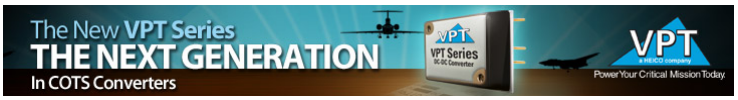
VPT30-2800S Series



HIGH RELIABILITY COTS DC-DC CONVERTERS

DESCRIPTION

The VPT30 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 package ensure long term reliability.

The VPT30 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 the USA 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

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, -55°C to 100°C
- Internally Conformal Coated
- Six Sided Non-Hermetic Rugged Metal Enclosure
- Meets MIL-STD-461C/D/E Conducted Emissions Requirements When Used With a VPTF series EMI Filter

Figure 1 – VPT30-2800S Converter
(Not To Scale)

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West, Suite 206
Everett, WA 98204
http://www.vpt-inc.com

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SPECIFICATIONS (T_{CASE} = -55°C to +100°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS			
Input Voltage (Continuous)	50 V_{DC}	Junction Temperature Rise to Case	+17°C
Input Voltage (Transient, 1 second)	80 Volts	Storage Temperature	-55°C to +125°C
Output Power[1]	30 Watts	Lead Solder Temperature (10 seconds)	300°C
Power Dissipation (Full Load, T_{CASE} = +100°C)	14 Watts	Weight (Maximum)	48 Grams

Parameter	Conditions	VPT30-283R3S			VPT30-2805S			Units
		Min	Typ	Max	Min	Typ	Max	
STATIC								
INPUT Voltage[4]	Continuous	15	28	50	15	28	50	V
	Transient, 1 sec	-	-	80	-	-	80	V
Current	Inhibited	-	4	6	-	4	6	mA
	No Load	-	50	80	-	50	80	mA
Ripple Current	Full Load, 20Hz to 10MHz	-	30	75	-	30	75	mA_{p-p}
Inhibit Pin Input[4]		0	-	1.5	0	-	1.5	V
Inhibit Pin Open Circuit Voltage[4]		9.0	11.0	13.0	9.0	11.0	13.0	V
UVLO Turn On		12.0	-	14.8	12.0	-	14.8	V
UVLO Turn Off[4]		11.0	-	14.5	11.0	-	14.5	V
OUTPUT Voltage V_{OUT}	T_{CASE} = 25°C	3.25	3.30	3.35	4.92	5.00	5.08	V
V_{OUT}	T_{CASE} = -55°C to +100°C	3.21	3.30	3.38	4.87	5.00	5.13	V
Power[3]		0	-	25	0	-	30	W
Current[3] V_{OUT}		0	-	7.6	0	-	6.0	A
Ripple Voltage V_{OUT}	Full Load, 20Hz to 10MHz	-	20	50	-	15	50	mV_{p-p}
Line Regulation V_{OUT}	V_{IN} = 15V to 50V	-	1	10	-	1	10	mV
Load Regulation V_{OUT}	No Load to Full Load	-	1	10	-	1	10	mV
EFFICIENCY		70	75	-	74	81	-	%
LOAD FAULT POWER DISSIPATION	Overload[4]	-	-	16	-	-	16	W
	Short Circuit	-	-	16	-	-	16	W
CAPACITIVE LOAD[4]		-	-	1000	-	-	1000	µF
SWITCHING FREQUENCY		400	500	550	400	500	550	kHz
SYNC FREQUENCY RANGE	V_H - V_L = 5V, D = 20-80%	500	-	600	500	-	600	kHz
ISOLATION	500 V_{DC}	100	-	-	100	-	-	MΩ
MTBF (MIL-HDBK-217F)	GM @ T_C = 55°C	-	418	-	-	418	-	kHrs
DYNAMIC								
Load Step Output Transient V_{OUT}	Half Load to Full Load	-	200	400	-	200	500	mV_{PK}
Load Step Recovery[2]		-	300	500	-	300	500	µSec
Line Step Output Transient[4] V_{OUT}	V_{IN} = 16V to 40V	-	350	600	-	350	600	mV_{PK}
Line Step Recovery[2, 4]		-	400	600	-	400	600	µSec
Turn On Delay V_{OUT}	V_{IN} = 0V to 28V	-	10	20	-	10	20	mSec
Turn On Overshoot		-	0	15	-	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 110°C. 4. Verified by qualification testing.

SPECIFICATIONS (T_{CASE} = -55°C to +100°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS			
Input Voltage (Continuous)	50 V_{DC}	Junction Temperature Rise to Case	+17°C
Input Voltage (Transient, 1 second)	80 Volts	Storage Temperature	-55°C to +125°C
Output Power[1]	30 Watts	Lead Solder Temperature (10 seconds)	300°C
Power Dissipation (Full Load, T_{CASE} = +100°C)	14 Watts	Weight (Maximum)	48 Grams

Parameter	Conditions	VPT30-2812S			VPT30-2815S			Units
		Min	Typ	Max	Min	Typ	Max	
STATIC								
INPUT Voltage[4]	Continuous	15	28	50	15	28	50	V
	Transient, 1 sec	-	-	80	-	-	80	V
Current	Inhibited	-	4	6	-	4	6	mA
	No Load	-	50	80	-	50	80	mA
Ripple Current	Full Load, 20Hz to 10MHz	-	30	75	-	30	75	mA_{p-p}
Inhibit Pin Input[4]		0	-	1.5	0	-	1.5	V
Inhibit Pin Open Circuit Voltage[4]		9.0	11.0	13.0	9.0	11.0	13.0	V
UVLO Turn On		12.0	-	14.8	12.0	-	14.8	V
UVLO Turn Off[4]		11.0	-	14.5	11.0	-	14.5	V
OUTPUT Voltage V_{OUT}	T_{CASE} = 25°C	11.82	12.0	12.18	14.77	15.0	15.23	V
V_{OUT}	T_{CASE} = -55°C to +100°C	11.70	12.0	12.30	14.62	15.0	15.38	V
Power[3]		0	-	30	0	-	30	W
Current[3] V_{OUT}		0	-	2.5	0	-	2.0	A
Ripple Voltage V_{OUT}	Full Load, 20Hz to 10MHz	-	10	50	-	10	50	mV_{p-p}
Line Regulation V_{OUT}	V_{IN} = 15V to 50V	-	1	10	-	1	10	mV
Load Regulation V_{OUT}	No Load to Full Load	-	1	10	-	1	10	mV
EFFICIENCY		78	83	-	79	84	-	%
LOAD FAULT POWER DISSIPATION	Overload[4]	-	-	14	-	-	14	W
	Short Circuit	-	-	14	-	-	14	W
CAPACITIVE LOAD[4]		-	-	500	-	-	500	µF
SWITCHING FREQUENCY		400	500	550	400	500	550	kHz
SYNC FREQUENCY RANGE	V_H - V_L = 5V, D = 20-80%	500	-	600	500	-	600	kHz
ISOLATION	500 V_{DC}	100	-	-	100	-	-	MΩ
MTBF (MIL-HDBK-217F)	GM @ T_C = 55°C	-	418	-	-	418	-	kHrs
DYNAMIC								
Load Step Output Transient V_{OUT}	Half Load to Full Load	-	350	700	-	350	700	mV_{PK}
Load Step Recovery[2]		-	250	500	-	250	500	µSec
Line Step Output Transient[4] V_{OUT}	V_{IN} = 16V to 40V	-	700	1100	-	700	1100	mV_{PK}
Line Step Recovery[2, 4]		-	300	500	-	300	500	µSec
Turn On Delay V_{OUT}	V_{IN} = 0V to 28V	-	10	20	-	10	20	mSec
Turn On Overshoot		-	0	50	-	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 110°C. 4. Verified by qualification testing.

BLOCK DIAGRAM

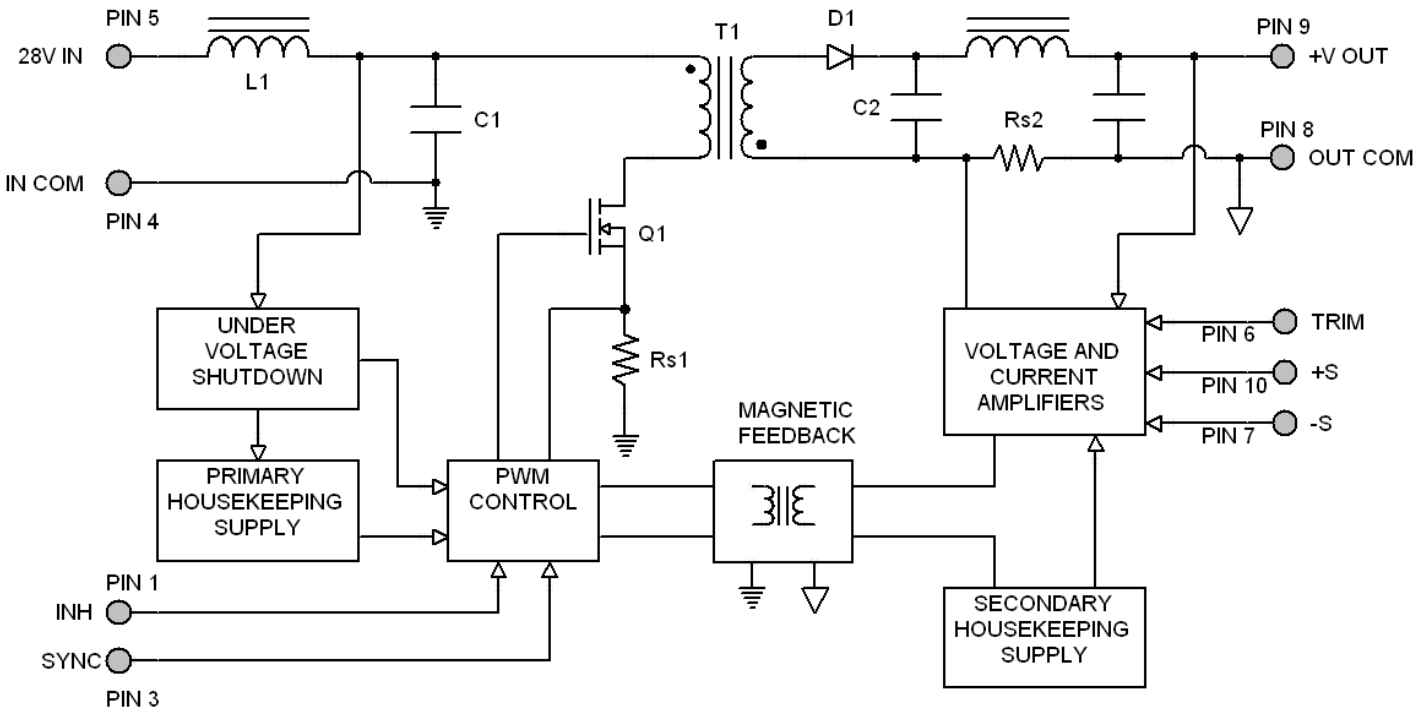


Figure 2

CONNECTION DIAGRAM

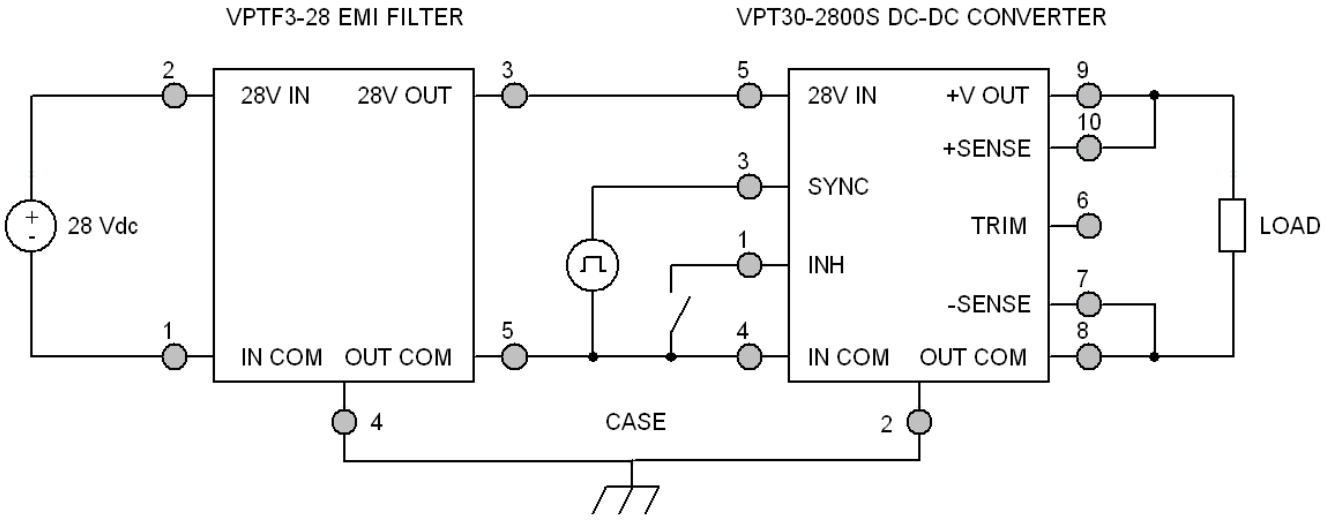


Figure 3
(Shown with optional EMI filter)

CONNECTION DIAGRAMS

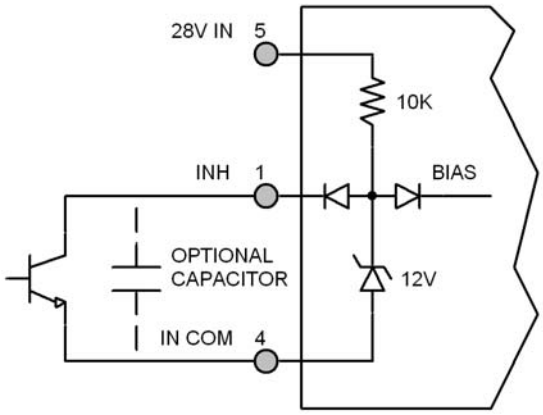


Figure 4 –Inhibit Circuit

(Shown with optional capacitor for turn-on delay)

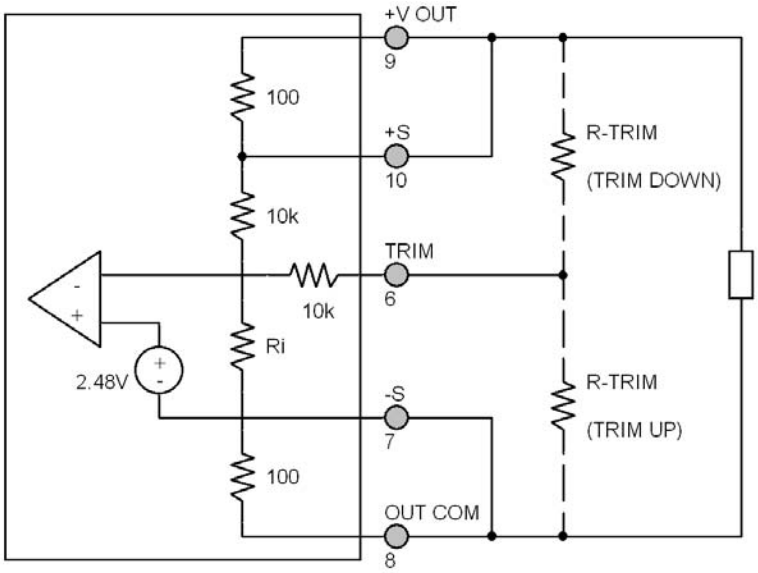


Figure 5 – Output Voltage Trim Circuit

OUTPUT VOLTAGE TRIM

The output voltage can be trimmed down by connecting a resistor between the TRIM pin and the +V OUT pin, or can be trimmed up by connecting a resistor between the TRIM pin and the OUT COM pin as shown in Figure 5. 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.

VPT30-283R3S		VPT30-2805S		VPT30-2812S		VPT30-2815S	
$+V_{OUT}$ (V)	R_{TRIM} (Ω)	$+V_{OUT}$ (V)	R_{TRIM} (Ω)	$+V_{OUT}$ (V)	R_{TRIM} (Ω)	$+V_{OUT}$ (V)	R_{TRIM} (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
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

EFFICIENCY PERFORMANCE CURVES (T_{CASE} = 25°C, Full Load, Unless Otherwise Specified)

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

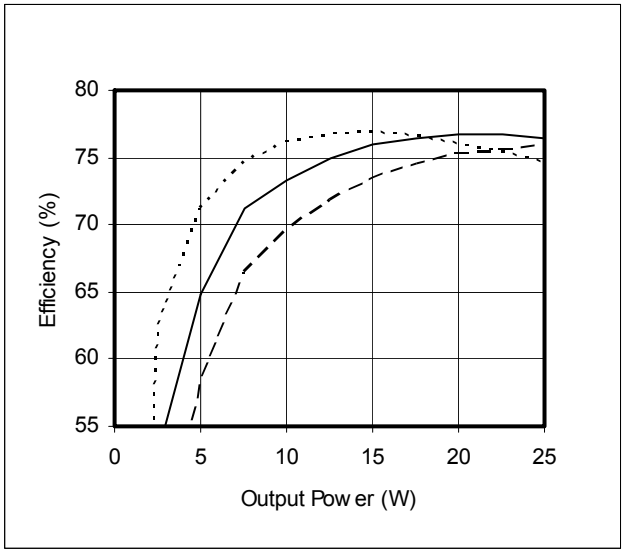


Figure 6 – VPT30-283R3S
Efficiency (%) vs. Output Power (W)

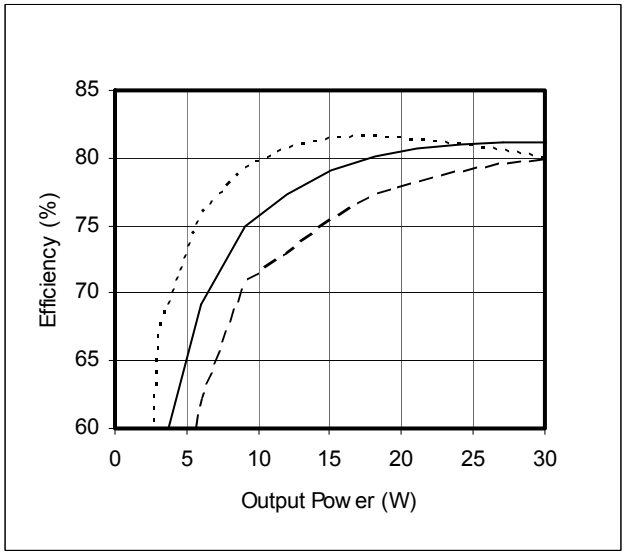


Figure 7 – VPT30-2805S
Efficiency (%) vs. Output Power (W)

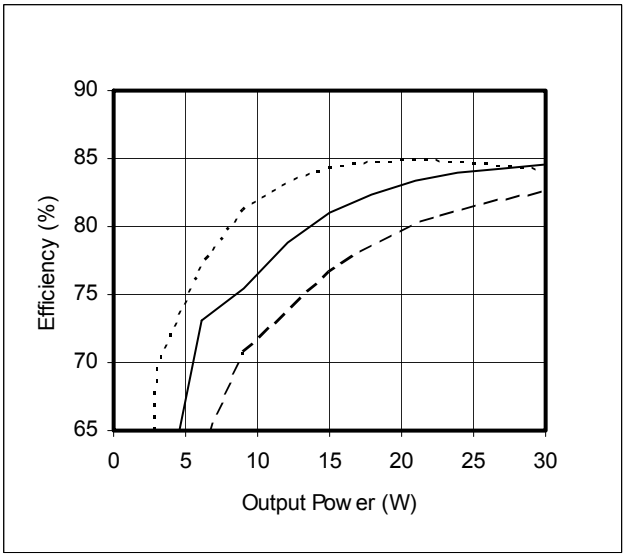


Figure 8 – VPT30-2812S
Efficiency (%) vs. Output Power (W)

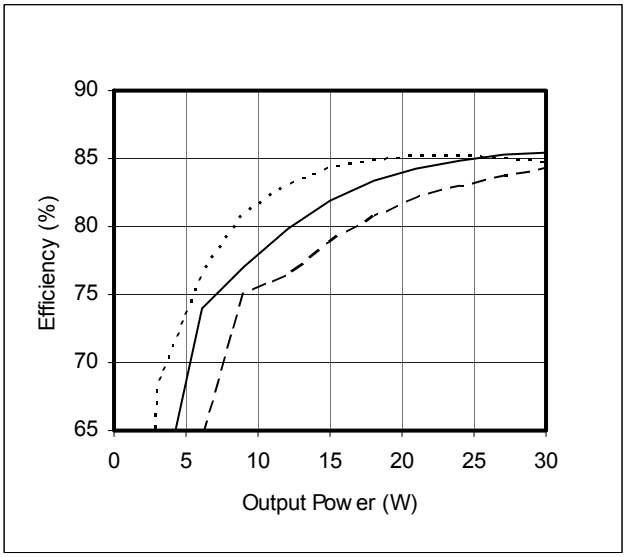


Figure 9 – VPT30-2815S
Efficiency (%) vs. Output Power (W)

EMI PERFORMANCE CURVES

(T_{CASE} = 25°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

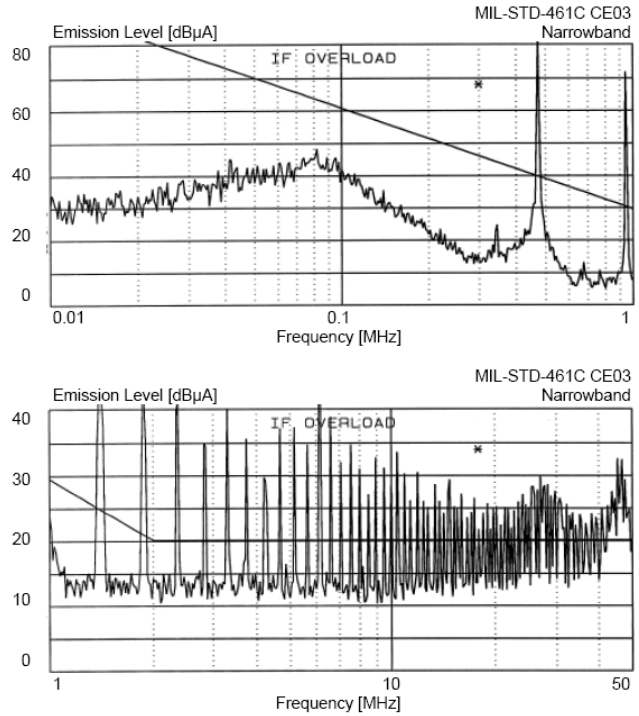


Figure 10 – VPT30-2800S without EMI Filter

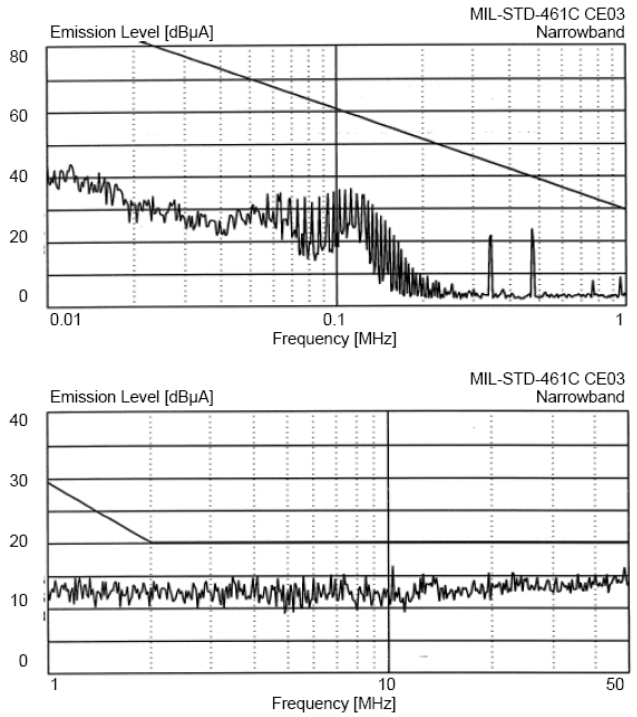


Figure 11 – VPT30-2800S with VPTF Series EMI Filter

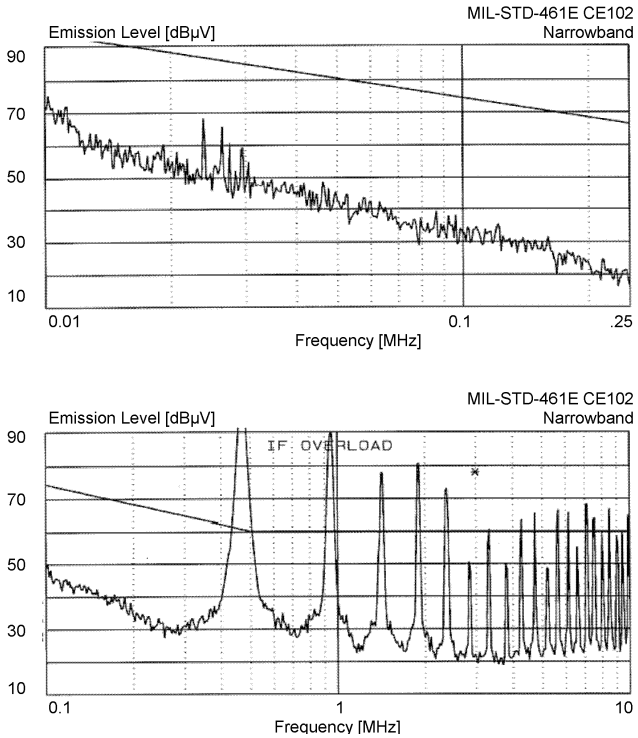


Figure 12 – VPT30-2800S without VPTF Series EMI Filter

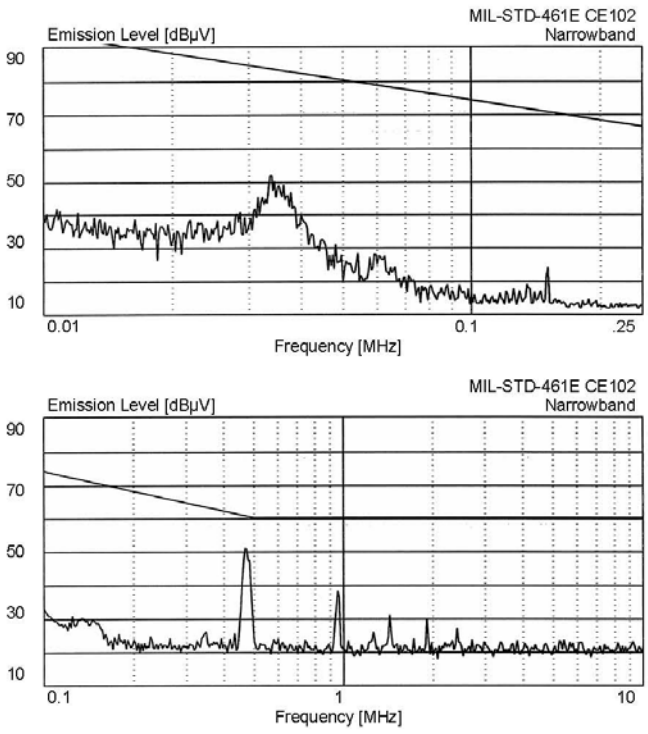
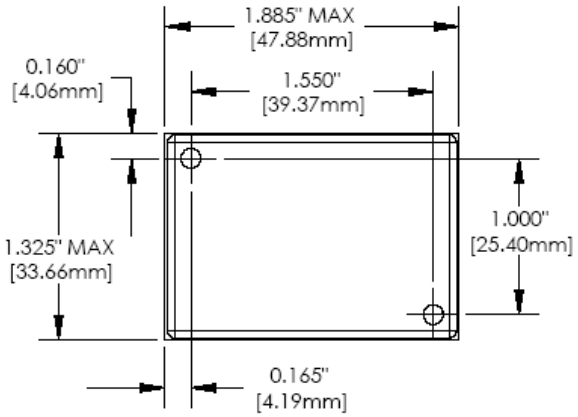
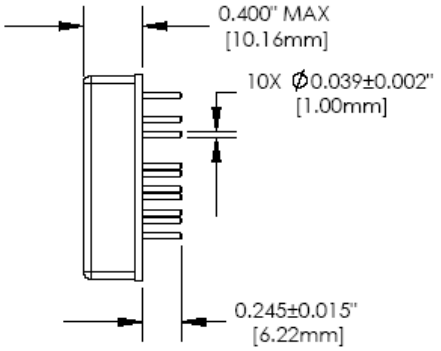


Figure 13 – VPT30-2800S with VPTF Series EMI Filter

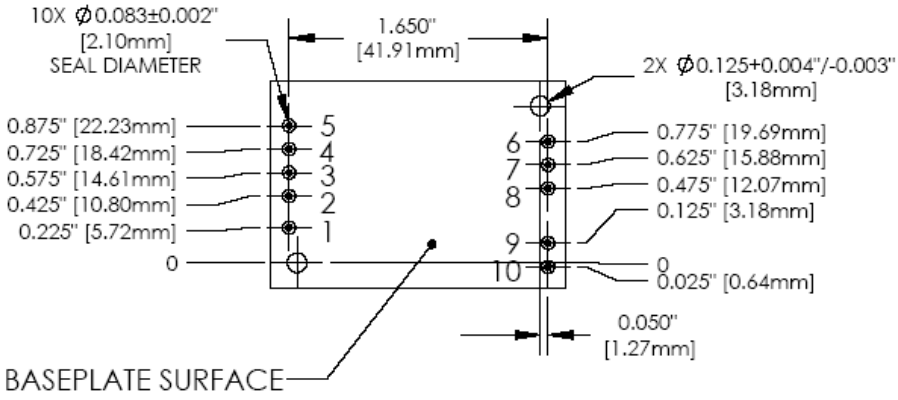
PACKAGE SPECIFICATIONS



TOP VIEW



SIDE VIEW



BOTTOM VIEW

PIN	FUNCTION
1	INHIBIT
2	CASE
3	SYNC
4	IN COM
5	28V IN
6	TRIM
7	-SENSE
8	OUT COM
9	+V OUT
10	+SENSE

Figure 14 – Package and Pinout
(Dimensional Limits are ±0.005" Unless Otherwise Stated)

Package Notes:
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.
5. For applications requiring exposure to liquid cleaning, please contact VPT.

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, 5Vpp, 20 – 80% duty cycle, internally capacitively coupled.
4	IN COM	Input Return Connection.
5	28V IN	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 0.5V total drop (positive and return).
8	OUT COM	Output Return Connection.
9	+V OUT	Positive Output Voltage Connection.
10	+SENSE	Positive Output Voltage Remote Sense. Compensate for up to 0.5V total drop (positive and return).

100% ENVIRONMENTAL SCREENING

Screening	Condition
Internal Visual	IPC-A-610
Stabilization Bake	MIL-STD-883, Method 1008, Condition B, 125°C, 24 hours
Temperature Cycling	MIL-STD-883, Method 1010, Condition B, -55°C to +125°C, 10 Cycles
Burn-In	MIL-STD-883, Method 1015, 96 hours at +100°C
Final Electrical	100% at 25°C
External Visual	MIL-STD-883, Method 2009

ORDERING INFORMATION

VPT30-	28	05	S
1	2	3	4

(1)	(2)		(3)		(4)	
Product Series	**Nominal Input Voltage**		**Output Voltage**		**Number of Outputs**	
VPT30-	**28**	28 Volts	**3R3** **05** **12** **15**	3.3 Volts 5 Volts 12 Volts 15 Volts	**S**	Single

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