



Power Your Critical Mission Today

VHR30-2800T SERIES

HIGH RELIABILITY COTS DC-DC CONVERTERS

Models Available

Input: 9 V to 80 V continuous, 100 V transient
 30 W, triple outputs of 3.3 V, 5 V, 12 V, 15 V
 -40 °C to 100 °C Operation

DATASHEET

1.0 DESCRIPTION

The VHR series of industrial grade DC-DC converters provides cost effective, high reliability solutions for use in defense, avionics and manufacturing industries. The VHR industrial grade products leverage decades of VPT's proven heritage in military and aerospace electronics.

VPT's VHR30-2800T series is ideal for non flight-critical solutions in military, avionics, unmanned systems as well as manufacturing equipment and controls. A wide input voltage range which accommodates nominal 28 V inputs, low input and output ripple, fixed operating frequency and companion EMI filters simplify system design while ensuring operating success in the most rugged of environments.

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
- 30 Watts Output Power
- Three Independent Fully Isolated Outputs
- Wide Input Voltage Range: 9 to 80 Volts per MIL-STD-704 and MIL-STD-1275
- High Input Transient Voltage: 100 Volts for 1 sec per MIL-STD-1275
- Each Output can be configured as a Positive or Negative Output
- Zero Cross Regulation
- No Minimum Load Requirement
- Input Undervoltage Lockout
- Fixed Frequency
- Output Soft Start
- Short Circuit Protection
- Magnetic Feedback, no Optoisolators
- Wide Temperature Range, -40 °C to 100 °C
- Internally Conformal Coated
- Standard Six Sided Non-Hermetic Rugged Metal Package

1.2 COMPLIANCE

- MIL-STD-1275
- MIL-STD-704
- Meets MIL-STD-461C-G and EN55022 when used with an appropriate VHR EMI Filter

1.3 PACKAGING

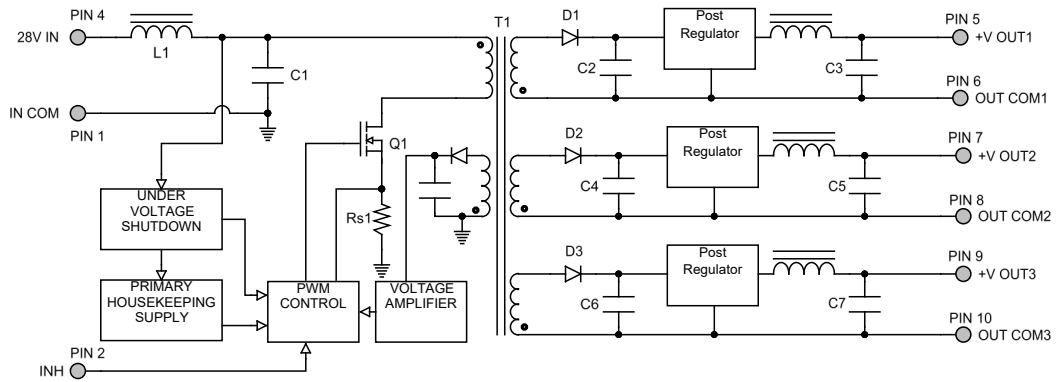
- Low-profile: 1.885" x 1.325" x 0.400"
- Max weight: 50 g

1.4 SIMILAR PRODUCTS AND ACCESSORIES

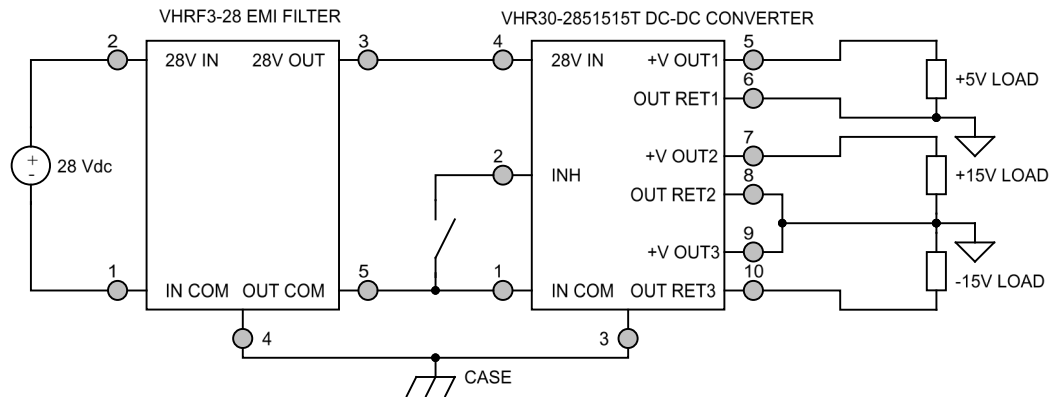
- [DVTR](#) 30 W triple output DC-DC Converter
- [VPT30](#) 30 W triple output COTS DC-DC Converter
- [EMI filters, Thermal Pads, Front-End Modules and Accessories](#)

2.0 DESCRIPTION

2.1 BLOCK DIAGRAM

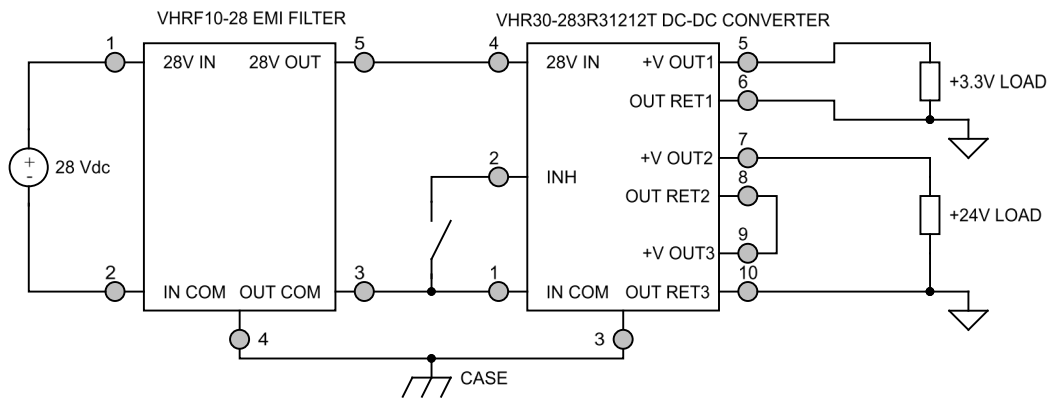


2.2 CONNECTION DIAGRAM

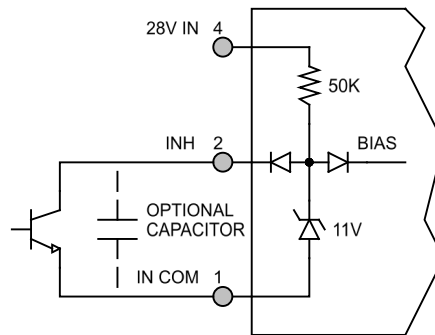


(Shown with optional VHRF3-28 EMI filter, recommended for input voltages > 13V, and optional negative output configuration.)

2.2 CONNECTION DIAGRAMS (CONTINUED)



(Shown with optional VHRF10-28 EMI filter, recommended for input voltages < 13V, and optional stacked output configuration.)



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

3.0 SPECIFICATIONS

3.1 ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings

| | | | |
|-----------------------------------|-------|---------------------------------------|------------------|
| Input Voltage (Continuous): | 80 V | Operating Temperature (Full Load): | -40 °C to 100 °C |
| Input Voltage (Transient, 1 sec): | 100 V | Storage Temperature: | -55 °C to 125 °C |
| | | Lead Solder Temperature (10 seconds): | 300 °C |

3.2 PERFORMANCE SPECIFICATIONS

Tcase = -40 °C to 100 °C, Vin = +28 V ± 5%, Full Load, Unless Otherwise Specified

| VHR30-2800T | | | | | |
|---|-------------------------------|-----|-----|-----|-------|
| Parameter | Conditions | Min | Typ | Max | Units |
| INPUT | | | | | |
| Voltage | Continuous ⁴ | 9 | 28 | 80 | V |
| | Transient, 1 sec ³ | - | - | 100 | V |
| Current | INH < 1.5 V | - | 1 | 5 | mA |
| | No Load | - | 90 | 130 | mA |
| Ripple Current ⁵ | 20 Hz to 10 MHz | - | 30 | 90 | mA |
| Undervoltage Lockout | Turn On | 9.8 | - | 11 | V |
| | Turn Off ³ | 8 | - | 8.9 | V |
| OUTPUT STATIC | | | | | |
| Power ² | | 0 | - | 30 | W |
| Load Fault Power Dissipation | Short Circuit | - | 2 | 5 | W |
| FUNCTION | | | | | |
| Inhibit Pin Input ³ | Output Inhibited | 0 | - | 1.5 | V |
| Inhibit Pin Open Circuit Voltage ³ | Output Enabled | 9 | 11 | 13 | V |
| GENERAL | | | | | |
| Efficiency ⁵ | | 77 | 82 | - | % |
| Switching Frequency | Input | 400 | 500 | 550 | kHz |
| | Output | 325 | 400 | 475 | kHz |
| Isolation Input / Output / Case | 500 V DC, Tcase = 25 °C | 100 | - | - | MΩ |
| Isolation Output / Output | 100 V DC, Tcase = 25 °C | 20 | - | - | MΩ |
| Weight | | - | - | 50 | g |
| MTBF (MIL-HDBK-217F) | GM @ Tcase = 55 °C | | 672 | | kHr |

| Parameter | Conditions | 3.3 V Output | | | 5 V Output | | | Units |
|--|--------------------------|--------------|-----|------|------------|-----|------|-------|
| | | Min | Typ | Max | Min | Typ | Max | |
| OUTPUT STATIC | | | | | | | | |
| Voltage | Tcase = 25 °C | 3.25 | 3.3 | 3.35 | 4.92 | 5 | 5.08 | V |
| | Tcase = -40 °C to 100 °C | 3.21 | 3.3 | 3.38 | 4.87 | 5 | 5.13 | V |
| Power ² | | 0 | - | 10 | 0 | - | 15 | W |
| Current ² | | 0 | - | 3 | 0 | - | 3 | A |
| Ripple Voltage | 20 Hz to 10 MHz | - | 40 | 100 | - | 40 | 100 | mVpp |
| Line Regulation ⁵ | Vin = 9 V to 80 V | - | 2 | 20 | - | 2 | 20 | mV |
| Load Regulation | No Load to Full Load | - | 3 | 30 | - | 3 | 30 | mV |
| OUTPUT DYNAMIC | | | | | | | | |
| Load Step, Half to Full Load | Output Transient | - | 140 | 280 | - | 100 | 200 | mVpk |
| | Recovery ¹ | - | 120 | 240 | - | 90 | 180 | μs |
| Line Step ^{3, 5} , Vin = 16 V to 40 V | Output Transient | - | 50 | 100 | - | 60 | 120 | mVpk |
| | Recovery ¹ | - | 50 | 100 | - | 50 | 100 | μs |
| Turn On ⁵ , Vin = 0 to 28 V | Delay | - | 14 | 20 | - | 14 | 20 | ms |
| | Overshoot | - | 0 | 15 | - | 0 | 25 | mVpk |
| GENERAL | | | | | | | | |
| Capacitive Load ³ | | - | - | 1000 | - | - | 1000 | μF |

1. Time for output voltage to settle to within 1% of its nominal value.
2. Derate linearly to 0 at 110 °C.
3. Verified by initial electrical design verification. Post design verification, parameter shall be guaranteed to the limits specified.
4. Operation down to 9 V is possible after the input voltage is taken above 11 V to start the module.
5. Tested with a balanced full load of 10 W per each output.

3.2 PERFORMANCE SPECIFICATIONS (CONTINUED)

T_{case} = -40 °C to 100 °C, V_{in} = +28 V ± 5%, Full Load, Unless Otherwise Specified

| Parameter | Conditions | 12 V Output | | | 15 V Output | | | Units |
|--|--------------------------------------|-------------|-----|-------|-------------|-----|-------|-------|
| | | Min | Typ | Max | Min | Typ | Max | |
| OUTPUT STATIC | | | | | | | | |
| Voltage | T _{case} = 25 °C | 11.82 | 12 | 12.18 | 14.77 | 15 | 15.23 | V |
| | T _{case} = -40 °C to 100 °C | 11.7 | 12 | 12.3 | 14.62 | 15 | 15.38 | V |
| Power ² | | 0 | - | 15 | 0 | - | 15 | W |
| Current ² | | 0 | - | 1.25 | 0 | - | 1 | A |
| Ripple Voltage | 20 Hz to 10 MHz | - | 40 | 100 | - | 40 | 100 | mVpp |
| Line Regulation ⁵ | V _{in} = 9 V to 80 V | - | 2 | 20 | - | 2 | 20 | mV |
| Load Regulation | No Load to Full Load | - | 3 | 30 | - | 3 | 30 | mV |
| OUTPUT DYNAMIC | | | | | | | | |
| Load Step, Half to Full Load | Output Transient | - | 120 | 240 | - | 110 | 220 | mVpk |
| | Recovery ¹ | - | 0 | 100 | - | 0 | 100 | μs |
| Line Step ^{3, 5} , V _{in} = 16 V to 40 V | Output Transient | - | 150 | 300 | - | 180 | 360 | mVpk |
| | Recovery ¹ | - | 50 | 100 | - | 50 | 100 | μs |
| Turn On ⁵ , V _{in} = 0 to 28 V | Delay | - | 14 | 20 | - | 14 | 20 | ms |
| | Overshoot | - | 0 | 50 | - | 0 | 50 | mVpk |
| GENERAL | | | | | | | | |
| Capacitive Load ³ | | - | - | 500 | - | - | 500 | μF |

1. Time for output voltage to settle to within 1% of its nominal value.
2. Derate linearly to 0 at 110 °C.
3. Verified by initial electrical design verification. Post design verification, parameter shall be guaranteed to the limits specified.
4. Operation down to 9 V is possible after the input voltage is taken above 11 V to start the module.
5. Tested with a balanced full load of 10 W per each output.

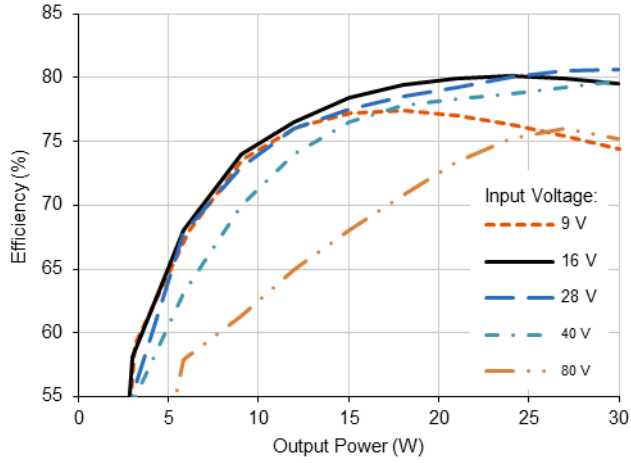


4.0 PERFORMANCE CURVES

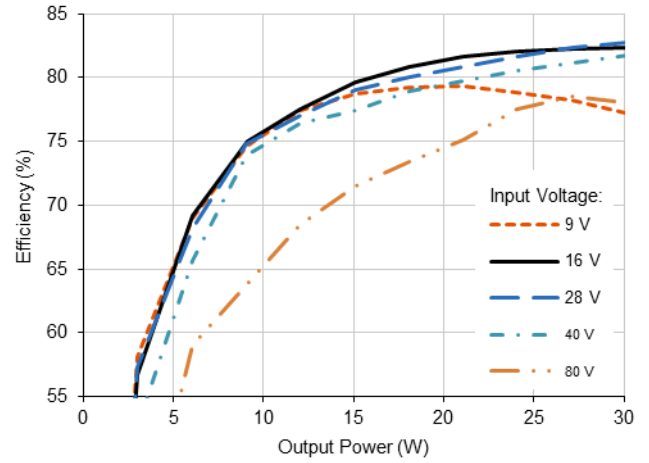
4.1 EFFICIENCY PERFORMANCE CURVES

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

4.1.1 VHR30-283R31212T Efficiency (%) vs. Output Power (W)

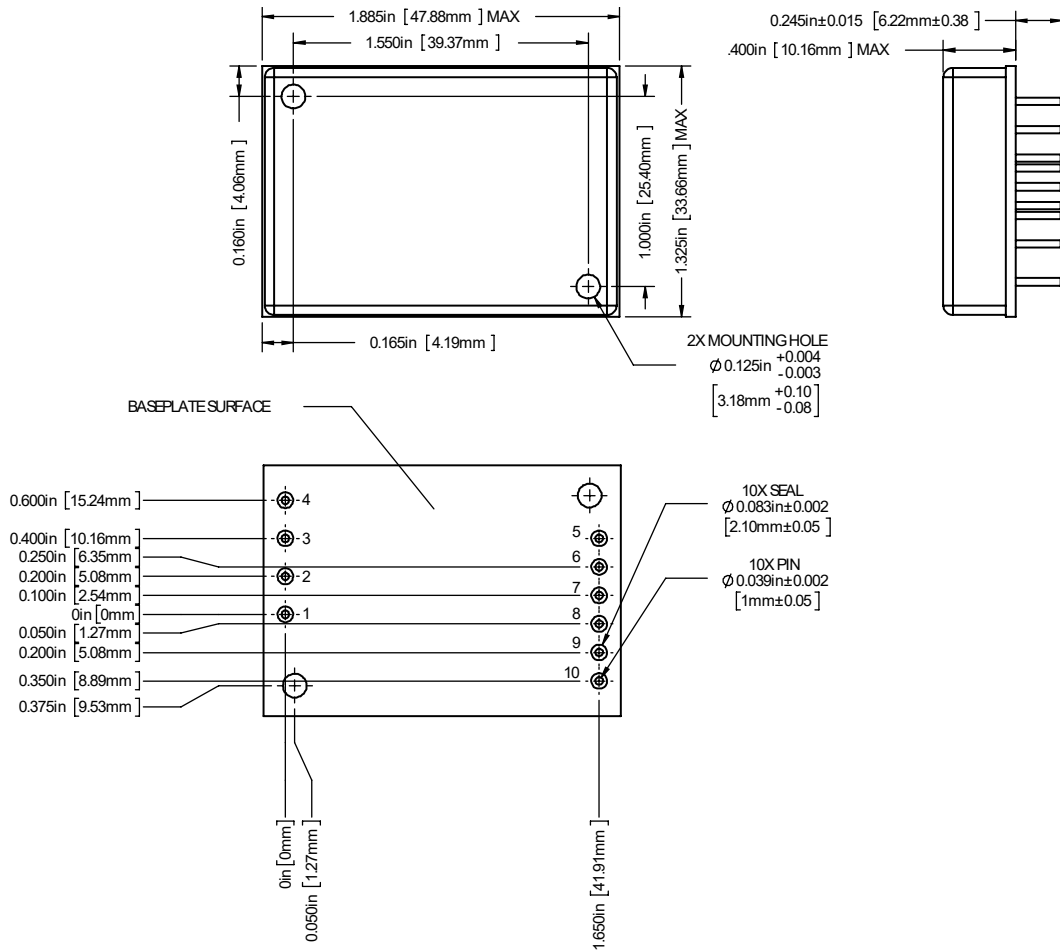


4.1.2 VHR30-2851515T Efficiency (%) vs. Output Power (W)



5.0 MECHANICAL OUTLINES AND PINOUT

Standard Metal 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 | INCOM | 6 | OUTRET1 |
| 2 | INHIBIT | 7 | +VOUT2 |
| 3 | CASE | 8 | OUTRET2 |
| 4 | 28V IN | 9 | +VOUT3 |
| 5 | +VOUT1 | 10 | OUTRET3 |



6.0 PACKAGE PIN DESCRIPTION

| Pin | Function | Description |
|-----|----------|--|
| 1 | INCOM | Input Return Connection. |
| 2 | 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. |
| 3 | CASE | Case Connection. |
| 4 | 28VIN | Positive Input Voltage Connection. |
| 5 | +VOUT1 | Positive Output 1 Voltage Connection. |
| 6 | OUTRET1 | Output Return 1 Connection. |
| 7 | +VOUT2 | Positive Output 2 Voltage Connection. |
| 8 | OUTRET2 | Output Return 2 Connection. |
| 9 | +VOUT3 | Positive Output 3 Voltage Connection. |
| 10 | OUTRET3 | Output Return 3 Connection. |

7.0 ENVIRONMENTAL SCREENING

| Screening | Condition |
|------------------|--------------------|
| Internal Visual | IPC-A-610, Class 3 |
| Final Electrical | 100% at 25 °C |
| External Visual | Internal Procedure |

8.0 ORDERING INFORMATION

| | | | | | |
|--------|----|---|----|----|---|
| VHR30- | 28 | 5 | 15 | 15 | T |
| 1 | 2 | 3 | 4 | 5 | 6 |

| (1) Product Series | (2) Nominal Input Voltage | (3) Output 1 | (4) Output 2 | (5) Output 3 | (6) Number of Outputs | | | | | |
|-----------------------|------------------------------|-----------------|-----------------|----------------------|--------------------------|---------------------------------|----------|----------------------|---|--------|
| VHR30- | 28 | 28 Volts | 3R3 5 | 3.3 Volts 5 Volts | 5 12 15 | 5 Volts 12 Volts 15 Volts | 12 15 | 12 Volts 15 Volts | T | Triple |

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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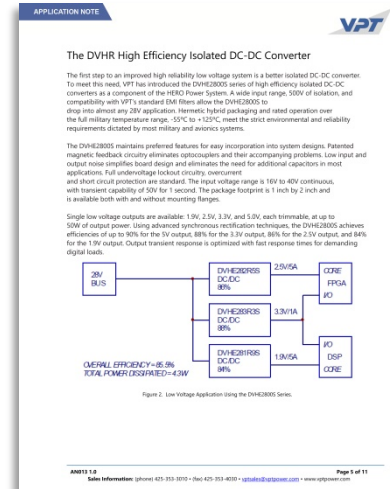
10.0 ADDITIONAL INFORMATION

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

[Product Literature](#)



[Application Notes and White Papers](#)



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