

Power Your Critical Mission Today

VHR30-2800S SERIES

HIGH RELIABILITY COTS DC-DC CONVERTERS

Models Available

Input: 15 V to 50 V continuous, 80 V transient
30 W, single output of 3.3 V, 5 V, 12 V, 15 V
-40 °C to 100 °C Operation

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 VHR30-2800S 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
- Up to 30 Watts Maximum 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 Voltage Trim (+10% / -20%)
- Remote Sense
- Frequency Synchronization
- Output Soft Start
- Current Limit Protection
- 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-F and EN55022 when used with an appropriate VHR EMI Filter

1.3 PACKAGING

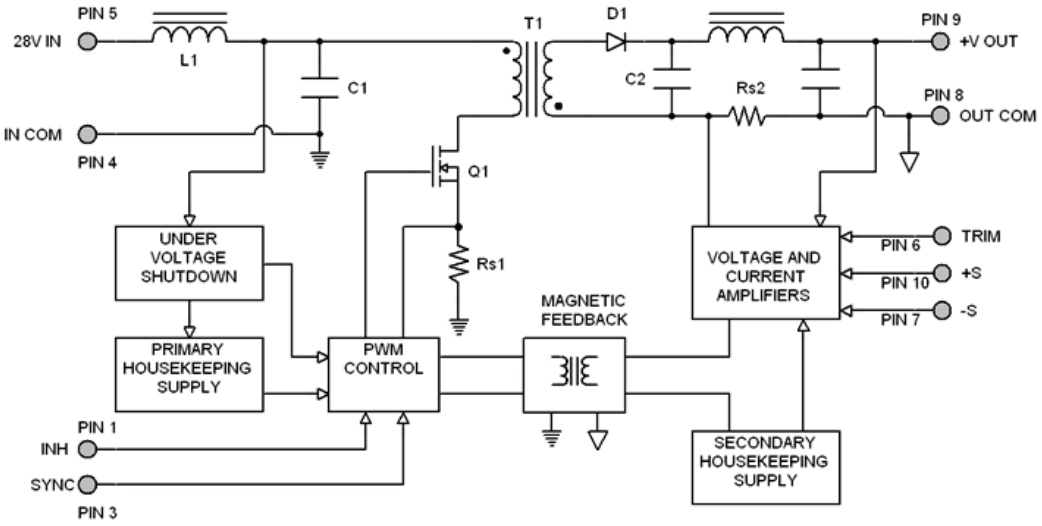
- Low-profile: 1.885" x 1.325" x 0.400"
- Max weight: 48 g

1.4 SIMILAR PRODUCTS AND ACCESSORIES

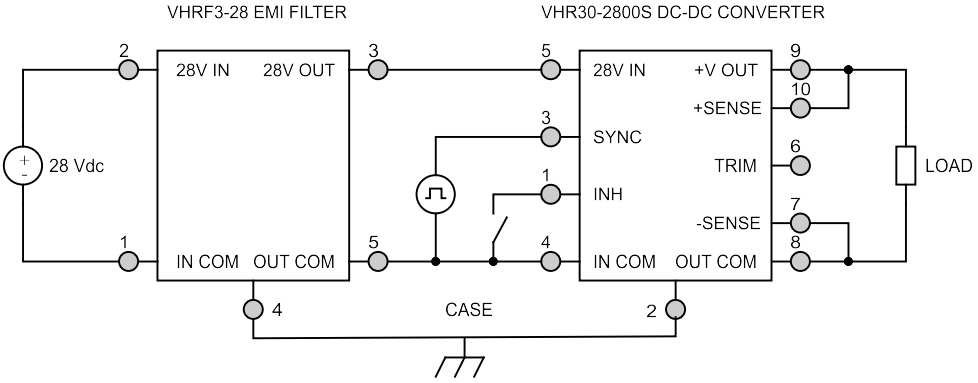
- DVTR 40 W single output DC-DC Converter
- VXR30 30W single output COTS DC-DC Converter
- VPT30 30 W single output COTS DC-DC Converter
- EMI filters, Thermal Pads, Front-End Modules and Accessories

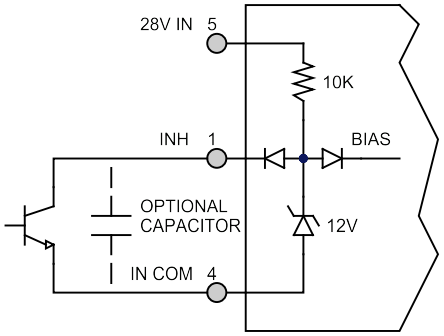
2.0 DESCRIPTION

2.1 BLOCK DIAGRAM

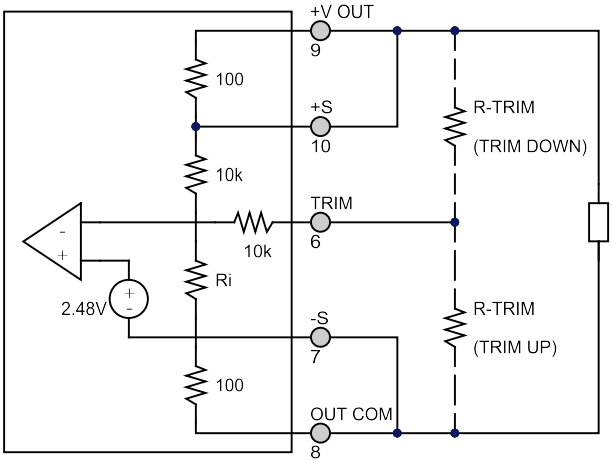


2.2 CONNECTION DIAGRAM





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



Output Voltage Trim Circuit

3.0 SPECIFICATIONS

3.1 ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings			
Input Voltage (Continuous):	50 V	Operating Temperature (Full Load):	-40 °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 = -40 °C to 100 °C, Vin = +28 V ± 5%, Full Load, Unless Otherwise Specified

		VHR30-283R3S			VHR30-2805S			
Parameter	**Conditions**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Units**
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	80	-	50	80	mA
Ripple Current	20 Hz to 10 MHz	-	30	75	-	30	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	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	-	25	0	-	30	W
Current[2]		0	-	7.6	0	-	6	A
Ripple Voltage	20 Hz to 10 MHz	-	20	50	-	15	50	mVpp
Line Regulation	Vin = 15 V to 50 V	-	1	10	-	1	10	mV
Load Regulation	No Load to Full Load	-	1	10	-	1	10	mV
Load Fault Power Dissipation	Overload[3]	-	-	16	-	-	16	W
	Short Circuit	-	-	16	-	-	16	W
OUTPUT DYNAMIC								
Load Step, Half to Full Load	Output Transient	-	200	400	-	200	500	mVpk
	Recovery[1]	-	300	500	-	300	500	µs
Line Step[3], Vin = 16 V to 40 V	Output Transient	-	350	600	-	350	600	mVpk
	Recovery[1]	-	400	600	-	400	600	µs
Turn On, Vin = 0 to 28 V	Delay	-	10	20	-	10	20	ms
	Overshoot	-	0	15	-	0	25	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
Voltage Trim Range		-12	-	10	-20	-	10	%
SYNC Frequency Range	V_H - V_L = 5 V, D = 50%	500	-	600	500	-	600	kHz
GENERAL								
Efficiency		70	75	-	74	81	-	%
Capacitive Load[3]		-	-	1000	-	-	1000	µF
Switching Frequency		400	500	550	400	500	550	kHz
Isolation	500 V DC, Tcase = 25 °C	100	-	-	100	-	-	MΩ
Weight		-	-	48	-	-	48	g
MTBF (MIL-HDBK-217F)	GM @ Tcase = 55 °C	-	418	-	-	418	-	kHr

1. Time for output voltage to settle within 1% of its nominal value
2. Derate linearly to 0 at 110 °C
3. Verified by qualification testing

3.2 PERFORMANCE SPECIFICATIONS (CONTINUED)

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

		VHR30-2812S			VHR30-2815S			
Parameter	**Conditions**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Units**
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	80	-	50	80	mA
Ripple Current	20 Hz to 10 MHz	-	30	75	-	30	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	Tcase = 25 °C	11.82	12	12.18	14.77	15	15.23	V
	Tcase = - 40 °C to 100 °C	11.7	12	12.3	14.62	15	15.38	V
Power[2]		0	-	30	0	-	30	W
Current[2]		0	-	2.5	0	-	2	A
Ripple Voltage	20 Hz to 10 MHz	-	10	50	-	10	50	mVpp
Line Regulation	Vin = 15 V to 50 V	-	1	10	-	1	10	mV
Load Regulation	No Load to Full Load	-	1	10	-	1	10	mV
Load Fault Power Dissipation	Overload[3]	-	-	14	-	-	14	W
	Short Circuit	-	-	14	-	-	14	W
OUTPUT DYNAMIC								
Load Step, Half to Full Load	Output Transient	-	350	700	-	350	700	mVpk
	Recovery[1]	-	250	500	-	250	500	µs
Line Step[3], Vin = 16 V to 40 V	Output Transient	-	700	1100	-	700	1100	mVpk
	Recovery[1]	-	300	500	-	300	500	µs
Turn On, Vin = 0 to 28 V	Delay	-	10	20	-	10	20	ms
	Overshoot	-	0	50	-	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
Voltage Trim Range		-20	-	10	-20	-	10	%
SYNC Frequency Range	V_H - V_L = 5 V, D = 50%	500	-	600	500	-	600	kHz
GENERAL								
Efficiency		78	83	-	79	84	-	%
Capacitive Load[3]		-	-	500	-	-	500	µF
Switching Frequency		400	500	550	400	500	550	kHz
Isolation	500 V DC, Tcase = 25 °C	100	-	-	100	-	-	MΩ
Weight		-	-	48	-	-	48	g
MTBF (MIL-HDBK-217F)	GM @ Tcase = 55 °C	-	418	-	-	418	-	kHr

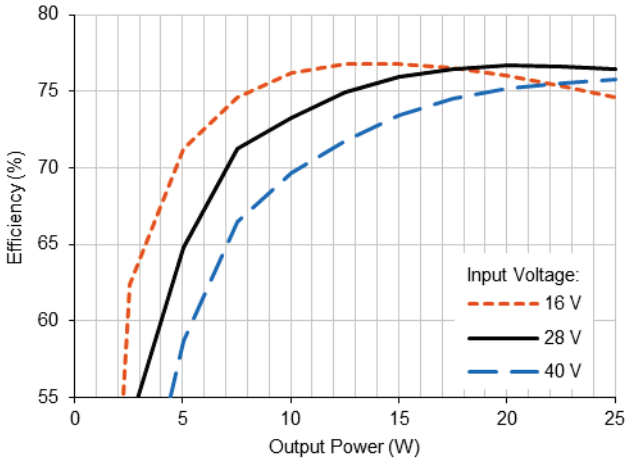
1. Time for output voltage to settle within 1% of its nominal value
2. Derate linearly to 0 at 110 °C
3. Verified by qualification testing

4.0 PERFORMANCE CURVES

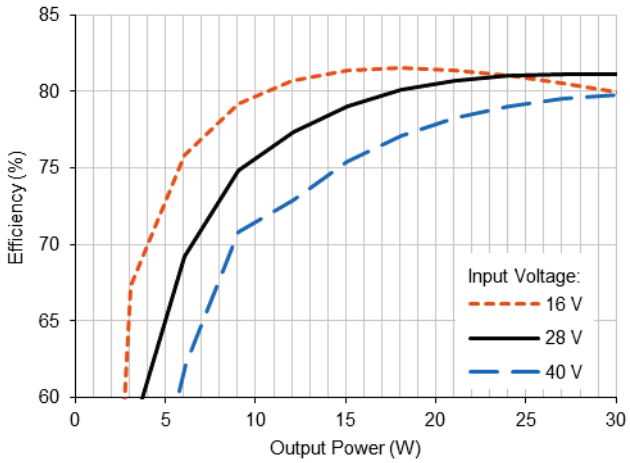
Tcase = 25 °C, Full Load, Unless Otherwise Specified

4.1 EFFICIENCY PERFORMANCE CURVES

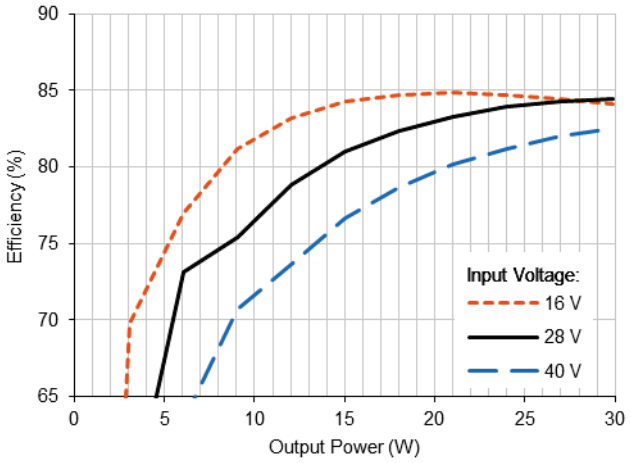
4.1.1 VHR30-283R3S Efficiency (%) vs. Output Power (W)



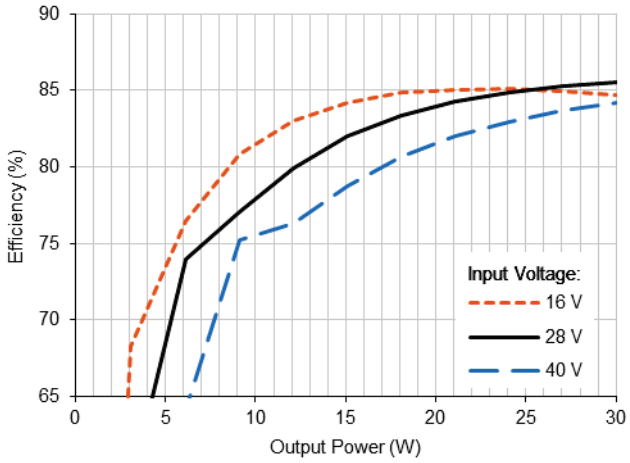
4.1.2 VHR30-2805S Efficiency (%) vs. Output Power (W)



4.1.3 VHR30-2812S Efficiency (%) vs. Output Power (W)

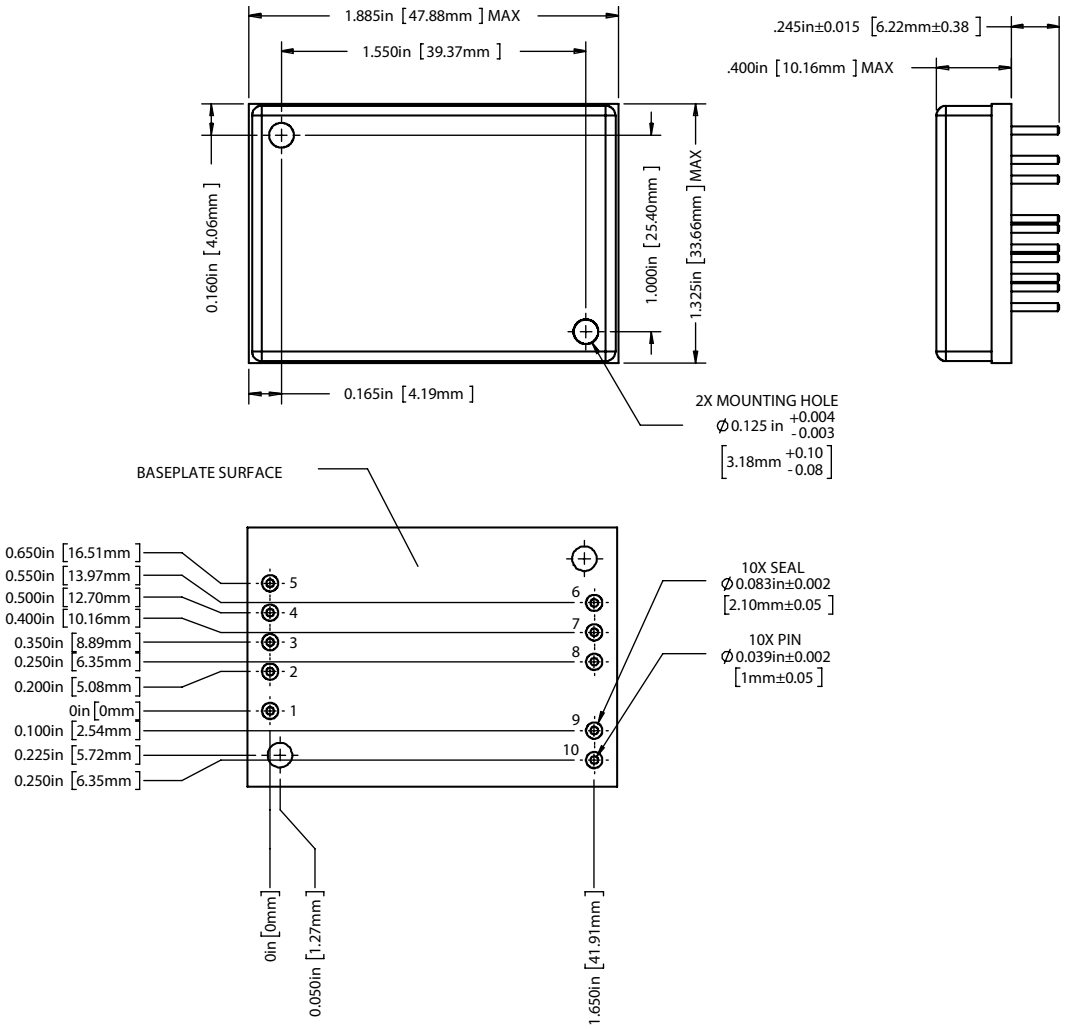


4.1.4 VHR30-2815S Efficiency (%) vs. Output Power (W)



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	INHIBIT	6	TRIM
2	CASE	7	-SENSE
3	SYNC	8	OUTCOM
4	INCOM	9	+VOUT
5	28VIN	10	+SENSE

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	SYNC	Frequency Synchronization Signal Input. TTL squarewave, 5 Vpp, 20 – 80% duty cycle, internally capacitively coupled.
4	INCOM	Input Return Connection.
5	28VIN	Positive Input Voltage Connection.
6	TRIM	Trim Output Voltage to +10%, -20% of Nominal Value. Leave open if not used.
7	-SENSE	Output Return Remote Sense. Compensate for up to 0.5 V total drop (positive and return).
8	OUTCOM	Output Return Connection.
9	+VOUT	Positive Output Voltage Connection.
10	+SENSE	Positive Output Voltage Remote Sense. Compensate for up to 0.5 V total drop (positive and return).

7.0 OUTPUT VOLTAGE TRIM

The output voltage can be trimmed down by connecting a resistor between the TRIM pin and the +VOUT pin, or can be trimmed up by connecting a resistor between the TRIM pin and the OUTCOM pin as shown in Section 2.2. 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.

VHR30-283R3S		VHR30-2805S		VHR30-2812S		VHR30-2815S	
+Vout (V)	Rtrim (Ω)	+ Vout (V)	Rtrim (Ω)	+ Vout (V)	Rtrim (Ω)	+ Vout (V)	Rtrim (Ω)
3.60	72.7k	5.5	39.6k	13.2	10.7k	16.50	6.5k
3.55	89.2k	5.4	52k	13.0	14.8k	16.25	9.8k
3.50	114k	5.3	72.6k	12.8	21k	16.00	14.8k
3.45	155k	5.2	113.9k	12.6	31.3k	15.75	23k
3.40	238k	5.1	237k	12.4	51.9k	15.50	39.6k
3.35	487k	5.0	--	12.2	114k	15.25	89k
3.30	--	4.9	232.5k	12.0	--	15.00	--
3.25	144k	4.8	106.1k	11.8	457k	14.75	482k
3.20	61.9k	4.7	64k	11.6	218k	14.50	231k
3.15	34.7k	4.6	43k	11.4	139k	14.25	147k
3.10	21k	4.5	30.4k	11.2	99k	14.00	105k
3.05	12.79k	4.4	22k	11.0	75.2k	13.75	80.2k
3.00	7.33k	4.3	16k	10.8	59.4k	13.50	63.5k
2.95	3.43k	4.2	11.5k	10.6	48k	13.25	51.6k
2.90	498	4.1	8.0k	10.4	39.5k	13.00	42.6k
		4.0	5.2k	10.2	32.9k	12.75	35.6k
				10.0	27.6k	12.50	30k
				9.8	23.3k	12.25	25.5k
				9.6	19.7k	12.00	21.7k

8.0 ENVIRONMENTAL SCREENING

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

9.0 ORDERING INFORMATION

VHR30-	28	05	S
1	2	3	4

(1) Product Series	(2) Nominal Input Voltage		(3) Output Voltage		(4) Number of Outputs	
VHR30-	**28**	28 Volts	**3R3**	3.3 Volts	**S**	Single
			05	5 Volts		
			12	12 Volts		
			15	15 Volts		

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.

10.0 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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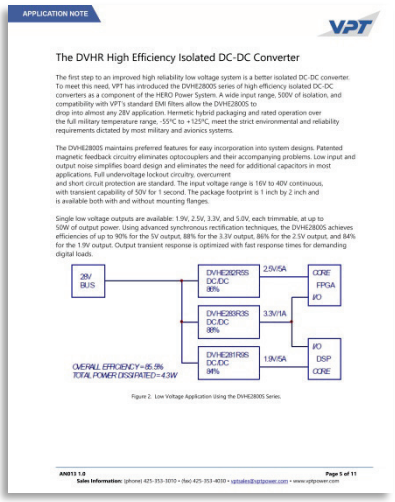
11.0 ADDITIONAL INFORMATION

Visit the VPT website for additional technical resources, including:

Product Literature



Application Notes and White Papers



Technical Video Labs



Additional Products For Avionics/Military, Hi-Temp, Hi-Rel COTS, and Space Applications

