DVAB2800D Series

TECHNICAL PREVIEW

HIGH RELIABILITY HYBRID DC-DC CONVERTERS

DESCRIPTION

The DVAB 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 DVAB series are independent dual control loops which provide tight regulation and zero cross regulation error while maintaining high efficiency. Operating at a nominal fixed frequency of 325 kHz, per stage, these regulated, isolated units utilize a high speed magnetic feedback design and well controlled undervoltage lockout circuitry to eliminate slow start-up problems.

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

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
- Very Low Output Noise
- Wide Input Voltage Range: 15 to 50 Volts per MIL-STD-704
- Dual Outputs with Zero Cross Regulation Error
- Up to 15 Watts Output Power
- High Input Transient Voltage: 80 Volts for 1 sec per MIL-STD-704A
- Fault Tolerant Magnetic Feedback Circuit
- NO Use of Optoisolators
- Undervoltage Lockout
- Indefinite Short Circuit Protection
- Current Limit Protection
- Precision Projection Welded Hermetic Package
- High Power Density
- Custom Versions Available
- Additional Environmental Screening Available
- Meets MIL-STD-461 Revisions C, D, E and F EMC Requirements When Used With VPT's EMI Filters
- Flanged and Non-flanged Versions Available.
- MIL-PRF-38534 Element Evaluated Components

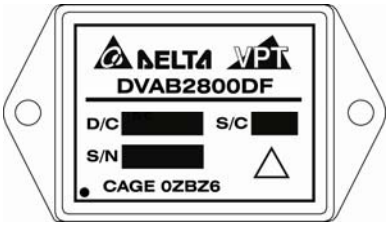

Figure 1 – DVAB2800D / DVAB2800DF DC-DC Converter
(Exact marking may differ from that shown)

11314 4th Avenue
West, Suite 206
Everett, WA 98204
http://www.vpt-inc.com

Sales Information:
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E-mail: vptsales@vpt-inc.com

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	15 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T_{CASE} = +125°C)	7.0 Watts	Weight (Maximum) (Un-Flanged / Flanged)	(24 / 28) Grams

Parameter	Conditions	DVAB2805D			DVAB2812D			Units
		Min	Typ	Max	Min	Typ	Max	
STATIC								
INPUT Voltage	Continuous	15	28	50	15	28	50	V
	Transient[4], 1 sec	-	-	80	-	-	80	V
Current	Inhibited	-	3.5	5	-	3.5	5	mA
	No Load	-	20	60	-	20	60	mA
Ripple Current	Full Load, 20Hz to 10MHz	-	25	60	-	25	60	mA_{p-p}
Inhibit Pin Input[4]		0	-	1.5	0	-	1.5	V
Inhibit Pin Open Circuit Voltage		12	14	17	12	14	17	V
UVLO Turn On		10.5	-	14.5	10.5	-	14.5	V
UVLO Turn Off[4]		8.5	-	13.5	8.5	-	13.5	V
OUTPUT Voltage $\pm V_{OUT}$	T_{CASE} = 25°C	4.95	5.0	5.05	11.88	12.0	12.12	V
$\pm V_{OUT}$	T_{CASE} = -55°C to +125°C	4.925	5.0	5.075	11.82	12.0	12.18	V
Power[1] Total		0	-	15	0	-	15	W
$\pm V_{OUT}$	Either Output	0	-	7.5	0	-	7.5	W
Current[1] $\pm V_{OUT}$	Either Output	0	-	1.5	0	-	0.63	A
Ripple Voltage $\pm V_{OUT}$	Full Load, 20Hz to 10MHz	-	10	60	-	15	60	mV_{p-p}
Line Regulation $\pm V_{OUT}$	V_{IN} = 15V to 50V	-	1	20	-	1	20	mV
Load Regulation $\pm V_{OUT}$	No Load to Full Load	-	7	50	-	3	50	mV
EFFICIENCY	Full Load	69	-	-	73	-	-	%
LOAD FAULT POWER DISSIPATION	Overload[4]	-	-	8	-	-	8	W
	Short Circuit	-	-	8	-	-	8	W
CAPACITIVE LOAD[4]	Either Output	-	-	500	-	-	500	µF
SWITCHING FREQUENCY		550	650	700	550	650	700	kHz
SYNCHRONIZATION FREQUENCY[2]		700	750	800	700	750	800	kHz
ISOLATION	500 V_{DC}, T_{CASE} = 25°C	100	-	-	100	-	-	MΩ
MTBF (MIL-HDBK-217F)	AIF @ T_C = 55°C	-	393	-	-	393	-	kHrs
DYNAMIC								
Load Step Output Transient $\pm V_{OUT}$	Half Load to Full Load	-	100	300	-	350	600	mV_{PK}
Load Step Recovery[3]		-	100	300	-	200	400	µSec
Line Step Output Transient[4] $\pm V_{OUT}$	V_{IN} = 15V to 50V	-	100	300	-	100	300	mV_{PK}
Line Step Recovery[3, 4]		-	100	300	-	100	300	µSec
Turn On Delay $\pm V_{OUT}$	V_{IN} = 0V to 28V	-	10	20	-	10	20	mSec
Turn On Overshoot		-	0	25	-	0	50	mV_{PK}

Notes:
1. Derate linearly to 0 at 135°C.
2. Synchronization is TTL signal with $V_{SYNC\ MAX}$ = 6V.
3. Time for output voltage to settle within 1% of its nominal value.
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	15 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T_{CASE} = +125°C)	7.0 Watts	Weight (Maximum) (Un-Flanged / Flanged)	(24 / 28) Grams

Parameter		Conditions	DVAB2815D			Units
			Min	Typ	Max	
STATIC						
INPUT Voltage		Continuous	15	28	50	V
		Transient[4], 1 sec	-	-	80	V
Current		Inhibited	-	3.5	5	mA
		No Load	-	25	60	mA
Ripple Current		Full Load, 20Hz to 10MHz	-	25	60	mA_{p-p}
Inhibit Pin Input[4]			0	-	1.5	V
Inhibit Pin Open Circuit Voltage			12	14	17	V
UVLO Turn On			10.5	-	14.5	V
UVLO Turn Off[4]			8.5	-	13.5	V
OUTPUT Voltage	$\pm V_{OUT}$	T_{CASE} = 25°C	14.85	15.0	15.15	V
	$\pm V_{OUT}$	T_{CASE} = -55°C to +125°C	14.775	15.0	15.225	V
Power[1]	Total		0	-	15	W
	$\pm V_{OUT}$	Either Output	0	-	7.5	W
Current[1]	$\pm V_{OUT}$	Either Output	0	-	0.5	A
Ripple Voltage	$\pm V_{OUT}$	Full Load, 20Hz to 10MHz	-	25	60	mV_{p-p}
Line Regulation	$\pm V_{OUT}$	V_{IN} = 15V to 50V	-	1	20	mV
Load Regulation	$\pm V_{OUT}$	No Load to Full Load	-	2	50	mV
EFFICIENCY		Full Load	73	-	-	%
LOAD FAULT POWER DISSIPATION		Overload[4]	-	-	8	W
		Short Circuit	-	-	8	W
CAPACITIVE LOAD[4]		Either Output	-	-	500	µF
SWITCHING FREQUENCY			550	650	700	kHz
SYNCHRONIZATION FREQUENCY[2]			700	750	800	kHz
ISOLATION		500 V_{DC}, T_{CASE} = 25°C	100	-	-	MΩ
MTBF (MIL-HDBK-217F)		AIF @ T_C = 55°C	-	393	-	kHrs
DYNAMIC						
Load Step Output Transient	$\pm V_{OUT}$	Half Load to Full Load	-	350	600	mV_{PK}
Load Step Recovery[3]			-	200	400	µSec
Line Step Output Transient[4]	$\pm V_{OUT}$	V_{IN} = 15V to 50V	-	100	300	mV_{PK}
Line Step Recovery[3, 4]			-	100	300	µSec
Turn On Delay	$\pm V_{OUT}$	V_{IN} = 0V to 28V	-	10	20	mSec
Turn On Overshoot			-	0	50	mV_{PK}

Notes:
1. Derate linearly to 0 at 135°C.
2. Synchronization is TTL signal with $V_{SYNC\ MAX}$ = 6V.
3. Time for output voltage to settle within 1% of its nominal value.
4. Verified by qualification testing.

BLOCK DIAGRAM

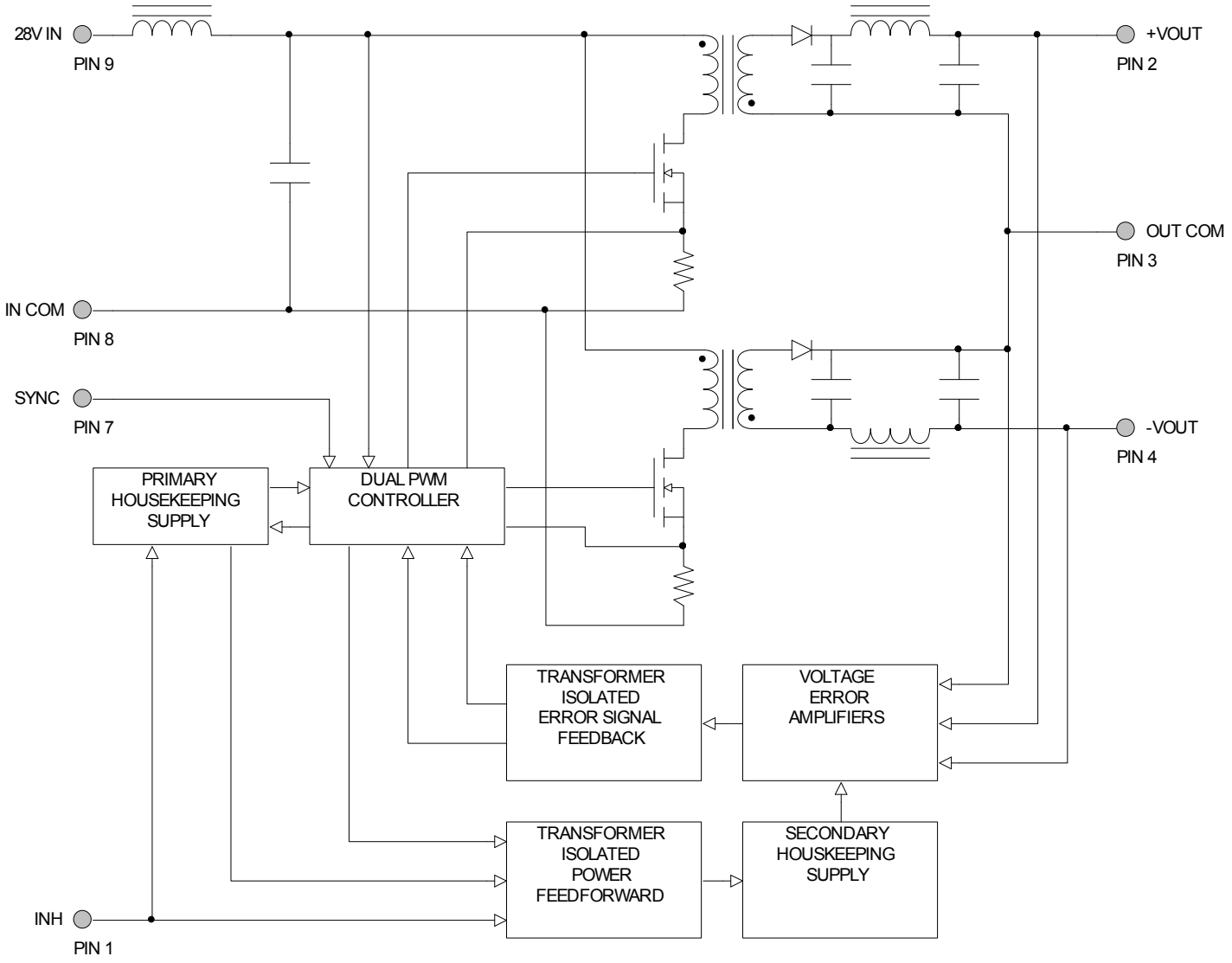


Figure 2

CONNECTION DIAGRAM

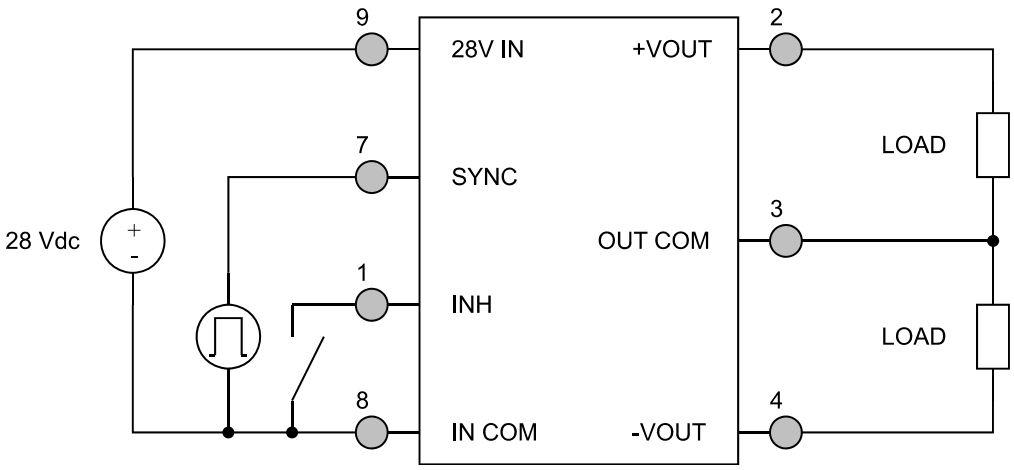


Figure 3

INHIBIT DRIVE CONNECTION DIAGRAMS

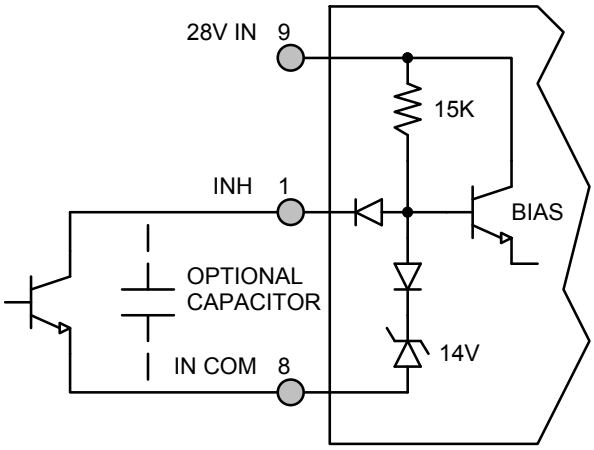


Figure 4 – Internal Inhibit Circuit and Recommended Drive
(Shown with optional capacitor for turn-on delay)

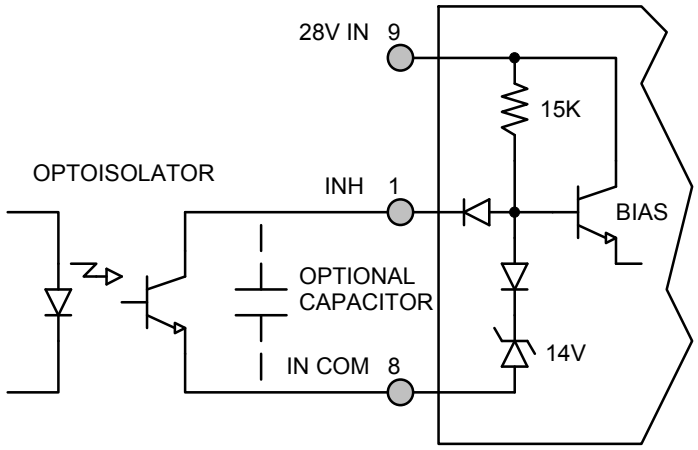


Figure 5 – Isolated Inhibit Drive
(Shown with optional capacitor for turn-on delay)

EMI FILTER HOOKUP DIAGRAM

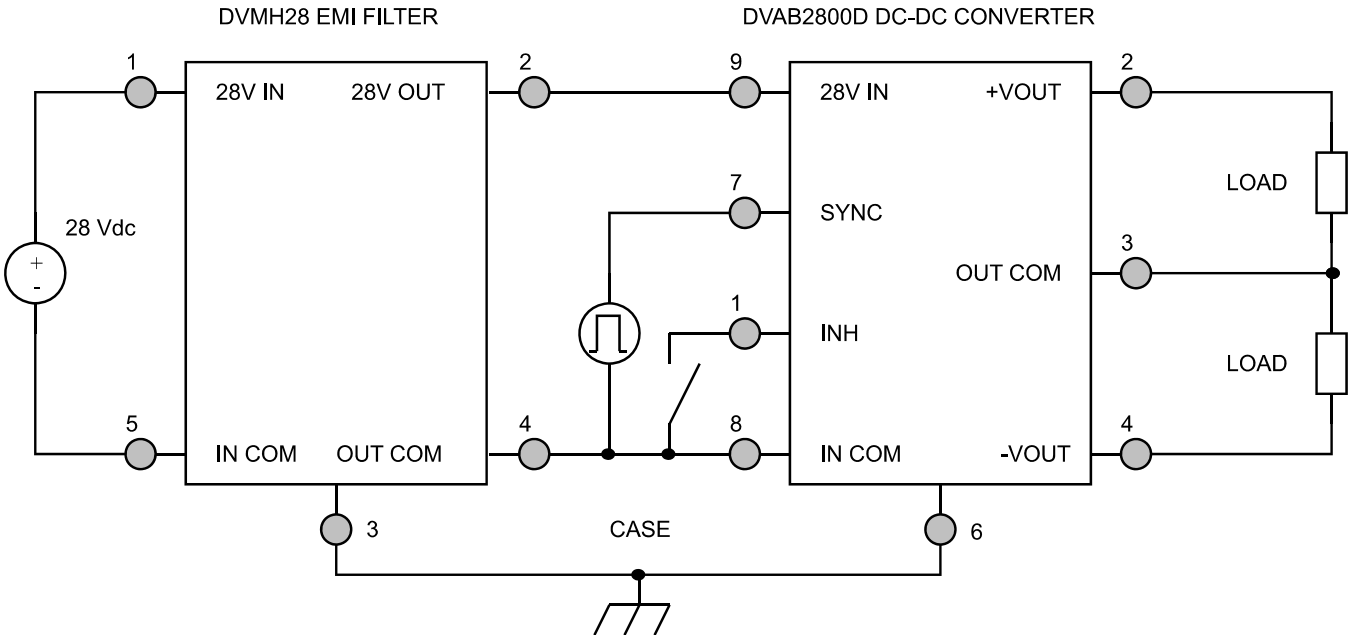
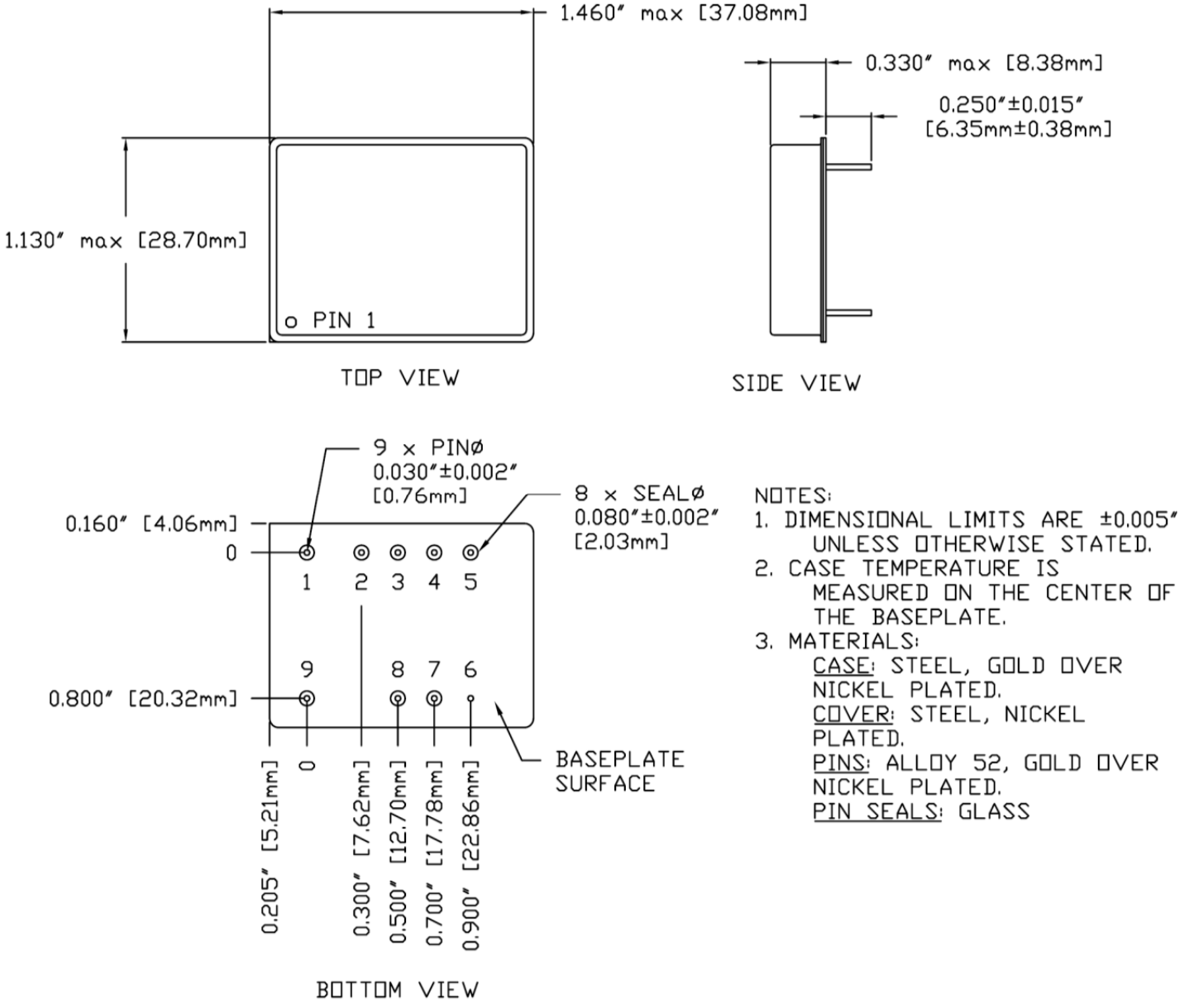


Figure 6 – Converter with EMI Filter

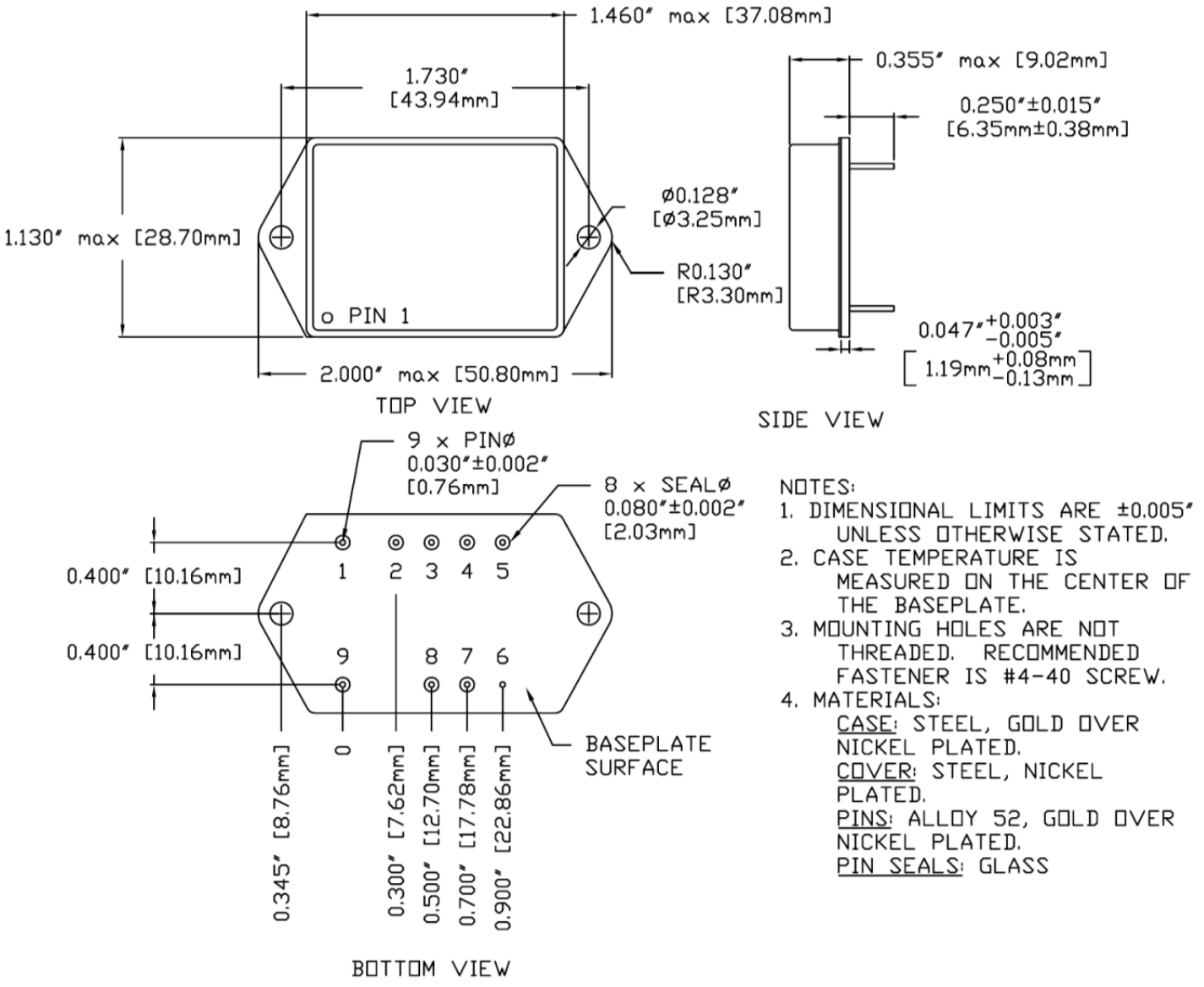
PACKAGE SPECIFICATIONS (NON-FLANGED)



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

Figure 11 – Non-Flanged Package and Pinout

PACKAGE SPECIFICATIONS (FLANGED)



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

Figure 12 – Flanged Package and Pinout

PACKAGE PIN DESCRIPTION

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

ENVIRONMENTAL SCREENING (100% Tested Per MIL-STD-883 as referenced to MIL-PRF-38534)

Screening	MIL-STD-883	Standard (No Suffix)	Extended /ES	HB /HB	Class H /H	Class K /K
Non-Destructive Bond Pull	Method 2023	•	•	•	•	•
Internal Visual	Method 2017, 2032 Internal Procedure	• 	• 	• 	• 	•
Temperature Cycling	Method 1010, Condition C Method 1010, -55°C to 125°C	 	 •	• 	• 	•
Constant Acceleration	Method 2001, 3000g, Y1 Direction Method 2001, 500g, Y1 Direction	 	 •	• 	• 	•
PIND	Method 2020, Condition A[2]					•
Pre Burn-In Electrical	100% at 25°C					•
Burn-In	Method 1015, 320 hours at +125°C Method 1015, 160 hours at +125°C 96 hours at +125°C 24 hours at +125°C	 •	 • 	• 	• 	•
Final Electrical	MIL-PRF-38534, Group A[1] 100% at 25°C	 •	 •	• 	• 	•
Hermeticity	Method 1014, Fine Leak, Condition A Method 1014, Gross Leak, Condition C Dip (1 x 10^{-3})	 •	• • 	• • 	• • 	• •
Radiography	Method 2012[3]					•
External Visual	Method 2009	•	•	•	•	•

Notes:
1. 100% R&R testing at –55°C, +25°C, and +125°C with all test data included in product shipment.
2. PIND test Certificate of Compliance included in product shipment.
3. Radiographic test Certificate of Compliance and film(s) included in product shipment.

ORDERING INFORMATION

DVAB	28	05	D	F	/HB	-	XXX
1	2	3	4	5	6		7

(1) (2) (3) (4)

Product Series	Nominal Input Voltage		Output Voltage		Number of Outputs	
DVAB	**28**	28 Volts	**05** **12** **15**	± 5 Volts ± 12 Volts ± 15 Volts	**D**	Dual

(5) (6) (7)

Package Option		Screening Code[1,2]		Additional Screening Code
None **F**	Non-Flanged Flanged	**None** **/ES** **/HB** **/H** **/K**	Standard Extended HB Class H Class K	Contact Sales

Notes:
1. Contact the VPT Inc. Sales Department for availability of Class H (/H) or Class K (/K) qualified products.
2. VPT Inc. reserves the right to ship higher screened or SMD products to meet lower screened orders at our sole discretion unless specifically forbidden by customer contract.

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.

SMD (STANDARD MICROCIRCUIT DRAWING) NUMBERS

Standard Microcircuit Drawing (SMD)	DVAB2800D Series Similar Part Number
*T.B.D.	DVAB2805D/H DVAB2805DF/H
*T.B.D.	DVAB2812D/H DVAB2812DF/H
*T.B.D.	DVAB2815D/H DVAB2815DF/H

Do not use the DVAB2800D Series similar part number for SMD product acquisition. It is listed for reference only. For exact specifications for the SMD product, refer to the SMD drawing. SMD's can be downloaded from the DLA Land and Maritime (Previously known as DSCC) website at http://www.dscc.dla.mil/programs/smcr/. The SMD number listed above is for MIL-PRF-38534 Class H screening, standard gold plated lead finish, and no RHA (Radiation Hardness Assurance) level. Please reference the SMD for other screening levels, lead finishes, and radiation levels. All SMD products are marked with a "Q" on the cover as specified by the QML certification mark requirement of MIL-PRF-38534.

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