VPT100+2800D Series

HIGH RELIABILITY COTS DC-DC CONVERTERS

DESCRIPTION

The VPT100 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. A high efficiency design reduces input power requirements and eases thermal management. 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 VPT100 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 100 Watts Maximum Output Power
- High Efficiency, Up to 89%
- Wide Input Voltage Range: 16 to 40 Volts per MIL-STD-704 and MIL-STD-1275
- High Input Transient Voltage: 50 Volts for 1 sec
- 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, -55°C to 100°C
- Internally Conformal Coated
- Six Sided Non-Hermetic Rugged Metal Enclosure
- Meets MIL-STD-461 Revisions C, D, E and F EMC Requirements When Used With VPT's EMI Filters

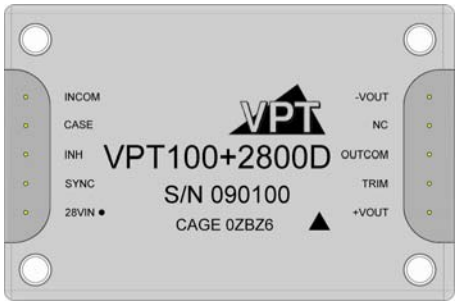

Figure 1 – VPT100+2800D Converter
(Not To Scale)

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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)	40 V_{DC}	Junction Temperature Rise to Case	+17°C
Input Voltage (Transient, 1 second)	50 Volts	Storage Temperature	-55°C to +125°C
Output Power	100 Watts	Lead Solder Temperature (10 seconds)	300°C
Power Dissipation (Full Load, T_{CASE} = +100°C)	17 Watts	Weight (Maximum)	76 Grams

Parameter		Conditions	VPT100+2812D			VPT100+2815D			Units
			Min	Typ	Max	Min	Typ	Max	
STATIC									
INPUT Voltage[3]		Continuous	16	28	40	16	28	40	V
		Transient, 1 sec	-	-	50	-	-	50	V
Current		Inhibited	-	-	5	-	-	5	mA
		No Load	-	50	100	-	50	100	mA
Ripple Current		Full Load[4], 20Hz to 10MHz	-	-	200	-	-	200	mA_{p-p}
Inhibit Pin Input[3]			0	-	1.5	0	-	1.5	V
Inhibit Pin Open Circuit Voltage[3]			9.0	12.0	14.0	9.0	12.0	14.0	V
UVLO Turn On			14.5	-	15.8	14.5	-	15.8	V
UVLO Turn Off[3]			14.0	-	15.0	14.0	-	15.0	V
OUTPUT Voltage[4]	$+V_{OUT}$	T_{CASE} = 25°C	11.82	12.0	12.18	14.775	15.0	15.225	V
	$+V_{OUT}$	T_{CASE} = -55°C to +100°C	11.70	12.0	12.30	14.625	15.0	15.375	V
	$-V_{OUT}$	T_{CASE} = 25°C	11.70	12.0	12.30	14.625	15.0	15.375	V
	$-V_{OUT}$	T_{CASE} = -55°C to +100°C	11.58	12.0	12.42	14.475	15.0	15.525	V
Power[2,5]	Total		-	-	100	-	-	100	W
	$\pm V_{OUT}$	Either Output	-	-	70	-	-	70	W
Current[2,5]	$\pm V_{OUT}$	Either Output	-	-	5.83	-	-	4.66	A
Ripple Voltage	$\pm V_{OUT}$	Full Load[4], 20Hz to 10MHz	-	-	100	-	-	100	mV_{p-p}
Line Regulation	$+V_{OUT}$	V_{IN} = 16V to 40V	-	-	20	-	-	20	mV
	$-V_{OUT}$	V_{IN} = 16V to 40V	-	-	100	-	-	100	mV
Load Regulation	$+V_{OUT}$	No Load to Full Load[4]	-	-	100	-	-	100	mV
	$-V_{OUT}$	No Load to Full Load[4]	-	-	150	-	-	150	mV
Cross Regulation	$-V_{OUT}$	+Load 70%, -Load 30% +Load 30%, -Load 70%	-	-	450	-	-	450	mV
EFFICIENCY		Full Load[4]	86	88	-	87	89	-	%
LOAD FAULT POWER DISSIPATION		Overload[3]	-	-	24	-	-	24	W
		Short Circuit	-	-	24	-	-	24	W
CAPACITIVE LOAD[3]		Either Output	-	-	500	-	-	500	µF
SWITCHING FREQUENCY			300	-	380	300	-	380	kHz
SYNC FREQUENCY RANGE		$V_H - V_L$ = 5V, DC = 20-80%	300	-	380	300	-	380	kHz
ISOLATION		500 V_{DC}, T_{CASE} = 25°C	100	-	-	100	-	-	MΩ
MTBF (MIL-HDBK-217F)		GM @ T_C = 55°C	-	344	-	-	344	-	kHrs

See notes next page.

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

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Parameter		Conditions	VPT100+2812D			VPT100+2815D			Units
			Min	Typ	Max	Min	Typ	Max	
DYNAMIC									
Load Step Output Transient	$\pm V_{OUT}$	Half Load to Full Load	-	-	600	-	-	600	mV_{PK}
Load Step Recovery[1]			-	-	300	-	-	300	µSec
Line Step Output Transient[3]	$\pm V_{OUT}$	V_{IN} = 16V to 40V	-	-	900	-	-	1200	mV_{PK}
Line Step Recovery[1,3]			-	-	300	-	-	300	µSec
Turn On Delay	$\pm V_{OUT}$	V_{IN} = 0V to 28V	-	6	10	-	6	10	mSec
Turn On Overshoot			-	0	50	-	0	50	mV_{PK}

Notes:
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. Half load at $+V_{OUT}$ and half load at $-V_{OUT}$.
5. Up to 70% of the total power or current can be drawn from any one of the two outputs.

BLOCK DIAGRAM

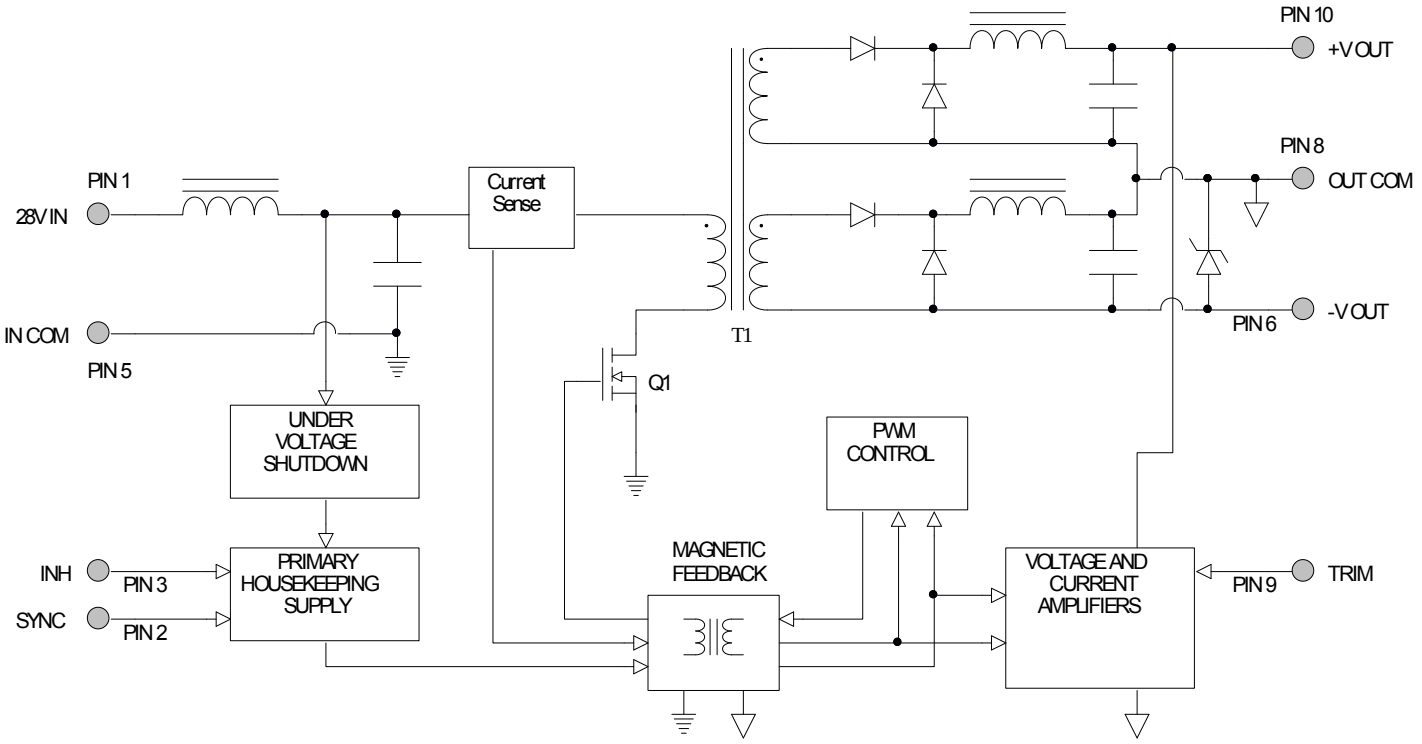


Figure 2

CONNECTION DIAGRAM

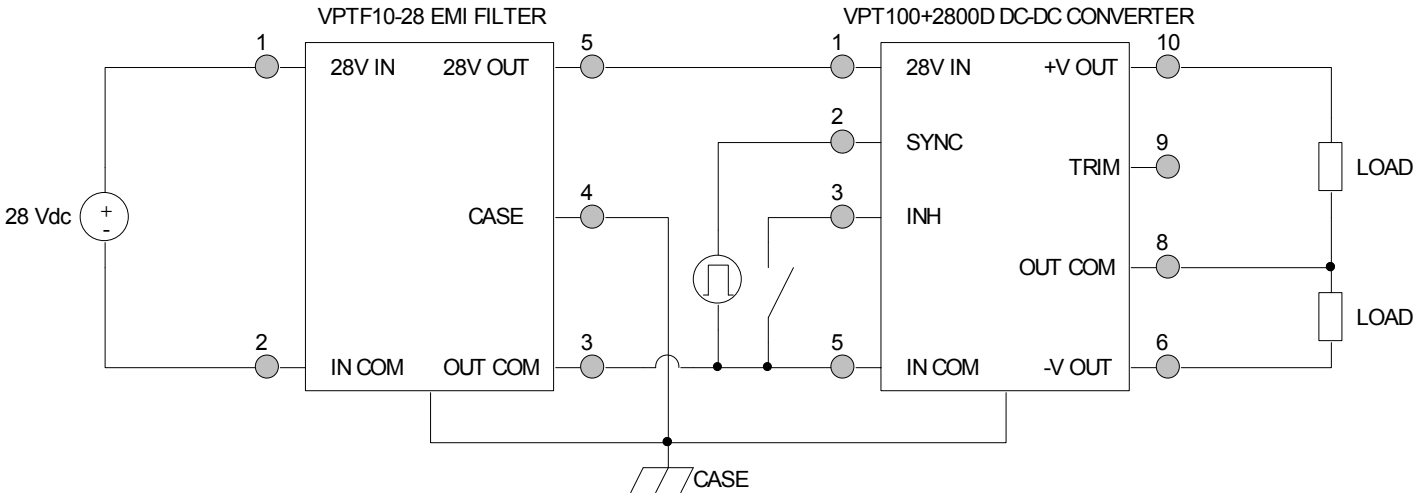


Figure 3

CONNECTION DIAGRAMS

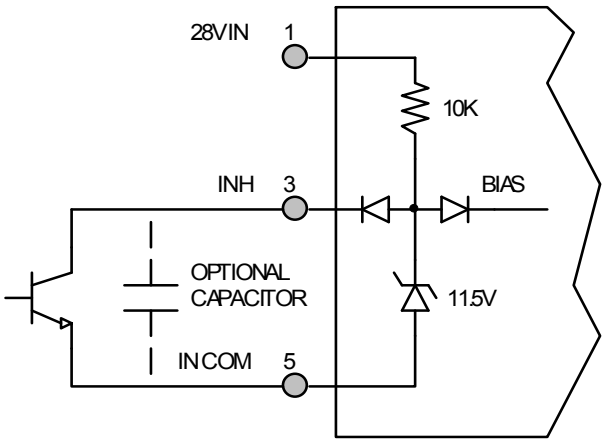


Figure 4 – Inhibit Circuit
(Shown with optional capacitor for turn-on delay)

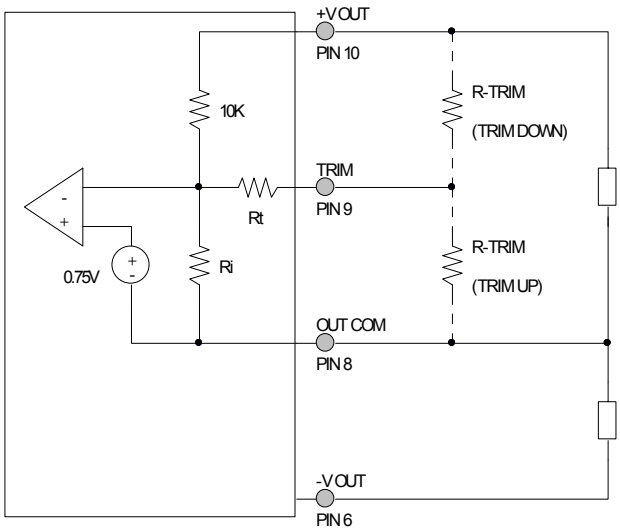


Figure 5 – Output Voltage Trim Circuit

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.

VPT100+2812D		VPT100+2815D	
$\pm V_{OUT}$ (V)	R_{TRIM} (Ω)	$\pm V_{OUT}$ (V)	R_{TRIM} (Ω)
13.2	1.14k	16.50	686
13.0	2.39k	16.25	1.69k
12.8	4.26k	16.00	3.19k
12.6	7.39k	15.75	5.7k
12.4	13.6k	15.50	10.7k
12.2	32.4k	15.25	25.9k
12.0	--	15.00	--
11.8	548k	14.75	551k
11.6	266k	14.50	270k
11.4	172k	14.25	175k
11.2	126k	14.00	128k
11.0	97.4k	13.75	99.5k
10.8	78.6k	13.50	80.6k
10.6	65.3k	13.25	67k
10.4	55.2k	13.00	56.9k
10.2	47.4k	12.75	49k
10.0	41.1k	12.50	42.6k
9.8	36k	12.25	37.5k
9.6	31.8k	12.00	33.2k

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

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

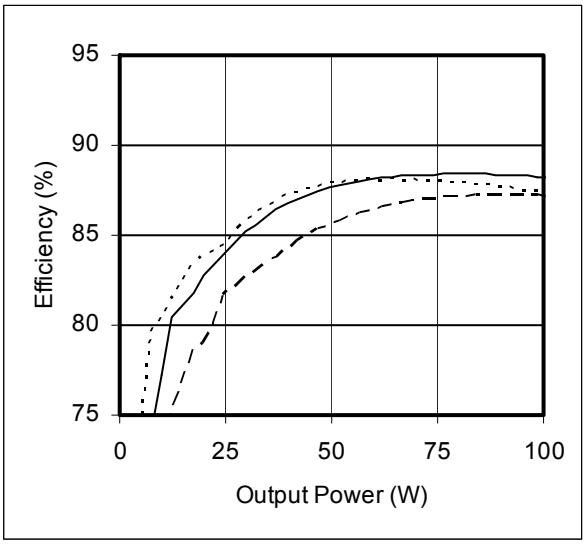


Figure 6 – VPT100+2812D
Efficiency (%) vs. Output Power (W)

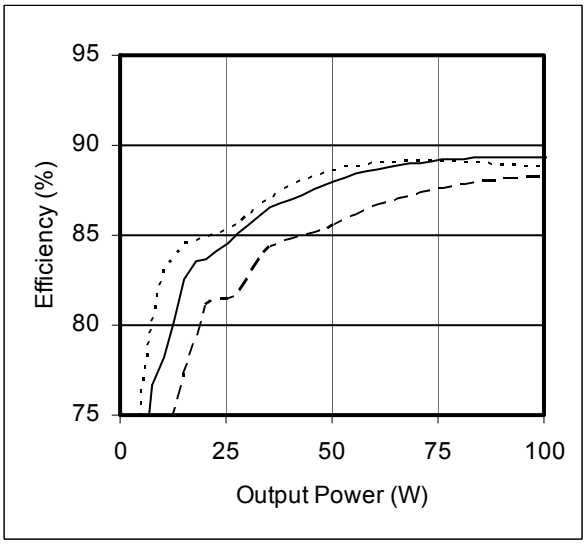


Figure 7 – VPT100+2815D
Efficiency (%) vs. Output Power (W)

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

+Io = 10%	+Io = 30%	+Io = 50%	+Io = 70%

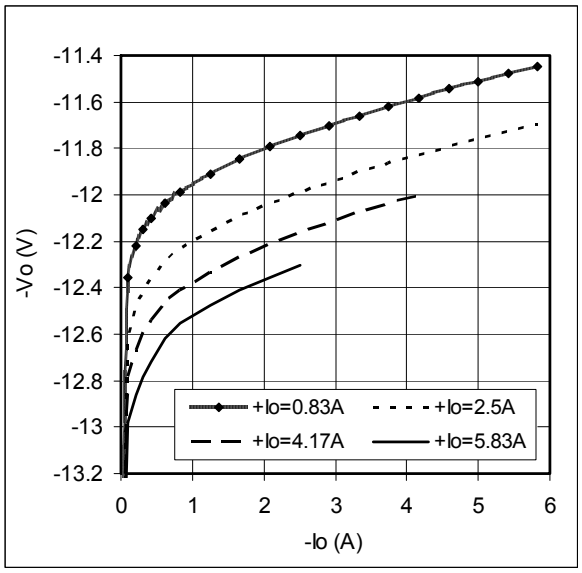


Figure 8 – VPT100+2812D
-Vout (V) vs. -Iout (A)

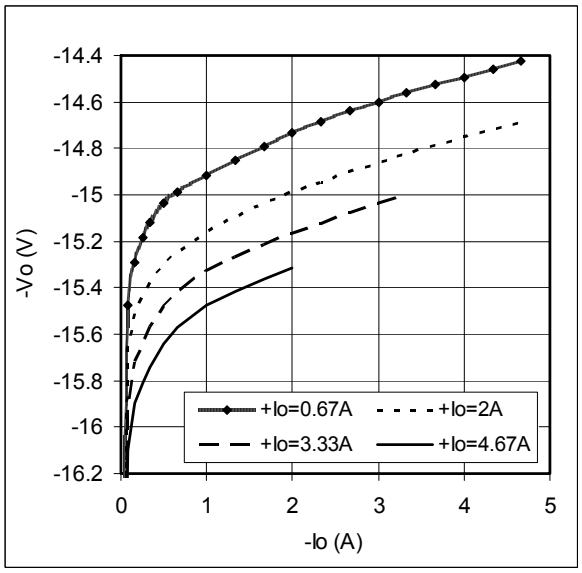


Figure 9 – VPT100+2815D
-Vout (V) vs. -Iout (A)

EMI PERFORMANCE CURVES

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

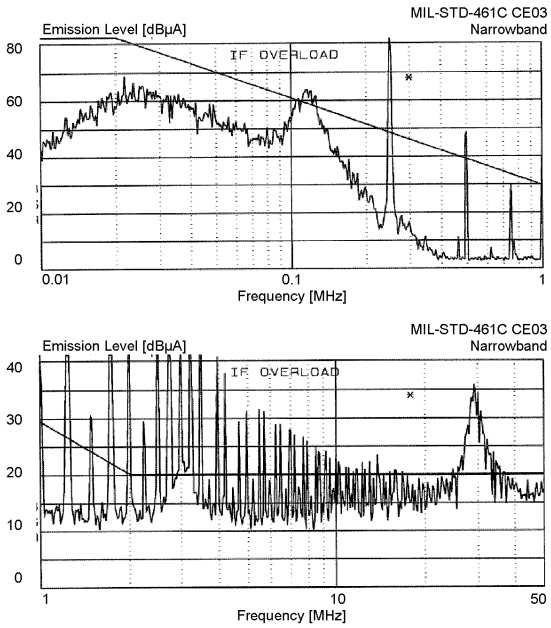


Figure 10 – VPT100+2800D without EMI Filter

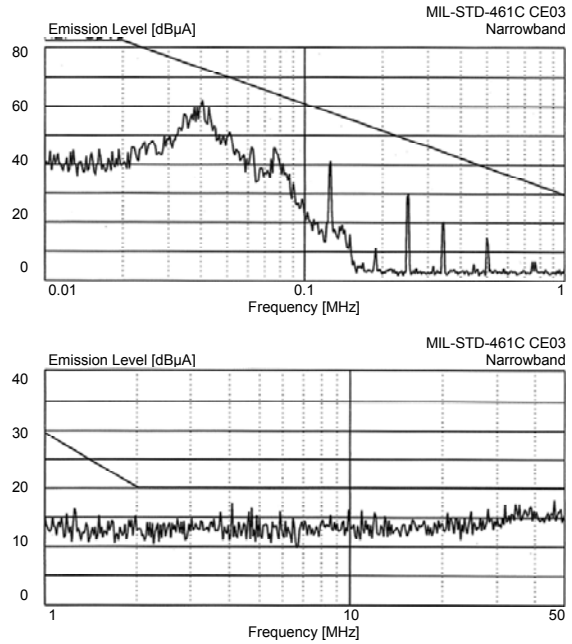


Figure 11 – VPT100+2800D with VPTF Series EMI Filter

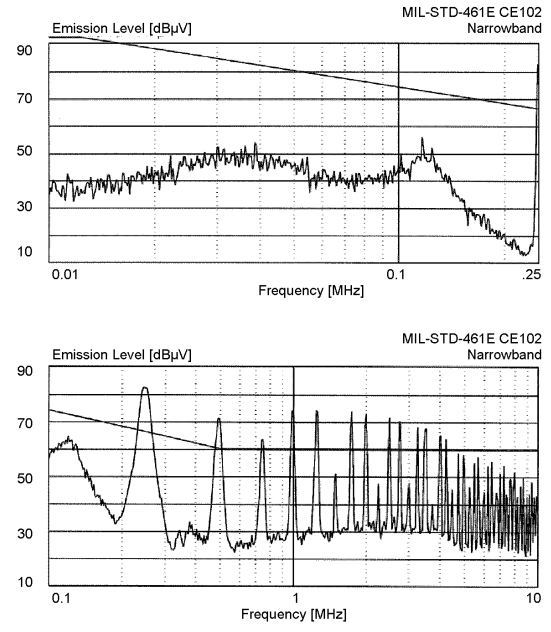


Figure 12 – VPT100+2800D without EMI Filter

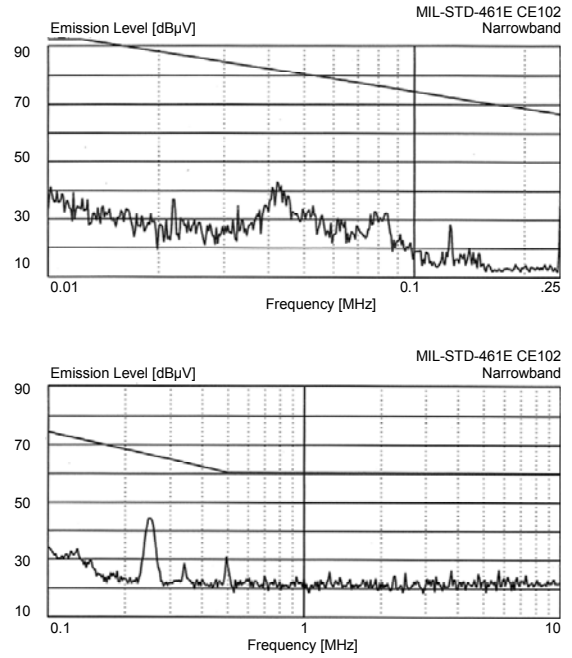
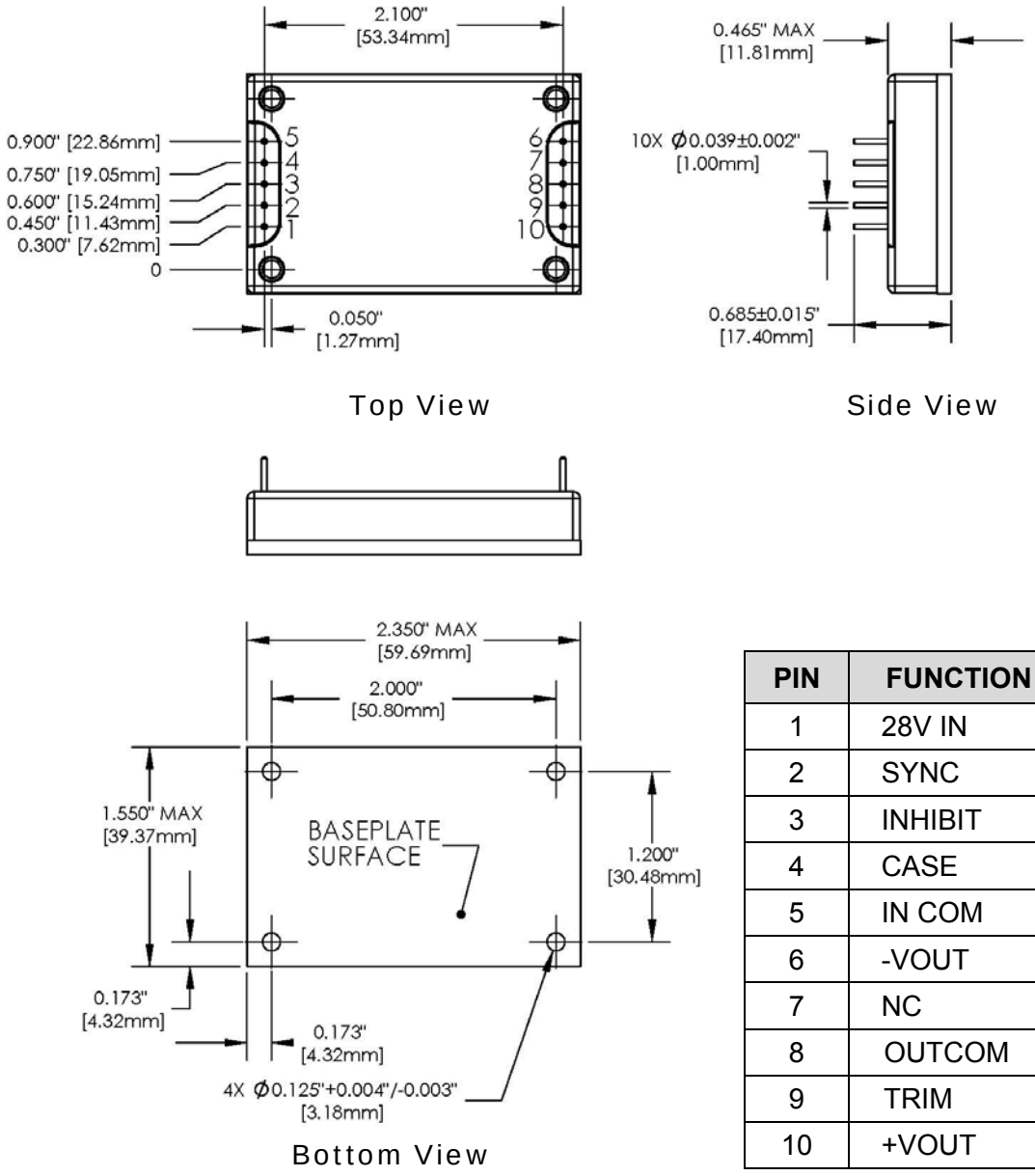


Figure 13 – VPT100+2800D with VPTF Series EMI Filter

PACKAGE SPECIFICATIONS



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

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	28VIN	Positive Input Voltage Connection
2	SYNC	Input Synchronization Signal. TTL squarewave, 5Vpp, 20 - 80% duty cycle, internally capacitively coupled.
3	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.
4	CASE	Case Connection
5	INCOM	Input Return Connection
6	-VOUT	Negative Output Voltage Connection
7	NC	No Connection.
8	OUTCOM	Output Return Connection
9	TRIM	Trim Output Voltage to +10%, -20% of Nominal Value. Leave open if not used.
10	+VOUT	Positive Output Voltage Connection

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	96 hours at +100°C
Final Electrical	100% at 25°C
External Visual	MIL-STD-883, Method 2009

ORDERING INFORMATION

VPT100+	28	12	D
1	2	3	4

(1)	(2)		(3)		(4)	
Product Series	**Nominal Input Voltage**		**Output Voltage**		**Number of Outputs**	
VPT100+	**28**	28 Volts	**12** **15**	12 Volts 15 Volts	**D**	Dual

CONTACT INFORMATION

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