DVPL0505S 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, fast transient response, and power sequencing capability.

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 or 3.3V Input
- Adjustable Output Voltage, 0.8V to 3.4V
- Up to 5 Amps or 16W Output
- High Efficiency, Up to 97%
- Output Voltage Sequencing
- Output Voltage Tracking
- 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-461C and MIL-STD-461D EMC Requirements When Used With VPT DC-DC Converters and EMI filters
- Additional Environmental Screening Available
- MIL-PRF-38534 Element Evaluated Components

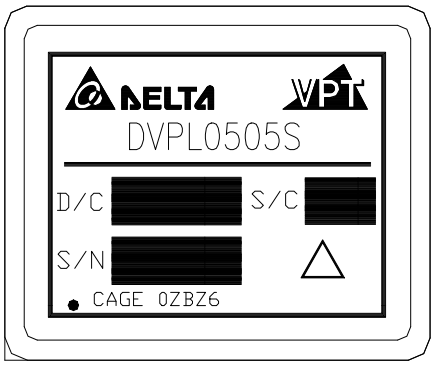

Figure 1 – DVPL0505S DC-DC Converter
(Exact marking may differ from that shown)

http://www.vptpower.com

Sales Information:
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SPECIFICATIONS (T_{CASE} = -55°C to +125°C, V_{IN} = +3.3V, +5V ± 5%, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS			
Input Voltage (Continuous)	5.5 V_{DC}	Junction Temperature Rise to Case	+10°C
Input Voltage (Transient, 1 second)	5.8 V_{DC}	Storage Temperature	-65°C to +150°C
Output Power[1]	16.5 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T_{CASE} = +125°C)	1.3 Watt	Weight (Maximum)	12 Grams
ESD Rating per MIL-PRF-38534	2		

Parameter		Conditions	DVPL0505S			Units
			Min	Typ	Max	
STATIC						
INPUT Voltage[4]	V_{IN}	Vout = 0.8V to 2.5V	3.0		5.5	V
	V_{IN}	Vout = 2.6V to 3.3V	4.0		5.5	V
Current		Inhibited	-	-	3	mA
		No Load			60	mA
Inhibit Pin Input[4]			0	-	1.5	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°C	-1.5	Vout	+1.5	%Vout
	V_{OUT}	T_{CASE} = -55°C to +125°C	-2.5	Vout	+2.5	%Vout
Power[3,1]		V_{OUT} = 3.3V	0		16.5	W
Current[3]	V_{OUT}		0		5	A
Ripple Voltage	V_{OUT}	Full Load, 20Hz to 10MHz		35	90	mV_{p-p}
Load Regulation	V_{OUT}	No Load to Full Load		15	40	mV
EFFICIENCY		Vin = 5V, Vout = 3.3V	93	96		%
FAULT POWER DISSIPATION		Short Circuit			3	W
CAPACITIVE LOAD[4]					5000	µF
SWITCHING FREQUENCY			240	300	350	kHz
CASE ISOLATION		500 V_{DC}	100	-	-	MΩ
MTBF (MIL-HDBK-217F)[7]		AIF @ T_C = 55°C		1.14		MHrs
DYNAMIC						
Load Step Output Transient[5]	V_{OUT}	Half Load to Full Load		100	250	mV
Load Step Recovery[2,5]				30	100	µSec
Turn On Delay	V_{OUT}	V_{IN} = 0V to 5V			6	mSec
Turn On Overshoot					60	mV_{PK}
VOLTAGE TRACKING						
Tracking Accuracy[4]		Power-up		100	300	mV
		Power-down		200	400	mV
Slew Rate[4]		At track pin	0.1		2	V/mSec
Tracking Delay[4]		From Vin to tracking voltage applied	10	-	-	mSec

1. Dependent on output voltage.
2. Time for output voltage to settle within 1% of its nominal value, whichever is greater.
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. With 100µF capacitor from Vin to Ground.
6. Vout not necessarily in regulation.
7. Correction factor of 0.12 added to ceramic capacitors.

BLOCK DIAGRAM

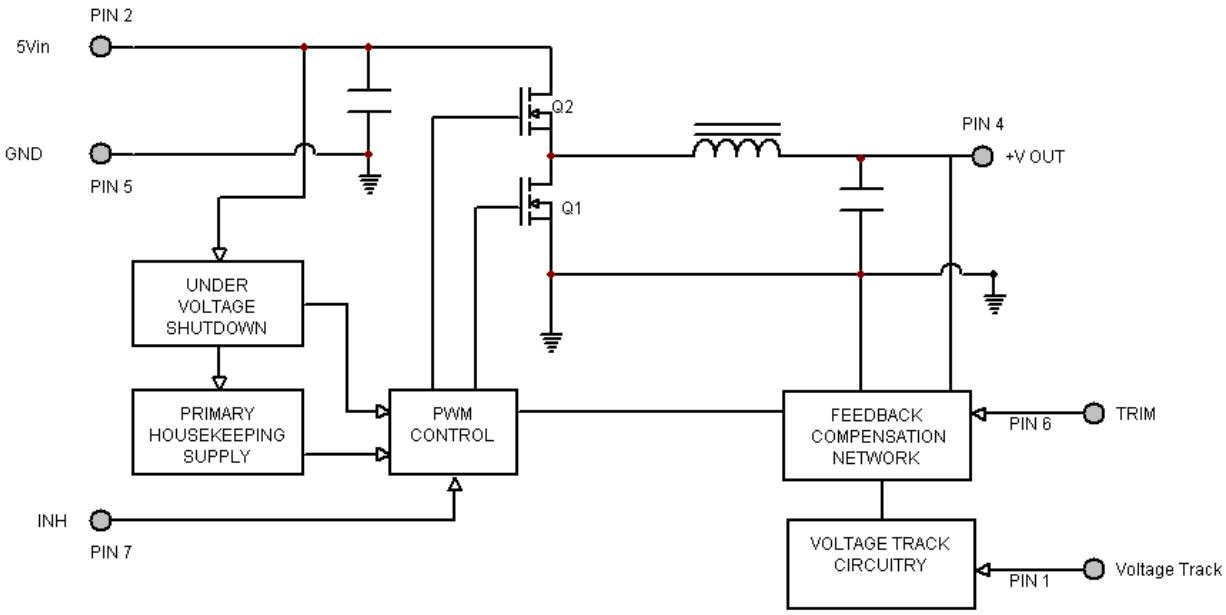


Figure 2

CONNECTION DIAGRAM

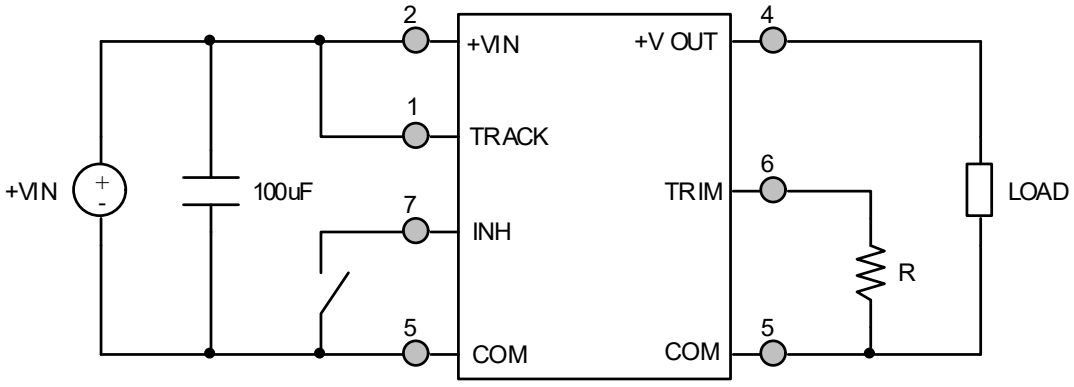


Figure 3
(Shown with recommended 100uF input capacitor)

TYPICAL DISTRIBUTED APPLICATION

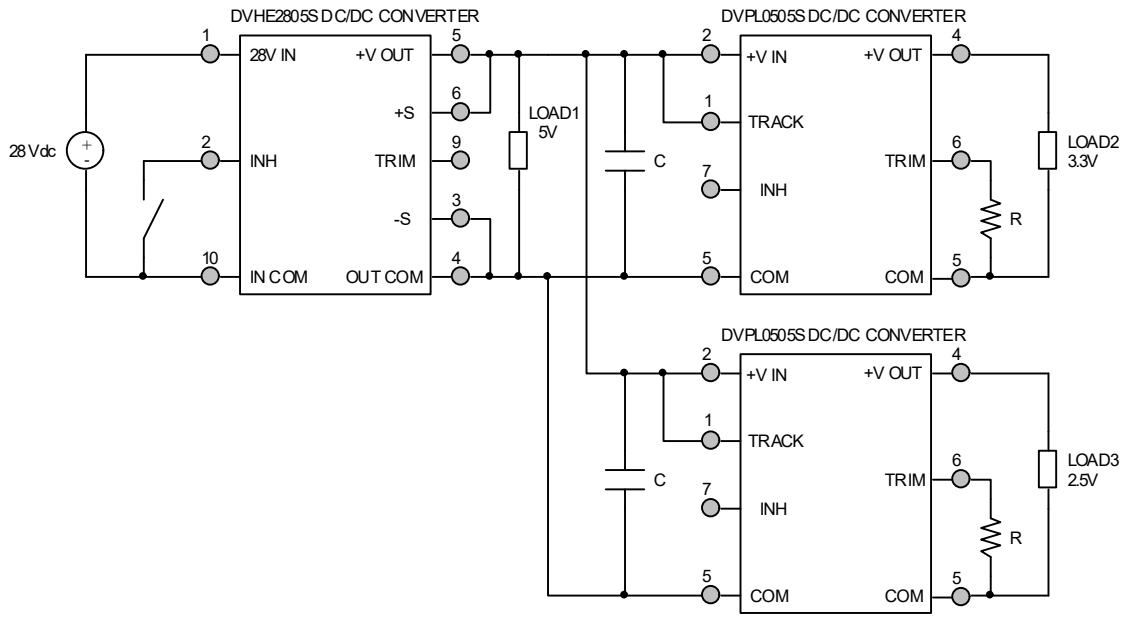


Figure 4

TRACKING APPLICATION

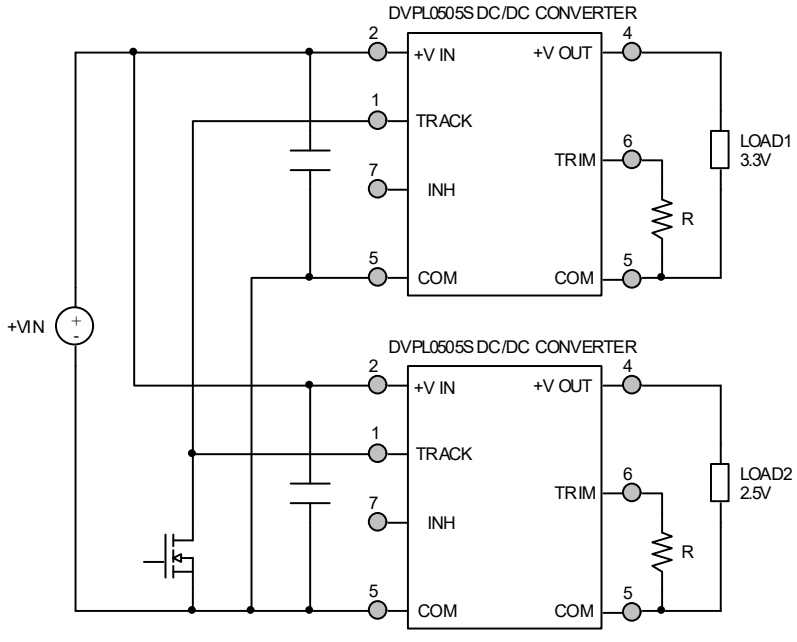


Figure 5

INTERNAL CONNECTION DIAGRAMS

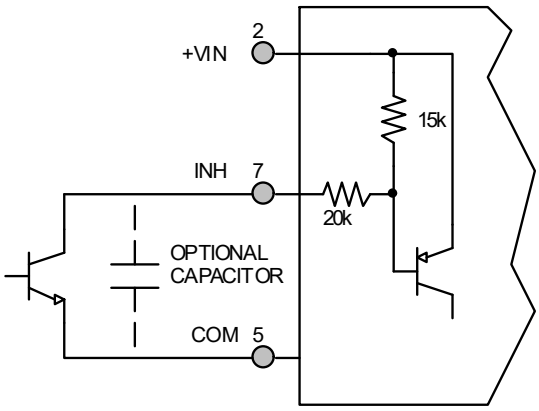


Figure 6 – Internal Inhibit Circuit and Recommended Drive
(Shown with optional capacitor for turn-on delay)

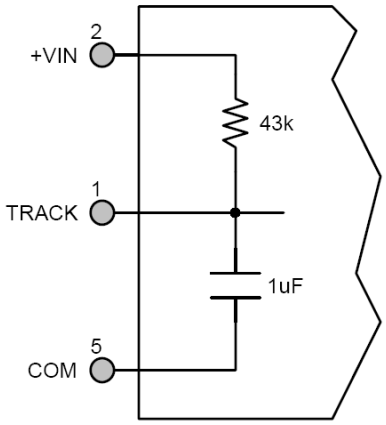


Figure 7 – Internal Track Circuit

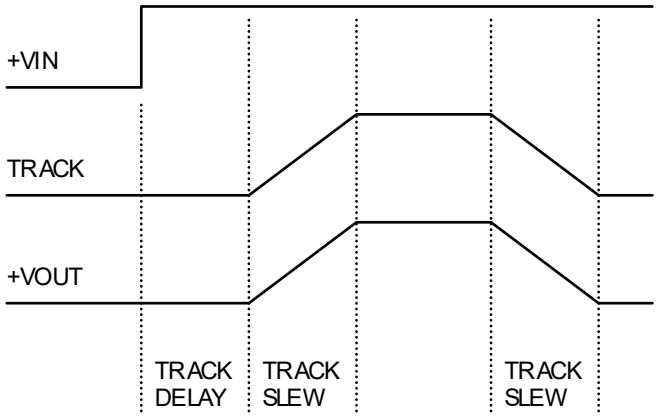
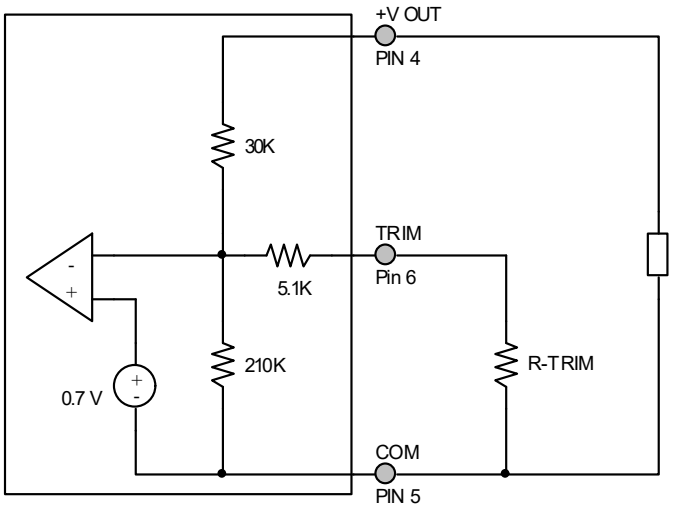


Figure 8 – Track timing relations

OUTPUT VOLTAGE TRIM



The output voltage is set with an external resistor connected from 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 open is 0.80V.

DVPL0505S	
$+V_{OUT}$ (V)	R_{TRIM} (Ω)
0.8	-
0.9	205k
1.0	99.9k
1.2	47.4k
1.5	24.9k
1.8	15.9k
1.9	14k
2.0	12.4k
2.5	7.25k
2.8	5.40k
3.0	4.44k
3.3	3.30k
3.4	2.98k

$$Vo = \frac{168R_{TRIM} + 5.267*10^6}{210R_{TRIM} + 1.071*10^6}$$

$$R_{TRIM} = \frac{5.267*10^6 - 1.071*10^6 * Vo}{210*Vo - 168}$$

Figure 9 – Output Voltage Trim

EFFICIENCY PERFORMANCE CURVES (T_{CASE} = 25°C, Full Load, Unless Otherwise Specified)

V_{OUT} = 3.3V	V_{OUT} = 2.5V	V_{OUT} =1.5V	V_{OUT} = 0.8V

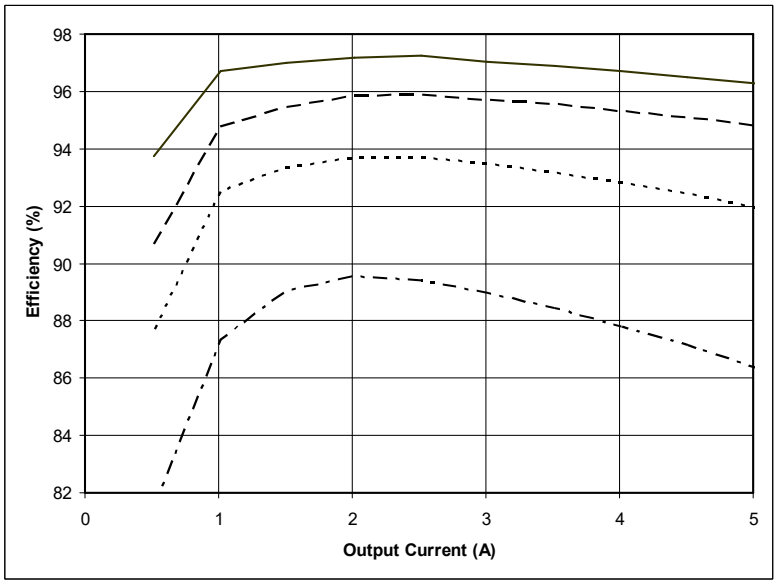


Figure 10 – DVPL0505S Vin=5.0V
Efficiency (%) vs. Output Current (A)

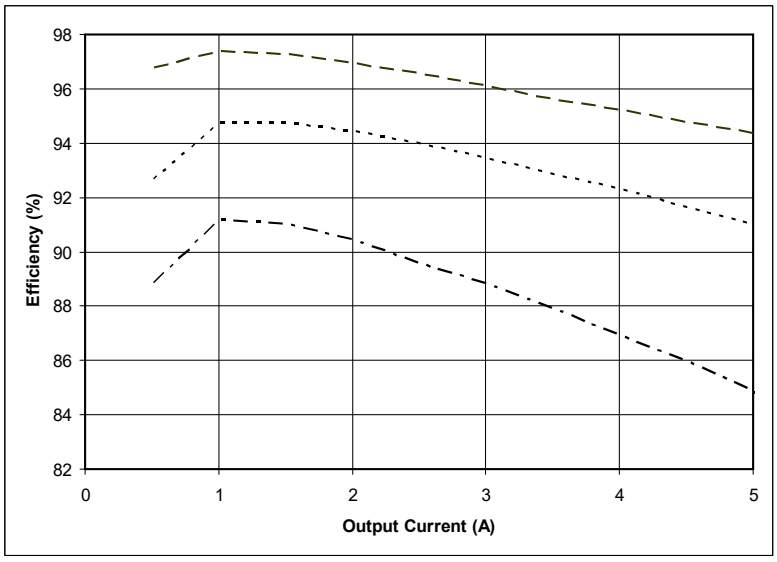


Figure 11 – DVPL0505S Vin=3.3V
Efficiency (%) vs. Output Current (A)

EMI PERFORMANCE CURVES (T_{CASE} = 25°C, Full Load, Unless Otherwise Specified)

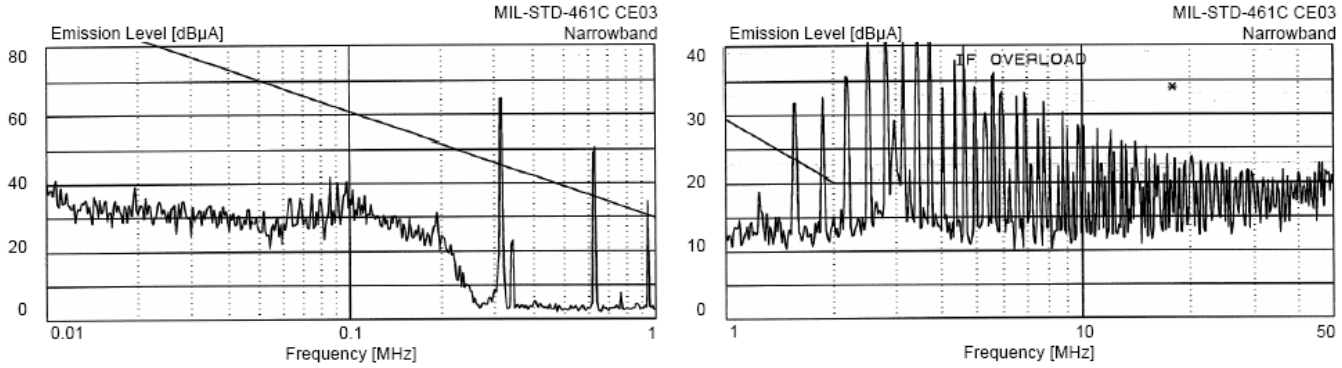


Figure 12 – 5V input line, DVPL, C_{IN}=100µF

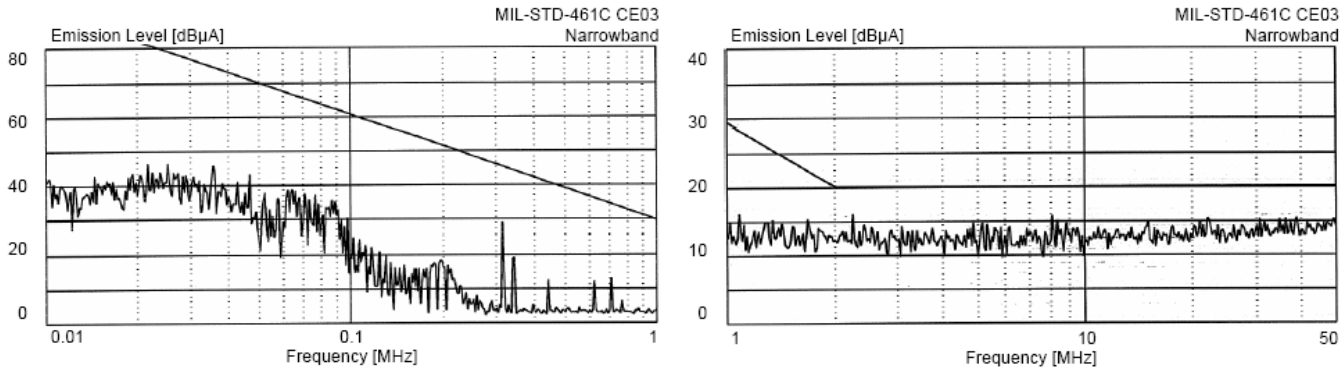


Figure 13 – 5V input line, DVMC and DVPL, C_{IN}=100µF

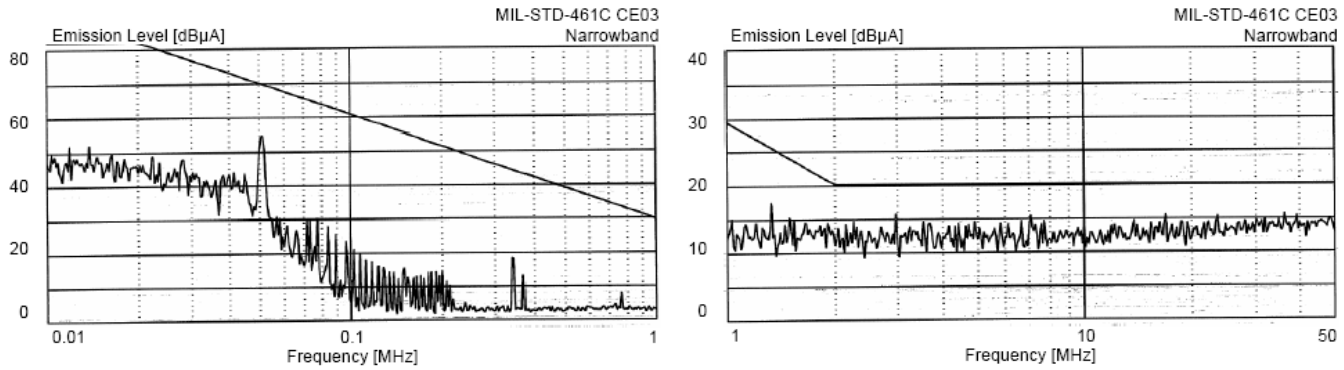
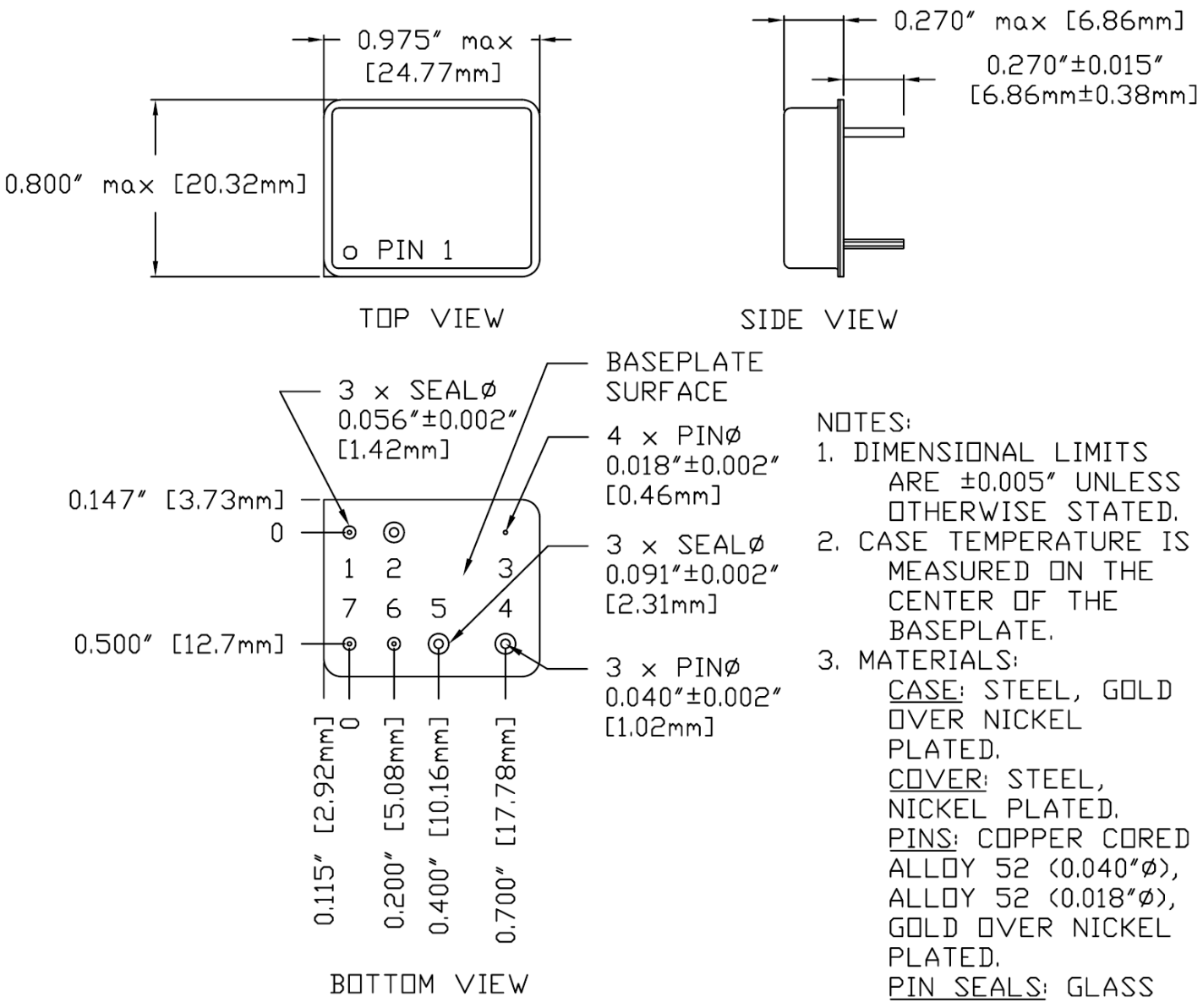


Figure 14- 28V input line, DVMC, DVHE and DVPL, C_{IN}=100µF

PACKAGE SPECIFICATIONS



PIN	FUNCTION	PIN	FUNCTION
1	TRACK	5	COM
2	+V IN	6	TRIM
3	CASE	7	INHIBIT
4	+V OUT		

Figure 15 – Package and Pinout

PACKAGE PIN DESCRIPTION

Pin	Function	Description
1	TRACK	The output voltage will follow this pin. Used for output voltage sequencing or tracking. If not used, the Track pin should be connected to Vin.
2	+V IN	Positive Input Voltage Connection
3	CASE	Case Connection
4	+V OUT	Positive Output Voltage Connection
5	COM	Common Return Connection
6	TRIM	Trim pin sets output voltage with a resistor to Common
7	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.

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 or B1		•	•	•
	TM1014, Gross Leak, Condition C or B2		•	•	•
	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

DVPL	05	05	S	/H	-	XXX
1	2	3	4	5		6

(1)	(2)		(3)		(4)	
Product Series	**Nominal Input Voltage**		**Output Current**		**Number of Outputs**	
DVPL	**05**	5 Volts	**05**	5 Amps	**S**	Single

(5)		(6)
Screening Code[1,2]		**Additional Screening Code**
None **/ES** **/H** **/K**	Standard Extended 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)	DVPL0505S Series Similar Part Number
5962-0924101HXC	DVPL0505S/H

Do not use the DVPL0505S 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:

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