



DVAB2800D Series

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
- 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)

SPECIFICATIONS ($T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{IN} = +28\text{V} \pm 5\%$, 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, $T_{CASE} = +125^{\circ}\text{C}$)	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	-	2	5	-	2	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	$\pm V_{OUT}$ $T_{CASE} = 25^{\circ}\text{C}$	4.95	5.0	5.05	11.88	12.0	12.12	V	
	$\pm V_{OUT}$ $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$	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	-	0.625	A	
Ripple Voltage	$\pm V_{OUT}$ Full Load, 20Hz to 10MHz	-	25	60	-	20	60	mV _{p-p}	
Line Regulation	$\pm V_{OUT}$ $V_{IN} = 15\text{V}$ to 50V	-	1	20	-	1	20	mV	
Load Regulation	$\pm V_{OUT}$ No Load to Full Load	-	4	50	-	2	50	mV	
EFFICIENCY	Full Load	69	-	-	73	-	-	%	
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} , $T_{CASE} = 25^{\circ}\text{C}$	100	-	-	100	-	-	M Ω	
MTBF (MIL-HDBK-217F)	AIF @ $T_C = 55^{\circ}\text{C}$	-	393	-	-	393	-	kHrs	
DYNAMIC									
Load Step Output Transient	$\pm V_{OUT}$	Half Load to Full Load	-	100	300	-	300	600	mV _{PK}
Load Step Recovery ³			-	100	300	-	200	400	μSec
Line Step Output Transient ⁴	$\pm V_{OUT}$	$V_{IN} = 16\text{V}$ to 40V	-	100	300	-	150	400	mV _{PK}
Line Step Recovery ^{3, 4}			-	100	300	-	150	300	μSec
Turn On Delay	$\pm V_{OUT}$	$V_{IN} = 0\text{V}$ 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 $V_{SYNC\ MAX} = 6\text{V}$.
 3. Time for output voltage to settle within 1% of its nominal value.
 4. Verified by qualification testing.

SPECIFICATIONS ($T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{IN} = +28\text{V} \pm 5\%$, 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, $T_{CASE} = +125^{\circ}\text{C}$)	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	-	2	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	$\pm V_{OUT}$ $T_{CASE} = 25^{\circ}\text{C}$	14.85	15.0	15.15	V	
	$\pm V_{OUT}$ $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$	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	-	20	60	mV _{p-p}	
Line Regulation	$\pm V_{OUT}$ $V_{IN} = 15\text{V}$ to 50V	-	1	20	mV	
Load Regulation	$\pm V_{OUT}$ No Load to Full Load	-	2	50	mV	
EFFICIENCY	Full Load	73	-	-	%	
CAPACITIVE LOAD ⁴	Either Output	-	-	500	μF	
SWITCHING FREQUENCY		550	650	700	kHz	
SYNCHRONIZATION FREQUENCY ²		700	750	800	kHz	
ISOLATION	500 V _{DC} , $T_{CASE} = 25^{\circ}\text{C}$	100	-	-	M Ω	
MTBF (MIL-HDBK-217F)	AIF @ $T_C = 55^{\circ}\text{C}$	-	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	$\pm V_{OUT}$	$V_{IN} = 16\text{V}$ to 40V	-	200	500	mV _{PK}
Line Step Recovery ^{3, 4}			-	100	300	μSec
Turn On Delay	$\pm V_{OUT}$	$V_{IN} = 0\text{V}$ 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 $V_{SYNC\ MAX} = 6\text{V}$.
 3. Time for output voltage to settle within 1% of its nominal value.
 4. Verified by qualification testing.

CONNECTION DIAGRAM

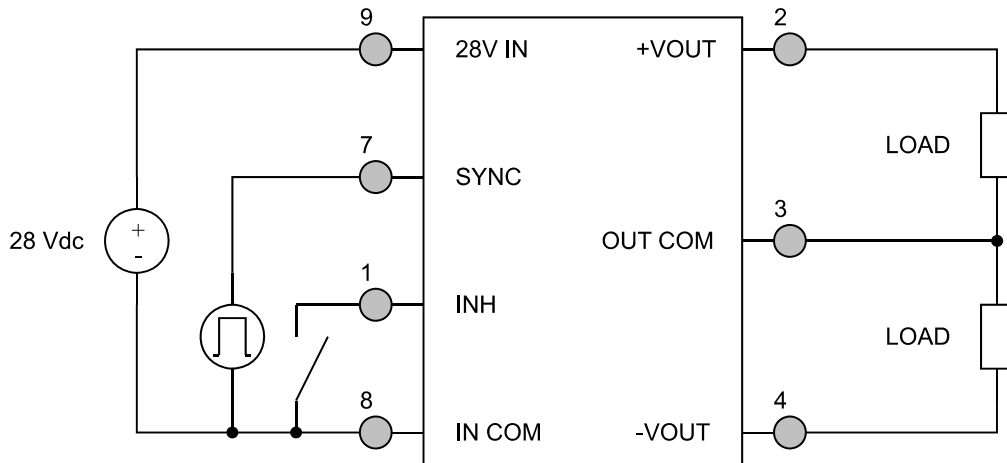


Figure 3

INHIBIT DRIVE CONNECTION DIAGRAMS

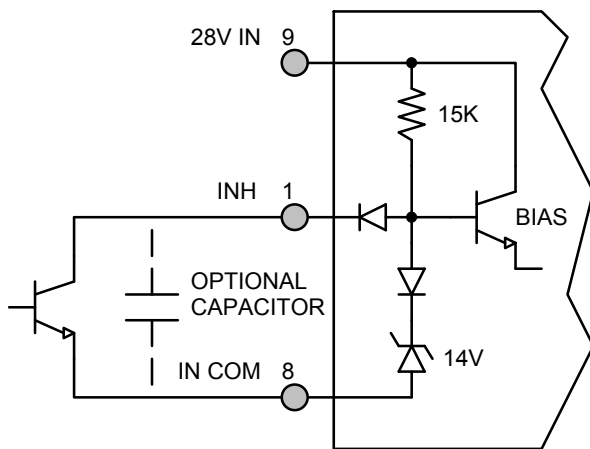


Figure 4 – Internal Inhibit Circuit and Recommended Drive
(Shown with optional capacitor for turn-on delay)

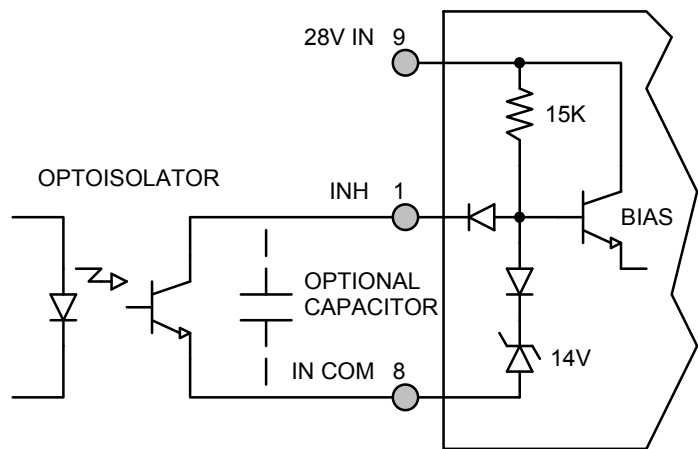


Figure 5 – Isolated Inhibit Drive
(Shown with optional capacitor for turn-on delay)

EMI FILTER HOOKUP DIAGRAM

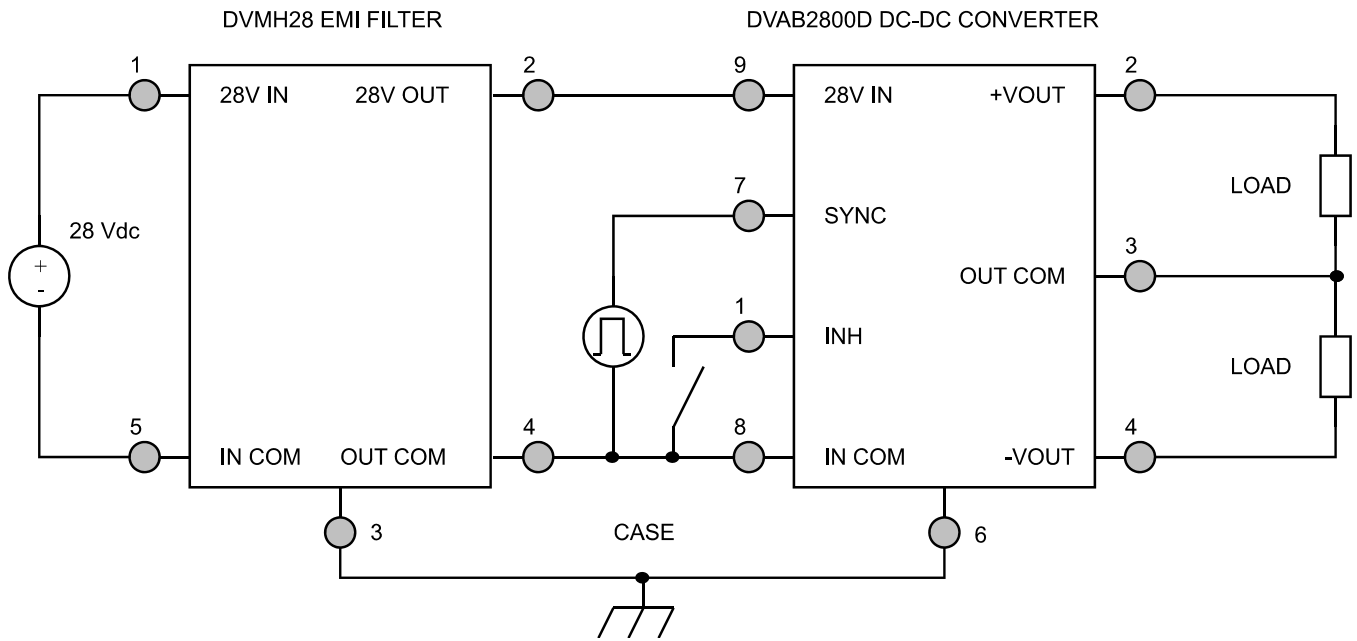


Figure 6 – Converter with EMI Filter

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

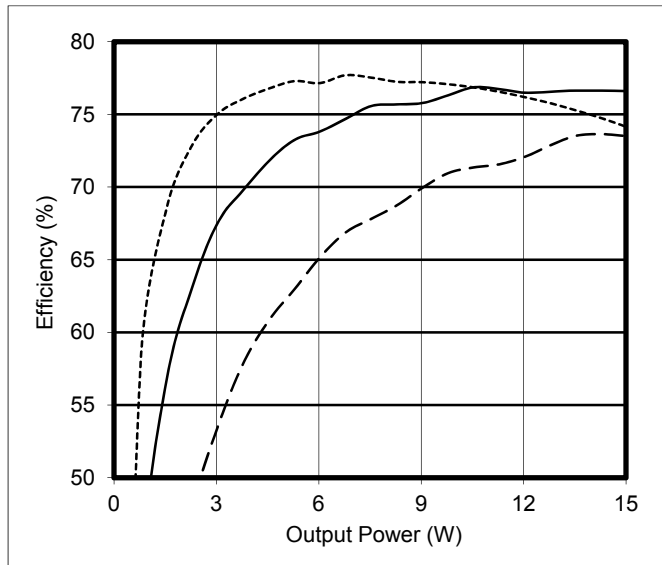
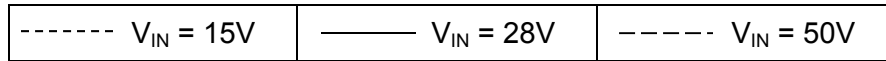


Figure 7 – DVAB2805D
 Efficiency (%) vs. Output Power (W)

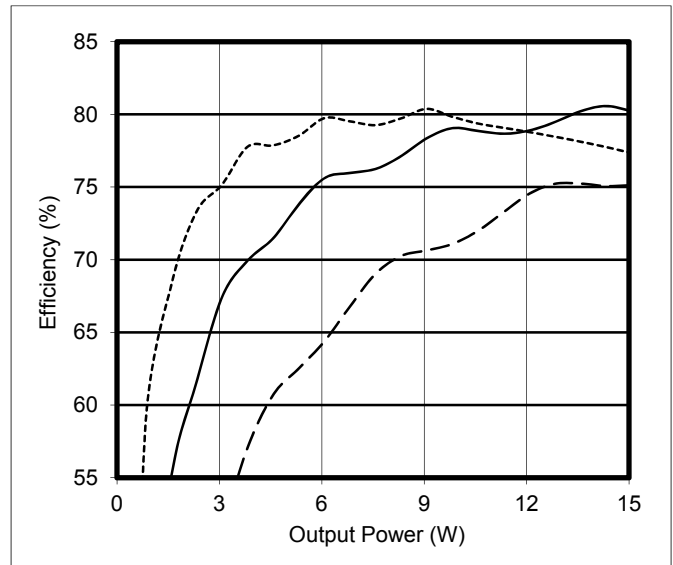


Figure 8 – DVAB2812D
 Efficiency (%) vs. Output Power (W)

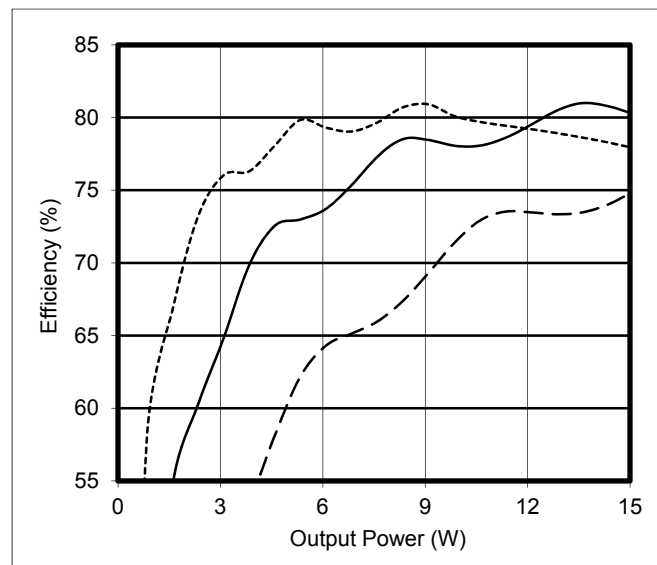
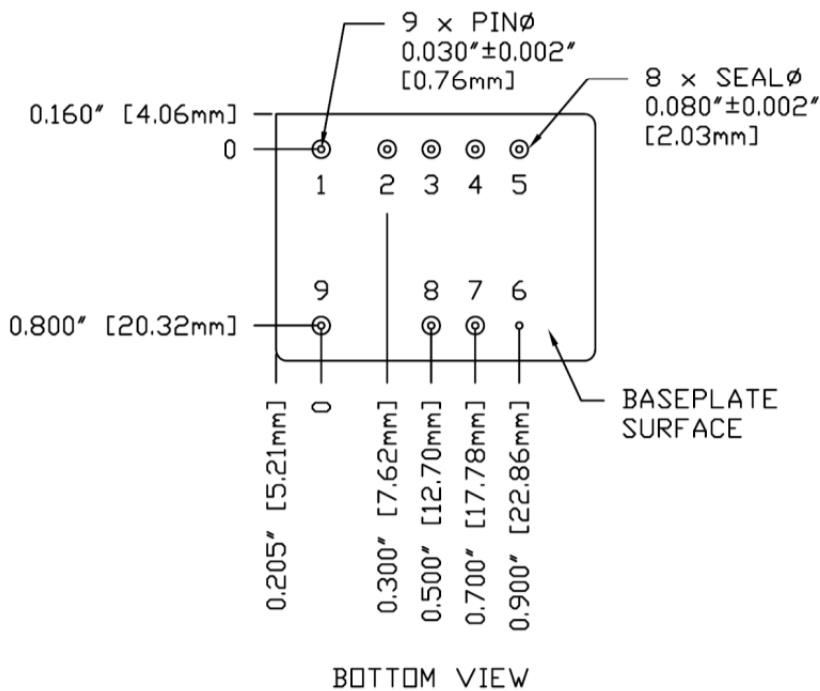
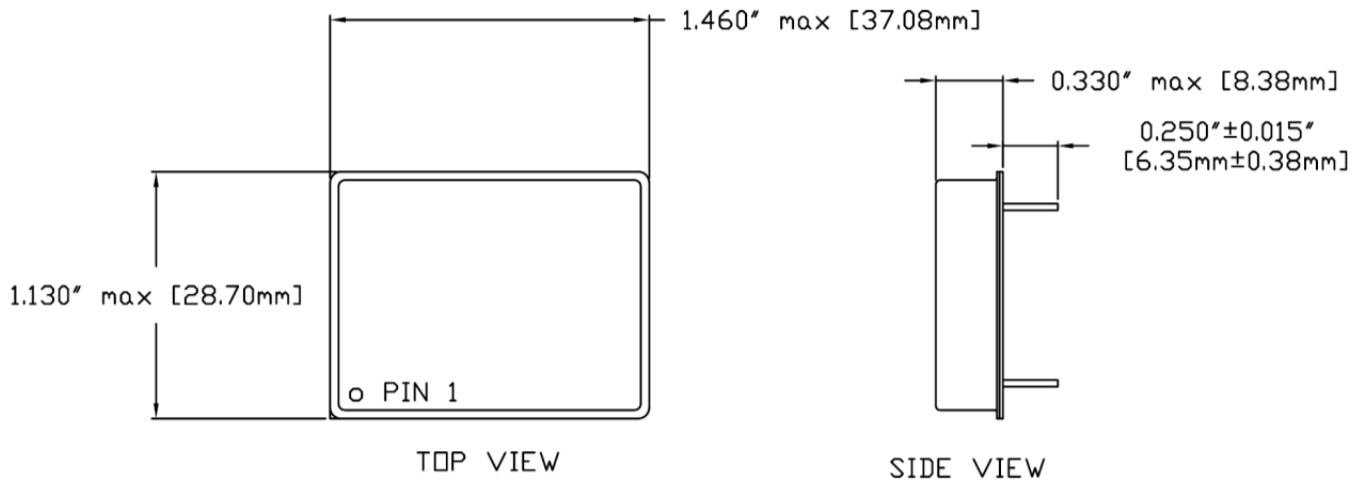


Figure 9 – DVAB2815D
 Efficiency (%) vs. Output Power (W)

PACKAGE SPECIFICATIONS (NON-FLANGED)



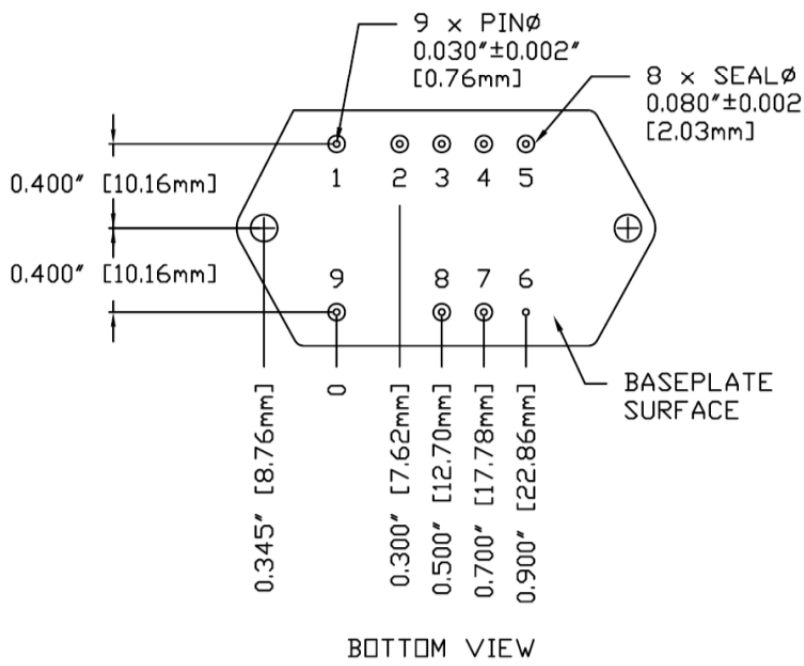
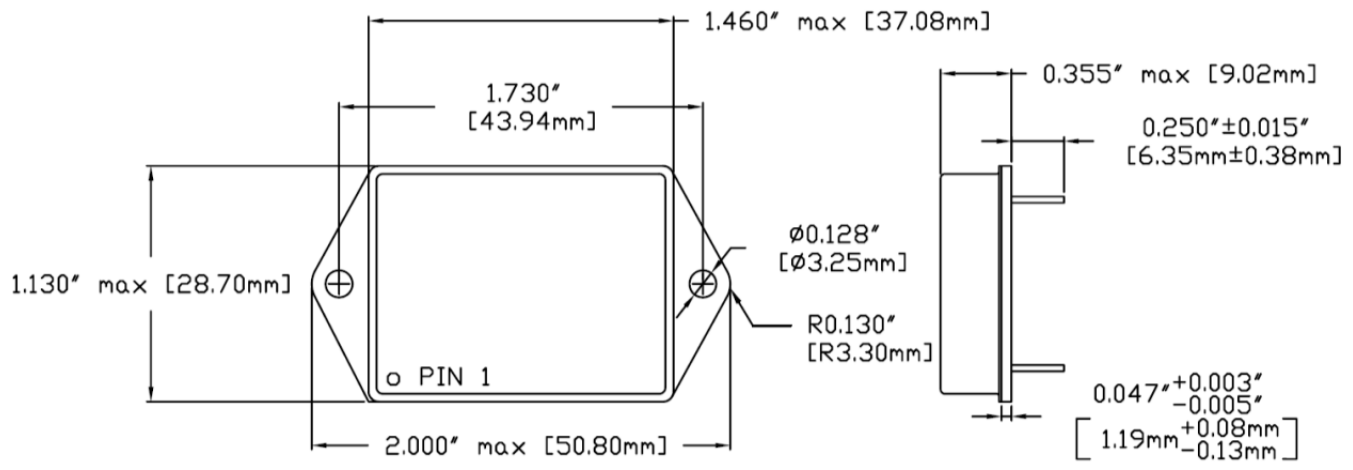
NOTES:

1. DIMENSIONAL LIMITS ARE ±0.005" UNLESS OTHERWISE STATED.
2. CASE TEMPERATURE IS MEASURED ON THE CENTER OF THE BASEPLATE.
3. MATERIALS:
CASE: STEEL, GOLD OVER NICKEL PLATED.
COVER: STEEL, NICKEL PLATED.
PINS: ALLOY 52, GOLD OVER NICKEL PLATED.
PIN SEALS: GLASS

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 10 – Non-Flanged Package and Pinout

PACKAGE SPECIFICATIONS (FLANGED)



- NOTES:
1. DIMENSIONAL LIMITS ARE ±0.005" UNLESS OTHERWISE STATED.
 2. CASE TEMPERATURE IS MEASURED ON THE CENTER OF THE BASEPLATE.
 3. MOUNTING HOLES ARE NOT THREADED. RECOMMENDED FASTENER IS #4-40 SCREW.
 4. MATERIALS:
CASE: STEEL, GOLD OVER NICKEL PLATED.
COVER: STEEL, NICKEL PLATED.
PINS: ALLOY 52, GOLD OVER NICKEL PLATED.
PIN SEALS: GLASS

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 – 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

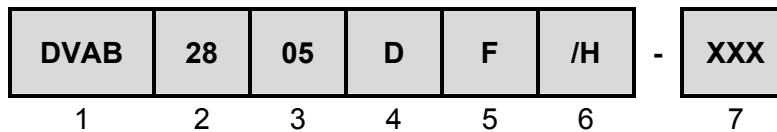
ENVIRONMENTAL SCREENING (100% Tested Per MIL-STD-883 as referenced to MIL-PRF-38534)

Test	MIL-STD-883 Test Method, Condition	No Suffix (Standard) Non-QML ⑤	/ES (Extended) Non-QML ⑤	/HB (HB) Non-QML ⑤	/KB (KB) Non-QML ⑤
Non-Destructive Bond Pull	TM2023	• ④	• ④	• ④	•
Internal Visual	TM2010, TM2017, TM2032 (MIL-STD-750, TM2072, TM2073)	•	•	•	•
Temperature Cycling	TM1010, Condition C -65°C to 150°C, Ambient			•	•
	TM1010, Condition B -55°C to 125°C, Ambient		•		
Constant Acceleration	TM2001, 3000g, Y1 Direction			•	•
	TM2001, 500g, Y1 Direction		•		
PIND ⑦	TM2020, Condition A				•
Pre Burn-In Electrical	25°C				•
Burn-In	TM1015, 320 hrs, 125°C, Case Typ				•
	TM1015, 160 hrs, 125°C, Case Typ			•	
	96 hrs, 125°C, Case Typ		•		
	24 hrs, 125°C, Case Typ	•			
Final Electrical	MIL-PRF-38534, Group A Subgroups 1-6 -55°C, 25°C, 125°C ③			•	•
	MIL-PRF-38534, Group A Subgroups 1 and 4 25°C	•	•		
Hermeticity (Seal)	TM1014, Fine Leak, Condition A2		•	•	•
	TM1014, Gross Leak, Condition C		•	•	•
	Gross Leak, Dip (1 x 10 ⁻³)	•			
Radiography ⑧	TM2012				•
External Visual	TM2009	•	•	•	•

Notes:

- ① Contact Sales for more information concerning additional environmental screening and testing options desired.
- 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.
- ③ 100% R&R testing with all test data included in product shipment.
- ④ Not required per MIL-PRF-38534. Test is performed for additional product quality assurance.
- ⑤ Non-QML products may not meet all requirements of MIL-PRF-38534.
- ⑥ Note intentionally not used.
- ⑦ PIND test Certificate of Compliance included in product shipment.
- ⑧ Radiographic test Certificate of Compliance and film(s) or data CD included in product shipment.

ORDERING INFORMATION



(1) Product Series	(2) Nominal Input Voltage		(3) Output Voltage		(4) Number of Outputs	
DVAB	28	28 Volts	05 12 15	± 5 Volts ± 12 Volts ± 15 Volts	D	Dual

(5) Package Option		(6) Screening Code ^{1,2}		(7) Additional Screening Code
None F	Non-Flanged Flanged	None /ES /HB /H /KB /K	Standard Extended HB Class H KB Class K	Contact Sales

Notes: 1. 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.dsccl.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

All information contained in this datasheet is believed to be accurate, however, no responsibility is assumed for possible errors or omissions. The products or specifications contained herein are subject to change without notice.