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DATA SHEET

Power Your Critical Mission Today

SVTR2800D SERIES

SPACE QUALIFIED HYBRID DC-DC CONVERTERS



SVTR Series DC-DC Converter

Models Available
Input: 15 V to 50 V continuous, 80 V transient
40 W, dual outputs of ±5 V, ±8 V, ±12 V, ±15 V
Qualified to MIL-PRF-38534 Class H and Class K

1.0 DESCRIPTION

The SVTR Series of space qualified DC-DC converters 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 SVTR 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, Level P. Characterization is performed at both the component level and at the SVTR Series hybrid converter level.

The SVTR Series of DC-DC converters is radiation tolerant and suited for use in low Earth orbit (LEO), medium Earth orbit (MEO), geostationary orbit (GEO), deep space, and launch vehicle programs.

1.1 FEATURES

- Up to 40 W output power
- Wide input voltage range: 15 V to 50 V plus 80 V transient
- Continuous operation over full military temperature range of -55 °C to +125 °C with no power derating
- Very low output noise
- Radiation immune magnetic feedback circuit
- No use of optoisolators
- Undervoltage lockout
- Current limit protection / short circuit protection

1.2 SPACE LEVEL CHARACTERIZATIONS

- Guaranteed TID performance to 30 krad(Si) including ELDRS
- SEE performance to 44 MeV-cm^2/mg. Transients are fully characterized for cross section and magnitude
- Worst-case analysis, stress, radiation, reliability reports available

1.3 MANUFACTURING AND COMPLIANCE

- Qualified to MIL-PRF-38534 Class H and Class K, DLA SMD # 5962-11223
- MIL-PRF-38534 element evaluated components
- MIL-STD-461 C/D/E/F when used with appropriate VPT EMI filter
- Manufactured in a MIL-PRF-38534 Class H and Class K facility
- MIL-STD-883
- ISO-9001

1.4 PACKAGING

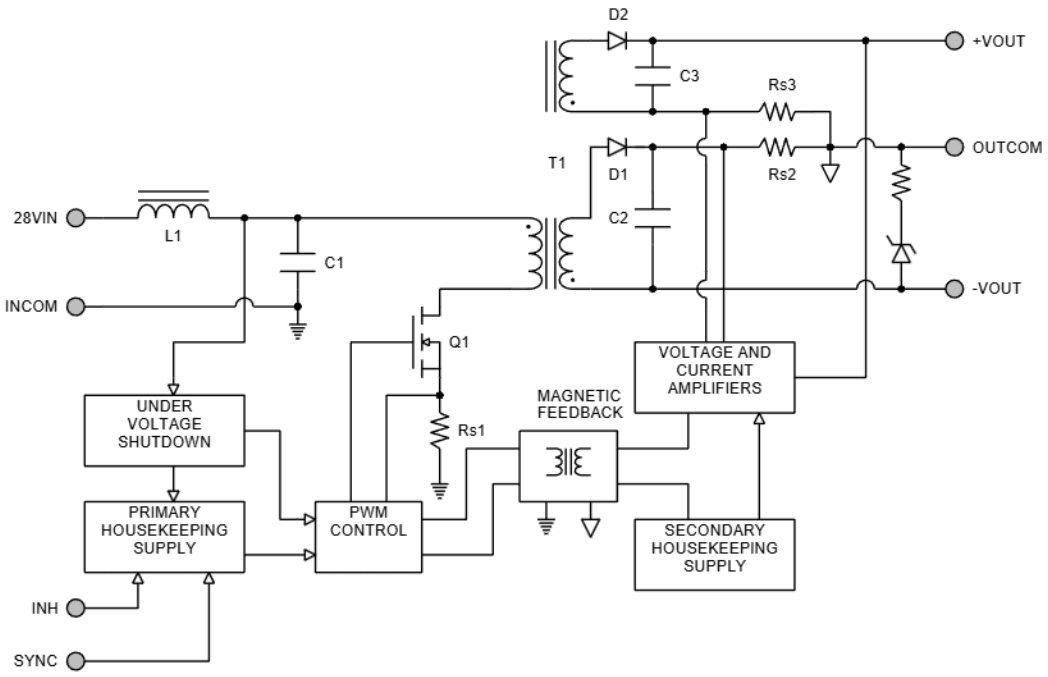
- Low-profile: 2.890" x 1.125" x 0.405"
- Max weight: 55 g
- Industry standard pinout
- Precision seam-welded hermetic metal case
- Flanged and Non-flanged versions available

1.5 SIMILAR PRODUCTS AND ACCESSORIES

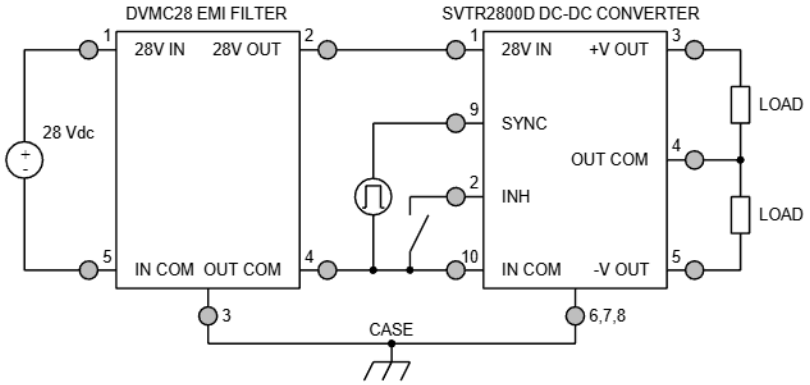
- SVTR 40 W single output DC-DC converter
- SVRTR 40 W space qualified DC-DC converter, 100 krad(Si)
- Custom versions available
- EMI filters
- Non-isolated, space qualified point of load converters
- Use with Thermal Pad TP-003

2.0 DIAGRAMS

2.1 BLOCK DIAGRAM



2.2 CONNECTION DIAGRAM



3.0 SPECIFICATIONS

3.1 ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings			
Input Voltage (Continuous):	-0.5 V to 50 V	Operating Temperature (Full Load):	-55 °C to +125 °C
Input Voltage (Transient, 1 second):	-0.5 V to 80 V	Storage Temperature:	-65 °C to +150 °C
ESD Rating per MIL-PRF-38534:	3A	Lead Solder Temperature (10 seconds):	270 °C

3.2 PERFORMANCE SPECIFICATIONS

Tcase = -55 °C to +125 °C, Vin = +28 V ± 5%, Full Load[1], Unless Otherwise Specified

		SVTR2805D			SVTR2808D			
Parameter	**Conditions**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Units**
INPUT								
Voltage	Continuous	15	28	50	15	28	50	V
	Transient, 1 sec[4]	-	-	80	-	-	80	V
Current	INH < 1.5 V	-	4	6	-	4	6	mA
	No Load	-	60	90	-	60	90	mA
Ripple Current	20 Hz to 10 MHz	-	30	50	-	30	50	mApp
Undervoltage Lockout	Turn-On	12.0	-	14.8	12.0	-	14.8	V
	Turn-Off[4]	11.0	-	14.5	11.0	-	14.5	V
OUTPUT STATIC								
Voltage	+Vout, Tcase = 25 °C	4.95	5	5.05	7.92	8.0	8.08	V
	+Vout, Tcase = -55 °C to +125 °C	4.925	5	5.075	7.88	8.0	8.12	V
	–Vout, Tcase = 25 °C	4.80	5	5.20	7.80	8.0	8.20	V
	–Vout, Tcase = -55 °C to +125 °C	4.70	5	5.30	7.76	8.0	8.24	V
Power[2,6]	Total	0	-	30	0	-	35	W
	Either Output	0	-	21	0	-	24.5	W
Current[2,6]	Total	0	-	6.0	0	-	4.38	A
	Either Output	0	-	4.2	0	-	3.06	A
Ripple Voltage	20 Hz to 10 MHz	-	30	60	-	40	60	mVpp
Line Regulation	+Vout, V_{IN} = 16 V to 40 V	-	2	20	-	2	20	mV
	–Vout, V_{IN} = 16 V to 40 V	-	25	200	-	35	200	mV
Load Regulation[7]	+Vout, No Load to Full Load	-	5	50	-	5	50	mV
	–Vout, No Load to Full Load	-	30	200	-	30	200	mV
Cross Regulation, –Vout	+Vout: 70% load, –Vout: 30% load	-	360	650	-	450	650	mV
	+Vout: 30% load, –Vout: 70% load							
Load Fault Power Dissipation	Overload[4]	-	-	16	-	-	15	W
	Short Circuit	-	-	16	-	-	15	W
OUTPUT DYNAMIC								
Load Step, Half to Full Load, Either Output	Output Transient	-	100	400	-	100	400	mVpk
	Recovery[3]	-	100	350	-	50	300	µs
Line Step[4], Vin = 16 V to 40 V	Output Transient	-	300	600	-	200	550	mVpk
	Recovery[3]	-	300	500	-	250	500	µs
Turn-On, Vin = 0 to 28 V	Delay	-	10	20	-	10	20	ms
	Overshoot	-	0	25	-	0	25	mVpk
FUNCTION								
INH Pin Input[4]	Output Inhibited	0	-	1.5	0	-	1.5	V
INH Pin Open Circuit Voltage[4]	Output Enabled	9	11	13	9	11	13	V
SYNC Frequency Range		500	-	600	500	-	600	kHz
GENERAL								
Efficiency		73	77	-	74	80	-	%
Capacitive Load[4]		-	-	500	-	-	500	µF
Switching Frequency		400	525	550	400	525	550	kHz
Isolation	500 V DC, Tcase = 25 °C	100	-	-	100	-	-	MΩ
Weight	Non-flanged package option	-	-	52	-	-	52	g
	Flanged package option	-	-	55	-	-	55	g
MTBF (MIL-HDBK-217F)	SF @ Tcase = 55 °C	-	752	-	-	752	-	kHr
POST-RAD END-OF-LIFE LIMITS[5]								
Input Ripple Current		-	-	70	-	-	70	mApp
Output Voltage	+Vout, Tcase = -55 °C to +125 °C	4.89	-	5.10	7.8	-	8.2	V
	–Vout, Tcase = -55 °C to +125 °C	4.665	-	5.325	7.68	-	8.32	V

1. Half load at +Vout and half load at –Vout
2. Up to 70% of the total power or current can be drawn from either of the two outputs
3. Time for output voltage to settle within 1% of steady-state value
4. Verified by qualification testing
5. End-of-Life performance includes aging and radiation degradation and is within standard limits except where noted
6. Derate linearly to 0 at 135 °C
7. 5% Load to Full Load at -55 °C

3.2 PERFORMANCE SPECIFICATIONS (CONTINUED)

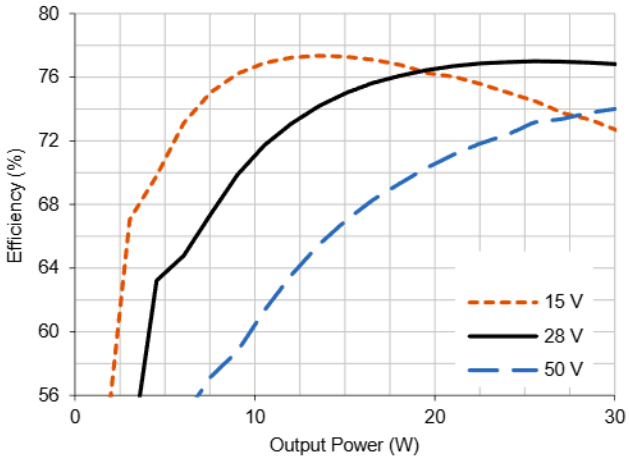
Tcase = -55 °C to +125 °C, Vin = +28 V ± 5%, Full Load[1], Unless Otherwise Specified

		SVTR2812D			SVTR2815D			
Parameter	**Conditions**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Units**
INPUT								
Voltage	Continuous	15	28	50	15	28	50	V
	Transient, 1 sec[4]	-	-	80	-	-	80	V
Current	INH < 1.5 V	-	4	6	-	4	6	mA
	No Load	-	60	90	-	60	90	mA
Ripple Current	20 Hz to 10 MHz	-	30	50	-	25	50	mApp
Undervoltage Lockout	Turn-On	12.0	-	14.8	12.0	-	14.8	V
	Turn-Off[4]	11.0	-	14.5	11.0	-	14.5	V
OUTPUT STATIC								
Voltage	+Vout, Tcase = 25 °C	11.88	12	12.12	14.85	15	15.15	V
	+Vout, Tcase = -55 °C to +125 °C	11.82	12	12.18	14.70	15	15.30	V
	–Vout, Tcase = 25 °C	11.80	12	12.20	14.70	15	15.30	V
	–Vout, Tcase = -55 °C to +125 °C	11.64	12	12.36	14.55	15	15.45	V
Power[2,6]	Total	0	-	40	0	-	40	W
	Either Output	0	-	28	0	-	28	W
Current[2,6]	Total	0	-	3.33	0	-	2.67	A
	Either Output	0	-	2.33	0	-	1.87	A
Ripple Voltage	20 Hz to 10 MHz	-	25	50	-	25	50	mVpp
Line Regulation	+Vout, V_{IN} = 16 V to 40 V	-	2	20	-	2	20	mV
	–Vout, V_{IN} = 16 V to 40 V	-	25	200	-	65	200	mV
Load Regulation[7]	+Vout, No Load to Full Load	-	2	50	-	2	50	mV
	–Vout, No Load to Full Load	-	20	200	-	35	200	mV
Cross Regulation, –Vout	+Vout: 70% load, –Vout: 30% load	-	430	650	-	420	650	mV
	+Vout: 30% load, –Vout: 70% load							
Load Fault Power Dissipation	Overload[4]	-	-	14	-	-	14	W
	Short Circuit	-	-	14	-	-	14	W
OUTPUT DYNAMIC								
Load Step, Half to Full Load, Either Output	Output Transient	-	300	450	-	280	500	mVpk
	Recovery[3]	-	120	400	-	100	300	µs
Line Step[4], Vin = 16 V to 40 V	Output Transient	-	500	900	-	500	900	mVpk
	Recovery[3]	-	300	500	-	300	500	µs
Turn-On, Vin = 0 to 28 V	Delay	-	10	20	-	10	20	ms
	Overshoot	-	0	50	-	0	50	mVpk
FUNCTION								
INH Pin Input[4]	Output Inhibited	0	-	1.5	0	-	1.5	V
INH Pin Open Circuit Voltage[4]	Output Enabled	9	11	13	9	11	13	V
SYNC Frequency Range		500	-	600	500	-	600	kHz
GENERAL								
Efficiency		78	83	-	78	84	-	%
Capacitive Load[4]		-	-	500	-	-	500	µF
Switching Frequency		400	525	550	400	525	550	kHz
Isolation	500 V DC, Tcase = 25 °C	100	-	-	100	-	-	MΩ
Weight	Non-flanged package option	-	-	52	-	-	52	g
	Flanged package option	-	-	55	-	-	55	g
MTBF (MIL-HDBK-217F)	SF @ Tcase = 55 °C	-	752	-	-	752	-	kHr
POST-RAD END-OF-LIFE LIMITS[5]								
Input Ripple Current		-	-	70	-	-	70	mApp
Output Voltage	+Vout, Tcase = -55 °C to +125 °C	11.66	-	12.30	14.565	-	15.40	V
	–Vout, Tcase = -55 °C to +125 °C	11.48	-	12.48	14.415	-	15.55	V

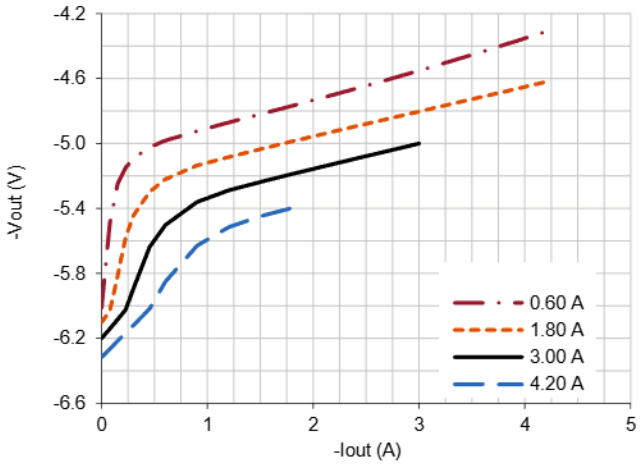
1. Half load at +Vout and half load at –Vout
2. Up to 70% of the total power or current can be drawn from either of the two outputs
3. Time for output voltage to settle within 1% of steady-state value
4. Verified by qualification testing
5. End-of-Life performance includes aging and radiation degradation and is within standard limits except where noted
6. Derate linearly to 0 at 135 °C
7. 5% Load to Full Load at -55 °C

4.0 PERFORMANCE CURVES

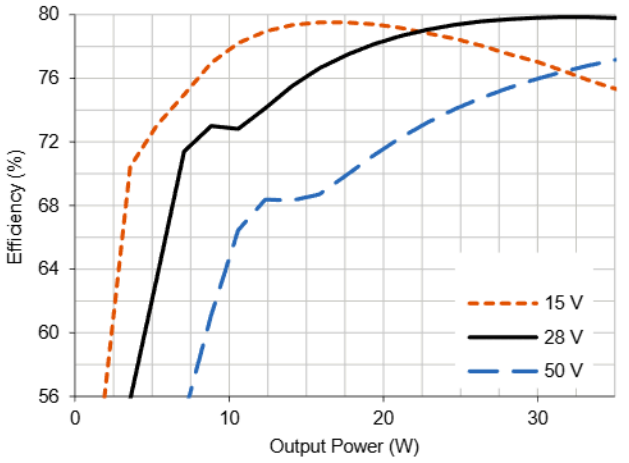
4.1.1 SVTR2805D Efficiency (Typical, 25 °C)



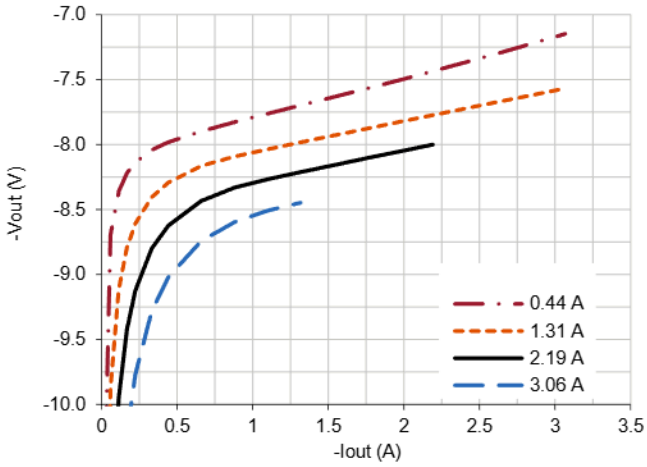
4.1.2 SVTR2805D Cross-Regulation (Typical, 25 °C)



4.2.1 SVTR2808D Efficiency (Typical, 25 °C)

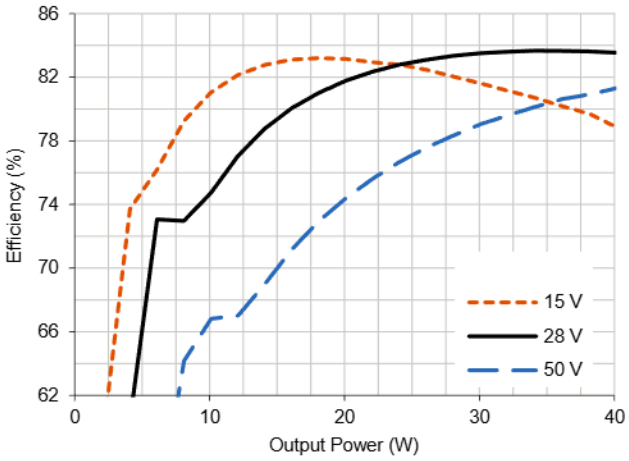


4.2.2 SVTR2808D Cross-Regulation (Typical, 25 °C)

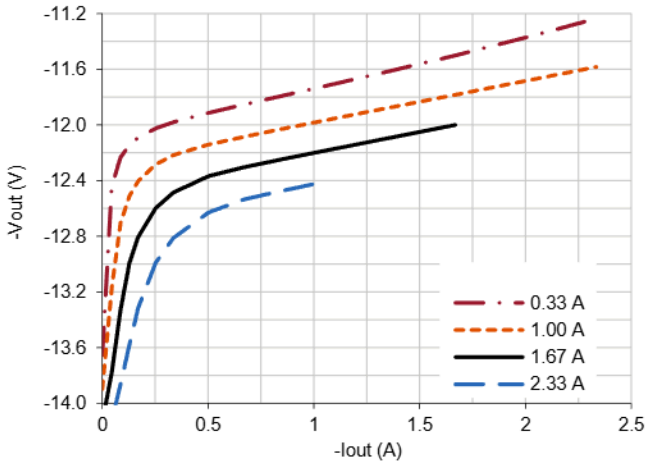


4.0 PERFORMANCE CURVES (CONTINUED)

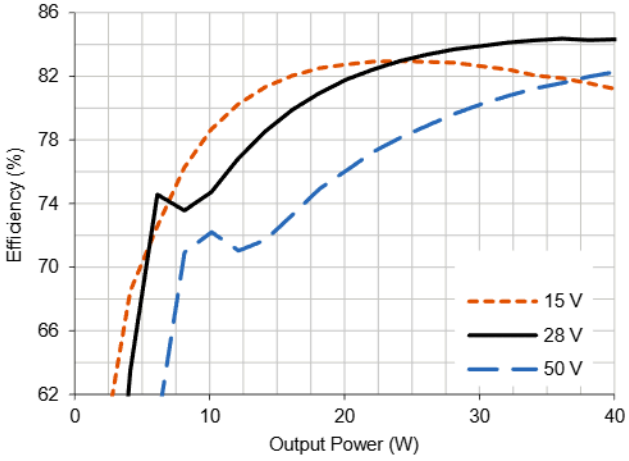
4.3.1 SVTR2812D Efficiency (Typical, 25 °C)



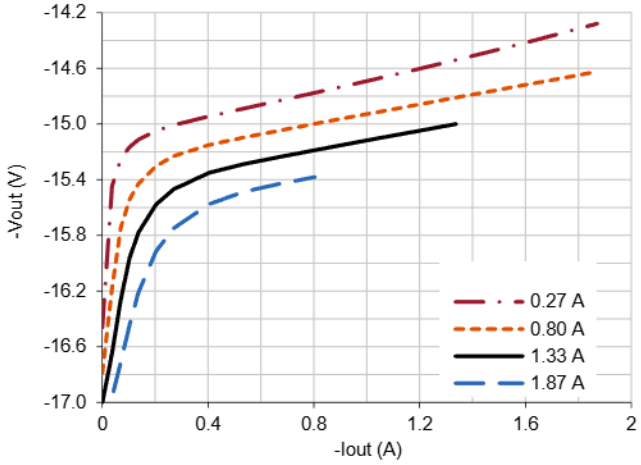
4.3.2 SVTR2812D Cross-Regulation (Typical, 25 °C)



4.4.1 SVTR2815D Efficiency (Typical, 25 °C)

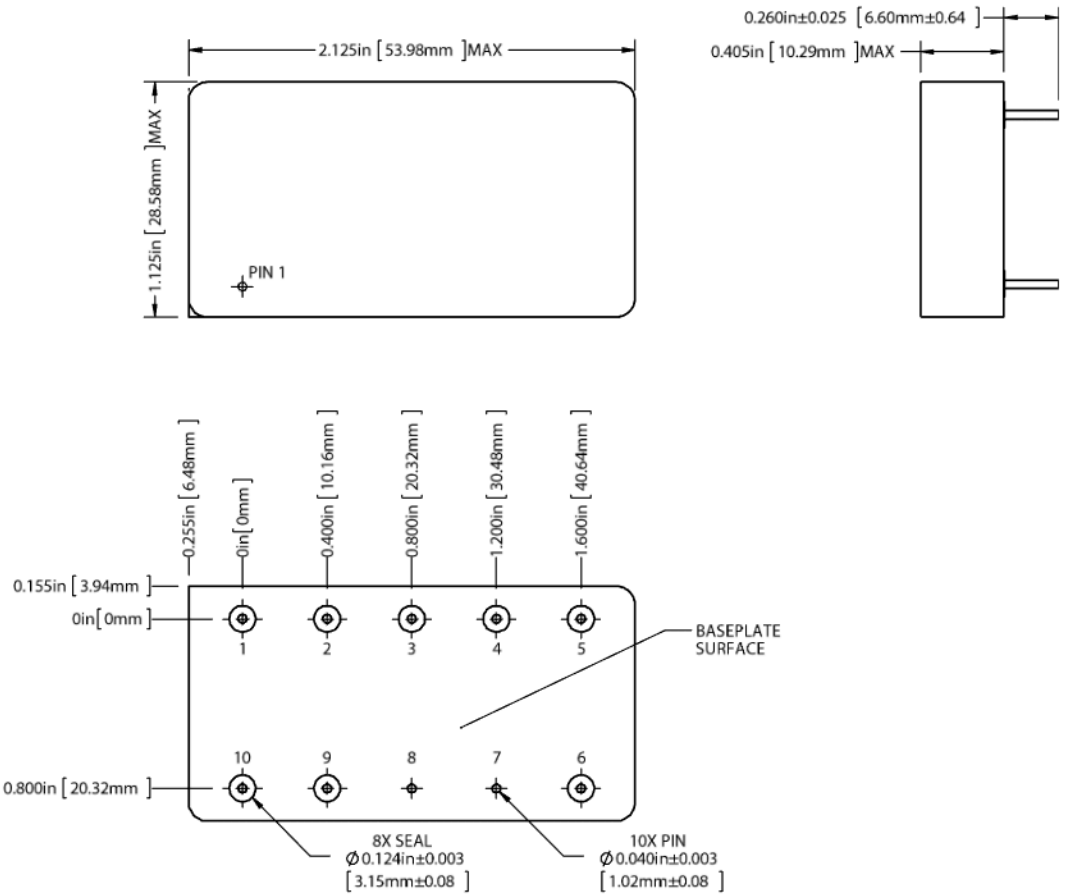


4.4.2 SVTR2815D Cross-Regulation (Typical, 25 °C)



5.0 MECHANICAL OUTLINES AND PINOUT

Non-Flanged Package Option:

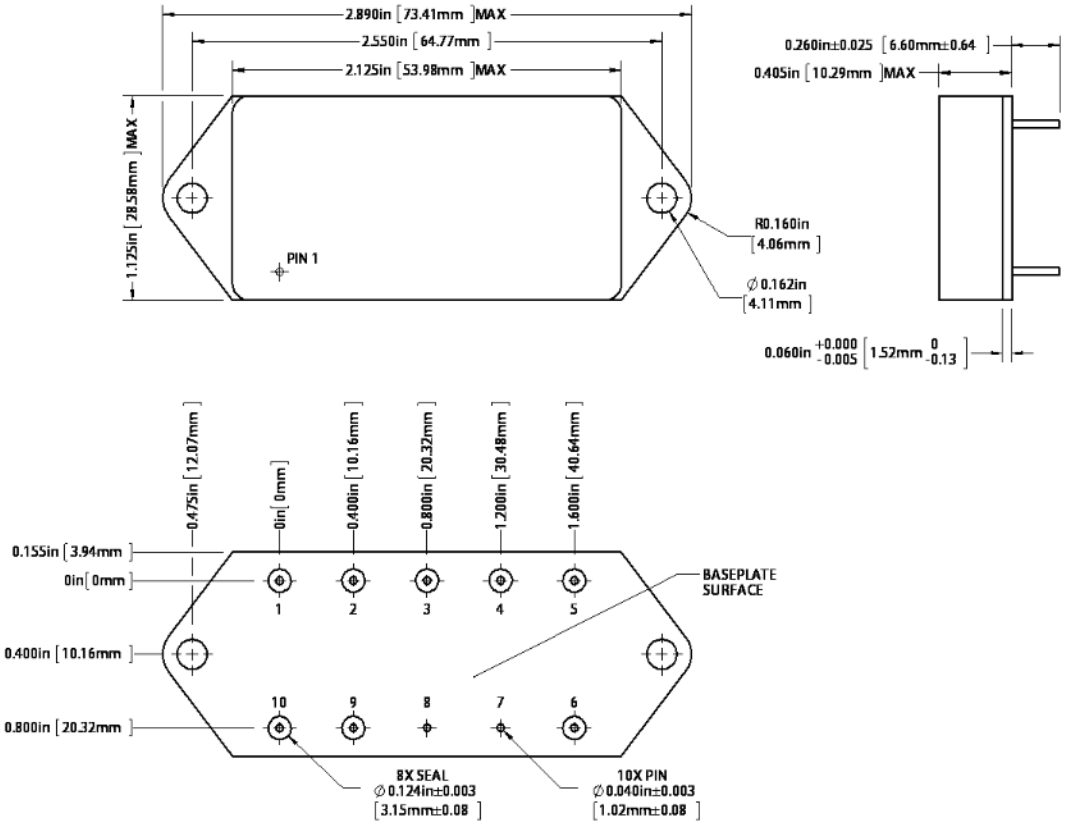


1. Tolerances are +0.005" unless otherwise stated
2. Case temperature is measured on the center of the baseplate surface
3. Materials: Case (Steel, gold over nickel plated); Cover (Kovar, nickel plated); Pin (Copper-cored alloy 52, gold over nickel plated); Pin Seals (Ceramic)

Pin	Function	Pin	Function	Pin	Function	Pin	Function
1	28VIN	4	OUTCOM	7	CASE	10	INCOM
2	INH	5	–VOUT	8	CASE		
3	+VOUT	6	CASE	9	SYNC		

5.0 MECHANICAL OUTLINES AND PINOUT (CONTINUED)

Flanged Package Option:



1. Tolerances are +0.005" unless otherwise stated
2. Case temperature is measured on the center of the baseplate surface
3. Mounting holes are not threaded. Recommended fastener is 6-32
4. Materials: Case (Steel, gold over nickel plated); Cover (Kovar, nickel plated); Pin (Copper-cored alloy 52, gold over nickel plated); Pin Seals (Ceramic)

Pin	Function	Pin	Function	Pin	Function	Pin	Function
1	28VIN	4	OUTCOM	7	CASE	10	INCOM
2	INH	5	–VOUT	8	CASE		
3	+VOUT	6	CASE	9	SYNC		

6.0 TECHNICAL NOTES

Please note that many of these functions are also demonstrated in detail on the VPT website in the form of technical video labs.



6.1 GENERAL INFORMATION

6.1.1 Topology Description

The SVTR2800D Series is an isolated dual-output flyback converter. It provides a positive and negative output voltage with respect to the OUTCOM pin. Up to 70% of the total output power is available from either output. The internal voltage regulation loop actively regulates the positive output using VPT's proprietary magnetic feedback technology. The negative output is regulated by cross-regulation of the transformer windings. The negative output is well-regulated for balanced load conditions. For unbalanced load conditions, refer to the cross regulation performance graphs in Section 4.2 for expected performance. For a balanced or near-balanced load condition, the converter will regulate down to zero load, and no minimum load is required. For an unbalanced load condition, with negative loads greater than 10%, a minimum load of 10% is recommended on the positive output.

6.1.2 External Components

The SVTR2800D Series is designed to operate stand-alone in most applications. It does not require any external components for proper operation or to meet the datasheet specifications. Input and output L-C filters are provided internally for low ripple and noise. To further reduce output ripple and noise, a small ceramic capacitor, 1 µF to 10 µF, can be added at the output. Most application specific ripple requirements can be met with the addition of output capacitors alone. External output capacitance can be added up to the maximum listed in Section 3.2.

6.1.3 Source Impedance

The impedance of the 28 V input source can interact with the DC-DC converter and can affect performance. High source impedance is often caused by a long input cable or components added in series with the input. Source resistance will cause a DC voltage drop as the converter draws DC input current. This voltage drop is simply the cable resistance multiplied by the input current at low line. The voltage drop and the actual voltage at the input to the converter will determine the minimum source voltage at which the converter will operate. A high source inductance can interact with the feedback control loop of the converter. VPT's EMI filters will usually isolate the source and eliminate this problem. In some cases, additional input capacitance will be needed to stabilize the system.

6.1.4 Output Configurations

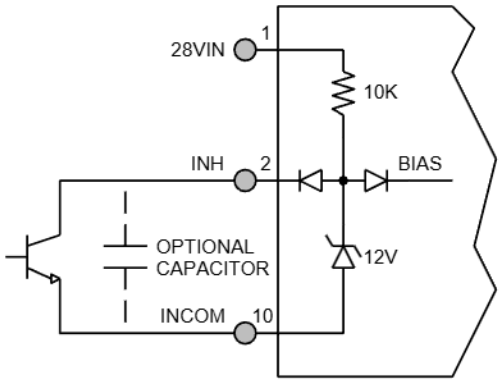
Since the converter is isolated, the outputs can be used as a traditional dual-output, with a positive and negative voltage referenced to OUTCOM, or as a single-ended output referenced to –VOUT or +VOUT. For example, the SVTR2812D model can provide +12 V and –12 V in the traditional dual output configuration, or can provide +24 V referenced to –VOUT, or –24 V referenced to +VOUT in single-ended configuration. In the single-ended configuration, the OUTCOM pin will be at +12 V relative to –VOUT.

The outputs of multiple converters can be stacked in series to provide higher voltages. When outputs of multiple modules are stacked, they naturally share the load. For example, two SVTR2812D converters can be stacked to provide a 48 V output at 80 W.

6.2 FUNCTION DESCRIPTIONS

6.2.1 On/Off Control (Inhibit)

The INH (Inhibit) pin is a primary-side control pin referenced to INCOM. The INH pin must be driven using an open collector or open drain configuration. Pulling the INH pin low disables the converter output, removes bias voltage from internal control circuitry, and puts the converter in a state of minimum input current draw. Leaving INH open enables the output, allowing the converter to operate normally. The pin must be pulled below 1.5 V to disable the output. An optional capacitor from INH to INCOM may be used to delay turn-on. The INH pin should be left open if not used.



6.2.2 Frequency Synchronization (SYNC)

The SVTR2800D Series will free run at a switching frequency of approximately 500 kHz, which has been set for optimum converter performance. Frequency synchronization is not necessary unless required by system constraints. The SVTR2800D Series provides a frequency synchronization input (SYNC) referenced to INCOM.

The SYNC pin can be driven by an external clock. The internal clock and internal power train will operate at the frequency applied to the SYNC pin. The SYNC pin should be driven with a TTL type 5 V square wave signal. The duty cycle of the square wave should be between 20% and 80%. The SYNC pin is internally capacitively-coupled and the internal load is equivalent to 220 pF. Proper layout and circuit techniques are necessary to prevent noise from being injected into this pin. Synchronized converters should be physically located close together and share a low impedance INCOM connection. The SYNC pin can be left open or connected to INCOM if not used.

6.3 PROTECTION FEATURES

6.3.1 Input Undervoltage Lockout

The SVTR2800D Series provides input undervoltage lockout protection. For input voltages below the turn-on voltage, the converter will remain off, drawing minimal current from the source. When the input voltage exceeds the turn-on voltage, the converter will start. The lockout circuit is designed to tolerate slow ramping input voltage waveforms. VPT's proprietary magnetic feedback technology provides bias voltage to all secondary control circuits and control amplifiers before the output starts, ensuring a well-controlled start up sequence.

6.3.2 Output Soft Start

The SVTR2800D Series utilizes an output soft-start function to ramp the output in a controlled manner, eliminating output voltage overshoot and limiting inrush current at turn on. A voltage-mode soft-start ensures the output waveform remains consistent regardless of changes in the load current. The output rise time is approximately 8 ms. The soft-start function is active whether the module is turned on with an application of input voltage or from release of the inhibit pin. Under normal conditions, current drawn from the source during turn on will not exceed the full load input current. The turn-on delay time is specified from the application of input voltage (or release of the inhibit pin) until the output reaches 90% of its final value.

6.3.3 Output Overcurrent Protection

The SVTR2800D Series provides output overcurrent and output short circuit protection. During a load fault condition, a constant output current control circuit reduces the converter duty cycle to limit the total output current to approximately 125% its rated value. The current limit protection circuit limits the sum of output currents in both +Vout and –Vout. It does not distinguish if the current is on the positive or negative output. The converter will continue to provide constant current into any overload or short circuit condition. This feature allows the converter to start into any capacitive load. Recovery is automatic and immediate upon removal of the fault condition. Sustained short circuit or overload operation can cause excessive power dissipation. Care should be taken to control the operating temperature of the converter in this condition.

6.4 THERMAL CONSIDERATIONS

The SVTR2800D Series is rated for full power operation at 125 °C. Operation above 125 °C is allowed at reduced power. Specifically, the output power should be derated linearly from full power at 125 °C to half power at 130 °C and to zero power at 135 °C. The operating temperature of the converter is specified on the baseplate of the converter. The converter is designed to be conduction-cooled, with the baseplate mounted to a heat sink, chassis, PCB or other thermal surface. The internal power dissipating components are mounted to the baseplate of the converter and all heat flow is through the baseplate and mounting flanges. The lid of the converter does not provide a good thermal path.

The hybrid DC-DC converter contains many semiconductor components. The maximum temperature rise from junction to case is 15 °C at full load.

6.5 VPT RHA PLAN AND APPROACH

VPT takes a conservative approach to radiation testing to ensure product performance during space travel. VPT's DLA approved Radiation Hardness Assurance (RHA) plan documents VPT's processes and procedures for guaranteeing the performance of VPT products under various environmental conditions in space, including TID, SEE, and ELDRS.

Documents Available	Details
DLA approved Radiation Hardness Assurance (RHA) Plan Summary	The radiation environments covered by this overview include: total ionizing dose (TID), which includes enhanced low dose rate sensitivity (ELDRS); displacement damage (DD); and single event effects (SEE).
Worst-Case Analysis Report	Detailed worst-case analysis guarantees circuit performance post radiation and end of life.
Stress Report	Individual component stress analysis and deratings are included as part of the WCA report.
Radiation Test Summary Report	An overview report on the component level RLAT and characterization testing for TID and DD as well as the hybrid level characterizations for TID and SEE response.
Reliability Report	MTBF report based on MIL-HDBK-217 reliability calculations.
Thermal Analysis Report	Component temperature rise analysis and measurement results.

Test Definition	VPT's Approach
Total Ionizing Dose (TID). A measure of the energy absorbed in the semiconductor components from the naturally occurring sources of radiation (protons, electrons, photons). This results in the slow degradation of semiconductor performance specifications. TID is tested by exposing components to gamma radiation from a Cobalt-60 source.	Designed for 30 krad(Si). Sensitive semiconductor components undergo RLAT to 60 krad(Si) per MIL-STD-883 Method 1019. Converters are characterized to 60 krad(Si).
Enhanced Low Dose Rate Sensitivity (ELDRS): Many linear-bipolar integrated circuits show enhanced parameter degradation when exposed at low dose rates close to those seen in a space environment as compared to the high dose rates (50-300 rad(Si)/s) that components were traditionally tested at for TID degradation. MIL-STD-883 Method 1019 gives guidance for characterizing components for ELDRS. Components that exhibit ELDRS are tested for TID at a rate below 0.01 rad(Si)/s.	All bipolar linear ICs characterized for ELDRS sensitivity and tested in accordance with MIL-STD-883 test method 1019 section 3.13
Single Event Effects (SEE). Single high energy protons and heavy ions can deposit sufficient energy in a semiconductor component, causing a range of effects. SEEs include single event latchups (SELs), single event gate ruptures (SEGRs), single event transients (SETs), single event functional interrupts (SEFIs) and single event burnouts (SEBs).	Converters are characterized for catastrophic events (SEL, SEB, SEGR) as well as functional interrupts (SEFI) under heavy ion exposure to LET = 44 MeV-cm^2/mg. Converters are also characterized for cross section and magnitude of output transients (SET) for at least 3 different LET levels.
Radiation Lot Acceptance Testing (RLAT): Semiconductor wafer lots are exposed to TID on a sample basis. If the parameter degradation for the tested samples is within the predetermined acceptance limits, then the lot can be used in radiation hardened converters.	Sensitive semiconductor components undergo RLAT for TID.

7.0 ENVIRONMENTAL SCREENING

100% tested per MIL-STD-883 as referenced to MIL-PRF-38534.

Contact sales for more information concerning additional environmental screening and testing options. VPT Inc. reserves the right to ship higher screened or SMD products to meet orders for lower screening levels at our sole discretion unless specifically forbidden by customer contract.

Test	MIL-STD-883 Test Method, Condition	/H+ (Class H + PIND)	/K (Class K)	/EM (Engineering Model) Non-QML[1,6]
Non-Destructive Bond Pull	TM2023	•[2]	•	•[2]
Internal Visual	TM2010, TM2017, TM2032 (MIL-STD-750, TM2072, TM2073)	•	•	•
Temperature Cycling	TM1010, Condition C -65 °C to 150 °C, Ambient	•	•	
Constant Acceleration	TM2001, 3000g, Y1 Direction	•	•	
PIND[3]	TM2020, Condition A	•[2]	•	
Pre Burn-In Electrical	25 °C		•	
Burn-In	TM1015, 320 hrs., 125 °C, Case Typ		•	
	TM1015, 160 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[4]	•	•	
	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 ($1x10^{-3}$)			•
Radiography[5]	TM2012		•	
External Visual	TM2009	•	•	•

1. Non-QML products may not meet all requirements of MIL-PRF-38534
2. Not required per MIL-PRF-38534. Test performed for additional product quality assurance
3. PIND test Certificate of Compliance included in product shipment
4. 100% R&R testing with all test data included in product shipment
5. Radiographic test Certificate of Compliance and film(s) or data CD included in product shipment
6. Engineering models utilize only the screening specified and are not considered compliant for flight use

8.0 STANDARD MICROCIRCUIT DRAWING (SMD) NUMBERS

Standard Microcircuit Drawing Number	SVTR2800D Series Similar Part Number
5962P1122301HXC	SVTR2805D/H+
5962P1122301HXA	SVTR2805D/H+-E
5962P1122301HYC	SVTR2805DF/H+
5962P1122301HYA	SVTR2805DF/H+-E
5962P1122301KXC	SVTR2805D/K
5962P1122301KXA	SVTR2805D/K-E
5962P1122301KYC	SVTR2805DF/K
5962P1122301KYA	SVTR2805DF/K-E
5962P1122302HXC	SVTR2812D/H+
5962P1122302HXA	SVTR2812D/H+-E
5962P1122302HYC	SVTR2812DF/H+
5962P1122302HYA	SVTR2812DF/H+-E
5962P1122302KXC	SVTR2812D/K
5962P1122302KXA	SVTR2812D/K-E
5962P1122302KYC	SVTR2812DF/K
5962P1122302KYA	SVTR2812DF/K-E
5962P1122303HXC	SVTR2815D/H+
5962P1122303HXA	SVTR2815D/H+-E
5962P1122303HYC	SVTR2815DF/H+
5962P1122303HYA	SVTR2815DF/H+-E
5962P1122303KXC	SVTR2815D/K
5962P1122303KXA	SVTR2815D/K-E
5962P1122303KYC	SVTR2815DF/K
5962P1122303KYA	SVTR2815DF/K-E
5962P1122304HXC	SVTR2808D/H+
5962P1122304HXA	SVTR2808D/H+-E
5962P1122304HYC	SVTR2808DF/H+
5962P1122304HYA	SVTR2808DF/H+-E
5962P1122304KXC	SVTR2808D/K
5962P1122304KXA	SVTR2808D/K-E
5962P1122304KYC	SVTR2808DF/K
5962P1122304KYA	SVTR2808DF/K-E

Do not use the SVTR2800D 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.

9.0 ORDERING INFORMATION

SVTR	28	05	D	F	/K	-	XXX
1	2	3	4	5	6		7

(1) Product Series	(2) Nominal Input Voltage	(3) Output Voltage	(4) Number of Outputs	(5) Package Option	(6) Screening Code[1,2,3]	(7) Additional Screening Code
SVTR	**28** 28 Volts	**05** 05 Volts **08** 08 Volts **12** 12 Volts **15** 15 Volts	**D** Dual	(None) Non-Flanged **F** Flanged	**/EM** Engineering Model **/H+** Class H + PIND **/K** Class K	Contact Sales

1 Contact the VPT 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
3 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 only and have no guarantee regarding operation in a radiation environment. 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 requirements, source inspection, and/or special element evaluation for space or other higher quality applications.

10.0 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

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.

11.0 ADDITIONAL INFORMATION

Visit the VPT website for additional technical resources, including:

Product Catalogs



Application Notes and White Papers



Technical Video Labs



Additional Products For Avionics/Military, Hi-Rel COTS, and Space Applications



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