



DVETR2800S Series

HIGH RELIABILITY HYBRID DC-DC CONVERTERS WITH INTEGRAL EMI FILTER

DESCRIPTION

The DVETR series of high reliability DC-DC converters is operable over the full military (-55 °C to +125 °C) temperature range with no power derating. Unique to the DVETR series is a fault tolerant magnetic feedback circuit. Operating at a nominal fixed frequency of 500 kHz per stage, these regulated, isolated units utilize well-controlled undervoltage lockout circuitry to eliminate slow start-up problems.

These converters are designed and manufactured in a facility qualified to ISO9001, compliant to AS9000, and certified to MIL-PRF-38534 and MIL-STD-883.

FEATURES

- High Reliability
- Very Low Output Noise
- Wide Input Voltage Range: 15 to 50 Volts per MIL-STD-704
- Up to 40 Watts Output Power
- Fault Tolerant Magnetic Feedback Circuit
- NO Use of Optoisolators
- Undervoltage Lockout
- Industry Standard Pinout
- High Input Transient Voltage: 80 Volts for 1 sec per MIL-STD-704A
- Solder Seal Hermetic Package
- High Power Density: > 30 W/in³
- Custom Versions Available
- Additional Environmental Screening Available
- No External EMI Filter Required
- Meets MIL-STD-461C and MIL-STD-461D EMC Requirements
- Protects Against Conducted Susceptibility Specified in MIL-STD-461C, SC01 and CS02
- Flanged and Non-flanged Versions Available
- MIL-PRF-38534 Element Evaluated Components

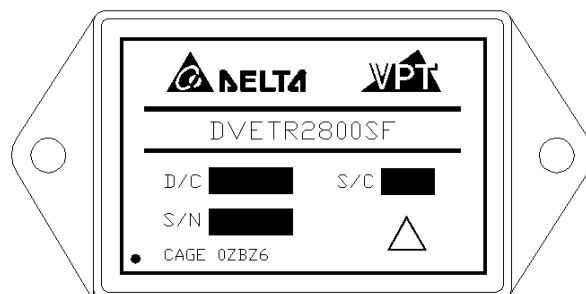


Figure 1 – DVETR2800S / DVETR2800SF DC-DC Converter
(Not To Scale)

SPECIFICATIONS (T_{CASE} = -55°C to +125°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS

Input Voltage (Continuous)	50 V _{DC}	Junction Temperature Rise to Case	+15°C
Input Voltage (Transient, 1 second)	80 Volts	Storage Temperature	-65°C to +150°C
Output Power ¹	40 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T _{CASE} = +125°C)	14 Watts	Weight	50 grams

Parameter		Conditions	DVETR283R3S			DVETR2805S			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	-	-	6	-	-	6	mA	
		No Load	-	-	75	-	-	75	mA	
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			13.0	-	14.8	13.0	-	14.8	V	
UVLO Turn Off ⁴			11.0	-	14.5	11.0	-	14.5	V	
OUTPUT Voltage	V _{OUT}	T _{CASE} = 25°C	3.267	3.30	3.333	4.95	5.00	5.05	V	
	V _{OUT}	T _{CASE} = -55°C to +125°C	3.25	3.30	3.35	4.925	5.00	5.075	V	
Power ³			0	-	20	0	-	30	W	
Current ³		V _{OUT}	0	-	6.06	0	-	6.0	A	
Ripple Voltage		V _{OUT}	Full Load, 20Hz to 20MHz		-	-	50	mV _{p-p}		
Line Regulation		V _{OUT}	V _{IN} = 15V to 50V		-	-	20	mV		
Load Regulation		V _{OUT}	No Load to Full Load		-	-	50	mV		
EFFICIENCY			65	-	-	70	-	-	%	
LOAD FAULT POWER DISSIPATION		Overload ⁴	-	-	12	-	-	12	W	
		Short Circuit	-	-	12	-	-	12	W	
CAPACITIVE LOAD ⁴			-	-	1000	-	-	1000	μF	
SWITCHING FREQUENCY			350	475	550	350	475	550	kHz	
SYNC FREQUENCY RANGE		V _H - V _L = 5V, DC = 20-80%	500	-	600	500	-	600	kHz	
ISOLATION		500 V _{DC}	100	-	-	100	-	-	MΩ	
THERMAL RESISTANCE		Case to Ambient (θCA)	-	19	-	-	19	-	°C/W	
MTBF (MIL-HDBK-217F)		AIF @ T _C = 55°C	-	413	-	-	413	-	kHrs	
DYNAMIC										
Load Step Output Transient		V _{OUT}	Half Load to Full Load	-	-	400	-	-	500	mV _{PK}
Load Step Recovery ²				-	-	500	-	-	500	μSec
Line Step Output Transient ⁴		V _{OUT}	V _{IN} = 16V to 40V	-	300	600	-	300	600	mV _{PK}
Line Step Recovery ^{2, 4}				-	300	500	-	300	500	μSec
Turn On Delay		V _{OUT}	V _{IN} = 0V to 28V	-	-	20	-	-	20	mSec
Turn On Overshoot ²				-	-	15	-	-	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 135°C. 4. Verified by qualification testing.

SPECIFICATIONS (T_{CASE} = -55°C to +125°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS

Input Voltage (Continuous)	50 V _{DC}	Junction Temperature Rise to Case	+15°C
Input Voltage (Transient, 1 second)	80 Volts	Storage Temperature	-65°C to +150°C
Output Power ¹	40 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T _{CASE} = +125°C)	14 Watts	Weight	50 grams

Parameter		Conditions	DVETR2812S			DVETR2815S			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	-	-	6	-	-	6	mA
		No Load	-	-	75	-	-	75	mA
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			13.0	-	14.8	13.0	-	14.8	V
UVLO Turn Off ⁴			11.0	-	14.5	11.0	-	14.5	V
OUTPUT Voltage	V _{OUT}	T _{CASE} = 25°C	11.88	12.0	12.12	14.85	15.0	15.15	V
	V _{OUT}	T _{CASE} = -55°C to +125°C	11.82	12.0	12.18	14.775	15.0	15.225	V
Power ³			0	-	40	0	-	40	W
Current ³	V _{OUT}		0	-	3.33	0	-	2.67	A
Ripple Voltage	V _{OUT}	Full Load, 20Hz to 20MHz	-	-	50	-	-	50	mV _{p-p}
Line Regulation	V _{OUT}	V _{IN} = 15V to 50V	-	-	20	-	-	20	mV
Load Regulation	V _{OUT}	No Load to Full Load	-	-	50	-	-	50	mV
EFFICIENCY			74	-	-	75	-	-	%
LOAD FAULT POWER DISSIPATION		Overload ⁴	-	-	12	-	-	12	W
		Short Circuit	-	-	12	-	-	12	W
CAPACITIVE LOAD ⁴			-	-	500	-	-	500	μF
SWITCHING FREQUENCY			350	475	550	350	475	550	kHz
SYNC FREQUENCY RANGE		V _H - V _L = 5V, DC = 20-80%	500	-	600	500	-	600	kHz
ISOLATION		500 V _{DC}	100	-	-	100	-	-	MΩ
THERMAL RESISTANCE		Case to Ambient (θCA)	-	19	-	-	19	-	°C/W
MTBF (MIL-HDBK-217F)		AIF @ T _C = 55°C	-	413	-	-	413	-	kHrs
DYNAMIC									
Load Step Output Transient	V _{OUT}	Half Load to Full Load	-	-	700	-	-	700	mV _{PK}
Load Step Recovery ²			-	-	500	-	-	500	μSec
Line Step Output Transient ⁴	V _{OUT}	V _{IN} = 16V to 40V	-	500	900	-	500	900	mV _{PK}
Line Step Recovery ^{2, 4}			-	300	500	-	300	500	μSec
Turn On Delay	V _{OUT}	V _{IN} = 0V to 28V	-	-	20	-	-	20	mSec
Turn On Overshoot ²			-	-	50	-	-	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 135°C. 4. Verified by qualification testing.

SPECIFICATIONS (T_{CASE} = -55°C to +125°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS

Input Voltage (Continuous)	50 V _{DC}	Junction Temperature Rise to Case	+15°C
Input Voltage (Transient, 1 second)	80 Volts	Storage Temperature	-65°C to +150°C
Output Power ¹	40 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T _{CASE} = +125°C)	14 Watts	Weight	50 grams

Parameter		Conditions	DVETR285R2S			Units
			Min	Typ	Max	
STATIC						
INPUT Voltage ⁴		Continuous	15	28	50	V
		Transient, 1 sec	-	-	80	V
Current		Inhibited	-	-	6	mA
		No Load	-	-	75	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			13.0	-	14.8	V
UVLO Turn Off ⁴			11.0	-	14.5	V
OUTPUT Voltage	V _{OUT}	T _{CASE} = 25°C	5.148	5.20	5.252	V
	V _{OUT}	T _{CASE} = -55°C to +125°C	5.122	5.20	5.278	V
Power ³			0	-	30	W
Current ³		V _{OUT}	0	-	6.0	A
Ripple Voltage		V _{OUT}	Full Load, 20Hz to 20MHz		50	mV _{p-p}
Line Regulation		V _{OUT}	V _{IN} = 15V to 50V		20	mV
Load Regulation		V _{OUT}	No Load to Full Load		50	mV
EFFICIENCY			70	-	-	%
LOAD FAULT POWER DISSIPATION		Overload ⁴	-	-	12	W
		Short Circuit	-	-	12	W
CAPACITIVE LOAD ⁴			-	-	1000	μF
SWITCHING FREQUENCY			350	475	550	kHz
SYNC FREQUENCY RANGE		V _H - V _L = 5V, DC = 20-80%	500	-	600	kHz
ISOLATION		500 V _{DC}	100	-	-	MΩ
THERMAL RESISTANCE		Case to Ambient (θ _{CA})	-	19	-	°C/W
MTBF (MIL-HDBK-217F)		AIF @ T _C = 55°C	-	413	-	kHrs
DYNAMIC						
Load Step Output Transient		Half Load to Full Load	-	-	500	mV _{PK}
Load Step Recovery ²			-	-	500	μSec
Line Step Output Transient ⁴		V _{IN} = 16V to 40V	-	300	600	mV _{PK}
Line Step Recovery ^{2, 4}			-	300	500	μSec
Turn On Delay		V _{IN} = 0V to 28V	-	-	20	mSec
Turn On Overshoot ²			-	-	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 135°C. 4. Verified by qualification testing.

BLOCK DIAGRAM

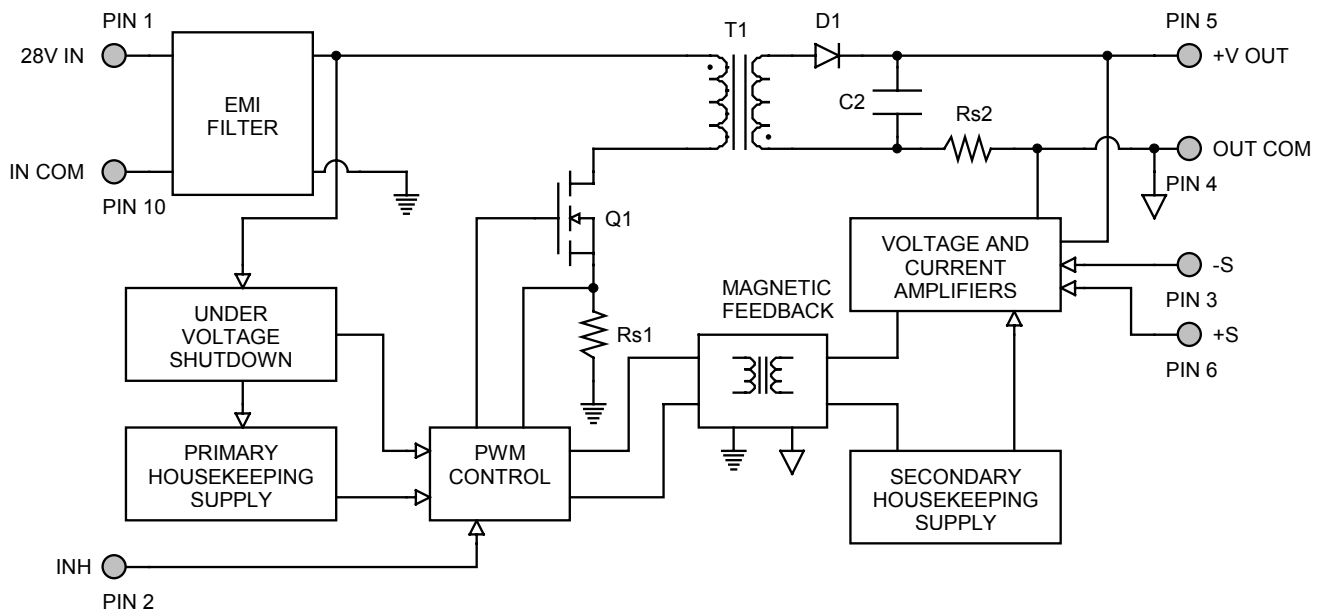


Figure 2

CONNECTION DIAGRAM

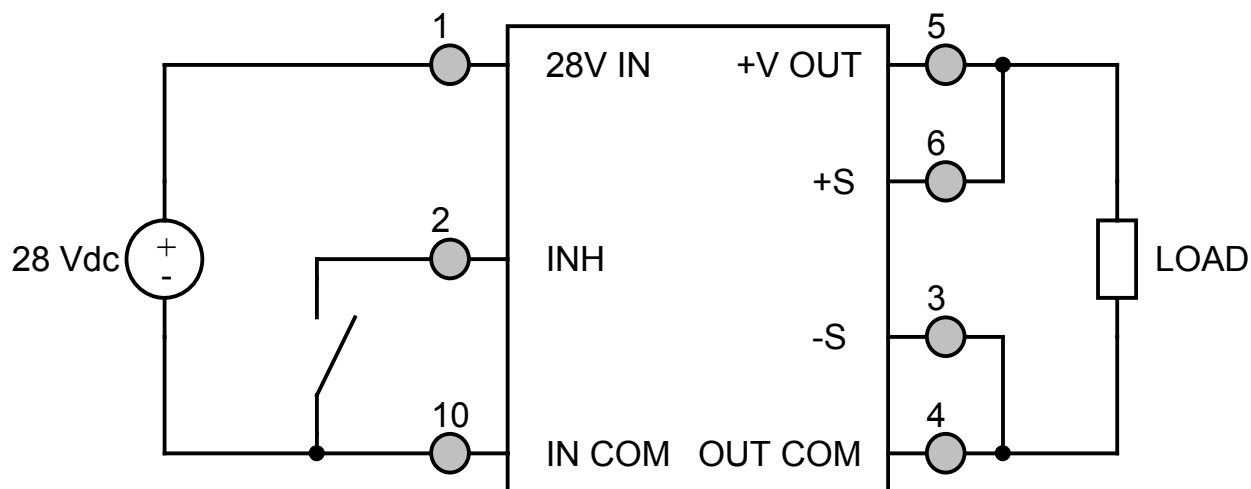


Figure 3

INHIBIT DRIVE CONNECTION DIAGRAMS

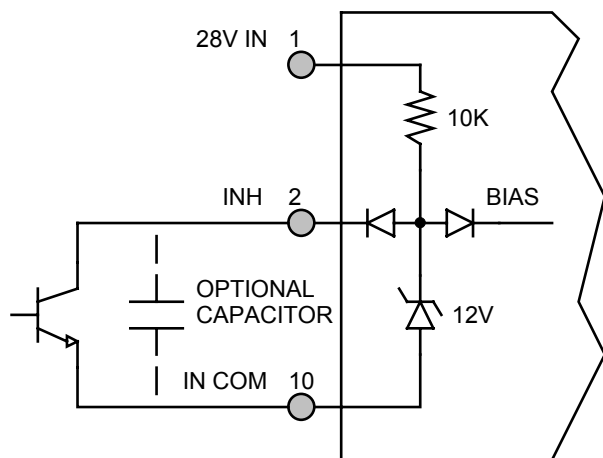


Figure 4 – Internal Inhibit Circuit and Recommended Drive
(Shown with optional capacitor for turn-on delay)

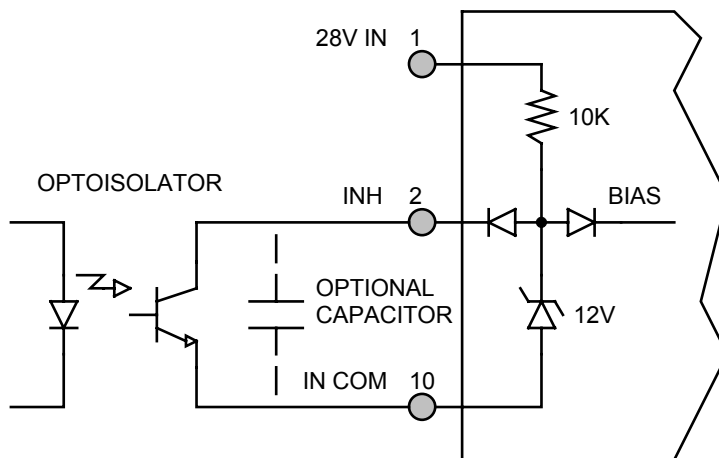


Figure 5 – Isolated Inhibit Drive
(Shown with optional capacitor for turn-on delay)

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

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

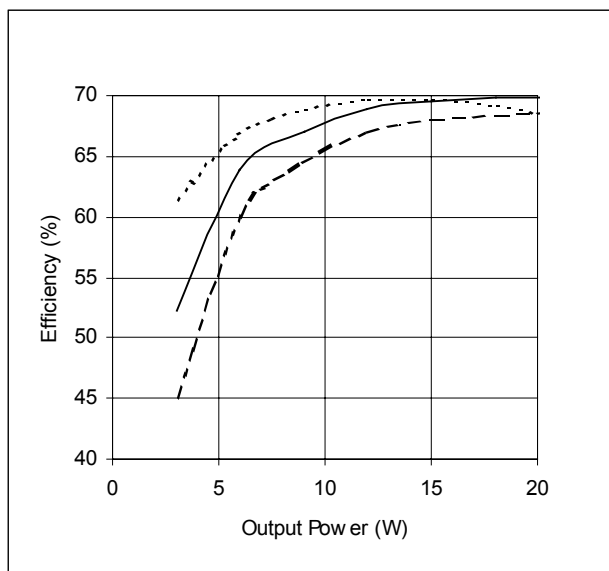


Figure 6 – DVETR283R3S
Efficiency (%) vs. Output Power (W)

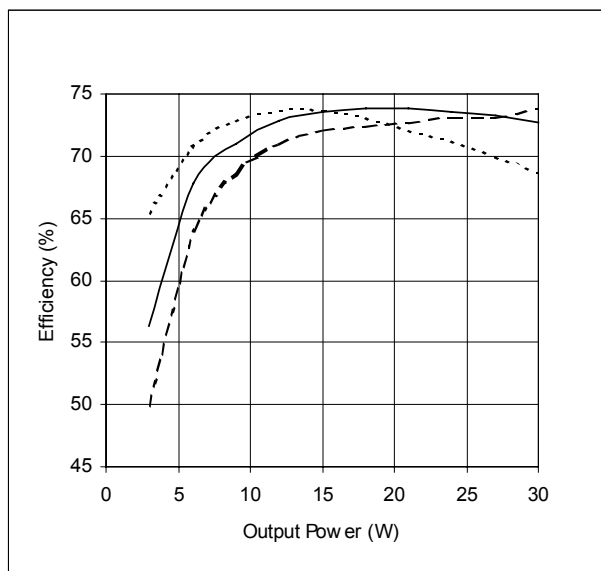


Figure 7 – DVETR2805S / DVETR285R2S
Efficiency (%) vs. Output Power (W)

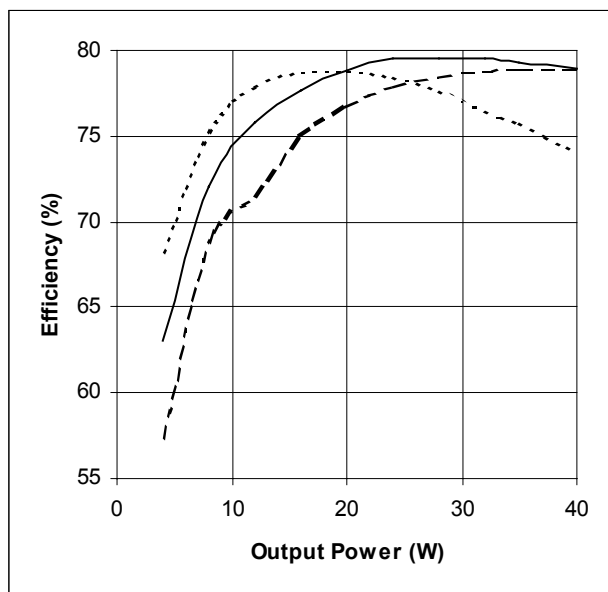


Figure 8 – DVETR2812S
Efficiency (%) vs. Output Power (W)

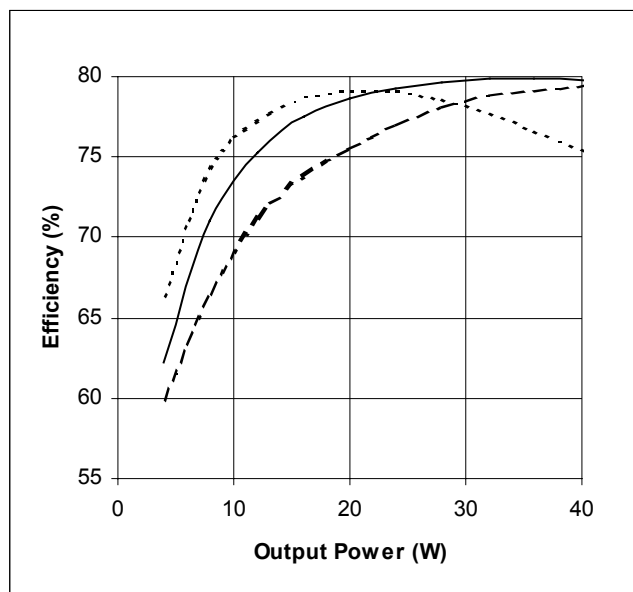


Figure 9 – DVETR2815S
Efficiency (%) vs. Output Power (W)

EMI PERFORMANCE CURVES

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

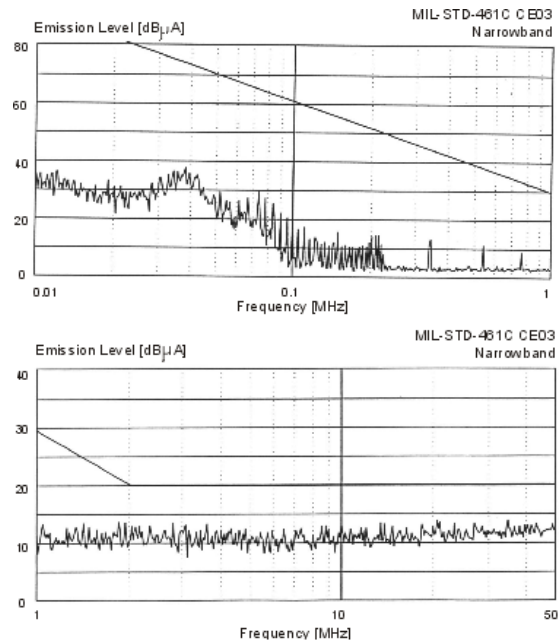


Figure 10 – MIL-STD-461C
DVETR2800S

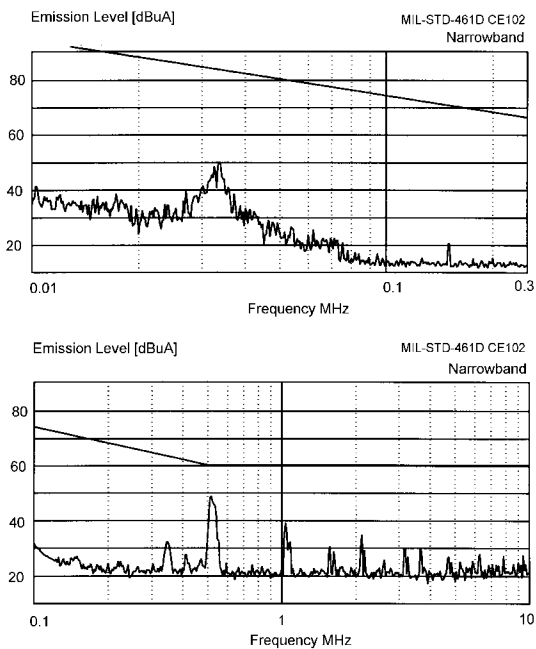
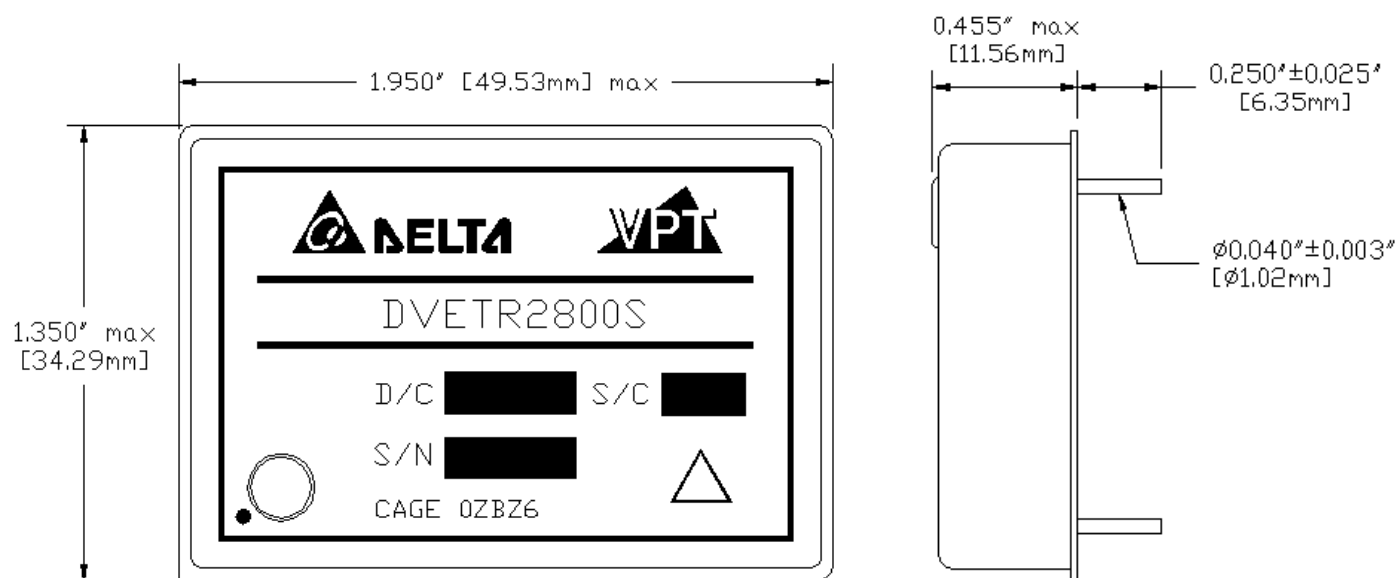


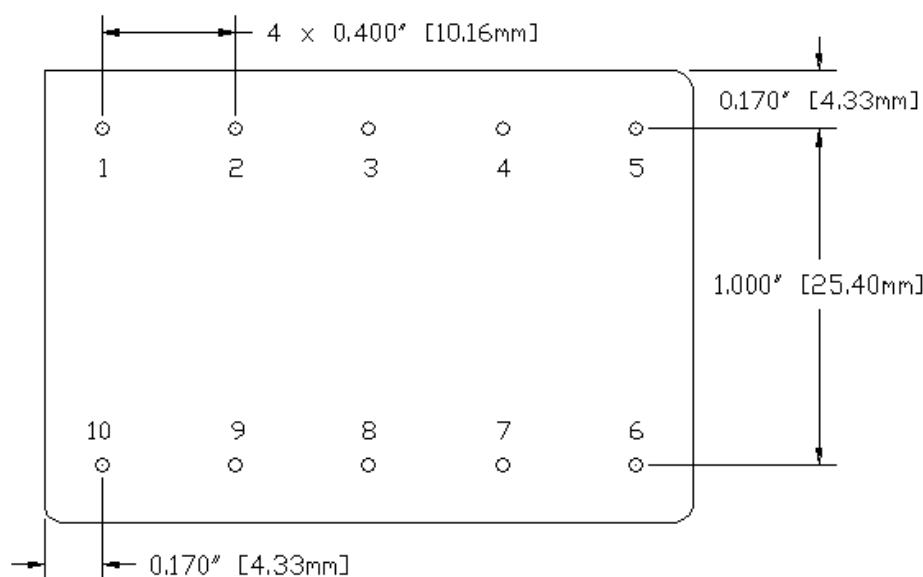
Figure 11 – MIL-STD-461D
DVETR2800S

PACKAGE SPECIFICATIONS (NON-FLANGED, SOLDER SEAL)



TOP VIEW

SIDE VIEW

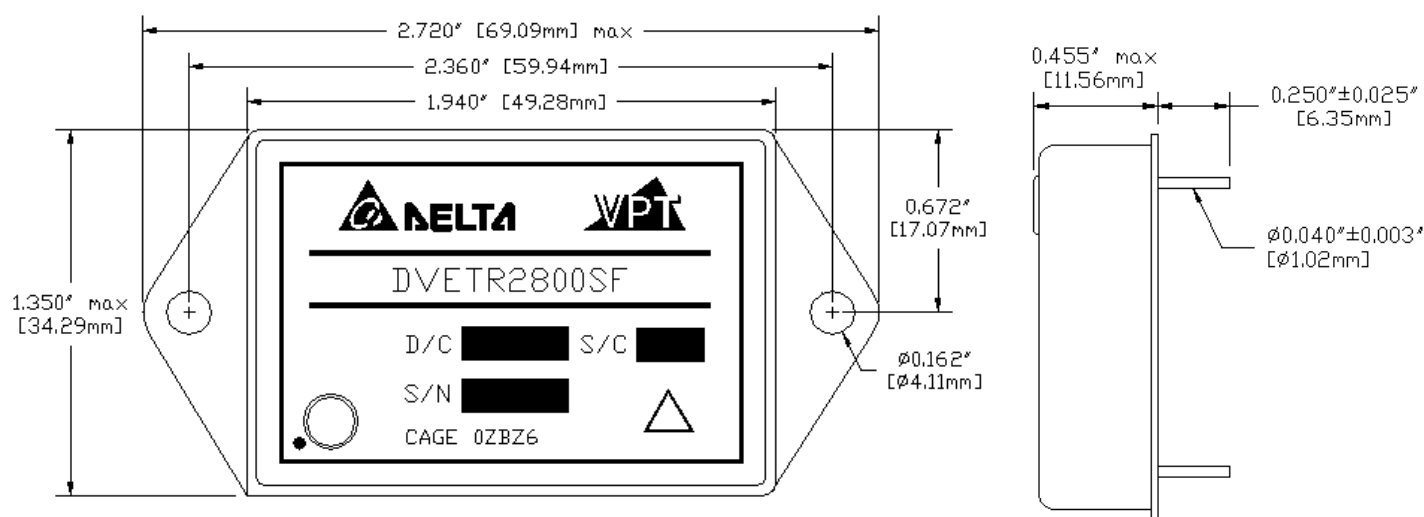


BOTTOM VIEW

PIN	FUNCTION
1	28V IN
2	INHIBIT
3	-S
4	OUT COM
5	+V OUT
6	+S
7	CASE
8	N/C
9	N/C
10	IN COM

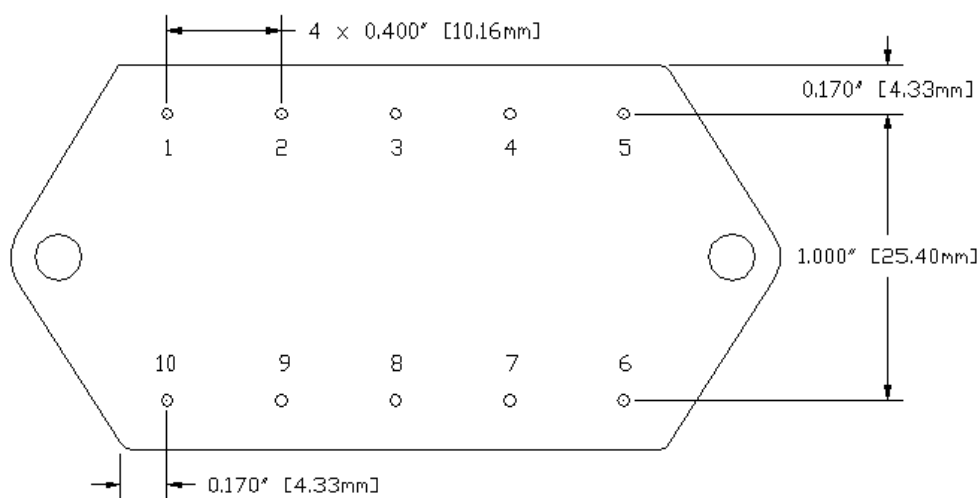
Figure 12 – Non-Flanged, Solder Seal Package and Pinout
(Dimensional Limits are ±0.005" Unless Otherwise Stated)

PACKAGE SPECIFICATIONS (FLANGED, SOLDER SEAL)



TOP VIEW

SIDE VIEW



BOTTOM VIEW

PIN	FUNCTION
1	28V IN
2	INHIBIT
3	-S
4	OUT COM
5	+V OUT
6	+S
7	CASE
8	N/C
9	N/C
10	IN COM

Figure 13 – Flanged, Solder Seal Package and Pinout
(Dimensional Limits are ±0.005" Unless Otherwise Stated)

PACKAGE PIN DESCRIPTION

Pin	Function	Description
1	28V IN	Positive Input Voltage Connection
2	INHIBIT	Logic Low = Disabled Output. Connecting the inhibit pin to input common causes converter shutdown. Logic High = Enabled Output. Unconnected or open collector TTL.
3	-S	Return Sense
4	OUT COM	Output Common Connection
5	+V OUT	Positive Output Voltage Connection
6	+S	Positive Sense
7	CASE	Case Connection
8	N/C	No Connection
9	N/C	No Connection
10	IN COM	Input Common Connection

ENVIRONMENTAL SCREENING (Per MIL-STD-883 as referenced to MIL-PRF-38534, Class H)

Screening	MIL-STD-883	Standard (No Suffix)	Extended /ES
Pre-Cap Inspection	Method 2017, 2032 Internal Procedure	•	•
Temperature Cycling	Method 1010, -55°C to 125°C		•
Constant Acceleration	Method 2001, 500g		•
Burn-In	96 hours at +125°C 24 hours at +125°C	•	•
Hermeticity	Method 1014, Fine Leak, Condition A Method 1014, Gross Leak, Condition C Dip (1×10^{-3})	•	• •
Final Electrical	100% at 25°C	•	•
Final Inspection	Method 2009	•	•

ORDERING INFORMATION

DVETR	28	05	S	F	/ES	-	XXX
1	2	3	4	5	6		7

(1) Product Series	(2) Nominal Input Voltage	(3) Output Voltage	(4) Number of Outputs
DVETR	28	28 Volts	Single
		3R3 05 5R2 12 15	3.3 Volts 5 Volts 5.2 Volts 12 Volts 15 Volts

(5) Package Option	(6) Screening Code	(7) Additional Screening Code
None F	Non-Flanged Flanged	None /ES
	Standard Extended	Contact Sales

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 requirement, source inspection, and/or special element evaluation for space or other higher quality applications.

CONTACT INFORMATION

To request a quotation or place an order please contact your sales representative or the VPT Inc. Sales Department at:

Phone: (425) 487-4850
Fax: (425) 487-4802
E-mail: sales@vpt-inc.com

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