



# DVSA2800D Series

## HIGH RELIABILITY HYBRID DC-DC CONVERTERS

### DESCRIPTION

The DVSA 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 DVSA series are robust and effective input and output filters which provide dramatically reduced input and output noise performance when compared to other manufacturers competing devices. Operating at a nominal fixed frequency of 450 kHz, 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
- Up to 6 Watts Output Power
- Fault Tolerant Magnetic Feedback Circuit
- NO Use of Optoisolators
- Undervoltage Lockout
- Indefinite Short Circuit Protection
- Current Limit Protection
- Industry Standard Pinout
- High Input Transient Voltage: 80 Volts for 1 sec per MIL-STD-704A
- Precision Projection Welded Hermetic Package
- High Power Density: > 19 W/in<sup>3</sup>
- 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
- MIL-PRF-38534 Element Evaluated Components
- Space Applications should consider VPT's "S" Series of Radiation Tolerant Power Conversion Devices. Contact VPT for details



**Figure 1** – DVSA2800D DC-DC Converter  
(Exact marking may differ from that shown)

## SPECIFICATIONS (T<sub>CASE</sub> = -55°C to +125°C, V<sub>IN</sub> = +28V ± 5%, Full Load<sup>5</sup>, Unless Otherwise Specified)

### ABSOLUTE MAXIMUM RATINGS

Input Voltage (Continuous)	50 V <sub>DC</sub>	Junction Temperature Rise to Case	+10°C
Input Voltage (Transient, 1 second)	80 Volts	Storage Temperature	-65°C to +150°C
Output Power <sup>1</sup>	6 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T <sub>CASE</sub> = +125°C)	2.5 Watts	Weight (Maximum)	15 Grams
ESD Rating per MIL-PRF-38534	3B		

Parameter	Conditions	DVSA2805D			DVSA2807D			Units
		Min	Typ	Max	Min	Typ	Max	
<b>STATIC</b>								
INPUT Voltage <sup>4</sup>	Continuous	15	28	50	15	28	50	V
	Transient, 1 sec	-	-	80	-	-	80	V
Current	Inhibited	-	4	6	-	4	6	mA
	No Load	-	45	60	-	45	60	mA
Ripple Current	Full Load <sup>5</sup> , 20Hz to 10MHz	-	30	50	-	30	50	mA <sub>p-p</sub>
Inhibit Pin Input <sup>4</sup>		0	-	1.5	0	-	1.5	V
Inhibit Pin Open Circuit Voltage <sup>4</sup>		9.0	11.0	13.0	9.0	11.0	13.0	V
UVLO Turn On		12.0	-	14.8	12.0	-	14.8	V
UVLO Turn Off <sup>4</sup>		11.0	-	14.5	11.0	-	14.5	V
OUTPUT Voltage <sup>5</sup>	+V <sub>OUT</sub> T <sub>CASE</sub> = 25°C	4.95	5.0	5.05	6.93	7.0	7.07	V
	+V <sub>OUT</sub> T <sub>CASE</sub> = -55°C to +125°C	4.925	5.0	5.075	6.895	7.0	7.105	V
	-V <sub>OUT</sub> T <sub>CASE</sub> = 25°C	4.80	5.0	5.20	6.72	7.0	7.28	V
	-V <sub>OUT</sub> T <sub>CASE</sub> = -55°C to +125°C	4.75	5.0	5.25	6.65	7.0	7.35	V
Power <sup>3,6</sup>	Total	0	-	5	0	-	5	W
	±V <sub>OUT</sub> Either Output	0	-	3.5	0	-	3.5	W
Current <sup>3,6</sup>	±V <sub>OUT</sub> Either Output	0	-	0.7	0	-	0.5	A
Ripple Voltage	±V <sub>OUT</sub> Full Load <sup>5</sup> , 20Hz to 10MHz	-	30	50	-	30	60	mV <sub>p-p</sub>
Line Regulation	+V <sub>OUT</sub> V <sub>IN</sub> = 16V to 40V	-	2	20	-	2	20	mV
	-V <sub>OUT</sub> V <sub>IN</sub> = 16V to 40V	-	10	200	-	10	200	mV
Load Regulation <sup>7</sup>	+V <sub>OUT</sub> No Load to Full Load <sup>5</sup>	-	5	50	-	2	50	mV
	-V <sub>OUT</sub> No Load to Full Load <sup>5</sup>	-	45	200	-	40	200	mV
Cross Regulation	-V <sub>OUT</sub> +Load 70%, -Load 30% +Load 30%, -Load 70%	-	220	450	-	220	450	mV
EFFICIENCY	Full Load <sup>5</sup>	66	71	-	69	73	-	%
LOAD FAULT POWER DISSIPATION	Overload <sup>4</sup>	-	-	3	-	-	3	W
	Short Circuit	-	-	3	-	-	3	W
CAPACITIVE LOAD <sup>4</sup>	Either Output	-	-	500	-	-	500	μF
SWITCHING FREQUENCY		350	450	500	350	450	500	kHz
ISOLATION	500 V <sub>DC</sub> , T <sub>CASE</sub> = 25°C	100	-	-	100	-	-	MΩ
MTBF (MIL-HDBK-217F)	AIF @ T <sub>C</sub> = 55°C	-	457	-	-	457	-	kHrs

See notes next page.

## SPECIFICATIONS (T<sub>CASE</sub> = -55°C to +125°C, V<sub>IN</sub> = +28V ± 5%, Full Load<sup>5</sup>, Unless Otherwise Specified)

### ABSOLUTE MAXIMUM RATINGS

Input Voltage (Continuous)	50 V <sub>DC</sub>	Junction Temperature Rise to Case	+10°C
Input Voltage (Transient, 1 second)	80 Volts	Storage Temperature	-65°C to +150°C
Output Power <sup>1</sup>	6 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T <sub>CASE</sub> = +125°C)	2.5 Watts	Weight (Maximum)	15 Grams
ESD Rating per MIL-PRF-38534	3B		

Parameter	Conditions	DVSA2805D			DVSA2807D			Units	
		Min	Typ	Max	Min	Typ	Max		
<b>DYNAMIC</b>									
Load Step Output Transient	±V <sub>OUT</sub>	Half Load to Full Load	-	130	300	-	130	300	mV <sub>PK</sub>
Load Step Recovery <sup>2</sup>			-	200	400	-	120	450	μSec
Line Step Output Transient <sup>4</sup>	±V <sub>OUT</sub>	V <sub>IN</sub> = 16V to 40V	-	500	1000	-	400	1000	mV <sub>PK</sub>
Line Step Recovery <sup>2, 4</sup>			-	300	700	-	300	500	μSec
Turn On Delay	±V <sub>OUT</sub>	V <sub>IN</sub> = 0V to 28V	-	10	20	-	10	20	mSec
Turn On Overshoot			-	0	25	-	0	25	mV <sub>PK</sub>

- 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 initial electrical design verification. Post design verification, parameter shall be guaranteed to the limits specified.
  5. Half load at +V<sub>OUT</sub> and half load at -V<sub>OUT</sub>.
  6. Up to 70% of the total power or current can be drawn from any one of the two outputs.
  7. 5% Load to Full Load at -55°C.

## SPECIFICATIONS (T<sub>CASE</sub> = -55°C to +125°C, V<sub>IN</sub> = +28V ± 5%, Full Load<sup>5</sup>, Unless Otherwise Specified)

### ABSOLUTE MAXIMUM RATINGS

Input Voltage (Continuous)	50 V <sub>DC</sub>	Junction Temperature Rise to Case	+10°C
Input Voltage (Transient, 1 second)	80 Volts	Storage Temperature	-65°C to +150°C
Output Power <sup>1</sup>	6 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T <sub>CASE</sub> = +125°C)	2.5 Watts	Weight (Maximum)	15 Grams
ESD Rating per MIL-PRF-38534	3B		

Parameter	Conditions	DVSA2812D			DVSA2815D			Units
		Min	Typ	Max	Min	Typ	Max	
<b>STATIC</b>								
INPUT Voltage <sup>4</sup>	Continuous	15	28	50	15	28	50	V
	Transient, 1 sec	-	-	80	-	-	80	V
Current	Inhibited	-	4	6	-	4	6	mA
	No Load	-	45	60	-	45	60	mA
Ripple Current	Full Load <sup>5</sup> , 20Hz to 10MHz	-	30	50	-	30	50	mA <sub>p-p</sub>
Inhibit Pin Input <sup>4</sup>		0	-	1.5	0	-	1.5	V
Inhibit Pin Open Circuit Voltage <sup>4</sup>		9.0	11.0	13.0	9.0	11.0	13.0	V
UVLO Turn On		12.0	-	14.8	12.0	-	14.8	V
UVLO Turn Off <sup>4</sup>		11.0	-	14.5	11.0	-	14.5	V
OUTPUT Voltage <sup>5</sup>	+V <sub>OUT</sub> T <sub>CASE</sub> = 25°C	11.88	12.0	12.12	14.85	15.0	15.15	V
	+V <sub>OUT</sub> T <sub>CASE</sub> = -55°C to +125°C	11.82	12.0	12.18	14.775	15.0	15.225	V
	-V <sub>OUT</sub> T <sub>CASE</sub> = 25°C	11.80	12.0	12.20	14.80	15.0	15.20	V
	-V <sub>OUT</sub> T <sub>CASE</sub> = -55°C to +125°C	11.52	12.0	12.48	14.40	15.0	15.60	V
Power <sup>3,6</sup>	Total	0	-	6	-	-	6	W
	±V <sub>OUT</sub> Either Output	0	-	4.2	-	-	4.2	W
Current <sup>3,6</sup>	±V <sub>OUT</sub> Either Output	0	-	0.35	-	-	0.28	A
Ripple Voltage	±V <sub>OUT</sub> Full Load <sup>5</sup> , 20Hz to 10MHz	-	30	50	-	30	50	mV <sub>p-p</sub>
Line Regulation	+V <sub>OUT</sub> V <sub>IN</sub> = 16V to 40V	-	2	20	-	2	20	mV
	-V <sub>OUT</sub> V <sub>IN</sub> = 16V to 40V	-	10	200	-	10	200	mV
Load Regulation <sup>7</sup>	+V <sub>OUT</sub> No Load to Full Load <sup>5</sup>	-	2	50	-	2	50	mV
	-V <sub>OUT</sub> No Load to Full Load <sup>5</sup>	-	40	200	-	40	200	mV
Cross Regulation	-V <sub>OUT</sub> +Load 70%, -Load 30% +Load 30%, -Load 70%	-	220	450	-	220	450	mV
EFFICIENCY	Full Load <sup>5</sup>	72	77	-	73	79	-	%
LOAD FAULT POWER DISSIPATION	Overload <sup>4</sup>	-	-	3	-	-	3	W
	Short Circuit	-	-	3	-	-	3	W
CAPACITIVE LOAD <sup>4</sup>	Either Output	-	-	500	-	-	500	μF
SWITCHING FREQUENCY		350	450	500	350	450	500	kHz
ISOLATION	500 V <sub>DC</sub> , T <sub>CASE</sub> = 25°C	100	-	-	100	-	-	MΩ
MTBF (MIL-HDBK-217F)	AIF @ T <sub>C</sub> = 55°C	-	457	-	-	457	-	kHrs

See notes next page.

## SPECIFICATIONS (T<sub>CASE</sub> = -55°C to +125°C, V<sub>IN</sub> = +28V ± 5%, Full Load<sup>5</sup>, Unless Otherwise Specified)

### ABSOLUTE MAXIMUM RATINGS

Input Voltage (Continuous)	50 V <sub>DC</sub>	Junction Temperature Rise to Case	+10°C
Input Voltage (Transient, 1 second)	80 Volts	Storage Temperature	-65°C to +150°C
Output Power <sup>1</sup>	6 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T <sub>CASE</sub> = +125°C)	2.5 Watts	Weight (Maximum)	15 Grams
ESD Rating per MIL-PRF-38534	3B		

Parameter	Conditions	DVSA2812D			DVSA2815D			Units	
		Min	Typ	Max	Min	Typ	Max		
<b>DYNAMIC</b>									
Load Step Output Transient	±V <sub>OUT</sub>	Half Load to Full Load	-	120	300	-	130	300	mV <sub>PK</sub>
Load Step Recovery <sup>2</sup>			-	100	450	-	100	500	μSec
Line Step Output Transient <sup>4</sup>	±V <sub>OUT</sub>	V <sub>IN</sub> = 16V to 40V	-	600	1200	-	500	1200	mV <sub>PK</sub>
Line Step Recovery <sup>2, 4</sup>			-	300	500	-	300	500	μSec
Turn On Delay	±V <sub>OUT</sub>	V <sub>IN</sub> = 0V to 28V	-	10	20	-	10	20	mSec
Turn On Overshoot			-	0	50	-	0	50	mV <sub>PK</sub>

- 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 initial electrical design verification. Post design verification, parameter shall be guaranteed to the limits specified.
  5. Half load at +V<sub>OUT</sub> and half load at -V<sub>OUT</sub>.
  6. Up to 70% of the total power or current can be drawn from any one of the two outputs.
  7. 5% Load to Full Load at -55°C.

**BLOCK DIAGRAM**

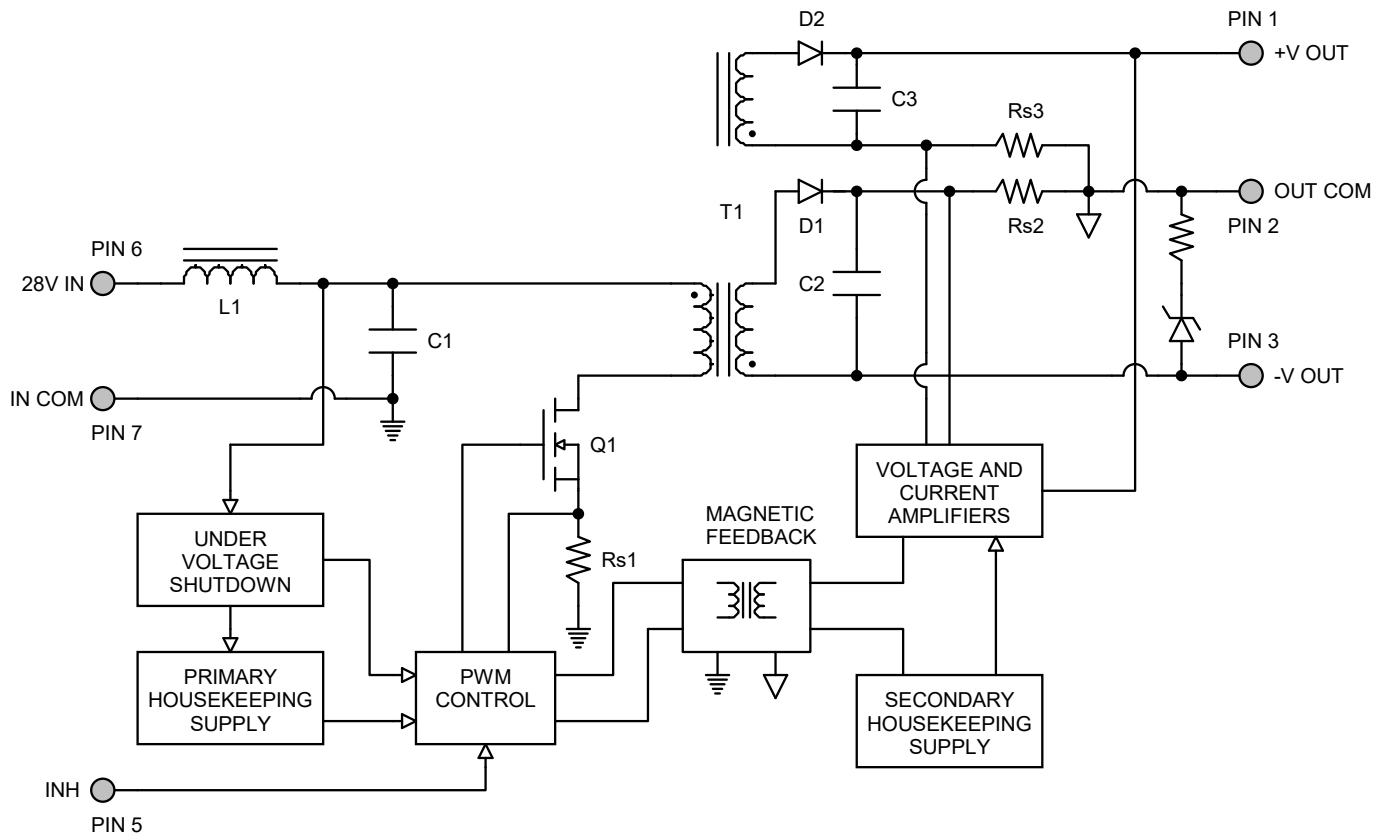


Figure 2

**CONNECTION DIAGRAM**

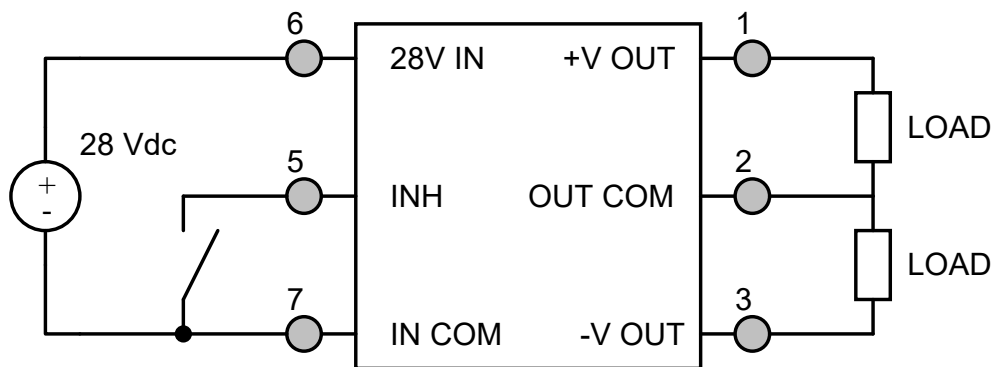
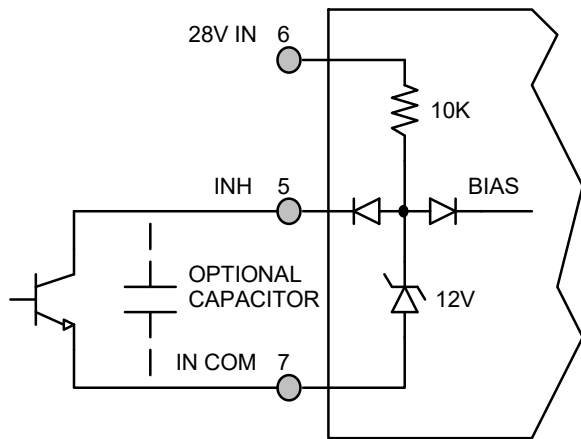
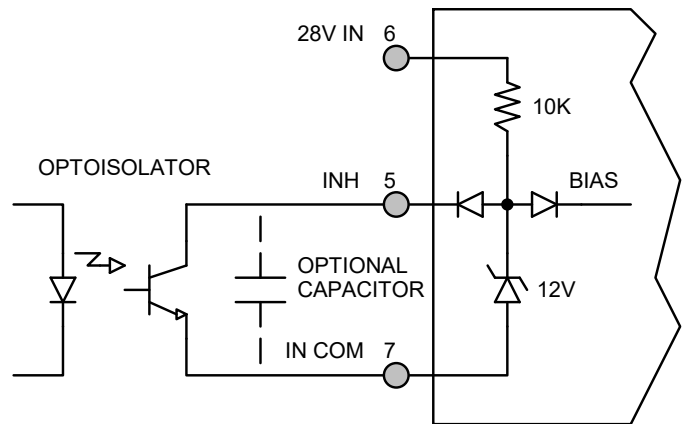


Figure 3

**INHIBIT DRIVE CONNECTION DIAGRAMS**

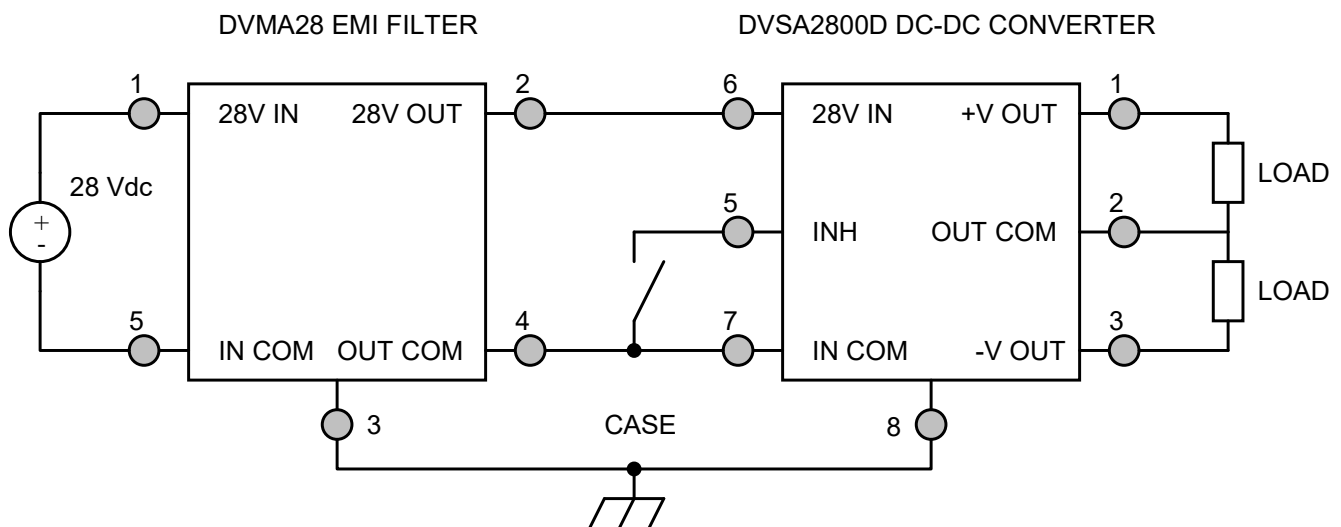


**Figure 4** – Internal Inhibit Circuit and Recommended Drive  
(Shown with optional capacitor for turn-on delay)



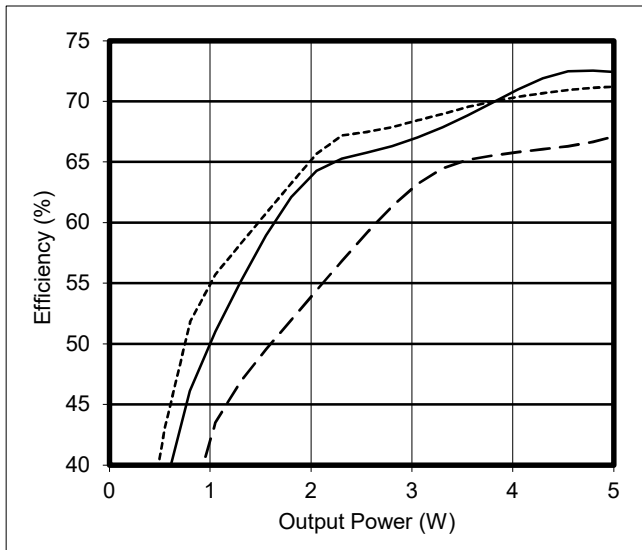
**Figure 5** – Isolated Inhibit Drive  
(Shown with optional capacitor for turn-on delay)

**EMI FILTER HOOKUP DIAGRAM**

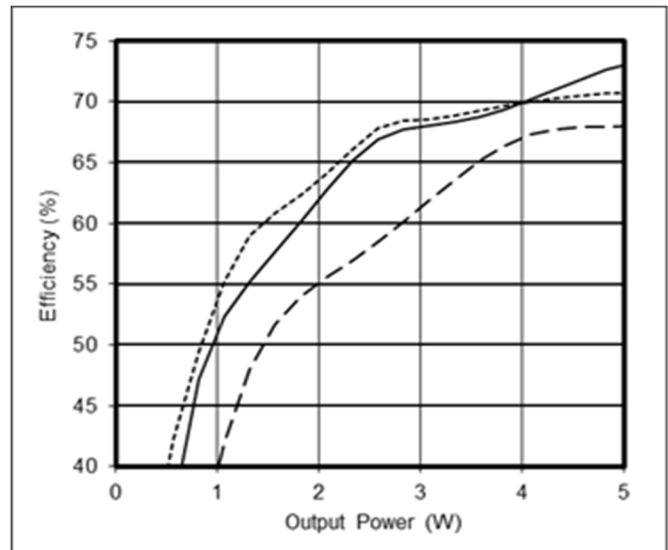


**Figure 6** – Converter with EMI Filter

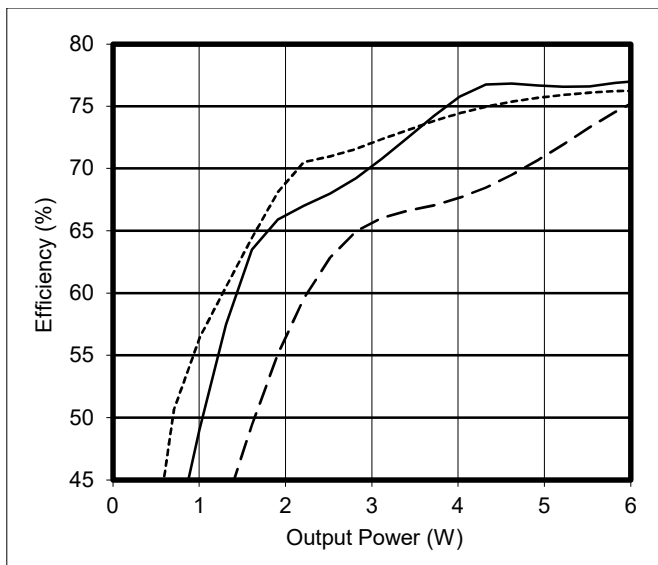
**EFFICIENCY PERFORMANCE CURVES** ( $T_{CASE} = 25^{\circ}C$ , Full Load, Unless Otherwise Specified)



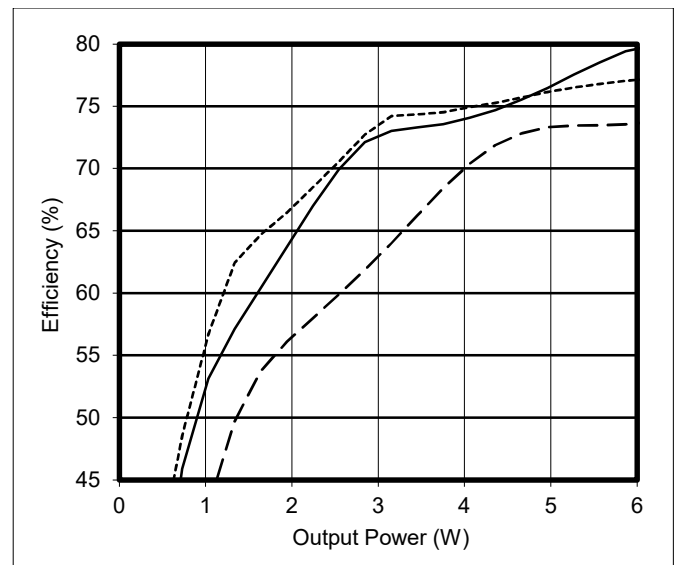
**Figure 7 – DVSA2805D**  
Efficiency (%) vs. Output Power (W)



**Figure 8 – DVSA2807D**  
Efficiency (%) vs. Output Power (W)



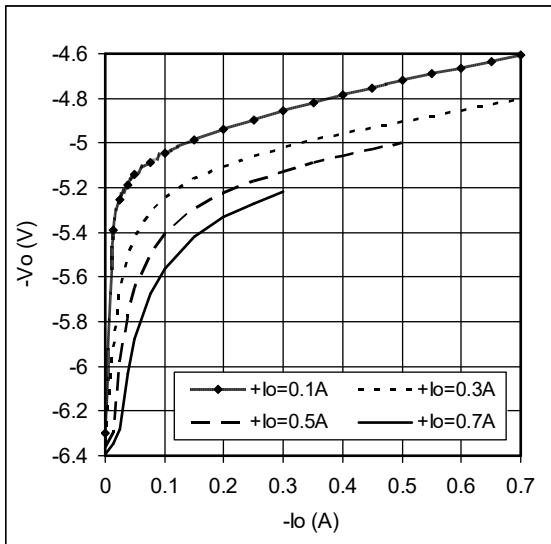
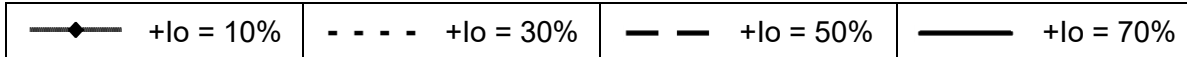
**Figure 9 – DVSA2812D**  
Efficiency (%) vs. Output Power (W)



**Figure 10 – DVSA2815D**  
Efficiency (%) vs. Output Power (W)

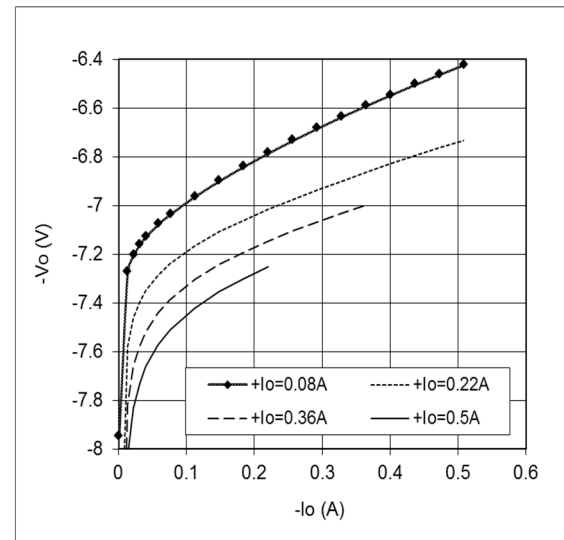


**CROSS REGULATION CURVES** ( $T_{CASE} = 25^{\circ}C$ , Full Load, Unless Otherwise Specified)



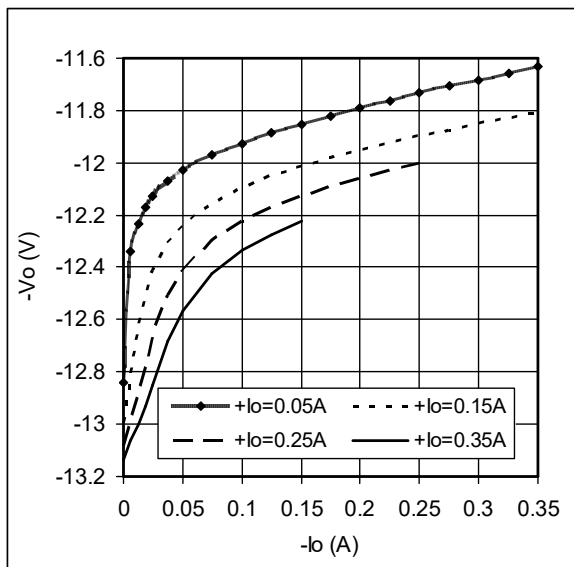
**Figure 11 – DVSA2805D**

-Vout (V) vs. -Iout (A)



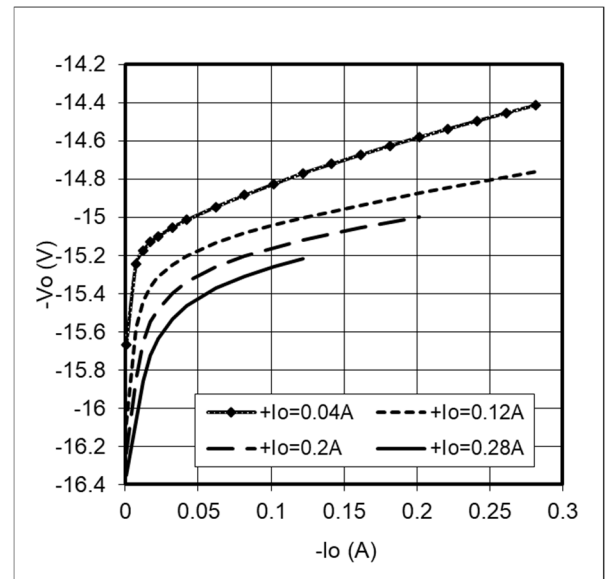
**Figure 12 – DVSA2807D**

-Vout (V) vs. -Iout (A)



**Figure 13 – DVSA2812D**

-Vout (V) vs. -Iout (A)

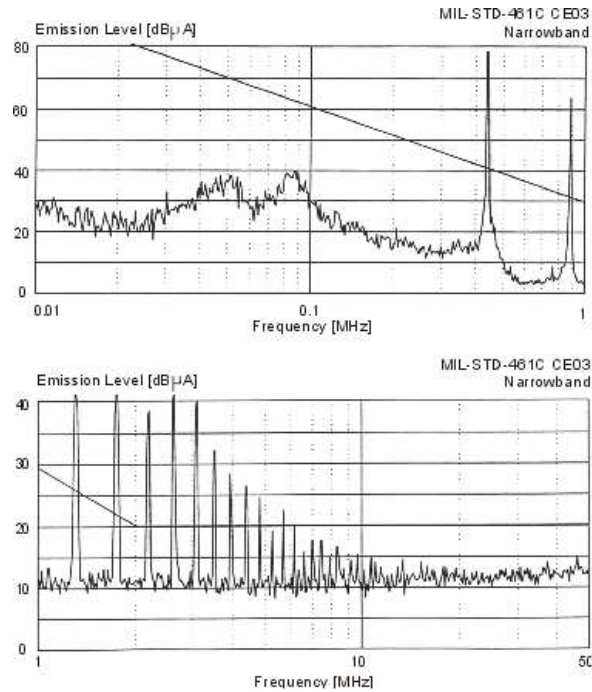


**Figure 14 – DVSA2815D**

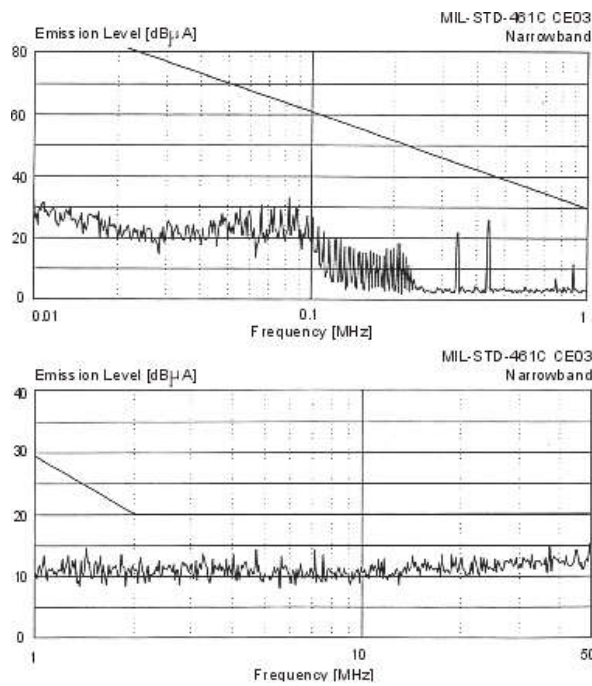
-Vout (V) vs. -Iout (A)

**EMI PERFORMANCE CURVES**

(T<sub>CASE</sub> = 25°C, V<sub>IN</sub> = +28V ± 5%, Full Load, Unless Otherwise Specified)

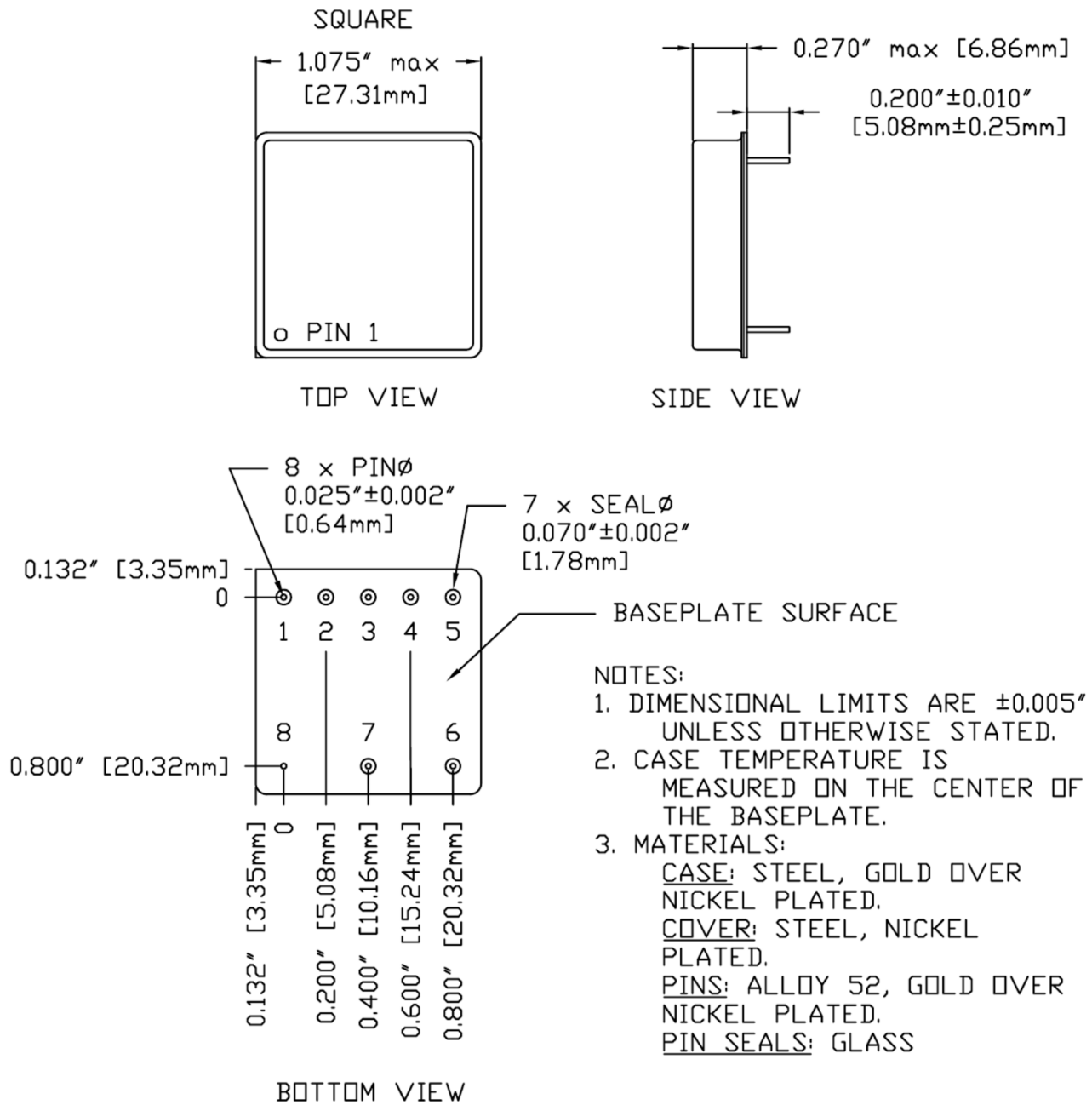


**Figure 15 – DVSA2800D without EMI Filter**



**Figure 16 – DVSA2800D with EMI Filter**

**PACKAGE SPECIFICATIONS**



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

**Figure 17 – Package and Pinout**

## PACKAGE PIN DESCRIPTION

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

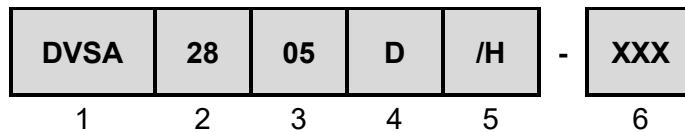
## ENVIRONMENTAL SCREENING (100% Tested Per MIL-STD-883 as referenced to MIL-PRF-38534)

Test	MIL-STD-883 Test Method, Condition	No Suffix (Standard) Non-QML ⑤	/ES (Extended) Non-QML ⑤	/H (Class H)	/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 <sup>-3</sup> )	•			
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)

(2)

(3)

(4)

Product Series	Nominal Input Voltage		Output Voltage		Number of Outputs	
<b>DVSA</b>	<b>28</b>	28 Volts	<b>05</b> <b>07</b> <b>12</b> <b>15</b>	± 5 Volts ± 7 Volts ± 12 Volts ± 15 Volts	<b>D</b>	Dual

(5)

(6)

Screening Code <sup>1,2</sup>		Additional Screening Code
<b>None</b> <b>/ES</b> <b>/H</b> <b>/K</b>	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)	DVSA2800D Series Similar Part Number
5962-0324201HXC	DVSA2805D/H
5962-0324201HXA	DVSA2805D/H-E
5962-0324201KXC	DVSA2805D/K
5962-0324201KXA	DVSA2805D/K-E
5962-0324202HXC	DVSA2812D/H
5962-0324202HXA	DVSA2812D/H-E
5962-0324202KXC	DVSA2812D/K
5962-0324202KXA	DVSA2812D/K-E
5962-0324203HXC	DVSA2815D/H
5962-0324203HXA	DVSA2815D/H-E
5962-0324203KXC	DVSA2815D/K
5962-0324203KXA	DVSA2815D/K-E
5962-0324204HXC	DVSA2807D/H
5962-0324204HXA	DVSA2807D/H-E
5962-0324204KXC	DVSA2807D/K
5962-0324204KXA	DVSA2807D/K-E

Do not use the DVSA2800D 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](mailto:vptsales@vptpower.com)

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