



DVSB2800D Series

HIGH RELIABILITY HYBRID DC-DC CONVERTERS

DESCRIPTION

The DVSB series of high-reliability DC-DC converters provide decades of successful critical mission support. Operable over the full military (-55 °C to +125 °C) temperature range with no power derating, the DVSB series unique input, and output filters dramatically reduce input and output noise performance. While operating at a nominal fixed frequency of 450 kHz, these regulated, isolated units utilize a high-speed magnetic feedback design and well-controlled under-voltage 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
- Up to 12.5 Watts Output Power
- Fault Tolerant Magnetic Feedback Circuit
- NO Use of Optoisolators
- Undervoltage Lockout
- Indefinite Short Circuit Protection
- Current Limit Protection
- High Input Transient Voltage: 80 Volts for 1 sec per MIL-STD-704A
- Precision Projection Welded Hermetic Package
- High Power Density
- Custom Versions Available
- Additional Environmental Screening Available
- Meets MIL-STD-461C and MIL-STD-461D EMC Requirements When Used With a DVMH28 EMI Filter
- Flanged and Non-flanged Versions Available.
- MIL-PRF-38534 Element Evaluated Components

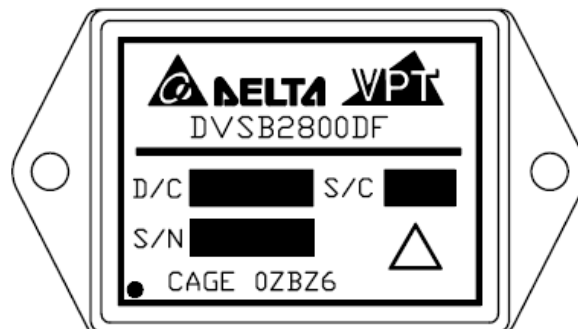


Figure 1 – DVSB2800D / DVSB2800DF DC-DC Converter
(Exact marking may differ from that shown)

Sales Information:
Phone: (425) 353-3010
Fax: (425) 353-4030
E-mail: vp.sales@vptpower.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	12.5 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T _{CASE} = +125°C)	6.0 Watts	Weight (Maximum) (Un-Flanged / Flanged)	(24 / 28) Grams
ESD Rating per MIL-PRF-38534	3A		

Parameter	Conditions	DVSB2853R3D			Units	
		Min	Typ	Max		
STATIC						
INPUT Voltage ⁴	Continuous	15	28	50	V	
	Transient, 1 sec ⁴	-	-	80	V	
Current	Inhibited	-	3.5	5.0	mA	
	No Load	-	-	60	mA	
Ripple Current	Full Load, 20Hz to 10MHz	-	40	60	mA _{p-p}	
Inhibit Pin Input ⁴		0	-	1.5	V	
Inhibit Pin Open Circuit Voltage ⁴		12	14	17	V	
UVLO Turn On		10.5	-	14.5	V	
UVLO Turn Off ⁴		8.5	-	13.5	V	
OUTPUT Voltage	V _{OUT1}	T _{CASE} = 25°C	4.95	5.0	5.05	V
	V _{OUT2}		3.267	3.3	3.333	V
	V _{OUT1}	T _{CASE} = -55°C to +125°C	4.925	5.0	5.075	V
	V _{OUT2}		3.25	3.3	3.35	V
Power ^{3,4}	Total		0	-	12.5	W
	V _{OUT1}		0	-	7.5	W
	V _{OUT2}		0	-	5	W
Current ³	V _{OUT1}		0	-	1.5	A
	V _{OUT2}		0	-	1.5	A
Ripple Voltage	V _{OUT1} V _{OUT2}	Full Load, 20Hz to 10MHz	-	40	60	mV _{p-p}
Line Regulation	V _{OUT1} V _{OUT2}	V _{IN} = 15V to 50V	-	0	25	mV
Load Regulation	V _{OUT1} V _{OUT2}	No Load to Full Load	-	10	50	mV
Cross Regulation	V _{OUT1} V _{OUT2}	V _{OUT1} = 0%, V _{OUT2} = 100% V _{OUT1} = 100%, V _{OUT2} = 0%	-	10	50	mV
EFFICIENCY		Full Load	69	74	-	%
LOAD FAULT POWER DISSIPATION		Overload ⁴	-	-	10	W
		Short Circuit	-	-	10	W
CAPACITIVE LOAD ⁴		Either Output	-	-	500	μF
SWITCHING FREQUENCY			550	650	700	kHz
SYNCHRONIZATION FREQUENCY ⁵			700	750	800	kHz
ISOLATION		500 V _{DC} , T _{CASE} = 25°C	100	-	-	MΩ
MTBF (MIL-HDBK-217F)		AIF @ T _C = 55°C	-	350	-	kHrs

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	12.5 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T _{CASE} = +125°C)	6.0 Watts	Weight (Maximum) (Un-Flanged / Flanged)	(24 / 28) Grams
ESD Rating per MIL-PRF-38534	3A		

Parameter	Conditions	DVSB2853R3D			Units	
		Min	Typ	Max		
DYNAMIC						
Load Step Output Transient	V _{OUT1} V _{OUT2}	Half Load to Full Load	-	200	400	mV _{PK}
Load Step Recovery ²	V _{OUT1} V _{OUT2}		-	450	700	μSec
Line Step Output Transient ⁴	V _{OUT1} V _{OUT2}	V _{IN} = 16V to 40V	-	100	400	mV _{PK}
Line Step Recovery ^{2, 4}	V _{OUT1} V _{OUT2}		-	300	600	μSec
Turn On Delay			-	-	20	mSec
Turn On Overshoot	V _{OUT1}	V _{IN} = 0V to 28V	-	-	25	mV _{PK}
	V _{OUT2}		-	-	15	mV _{PK}

Notes:

1. This note intentionally not used.
2. Time for output voltage to settle within 1% of its nominal value.
3. Derate linearly to 0 at 135°C.
4. Verified by initial electrical design verification. Post design verification, parameter shall be guaranteed to the limits specified.
5. Synchronization is TTL signal with V_{SYNC MAX} = 6V.

BLOCK DIAGRAM

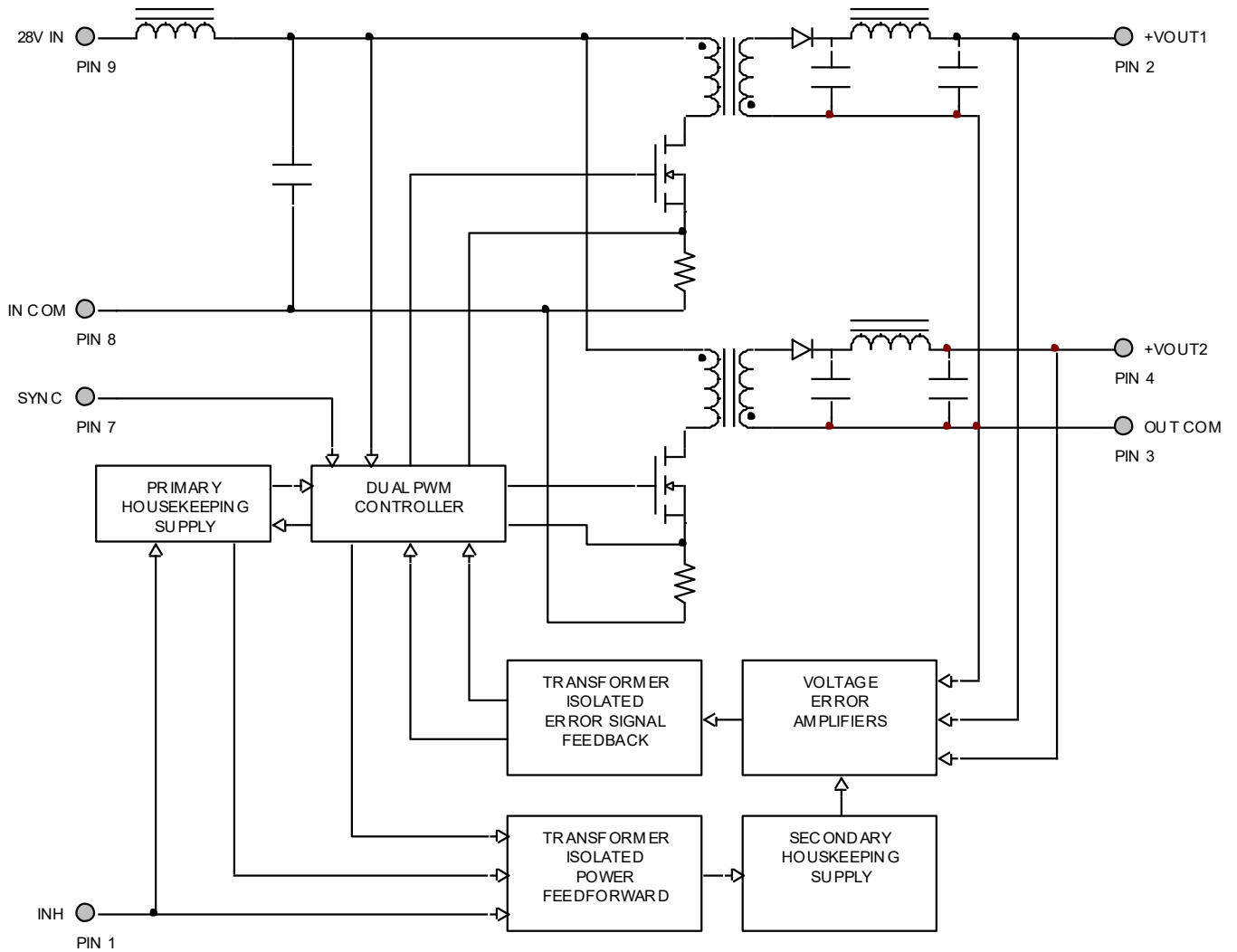


Figure 2

CONNECTION DIAGRAM

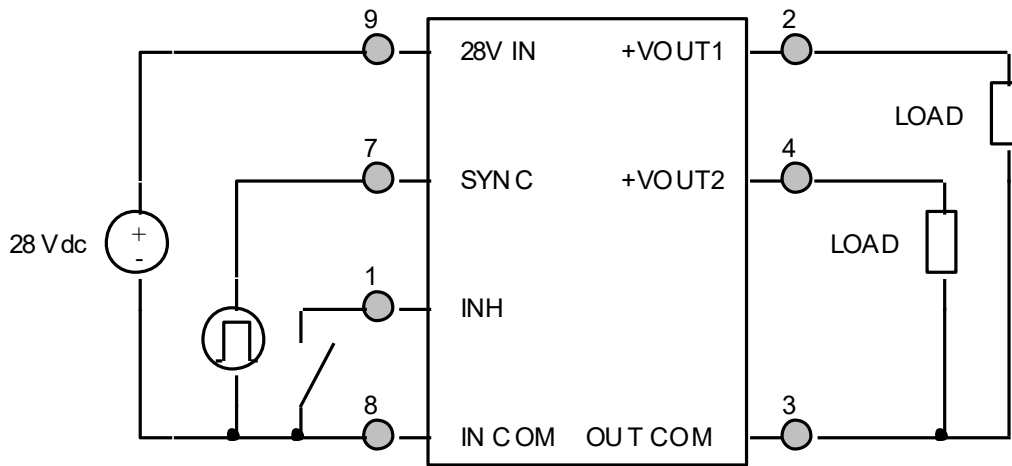


Figure 3

INHIBIT DRIVE CONNECTION DIAGRAMS

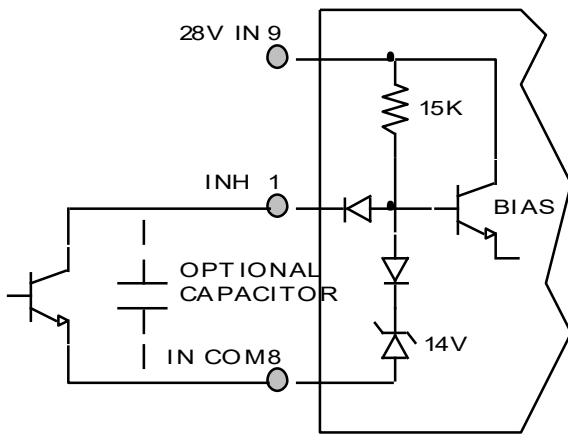


Figure 4 – Internal Inhibit Circuit and Recommended Drive
(Shown with optional capacitor for turn-on delay)

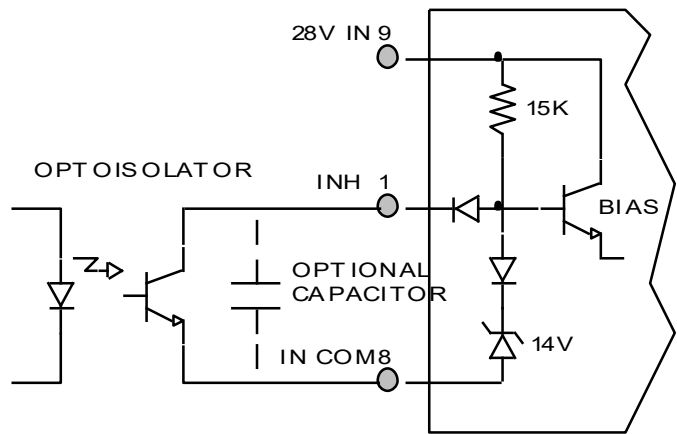


Figure 5 – Isolated Inhibit Drive
(Shown with optional capacitor for turn-on delay)

EMI FILTER HOOKUP DIAGRAM

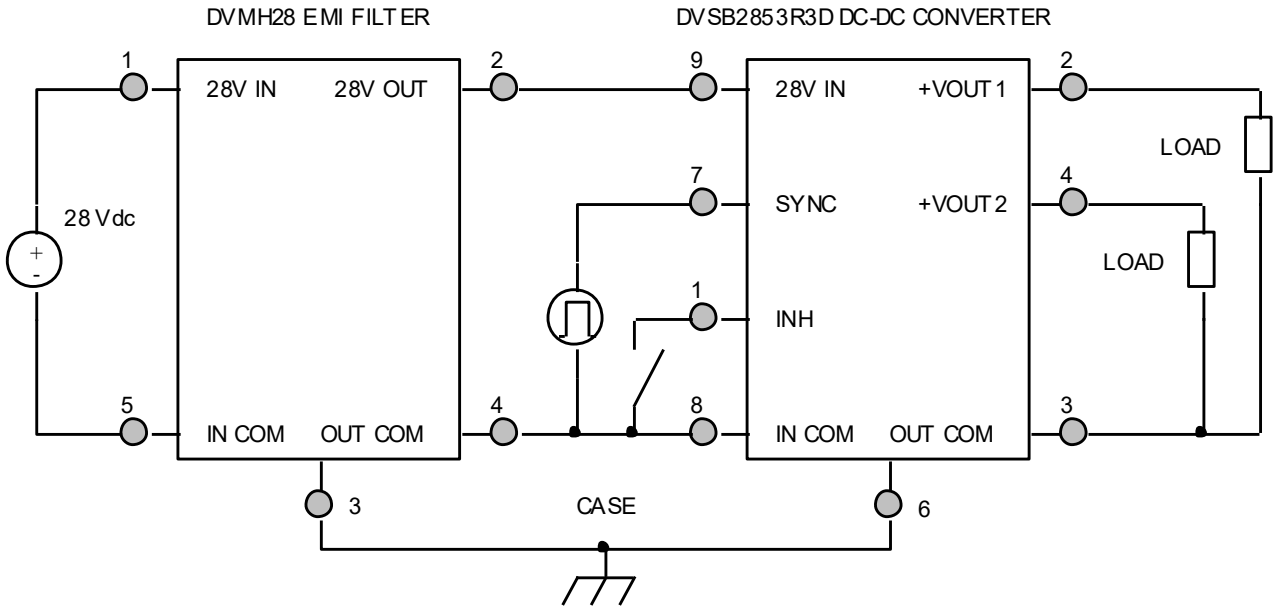


Figure 6 – Converter with EMI Filter

EFFICIENCY PERFORMANCE CURVES ($T_{CASE} = 25^{\circ}C$)

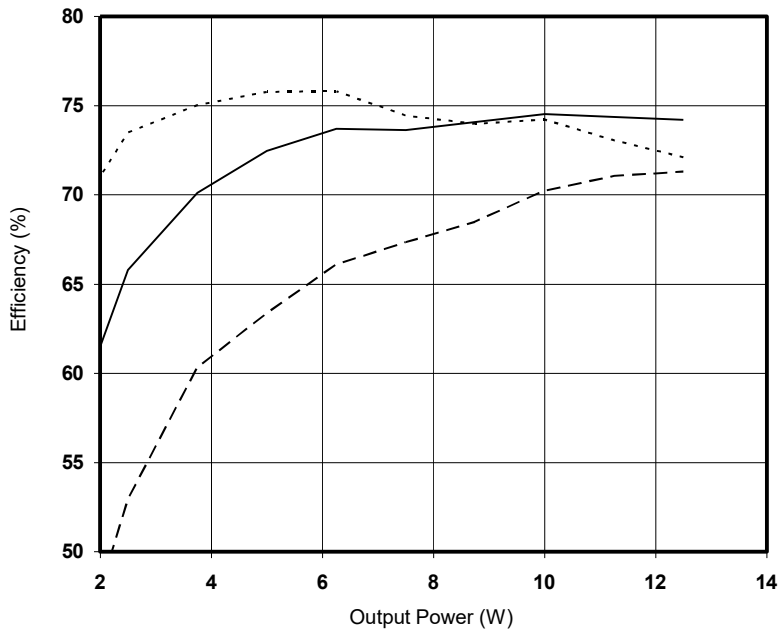


Figure 7 – DVSB2853R3D
Efficiency (%) vs. Output Power (W)

EMI PERFORMANCE CURVES

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

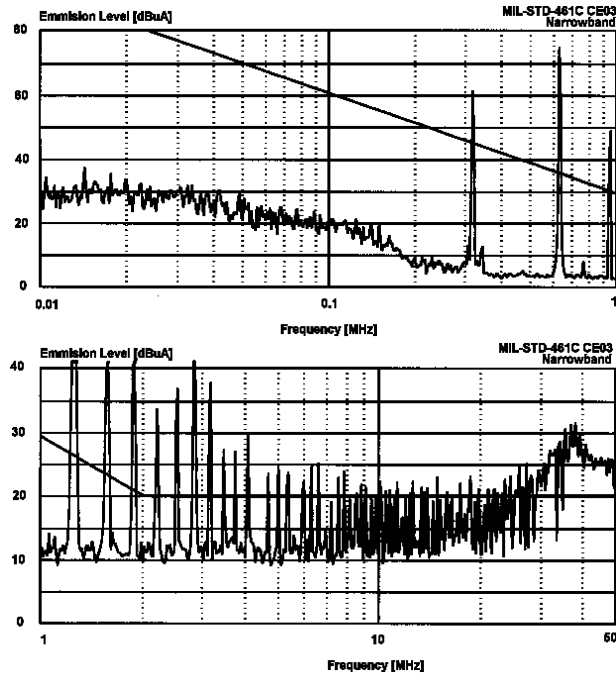


Figure 9 – DVSB2853R3D without EMI Filter

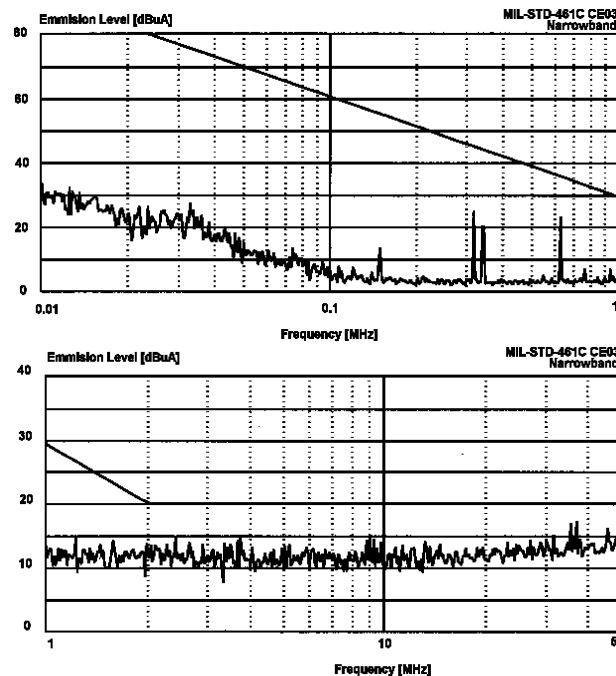
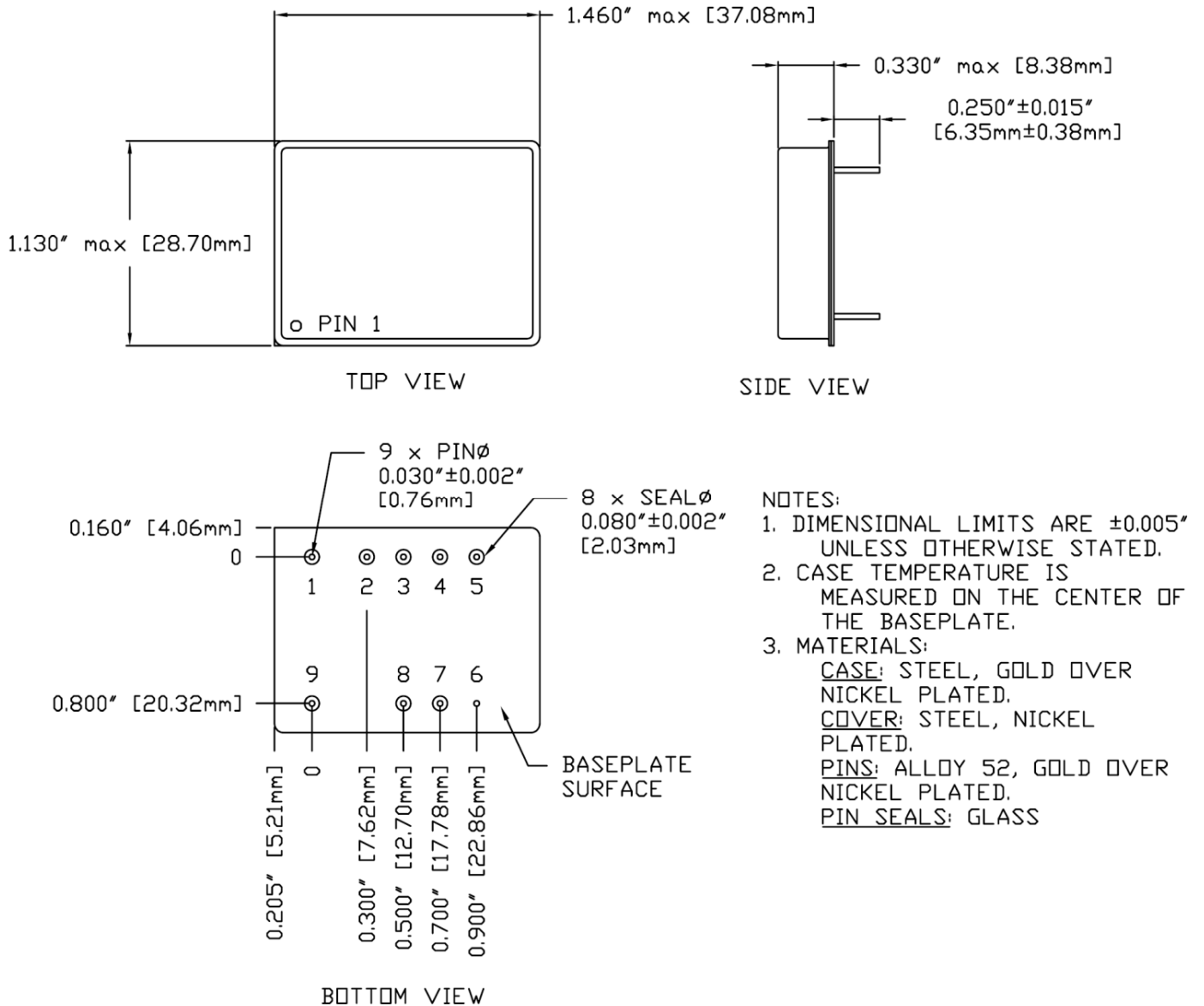


Figure 10 – DVSB2853R3D with EMI Filter

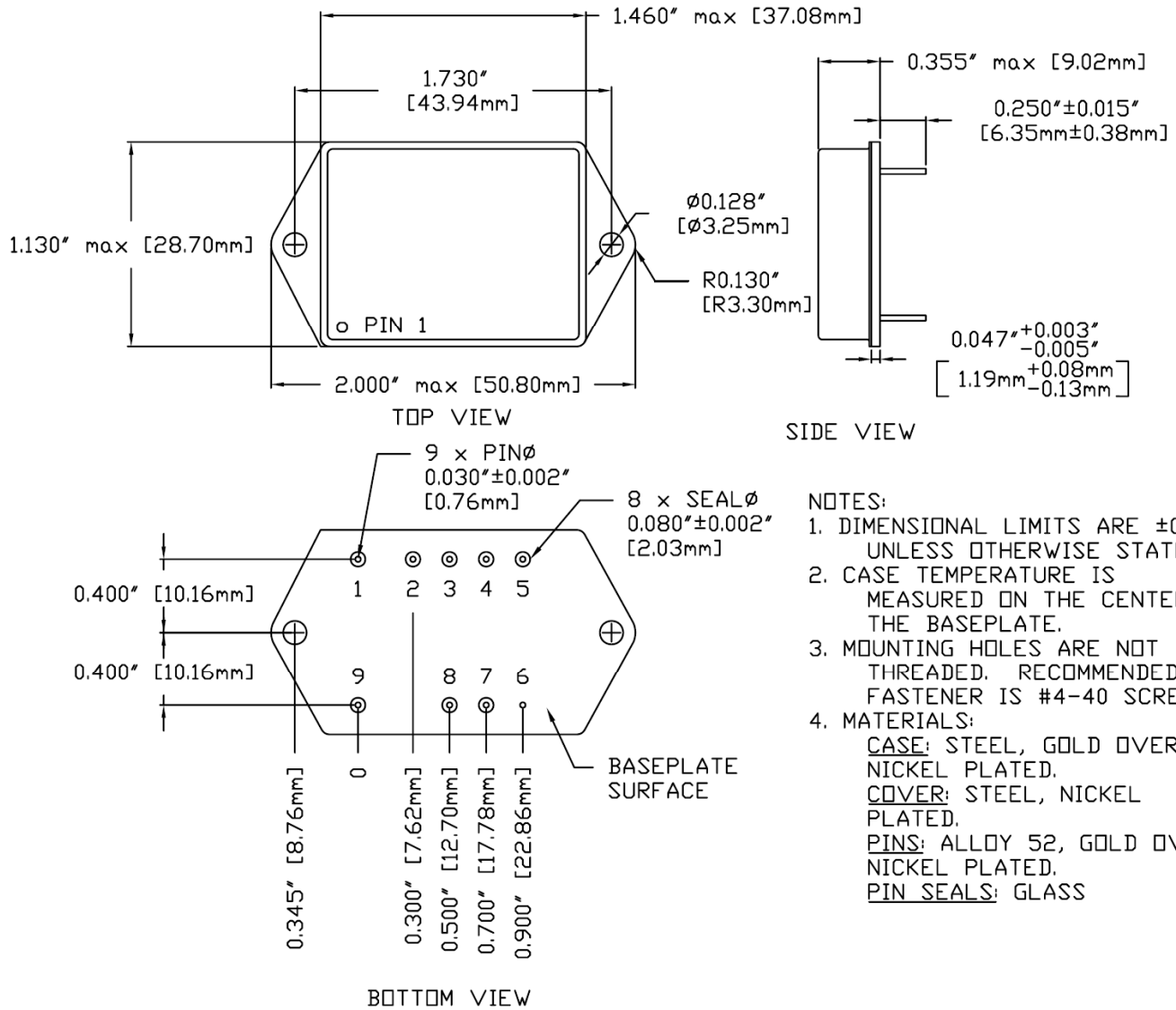
PACKAGE SPECIFICATIONS (NON-FLANGED)



Pin	Function	Pin	Function	Pin	Function
1	INHIBIT	4	+VOUT2	7	SYNC
2	+VOUT1	5	N/C	8	IN COM
3	OUT COM	6	CASE	9	28V IN

Figure 11 – Non-Flanged Package and Pinout

PACKAGE SPECIFICATIONS (FLANGED)



- NOTES:**
1. DIMENSIONAL LIMITS ARE $\pm 0.005"$ 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	+VOUT2	7	SYNC
2	+VOUT1	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	+VOUT1	Positive Output 1 Voltage Connection
3	OUT COM	Output Common Connection
4	+VOUT2	Positive Output 2 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

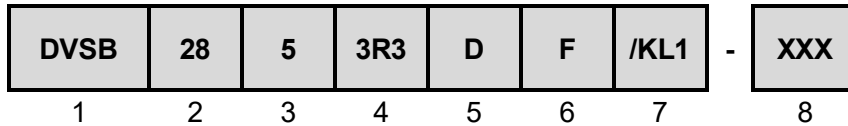
ENVIRONMENTAL SCREENING (100% Tested Per MIL-STD-883 as referenced to MIL-PRF-38534)

Test	MIL-STD-883 Test Method, Condition	No Suffix (Standard) Non-QML 5	/ES (Extended) Non-QML 5	/H (Class H)	/KL1 Non-QML 5,9
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 or B1		•	•	•
	TM1014, Gross Leak, Condition C1 or B2		•	•	•
	Gross Leak, Dip (No Bomb), Visual Verification	•			
Radiography ⁸	TM2012				•
External Visual	TM2009	•	•	•	•

Notes:

- Contact Sales for more information concerning additional environmental screening and testing options desired.
- 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.
- 100% R&R testing with all test data included in product shipment.
- Not required per MIL-PRF-38534. Test is performed for additional product quality assurance.
- Non-QML products may not meet all requirements of MIL-PRF-38534.
- Note intentionally not used.
- PIND test Certificate of Compliance included in product shipment.
- Radiographic test Certificate of Compliance and film(s) or data CD included in product shipment.
- KL1 products are identical in every way with Class K products in compliance with MIL-PRF-38534 revision L and later revisions except they contain elements evaluated to the requirements of MIL-PRF-38534 revision K and previous revisions. These devices are not marked with an SMD number or MIL-PRF-38534 certification mark and are sealed with -KL1 screening code in place of -K.

ORDERING INFORMATION



(1)

(2)

(3)

(4)

Product Series	Nominal Input Voltage		Output 1 Voltage		Output 2 Voltage	
DVSB	28	28 Volts	5	+5 Volts	3R3	+3.3 Volts

(5)

(6)

(7)

(8)

Number of Outputs		Package Option		Screening Code ^{1,2,3}		Additional Screening Code
D	Dual	None F	Non-Flanged Flanged	None /ES /H /KL1	Standard Extended Class H Class KL1	Contact Sales

- Notes:
1. Contact the VPT Inc. Sales Department for availability of Class H (/H) and KL1 (/KL1) 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.
 3. -KL1 products are identical in every way with Class K products in compliance with MIL-PRF-38534 revision L and later revisions except they contain elements evaluated to the requirements of MIL-PRF-38534 revision K and previous revisions. These devices are not marked with an SMD number or MIL-PRF-38534 certification mark and are marked with -KL1 screening code in place of -K.

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)	CAGE Number	DVSB2800D Series Similar Part Number
5962-0820701HXC	0ZBZ6	DVSB2853R3D/H
5962-0820701HXA	0ZBZ6	DVSB2853R3D/H-E
5962-0820701HYC	0ZBZ6	DVSB2853R3DF/H
5962-0820701HYA	0ZBZ6	DVSB2853R3DF/H-E

Do not use the DVSB2800D 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. SMDs can be downloaded from the DLA Land and Maritime (Previously known as DSCC) website at <https://landandmaritimeapps.dla.mil/programs/defaultapps.asp>. The SMD number listed above represents the Federal Stock Class, Device Type, Device Class Designator, Case Outline, Lead Finish and RHA Designator (where applicable). 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@vptpower.com

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