

SGRBX SERIES

SPACE QUALIFIED DC-DC CONVERTER BOX



Product Example Overview

Input: 98 V to 136 V continuous, 141 V transient
1600 W, single output of 28 V
Efficiency up to 96%
Modified versions available to meet customer-specific requirements

1.0 DESCRIPTION

The SGRBX Series is a box solution that contains four SGRB Series DC-DC converters. The individual SGRB slices are configured within the box framework to deliver up to 1600 watts of output power. Customers may select different SGRB Series units to be paralleled inside of the box solution to reach the desired output voltages and power levels required for their specific application. Multiple SGRBX boxes can be paralleled to reach higher power levels if needed.

The SGRBX Series is a technology leading solution for space-rated DC-DC power conversion. VPT designed this box solution and the individual SGRB converters to thrive in the most demanding commercial, scientific, and military space environments. With state-of-the-art GaN technology, its radiation hardened design ensures long-term reliability, making it the perfect choice for space payload or primary spacecraft bus applications that require high efficiency and low noise.

The SGRBX utilizes SGRB converters slices with their advanced fixed frequency reduced voltage switching topology resulting in extremely low input and output noise. This award-winning power conversion solution can be used for a wide range of high-power space applications. With VPT's extensive history of space flight heritage and proven performance, the SGRBX Series will deliver the dependable performance that your mission demands.

1.1 FEATURES

- Up to 1600 W output power
- Continuous operation over a temperature range of -35 °C to +70 °C with no power derating
- Very low output noise
- Undervoltage lockout
- Integrated EMI filter

1.1 FEATURES (CONTINUED)

- High Efficiency up to 96% using GaN Technology
- 141 V, 1 msec transient
- 80 V transient with reduced output power
- Overvoltage Protection
- Current limit protection / Short Circuit protection
- Power Supply Telemetry
- Parallel operation for higher power requirements using current share. See Section 6.2.3 Parallel Operation (SHARE) for more details.

1.2 SPACE LEVEL CHARACTERIZATIONS

- Guaranteed TID performance to 100 krad(Si) including ELDRS
- SEE performance to 85 MeV/mg/cm². Transients are fully analyzed for cross-section and magnitude
- Worst-Case Analysis & Thermal Analysis available for purchase
- Radiation, MTBF reliability reports available

1.3 MANUFACTURING AND COMPLIANCE

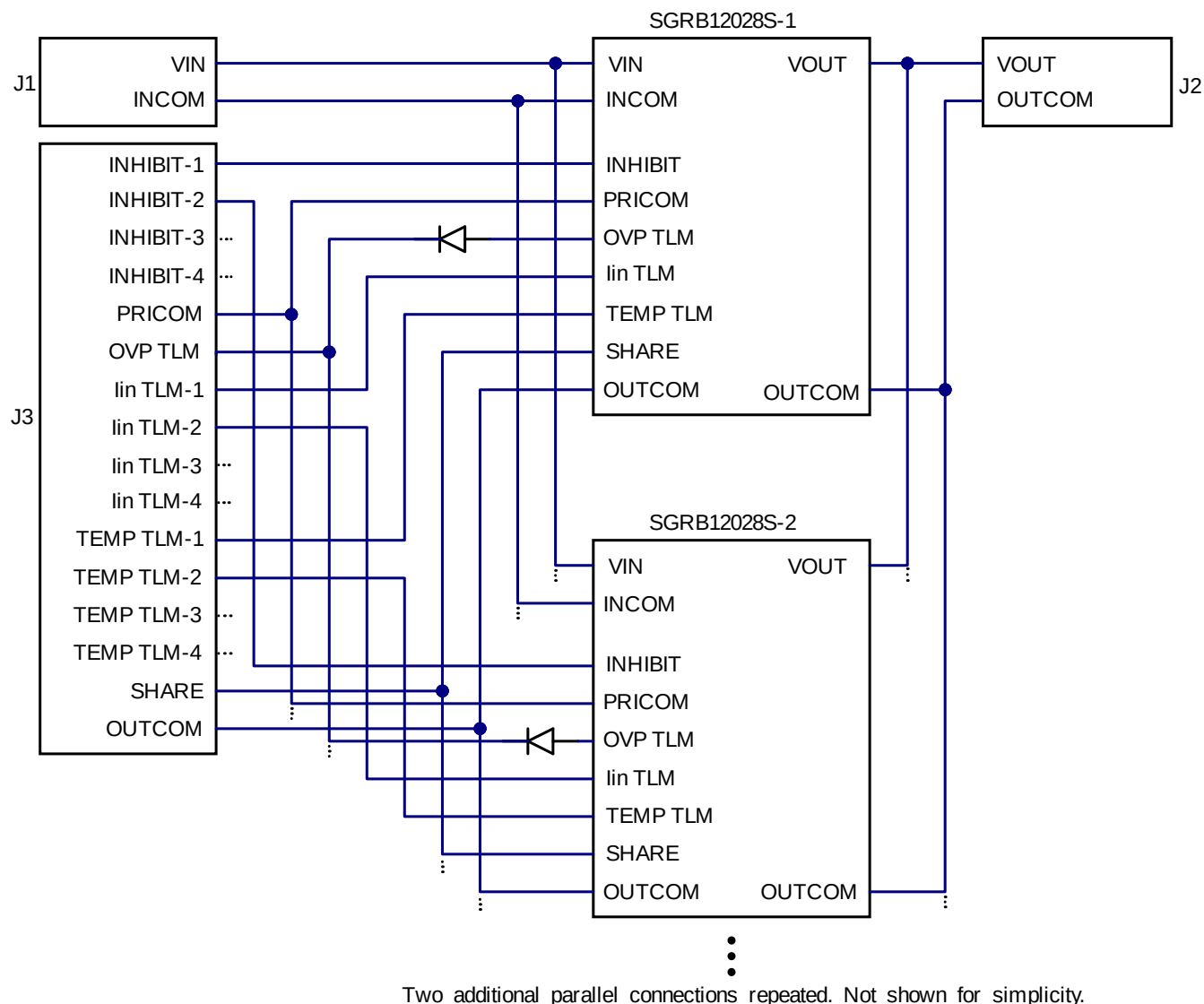
- Manufactured in a facility certified to SAE AS9100, J-STD-001 (Space Addendum) and IPC-A-610
- Designed in line with MIL-HDBK-1547 derating

1.4 PACKAGING

- Profile: 10.824" x 6.335" x 4.819"
- Max weight: 5.5 kg
- Aluminum case and cover with nickel plating

2.0 EXAMPLE DIAGRAMS

2.1 BLOCK DIAGRAM



Note: Throughout this document, performance and operation details are based on a SGRB91429, a box of four SGRB12028S converters operating in a parallel configuration. For other configurations contact vp.sales@vptpower.com.

3.0 PRODUCT EXAMPLE SPECIFICATIONS

3.1 ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings			
Input Voltage (Continuous):	-0.5 V to 136 V	Operating Temperature (Full Load):	-35 °C to +70 °C
Input Voltage (Transient, 1 msec):	-0.5 V to 141 V	Storage Temperature:	-45 °C to +95 °C
Input Voltage (Transient, 10 µsec):	-0.5 V to 150 V		

3.2 PERFORMANCE SPECIFICATIONS

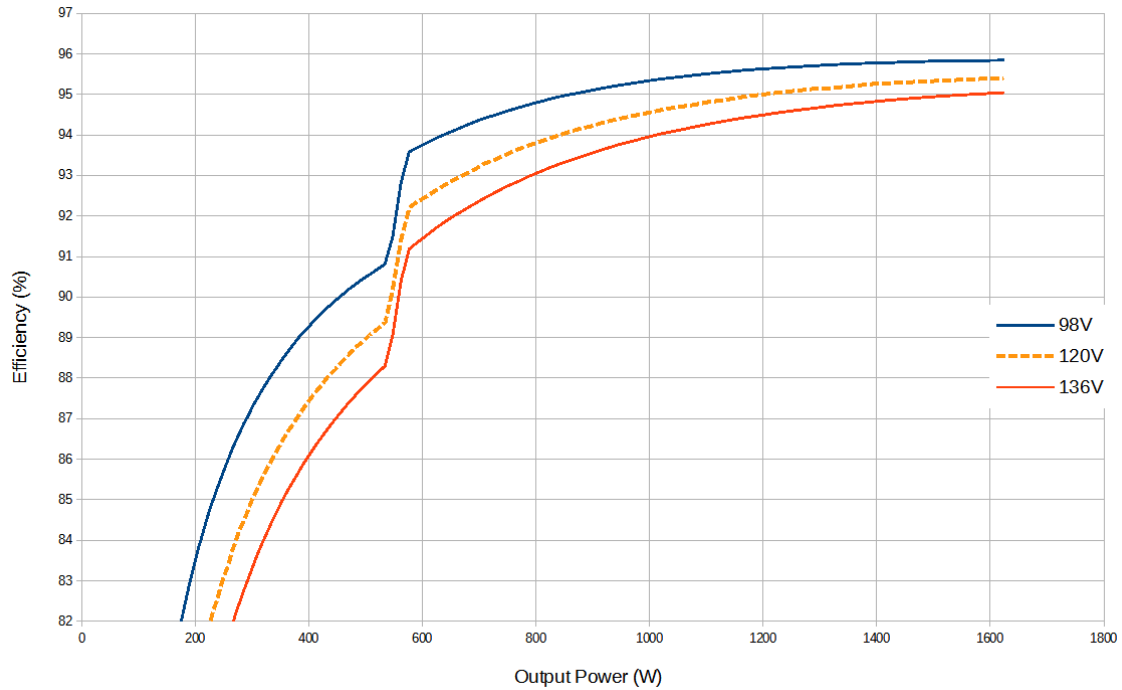
Tcase = -35 °C to +70 °C, Vin = +120 V ± 5%, Full Load, Unless Otherwise Specified

SGRB91429					
Parameter	Conditions	Min	Typ	Max	Units
INPUT					
Voltage	Continuous	98	120	136	V
	Transient, 1 msec ³	-	-	141	V
	Transient, 10 µsec ³	-	-	150	V
Current	INH < 0.5 V	-	8	20	mA
	No Load	-	400	600	mA
Undervoltage Lockout	Turn-On	-	-	95	V
	Turn-Off ^{3, 4, 5}	75	-	-	V
OUTPUT STATIC					
Voltage	+Vout, Tcase = -35 °C to +70 °C	-1.5%	Vset	1.5%	V
Power ²		0	-	1600	W
Current ²		0	-	57.2	A
Ripple Voltage	20 Hz to 10 MHz	-	-	100	mVpp
Line Regulation	VIN = 98 V to 136 V	-	10	100	mV
Load Regulation	No Load to Full Load	-	90	160	mV
Load Fault Power Dissipation	Overload ³	-	92	120	W
	Short Circuit ³	-	84	110	W
OUTPUT DYNAMIC					
Load Step, 10 A Step		-	410	550	mVpk
	Recovery ¹	-	90	200	µs
Turn-On, Vin = 0 to 120 V	Delay	-	35	50	ms
	Overshoot	-	0	25	mVpk
FUNCTION					
INH Pin Input ³	Output Inhibited	0	-	1.25	V
INH Pin Open Circuit Voltage ³	Output Enabled	0	-	16	V
SHARE Pin Voltage ³		-	-	10	V
Current Share Accuracy ³		-	1.15	3.43	A
SYNC Frequency Range		500	-	550	kHz
Overvoltage Trip Point ³	Overvoltage signal = 5V	32.5	-	35	V
GENERAL					
Efficiency		93	95	-	%
Capacitive Load ³		-	-	400	µF
Switching Frequency		400	450	500	kHz
Isolation	100 V DC, Tcase = 25 °C	10	-	-	MΩ
Weight		-	5.0	5.5	kg
MTBF (MIL-HDBK-217F)	SF @ Tcase = 55 °C	-	452	-	kHr

1. Time for output voltage to settle within 1% of steady-state value
2. Derate linearly to 0 at 80°C
3. Verified by initial electrical design. Post design verification, parameter shall be guaranteed to the limits specified.
4. VPT does not guarantee output voltage regulation with input voltage below 94.0 V.
5. Derate output power linearly for input voltage below 94.0 V, down to 75% power at 80 V. Derate to zero output power below input voltage of 80 V.

4.0 EXAMPLE PERFORMANCE CURVES

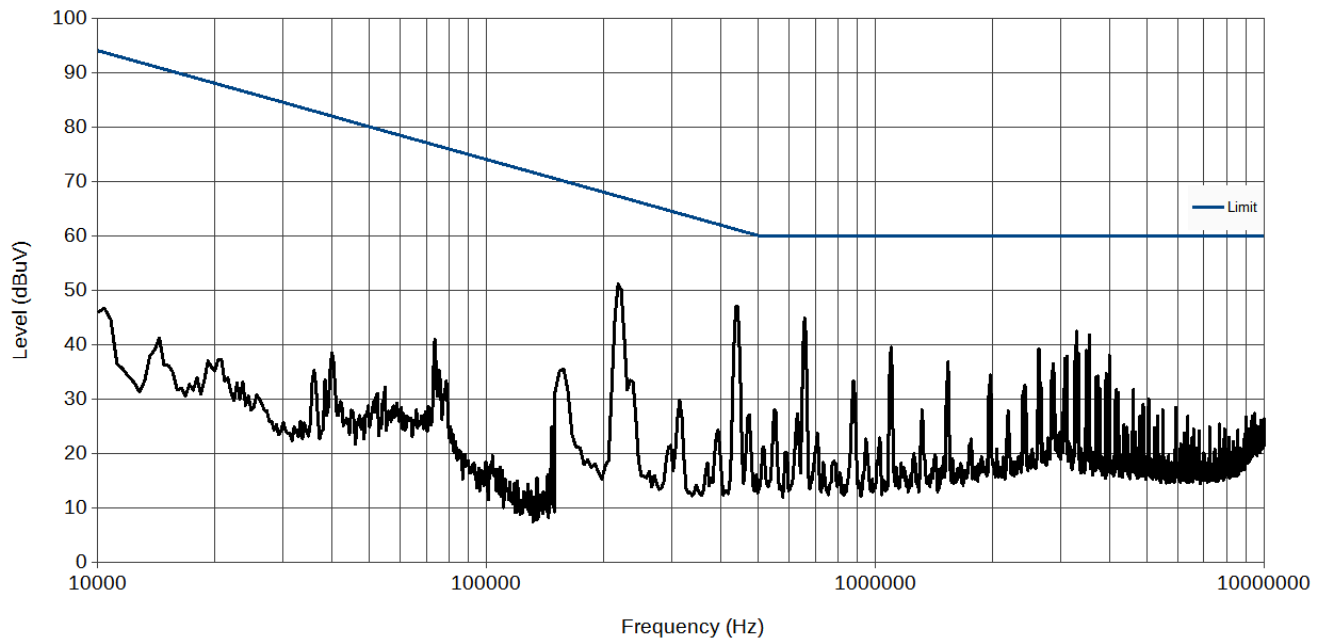
4.1.1 Efficiency, $V_o = 28\text{ V}$ (Typical, $25\text{ }^{\circ}\text{C}$)



4.2.1 Conducted Emissions on $V_{in} = 120\text{V}$, $V_o = 28\text{ V}$ (Typical, $25\text{ }^{\circ}\text{C}$)

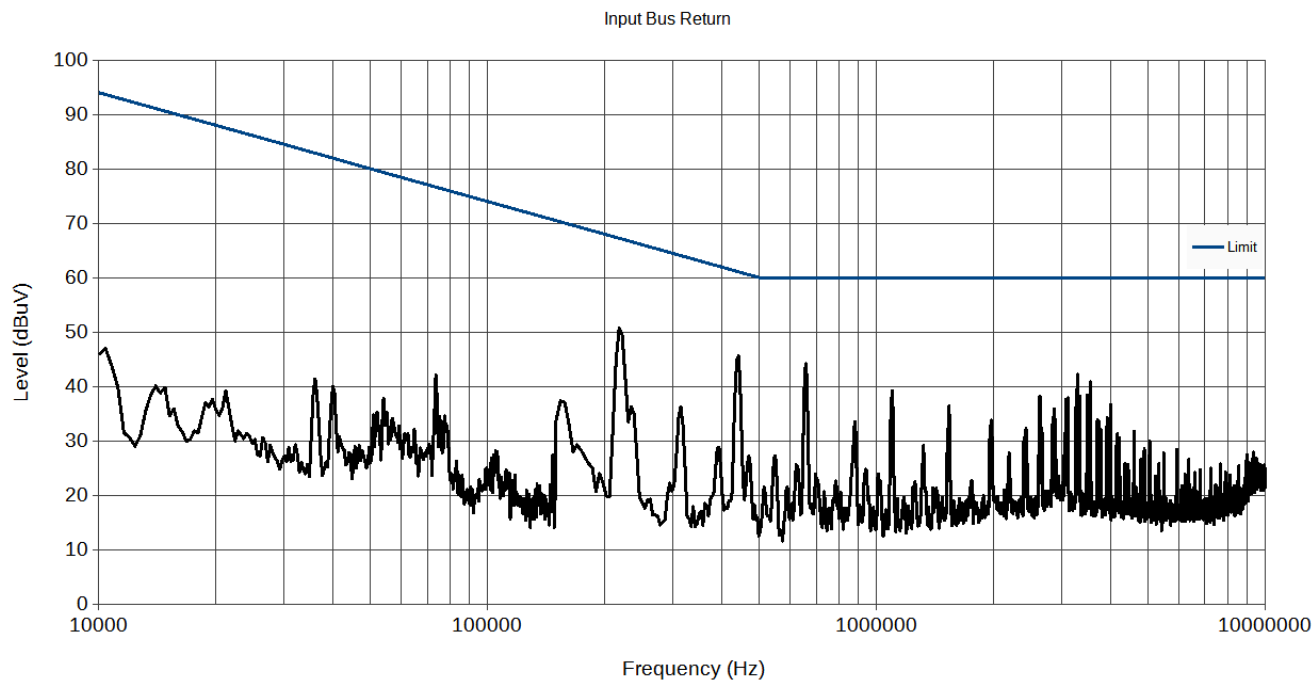
SGRB91429 Test Results MIL-STD-461G CE102

Input Bus Positive



4.2.2 Conducted Emissions on Vin = 120V, Vo = 28 V (Typical, 25 °C)

SGRB91429 Test Results MIL-STD-461G CE102



Technical drawing of the VPT-7 module, showing top, side, and connector views with dimensions and labels.

Top View:

- J1, INPUT (POWER):** Circular connector with 5 pins labeled A, B, C, D, E.
- J2, OUTPUT:** Circular connector with 16 pins labeled A through P.
- J3, INPUT (SIGNAL):** Circular connector with 24 pins labeled A through X.
- Mounting Holes:** 14X $\varnothing .201 \pm .003$. Mounting Hole dimensions: $\varnothing .005$ A B C.
- Dimensions:**
 - Overall width: 4.819
 - Distance from J1 to J3: 3.535
 - Distance from J1 to J2: 2.274
 - Distance from J1 to J3: 1.575
 - Distance from J1 to J3: 2.778
 - Distance from J1 to J3: 1.282
 - Distance from J1 to J3: .240
 - Distance from J1 to J3: CENTER OF M.H. 0

Side View:

- Temperature Sensor:** Located on the top surface.
- Dimensions:**
 - Overall height: 10.824
 - Distance from J1 to J3: 9.374
 - Distance from J1 to J3: 6.335 $\pm .010$ (5.984)
 - Distance from J1 to J3: .377 $\pm .030$
 - Distance from J1 to J3: CENTER OF M.H. 0
 - Distance from J1 to J3: .250 MOUNTING FLANGE
 - Distance from J1 to J3: .959
 - Distance from J1 to J3: 1.918
 - Distance from J1 to J3: 2.878
 - Distance from J1 to J3: 3.837
 - Distance from J1 to J3: 4.796
 - Distance from J1 to J3: 5.755
 - Distance from J1 to J3: 6.715
 - Distance from J1 to J3: 7.674
 - Distance from J1 to J3: 8.633
 - Distance from J1 to J3: 9.285
 - Distance from J1 to J3: 8.997 $\pm .030$
 - Distance from J1 to J3: (5.350)

Connector Details:

- J1, INPUT (POWER):** 5X 4.015, 2X 3.363, 2X .652, 0.
- J2, OUTPUT:** 14X R.402, 2X .652, 0.
- J3, INPUT (SIGNAL):** 24X R.250, 14X R.402, 2X .652, 0.
- Temperature Sensor:** .695 $\pm .005$ - .010 ALL CONNECTORS.
- Mounting Holes:** 14X $\varnothing .201 \pm .003$. Mounting Hole dimensions: $\varnothing .005$ A B C.
- Dimensions:**
 - Overall width: 4.819
 - Distance from J1 to J3: 3.535
 - Distance from J1 to J3: 2.274
 - Distance from J1 to J3: 1.575
 - Distance from J1 to J3: 2.778
 - Distance from J1 to J3: 1.282
 - Distance from J1 to J3: .240
 - Distance from J1 to J3: CENTER OF M.H. 0

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5.0 MECHANICAL OUTLINES AND EXAMPLE PINOUT (CONTINUED)

J1		J2		J3	
Pin	Function	Pin	Function	Pin	Function
A	VIN	A	VOUT	1	INHIBIT-1
B	VIN	B	VOUT	2	INHIBIT-1
C	VIN	C	VOUT	3	INHIBIT-2
D	INCOM	D	VOUT	4	INHIBIT-2
E	INCOM	E	VOUT	5	INHIBIT-3
F	INCOM	F	VOUT	6	INHIBIT-3
		G	OUTCOM	7	INHIBIT-4
		H	OUTCOM	8	INHIBIT-4
		J	OUTCOM	9	PRICOM
		K	OUTCOM	10	PRICOM
		L	OUTCOM	11	OVERVOLTAGE TELEMETRY
		M	OUTCOM	12	OVERVOLTAGE TELEMETRY
		N	OUTCOM	13	INPUT CURRENT TELEMETRY-1
		P	VOUT	14	INPUT CURRENT TELEMETRY-2
		R	VOUT	15	INPUT CURRENT TELEMETRY-3
		S	VOUT	16	INPUT CURRENT TELEMETRY-4
		T	OUTCOM	17	TEMPERATURE TELEMETRY-1
		U	OUTCOM	18	TEMPERATURE TELEMETRY-2
		V	OUTCOM	19	TEMPERATURE TELEMETRY-3
				20	TEMPERATURE TELEMETRY-4
				21	SYNC IN
				22	SYNC IN
				23	SYNC OUT
				24	SYNC OUT
				25	PRICOM
				26	PRICOM
				27	CURRENT SHARE
				28	OUTCOM
				29	OUTCOM
				30	PRICOM
				31	PRICOM
				32	PRICOM
				33	PRICOM
				34	PRICOM
				35	CURRENT SHARE
				36	PRICOM
				37	PRICOM

6.0 EXAMPLE 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

Each internal SGRB Series DC-DC converter uses a reduced voltage switching phase shifted full bridge topology. By reducing the voltage during switching, losses and high frequency noise are reduced on both the input and output. The design utilizes GaN radiation hardened switching devices to both optimize efficiency and reduce overall size and weight.

6.1.2 External Components

Each internal SGRB Series DC-DC converter 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 μ F to 10 μ F, 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. For applications requiring additional capacitance please contact VPT for assistance.

6.1.3 References

The following table is for quick reference. It summarizes the SGRBX Series signals and their appropriate references. For a more detailed explanation please refer to the SGRB12028S datasheet.

SIGNAL	REFERENCE
VIN	INCOM
VOUT	OUTCOM
INHIBIT	PRICOM
OVERVOLTAGE TELEMETRY	PRICOM
INPUT CURRENT TELEMETRY	PRICOM
TEMPERATURE TELEMETRY	PRICOM
SYNC IN, SYNC OUT	PRICOM
CURRENT SHARE	OUTCOM

6.2 FUNCTION DESCRIPTIONS

6.2.1 On/Off Control (INHIBIT)

The INHIBIT pin is a primary-side control pin referenced to PRICOM. There are four INHIBIT pins. One for each internal SGRB Series DC-DC converter. The INHIBIT pin must be driven by using a switch, relay, open collector, or open drain configuration. Pulling one INHIBIT pin low disables the corresponding internal SGRB Series DC-DC converter's output, removes bias voltage from internal control circuitry, and puts that converter in a state of minimum input current draw. Leaving INHIBIT open enables the output, allowing the converter to operate normally. The pin must be pulled below 1.25 V to disable the output. An optional capacitor from INHIBIT to PRICOM may be used to delay turn-on. The INHIBIT pins should be left open if not used.

6.2.2 Frequency Synchronization (SYNC IN, SYNC OUT) (OPTIONAL)

The four internal SGRB Series DC-DC converters will free run at a switching frequency of approximately 450 kHz, which has been set for optimum converter performance. Frequency synchronization is not necessary unless required by system constraints. The SGRB Series provides a frequency synchronization input (SYNC IN) and output (SYNC OUT), both referenced to PRICOM. Upon request, the four internal SGRB Series DC-DC converters can be configured so that the SYNC OUT pin of one is driving the SYNC IN pin of the next and so on, so that all four SGRB Series DC-DC converters are synchronized together. In this configuration, the SYNC IN pin of the SGRBX Series can be driven by an external clock or by the SYNC OUT pin of another SGRBX Series converter. All internal clocks and internal power trains will operate at the frequency applied to the SYNC IN pin. The SYNC IN pin should be driven with a TTL type 5 V square wave signal. The duty cycle of the square wave should be between 40% and 60%. The SYNC IN pin is internally capacitively coupled, and the internal load is equivalent to 220 pF. Proper circuit techniques and layout of cable harnesses are necessary to prevent noise from being injected into this pin. Synchronized converters should be located physically close together and share a low impedance PRICOM connection. The SYNC IN pin can be left open or connected to PRICOM if not used.

6.2.3 Parallel Operation (CURRENT SHARE)

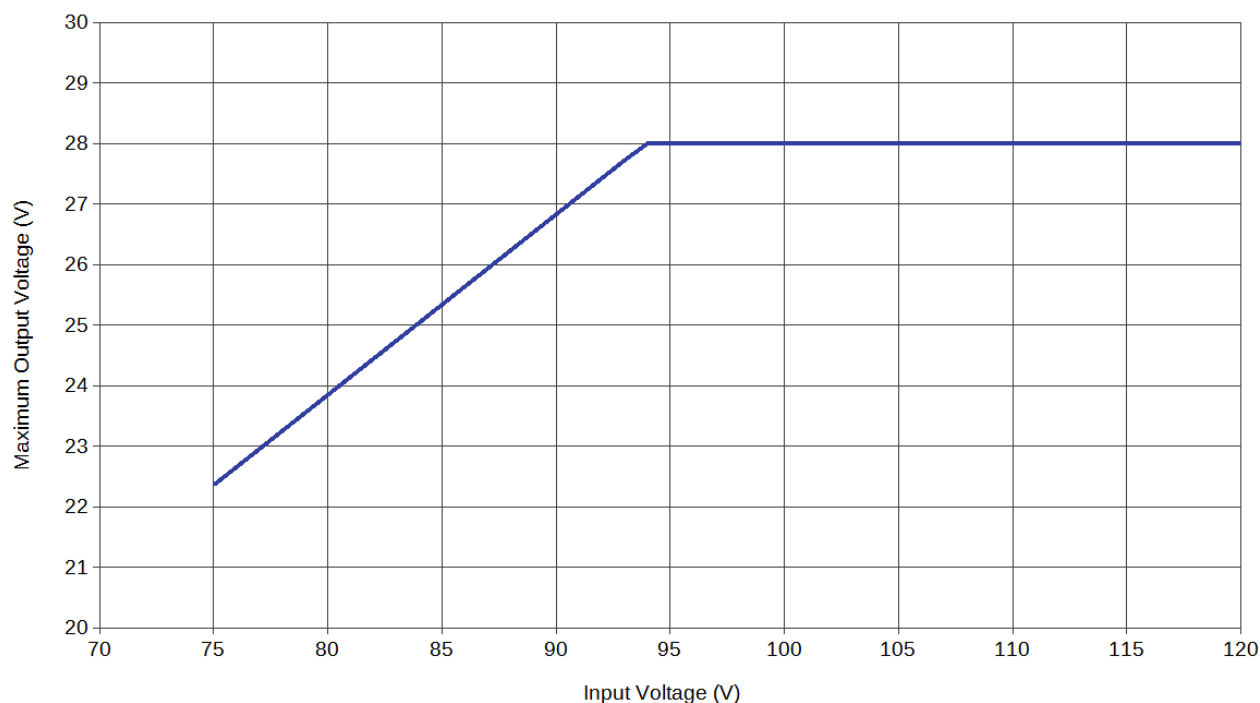
The SGRB Series DC-DC converter provides a SHARE function for active current-sharing among paralleled modules. The four internal SGRB Series DC-DC converters are already configured to current share with one another. To enable current sharing with additional SGRBX Series converters, connect a single wire between the SHARE pins of all parallel modules. The SHARE pin can be noise sensitive. Paralleled boxes should be located physically close to one another and share a low impedance OUTCOM connection. A symmetrical layout of the output cable harnesses will improve share accuracy. Frequency synchronization is not required for parallel operation. The SHARE pin should be left open if not used. Contact VPT for specific configuration recommendations.

6.3 PROTECTION FEATURES

6.3.1 Input Undervoltage Lockout

Each internal SGRB Series DC-DC Converter provides its own input undervoltage lockout (UVLO) 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. The UVLO will immediately turn off the output voltage when V_{in} is below the UVLO turn off threshold. When V_{in} is below 98 V and above the UVLO turn off threshold the unit will operate but may not meet performance detailed in the electrical performance table in section 3.2.

6.3.1.1 Maximum Output Voltage Capability as a Function of Input Voltage (Note: Curve is worst case)



6.3.2 Output Soft Start

Each internal SGRB Series DC-DC Converter 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 30ms. 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

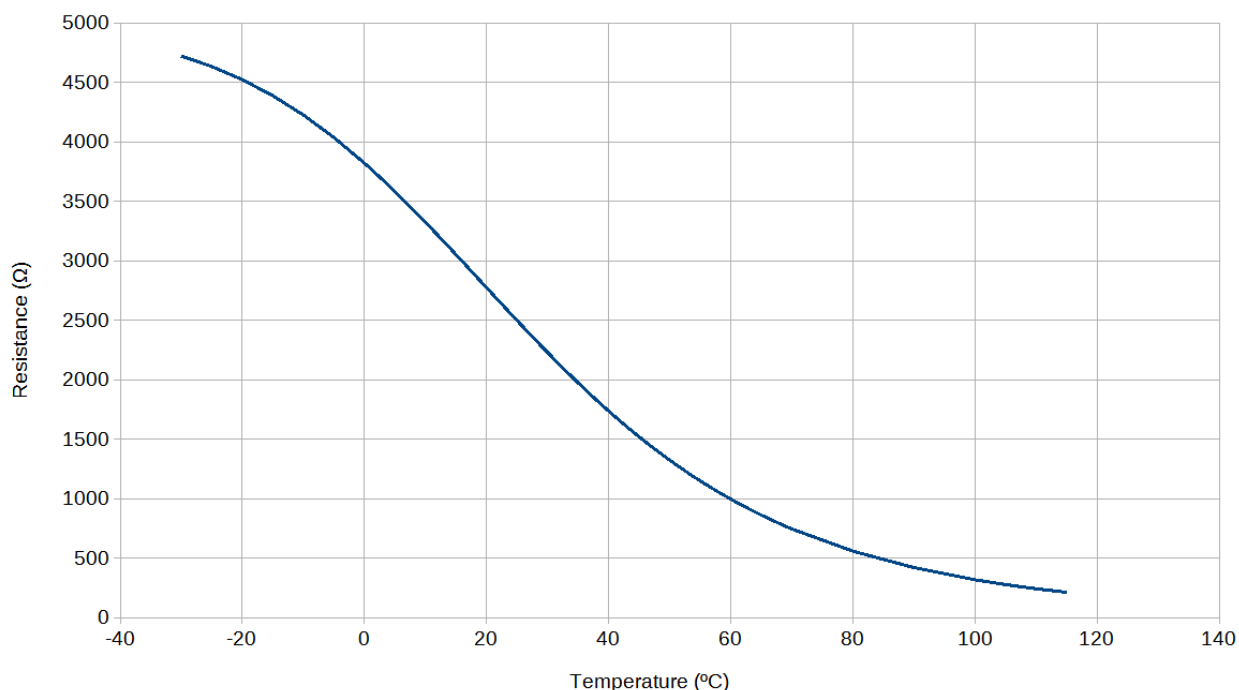
Each internal SGRB Series DC-DC Converter provides its own output overcurrent and output short circuit protection. During a load fault condition, a constant output current control circuit reduces the converter duty cycle to limit the output current to approximately 125% its rated value. The converter 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 TELEMETRY FEATURES

All telemetry signals are referenced to PRICOM

6.4.1 Temperature Telemetry

The temperature telemetry uses a thermistor that has the properties below. A current source will need to be applied and a voltage read to determine the temperature of the circuit board. The current into the temperature telemetry pin should be limited to 1 mA. There are four Temperature Telemetry pins. One for each internal SGRB Series DC-DC converter.



6.4.2 Over Voltage Telemetry

If an internal failure causes the output voltage to exceed the overvoltage trip point the unit will latch itself off. If an overvoltage condition occurs the overvoltage telemetry signal will go to 4.0V. The overvoltage latch can be reset two ways. 1) Pull all inhibit pins low for at least 40 ms and then release it or 2) cycle the input voltage below the UVLO turn-off threshold.

6.4.3 Input Current Telemetry

The input current telemetry signal is a 0-5 V analog signal based on the input current of each internal SGRB Series DC-DC Converter. The accuracy of the current telemetry signal is +/- 5 %. There are four Input Current Telemetry pins. One for each internal SGRB Series DC-DC converter.

6.5 THERMAL CONSIDERATIONS

The SGRBX Series is rated for full power operation at 70°C. Operation above 70°C is allowed at reduced power. Specifically, the output power should be derated linearly from full power at 70°C to half power at 75°C and to zero power at 80°C. The operating temperature of the box is specified on the baseplate of the box. The box is designed to be conduction-cooled, with the baseplate mounted to a heat sink, chassis, heat pipe or other thermal surface.

6.6 RADIATION HARDNESS ASSURANCE

VPT takes a conservative approach to radiation testing to ensure product performance in a space environment. 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 Total Ionizing Dose (TID) and Single-Event Effects (SEE). Additionally, Enhanced Low Dose-Rate Sensitivity (ELDRS) effects are considered for all bipolar ICs used in the SGRB. Hardness is guaranteed by a combination of both converter-level analysis and Radiation Lot Acceptance Testing (RLAT) of all sensitive semiconductor piece-parts used within the converter.

6.6.1 Radiation Test and Performance Levels

Radiation Environment	Piece Part RLAT	Converter-Level Analysis
Total Ionizing Dose (TID)	High Dose Rate (HDR)	100 krad(Si)
	Low Dose Rate (LDR)	100 krad(Si) ¹
Single-Event Effects (SEE)	Destructive (SEB, SEGR, SEL)	≥ 85 MeV/mg/cm ²
	Non-Destructive (SET, SEU, SEFI) ²	≥ 85 MeV/mg/cm ²

1. Piece-part LDR screening performed only on potentially ELDRS parts (bipolar ICs).
2. The PWM IC used in this part is susceptible to a non-destructive SEFI/SEL event with threshold LET ≥ 42 MeV/mg/cm². The SEFI manifests as a shutdown for up to 1 second, followed by a controlled soft-start of the converter. The non-destructive SEL manifests itself as a shutdown requiring user intervention to recover by cycling either the input power or the inhibit function. At the worst-case 125 °C and 85 MeV/mg/cm², the cross-section of these events is 6.36 x 10⁻⁶ cm². Full details available in the Radiation Test Report.

6.6.2 RHA Plan Summary

Test	RHA Plan for SGRB Series Isolated DC-DC Converters
Total Ionizing Dose (TID):	Sensitive semiconductor components undergo RLAT to 100 krad(Si) per MIL-STD-883 Method 1019. Converters are analyzed to 100 krad(Si).
Enhanced Low Dose Rate Sensitivity (ELDRS):	All bipolar linear ICs are characterized for ELDRS and tested in accordance with MIL-STD-883 test method 1019 section 3.13
Single Event Effects (SEE):	Converters are analyzed to LET ≥ 85 MeV/mg/cm ² for both catastrophic events (SEL, SEB, SEGR) and functional interrupts (SEFI) under heavy ion exposure. Converters are also analyzed for cross-section and magnitude of output transients (SET) for at least 3 different LET levels.
Radiation Lot Acceptance Testing (RLAT):	All production lots of sensitive semiconductor components undergo RLAT for TID at HDR and/or LDR as appropriate per part type.

6.6.3 Supporting Documentation Available (Contact Sales)

Report	Description
Radiation Hardness Assurance Plan:	DLA-approved RHA plan covering TID, SEE, and ELDRS
Worst-Case Analysis Report for purchase:	Detailed worst-case analysis including electrical stress/derating limits and guaranteed circuit performance post-radiation and end of life
Radiation Test Summary Report:	Overview of piece-part RLAT and hybrid characterization for all guaranteed environments. Also includes SEE cross-section data.
Reliability Report:	MTBF report based on MIL-HDBK-217 reliability calculations.
Thermal Analysis Report for purchase:	Component temperature rise analysis and measurement results.

7.0 ENVIRONMENTAL SCREENING

Test	Test Method and/or Condition	Flight	/EM (Engineering Model) ²
Internal Visual	IPC-A-610, Class 3 J-STD-001 (Space Addendum)	•	•
Random Vibration	7.5 Grms XYZ Axis Duration: 60 seconds/axis (See Table Below)	•	
Temperature Cycling	Temp: -35 °C to 70 °C Cycles: 10 Dwell: 30 minutes Ramp: 5 °C/min.	•	
Final Electrical ¹	100% at -35 °C, 25 °C, and 70 °C	•	
	100% at 25 °C		•
External Visual	Internal Procedure	•	•

1. 100% R&R testing with all test data included in product shipment.
2. Engineering models utilize only the screening specified and are not considered compliant for flight use.

7.1 QUALIFICATION

Test	Test Method and/or Condition
Pre Qual Electrical	100% at -35 °C, 25 °C, and 70 °C
Vibration	14.9 Grms XYZ Axis Duration: 180 seconds/axis (See Table Below)
Shock	XYZ Axis 3 shocks/axis Q = 10 (See Table Below)
Thermal Vacuum	Temp: -35 °C to 70 °C Cycles: 4 Dwell: 30 minutes Ramp: 5 °C/minutes (max)
Final Electrical	100% at -35 °C, 25 °C, and 70 °C

Vibration Environment

Frequency (Hz)	Screening ASD (G ² /Hz)	Qualification ASD (G ² /Hz)
20	5.3E-03	2.1E-02
120	7.0E-02	2.8E-01
270	7.0E-02	2.8E-01
370	4.0E-02	1.6E-01
800	4.0E-02	1.6E-01
2000	6.4E-03	2.6E-01

Shock Environment

Natural Frequency (Hz)	Qualification Peak Accel (G)
100	40
810	1400
10,000	1400

8.0 ORDERING INFORMATION

SGRBX	91429-001	-	/EM
1	2		3

(1) Product Series	(2) Series Number ¹	(3) Screening Code ²
SGRBX	91429-001	None Flight Model /EM Engineering Model

1. This series number is unique to your configuration and will be provided by VPT Inc. prior to your order placement.

2. 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(s) 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 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.

9.0 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.

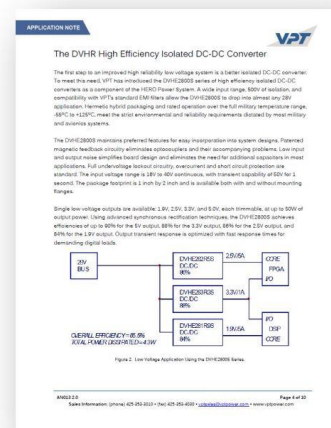
10.0 ADDITIONAL INFORMATION

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](#)

