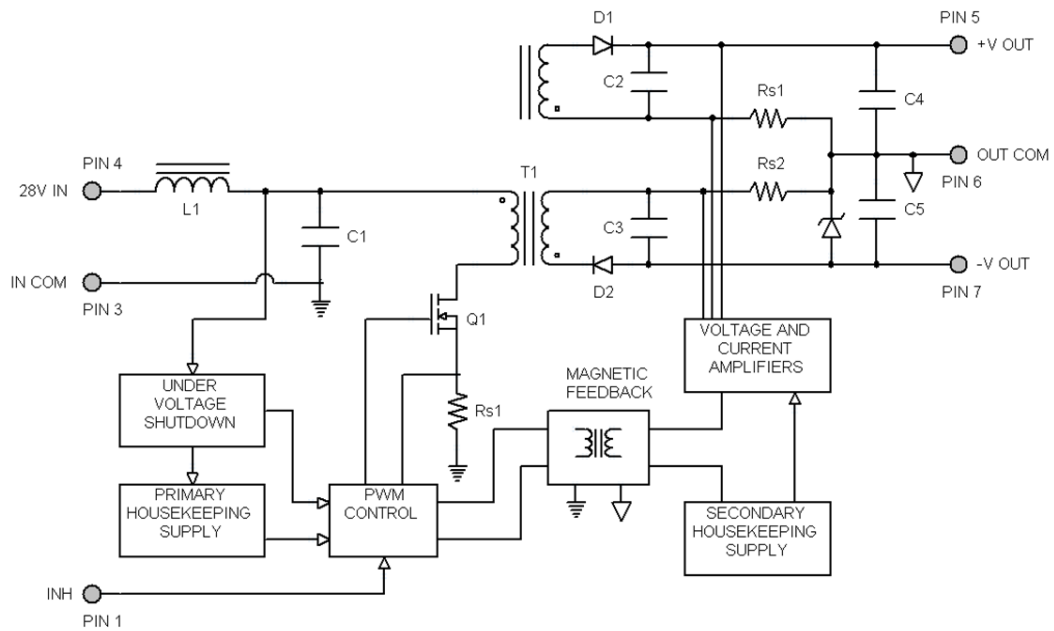
- Optional Rugged Epoxy Encapsulated V-SHIELD® Package
- Low-profile: 1.585" x 1.175" x 0.400"
- Max weight: 32 g

1.4 SIMILAR PRODUCTS AND ACCESSORIES

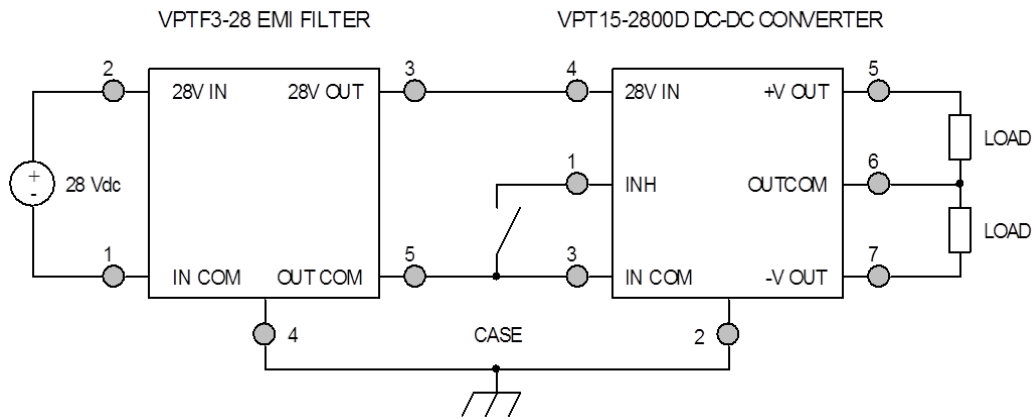
- [DVHF](#) 20 W dual output DC-DC Converter
- [VHR15](#) 15 W dual output COTS DC-DC Converter
- [EMI filters, Thermal Pads, Front-End Modules and Accessories](#)

2.0 DESCRIPTION

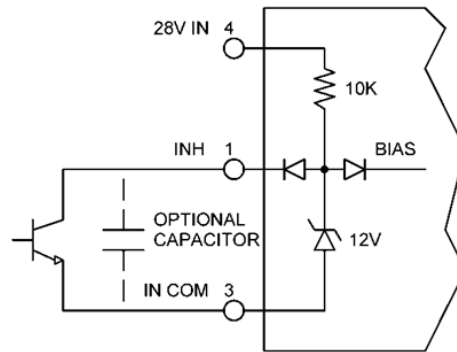
2.1 BLOCK DIAGRAM



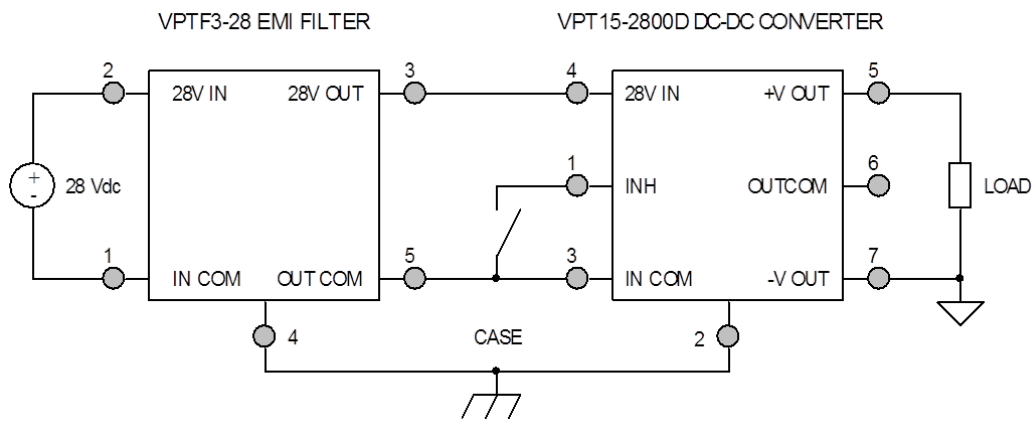
2.2 CONNECTION DIAGRAM



2.2 CONNECTION DIAGRAM (CONTINUED)



Inhibit Circuit (Shown with optional capacitor for turn-on delay)



Stacked Output Connection (Shown with optional EMI filter)

3.0 SPECIFICATIONS

3.1 ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings

| | | | |
|--------------------------------------|------|---------------------------------------|------------------|
| Input Voltage (Continuous): | 50 V | Operating Temperature (Full Load): | -55 °C to 100 °C |
| Input Voltage (Transient, 1 second): | 80 V | Storage Temperature: | -55 °C to 125 °C |
| | | Lead Solder Temperature (10 seconds): | 300 °C |

3.2 PERFORMANCE SPECIFICATIONS

Tcase = -55 °C to 100 °C, Vin = +28 V ± 5%, Full Load⁴, Unless Otherwise Specified

| Parameter | Conditions | VPT15-2805D | | | VPT15-2812D | | | Units |
|---|----------------------------------|-------------|-----|------|-------------|-----|-------|-------|
| | | Min | Typ | Max | Min | Typ | Max | |
| INPUT | | | | | | | | |
| Voltage | Continuous | 15 | 28 | 50 | 15 | 28 | 50 | V |
| | Transient, 1 sec ³ | - | - | 80 | - | - | 80 | V |
| Current | INH < 1.5 V | - | 4 | 6 | - | 4 | 6 | mA |
| | No Load | - | 50 | 65 | - | 50 | 65 | mA |
| Ripple Current | 20 Hz to 10 MHz | - | 40 | 75 | - | 40 | 75 | mApp |
| Undervoltage Lockout | Turn On | 12 | - | 14.8 | 12 | - | 14.8 | V |
| | Turn Off ³ | 11 | - | 14.5 | 11 | - | 14.5 | V |
| OUTPUT STATIC | | | | | | | | |
| Voltage | +Vout, Tcase = 25 °C | 4.92 | 5 | 5.08 | 11.82 | 12 | 12.18 | V |
| | +Vout, Tcase = -55 °C to 100 °C | 4.87 | 5 | 5.13 | 11.7 | 12 | 12.3 | V |
| | -Vout, Tcase = 25 °C | 4.87 | 5 | 5.13 | 11.7 | 12 | 12.3 | V |
| | -Vout, Tcase = -55 °C to 100 °C | 4.82 | 5 | 5.18 | 11.58 | 12 | 12.42 | V |
| Power ^{2,5} | Total | 0 | - | 15 | 0 | - | 15 | W |
| | Either Output | 0 | - | 10.5 | 0 | - | 10.5 | W |
| Current ^{2,5} | Either Output | 0 | - | 2.1 | 0 | - | 0.88 | A |
| Ripple Voltage | 20 Hz to 10 MHz | - | 20 | 50 | - | 20 | 50 | mVpp |
| Line Regulation | +Vout, Vin = 15 V to 50 V | - | 1 | 10 | - | 1 | 10 | mV |
| | -Vout, Vin = 15 V to 50 V | - | 30 | 150 | - | 30 | 150 | mV |
| Load Regulation ⁶ | +Vout, No Load to Full Load | - | 1 | 10 | - | 1 | 10 | mV |
| | -Vout, No Load to Full Load | - | 20 | 100 | - | 20 | 100 | mV |
| Cross Regulation, -Vout | +Vout: 70% load, -Vout: 30% load | - | 150 | 400 | - | 250 | 500 | mV |
| | +Vout: 30% load, -Vout: 70% load | - | - | - | - | - | - | - |
| Load Fault Power Dissipation | Overload ³ | - | - | 8 | - | - | 8 | W |
| | Short Circuit | - | - | 8 | - | - | 8 | W |
| OUTPUT DYNAMIC | | | | | | | | |
| Load Step, Half to Full Load | Output Transient | - | 120 | 400 | - | 140 | 400 | mVpk |
| | Recovery ¹ | - | 250 | 450 | - | 200 | 500 | µs |
| Line Step ³ , Vin = 16 V to 40 V | Output Transient | - | 400 | 700 | - | 400 | 900 | mVpk |
| | Recovery ¹ | - | 400 | 700 | - | 300 | 500 | µs |
| Turn On, Vin = 0 to 28 V | Delay | - | 10 | 20 | - | 10 | 20 | ms |
| | Overshoot | - | 0 | 25 | - | 0 | 50 | mVpk |
| FUNCTION | | | | | | | | |
| INH Pin Input ³ | Output Inhibited | 0 | - | 1.5 | 0 | - | 1.5 | V |
| INH Pin Open Circuit Voltage ³ | Output Enabled | 9 | 11 | 13 | 9 | 11 | 13 | V |
| GENERAL | | | | | | | | |
| Efficiency | | 75 | 80 | - | 77 | 80 | - | % |
| Capacitive Load ³ | Either Output | - | - | 500 | - | - | 500 | µF |
| Switching Frequency | | 400 | 500 | 550 | 400 | 500 | 550 | kHz |
| Isolation | 500 V DC, Tcase = 25 °C | 100 | - | - | 100 | - | - | MΩ |
| Weight | | - | - | 32 | - | - | 32 | g |
| MTBF (MIL-HDBK-217F) | GM @ Tcase = 55 °C | - | 363 | - | - | 363 | - | kHr |

1. Time for output voltage to settle within 1% of its nominal value.
2. Derate linearly at 110 °C.
3. Verified by initial electrical design verification. Post design verification, parameter shall be guaranteed to the limits specified.
4. Half load at +VOUT and half load at -VOUT.
5. Up to 70% of the total power or current can be drawn from either of the two outputs.
6. 5% Load to Full Load at -55 °C.

3.2 PERFORMANCE SPECIFICATIONS (CONTINUED)

Tcase = -55 °C to 100 °C, Vin = +28 V ± 5%, Full Load⁴, Unless Otherwise Specified

| VPT15-2815D | | | | | |
|---|----------------------------------|-------|-----|-------|-------|
| Parameter | Conditions | Min | Typ | Max | Units |
| INPUT | | | | | |
| Voltage | Continuous | 15 | 28 | 50 | V |
| | Transient, 1 sec ³ | - | - | 80 | V |
| Current | INH < 1.5 V | - | 4 | 6 | mA |
| | No Load | - | 50 | 65 | mA |
| Ripple Current | 20 Hz to 10 MHz | - | 40 | 75 | mApp |
| Undervoltage Lockout | Turn On | 12 | - | 14.8 | V |
| | Turn Off ³ | 11 | - | 14.5 | V |
| OUTPUT STATIC | | | | | |
| Voltage | +Vout, Tcase = 25 °C | 14.77 | 15 | 15.23 | V |
| | +Vout, Tcase = -55 °C to 100 °C | 14.62 | 15 | 15.38 | V |
| | -Vout, Tcase = 25 °C | 14.62 | 15 | 15.38 | V |
| | -Vout, Tcase = -55 °C to 100 °C | 14.47 | 15 | 15.53 | V |
| Power ^{2,5} | Total | 0 | - | 15 | W |
| | Either Output | 0 | - | 10.5 | W |
| Current ^{2,5} | Either Output | 0 | - | 0.7 | A |
| Ripple Voltage | 20 Hz to 10 MHz | - | 20 | 50 | mVpp |
| Line Regulation | +Vout, Vin = 15 V to 50 V | - | 1 | 10 | mV |
| | -Vout, Vin = 15 V to 50 V | - | 30 | 150 | mV |
| Load Regulation ⁶ | +Vout, No Load to Full Load | - | 1 | 10 | mV |
| | -Vout, No Load to Full Load | - | 20 | 100 | mV |
| Cross Regulation, -Vout | +Vout: 70% load, -Vout: 30% load | - | 250 | 500 | mV |
| | +Vout: 30% load, -Vout: 70% load | - | - | - | - |
| Load Fault Power Dissipation | Overload ³ | - | - | 8 | W |
| | Short Circuit | - | - | 8 | W |
| OUTPUT DYNAMIC | | | | | |
| Load Step, Half Load to Full Load | Output Transient | - | 150 | 400 | mVpk |
| | Recovery ¹ | - | 200 | 500 | µs |
| Line Step ³ , Vin = 16 V to 40 V | Output Transient | - | 400 | 900 | mVpk |
| | Recovery ¹ | - | 300 | 500 | µs |
| Turn On, Vin = 0 V to 28 V | Delay | - | 10 | 20 | ms |
| | Overshoot | - | 0 | 50 | mVpk |
| FUNCTION | | | | | |
| INH Pin Input ³ | Output Inhibited | 0 | - | 1.5 | V |
| INH Pin Open Circuit Voltage ³ | Output Enabled | 9 | 11 | 13 | V |
| GENERAL | | | | | |
| Efficiency | | 77 | 80 | - | % |
| Capacitive Load ³ | Either Output | - | - | 500 | µF |
| Switching Frequency | | 400 | 500 | 550 | kHz |
| Isolation | 500 V DC, Tcase = 25 °C | 100 | - | - | MΩ |
| Weight | | - | - | 32 | g |
| MTBF (MIL-HDBK-217F) | GM @ Tcase = 55 °C | - | 363 | - | kHr |

1. Time for output voltage to settle within 1% of its nominal value.
2. Derate linearly at 110 °C.
3. Verified by initial electrical design verification. Post design verification, parameter shall be guaranteed to the limits specified.
4. Half load at +VOUT and half load at -VOUT.
5. Up to 70% of the total power or current can be drawn from either of the two outputs.
6. 5% Load to Full Load at -55 °C.

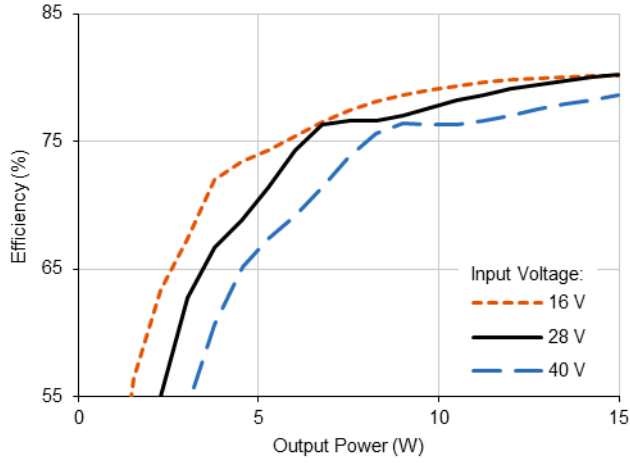


4.0 PERFORMANCE CURVES

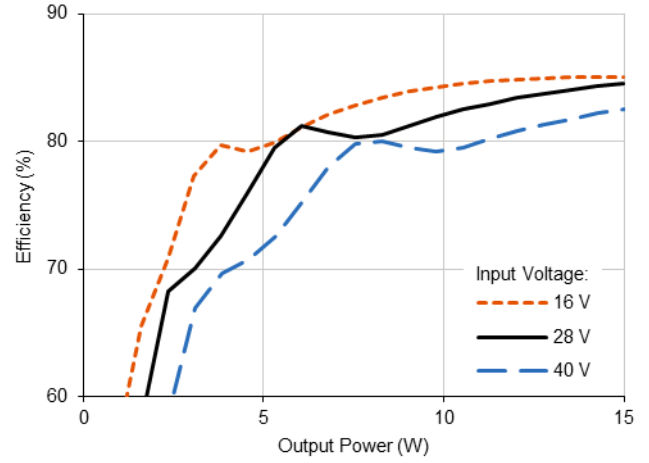
T_{case} = 25 °C, Full Load, Unless Otherwise Specified

4.1 EFFICIENCY PERFORMANCE CURVES

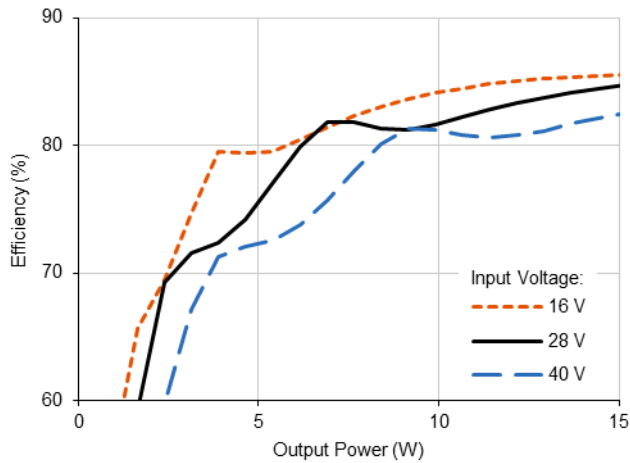
4.1.1 VPT15-2805D Efficiency (%) vs. Output Power (W)



4.1.2 VPT15-2812D Efficiency (%) vs. Output Power (W)



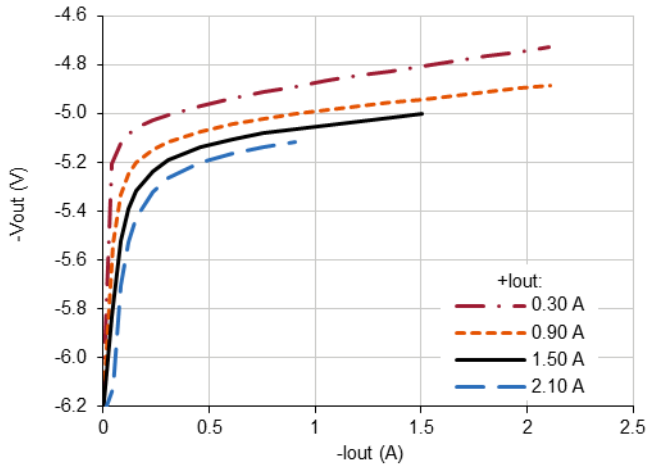
4.1.3 VPT15-2815D Efficiency (%) vs. Output Power (W)



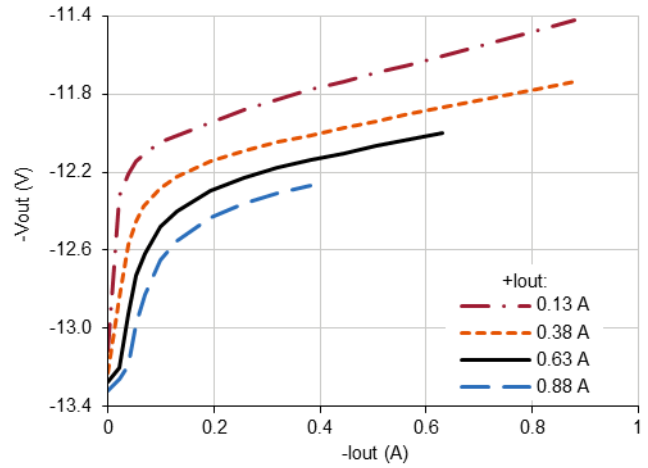
4.0 PERFORMANCE CURVES (CONTINUED)

4.2 CROSS REGULATION CURVES

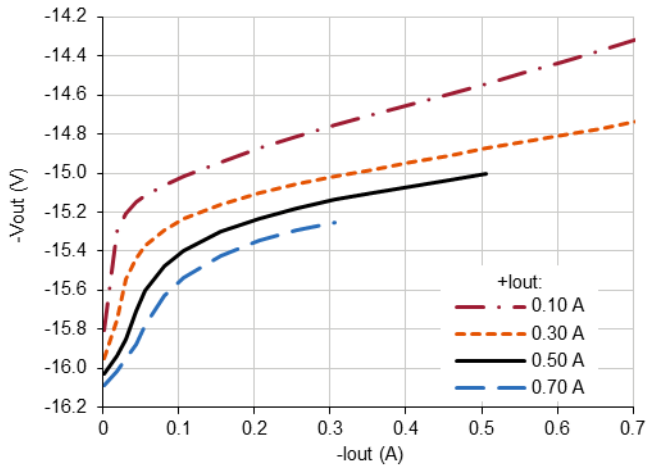
4.2.1 VPT15-2805D -Vout (V) vs. -Iout (A)



4.2.2 VPT15-2812D -Vout (V) vs. -Iout (A)

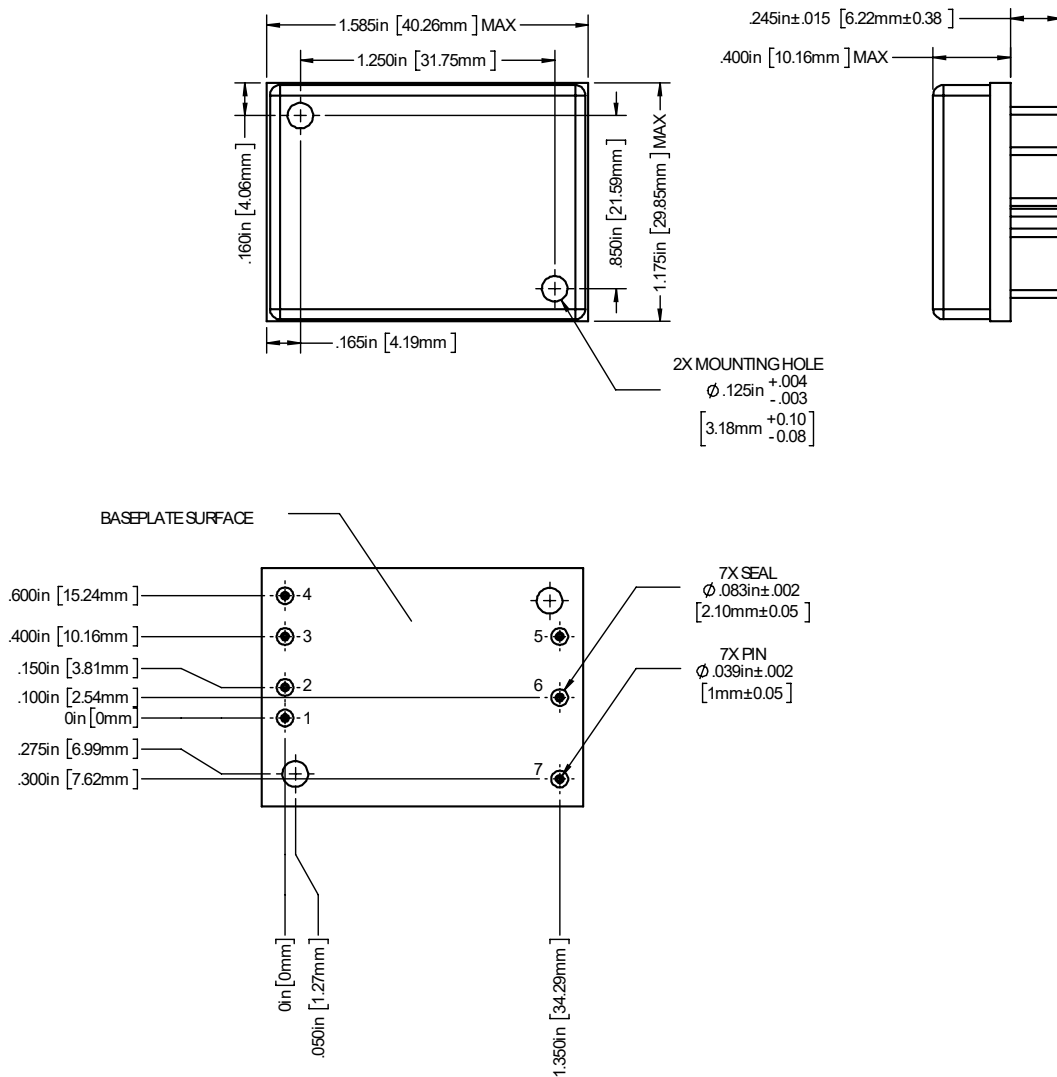


4.2.3 VPT15-2815D -Vout (V) vs. -Iout (A)



5.0 MECHANICAL OUTLINES AND PINOUT

Standard Package:

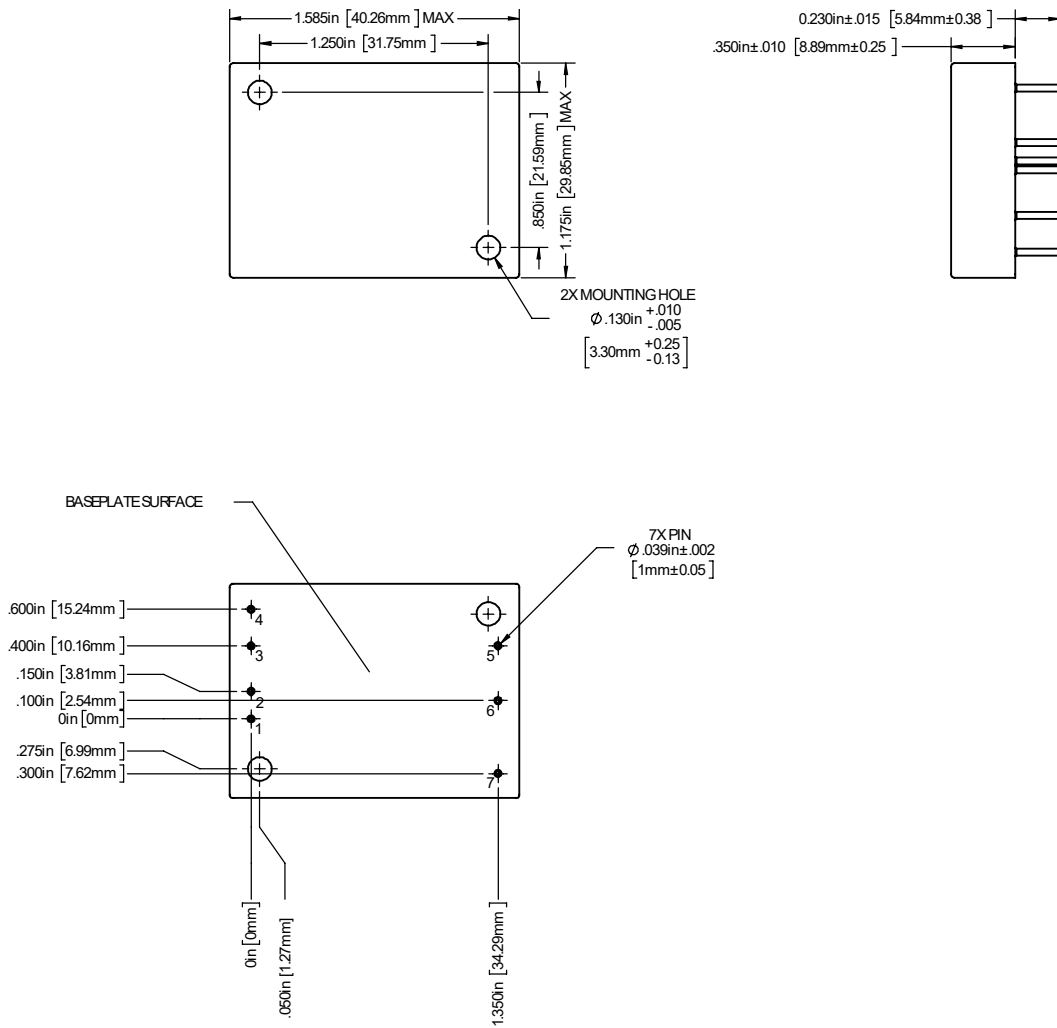


1. Case temperature is measured on the center of the baseplate surface.
2. Materials: Baseplate (Aluminum, conductive conversion coating); Cover (Nickel Plated); Pins (Copper, gold over nickel plating)
3. Mounting holes are not threaded. Recommended fastener is 4-40
4. This Package is not hermetic. VPT offers a wide range of hermetic products. Please contact VPT for details if hermetic products are required.

| Pin | Function | Pin | Function |
|-----|----------|-----|----------|
| 1 | INHIBIT | 5 | +VOUT |
| 2 | CASE | 6 | OUTCOM |
| 3 | INCOM | 7 | -VOUT |
| 4 | 28VIN | | |

5.0 MECHANICAL OUTLINES AND PINOUT (CONTINUED)

Optional Epoxy Encapsulated Package:



1. Case temperature is measured on the center of the baseplate surface.
2. Materials: Baseplate (Aluminum, conductive conversion coating); Cover (Nickel Plated); Pins (Copper, gold over nickel plating)
3. Mounting holes are not threaded. Recommended fastener is 4-40
4. This Package is not hermetic. VPT offers a wide range of hermetic products. Please contact VPT for details if hermetic products are required.

| Pin | Function | Pin | Function |
|-----|----------|-----|----------|
| 1 | INHIBIT | 5 | +VOUT |
| 2 | CASE | 6 | OUTCOM |
| 3 | INCOM | 7 | -VOUT |
| 4 | 28VIN | | |



6.0 PACKAGE PIN DESCRIPTION

| Pin | Function | Description |
|-----|----------|--|
| 1 | INHIBIT | This is an open collector input. Logic Low = Disabled Output. Connect the inhibit pin to input common to disable the output. Unconnected, open collector or open drain = Enabled Output. |
| 2 | CASE | Case Connection. |
| 3 | INCOM | Input Return Connection. |
| 4 | 28VIN | Positive Input Voltage Connection. |
| 5 | +VOUT | Positive Output Voltage Connection. |
| 6 | OUTCOM | Output Return Connection. |
| 7 | -VOUT | Negative Output Voltage Connection. |

7.0 ENVIRONMENTAL SCREENING

| Screening | Condition |
|---------------------|---|
| Internal Visual | IPC-A-610, Class 3 |
| Temperature Cycling | MIL-STD-883, Method 1010, Condition B, -55 °C to +125 °C, 10 Cycles |
| Burn-In | 96 hours at +100 °C |
| Final Electrical | 100% at 25 °C |
| External Visual | Internal Procedure |

8.0 ORDERING INFORMATION

| | | | | |
|--------|----|----|---|---|
| VPT15- | 28 | 05 | D | W |
| 1 | 2 | 3 | 4 | 5 |

| (1) Product Series | (2) Nominal Input Voltage | (3) Output Voltage | (4) Number of Outputs | (5) Package Option |
|-----------------------|------------------------------|---|--------------------------|-----------------------------------|
| VPT15- | 28 | 28 Volts | D | Standard Metal Epoxy Encapsulated |
| | | 05 ±5 Volts 12 ±12 Volts 15 ±15 Volts | Dual | None W |

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 requirements, and source inspection.

9.0 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@vptpower.com

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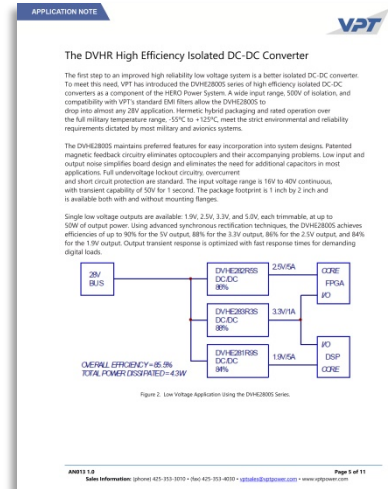
10.0 ADDITIONAL INFORMATION

Visit the [VPT website](http://www.vptpower.com) for additional technical resources, including:

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[Application Notes and White Papers](#)



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