

VPT30-2800T 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 or optional epoxy encapsulated 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 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
- 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, -55°C to 100°C
- Internally Conformal Coated
- Standard Six Sided Non-Hermetic Rugged Metal Package
- Optional Six Sided Rugged Epoxy Encapsulated Package with Integral Metalized EMI shield that is fully compatible with aqueous cleaning processes
- Meets MIL-STD-461 Revisions C, D, E and F EMC Requirements When Used With VPT's EMI Filters



Figure 1 – VPT30-2800T DC-DC Converter Standard Metal Package



Figure 2 VPT30-2800TW DC-DC Converter Optional Epoxy Encapsulated Package

(Not to Scale)

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

ABSOLUTE MAXIMUM RATINGS

Input Voltage (Continuous)	80 V _{DC}	Junction Temperature Rise to Case	24°C
Input Voltage (Transient, 1 sec)	100 Volts	Storage Temperature	-55°C to +125°C
Output Power	30 Watts	Lead Solder Temperature (10 seconds)	300°C
Power Dissipation ⁶ (Full Load, T _{CASE} = +100°C)	9 Watts	Weight (Maximum)	50 Grams

Parameter	Conditions	VPT30-2800T			Units
		Min	Typ	Max	
STATIC					
INPUT Voltage ^{4,5}	Continuous	9	28	80	V
	Transient, 1 sec	-	-	100	V
Current	Inhibited	-	1	5	mA
	No Load	-	90	130	mA
Ripple Current ⁶	Full Load, 20Hz to 10MHz	-	30	90	mA
Inhibit Pin Input ⁴		0	-	1.5	V
Inhibit Pin Open Circuit Voltage ⁴		9.0	11.0	13.0	V
UVLO Turn On		9.8	-	11.0	V
UVLO Turn Off ⁴		8.0	-	8.9	V
OUTPUT POWER		0	-	30	W
EFFICIENCY ⁶	Full Load	77	82	-	%
LOAD FAULT POWER DISSIPATION	Short Circuit	-	2	5	W
SWITCHING FREQUENCY	Input	400	500	550	kHz
	Output	325	400	475	kHz
ISOLATION Input / Output / Case	500 V _{DC}	100	-	-	MΩ
ISOLATION Output / Output	100V _{DC}	20	-	-	MΩ
MTBF (MIL-HDBK-217F)	GM @ T _C = 55°C		672		kHrs

Parameter	Conditions	3.3V Output			5V Output			Units	
		Min	Typ	Max	Min	Typ	Max		
STATIC									
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	-	10	0	-	15	W
Current ³	V _{OUT}		0	-	3.0	0	-	3.0	A
Ripple Voltage	V _{OUT}	Full Load, 20Hz to 10MHz	-	40	100	-	40	100	mV _{P-P}
Line Regulation ⁶	V _{OUT}	V _{IN} = 9V to 80V	-	2	20	-	2	20	mV
Load Regulation	V _{OUT}	No Load to Full Load	-	3	30	-	3	30	mV
CAPACITIVE LOAD ⁴			-	-	1000	-	-	1000	μF

See notes on next page.

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

ABSOLUTE MAXIMUM RATINGS

Input Voltage (Continuous)	80 V _{DC}	Junction Temperature Rise to Case	24°C
Input Voltage (Transient, 1 sec)	100 Volts	Storage Temperature	-55°C to +125°C
Output Power	30 Watts	Lead Solder Temperature (10 seconds)	300°C
Power Dissipation ⁶ (Full Load, T _{CASE} = +100°C)	9 Watts	Weight (Maximum)	50 Grams

Parameter	Conditions	3.3V Output			5V Output			Units	
		Min	Typ	Max	Min	Typ	Max		
DYNAMIC									
Load Step Output Transient	V _{OUT}	Half Load to Full Load	-	140	280	-	100	200	mV _{PK}
Load Step Recovery ²			-	120	240	-	90	180	μSec
Line Step Output Transient ^{4,6}	V _{OUT}	V _{IN} = 16V to 40V	-	50	100	-	60	120	mV _{PK}
Line Step Recovery ^{2,4,6}			-	50	100	-	50	100	μSec
Turn On Delay ⁶	V _{OUT}	V _{IN} = 0V to 28V	-	14	20	-	14	20	mSec
Turn On Overshoot ⁶			-	0	15	-	0	25	mV _{PK}

Parameter	Conditions	12V Output			15V Output			Units	
		Min	Typ	Max	Min	Typ	Max		
STATIC									
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	-	15	0	-	15	W
Current ³	V _{OUT}		0	-	1.25	0	-	1.0	A
Ripple Voltage	V _{OUT}	Full Load, 20Hz to 10MHz	-	40	100	-	40	100	mV _{P-P}
Line Regulation ⁶	V _{OUT}	V _{IN} = 9V to 80V	-	2	20	-	2	20	mV
Load Regulation	V _{OUT}	No Load to Full Load	-	3	30	-	3	30	mV
CAPACITIVE LOAD ⁴					500			500	μF
DYNAMIC									
Load Step Output Transient	V _{OUT}	Half Load to Full Load	-	120	240	-	110	220	mV _{PK}
Load Step Recovery ²			-	0	100	-	0	100	μSec
Line Step Output Transient ^{4,6}	V _{OUT}	V _{IN} = 16V to 40V	-	150	300	-	180	360	mV _{PK}
Line Step Recovery ^{2,4,6}			-	50	100	-	50	100	μSec
Turn On Delay ⁶	V _{OUT}	V _{IN} = 0V to 28V	-	14	20	-	14	20	mSec
Turn On Overshoot ⁶			-	0	50	-	0	50	mV _{PK}

- Notes:
1. Dependent on output voltage
 2. Time for output voltage to settle to within 1% of its nominal value
 3. Derate linearly to 0 at 110°C
 4. Verified by qualification testing
 5. Operation down to 9V is possible after the input voltage is taken above 11V to start the module
 6. Tested with a balanced full load of 10W per each output

BLOCK DIAGRAM

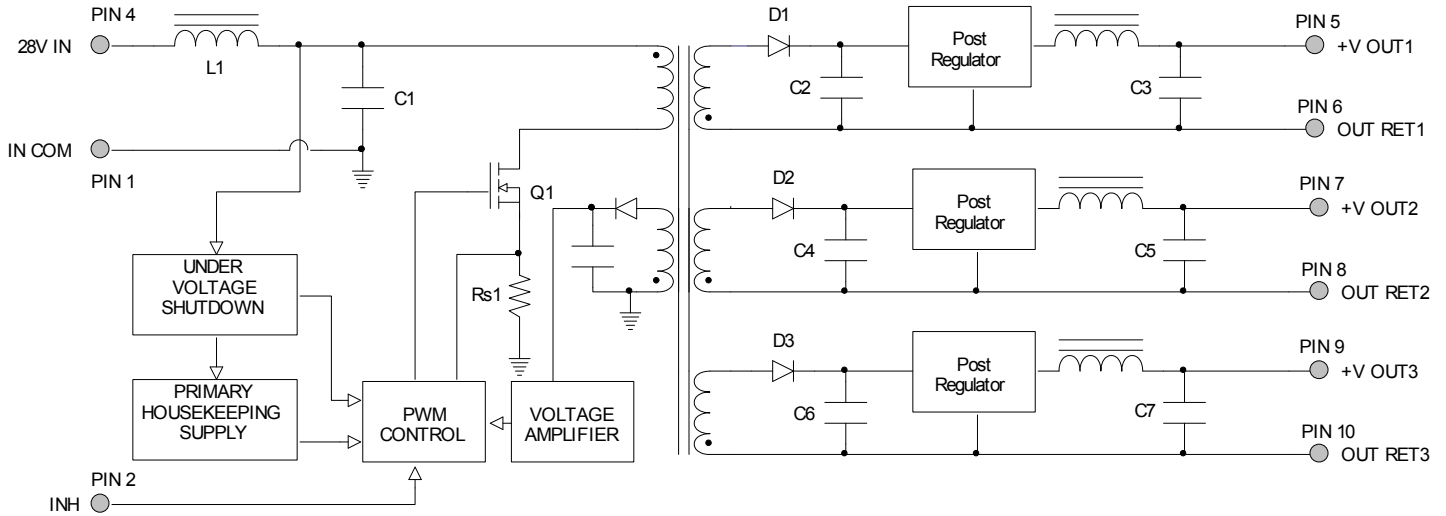


Figure 3

CONNECTION DIAGRAM

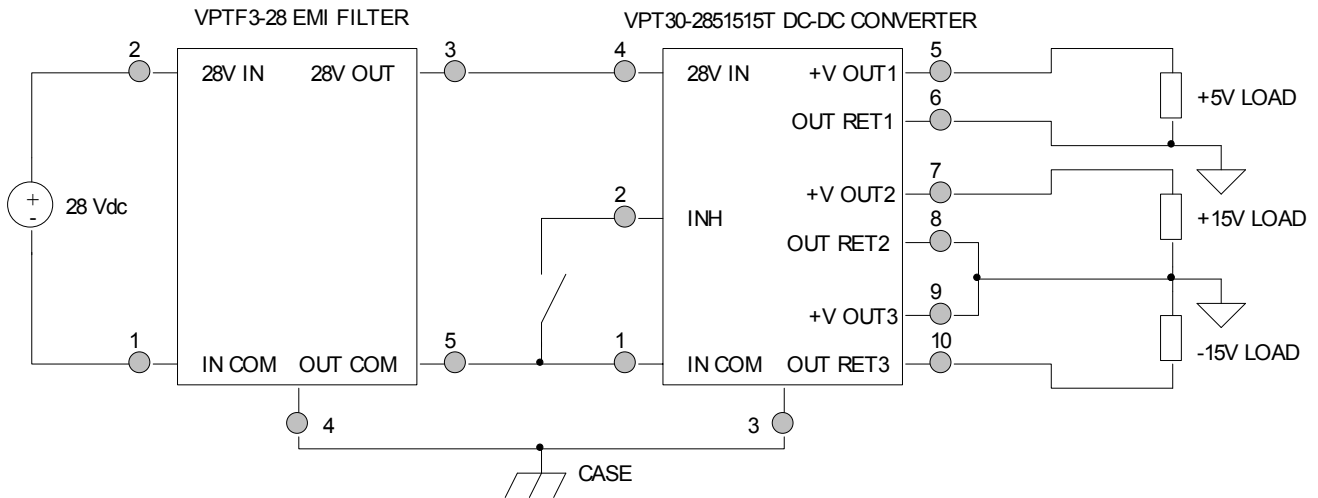


Figure 4

(Shown with optional VPTF3-28 EMI filter, recommended for input voltages > 13V, and optional negative output configuration.)

CONNECTION DIAGRAM

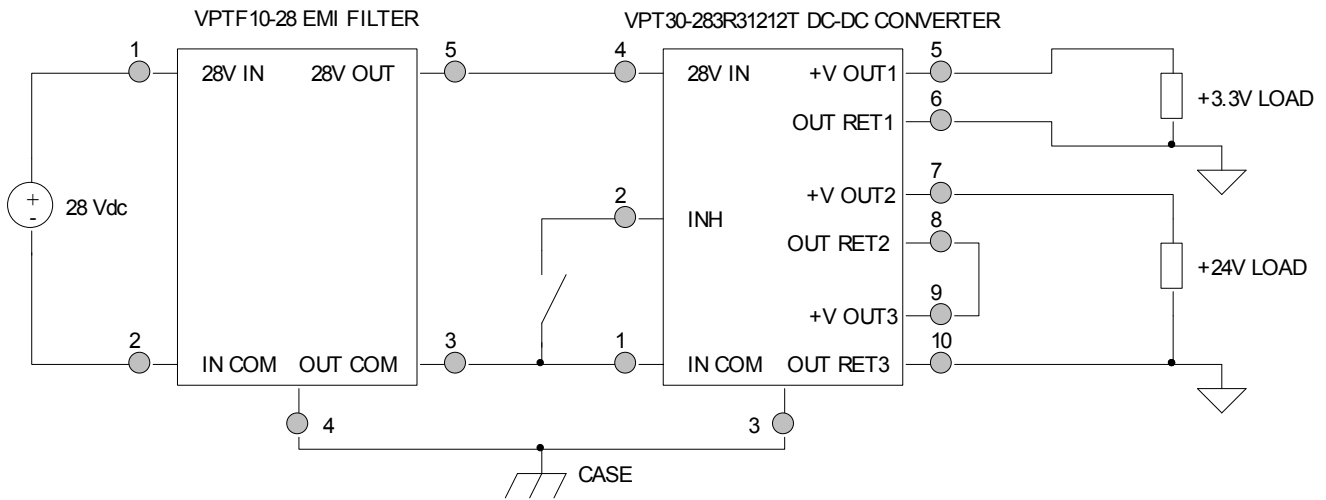


Figure 5

(Shown with optional VPTF10-28 EMI filter, recommended for input voltages < 13V, and optional stacked output configuration.)

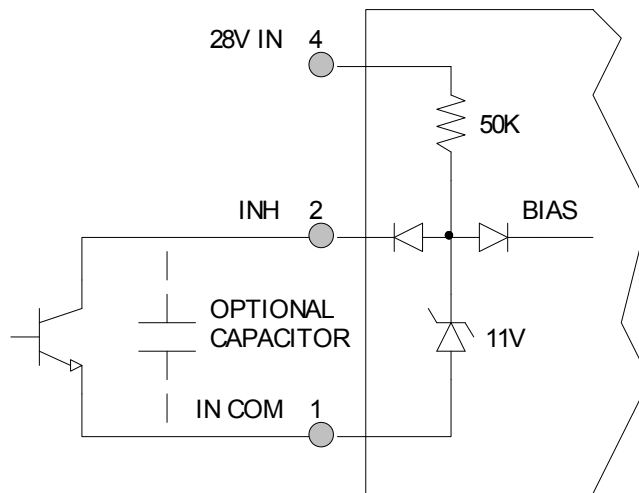


Figure 6 - Inhibit Circuit

(Shown with optional capacitor for turn-on delay)

EFFICIENCY PERFORMANCE CURVES ($T_{CASE} = 25^{\circ}C$, Full Load, Unless Otherwise Specified)

-----	$V_{IN} = 9V$	-----	$V_{IN} = 16V$	-----	$V_{IN} = 28V$	-----	$V_{IN} = 40V$	-----	$V_{IN} = 80V$
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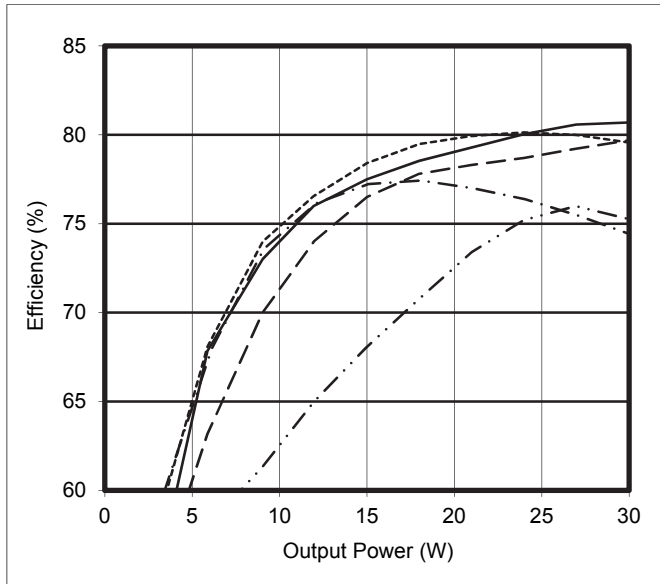


Figure 7 – VPT30-283R31212T
Efficiency (%) vs. Output Power (W)

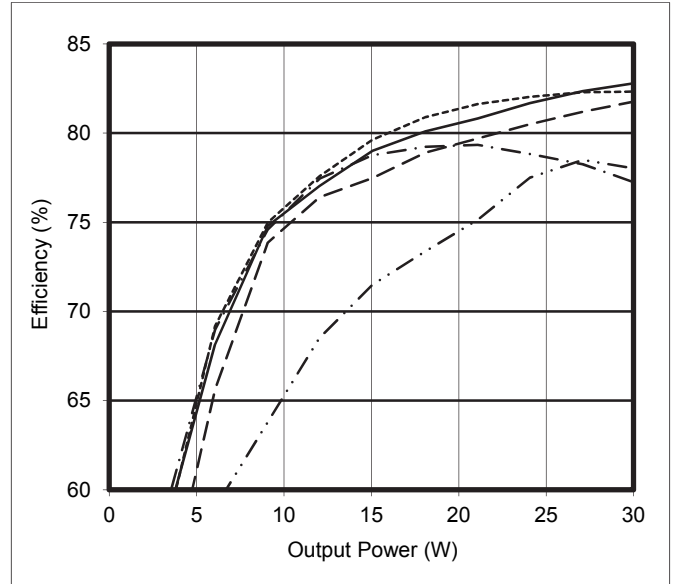


Figure 8 – VPT30-2851515T
Efficiency (%) vs. Output Power (W)

EMI PERFORMANCE CURVES

($T_{CASE} = 25^{\circ}C$, $V_{IN} = +28V \pm 5\%$, Full Load, Unless Otherwise Specified)

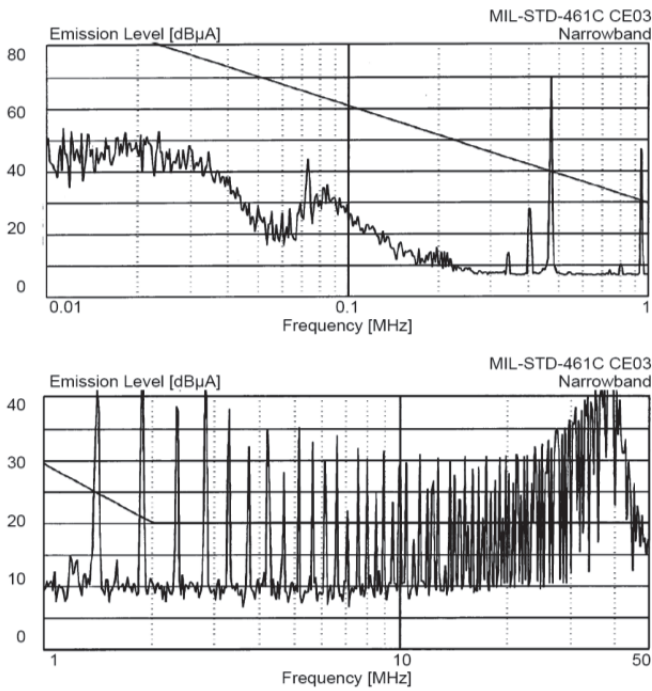


Figure 9 – VPT30-2800T without EMI Filter

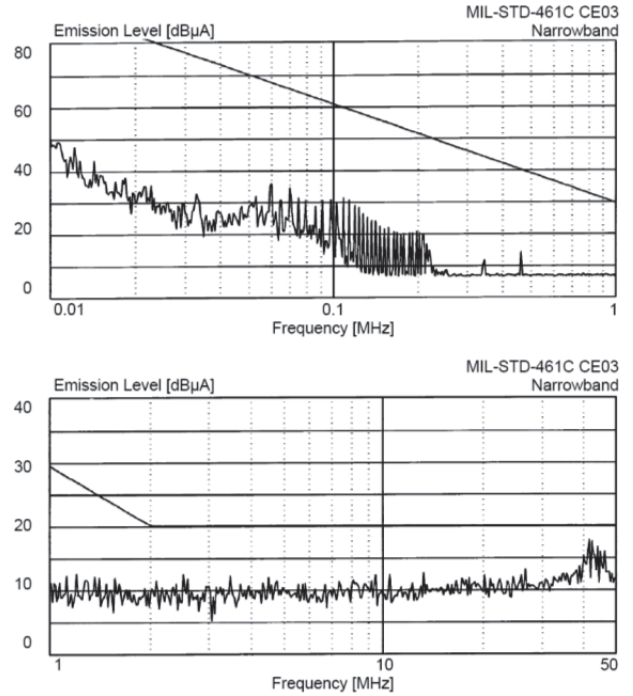


Figure 10 – VPT30-2800T with VPTF3-28 EMI Filter

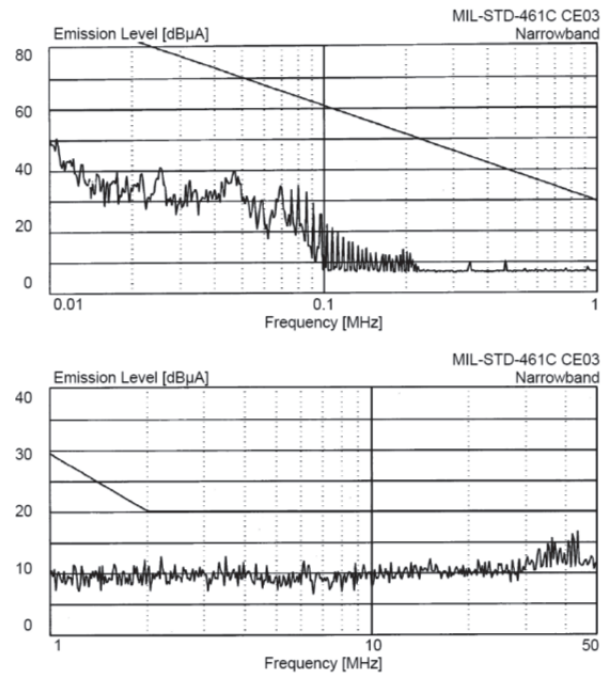


Figure 11 – VPT30-2800T with VPTF10-28 EMI Filter

EMI PERFORMANCE CURVES

($T_{CASE} = 25^{\circ}C$, $V_{IN} = +28V \pm 5\%$, Full Load, Unless Otherwise Specified)

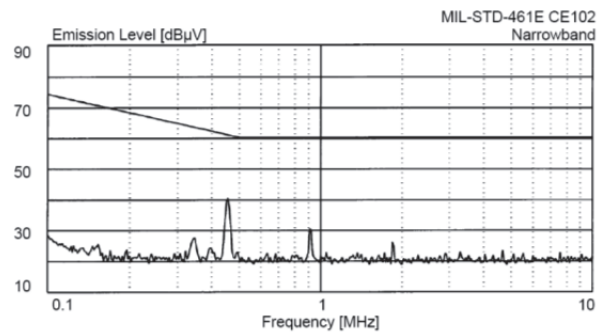
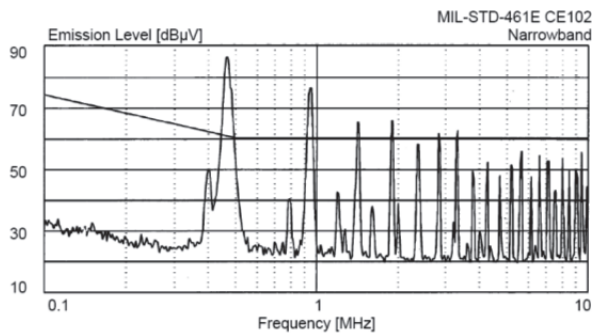
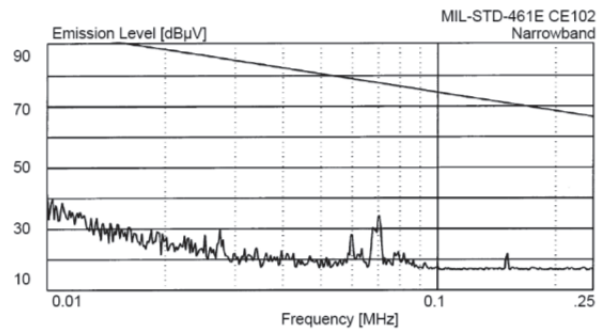
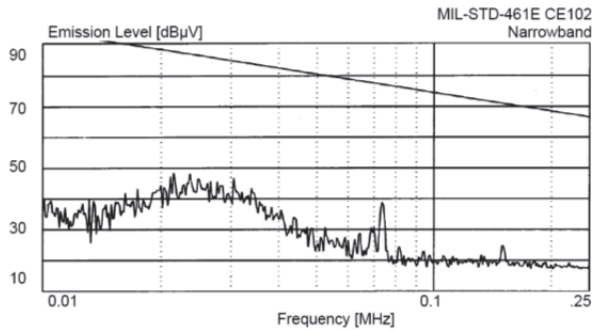


Figure 12 – VPT30-2800T without EMI Filter

Figure 13 – VPT30-2800T with VPTF3-28 EMI Filter

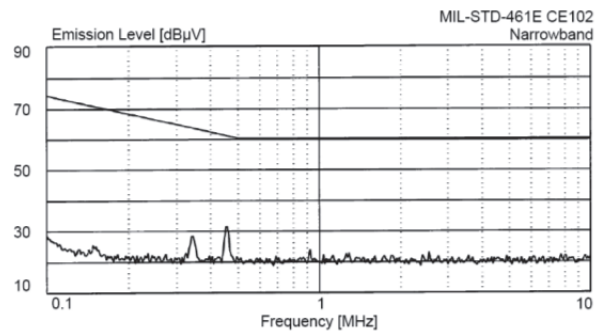
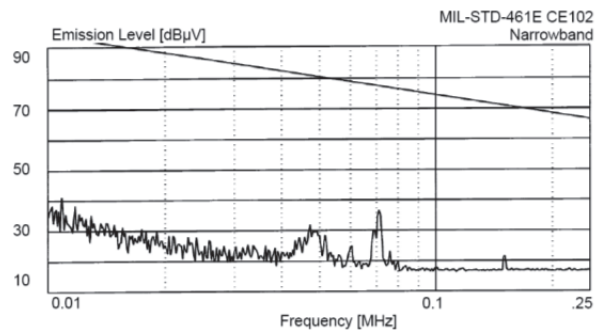


Figure 14 – VPT30-2800T with VPTF10-28 EMI Filter

STANDARD METAL PACKAGE

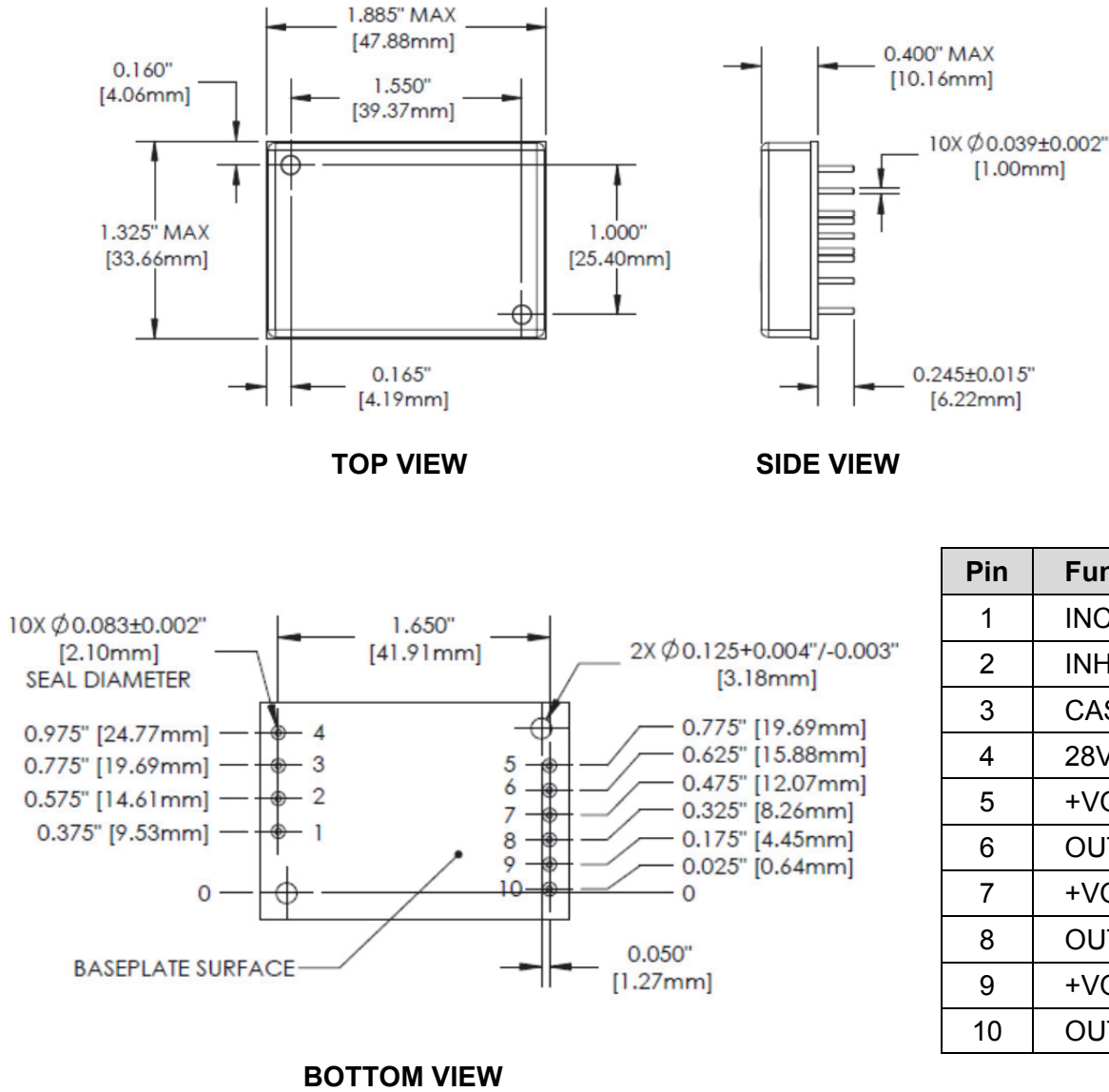
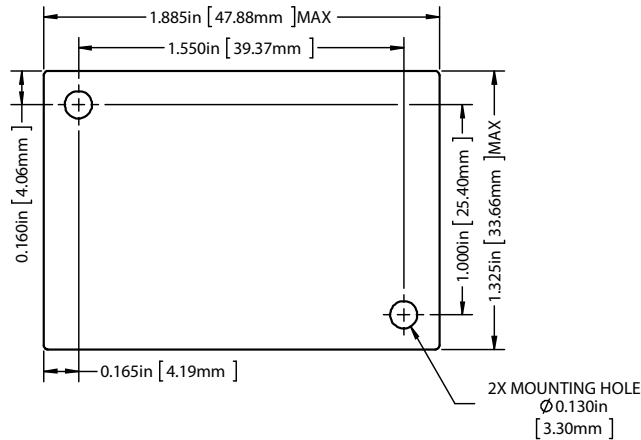


Figure 15 – Package and Pinout
(Dimensional Limits are ± 0.005 " Unless Otherwise Stated)

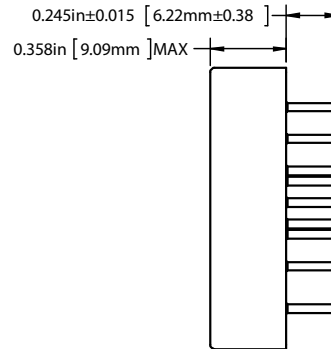
Package Notes

- Case temperature is measured on the center of the baseplate surface.
- Materials: Baseplate – aluminum, conductive conversion coating.
Cover – nickel plated.
Pins - copper, gold over nickel plating.
- Mounting holes are not threaded. Recommended fastener is 4-40.
- This Package is not hermetic. VPT offers a wide range of hermetic products. Please contact VPT for details if hermetic products are required.

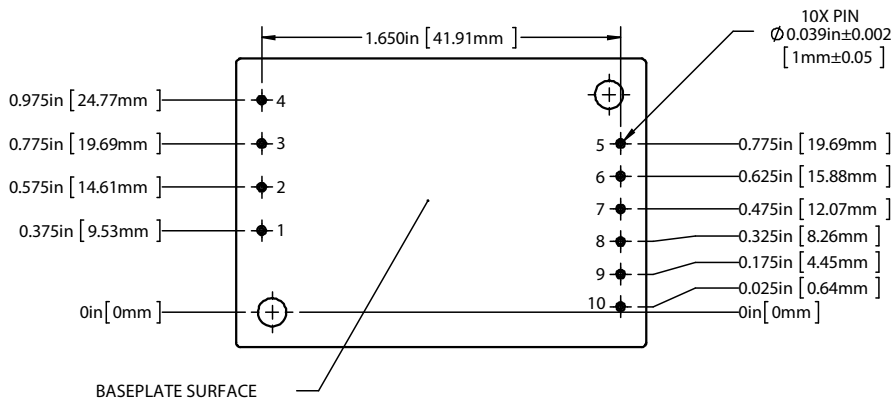
OPTIONAL EPOXY ENCAPSULATED PACKAGE



TOP VIEW



SIDE VIEW



BOTTOM VIEW

Pin	Function
1	INCOM
2	INHIBIT
3	CASE
4	28V IN
5	+VOUT1
6	OUTRET1
7	+VOUT2
8	OUTRET2
9	+VOUT3
10	OUTRET3

Figure 16 – Package and Pinout
(Dimensional Limits are ±0.005" Unless Otherwise Stated)

Package Notes

- Case temperature is measured on the center of the baseplate surface.
- Materials: Body - epoxy with integral metalized EMI shield.
Pins - copper, gold over nickel plating.
- Mounting holes are not threaded. Recommended fastener is 4-40.
- This package is highly resistant to chemical, solvent and salt environments and is fully compatible with high volume manufacturing processes including wave solder, cleaning solvents, high pressure sprays and aqueous wash processes.

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.

100% ENVIRONMENTAL SCREENING

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



ORDERING INFORMATION

VPT30-	28	5	15	15	T	W
1	2	3	4	5	6	7

(1) Product Series	(2) Nominal Input Voltage		(3) Output 1		(4) Outputs 2		(5) Outputs 3	
VPT30-	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

(6) Number of Outputs		(7) Package Option	
T	Triple	None W	Standard Metal Epoxy Encapsulated

This commercially available product series was specifically designed to accommodate factory configurable output voltage combinations in addition to those defined per the product ordering information table. Please contact your sales representative or the VPT Inc. Sales Department for more information.

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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