



VPT

Power Your Critical Mission Today

VHR15-2800S SERIES

HIGH RELIABILITY COTS DC-DC CONVERTERS

Models Available

Input: 15 V to 50 V continuous, 80 V transient
 15 W, single output 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 VHR15-2800S 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 15 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%)
- 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-461D-F and EN55022 when used with an appropriate VHR EMI Filter

1.3 PACKAGING

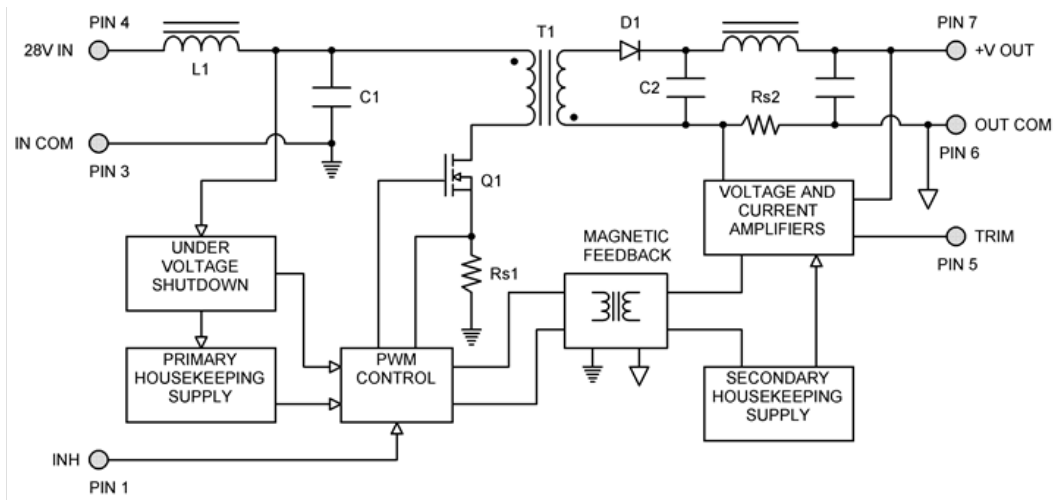
- Low-profile: 1.585" x 1.175" x 0.400"
- Max weight: 32 g

1.4 SIMILAR PRODUCTS AND ACCESSORIES

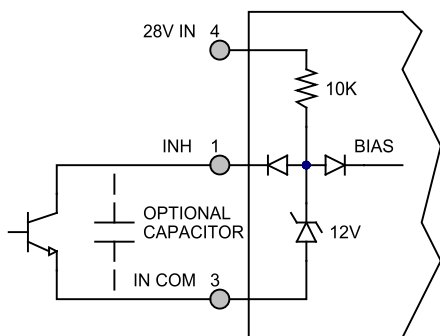
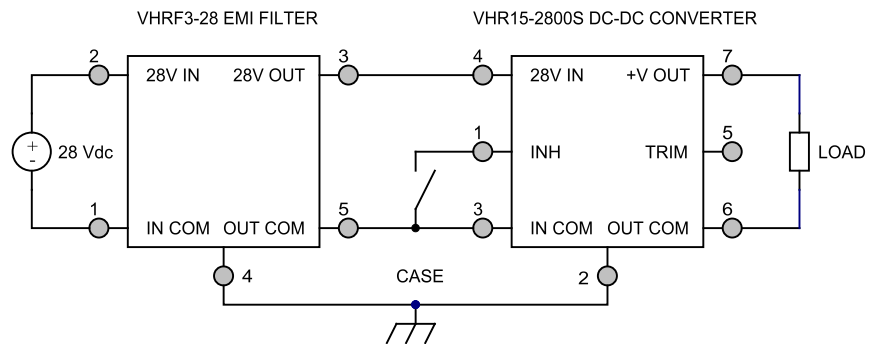
- [DVHF](#) 20 W single output DC-DC Converter
- [VXR15](#) 15W single output COTS DC-DC Converter
- [VPT15](#) 15 W single output COTS DC-DC Converter
- [EMI filters, Thermal Pads, Front-End Modules and Accessories](#)

2.0 DESCRIPTION

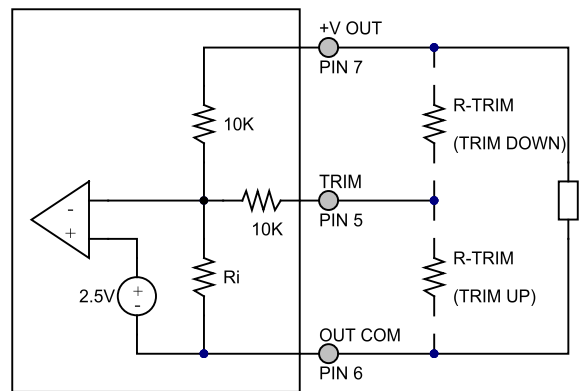
2.1 BLOCK DIAGRAM



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

Parameter	Conditions	VHR15-283R3S			VHR15-2805S			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	-	50	80	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	-	10	0	-	15	W
Current ²		0	-	3	0	-	3	A
Ripple Voltage	20 Hz to 10 MHz	-	10	40	-	10	40	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	-	-	8	-	-	9	W
	Short Circuit	-	-	8	-	-	8	W
OUTPUT DYNAMIC								
Load Step, Half to Full Load	Output Transient	-	170	250	-	170	250	mVpk
	Recovery ¹	-	300	450	-	300	450	µs
Line Step ³ , Vin = 16 V to 40 V	Output Transient	-	350	550	-	350	550	mVpk
	Recovery ¹	-	400	550	-	400	550	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		-10	-	10	-20	-	10	%
GENERAL								
Efficiency		67	70	-	72	76	-	%
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		-	-	32	-	-	32	g
MTBF (MIL-HDBK-217F)	GM @ Tcase = 55 °C	-	445	-	-	445	-	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

Parameter	Conditions	VHR15-2812S			VHR15-2815S			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	80	-	40	80	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	-	15	0	-	15	W
Current ²		0	-	1.25	0	-	1	A
Ripple Voltage	20 Hz to 10 MHz	-	10	30	-	10	30	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	-	-	8	-	-	8	W
	Short Circuit	-	-	8	-	-	8	W
OUTPUT DYNAMIC								
Load Step, Half to Full Load	Output Transient	-	250	350	-	250	350	mVpk
	Recovery ¹	-	150	250	-	150	250	µs
Line Step ³ , Vin = 16 V to 40 V	Output Transient	-	450	700	-	450	700	mVpk
	Recovery ¹	-	400	550	-	400	550	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	%
GENERAL								
Efficiency		76	80	-	76	80	-	%
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		-	-	32	-	-	32	g
MTBF (MIL-HDBK-217F)	GM @ Tcase = 55 °C	-	445	-	-	445	-	kHr

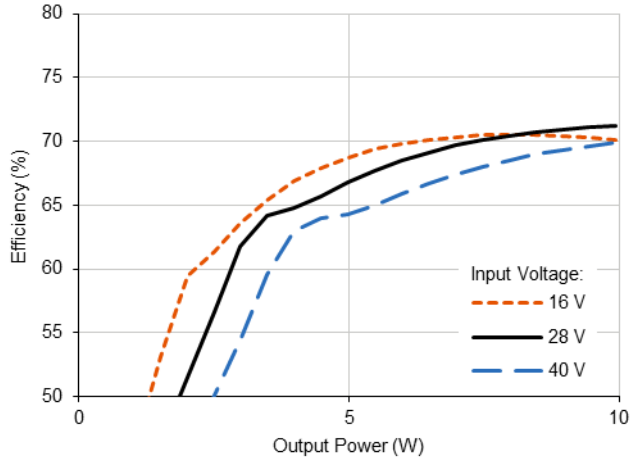
1. Dependent on output voltage
2. Time for output voltage to settle within 1% of its nominal value
3. Derate linearly to 0 at 110 °C
4. Verified by qualification testing

4.0 PERFORMANCE CURVES

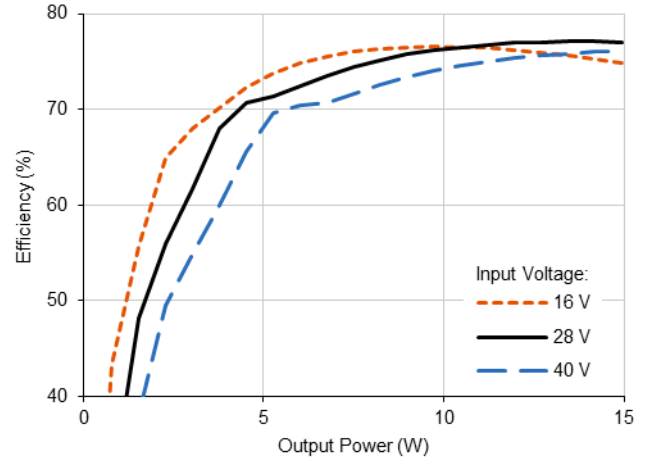
T_{case} = 25 °C, Full Load, Unless Otherwise Specified

4.1 EFFICIENCY PERFORMANCE CURVES

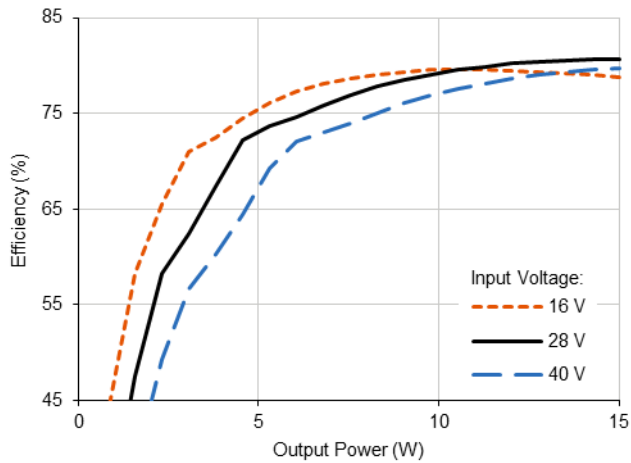
4.1.1 VHR15-283R3S Efficiency (%) vs. Output Power (W)



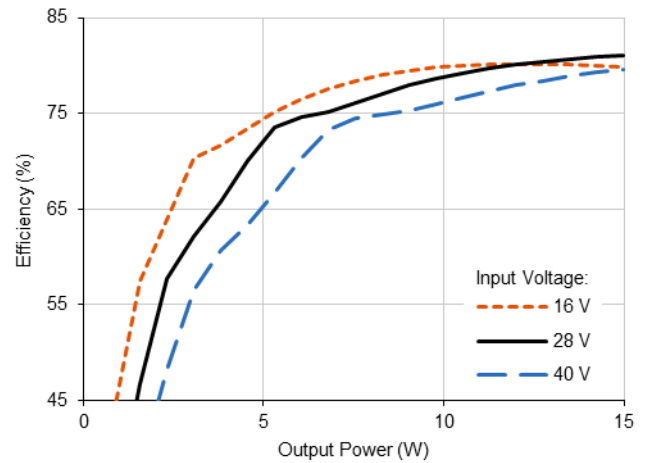
4.1.2 VHR15-2805S Efficiency (%) vs. Output Power (W)



4.1.3 VHR15-2812S Efficiency (%) vs. Output Power (W)

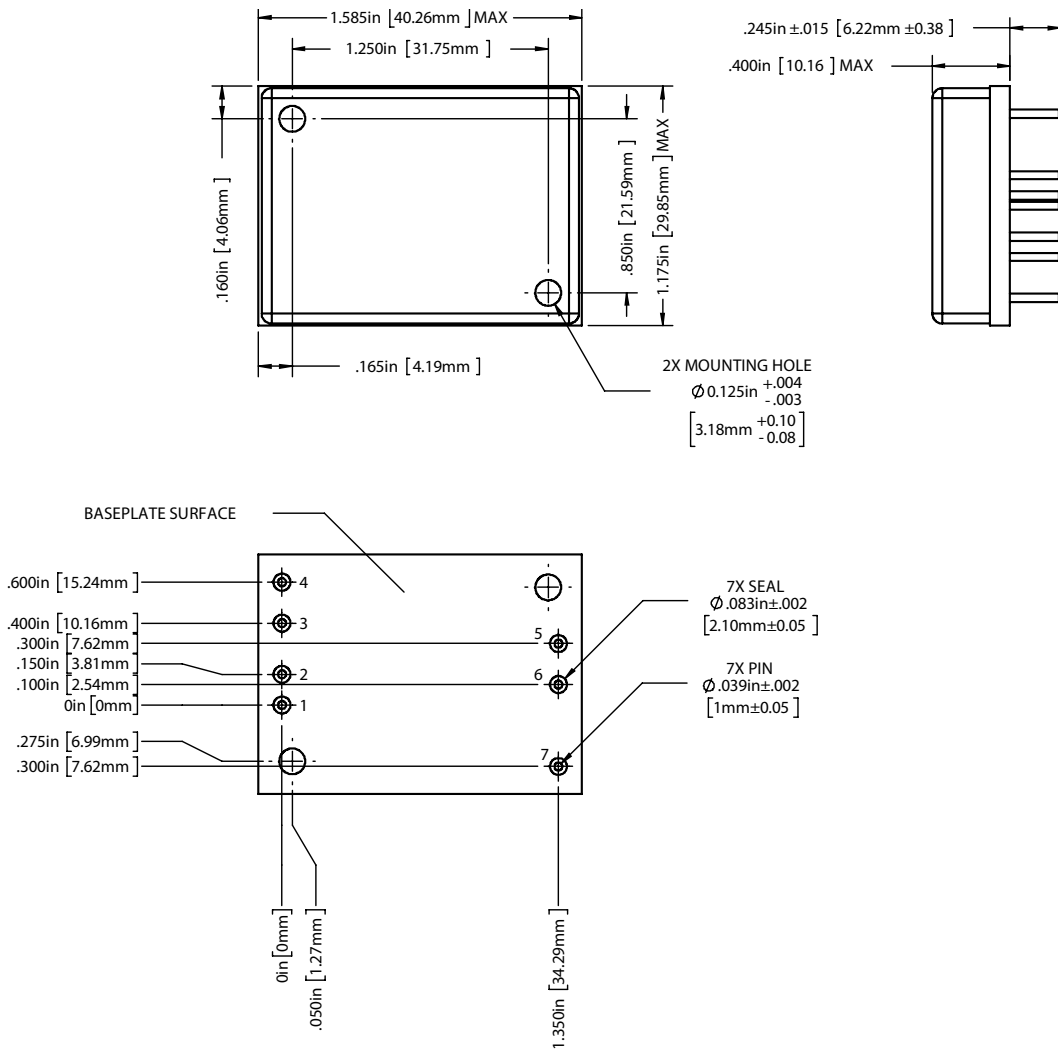


4.1.4 VHR15-2815S Efficiency (%) vs. Output Power (W)



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	5	TRIM
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	TRIM	Trim Output Voltage to +10%, -20% of Nominal Value. Leave open if not used.
6	OUTCOM	Output Return Connection.
7	+VOUT	Positive Output Voltage Connection.

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.

VHR15-283R3S		VHR15-2805S		VHR15-2812S		VHR15-2815S	
+Vout (V)	Rtrim (Ω)	+ Vout (V)	Rtrim (Ω)	+ Vout (V)	Rtrim (Ω)	+ Vout (V)	Rtrim (Ω)
3.60	7.27k	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
		4.2	11.5k	10.6	48k	13.25	51.6k
		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

VHR15-	28	05	S
1	2	3	4

(1) Product Series	(2) Nominal Input Voltage	(3) Output Voltage	(4) Number of Outputs
VHR15-	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

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. VPT, its logo and tagline are registered trademarks in the U.S. Patent and Trademark Office.

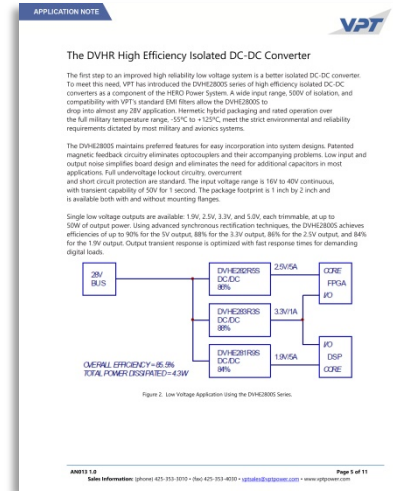
11.0 ADDITIONAL INFORMATION

Visit the [VPT website](http://www.vptpower.com) 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](#)

