

SMSA Single and Dual DC-DC Converters

28 VOLT INPUT – 5 WATT

FEATURES

- Radiation tolerant space dc-dc converter
 - Single event effects (SEE) LET performance to 86 MeV cm²/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 high frequency, space qualified, dc-dc converters provide up to 5 watts output power over the full military temperature range of -55°C to +125°C with up to 74% efficiency. 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. The SMSA Series' small size, light weight and hermetically sealed metal packages make them ideal for use in space, military, aerospace and other high reliability applications.

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 cm²/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.

DYNAMIC RESPONSE

The SMSA feed-forward compensation system provides excellent dynamic response and noise 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.

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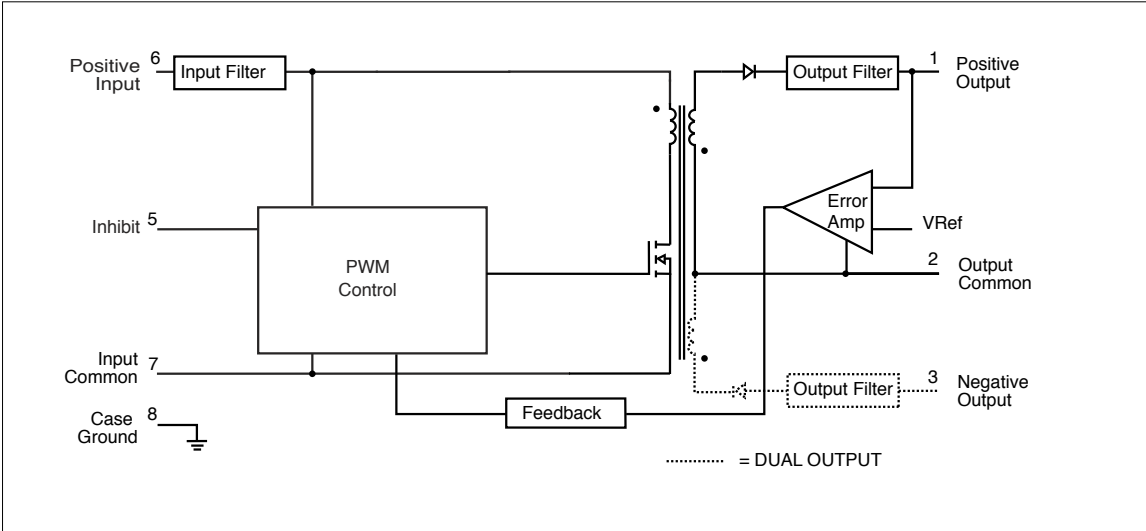


FIGURE 1: SMSA BLOCK DIAGRAM

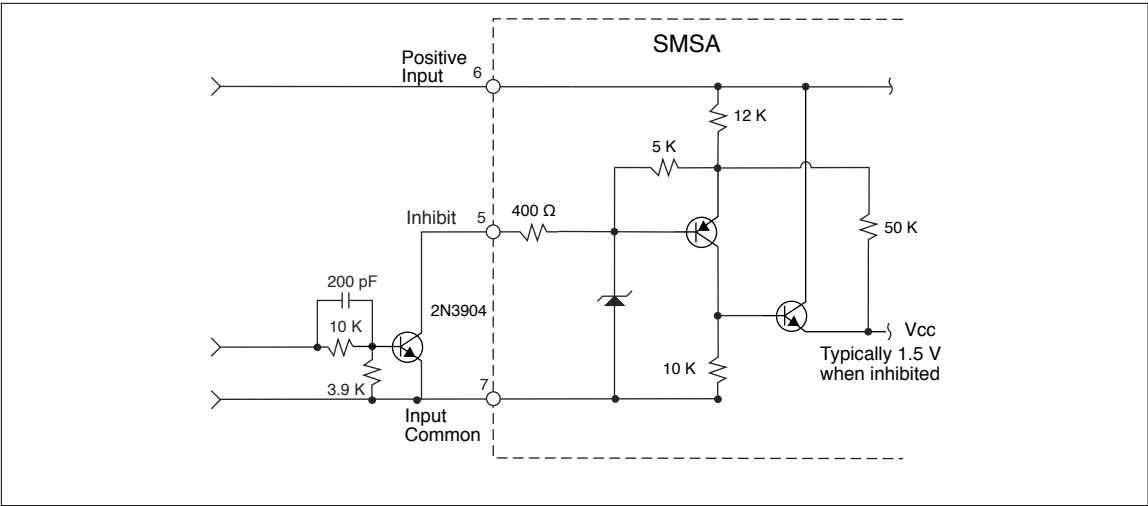


FIGURE 2: INHIBIT INTERFACE

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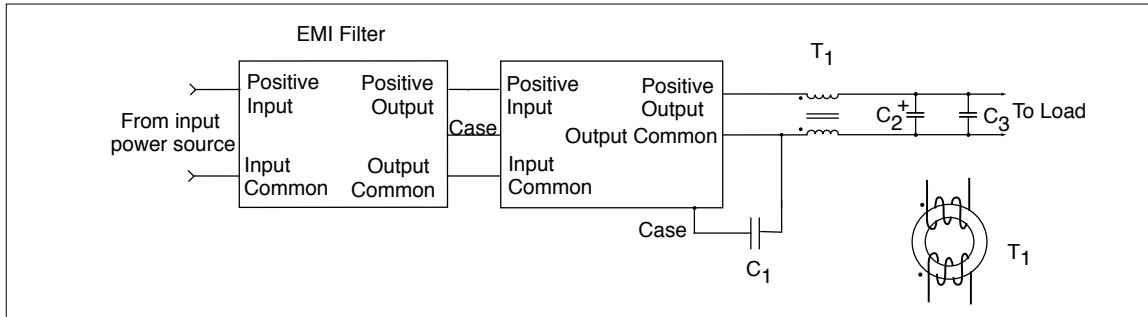


FIGURE 3: LOW NOISE OUTPUT FILTER FOR SMSA SINGLE OUTPUT MODEL

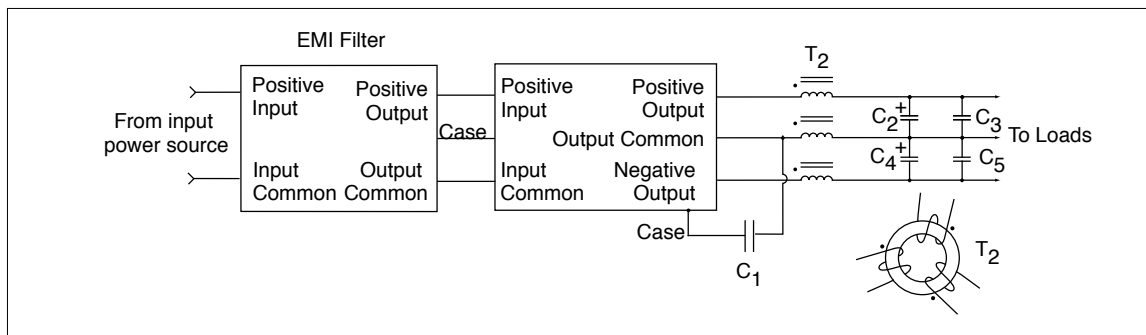


FIGURE 4: LOW NOISE OUTPUT FILTER FOR SMSA DUAL OUTPUT MODEL

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 μ F ceramic capacitor, 500 V

C2 = C4 = 6.8 μ F tantalum capacitor

C3 = C5 = 0.27 μ F ceramic capacitor

Single output: T1 = 15T #28 AWG winding on toroid, $\mu_i = 5000$

Dual output: T2 = 10T #28 AWG winding on toroid, $\mu_i = 5000$

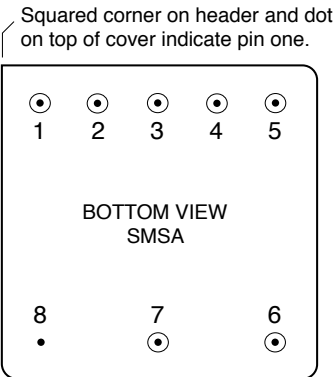
For best results, make interconnections as short as possible.

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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 27 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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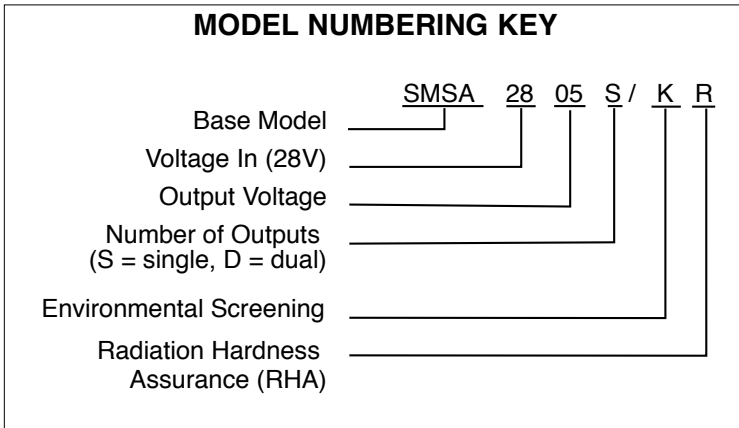


FIGURE 6: MODEL NUMBERING KEY

SMD NUMBERS	
STANDARD MICROCIRCUIT DRAWING (SMD)	SMSA SIMILAR PART
5962R0621001KXC	SMSA283R3/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: <http://www.landandmaritime.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 K	P L R
FILL IN FOR MODEL #	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 10 on page 15 for more information.

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 TEMPERATURE	FULL POWER	-55	—	+125	°C	
	ABSOLUTE ¹	-55	—	+135		
DERATING OUTPUT POWER/CURRENT ¹	LINEARLY	From 100% at 125°C to 0% at 135°C				
ESD RATING ¹ MIL-PRF-38534, 3.9.5.8.2	MIL-STD-883 METHOD 3015 CLASS 2	2000 - 3999			V	
ISOLATION: INPUT TO OUTPUT OR ANY PIN TO CASE EXCEPT CASE PIN	@ 500 VDC AT 25°C	100	—	—	Megohms	
INPUT TO OUTPUT CAPACITANCE ¹		—	50	—	pF	
UNDER VOLTAGE LOCKOUT ¹	V _{IN}	—	13	—	V	
CURRENT LIMIT	% OF FULL LOAD	—	166	—	%	
AUDIO REJECTION ¹		—	50	—	dB	
CONVERSION FREQUENCY	-55°C TO +125°C	400	500	600	kHz	
INHIBIT ACTIVE LOW (OUTPUT DISABLED) Do not apply a voltage to the inhibit pin	INHIBIT PIN PULLED LOW ¹	—	—	0.8	V	
	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
powerapps@crane-eg.com +1 425-882-3100 option 7*

Notes

1. Guaranteed by characterization test and/or analysis. Not a production test.

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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			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
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 10 kHz - 2 MHz	T _C = 25°C	—	300	600	—	150	450	—	150	450	mV p-p
	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 NO LOAD TO FULL	CONTINUOUS	16	28	40	16	28	40	16	28	40	V
	TRANSIENT ¹ 50 ms	0	—	50	0	—	50	0	—	50	
INPUT CURRENT ²	NO LOAD	—	35	50	—	35	50	—	35	60	
	INHIBITED	—	3	5	—	3	5	—	3	5	mA
	INHIBITED 50 krad ³	—	5	7	—	5	7	—	5	7	
INPUT RIPPLE CURRENT ⁴	10 kHz - 10 MHz	—	60	100	—	60	300	—	60	300	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 ^{1, 5}	POWER DISSIPATION	—	1.5	2.5	—	1.5	2.2	—	1.5	2.2	W
SHORT CIRCUIT	RECOVERY	—	12.5	75	—	12.5	75	—	12.5	75	ms
STEP LOAD RESPONSE ⁶ 50% - 100% - 50%	TRANSIENT	—	200	500	—	200	1500	—	200	1500	mV pk
	RECOVERY ¹	—	200	500	—	200	4500	—	200	4500	μs
STEP LINE RESPONSE ^{1, 6} 16 - 40 - 16 V	TRANSIENT	—	200	500	—	200	500	—	200	500	mV pk
	RECOVERY	—	400	500	—	400	1000	—	400	1000	μs
START-UP	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 I_{in} 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.

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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 10 kHz - 2 MHz	T _C = 25°C	—	125	200	—	150	600	mV p-p
	T _C = -55°C TO +125°C	—	—	300	—	—	900	
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 NO LOAD TO FULL	CONTINUOUS	16	28	40	16	28	40	V
	TRANSIENT ¹ 50 ms	0	—	50	0	—	50	
INPUT CURRENT ²	NO LOAD	—	35	42	—	35	50	mA
	INHIBITED	—	3	7	—	3	7	
	INHIBITED 50 krad ³	—	5	7	—	5	7	
INPUT RIPPLE CURRENT ³	10 kHz - 10 MHz	—	60	100	—	60	300	mA p-p
EFFICIENCY	T _C = 25°C	68	74	—	69	74	—	%
	T _C = -55°C TO +125°C	64	—	—	65	—	—	
LOAD FAULT ^{1, 4}	POWER DISSIPATION	—	1.2	2.1	—	1.2	2.0	W
SHORT CIRCUIT	RECOVERY	—	1	10	—	1	10	ms
STEP LOAD RESPONSE ⁵ 50% - 100% - 50%	TRANSIENT	—	300	400	—	400	3000	mV pk
	RECOVERY ¹	—	400	500	—	400	4500	μs
STEP LINE RESPONSE ^{1, 5} 16 - 40 - 16 V	TRANSIENT	-1000	250	800	-500	250	500	mV pk
	RECOVERY	—	700	800	—	500	1300	μs
START-UP	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 lin 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.

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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}	4.80	5.00	5.20	11.52	12.00	12.48	14.40	15.00	15.60	V
	-V _{OUT}	4.75	5.00	5.25	11.04	12.00	12.96	13.80	15.00	16.20	
OUTPUT CURRENT ² V _{IN} = 16 TO 40 V	EITHER OUTPUT	—	±500	800 ¹	—	±208	333 ¹	—	±167	267 ¹	mA
	TOTAL			1000			417			333	
OUTPUT POWER ² V _{IN} = 16 TO 40 V	EITHER OUTPUT	—	±2.5	4.0 ¹	—	±2.5	4.0 ¹	—	±2.5	4.0 ¹	W
	TOTAL			5.0			5.0			5.0	
OUTPUT RIPPLE 10 kHz - 2 MHz	T _C = 25°C	—	—	300	—	80	300	—	120	300	mV p-p
	T _C = -55°C TO +125°C	—	—	300	—	—	500	—	—	500	
LINE REGULATION V _{IN} = 16 TO 40 V	+V _{OUT}	—	20	100	—	20	100	—	10	50	mV
	-V _{OUT}	—	40	200	—	40	200	—	40	180	
LOAD REGULATION NO LOAD TO FULL	+V _{OUT}	—	10	50	—	10	50	—	10	50	mV
	-V _{OUT}	—	100	200	—	100	200	—	50	200	
CROSS REGULATION ³		—	—	750	—	—	1000	—	—	1000	mV
INPUT VOLTAGE NO LOAD TO FULL	CONTINUOUS	16	28	40	16	28	40	16	28	40	V
	TRANSIENT ¹ 50 ms	0	—	50	0	—	50	0	—	50	
INPUT CURRENT ⁴	NO LOAD	—	30	50	—	40	63	—	38	60	mA
	INHIBITED	—	3	7	—	3	7	—	3	7	
	INHIBITED 50 krad ³	—	5	7	—	5	7	—	5	7	
INPUT RIPPLE CURRENT ⁶	10 kHz - 10 MHz	—	60	200	—	60	300	—	60	300	mA p-p
EFFICIENCY	T _C = 25°C	65	70	—	67	73	—	68	73	—	%
	T _C = -55°C TO +125°C	63	—	—	65	—	—	66	—	—	
LOAD FAULT ^{1, 7} SHORT CIRCUIT	POWER DISSIPATION	—	1.3	2.1	—	1.3	1.9	—	1.3	1.8	W
	RECOVERY	—	—	50	—	1	30	—	1	50	ms
STEP LOAD RESPONSE ⁸ 50% - 100% - 50%	TRANSIENT	—	±200	±1400	—	±200	±1400	—	±200	±1400	mV pk
	RECOVERY ¹	—	200	4500	—	200	4500	—	200	4500	μs
STEP LINE RESPONSE ^{1, 8} 16 - 40 - 16 V	TRANSIENT	—	±200	±750	—	±200	±500	—	±600	±1500	mV pk
	RECOVERY	—	500	1200	—	500	2000	—	500	1200	μs
START-UP	DELAY	—	10	25	—	10	30	—	10	25	ms
	OVERSHOOT ¹	—	0	750	—	0	500	—	0	750	mV pk
CAPACITIVE LOAD ^{1, 9} T _C = 25°C	NO EFFECT ON DC PERFORMANCE	—	—	10	—	—	100	—	—	10	μF

Notes

- Guaranteed by characterization test and/or analysis. Not a production test.
- Up to 4 watts (80% of full power) is available from either output providing the opposite output is carrying 20% of total power.
- Shows regulation effect on the minus output during the defined cross loading conditions: +PO = 30-70%, -PO = 70-30% and -PO = 30-70%, +PO = 70-30. See Figure 24, Figure 25 and Figure 26 on page 12.
- The inhibited input current is tested with <0.8 volts on the inhibit.
- For RHA L, 50 krad converters, the pre-radiation spec for lin Inhibit is 7 mA max.
- Tested with a 2 μH external input inductor.
- Indefinite short circuit protection not guaranteed above 125°C (case).
- Recovery time is measured from application of the transient to point at which V_{OUT} is within 1% of V_{OUT} at final value.
- Applies to each output.

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TYPICAL PERFORMANCE PLOTS: 28 V_{IN}, 25°C T_C, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED.
 These are examples for reference only and are not guaranteed specifications.

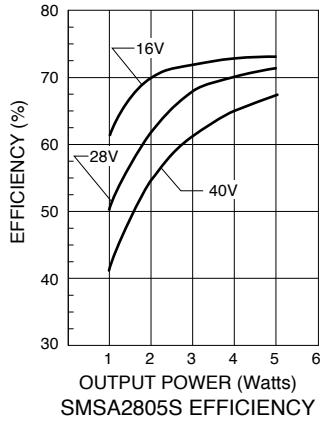


FIGURE 7

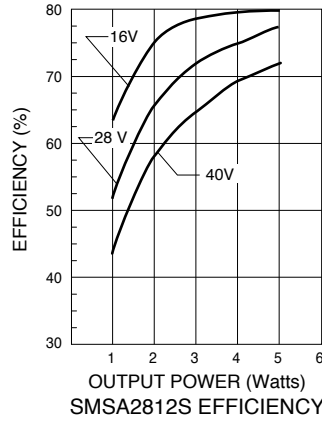


FIGURE 8

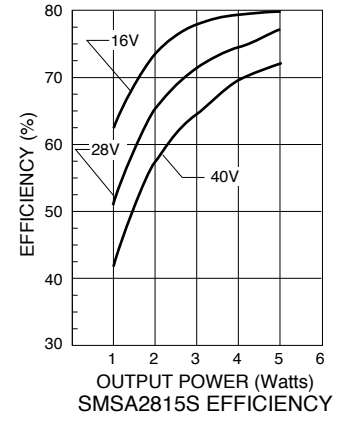


FIGURE 9

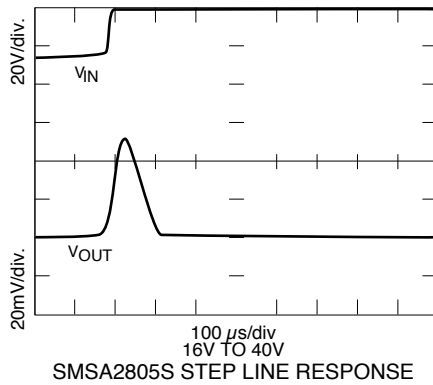


FIGURE 10

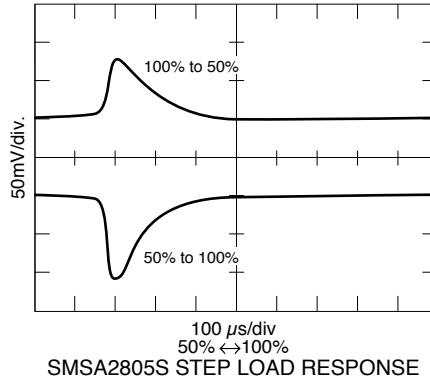


FIGURE 11

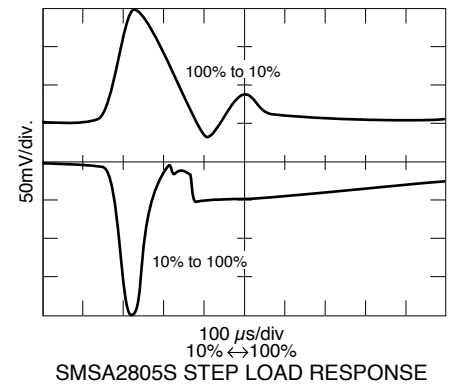


FIGURE 12

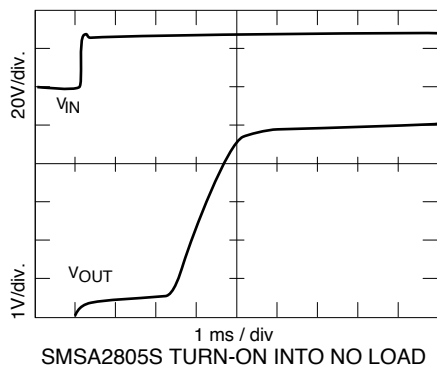


FIGURE 13

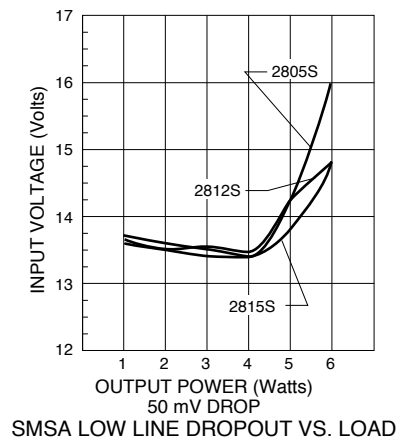


FIGURE 14

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TYPICAL PERFORMANCE PLOTS: 28 V_{IN}, 25°C T_C, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED. These are examples for reference only and are not guaranteed specifications.

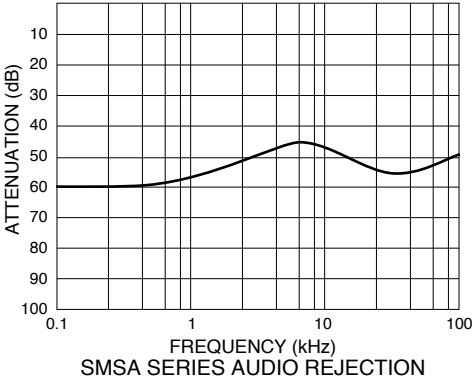


FIGURE 15

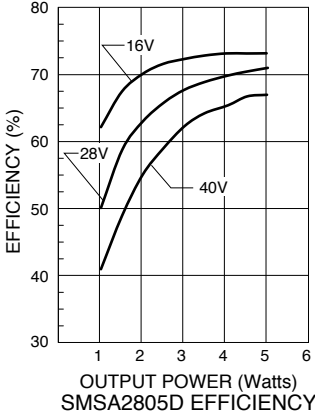


FIGURE 16

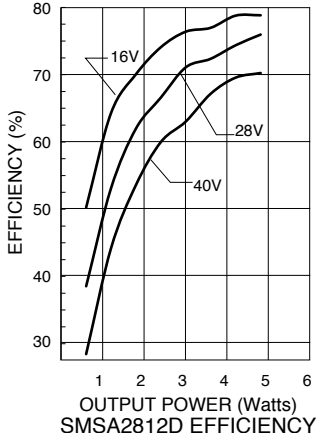


FIGURE 17

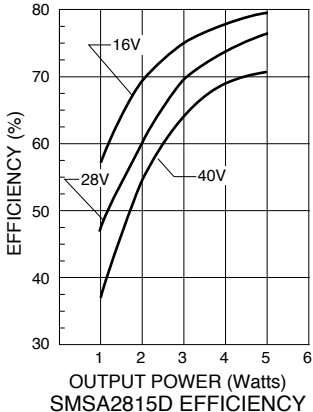


FIGURE 18

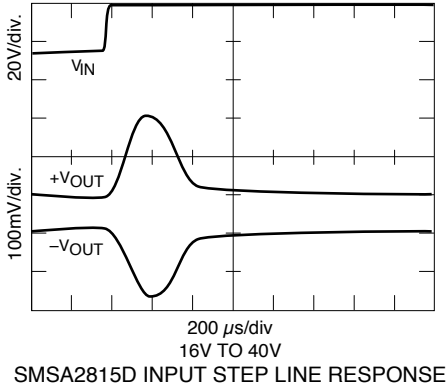


FIGURE 19

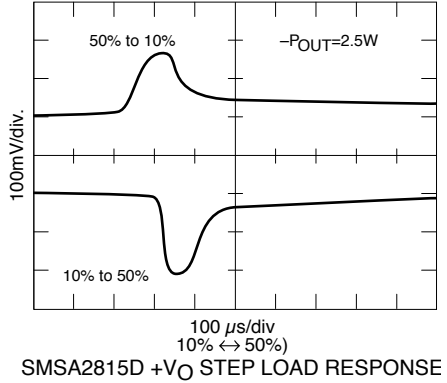


FIGURE 20

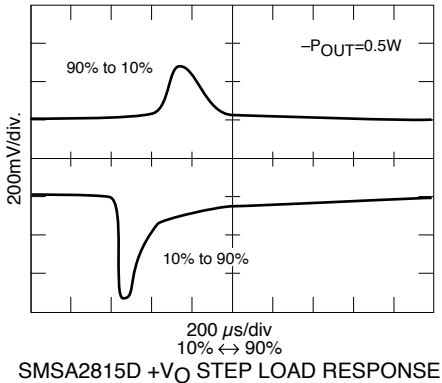


FIGURE 21

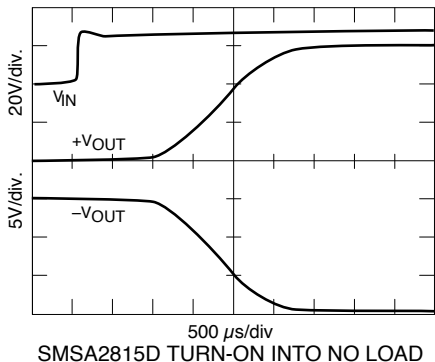


FIGURE 22

SMSA Single and Dual DC-DC Converters

28 VOLT INPUT – 5 WATT

TYPICAL PERFORMANCE PLOTS: 28 V_{IN}, 25°C T_C, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED.
 These are examples for reference only and are not guaranteed specifications.

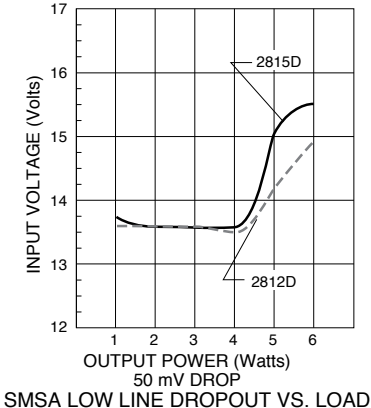


FIGURE 23

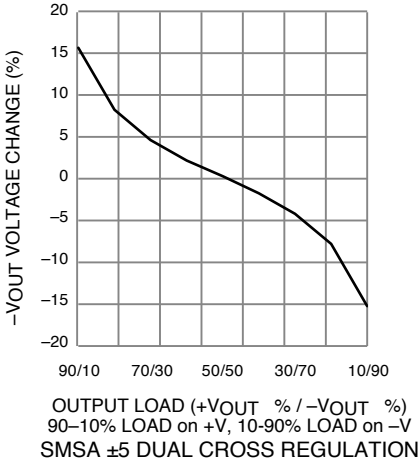


FIGURE 24

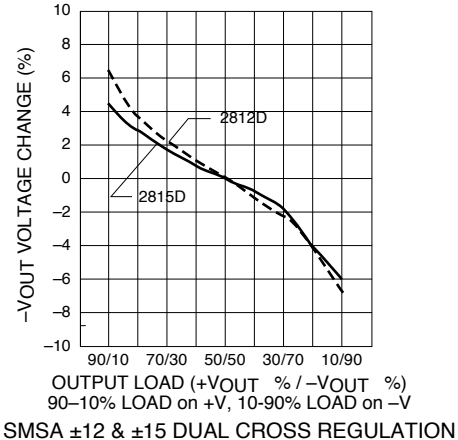


FIGURE 25

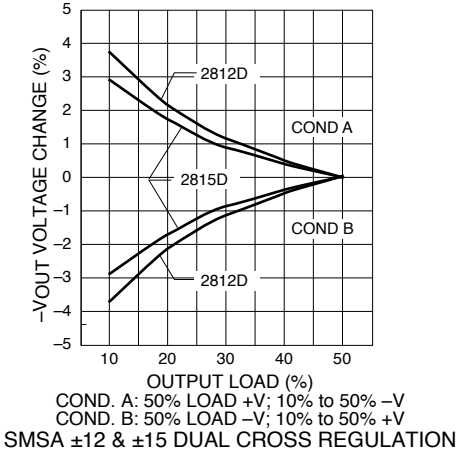
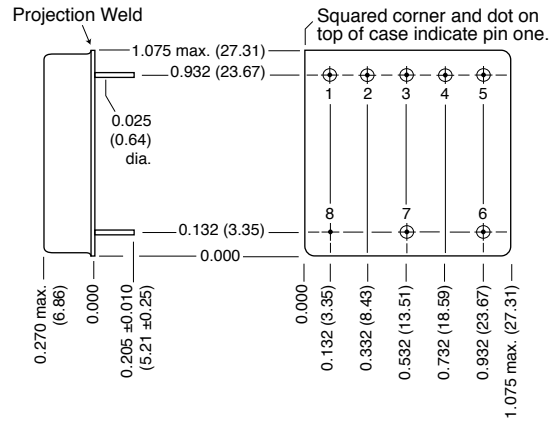


FIGURE 26

SMSA Single and Dual DC-DC Converters

28 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)

Case C1 SMSA, Rev F, 2013.05.30
 Please refer to the numerical dimensions for accuracy.

FIGURE 27: CASE C1

SMSA Single and Dual DC-DC Converters

28 VOLT INPUT – 5 WATT

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

COMPONENT-LEVEL TEST PERFORMED	NON-QML ¹	QML			
	PROTOTYPE	CLASS H		CLASS K	
	/O	/H		/K	
	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 ("O") 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 Converters

28 VOLT INPUT – 5 WATT

ENVIRONMENTAL SCREENING SPACE DC-DC CONVERTERS PROTOTYPE, CLASS H AND CLASS K, RHA ¹ P, L AND R

TEST PERFORMED	NON-QML ²	QML ³					
	PROTOTYPE	CLASS H			CLASS K		
	/OO 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) (Qual 100 times) Method 1010, Cond. C, -65°C to +150°C, ambient	■	■	■	■	■	■	■
Constant Acceleration Method 2001, 3000 g (Qual 5000 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 160 hours (includes mid-BI test)					■	■	■
Final Electrical Test, MIL-PRF-38534, Group A, Subgroups 1 and 4: +25°C case	■						
Subgroups 1 through 6, -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	■	■	■	■	■	■	■
RHA P: 30 krad(Si) total dose ^{1, 7, 8}		■			■		
RHA L: 50 krad(Si) total dose ^{1, 7, 8}			■			■	
RHA R: 100 krad(Si) total dose ^{1, 7, 8}				■			■
SEE, LET 86 MeV cm ² /mg ^{1, 9}		■	■	■	■	■	■

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

- Notes
- Our Redmond facility has a DLA approved RHA plan for Interpoint power products. Our SMD products with RHA "P", "L" or "R" code meet DLA requirements.
 - Non-QML prototype products may not meet all of the requirements of MIL-PRF-38534.
 - All processes are QML qualified and performed by certified operators.
 - "O" in the RHA designator position in Interpoint model numbers indicates DLA RHA "-" defined as no RHA.
 - Not required by DLA but performed to assure product quality.
 - Burn-in temperature designed to bring the case temperature to +125°C minimum. Burn-in is a powered test.
 - High dose rate test.
 - Low dose rate test.
 - No destructive events or SEL.

TABLE 10: ENVIRONMENTAL SCREENING AND RHA LEVELS

