SMSA Single and Dual DC-DC Converter

16 TO 40 VOLT INPUT - 5 WATT

FEATURES

- Radiation tolerant space DC-DC converter
  - Single event effects (SEE) LET performance to 86 MeV cm^2/mg
  - Total ionizing dose (TID) guaranteed per MIL-STD-883 method 1019, radiation hardness assurance (RHA)
    P = 30 krad(Si), L = 50 krad(Si), R = 100 krad(Si)
  - 50 - 300 rad(Si)/sec dose rate (Condition A)
  - 10 mrad(Si)/sec dose rate (Condition D)
- Operating temperature -55°C to +125°C
- Qualified to MIL-PRF-38534 Class H and K
- Input voltage range 16 to 40 volts
- Transient protection 50 volts for 50 ms
- Fully isolated
- Fixed high frequency switching
- Inhibit function
- Indefinite short circuit protection
- High power density, up to 74% typical efficiency

MODELS OUTPUT VOLTAGE (V)	
SINGLE	DUAL
3.3	±5
5	±12
5.2	±15
12	
15	

DESCRIPTION

The Interpoint® SMSA Series™ of DC-DC converters offers up to 5 watts of power in a radiation tolerant design. The low profile SMSA converters are manufactured in our fully certified and qualified MIL-PRF-38534 Class K production facility and packaged in hermetically sealed steel cases. They are ideal for use in programs requiring high reliability, small size, and high levels of radiation hardness assurance. Thick-film hybrid techniques provide military/aerospace reliability levels and optimum miniaturization. The hermetically sealed case is 1.075 by 1.075 inches with a height of 0.270 inches. Power density for the SMSA Series converters is 16 watts per cubic inch.

SCREENING

SMSA converters offer screening to space prototype (O), Class H or K, radiation hardness assurance (RHA) levels P - 30 krad(Si), L - 50 krad(Si) or R - 100 krad(Si). Single event effects (SEE) LET performance to 86 MeV cm^2/mg. See Table 10 on page 15 for more information.

CONVERTER DESIGN

The SMSA converters are switching regulators that use a flyback converter design with a constant switching frequency of 500 kHz. They are regulated, isolated units using a pulse width modulated topology. Isolation between input and output circuits is provided with a transformer in the forward power loop and an optical link in the feedback control loop. Excellent input line transient response and audio rejection is achieved by an advanced feed-forward compensation technique.

On dual output models negative output regulation is maintained by tightly coupled magnetics.

Predictable current limit is accomplished by direct monitoring of the output load current, which results in a constant current output above the overload point. Internal input and output filters eliminate the need for external capacitors.

WIDE VOLTAGE RANGE

The SMSA converters are designed to provide full power operation over the full 16 to 40 volt range. An undervoltage lockout feature keeps the converter shutdown below approximately 13 volts to ensure smooth initialization.

SPAN VOLTAGE ON DUALS

Dual outputs may be spanned to increase the output voltage by configuring the converter as a single output. The positive output is used as one rail and the negative output is used as the other rail. As an example the positive and negative 15 volt dual can be configured as a single 30 volt output. This can be used as a positive 30 volt output or a negative 30 volt output. In all cases Output Common of the converter is not connected.

If the dual is configured as a positive 30 volt output the negative output would be used as system ground and the positive output would be used as the positive 30 volt output. If the dual is configured as a negative 30 volt output the positive output would be used as system ground and the negative output would be used as the negative 30 volt output.

The maximum capacitance when using a span voltage on a dual is half the value specified for each output.

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Dynamic Response

The SMSA feed-forward compensation system provides excellent dynamic response and audio rejection. Audio rejection is typically 50 dB (Figure 15 on page 11).

Inhibit Function

SMSA converters provide an inhibit feature that can be used to disable internal switching and inhibit the unit's output. Inhibiting in this manner results in low standby current, and no generation of switching noise.

The converter is inhibited when an active low (≤0.8 V) is applied to the inhibit pin. The unit is enabled when the pin, which is internally connected to a pull-up resistor, is left unconnected or is connected to an open collector gate. The open circuit output voltage associated with the inhibit pin is 9 to 11 volts. In the inhibit mode, a maximum of 4 mA must be sunk from the inhibit pin at 28 volt input.

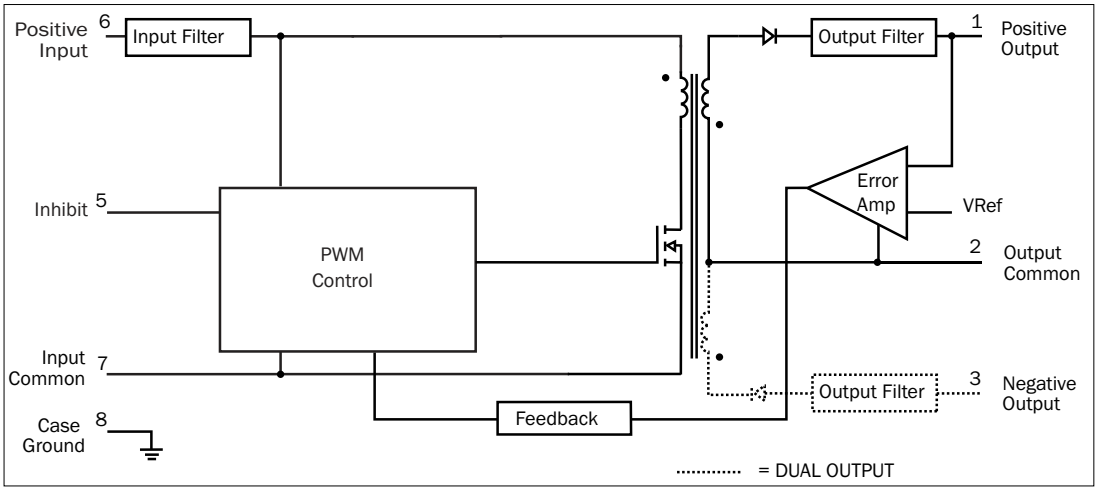

Figure 1: SMSA Block Diagram

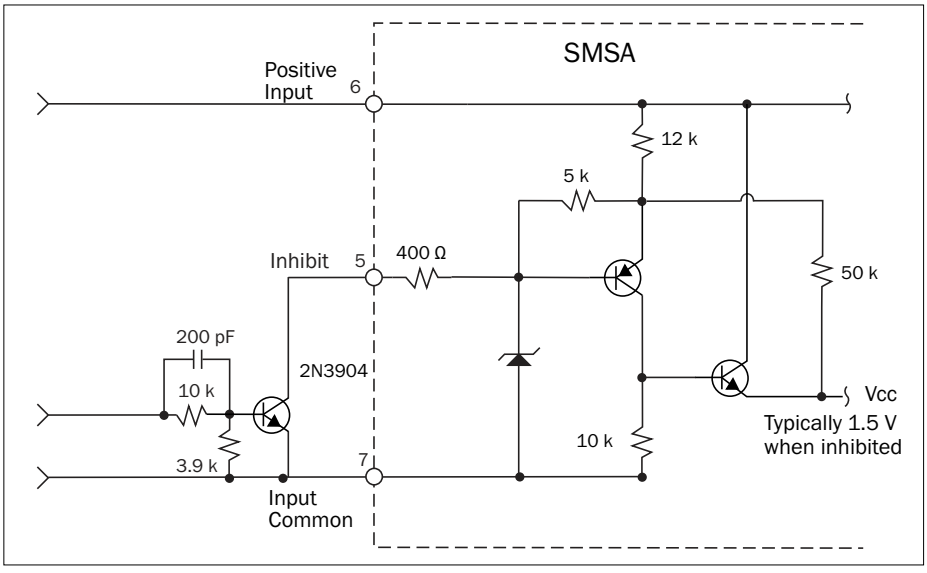

Figure 2: Inhibit Interface

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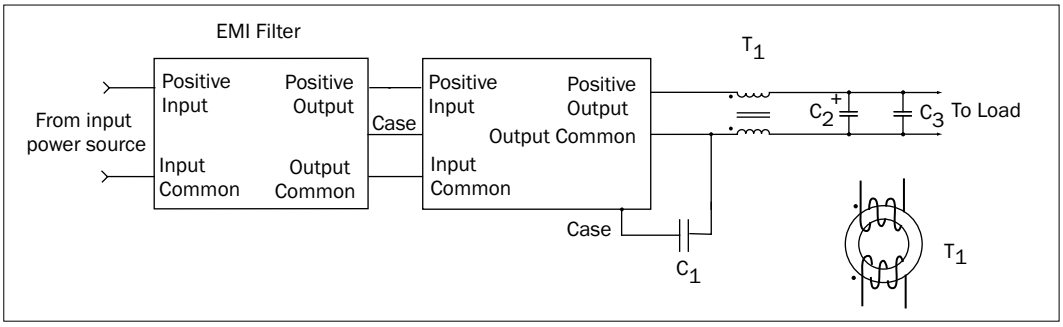

FIGURE 3: LOW NOISE OUTPUT FILTER FOR SMSA SINGLE OUTPUT MODEL

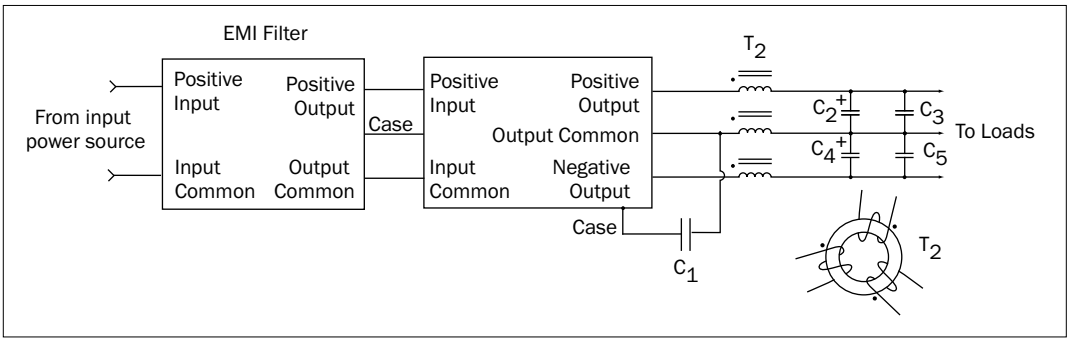

FIGURE 4: LOW NOISE OUTPUT FILTER FOR SMSA DUAL OUTPUT MODEL

The filter suggestions in Figure 3 and Figure 4 will further reduce the output ripple for systems requiring very low output noise.

C1 = 0.27 µF ceramic capacitor, 500 V
C2 = C4 = 6.8 µF tantalum capacitor
C3 = C5 = 0.27 µF ceramic capacitor
Single output: T1 = 15T #28 AWG winding on toroid, μ_i = 5000
Dual output: T2 = 10T #28 AWG winding on toroid, μ_i = 5000

For best results, make interconnections as short as possible.

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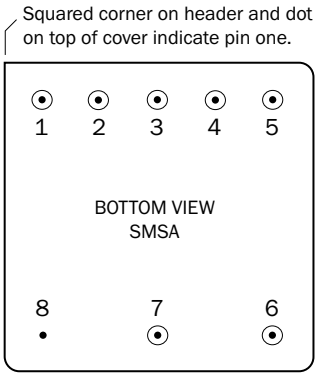
PIN OUT		
Pin	**Single Output**	**Dual Output**
1	Positive Output	Positive Output
2	Output Common	Output Common
3	No connection	Negative Output
4	No connection	No connection
5	Inhibit	Inhibit
6	Positive Input	Positive Input
7	Input Common	Input Common
8	Case Ground	Case Ground

TABLE 1: PIN OUT



See Figure 25 on page 13 for dimensions.

FIGURE 5: PIN OUT BOTTOM VIEW

PINS NOT IN USE	
Inhibit	Leave unconnected
“No Connection” pins	No electrical connection

TABLE 2: PINS NOT IN USE

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MODEL NUMBERING KEY

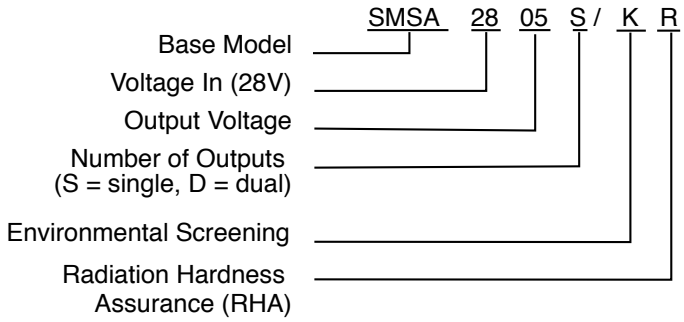

FIGURE 6: MODEL NUMBERING KEY

SMD NUMBERS	
STANDARD MICROCIRCUIT DRAWING (SMD)	**SMSA SIMILAR PART**
5962R0621001KXC	SMSA283R3S/KR
5962R9309202KXC	SMSA2805S/KR
5962R1421601KXC	SMSA285R2S/KR
5962R9309302KXC	SMSA2812S/KR
5962R9309402KXC	SMSA2815S/KR
5962R0052202KXC	SMSA2805D/KR
5962R9308902KXC	SMSA2812D/KR
5962R9309002KXC	SMSA2815D/KR
The SMD number shown is for Class K screening and radiation hardness assurance (RHA) level R. See the SMD for the numbers for other screening and radiation levels. For exact specifications for an SMD product, refer to the SMD drawing. SMDs can be downloaded from: https://landandmaritimeapps.dla.mil/programs/smcr	

TABLE 3: SMD NUMBER CROSS REFERENCE

MODEL NUMBER OPTIONS

ON THE LINES BELOW, ENTER ONE SELECTION FROM EACH CATEGORY TO DETERMINE THE MODEL NUMBER.

CATEGORY	Base Model and Input Voltage	Output Voltage [1]	Number of Outputs [2]	Screening [3]	RHA [4]
OPTIONS	SMSA28	3R3, 05, 5R2, 12, 15	S	O	O
		05, 12, 15	D	H	P
				K	L
					R
FILL IN FOR MODEL # [5]	SMSA28	_____	_____	/ _____	_____

Notes
1. An R indicates a decimal point. 3R3 is 3.3 volts out. The values of 3.3 and 5.2 are only available in single output models.
2. Number of Outputs: S is a single output and D is a dual output.
3. Screening: A screening level of O is a space prototype and is only used with RHA O. See Table 9 on page 14 and Table 10 on page 15 for more information.
4. RHA: Interpoint model numbers use an "O" in the RHA designator position to indicate the "-" (dash) radiation hardness assurance level of MIL-PRF-38534, which is defined as "no RHA." RHA O is only available with screening level O. See Table 11 on page 16 for more information.
5. If ordering by model number add suffix "-Q" to request solder dipped leads (SMSA2805S/KR-Q).

TABLE 4: MODEL NUMBER OPTIONS

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TABLE 5: OPERATING CONDITIONS - ALL MODELS, 25°C CASE, 28 VIN, UNLESS OTHERWISE SPECIFIED.

SMSA SERIES		ALL MODELS			
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
LEAD SOLDERING TEMPERATURE [1]	10 SECONDS MAX.	—	—	300	°C
STORAGE TEMPERATURE		-65	—	+150	°C
CASE OPERATING	FULL POWER	-55	—	+125	°C
TEMPERATURE	ABSOLUTE [1]	-55	—	+135	
DERATING OUTPUT POWER/CURRENT [1]	LINEARLY	From 100% at 125°C to 0% at 135°C			
ESD RATING [1, 2] MIL-PRF-38534, 3.9.5.8.2	MIL-STD-883 METHOD 3015 CLASS 2	2000 - 3999			V
ISOLATION: INPUT TO OUTPUT, INPUT TO CASE, OUTPUT TO CASE [3]	@ 500 VDC AT 25°C	100	—	—	Megohms
INPUT TO OUTPUT CAPACITANCE [1]		—	50	—	pF
UNDER VOLTAGE LOCKOUT [1]	V_{IN}	—	13	—	V
CURRENT LIMIT [4]	% OF FULL LOAD	—	166	—	%
AUDIO REJECTION [1]		—	50	—	dB
SWITCHING FREQUENCY	-55°C TO +125°C	400	500	600	kHz
INHIBIT ACTIVE LOW (OUTPUT DISABLED)	INHIBIT PIN PULLED LOW [1]	—	—	0.8	V
Do not apply a voltage to the inhibit pin	INHIBIT PIN SOURCE CURRENT [1]	—	—	4	mA
	REFERENCED TO	INPUT COMMON			
INHIBIT ACTIVE HIGH (OUTPUT ENABLED) Do not apply a voltage to the inhibit pin	INHIBIT PIN CONDITION	OPEN COLLECTOR OR UNCONNECTED			
	OPEN INHIBIT PIN VOLTAGE [1]	9	—	11	V

For mean time between failures (MTBF) contact Applications Engineering at powerapps@craneae.com or call +1 425.882.3100.

Notes
1. Guaranteed by characterization test and/or analysis. Not a production test.
2. Passes 2000 volts.
3. When testing isolation, input pins are tied together and output pins are tied together. They are tested against each other and against case. Discharge the pins before and after testing.
4. Current limit is defined as the point at which the output voltage decreases by 1%.

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TABLE 6: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

SINGLE OUTPUT MODELS		SMSA283R3S			SMSA2805S			SMSA285R2S			
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	UNITS
OUTPUT VOLTAGE		3.15	3.30	3.45	4.80	5.00	5.20	4.99	5.20	5.39	V
OUTPUT CURRENT	V_{IN} = 16 TO 40 V	0	—	1200	0	—	1000	0	—	962	mA
OUTPUT POWER	V_{IN} = 16 TO 40 V	—	—	4.0	—	—	5.0	—	—	5.0	W
OUTPUT RIPPLE	T_C = 25°C	—	300	600	—	150	450	—	150	450	mV p-p
10 kHz - 2 MHz	T_C = -55°C TO +125°C	—	—	900	—	—	675	—	—	675	
LINE REGULATION	V_{IN} = 16 TO 40 V	—	10	50	—	10	50	—	10	50	mV
LOAD REGULATION	NO LOAD TO FULL	—	10	50	—	10	50	—	10	50	mV
INPUT VOLTAGE	CONTINUOUS	16	28	40	16	28	40	16	28	40	V
NO LOAD TO FULL	TRANSIENT [1] 50 ms	0	—	50	0	—	50	0	—	50	
INPUT CURRENT [2]	NO LOAD	—	35	50	—	35	50	—	35	60	mA
	INHIBITED	—	3	5	—	3	5	—	3	5	
	INHIBITED 50 krad [3]	—	5	7	—	5	7	—	5	7	
INPUT RIPPLE CURRENT [4]	10 kHZ - 10 MHZ	—	60	100	—	60	150	—	60	150	mA p-p
EFFICIENCY	T_C = 25°C	60	—	—	64	74	—	64	74	—	%
	T_C = -55°C TO +125°C	60	—	—	62	—	—	62	—	—	
LOAD FAULT [5, 6]	POWER DISSIPATION	—	1.5	2.5	—	1.5	2.2	—	1.5	2.2	W
SHORT CIRCUIT	RECOVERY [1]	—	12.5	75	—	12.5	75	—	12.5	75	ms
STEP LOAD RESPONSE [6, 7]	TRANSIENT	—	±200	±500	—	200	±1500	—	±200	±1500	mV pk
50% - 100% - 50%	RECOVERY [1]	—	200	500	—	200	4500	—	200	4500	µs
STEP LINE RESPONSE [1, 6, 8]	TRANSIENT	—	±200	±500	—	±200	±500	—	±200	±500	mV pk
16 - 40 - 16 V	RECOVERY	—	400	500	—	400	1000	—	400	1000	µs
START-UP [6, 9]	DELAY	—	10	30	—	10	30	—	10	30	ms
	OVERSHOOT [1]	—	0	200	—	0	200	—	0	200	mV pk
CAPACITIVE LOAD [1] T_C = 25°C	NO EFFECT ON DC PERFORMANCE	—	—	500	—	—	300	—	—	300	µF

Notes
1. Guaranteed by characterization test and/or analysis. Not a production test.
2. The inhibited input current is tested with <0.8 volts on the inhibit.
3. For RHA L, 50 krad converters, the pre-radiation spec for Iin Inhibit is as stated in the table.
4. Tested with a 2 µH external input inductor.
5. Indefinite short circuit protection not guaranteed above 125°C (case).
6. Recovery time is measured from application of the transient to point at which V_{OUT} is within 1% of V_{OUT} at final value.
7. Step load test is performed at 10 microseconds typical.
8. Step line test is performed at 100 microseconds ± 20 microseconds.
9. Tested on release from inhibit.

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TABLE 7: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

SINGLE OUTPUT MODELS		SMSA2812S			SMSA2815S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		11.64	12.00	12.36	14.40	15.00	15.60	V
OUTPUT CURRENT	V_{IN} = 16 TO 40 V	—	—	417	—	—	333	mA
OUTPUT POWER	V_{IN} = 16 TO 40 V	—	—	5.0	—	—	5.0	W
OUTPUT RIPPLE	T_C = 25°C	—	125	200	—	150	500	mV p-p
10 kHz - 2 MHz	T_C = -55°C TO +125°C	—	—	300	—	—	525	
LINE REGULATION	V_{IN} = 16 TO 40 V	—	10	50	—	10	50	mV
LOAD REGULATION	NO LOAD TO FULL	—	10	50	—	10	50	mV
INPUT VOLTAGE	CONTINUOUS	16	28	40	16	28	40	V
NO LOAD TO FULL	TRANSIENT [1] 50 ms	0	—	50	0	—	50	
INPUT CURRENT [2]	NO LOAD	—	35	42	—	35	50	mA
	INHIBITED	—	3	5	—	3	5	
	INHIBITED 50 krad [3]	—	5	7	—	5	7	
INPUT RIPPLE CURRENT [4]	10 kHZ - 10 MHZ	—	60	100	—	60	250	mA p-p
EFFICIENCY	T_C = 25°C	70	74	—	71	74	—	%
	T_C = -55°C TO +125°C	684	—	—	65	—	—	
LOAD FAULT [5, 6]	POWER DISSIPATION	—	1.2	2.1	—	1.2	2.0	W
SHORT CIRCUIT	RECOVERY [1]	—	1	10	—	1	10	ms
STEP LOAD RESPONSE [6, 7]	TRANSIENT	—	±300	±400	—	±400	±3000	mV pk
50% - 100% - 50%	RECOVERY [1]	—	400	500	—	400	4500	µs
STEP LINE RESPONSE [1, 6, 8]	TRANSIENT	-1000	250	800	-500	250	500	mV pk
16 - 40 - 16 V	RECOVERY	—	700	800	—	500	1300	µs
START-UP [6, 9]	DELAY	—	10	30	—	10	30	ms
	OVERSHOOT [1]	—	0	500	—	0	500	mV pk
CAPACITIVE LOAD [1] T_C = 25°C	NO EFFECT ON DC PERFORMANCE	—	—	500	—	—	500	µF

Notes
1. Guaranteed by characterization test and/or analysis. Not a production test.
2. The inhibited input current is tested with <0.8 volts on the inhibit.
3. For RHA L, 50 krad converters, the pre-radiation spec for Iin Inhibit is 7 mA max.
4. Tested with a 2 µH external input inductor.
5. Indefinite short circuit protection not guaranteed above 125°C (case).
6. Recovery time is measured from application of the transient to point at which V_{OUT} is within 1% of V_{OUT} at final value.
7. Step load test is performed at 10 microseconds typical.
8. Step line test is performed at 100 microseconds ± 20 microseconds.
9. Tested on release from inhibit.

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TABLE 8: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

DUAL OUTPUT MODELS		SMSA2805D			SMSA2812D			SMSA2815D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	$+V_{OUT}$	4.90	5.00	5.10	11.64	12.00	12.36	14.40	15.00	15.60	V
	$-V_{OUT}$	4.85	5.00	5.15	11.44	12.00	12.56	14.28	15.00	15.89	
OUTPUT CURRENT [2]	EITHER OUTPUT	–	±500	800 [1]	–	±208	333 [1]	–	±167	267 [1]	mA
V_{IN} = 16 TO 40 V	TOTAL			1000			417			333	
OUTPUT POWER [2]	EITHER OUTPUT	–	±2.5	4.0 [1]	–	±2.5	4.0 [1]	–	±2.5	4.0 [1]	W
V_{IN} = 16 TO 40 V	TOTAL			5.0			5.0			5.0	
OUTPUT RIPPLE	T_C = 25°C	–	–	300	–	80	150	–	120	300	mV p-p
10 kHz - 2 MHz	T_C = -55°C TO +125°C	–	–	300	–	–	300	–	–	400	
LINE REGULATION	$+V_{OUT}$	–	20	30	–	10	12	–	10	50	mV
V_{IN} = 16 TO 40 V	$-V_{OUT}$	–	40	50	–	40	60	–	40	180	
LOAD REGULATION	$+V_{OUT}$	–	10	50	–	10	12	–	10	50	mV
NO LOAD TO FULL	$-V_{OUT}$	–	100	200	–	100	120	–	–	200	
CROSS REGULATION [3]		–	–	750	–	–	1000	–	–	1000	mV
INPUT VOLTAGE	CONTINUOUS	16	28	40	16	28	40	16	28	40	V
NO LOAD TO FULL	TRANSIENT [1] 50 ms	0	–	50	0	–	50	0	–	50	
INPUT CURRENT [4]	NO LOAD	–	30	50	–	40	50	–	38	50	mA
	INHIBITED	–	3	5	–	3	5	–	3	5	
	INHIBITED 50 krad [5]	–	5	7	–	5	7	–	5	7	
INPUT RIPPLE CURRENT [6]	10 kHz - 10 MHz	–	60	200	–	60	250	–	60	200	mA p-p
EFFICIENCY	T_C = 25°C	66	70	–	69	73	–	70	73	–	%
	T_C = -55°C TO +125°C	65	–	–	69	–	–	68	–	–	
LOAD FAULT [7, 8]	POWER DISSIPATION	–	1.3	2.1	–	1.3	1.9	–	1.3	1.8	W
SHORT CIRCUIT	RECOVERY [1]	–	–	50	-	1	30	–	1	50	ms
STEP LOAD RESPONSE [8, 9]	TRANSIENT	–	±200	±500	–	±200	±600	–	±200	±900	mV pk
50% - 100% - 50%	RECOVERY [1]	–	200	600	–	200	500	–	200	800	µs
STEP LINE RESPONSE [1, 8, 10]	TRANSIENT	–	±200	±750	–	±200	±500	–	±600	±1500	mV pk
16 - 40 - 16 V	RECOVERY	–	500	1200	–	500	2000	–	500	1200	µs
START-UP [8, 11]	DELAY	–	–	10	–	–	8	–	–	8	ms
	OVERSHOOT [1]	–	0	750	–	0	500	–	0	750	mV pk
CAPACITIVE LOAD [1, 12] T_C = 25°C	NO EFFECT ON DC PERFORMANCE	–	–	100	–	–	100	–	–	100	µF

Notes
1. Guaranteed by characterization test and/or analysis. Not a production test.
2. Up to 4 watts (80% of full power) is available from either output providing the opposite output is carrying 20% of total power.
3. Shows the effect on the minus output during the defined loading conditions: Measure -Vout for ±Iout =0.5 amps. Then compare with: a) -Vout for +Iout = 0.7 amps; -Iout =0.3 amps and b) -Vout for +Iout = 0.3 amps; -Iout = 0.7 amps.
See Figure 19, Figure 20 and Figure 21 on page 11.
4. The inhibited input current is tested with <0.8 volts on the inhibit.
5. For RHA L, 50 krad converters, the pre-radiation spec for Iin Inhibit is 7 mA max.
6. Tested with a 2 µH external input inductor.
7. Indefinite short circuit protection not guaranteed above 125°C (case).
8. Recovery time is measured from application of the transient to point at which V_{OUT} is within 1% of V_{OUT} at final value.
9. Step load test is performed at 10 microseconds typical.
10. Step line test is performed at 100 microseconds ± 20 microseconds.
11 Tested on release from inhibit.
12. Applies to each output.

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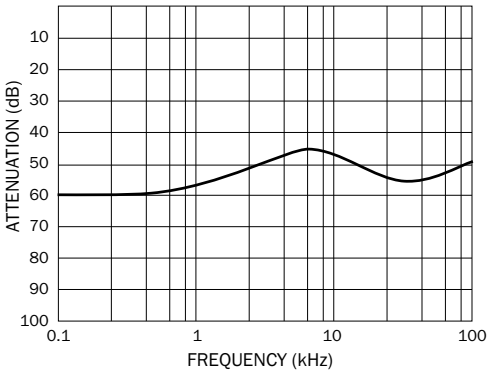
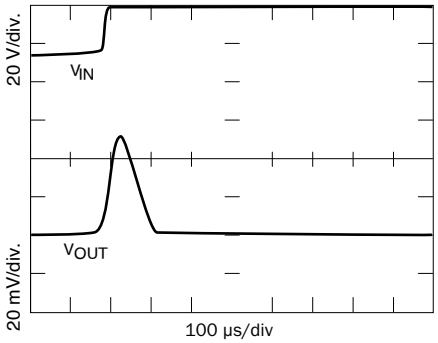
TYPICAL PERFORMANCE PLOTS: 28 VIN, 25°C CASE, 100% LOAD, UNLESS OTHERWISE SPECIFIED.
These are examples for reference only and are not guaranteed specifications.



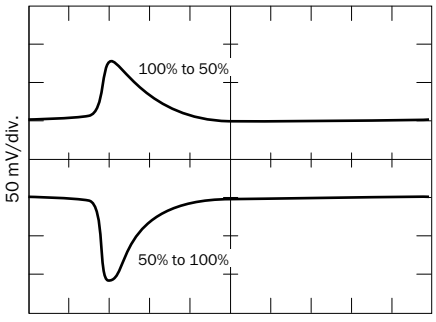
SMSA SERIES AUDIO REJECTION

FIGURE 7



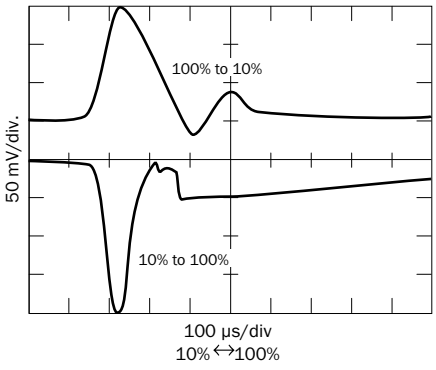
SMSA2805S STEP LINE RESPONSE

FIGURE 8



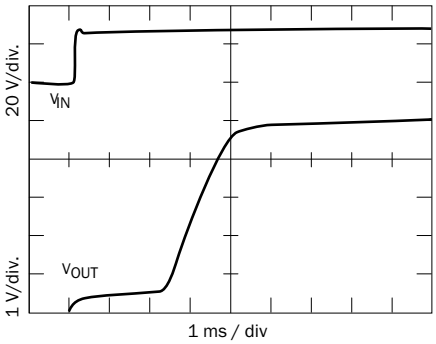
SMSA2805S STEP LOAD RESPONSE

FIGURE 9



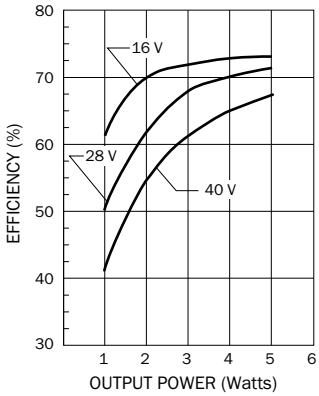
SMSA2805S STEP LOAD RESPONSE

FIGURE 10



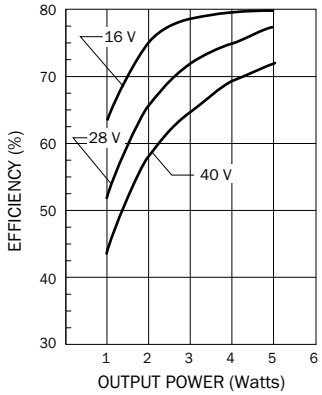
SMSA2805S TURN-ON INTO NO LOAD

FIGURE 11



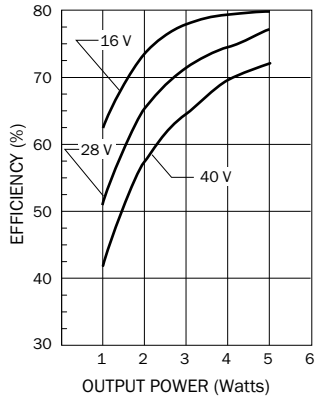
SMSA2805S EFFICIENCY

FIGURE 12



SMSA2812S EFFICIENCY

FIGURE 13



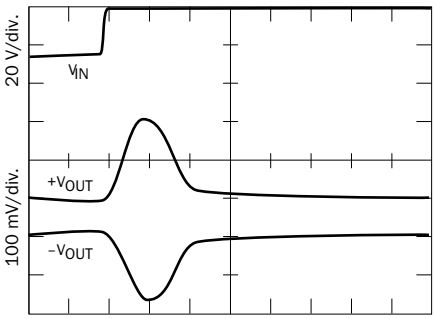
SMSA2815S EFFICIENCY

FIGURE 14

SMSA Single and Dual DC-DC Converter

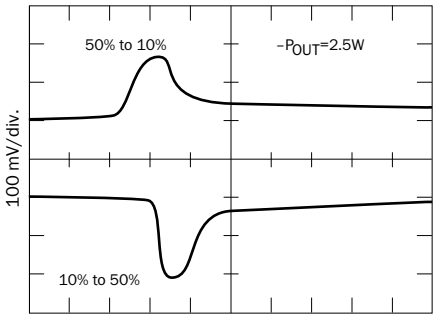
16 TO 40 VOLT INPUT - 5 WATT

TYPICAL PERFORMANCE PLOTS: 28 VIN, 25°C CASE, 100% LOAD, UNLESS OTHERWISE SPECIFIED.
These are examples for reference only and are not guaranteed specifications.



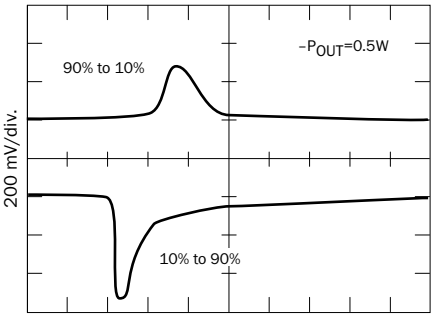
SMSA2815D INPUT STEP LINE RESPONSE

FIGURE 15



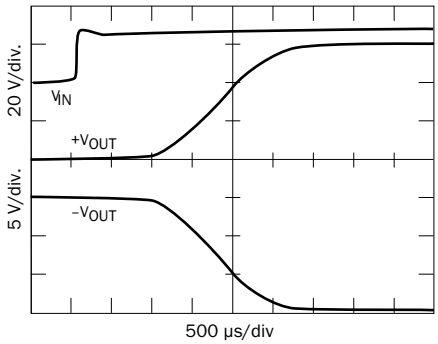
SMSA2815D +V_O STEP LOAD RESPONSE

FIGURE 16



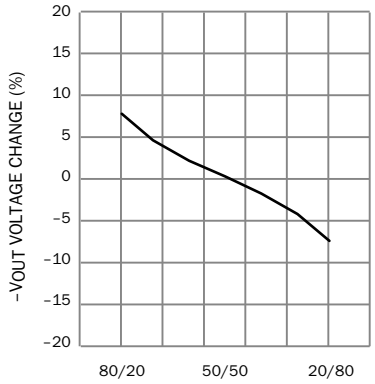
SMSA2815D +V_O STEP LOAD RESPONSE

FIGURE 17



SMSA2815D TURN-ON INTO NO LOAD

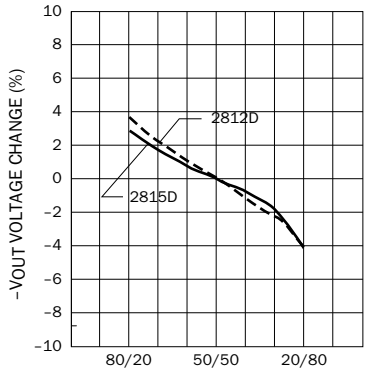
FIGURE 18



OUTPUT LOAD (+V_{OUT} % / –V_{OUT} %)
80-20% LOAD on +V, 20-80% LOAD on –V

SMSA ±5 DUAL CROSS REGULATION

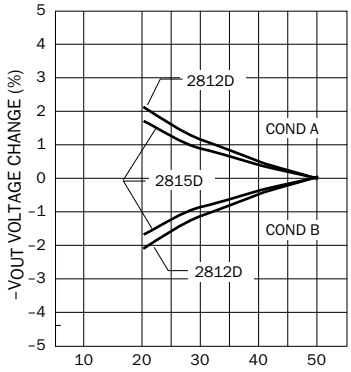
FIGURE 19



OUTPUT LOAD (+V_{OUT} % / –V_{OUT} %)
80-20% LOAD on +V, 20-80% LOAD on –V

SMSA ±12 & ±15 DUAL CROSS REGULATION

FIGURE 20



COND. A: 50% LOAD +V; 20% to 50% –V
COND. B: 50% LOAD –V; 20% to 50% +V

SMSA ±12 & ±15 DUAL CROSS REGULATION

FIGURE 21

SMSA Single and Dual DC-DC Converter

16 TO 40 VOLT INPUT - 5 WATT

TYPICAL PERFORMANCE PLOTS: 28 VIN, 25°C CASE, 100% LOAD, UNLESS OTHERWISE SPECIFIED.
These are examples for reference only and are not guaranteed specifications.

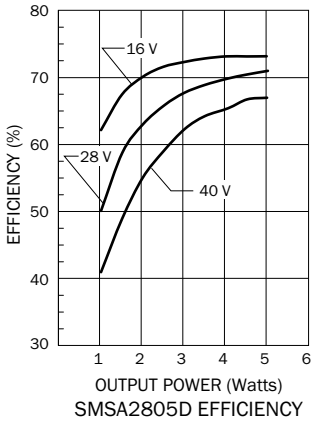


FIGURE 24

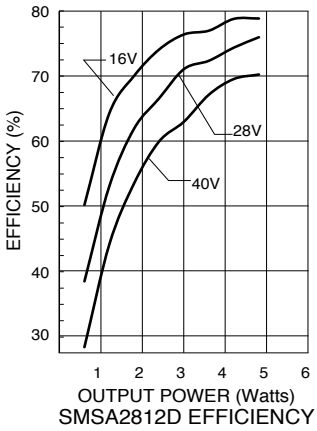


FIGURE 22

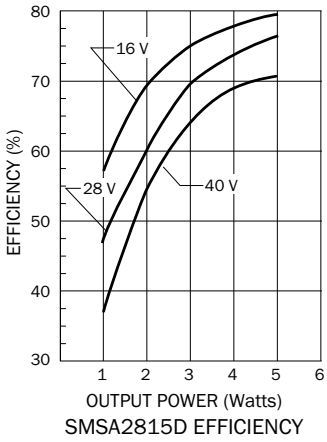
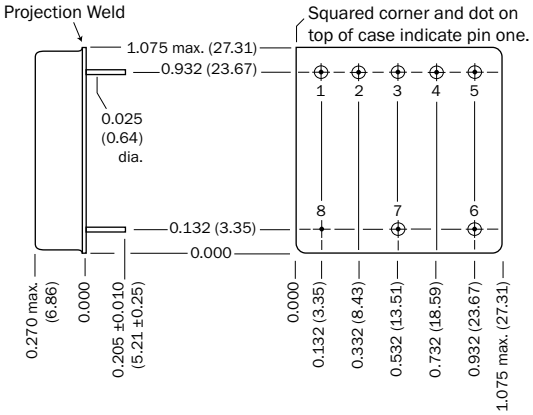


FIGURE 23

SMSA Single and Dual DC-DC Converter

16 TO 40 VOLT INPUT - 5 WATT

BOTTOM VIEW CASE C1



Weight: 15 grams maximum

Case dimensions in inches (mm)
Tolerance ±0.005 (0.13) for three decimal places
±0.01 (0.3) for two decimal places
unless otherwise specified

CAUTION
Heat from reflow or wave soldering may damage the device.
Solder pins individually with heat application not exceeding
300 °C for 10 seconds per pin

Materials
Header Cold Rolled Steel/Nickel/Gold
Cover Cold Rolled Steel/Nickel
Pins #52 alloy, gold, compression glass seal
Gold plating of 50 - 150 microinches
included in pin diameter
Seal hole: 0.070 ±0.003 (1.78 ±0.08)

Please refer to the numerical dimensions for accuracy.

FIGURE 25: CASE C1

SMSA Single and Dual DC-DC Converter

16 TO 40 VOLT INPUT - 5 WATT

ELEMENT EVALUATION SPACE DC-DC CONVERTERS
PROTOTYPE, CLASS H AND CLASS K

	NON-QML [1]	QML			
	PROTOTYPE	CLASS H		CLASS K	
	/0	/H		/K	
COMPONENT-LEVEL TEST PERFORMED	M/S [2]	M/S [2]	P [3]	M/S [2]	P [3]
Element Electrical	■	■	■	■	■
Visual		■	■	■	■
Internal Visual		■		■	
Temperature Cycling				■	■
Constant Acceleration				■	■
Interim Electrical				■	
Burn-in				■	
Post Burn-in Electrical				■	
Steady State Life				■	
Voltage Conditioning Aging					■
Visual Inspection					■
Final Electrical		■	■	■	■
Wire Bond Evaluation		■	■	■	■
SEM				■	

Notes
1. Non-QML products may not meet all of the requirements of MIL-PRF-38534.
2. M/S = Active components (microcircuit and semiconductor die)
3. P = Passive components, Class H and K element evaluation. Not applicable to space prototype (“0”) element evaluation.

Definitions
Element Evaluation: Component testing/screening per MIL-STD-883 as determined by MIL-PRF-38534
SEM: scanning electron microscopy

TABLE 9: ELEMENT EVALUATION

SMSA Single and Dual DC-DC Converter

16 TO 40 VOLT INPUT - 5 WATT

ENVIRONMENTAL SCREENING SPACE DC-DC CONVERTERS
PROTOTYPE, CLASS H AND K, RHA P, L AND R

	NON-QML [1]	QML [2, 3]					
	PROTOTYPE	CLASS H			CLASS K		
TEST PERFORMED	/00 [4]	/HP	/HL	/HR	/KP	/KL	/KR
Non-destruct wire bond pull, Method 2023		■ [5]	■ [5]	■ [5]	■	■	■
Pre-cap Inspection, Method 2017, 2032	■	■	■	■	■	■	■
Temperature Cycle (10 times)							
Method 1010, Cond. C, -55°C to +150°C, ambient	■	■	■	■	■	■	■
Constant Acceleration							
Method 2001, 3000 g	■	■	■	■	■	■	■
PIND, Test Method 2020, Cond. A		■ [5]	■ [5]	■ [5]	■	■	■
Pre burn-in test, Group A, Subgroups 1 and 4	■	■ [5]	■ [5]	■ [5]	■	■	■
Burn-in Method 1015, +125°C case, typical [6]							
96 hours	■						
160 hours		■	■	■			
2 x 150 hours (includes mid-BI test)					■	■	■
Final Electrical Test, MIL-PRF-38534, Group A,							
Subgroups 1 and 4: +25°C case	■						
Subgroups 1 through 5, -55°C, +25°C, +125°C case		■	■	■	■	■	■
Hermeticity Test, Method 1014							
Gross Leak, Cond. B_2, Kr85					■	■	■
Gross Leak, Cond. C_1, fluorocarbon	■	■	■	■			
Fine Leak, Cond. B_1, Kr85					■	■	■
Fine Leak, Cond. A_2, helium	■	■	■	■			
Radiography, Method 2012					■	■	■
Post Radiography Electrical Test, +25°C case					■ [5]	■ [5]	■ [5]
Final visual inspection, Method 2009	■	■	■	■	■	■	■

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Notes
1. Non-QML prototype products may not meet all of the requirements of MIL-PRF-38534.
2. All processes are QML qualified and performed by certified operators.
3. Class H or K QML products that have no SMD number are marked “CHP, CHL, CHR, CKP, CKL or CKR” per MIL-STD-38534, Table III instead of “QML”.
4. “O” in the RHA designator position in Interpoint model numbers indicates DLA RHA “-” defined as no RHA.
5. Not required by DLA but performed to assure product quality.
6. Burn-in temperature designed to bring the case temperature to +125°C minimum. Burn-in is a powered test.

TABLE 10: ENVIRONMENTAL SCREENING AND RHA LEVELS

SMSA Single and Dual DC-DC Converter

16 TO 40 VOLT INPUT - 5 WATT

Space Radiation Hardness Assurance Screening DC-DC Converters Class H and K, RHA [1] P, L and R

	QML					
	Class H			Class K		
Qualification Per MIL-STD	/HP	/HL	/HR	/KP	/KL	/KR
RHA P: 30 krad(Si) total dose [2, 3, 4]	■			■		
RHA L: 50 krad(Si) total dose [2, 3, 4]		■			■	
RHA R: 100 krad(Si) total dose [2, 3, 4]			■			■
SEE, LET 86 MeV cm^2/mg [5]	■	■	■	■	■	■

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Notes
1. DLA has approved the RHA plan for Interpoint power products. Our SMD products with RHA "P", "L" or "R" code meet DLA requirements.
2. Radiation sensitive components internal to the devices are procured with radiation guarantees or undergo radiation lot acceptance testing (RLAT) performed per condition A, method 1019 of MIL-STD-883.
3. Representative devices were initially High Dose Rate (HDR) tested using condition A of method 1019 of MIL-STD 883 to ensure RHA designator levels.
4 Representative devices have also been Low Dose Rate (LDR) tested using condition D of method 1019 of MIL-STD-883 to the RHA designator levels. Representative devices will also be re-tested after design or process changes that can affect RHA response of this device.
5. Single event testing was performed on a converter to 86 MeV-cm^2/mg using 15 MeV/nucleon gold ions with no latch-up, burn-out, functional interrupts, or gate ruptures exhibited. Single event upsets (output voltage transients) may be present up to 86 MeV-cm^2/mg.

TABLE 11: SPACE RADIATION HARDNESS ASSURANCE DC-DC CONVERTERS CLASS H AND CLASS K, RHA P, L AND R