



# SVSA2800S Series

## HIGH RELIABILITY HYBRID RADIATION TOLERANT DC-DC CONVERTERS

### DESCRIPTION

The SVSA series of high reliability DC-DC converters is operable over the full military temperature range (-55 °C to +125 °C) with no power derating. Paramount to the SVSA series is a magnetic feedback circuit that is radiation immune. Operating at a nominal fixed frequency of 450 kHz, these regulated, isolated units utilize well-controlled undervoltage lockout circuitry to eliminate slow start-up problems.

The SVSA series is specifically designed for the harsh radiation environment of space applications. Performance is guaranteed through the use of hardened semiconductor components, radiation lot acceptance testing (RLAT) of non-hardened components and analysis. The SVSA series has been characterized for Total Ionizing Dose (TID) performance including Enhanced Low Dose Rate Sensitivity (ELDRS) and for Single Event Effects (SEE) according to VPT's DLA approved Radiation Hardness Assurance (RHA) plan per MIL-PRF-38534, Appendix G. Characterization is performed at both the component level and at the SVSA series hybrid converter level.

These converters are designed and manufactured in a facility qualified to ISO9001 and certified to MIL-PRF-38534 Class H and Class K 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

- Guaranteed TID Performance to 30 krad(Si) including ELDRS, per VPT's RHA plan specified per MIL-PRF-38534, Appendix G, Level P with 2X margin.
- Characterized to 44 MeV-cm<sup>2</sup>/mg with minor transients only; no dropouts, shutdowns, latch up or burn out.
- High Reliability
- Up to 6 Watts Output Power
- Very Low Output Noise
- Wide Input Voltage Range: 15 to 50 Volts per MIL-STD-704
- Radiation Immune Magnetic Feedback Circuit
- NO Use of Optoisolators
- Undervoltage Lockout
- Current Limit and Short Circuit Protection
- 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 Modified Versions May Be 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
- Worst Case analysis, Stress, Radiation, and Reliability reports available<sup>1</sup>



Figure 1 – SVSA2800S DC-DC Converter (Exact marking may differ from that shown)

<sup>1</sup>Subject to all export restrictions and export regulations including but not limited to the Export Administration and Foreign Assets Control Regulations. Further restrictions may apply contact VPT for details.

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	+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, $T_{CASE} = +125^{\circ}\text{C}$ )	2.7 Watts	Weight (Maximum)	15 Grams

Parameter	Conditions <sup>5</sup>	SVSA283R3S			SVSA2805S			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, 20Hz to 10MHz	-	25	50	-	30	50	$\text{mA}_{p-p}$
	End-of-Life	-	-	100	-	-	100	$\text{mA}_{p-p}$
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	$V_{OUT}$ $T_{CASE} = 25^{\circ}\text{C}$	3.267	3.30	3.333	4.95	5.00	5.05	V
	$V_{OUT}$ $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$	3.25	3.30	3.35	4.925	5.00	5.075	V
	$V_{OUT}$ End-of-Life	3.244	-	3.35	4.89	-	5.10	V
Power <sup>3</sup>		0	-	4	0	-	5	W
Current <sup>3</sup>	$I_{OUT}$	0	-	1.21	0	-	1.0	A
Ripple Voltage	$V_{OUT}$ Full Load, 20Hz to 10MHz	-	-	30	-	-	30	$\text{mV}_{p-p}$
Line Regulation	$V_{OUT}$ $V_{IN} = 15\text{V}$ to $50\text{V}$	-	-	15	-	-	15	mV
Load Regulation	$V_{OUT}$ No Load to Full Load	-	-	50	-	-	50	mV
EFFICIENCY		62	65	-	65	68	-	%
LOAD FAULT POWER DISSIPATION	Overload <sup>4</sup>	-	-	3.3	-	-	3.3	W
	Short Circuit	-	-	3	-	-	3	W
CAPACITIVE LOAD <sup>4</sup>		-	-	1000	-	-	1000	$\mu\text{F}$
SWITCHING FREQUENCY		350	450	500	350	450	500	kHz
ISOLATION	500 $V_{DC}$	100	-	-	100	-	-	$\text{M}\Omega$
MTBF (MIL-HDBK-217F)	SF @ $T_C = 55^{\circ}\text{C}$	-	830	-	-	830	-	kHrs
<b>DYNAMIC</b>								
Load Step Output Transient	$V_{OUT}$ Half Load to Full Load	-	200	300	-	200	500	$\text{mV}_{PK}$
Load Step Recovery <sup>2</sup>		-	450	700	-	450	700	$\mu\text{Sec}$
Line Step Output Transient <sup>4</sup>	$V_{OUT}$ $V_{IN} = 16\text{V}$ to $40\text{V}$	-	250	500	-	350	700	$\text{mV}_{PK}$
Line Step Recovery <sup>2,4</sup>		-	600	1200	-	600	1200	$\mu\text{Sec}$
Turn On Delay	$V_{OUT}$ $V_{IN} = 0\text{V}$ to $28\text{V}$	-	10	20	-	10	20	mSec
Turn On Overshoot		-	0	15	-	0	25	$\text{mV}_{PK}$

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. End-of-Life performance includes aging and radiation degradation and is within standard limits except where noted.

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	+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, $T_{CASE} = +125^{\circ}\text{C}$ )	2.7 Watts	Weight (Maximum)	15 Grams

Parameter	Conditions <sup>5</sup>	SVSA2812S			SVSA2815S			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, 20Hz to 10MHz	-	30	50	-	30	50	$\text{mA}_{p-p}$
	End-of-Life	-	-	100	-	-	100	$\text{mA}_{p-p}$
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	$V_{OUT}$ $T_{CASE} = 25^{\circ}\text{C}$	11.88	12.0	12.12	14.85	15.0	15.15	V
	$V_{OUT}$ $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$	11.82	12.0	12.18	14.775	15.0	15.225	V
	$V_{OUT}$ End-of-Life	11.66	-	12.30	14.565	-	15.4	V
Power <sup>3</sup>		0	-	6	0	-	6	W
Current <sup>3</sup>	$I_{OUT}$	0	-	0.5	0	-	0.4	A
Ripple Voltage	$V_{OUT}$ Full Load, 20Hz to 10MHz	-	10	30	-	10	30	$\text{mV}_{p-p}$
Line Regulation	$V_{OUT}$ $V_{IN} = 15\text{V}$ to $50\text{V}$	-	2	15	-	2	15	mV
Load Regulation	$V_{OUT}$ No Load to Full Load	-	5	50	-	5	50	mV
EFFICIENCY		71	76	-	72	78	-	%
LOAD FAULT POWER DISSIPATION	Overload <sup>4</sup>	-	-	3	-	-	3	W
	Short Circuit	-	-	3	-	-	3	W
CAPACITIVE LOAD <sup>4</sup>		-	-	500	-	-	500	$\mu\text{F}$
SWITCHING FREQUENCY		350	450	500	350	450	500	kHz
ISOLATION	500 $V_{DC}$	100	-	-	100	-	-	$\text{M}\Omega$
MTBF (MIL-HDBK-217F)	SF @ $T_C = 55^{\circ}\text{C}$	-	830	-	-	830	-	kHrs
<b>DYNAMIC</b>								
Load Step Output Transient	$V_{OUT}$ Half Load to Full Load	-	300	700	-	300	700	$\text{mV}_{PK}$
Load Step Recovery <sup>2</sup>		-	200	400	-	200	400	$\mu\text{Sec}$
Line Step Output Transient <sup>4</sup>	$V_{OUT}$ $V_{IN} = 16\text{V}$ to $40\text{V}$	-	700	1200	-	700	1300	$\text{mV}_{PK}$
Line Step Recovery <sup>2,4</sup>		-	200	600	-	200	600	$\mu\text{Sec}$
Turn On Delay	$V_{OUT}$ $V_{IN} = 0\text{V}$ to $28\text{V}$	-	10	20	-	10	20	mSec
Turn On Overshoot		-	0	50	-	0	50	$\text{mV}_{PK}$

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. End-of-Life performance includes aging and radiation degradation and is within standard limits except where noted.

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	+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, $T_{CASE} = +125^{\circ}\text{C}$ )	2.7 Watts	Weight (Maximum)	15 Grams

Parameter	Conditions <sup>5</sup>	SVSA285R2S			Units
		Min	Typ	Max	
<b>STATIC</b>					
INPUT Voltage <sup>4</sup>	Continuous	15	28	50	V
	Transient, 1 sec	-	-	80	V
Current	Inhibited	-	4	6	mA
	No Load	-	45	60	mA
Ripple Current	Full Load, 20Hz to 10MHz	-	30	50	$\text{mA}_{p-p}$
	End-of-Life	-	-	100	$\text{mA}_{p-p}$
Inhibit Pin Input <sup>4</sup>		0	-	1.5	V
Inhibit Pin Open Circuit Voltage <sup>4</sup>		9.0	11.0	13.0	V
UVLO Turn On		12.0	-	14.8	V
UVLO Turn Off <sup>4</sup>		11.0	-	14.5	V
OUTPUT Voltage	$V_{OUT}$ $T_{CASE} = 25^{\circ}\text{C}$	5.148	5.20	5.252	V
	$V_{OUT}$ $T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$	5.122	5.20	5.278	V
	$V_{OUT}$ End-of-Life	5.08	-	5.30	V
Power <sup>3</sup>		0	-	5.2	W
Current <sup>3</sup>	$I_{OUT}$	0	-	1.0	A
Ripple Voltage	$V_{OUT}$ Full Load, 20Hz to 10MHz	-	10	30	$\text{mV}_{p-p}$
Line Regulation	$V_{OUT}$ $V_{IN} = 15\text{V}$ to $50\text{V}$	-	2	15	mV
Load Regulation	$V_{OUT}$ No Load to Full Load	-	15	50	mV
EFFICIENCY		65	68	-	%
LOAD FAULT POWER DISSIPATION	Overload <sup>4</sup>	-	-	3.3	W
	Short Circuit	-	-	3	W
CAPACITIVE LOAD <sup>4</sup>		-	-	1000	$\mu\text{F}$
SWITCHING FREQUENCY		350	450	500	kHz
ISOLATION	500 $V_{DC}$	100	-	-	$\text{M}\Omega$
MTBF (MIL-HDBK-217F)	SF @ $T_C = 55^{\circ}\text{C}$	-	830	-	kHrs
<b>DYNAMIC</b>					
Load Step Output Transient	$V_{OUT}$ Half Load to Full Load	-	200	500	$\text{mV}_{PK}$
Load Step Recovery <sup>2</sup>		-	450	700	$\mu\text{Sec}$
Line Step Output Transient <sup>4</sup>	$V_{OUT}$ $V_{IN} = 16\text{V}$ to $40\text{V}$	-	350	700	$\text{mV}_{PK}$
Line Step Recovery <sup>2,4</sup>		-	600	1200	$\mu\text{Sec}$
Turn On Delay	$V_{OUT}$ $V_{IN} = 0\text{V}$ to $28\text{V}$	-	10	20	mSec
Turn On Overshoot		-	0	25	$\text{mV}_{PK}$

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. End-of-Life performance includes aging and radiation degradation and is within standard limits except where noted.

BLOCK DIAGRAM

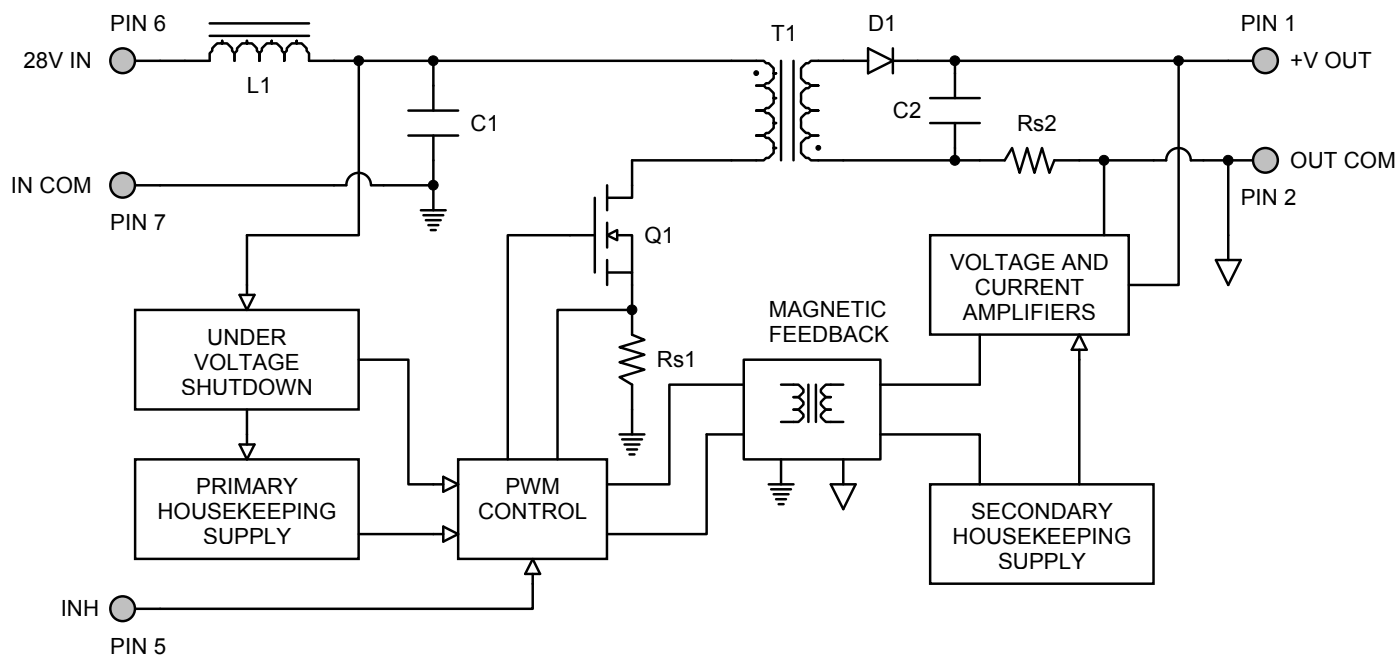


Figure 2

CONNECTION DIAGRAM

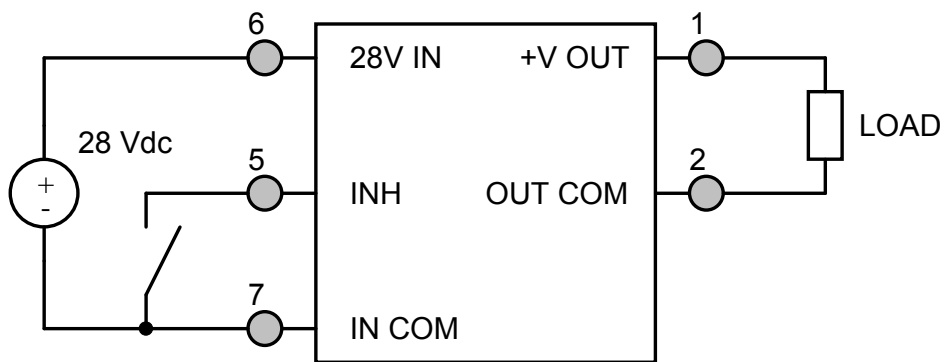
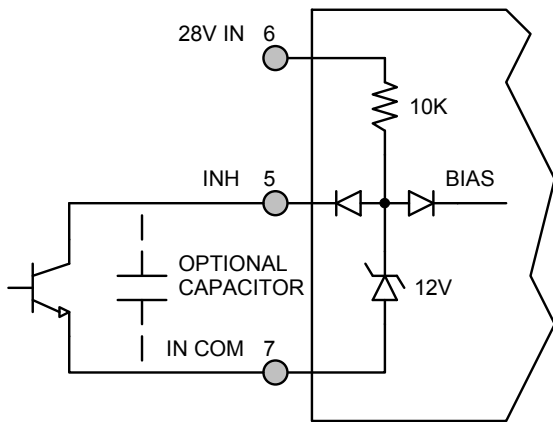
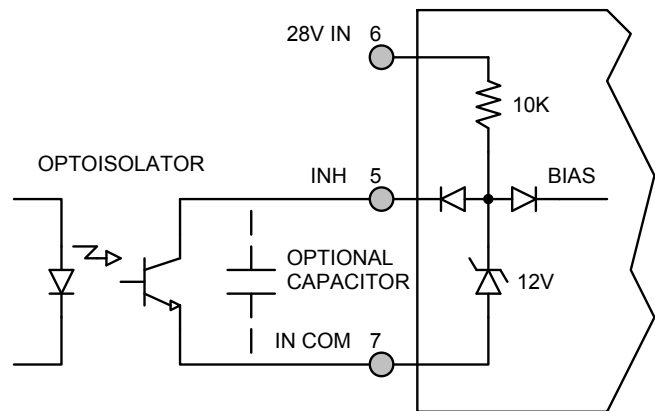


Figure 3

INHIBIT DRIVE CONNECTION DIAGRAMS

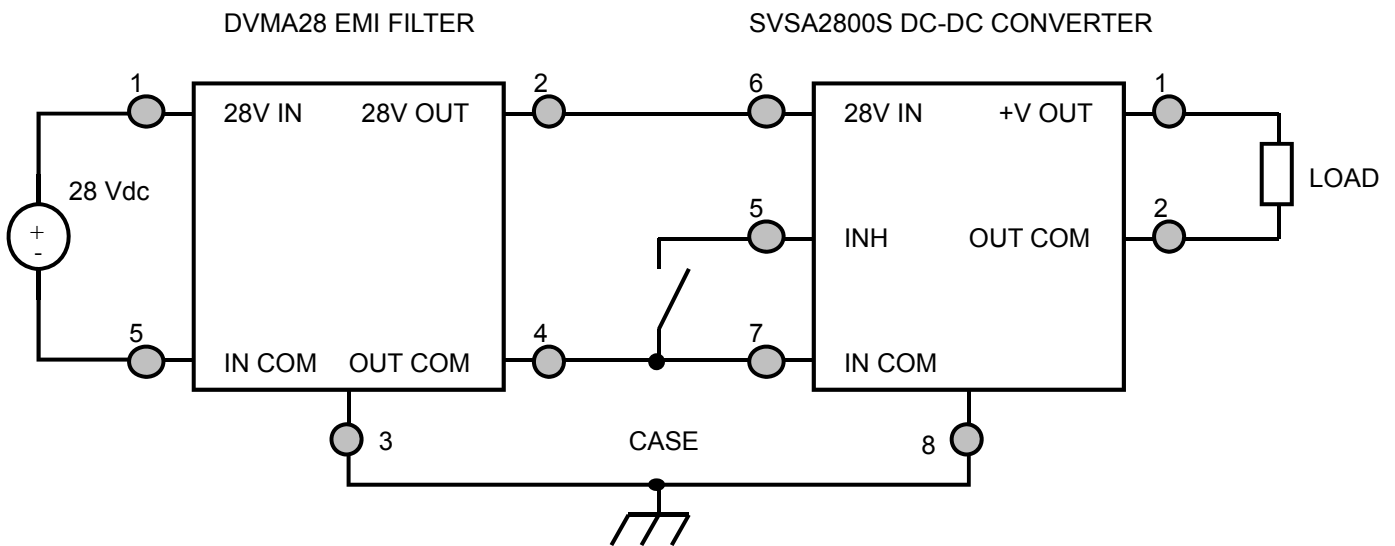


**Figure 4** – Internal Inhibit Circuit and Recommended Drive  
(Shown with optional capacitor for turn-on delay)



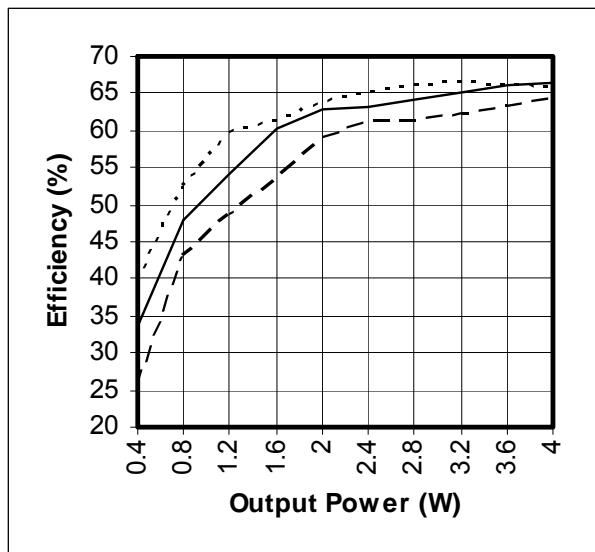
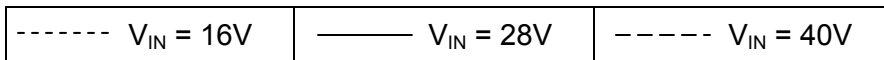
**Figure 5** – Isolated Inhibit Drive  
(Shown with optional capacitor for turn-on delay)

EMI FILTER HOOKUP DIAGRAM

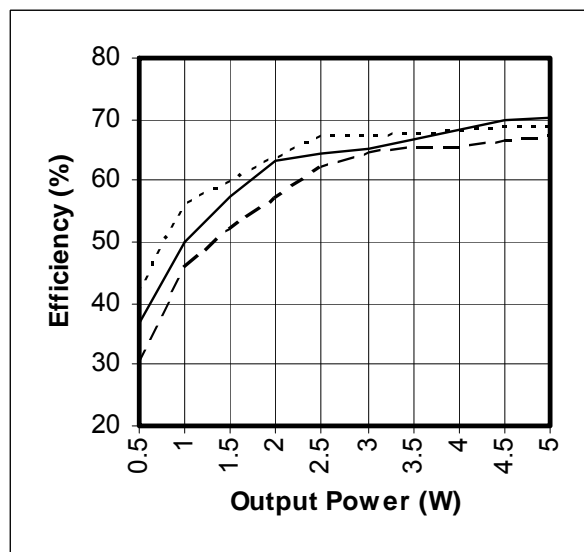


**Figure 6** – Converter with EMI Filter

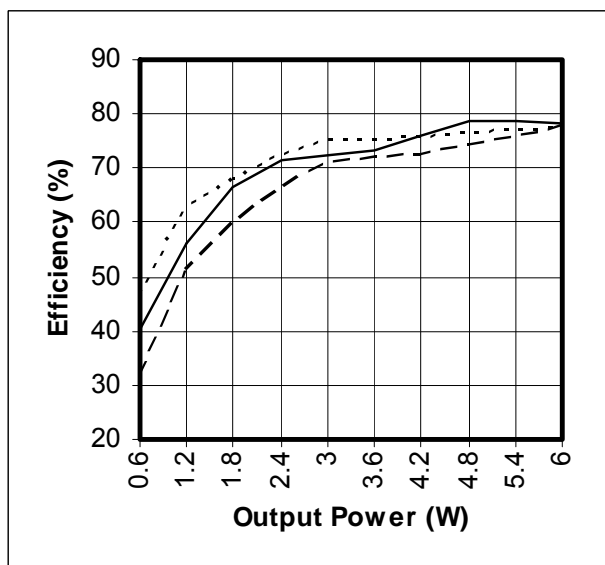
EFFICIENCY PERFORMANCE CURVES ( $T_{CASE} = 25^{\circ}C$ , Full Load, Unless Otherwise Specified)



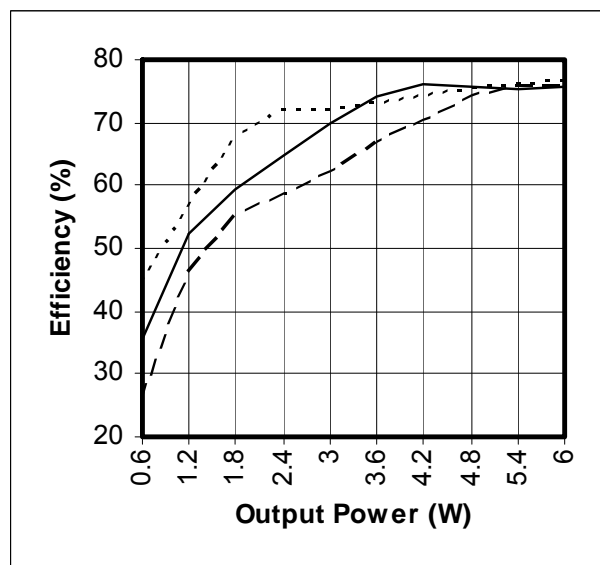
**Figure 7 – SVSA283R3S**  
Efficiency (%) vs. Output Power (W)



**Figure 8 – SVSA2805S / SVSA285R2S**  
Efficiency (%) vs. Output Power (W)

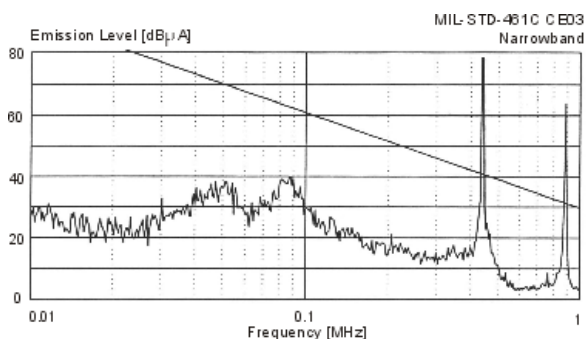


**Figure 9 – SVSA2812S**  
Efficiency (%) vs. Output Power (W)

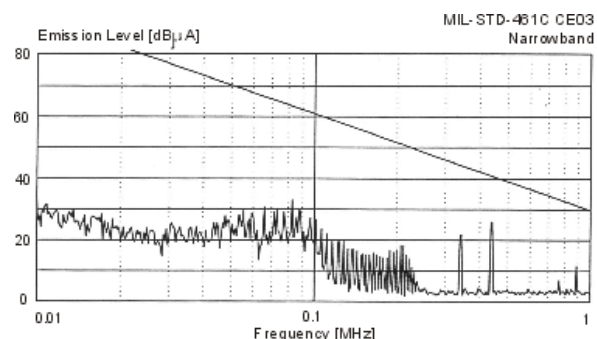


**Figure 10 – SVSA2815S**  
Efficiency (%) vs. Output Power (W)

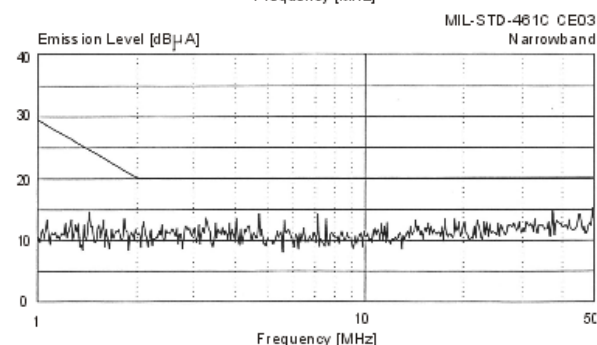
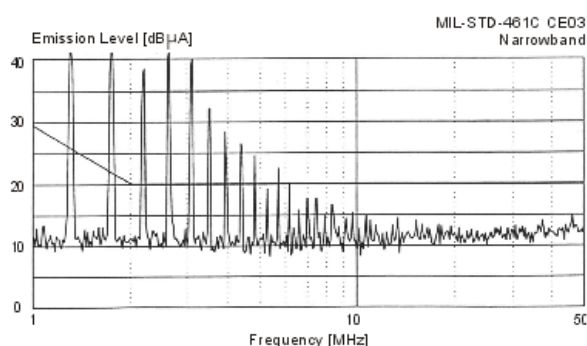
## EMI PERFORMANCE CURVES ( $T_{CASE} = 25^{\circ}C$ , $V_{IN} = +28V \pm 5\%$ , Full Load, Unless Otherwise Specified)



**Figure 11 – SVSA2800S without EMI Filter**



**Figure 12 – SVSA2800S with EMI Filter**



## RADIATION HARDNESS ASSURANCE (RHA)

The SVSA series radiation performance is guaranteed through the use of hardened semiconductor components, radiation lot acceptance testing (RLAT) of non-hardened components, and characterization of the completed hybrid according to VPT's Radiation Hardness Assurance (RHA) plan per MIL-PRF-38534, Appendix G. Post radiation end of life performance limits are determined by worst case analysis.

As part of qualification, one representative model of the hybrid converter family is characterized for total ionizing dose (TID). TID is tested to 60 krad(Si). Subsequent performance is guaranteed to 30 krad(Si) by 2 times margin. Characterization is performed at high dose rate (HDR) in accordance with condition C (minimum dose rate of 30 rad(Si)/s) of method 1019 of MIL-STD-883, and at low dose rate (LDR) in accordance with condition D of method 1019 of MIL-STD-883. A minimum of 1 biased sample and 1 unbiased sample is tested. After radiation exposure, converter testing is performed at 25 °C per standard datasheet limits. The radiation exposure test circuit is given in Figure 13.

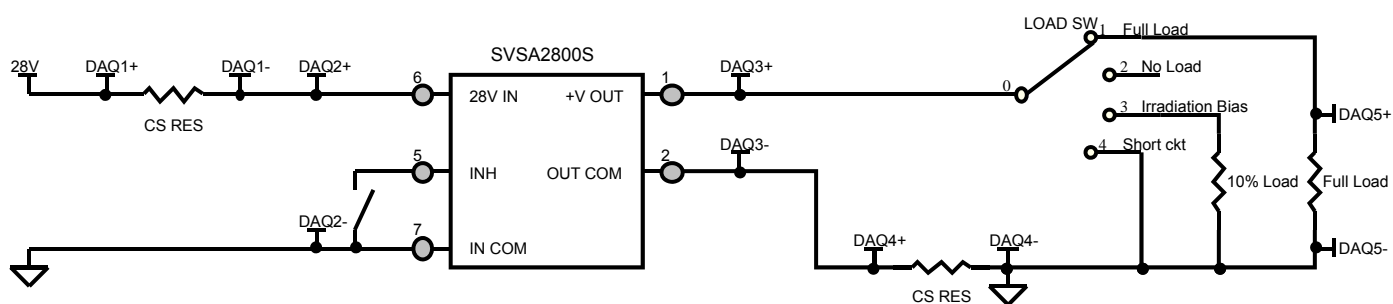
Also as part of qualification, one representative model of the hybrid converter family is characterized for Single Event Effects (SEE). The specific test LET is specified on the first page of the datasheet and is tested to a minimum fluence of  $1 \times 10^6$  particles/cm<sup>2</sup>. The characterization is performed at nominal input voltage at 25 °C in air. The radiation exposure test circuit is specified in Figure 14.



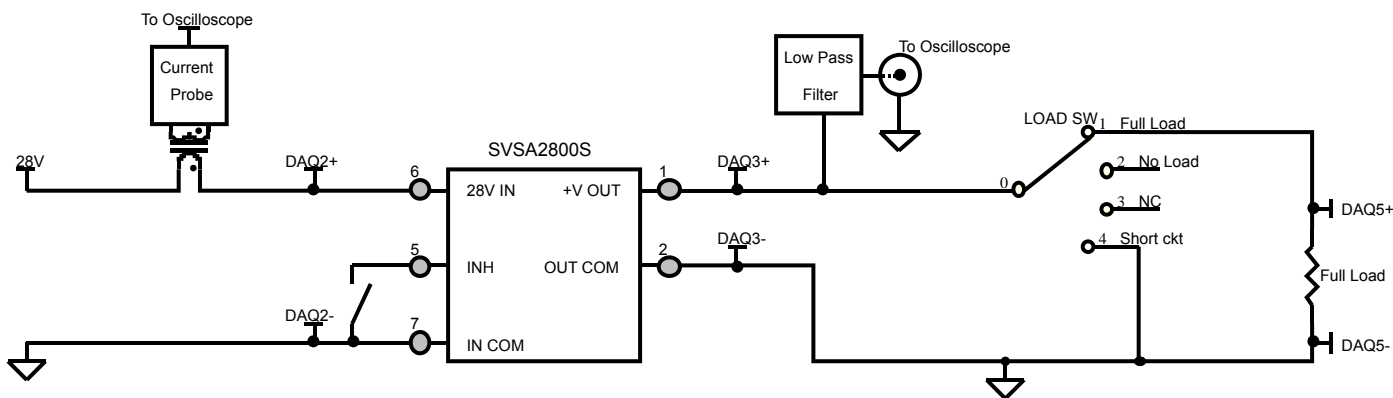
RADIATION HARDNESS ASSURANCE (continued)

Continued compliance is guaranteed by component testing and analysis. Critical semiconductor components, unless procured with manufacturer radiation guarantees, are subjected to RLAT at HDR in accordance with condition C of method 1019 of MIL-STD-883. Semiconductors which have been shown to exhibit ELDRS are subject to RLAT at LDR in accordance with condition D of method 1019 of MIL-STD-883. RLAT is not performed on inherently radiation hard semiconductor component technologies including zeners, diodes, and small signal BJTs.

RHA TEST CIRCUIT DIAGRAMS

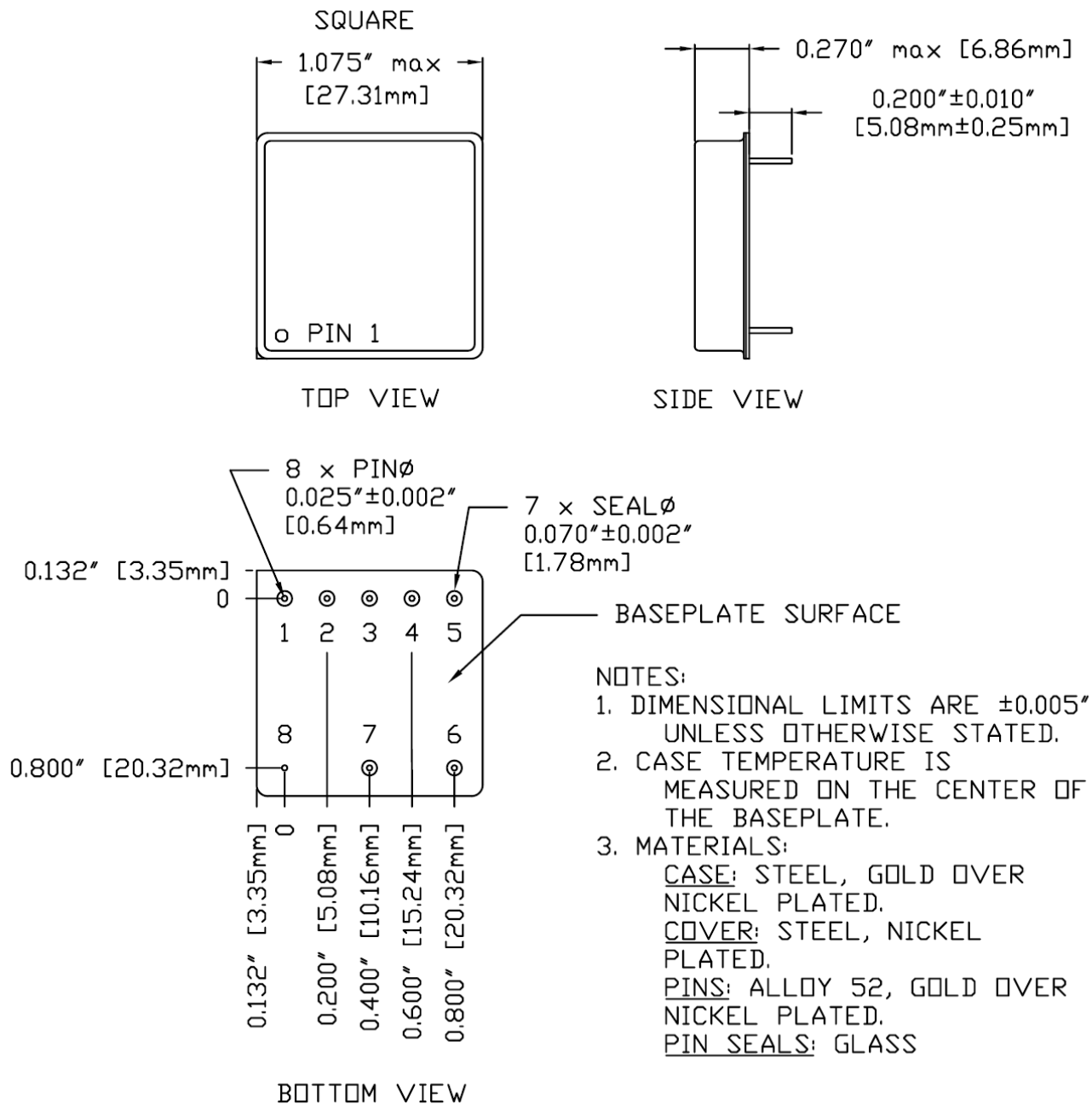


**Figure 13** – Radiation exposure circuit (TID)



**Figure 14** – Radiation exposure circuit (SEE)

PACKAGE SPECIFICATIONS



PIN	FUNCTION	PIN	FUNCTION
1	+V OUT	5	INHIBIT
2	OUT COM	6	28V IN
3	N/C	7	IN COM
4	N/C	8	CASE

**Figure 15 – Package and Pinout**

## PACKAGE PIN DESCRIPTION

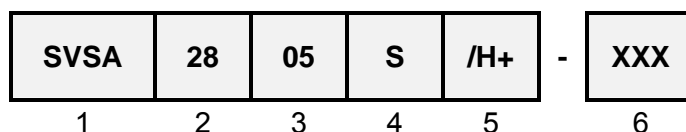
Pin	Function	Description
1	+V OUT	Positive Output Voltage Connection
2	OUT COM	Output Common Connection
3	N/C	No Connection
4	N/C	No Connection
5	INHIBIT	Logic Low = Disabled Output. Connecting the inhibit pin to input common causes converter shutdown. Logic High = Enabled Output. Unconnected or open 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)

Screening	MIL-STD-883	Class H+ /H+	Class K /K	Engineering Model <sup>5</sup> /EM
Non-Destructive Bond Pull	Method 2023 <sup>3</sup>	•	•	•
Internal Visual	Method 2017, 2032 Internal Procedure	•	•	•
Temperature Cycling	Method 1010, Condition C	•	•	
Constant Acceleration	Method 2001, 3000g, Y1 Direction	•	•	
PIND	Method 2020, Condition A <sup>2</sup>	•	•	
Pre Burn-In Electrical	100% at 25°C		•	
Burn-In	Method 1015, 320 hours at +125°C Method 1015, 160 hours at +125°C 24 Hours at +125°C	•	•	•
Final Electrical	MIL-PRF-38534, Group A <sup>1</sup> 100% at 25°C	•	•	•
Hermeticity	Method 1014, Fine Leak, Condition A Method 1014, Gross Leak, Condition C Dip ( $1 \times 10^{-3}$ )	• •	• •	•
Radiography	Method 2012 <sup>6</sup>		•	
External Visual	Method 2009	•	•	•

- Notes:
- 100% R&R testing at -55°C, +25°C, and +125°C with all test data included in product shipment.
  - PIND test Certificate of Compliance included in product shipment. This is an additional screening test not required per MIL-PRF-38534, Class H.
  - Non-Destructive bond pull per Method 2023 performed. This is an additional screening test not required per MIL-PRF-38534, Class H.
  - Please contact your sales representative or the VPT Inc. Sales Department for more information concerning additional environmental screening and testing options desired.
  - Engineering models utilize only the standard screening specified and are not considered compliant for flight use.
  - Radiographic test Certificate of Compliance and film(s) included in product shipment.

## ORDERING INFORMATION



(1)	(2)		(3)		(4)	
Product Series	Nominal Input Voltage		Output Voltage		Number of Outputs	
SVSA	28	28 Volts	3R3 05 5R2 12 15	3.3 Volts 5 Volts 5.2 Volts 12 Volts 15 Volts	S	Single

(5)	(6)
Screening Code	Additional Screening Code
/EM /H+ /K	Engineering Model Class H+ Class K
	Contact Sales

**Note:** Engineering models utilize only the standard screening specified and are not considered compliant for flight use. These models are intended for low volume engineering characterization. The customer must place the following statement on each line item of their purchase order(s) for /EM units when ordering engineering models:

**“(Customer Name) acknowledges that the /EM unit listed in this line item is not permitted for flight use and will be used for Engineering characterization only.”**

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)	SVSA2800S Series Similar Part Number
5962P1121901HXC 5962P1121901KXC	SVSA283R3S/H+ SVSA283R3S/K
5962P1121902HXC 5962P1121902KXC	SVSA2805S/H+ SVSA2805S/K
5962P1121903HXC 5962P1121903KXC	SVSA2812S/H+ SVSA2812S/K
5962P1121904HXC 5962P1121904KXC	SVSA2815S/H+ SVSA2815S/K

Do not use the SVSA2800S 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 <http://www.dsccl.dla.mil/programs/smcr/>. The SMD number listed above is for standard gold-plated lead finish and "P" 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](mailto: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.