



DVPL0503S Series

HIGH RELIABILITY HYBRID DC-DC CONVERTERS

DESCRIPTION

The DVPL series of high reliability DC-DC converters is operable over the full military (-55 °C to +125 °C) temperature range with no power derating. Operating at a nominal fixed frequency of 300 kHz, these regulated, non-isolated converters are optimized for low voltage point of load applications with high efficiency synchronous rectification and fast transient response.

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
- Operates From 5V Input
- Adjustable Output Voltage, 0.8V to 3.4V
- Up to 3 Amps or 10W Output
- High Efficiency, Up to 95%
- Operation Into a Pre-Biased Output
- Output Inhibit Control
- Low Output Noise
- NO Use of Optoisolators
- Over Current and Short Circuit Protection
- Precision Projection Welded Hermetic Package
- Meets MIL-STD-461 Revisions C, D, E and F EMC Requirements When Used With VPT DC-DC Converters and EMI filters
- Additional Environmental Screening Available
- MIL-PRF-38534 Element Evaluated Components



Figure 1 – DVPL0503S DC-DC Converter
(Exact marking may differ from that shown)

SPECIFICATIONS ($T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{IN} = +5\text{V} \pm 5\%$, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS

Input Voltage (Continuous)	5.5 V_{DC}	Junction Temperature Rise to Case	+8°C
Input Voltage (Transient, 20 milliseconds)	5.8 V_{DC}	Storage Temperature	-65°C to +150°C
Output Power ¹	10 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, $T_{CASE} = +125^{\circ}\text{C}$)	1.7 Watt	Weight (Maximum)	8 Grams
ESD Rating per MIL-PRF-38534	1C		

Parameter	Conditions	DVPL0503S			Units	
		Min	Typ	Max		
STATIC						
INPUT Voltage ⁴	V_{IN} Vout = 0.8V to 3.3V	4.0		5.5	V	
Current	Inhibited	-	-	3	mA	
	No Load		20	45	mA	
Inhibit Pin Input ⁴		0	-	0.2	V	
Inhibit Pin Open Circuit Voltage ⁴				Vin	V	
UVLO Turn On ^{4,6}			2.2		V	
UVLO Turn Off ⁴			2.0		V	
OUTPUT Voltage	V_{OUT} $T_{CASE} = 25^{\circ}\text{C}$	-1.5	Vout	+1.5	%Vout	
	V_{OUT} $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$	-2.5	Vout	+2.5	%Vout	
Power ^{3,1}	$V_{OUT} = 3.3\text{V}$	0		10	W	
Current ³	V_{OUT}	0		3	A	
Ripple Voltage	V_{OUT} Full Load, 20Hz to 10MHz		35	90	mV _{p-p}	
Load Regulation	V_{OUT} No Load to Full Load		20	40	mV	
EFFICIENCY	Vin = 5V, Vout = 3.3V	86	92		%	
FAULT POWER DISSIPATION ⁴	Short Circuit			4	W	
CAPACITIVE LOAD ⁴				5000	μF	
SWITCHING FREQUENCY		240	300	350	kHz	
CASE ISOLATION	500 V_{DC}	100	-	-	M Ω	
MTBF (MIL-HDBK-217F)	AIF @ $T_c = 55^{\circ}\text{C}$		823		kHrs	
DYNAMIC						
Load Step Output Transient ⁵	V_{OUT} Half Load to Full Load		200	350	mV	
Load Step Recovery ^{2,5}	$V_{OUT} = 3.3\text{V}$		200	400	μSec	
Turn On Delay	V_{OUT} $V_{IN} = 0\text{V}$ to 5V		5	10	mSec	
Turn On Overshoot				70	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.
 5. With 100 μF capacitor from Vin to Ground
 6. Vout not necessarily in regulation.

BLOCK DIAGRAM

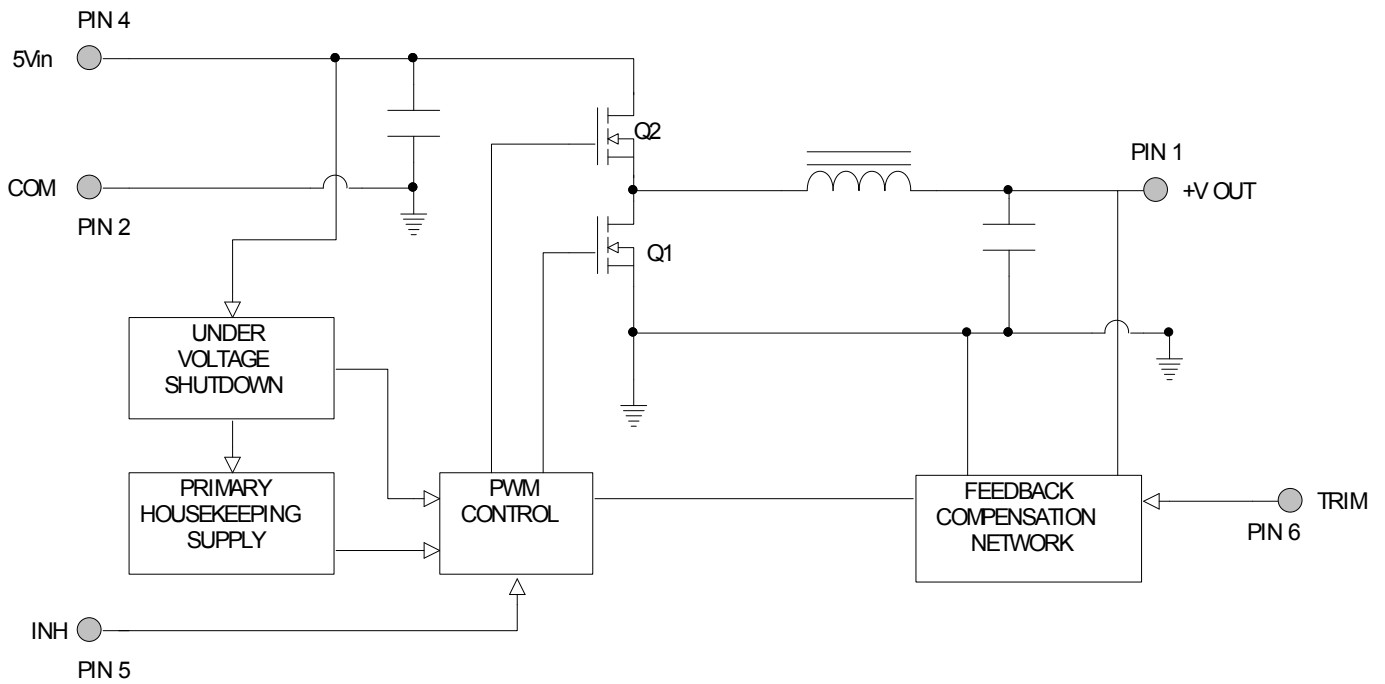


Figure 2

CONNECTION DIAGRAM

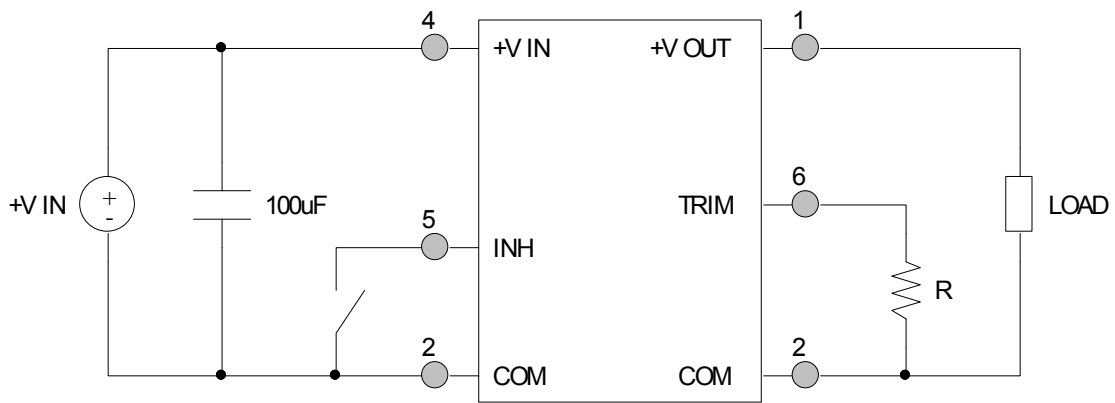


Figure 3

(Shown with recommended 100uF input capacitor)

TYPICAL DISTRIBUTED APPLICATION

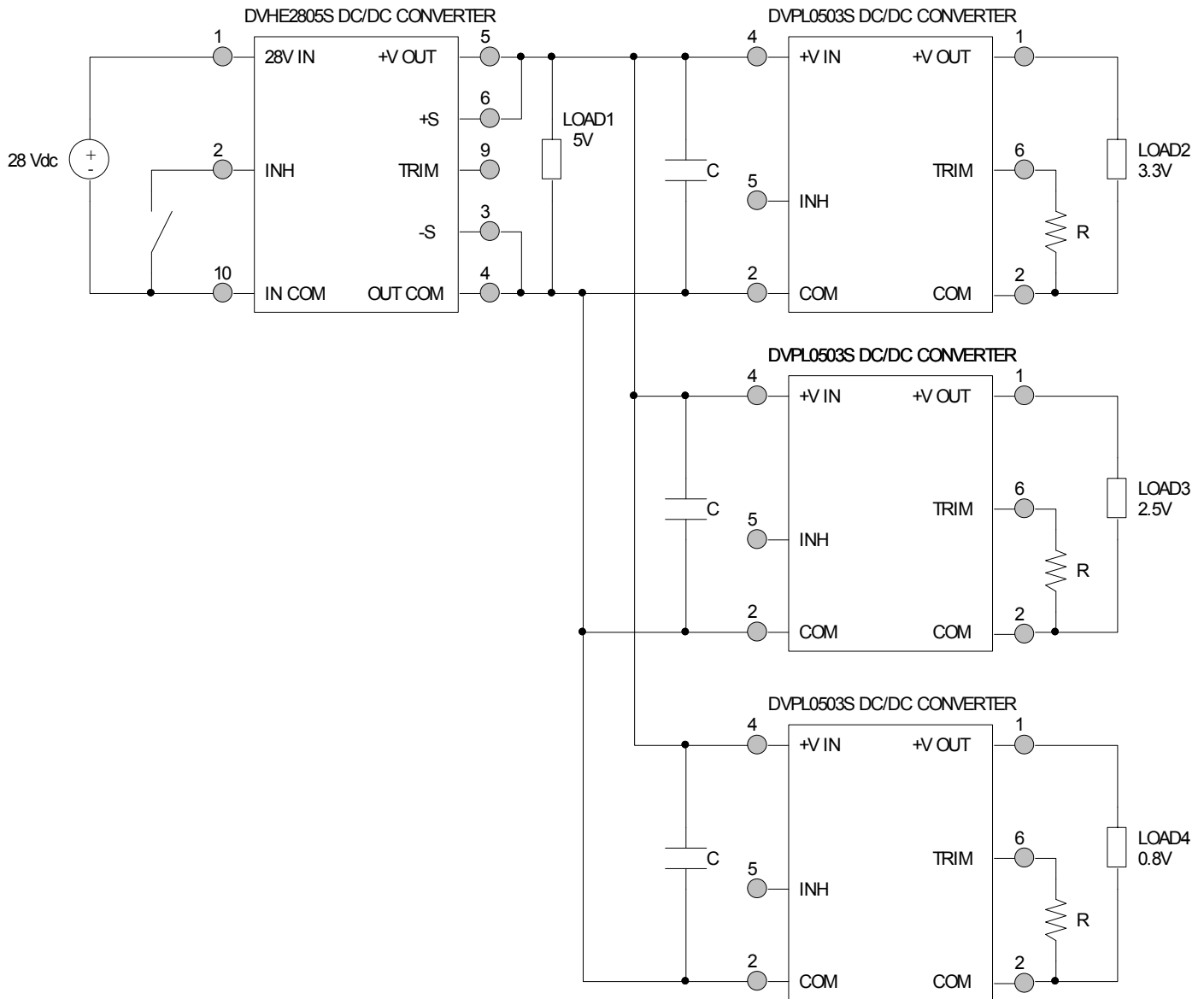
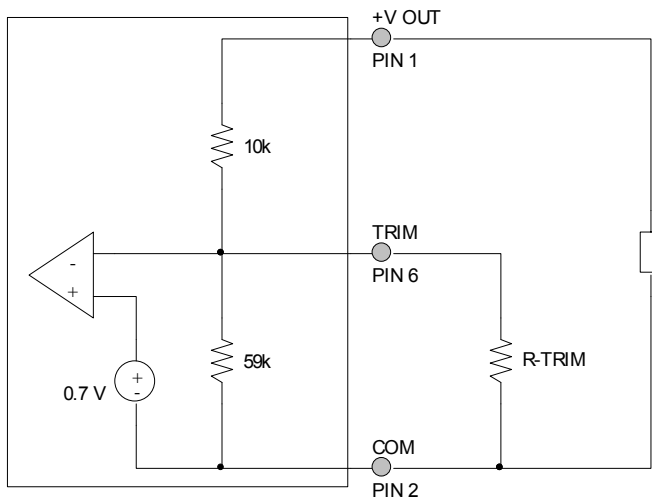


Figure 4

OUTPUT VOLTAGE TRIM



The output voltage is set with an external resistor connected from the TRIM pin to GND pin. This resistor must have a tolerance of 1% or less to achieve an accurate output voltage.

The default output voltage with the TRIM pin left floating is 0.8V.

DVPL0503S	
+V _{OUT} (V)	R _{TRIM} (Ω)
0.8	-
0.9	70.2k
1.0	35.0k
1.2	17.5k
1.5	10.0k
1.8	7.0k
1.9	6.37k
2.0	5.84k
2.5	4.12k
2.8	3.50k
3.0	3.18k
3.3	2.80k
3.4	2.69k

$$V_o = \frac{488.6 * 10^6}{69.8 * 10^3} + 55860$$

$$R_{trim} = \frac{488.6 * 10^6}{V_o * 69.8 * 10^3 - 55860}$$

Figure 5 – Output Voltage Trim

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

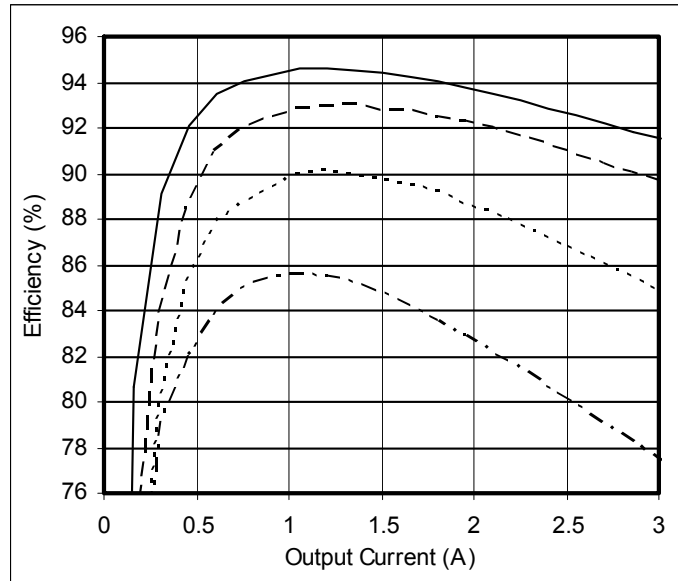
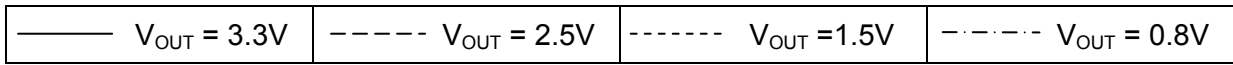


Figure 6 – DVPL0503S $V_{in}=5.0V$
Efficiency (%) vs. Output Current (A)

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

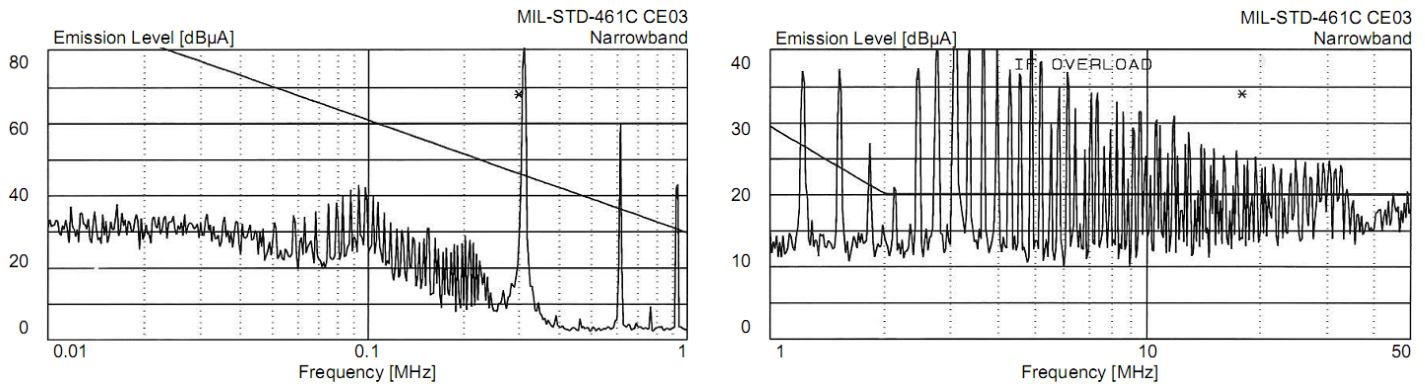


Figure 7 – 5V input line, DVPL, $C_{IN}=100\mu F$

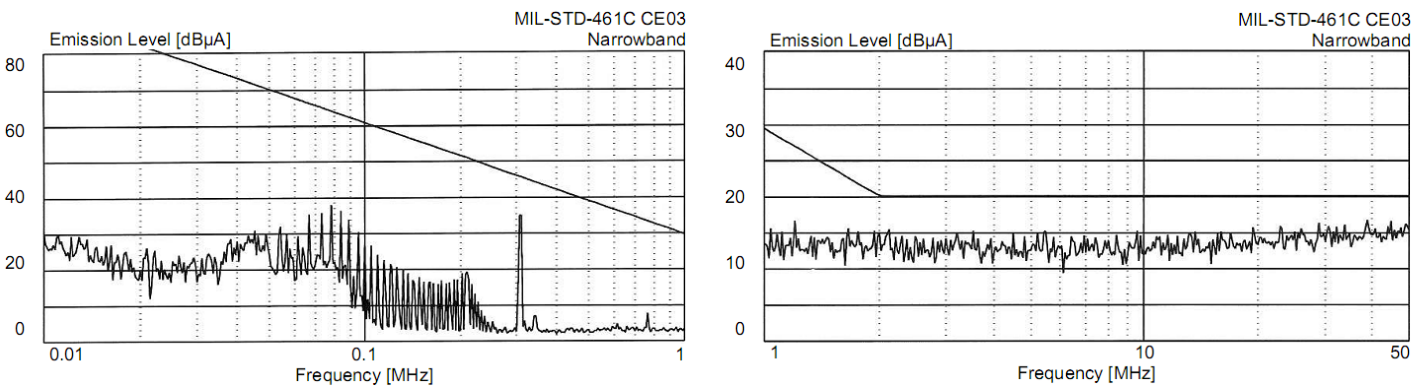


Figure 8 – 5V input line, DVMC and DVPL, $C_{IN}=100\mu F$

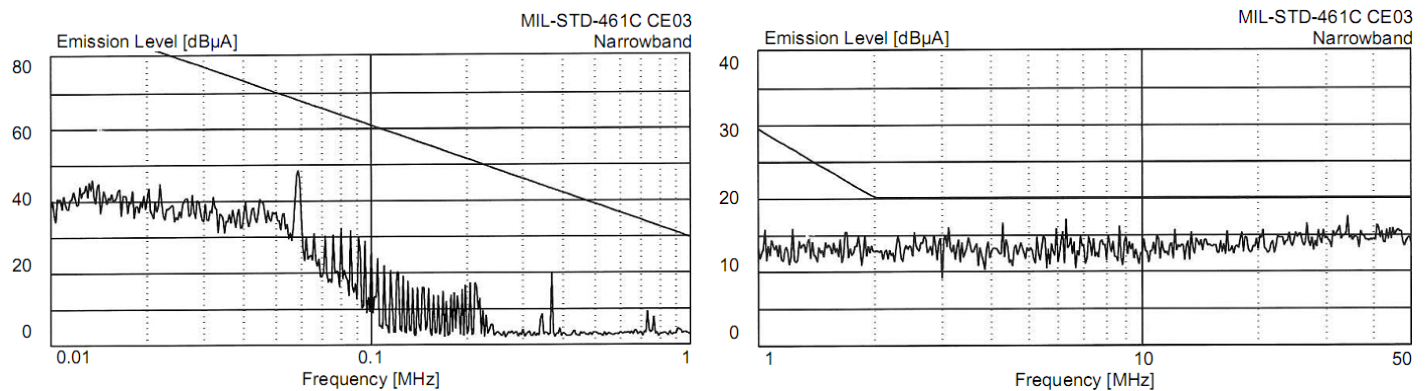
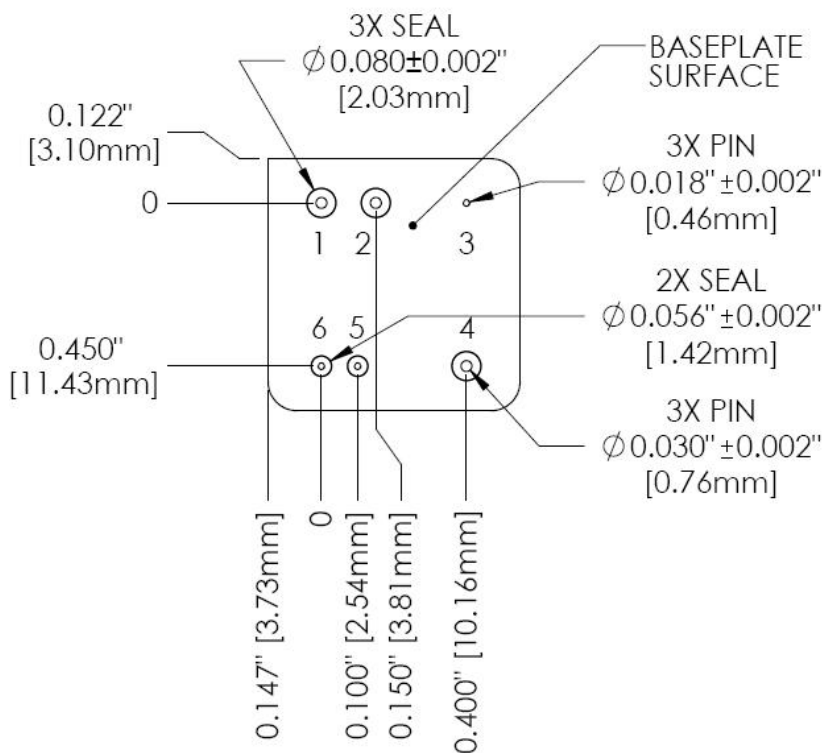
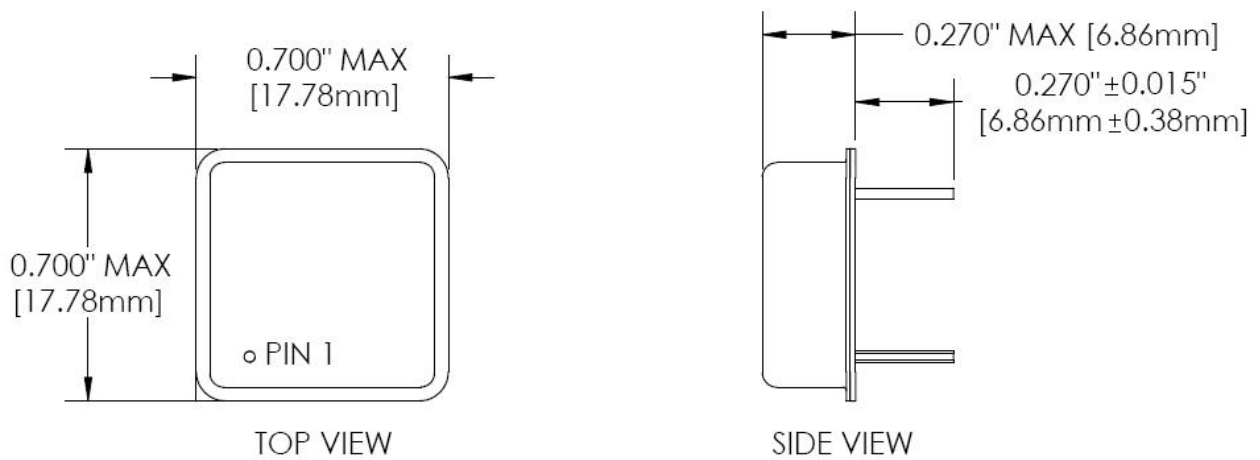


Figure 9 – 28V input line, DVMC, DVHE and DVPL, $C_{IN}=100\mu F$

PACKAGE SPECIFICATIONS



NOTES:

1. DIMENSIONAL LIMITS ARE $\pm 0.005"$ 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: COPPER CORED ALLOY 52 (0.030" ϕ), ALLOY 52 (0.018" ϕ), GOLD OVER NICKEL PLATED
PIN SEALS: GLASS

Pin	Function	Pin	Function
1	+V OUT	4	+V IN
2	COM	5	INHIBIT
3	CASE	6	TRIM

Figure 10 – Package and Pinout

PACKAGE PIN DESCRIPTION

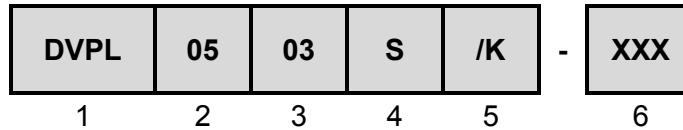
Pin	Function	Description
1	+V OUT	Positive Output Voltage Connection
2	COM	Common Return Connection
3	CASE	Case Connection
4	+V IN	Positive Input Voltage Connection
5	INHIBIT	Logic Low = Disabled Output. Connecting the inhibit pin to common causes converter shutdown. Logic High (open collector or open drain) = Enabled Output. Leave open if not used.
6	TRIM	Trim pin sets output voltage with a resistor to Common

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)	/K (Class K)
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 Current		(4) Number of Outputs	
DVPL	05	5 Volts	03	3 Amps	S	Single

(5) Screening Code ¹		(6) Additional Screening Code
None /ES /H /K	Standard Extended Class H 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)	DVPL0503S Series Similar Part Number
5962-1324301HXC	DVPL0503S/H
5962-1324301HXA	DVPL0503S/H-E
5962-1324301KXC	DVPL0503S/K
5962-1324301KXA	DVPL0503S/K-E

Do not use the DVPL0503S 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 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

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