



# VPT100-2800S 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 using synchronous rectification 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 fully encapsulated and 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. Individual component lot traceability is also maintained.

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 91%
- 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
- Fully Encapsulated
- Six Sided Metal Rugged Enclosure
- Meets MIL-STD-461C/D/E Conducted Emissions Requirements When Used With a VPTF series EMI Filter



**Figure 1 – VPT100-2800S Converter**  
(Not To Scale)



# VPT100-2800S Series

SPECIFICATIONS ( $T_{CASE} = -55^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$ ,  $V_{IN} = +28\text{V} \pm 5\%$ , 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 <sup>1</sup>	100 Watts	Lead Solder Temperature (10 seconds)	300°C
Power Dissipation (Full Load, $T_{CASE} = +100^{\circ}\text{C}$ )	18 Watts	Weight (Maximum)	90 Grams

Parameter		Conditions	VPT100-283R3S			VPT100-2805S			Units
			Min	Typ	Max	Min	Typ	Max	
STATIC									
INPUT Voltage <sup>4</sup>		Continuous	16	28	40	16	28	40	V
		Transient, 1 sec	-	-	50	-	-	50	V
Current		Inhibited	-	-	5	-	-	5	mA
		No Load	-	130	200	-	130	200	mA
Ripple Current		Full Load, 20Hz to 10MHz	-	-	120	-	-	150	mA <sub>p-p</sub>
Inhibit Pin Input <sup>4</sup>			0	-	1.5	0	-	1.5	V
Inhibit Pin Open Circuit Voltage <sup>4</sup>			9.0	11.0	13.0	9.0	11.0	13.0	V
UVLO Turn On			14.5	-	15.8	14.5	-	15.8	V
UVLO Turn Off <sup>4</sup>			14.0	-	15.0	14.0	-	15.0	V
OUTPUT Voltage	V <sub>OUT</sub>	T <sub>CASE</sub> = 25°C	3.267	3.30	3.333	4.95	5.00	5.05	V
	V <sub>OUT</sub>	T <sub>CASE</sub> = -55°C to +100°C	3.25	3.30	3.35	4.925	5.00	5.075	V
Power <sup>3</sup>			0	-	66	0	-	100	W
Current <sup>3</sup>	V <sub>OUT</sub>		0	-	20	0	-	20	A
Ripple Voltage	V <sub>OUT</sub>	Full Load, 20Hz to 10MHz	-	-	150	-	-	150	mV <sub>p-p</sub>
Line Regulation	V <sub>OUT</sub>	V <sub>IN</sub> = 16V to 40V	-	-	20	-	-	20	mV
Load Regulation	V <sub>OUT</sub>	No Load to Full Load	-	-	50	-	-	50	mV
EFFICIENCY			83	87	-	85	89	-	%
LOAD FAULT POWER DISSIPATION		Overload <sup>4</sup>	-	-	18	-	-	18	W
		Short Circuit	-	-	18	-	-	18	W
CAPACITIVE LOAD <sup>4</sup>			-	-	1000	-	-	1000	μF
SWITCHING FREQUENCY			230	260	290	230	260	290	kHz
SYNC FREQUENCY RANGE		V <sub>H</sub> -V <sub>L</sub> =5V Duty Cycle = 50%	240	-	325	240	-	325	kHz
ISOLATION		500 V <sub>DC</sub>	100	-	-	100	-	-	MΩ
MTBF (MIL-HDBK-217F)		GM @ T <sub>C</sub> = 55°C	-	TBD	-	-	TBD	-	kHrs
DYNAMIC									
Load Step Output Transient	V <sub>OUT</sub>	Half Load to Full Load	-	-	400	-	-	400	mV <sub>PK</sub>
Load Step Recovery <sup>2</sup>			-	-	500	-	-	500	μSec
Line Step Output Transient <sup>4</sup>	V <sub>OUT</sub>	V <sub>IN</sub> = 16V to 40V	-	-	300	-	-	300	mV <sub>PK</sub>
Line Step Recovery <sup>2, 4</sup>			-	-	150	-	-	150	μSec
Turn On Delay	V <sub>OUT</sub>	V <sub>IN</sub> = 0V to 28V	-	6	10	-	6	10	mSec
Turn On Overshoot			-	0	15	-	0	25	mV <sub>PK</sub>

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.



# VPT100-2800S Series

SPECIFICATIONS ( $T_{CASE} = -55^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$ ,  $V_{IN} = +28\text{V} \pm 5\%$ , Full Load, Unless Otherwise Specified)

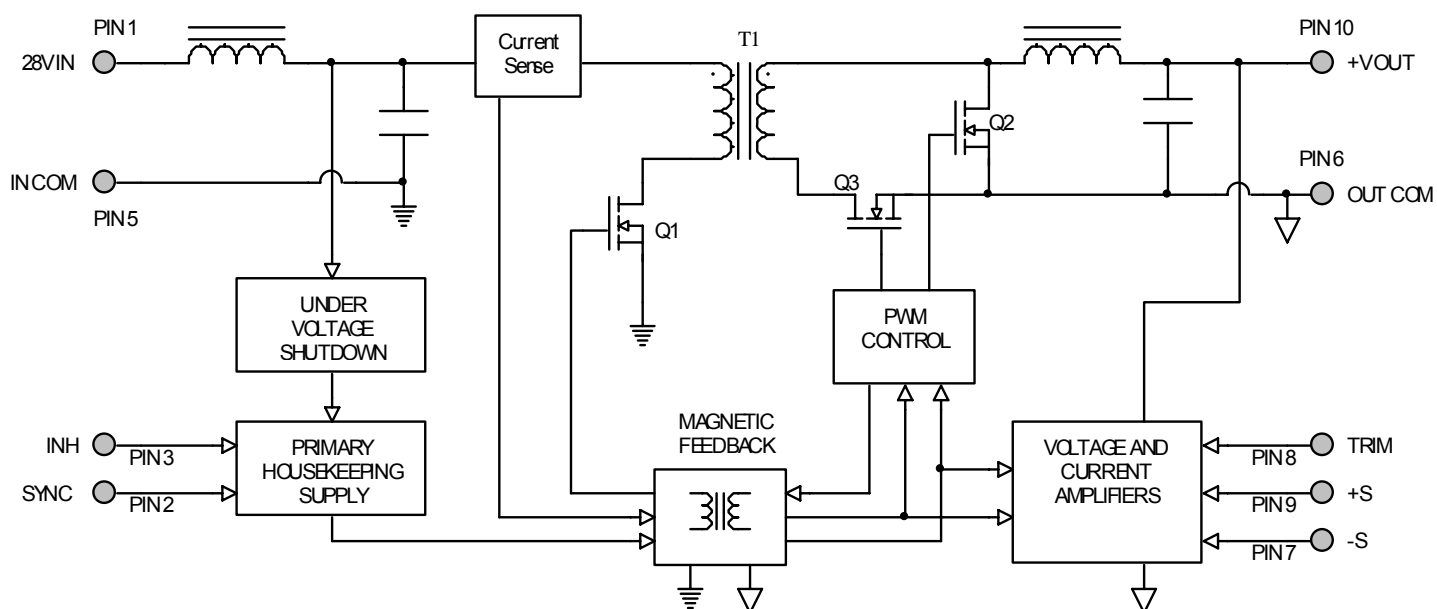
## ABSOLUTE MAXIMUM RATINGS

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 <sup>1</sup>	100 Watts	Lead Solder Temperature (10 seconds)	300°C
Power Dissipation (Full Load, $T_{CASE} = +100^{\circ}\text{C}$ )	18 Watts	Weight (Maximum)	90 Grams

Parameter		Conditions	VPT100-2812S			VPT100-2815S			Units
			Min	Typ	Max	Min	Typ	Max	
STATIC									
INPUT Voltage <sup>4</sup>		Continuous	16	28	40	16	28	40	V
		Transient, 1 sec	-	-	50	-	-	50	V
Current		Inhibited	-	-	5	-	-	5	mA
		No Load	-	100	200	-	100	200	mA
Ripple Current		Full Load, 20Hz to 10MHz	-	-	150	-	-	150	mA <sub>p-p</sub>
Inhibit Pin Input <sup>4</sup>			0	-	1.5	0	-	1.5	V
Inhibit Pin Open Circuit Voltage <sup>4</sup>			9.0	11.0	13.0	9.0	11.0	13.0	V
UVLO Turn On			14.5	-	15.8	14.5	-	15.8	V
UVLO Turn Off <sup>4</sup>			14.0	-	15.0	14.0	-	15.0	V
OUTPUT Voltage	V <sub>OUT</sub>	T <sub>CASE</sub> = 25°C	11.88	12.0	12.12	14.85	15.0	15.15	V
	V <sub>OUT</sub>	T <sub>CASE</sub> = -55°C to +100°C	11.76	12.0	12.24	14.70	15.0	15.30	V
Power <sup>3</sup>			0	-	100	0	-	100	W
Current <sup>3</sup>	V <sub>OUT</sub>		0	-	8.33	0	-	6.67	A
Ripple Voltage	V <sub>OUT</sub>	Full Load, 20Hz to 10MHz	-	-	200	-	-	200	mV <sub>p-p</sub>
Line Regulation	V <sub>OUT</sub>	V <sub>IN</sub> = 16V to 40V	-	-	20	-	-	20	mV
Load Regulation	V <sub>OUT</sub>	No Load to Full Load	-	-	100	-	-	100	mV
EFFICIENCY			86	90	-	86	90	-	%
LOAD FAULT POWER DISSIPATION		Overload <sup>4</sup>	-	-	18	-	-	18	W
		Short Circuit	-	-	18	-	-	18	W
CAPACITIVE LOAD <sup>4</sup>			-	-	500	-	-	500	μF
SWITCHING FREQUENCY			300	340	380	300	340	380	kHz
SYNC FREQUENCY RANGE		V <sub>H</sub> -V <sub>L</sub> =5V Duty Cycle = 50%	300	-	380	300	-	380	kHz
ISOLATION		500 V <sub>DC</sub>	100	-	-	100	-	-	MΩ
MTBF (MIL-HDBK-217F)		GM @ T <sub>C</sub> = 55°C	-	TBD	-	-	TBD	-	kHrs
DYNAMIC									
Load Step Output Transient	V <sub>OUT</sub>	Half Load to Full Load	-	-	800	-	-	800	mV <sub>PK</sub>
Load Step Recovery <sup>2</sup>			-	-	500	-	-	500	μSec
Line Step Output Transient <sup>4</sup>	V <sub>OUT</sub>	V <sub>IN</sub> = 16V to 40V	-	-	300	-	-	300	mV <sub>PK</sub>
Line Step Recovery <sup>2, 4</sup>			-	-	150	-	-	150	μSec
Turn On Delay	V <sub>OUT</sub>	V <sub>IN</sub> = 0V to 28V	-	6	10	-	6	10	mSec
Turn On Overshoot			-	0	50	-	0	50	mV <sub>PK</sub>

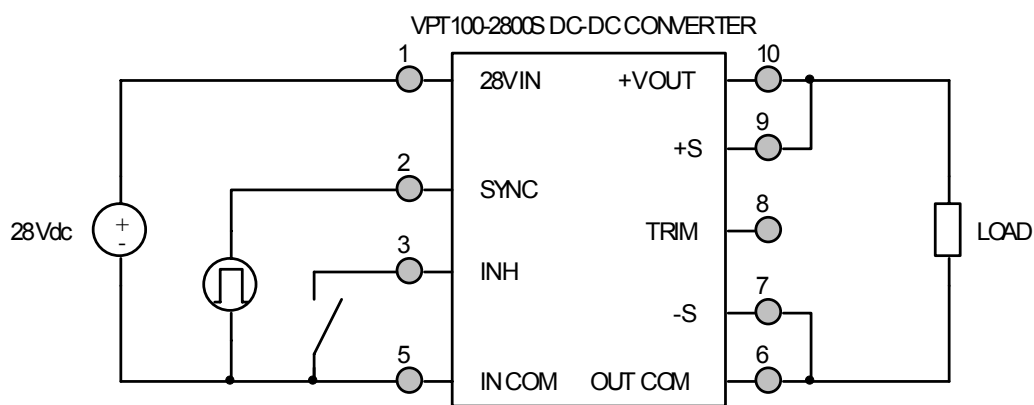
Notes: 1. Dependant on output voltage. 2. Time for output voltage to settle within 1% of its nominal value.  
3. Derate linearly to 0 at 110°C. 4. Verified by qualification testing.

### BLOCK DIAGRAM



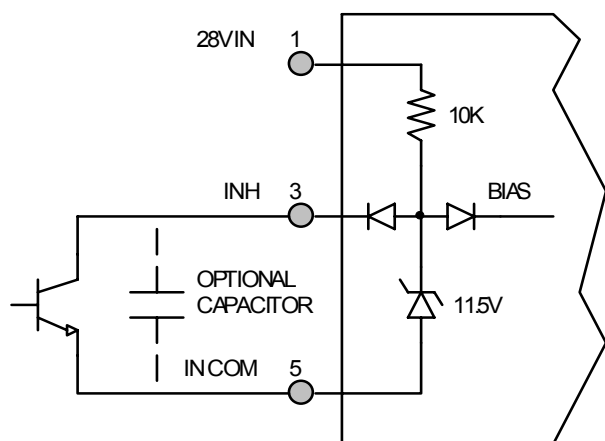
### Figure 2

## CONNECTION DIAGRAM



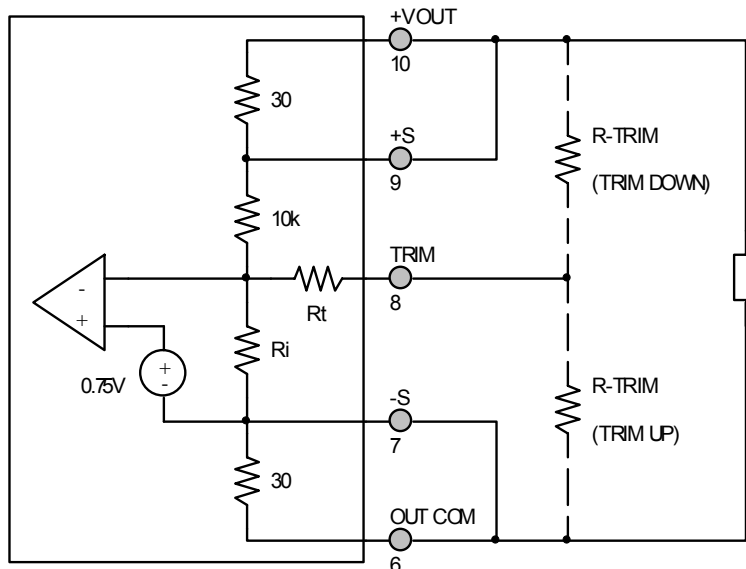
### Figure 3

## CONNECTION DIAGRAMS



**Figure 4** –Inhibit Circuit

(Shown with optional capacitor for turn-on delay)



**Figure 5** –Output Voltage Trim Circuit

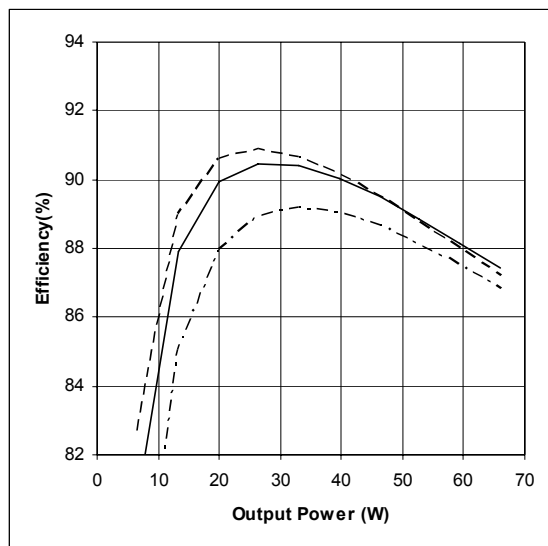
## OUTPUT VOLTAGE TRIM

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.

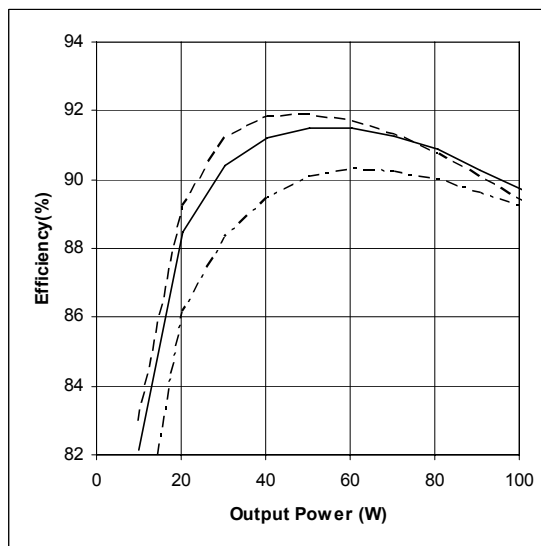
VPT100-283R3S		VPT100-2805S		VPT100-2812S		VPT100-2815S	
+V <sub>OUT</sub> (V)	R <sub>TRIM</sub> (Ω)	+V <sub>OUT</sub> (V)	R <sub>TRIM</sub> (Ω)	+V <sub>OUT</sub> (V)	R <sub>TRIM</sub> (Ω)	+V <sub>OUT</sub> (V)	R <sub>TRIM</sub> (Ω)
3.60	3.94k	5.5	980	13.2	1.14k	16.50	686
3.55	8.92k	5.4	4.72k	13.0	2.39k	16.25	1.69k
3.50	16.4k	5.3	10.9k	12.8	4.26k	16.00	3.19k
3.45	28.8k	5.2	23.4k	12.6	7.39k	15.75	5.7k
3.40	53.5k	5.1	60.5k	12.4	13.6k	15.50	10.7k
3.35	127k	5.0	--	12.2	32.4k	15.25	25.9k
3.30	--	4.9	404k	12.0	--	15.00	--
3.25	486k	4.8	189k	11.8	548k	14.75	552k
3.20	226k	4.7	118k	11.6	266k	14.50	270k
3.15	140k	4.6	82.4k	11.4	172k	14.25	175k
3.10	96.9k	4.5	61.1k	11.2	126k	14.00	128k
3.05	71.3k	4.4	46.9k	11.0	97.4k	13.75	99.5k
3.00	54.2k	4.3	36.8k	10.8	78.6k	13.50	80.6k
2.95	42k	4.2	29.2k	10.6	65.3k	13.25	67k
2.90	32.8k	4.1	23.3k	10.4	55.2k	13.00	56.9k
2.85	25.7k	4.0	18.5k	10.2	47.4k	12.75	49k
2.80	20.1k			10.0	41.1k	12.50	42.6k
2.75	15.4k			9.8	36k	12.25	37.5k
2.70	11.5k			9.6	31.8k	12.00	33.2k
2.65	8.26k						

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

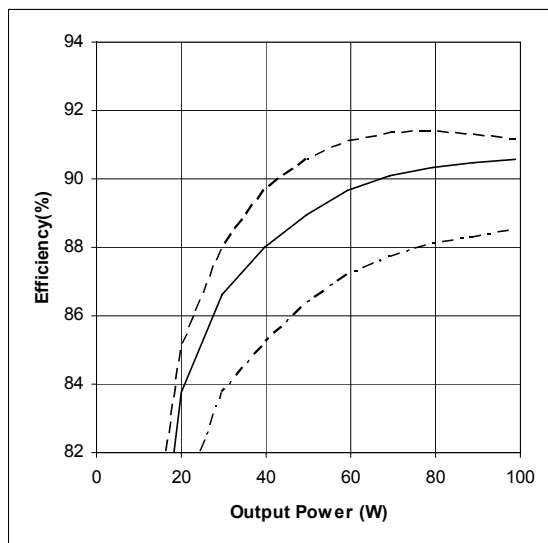
----- $V_{IN} = 16V$	—— $V_{IN} = 28V$	----- $V_{IN} = 40V$
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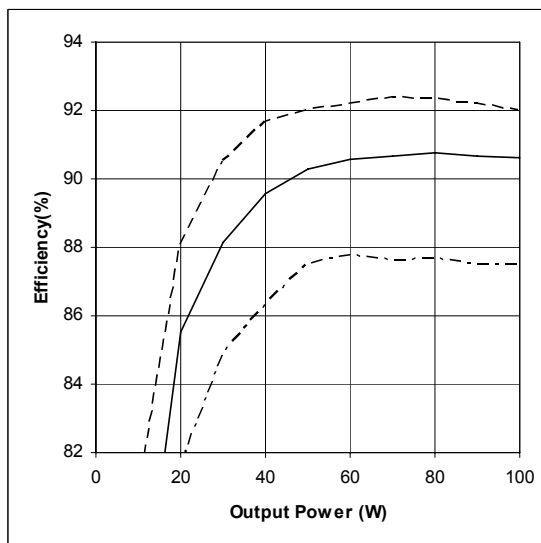
**Figure 6 – VPT100-283R3S**  
Efficiency (%) vs. Output Power (W)



**Figure 7 – VPT100-2805S**  
Efficiency (%) vs. Output Power (W)



**Figure 8 – VPT15-2812S**  
Efficiency (%) vs. Output Power (W)



**Figure 9 – VPT15-2815S**  
Efficiency (%) vs. Output Power (W)

Technical drawing of the baseplate surface showing dimensions and tolerances:

- Overall width: 2.350" MAX [59.69]
- Distance between mounting holes: 2.000" [50.80mm]
- Overall height: 1.200" [30.48mm]
- Distance from top edge to mounting holes: 1.550" MAX [39.37]
- Distance from left edge to mounting holes: 0.173" [4.32mm]
- Distance from right edge to mounting holes: 0.173" [4.32mm]
- Mounting holes: 4X  $\varnothing 0.116 + 0.004 / - 0.003$  [2.95mm]
- Label: BASEPLATE SURFACE

0.465" MAX  
[11.81mm]

10X  $\varnothing 0.039 \pm 0.002$ "  
[1.00mm]

$0.685 \pm 0.015$ "  
[17.40mm]

Technical drawing of the front view of a rectangular plate. The drawing includes the following dimensions and specifications:

- Overall width: 2.100" [53.34mm]
- Overall height: 0.900" [22.86mm]
- Vertical hole positions from the bottom edge (indicated by dimension lines):
  - 0.750" [19.05mm] (to hole 4)
  - 0.600" [15.24mm] (to hole 3)
  - 0.450" [11.43mm] (to hole 2)
  - 0.300" [7.62mm] (to hole 1)
- Horizontal hole positions: 0.050" [1.27mm] from each side edge to the center of the holes.
- Hole specifications: 10X  $\varnothing 0.079 \pm 0.002$ " [2.00mm] SEAL DIAMETER.
- Hole numbering: Holes are numbered 1 through 10. Holes 1 and 2 are on the left side, and holes 3 through 10 are on the right side.

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

1. Case temperature is measured on the center of the baseplate surface.
2. Materials: Baseplate – aluminum, chromate conversion coating.  
Cover – cold rolled steel, nickel plated.  
Pins – copper, gold over nickel plating.
3. Mounting holes are not threaded. Recommended fastener is 4-40. Recommended fastener torque is 5 to 6 in-lb.

## 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	OUTCOM	Output Return Connection
7	-SENSE	Output Return Remote Sense. Compensate for up to 0.5V total drop (positive and return).
8	TRIM	Trim Output Voltage to +10%, -20% of Nominal Value. Leave open if not used.
9	+SENSE	Positive Output Voltage Remote Sense. Compensate for up to 0.5V total drop (positive and return).
10	+V OUT	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	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

<b>VPT100-</b>	<b>28</b>	<b>05</b>	<b>S</b>
1	2	3	4

(1)	(2)		(3)		(4)	
Product Series	Nominal Input Voltage		Output Voltage		Number of Outputs	
<b>VPT100-</b>	<b>28</b>	28 Volts	<b>3R3</b> <b>05</b> <b>12</b> <b>15</b>	3.3 Volts 5 Volts 12 Volts 15 Volts	<b>S</b>	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](mailto:vptsales@vpt-inc.com)

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