SMSA Single and Dual DC-DC Converters

28 VOLT INPUT – 5 WATT

FEATURES

Small size, 1.16 in^2 (7.5 cm^2)

- Operating temperature -55° to +125°C
- Qualified to MIL-PRF-38534 Class H and K
- Radiation hardness assurance (RHA) to level R 100 krad(Si)
- Input voltage range 16 to 40 VDC
- Transient protection 50 V for 50 ms
- Fully isolated, magnetic feedback
- Fixed high frequency switching
- Inhibit function
- Indefinite short circuit protection
- High power density, 74% efficiency

MODELS VDC OUTPUT	
SINGLE	DUAL
3.3	±5
5	±12
5.2	±15
12	
15	

DESCRIPTION

The 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 the following screening options: Space Prototype (O), Class H, or Class K. Radiation tolerant to Radiation Hardness Assurance (RHA) levels of "-" (O), "P" or "R", per MIL-STD-38534. 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". See "Table 10: Environmental Screening and RHA Levels" 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 VDC voltage range. An undervoltage lockout feature keeps the converter shutdown below approximately 13 VDC 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). The minimum to maximum step line transient response is typically less than 1% ("Figure 10" on page 10 and "Figure 19" 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 VDC. In the inhibit mode, a maximum of 4 mA must be sunk from the inhibit pin at 28 VDC input.

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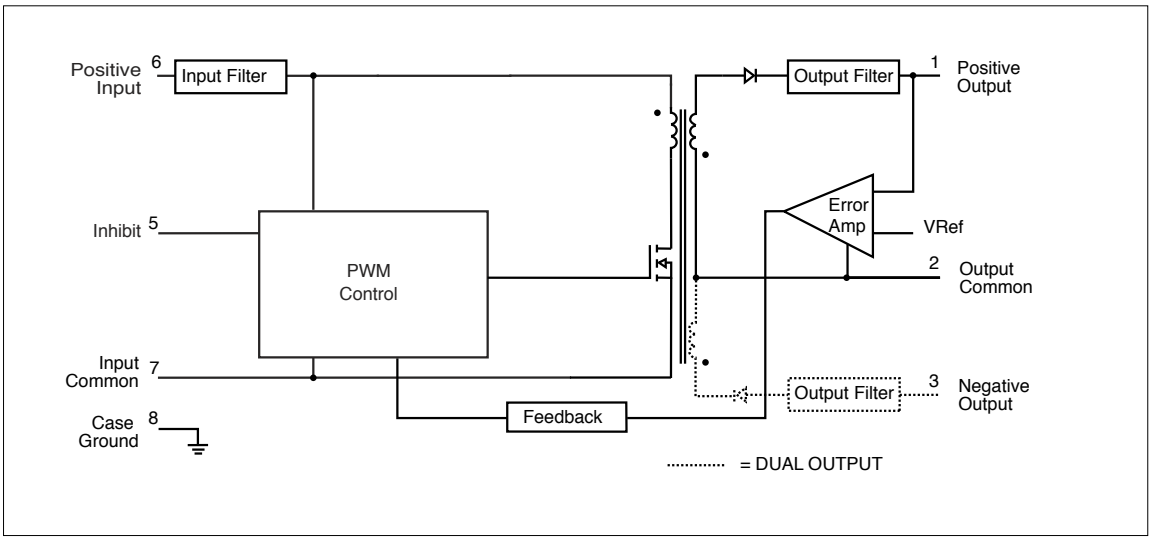

FIGURE 1: SMSA BLOCK DIAGRAM

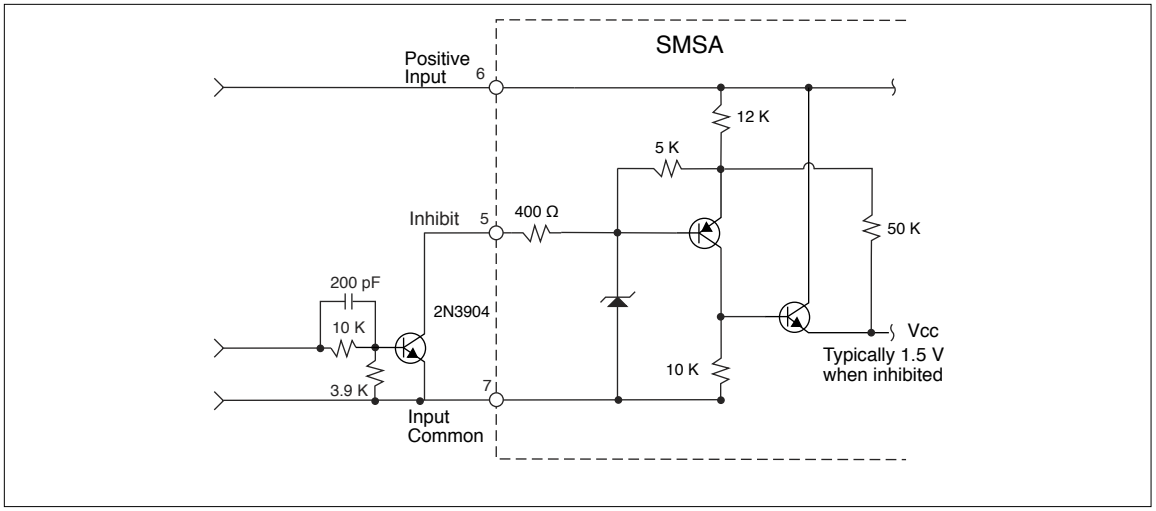

FIGURE 2: INHIBIT INTERFACE

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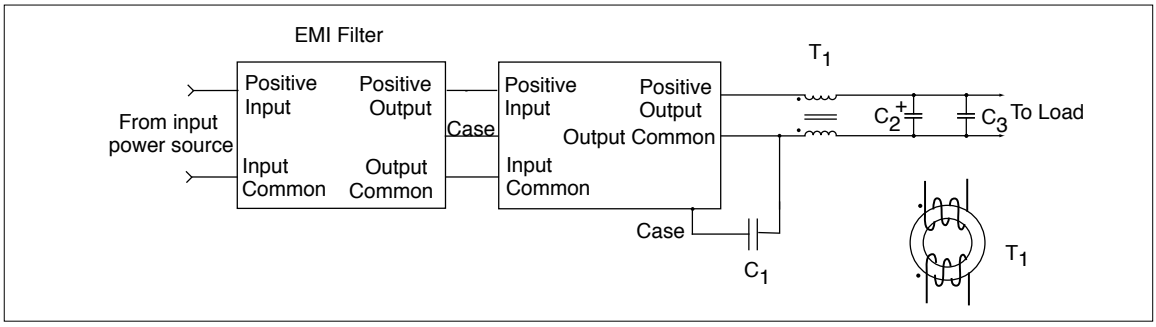

FIGURE 3: LOW NOISE OUTPUT FILTER FOR SMSA SINGLE OUTPUT MODEL

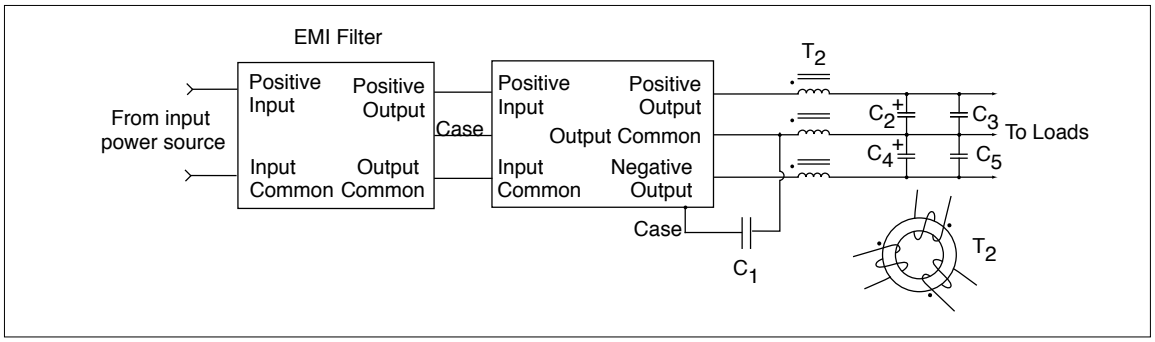

FIGURE 4: LOW NOISE OUTPUT FILTER FOR SMSA DUAL OUTPUT MODEL

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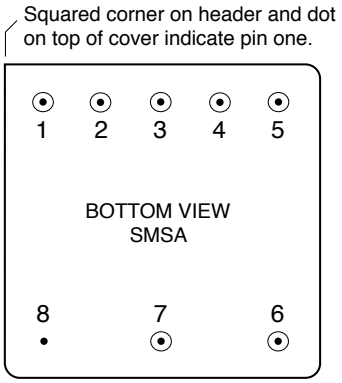
PIN OUT		
Pin	**Single Output**	**Dual Output**
1	Positive Output	Positive Output
2	Output Common	Output Common
3	No connection	Negative Output
4	No connection	No connection
5	Inhibit	Inhibit
6	Positive Input	Positive Input
7	Input Common	Input Common
8	Case Ground	Case Ground

TABLE 1: PIN OUT



See “Figure 26: Case C1” 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

SMSA Single and Dual DC-DC Converters

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MODEL NUMBERING KEY

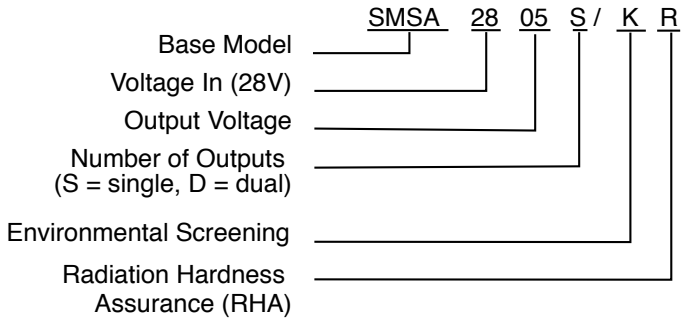

FIGURE 6: MODEL NUMBERING KEY

SMD NUMBERS	
STANDARD MICROCIRCUIT DRAWING (SMD)	**SMSA SIMILAR PART**
5962R0621001KXC	SMSA283R3/KR
5962R9309202KXC	SMSA2805S/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	P
				K	R
FILL IN FOR MODEL #	SMSA28	_____	_____	/ _____	_____

Notes:
1. Notes: 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: Element Evaluation” on page 14 and “Table 10: Environmental Screening and RHA Levels” 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: Environmental Screening and RHA Levels” 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 VDC VIN, UNLESS OTHERWISE SPECIFIED

		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			
ISOLATION, 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]		—	13	—	V
CURRENT LIMIT	% OF FULL LOAD	—	166	—	%
AUDIO REJECTION [1]		—	50	—	dB
CONVERSION FREQUENCY	-55° TO +125°C	450	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

Notes:
1. Guaranteed by qualification test and/or analysis. Not an in-line test.

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TABLE 6: ELECTRICAL CHARACTERISTICS: -55° TO +125°C CASE, 28 VDC 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		3.25	3.30	3.34	4.80	5.00	5.20	5.15	5.20	5.25	VDC
OUTPUT CURRENT	V_{in} = 16 to 40 VDC	0	—	1200	0	—	1000	0	—	962	mA
OUTPUT POWER	V_{in} = 16 to 40 VDC	—	—	4.0	—	—	5.0	—	—	5.0	W
OUTPUT RIPPLE	10 kHz - 2 MHz	—	300	900	—	150	675	—	150	450	mV p-p
LINE REGULATION	V_{in} = 16 TO 40 VDC	—	10	50	—	10	50	—	10	50	mV
LOAD REGULATION	NO LOAD TO FULL	—	10	50	—	10	50	—	10	50	mV
INPUT VOLTAGE	CONTINUOUS NO LOAD TO FULL	16	28	40	16	28	40	16	28	40	VDC
	TRANSIENT [1] 50 ms	0	—	50	0	—	50	0	—	50	ms
INPUT CURRENT [2]	NO LOAD	—	35	50	—	35	50	—	35	60	mA
	INHIBITED	—	3	5	—	3	5	—	3	5	
INPUT RIPPLE CURRENT [3] 10 KHZ - 10 MHZ	T_C = 25°C	–	50	100	–	50	200	–	50	200	mA p-p
		—	60	100	—	60	300	—	60	300	
EFFICIENCY		60	—	—	62	74	—	68	74	—	%
LOAD FAULT [1, 4, 5]	SHORT CIRCUIT POWER DISSIPATION	—	1.5	2.5	—	1.5	2.2	—	1.5	2.0	W
	RECOVERY	—	12.5	25	—	12.5	25	—	12.5	25	ms
STEP LOAD RESPONSE [5]	50% - 100% - 50% TRANSIENT	—	200	500	—	200	1500	—	200	3000	mV pk
	RECOVERY [1]	—	200	500	—	200	4500	—	200	500	µs
STEP LINE RESPONSE [1, 5]	TRANSIENT 16 - 40 - 16 VDC	—	200	500	—	200	500	—	200	500	mV pk
	40 to 16 VDC	—	200	500	—	200	500	—	200	500	
	RECOVERY 16 to 40 VDC	—	400	500	—	400	1000	—	400	1000	µs
	40 to 16 VDC	—	400	500	—	400	1000	—	400	1000	
START-UP	DELAY	—	10	30	—	10	30	—	10	75	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 qualification test and/or analysis. Not an in-line test.
2. The inhibited input current is tested with 0 V on the inhibit.
3. Tested with a 2 µH external input inductor.
4. Indefinite short circuit protection not guaranteed above 125°C (case).
5. 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° TO +125°C CASE, 28 VDC VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

SINGLE OUTPUT MODELS		SMSA2812S			SMSA2815S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		11.88	12.00	12.12	14.85	15.00	15.15	VDC
OUTPUT CURRENT	V_{in} = 16 to 40 VDC	—	—	417	—	—	333	mA
OUTPUT POWER	V_{in} = 16 to 40 VDC	—	—	5.0	—	—	5.0	W
OUTPUT RIPPLE	10 kHz - 2 MHz	—	125	300	—	150	900	mV p-p
LINE REGULATION	V_{in} = 16 TO 40 VDC	—	10	50	—	10	50	mV
LOAD REGULATION	NO LOAD TO FULL	—	10	50	—	10	50	mV
INPUT VOLTAGE	CONTINUOUS NO LOAD TO FULL	16	28	40	16	28	40	VDC
	TRANSIENT [1] 50 ms	0	—	50	0	—	50	ms
INPUT CURRENT [2]	NO LOAD	—	35	60	—	35	50	mA
	INHIBITED	—	3	5	—	3	5	
INPUT RIPPLE CURRENT [3] 10 KHZ - 10 MHZ	T_C = 25°C	–	50	100	–	50	200	mA p-p
		—	60	100	—	60	300	
EFFICIENCY		69	74	—	65	74	—	%
LOAD FAULT [1, 4, 5]	SHORT CIRCUIT POWER DISSIPATION	—	1.2	1.9	—	1.2	1.8	W
	RECOVERY	—	1	10	—	1	10	ms
STEP LOAD RESPONSE [5]	50% - 100% - 50% TRANSIENT	—	300	750	—	400	3000	mV pk
	RECOVERY [1]	—	400	1000	—	400	4500	µs
STEP LINE RESPONSE [1, 5]	TRANSIENT 16 to 40 VDC	—	200	800	—	200	500	mV pk
	40 to 16 VDC	—	250	600	—	250	500	
	RECOVERY 16 to 40 VDC	—	700	1300	—	500	1300	µs
	40 to 16 VDC	—	700	1300	—	500	1300	
START-UP	DELAY	—	10	75	—	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 qualification test and/or analysis. Not an in-line test.
2. The inhibited input current is tested with 0 V on the inhibit.
3. Tested with a 2 µH external input inductor.
4. Indefinite short circuit protection not guaranteed above 125°C (case).
5. 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° TO +125°C CASE, 28 VDC 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	VDC
	$-V_{OUT}$	-4.75	-5.00	-5.30	-11.40	-12.00	-12.60	-14.70	-15.00	-15.80	
OUTPUT CURRENT [2]	Either Output	—	±500	800 [1]	—	±208	333 [1]	—	±167	267 [1]	mA
V_{IN} = 16 to 40 VDC	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 VDC	TOTAL			5.0			5.0			5.0	
OUTPUT RIPPLE	10 kHz - 2 MHz	—	—	300	—	80	300	—	120	300	mV p-p
LINE REGULATION	$+V_{OUT}$	—	20	100	—	20	100	—	10	50	mV
V_{IN} = 16 TO 40 VDC	$-V_{OUT}$	—	40	200	—	40	200	—	40	180	
LOAD REGULATION	$+V_{OUT}$	—	10	50	—	10	50	—	10	50	mV
NO LOAD TO FULL	$-V_{OUT}$	—	100	200	—	100	200	—	50	200	
CROSS REGULATION [3]		—	5	8	—	5	8	—	5	8	%
INPUT VOLTAGE	CONTINUOUS NO LOAD TO FULL	16	28	40	16	28	40	16	28	40	VDC
	TRANSIENT [1] 50 ms	0	—	50	0	—	50	0	—	50	ms
INPUT CURRENT [4]	NO LOAD	—	30	50	—	40	63	—	38	50	mA
	INHIBITED	—	3	5	—	3	5	—	3	5	
INPUT RIPPLE CURRENT [5]	25°C	–	50	200	–	50	200	–	50	200	mA p-p
10 kHz - 10 MHz		—	60	300	—	60	300	—	60	300	
EFFICIENCY		63	70	—	65	73	—	66	73	—	%
LOAD FAULT [1, 6, 7]	SHORT CIRCUIT POWER DISSIPATION	—	1.3	2.1	—	1.3	1.7	—	1.3	1.6	W
	RECOVERY	—	—	50	–	1	30	—	1	30	ms
STEP LOAD RESPONSE [7]	50% - 100% - 50% TRANSIENT	—	±200	±550	—	±200	±550	—	±200	±600	mV pk
	RECOVERY [1]	—	200	500	—	200	500	—	200	500	µs
STEP LINE RESPONSE [1, 7]	TRANSIENT 16 - 40 - 16 VDC	—	±200	±500	—	±200	±500	—	±600	±1500	mV pk
	RECOVERY 16 to 40 VDC	—	300	750	—	300	750	—	500	1200	µs
	40 to 16 VDC	—	800	2000	—	800	2000	—	500	1200	
START-UP	DELAY	—	10	30	—	10	30	—	10	25	ms
	OVERSHOOT [1]	—	0	500	—	0	500	—	0	500	mV pk
CAPACITIVE LOAD [1] T_C = 25°C	NO EFFECT ON DC PERFORMANCE	—	—	10	—	—	100	—	—	10	µF

Notes:
1. Guaranteed by qualification test and/or analysis. Not an in-line 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 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” on page 12 and “Figure 25” on page 12.
4. The inhibited input current is tested with 0 V on the inhibit.
5. Tested with a 2 µH external input inductor.
6. Indefinite short circuit protection not guaranteed above 125°C (case).
7. 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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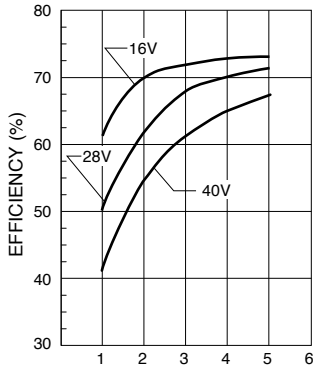
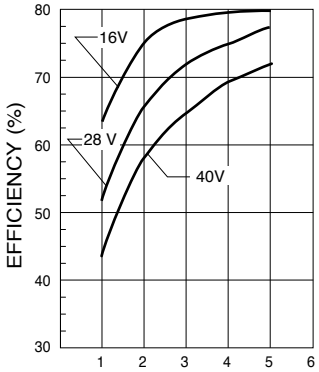
Typical Performance Curves: 25°C case, 28 VDC Vin, 100% load, unless otherwise specified.



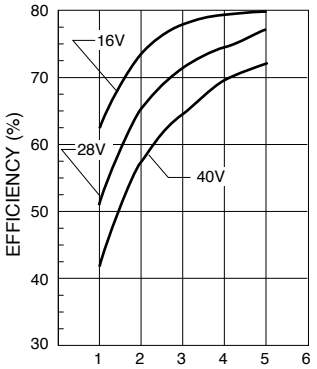
SMSA2805S EFFICIENCY

FIGURE 7



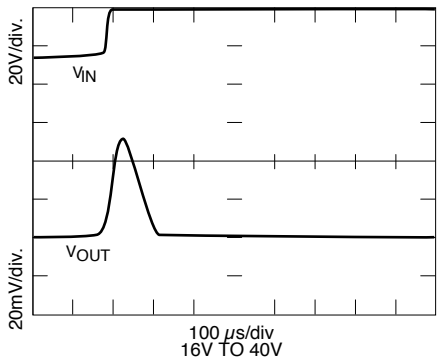
SMSA2812S EFFICIENCY

FIGURE 8



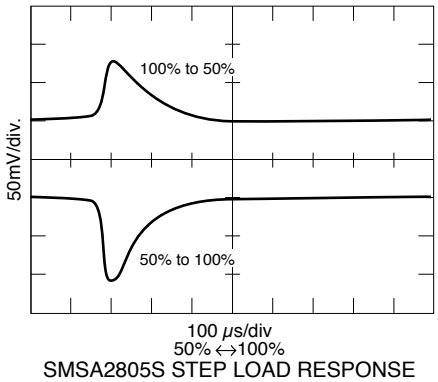
SMSA2815S EFFICIENCY

FIGURE 9



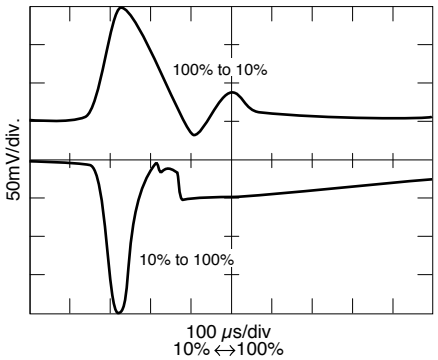
SMSA2805S STEP LINE RESPONSE

FIGURE 10



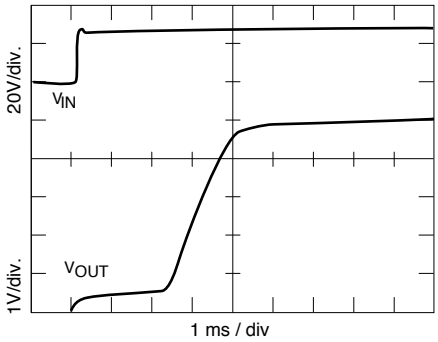
SMSA2805S STEP LOAD RESPONSE

FIGURE 11



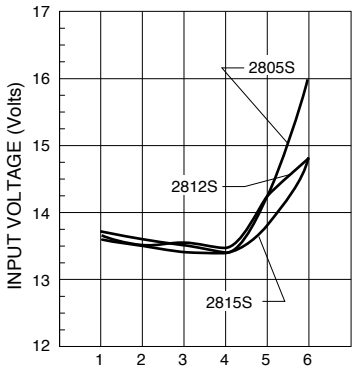
SMSA2805S STEP LOAD RESPONSE

FIGURE 12



SMSA2805S TURN-ON INTO NO LOAD

FIGURE 13



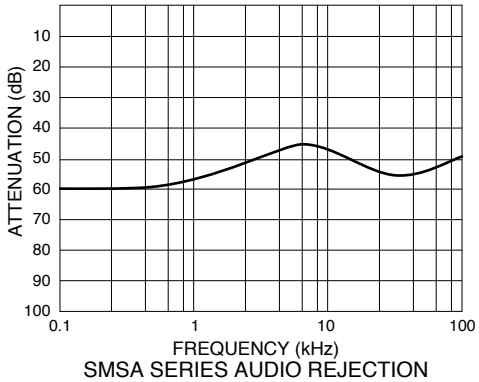
SMSA LOW LINE DROPOUT VS. LOAD

FIGURE 14

SMSA Single and Dual DC-DC Converters

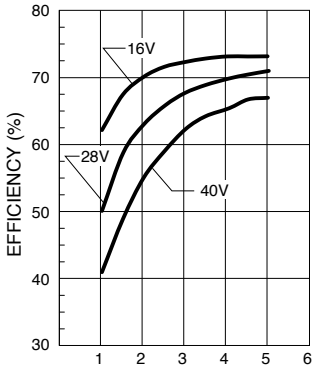
28 VOLT INPUT – 5 WATT

Typical Performance Curves: 25°C case, 28 VDC Vin, 100% load, unless otherwise specified.



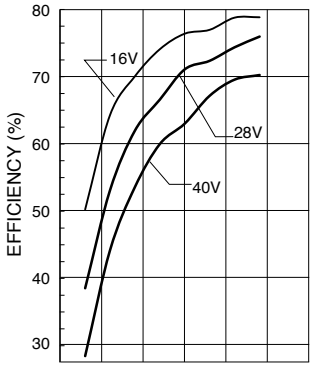
SMSA SERIES AUDIO REJECTION

FIGURE 15



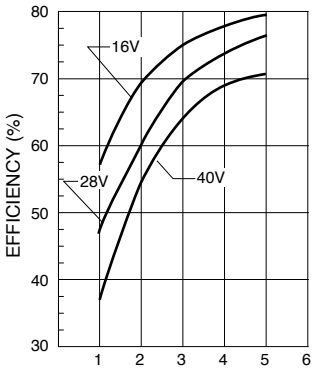
SMSA2805D EFFICIENCY

FIGURE 16



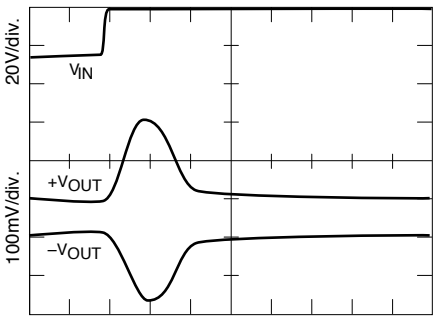
SMSA2812D EFFICIENCY

FIGURE 17



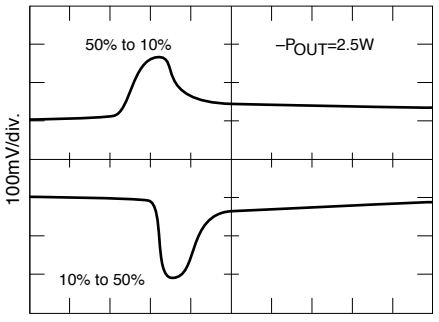
SMSA2815D EFFICIENCY

FIGURE 18



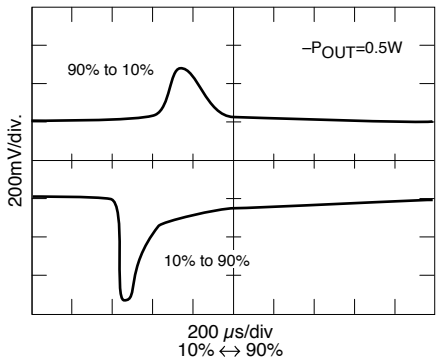
SMSA2815D INPUT STEP LINE RESPONSE

FIGURE 19



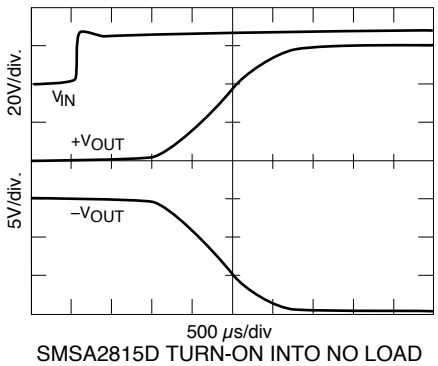
SMSA2815D +V_O STEP LOAD RESPONSE

FIGURE 20



SMSA2815D +V_O STEP LOAD RESPONSE

FIGURE 21



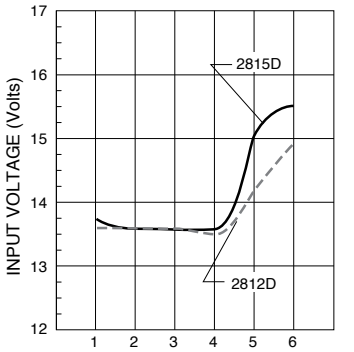
SMSA2815D TURN-ON INTO NO LOAD

FIGURE 22

SMSA Single and Dual DC-DC Converters

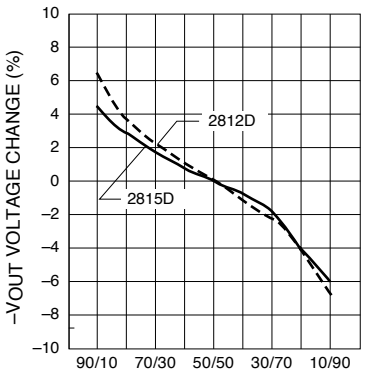
28 VOLT INPUT – 5 WATT

Typical Performance Curves: 25°C case, 28 VDC Vin, 100% load, unless otherwise specified.



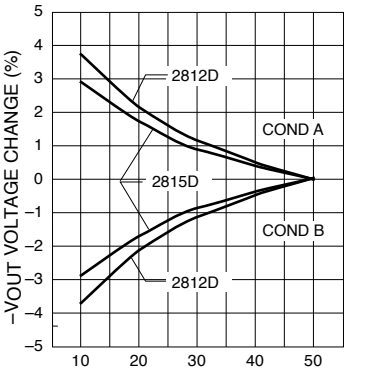
SMSA LOW LINE DROPOUT VS. LOAD

FIGURE 23



SMSA DUAL CROSS REGULATION

FIGURE 24



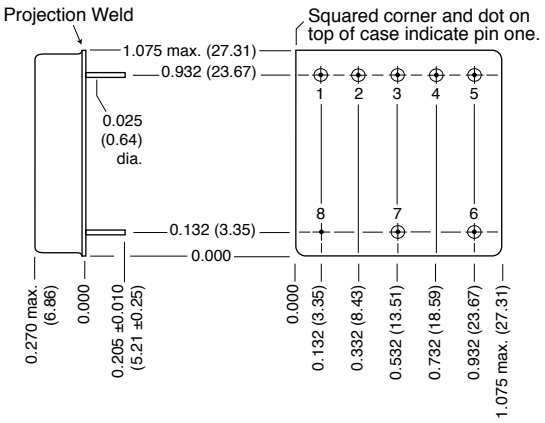
SMSA DUAL CROSS REGULATION

FIGURE 25

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 26: CASE C1

SMSA Single and Dual DC-DC Converters

28 VOLT INPUT – 5 WATT

DC-DC Converters Prototype, Class H and Class K, MIL-PRF-38534 Element Evaluation

	NON-QML [1]	QML			
	Prototype	Class H		Class K	
	/O	/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 (“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

DC-DC Converters Prototype, Class H and Class K MIL-PRF-38534 Environmental Screening and RHA[1] P or R

	NON-QML [2]	QML [3]			
	Prototype	Class H		Class K	
Test Performed	/OO	/HP	/HR	/KP	/KR
Non-destruct wire bond pull, Method 2023		■ [4]	■ [4]	■	■
Pre-cap Inspection, Method 2017, 2032	■	■	■	■	■
Temperature Cycle (10 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		■ [4]	■ [4]	■	■
Pre burn-in test, Group A, Subgroups 1 and 4	■	■ [4]	■ [4]	■	■
Burn-in Method 1015, +125°C case, typical [5]					
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					
Gross Leak, Method 1014	■	■	■	■	■
Fine Leak, Method 1014	■	■	■	■	■
Radiography, Method 2012				■	■
Post Radiography Electrical Test, +25°C case				■ [4]	■ [4]
Final visual inspection, Method 2009	■	■	■	■	■
RHA P: 30 krad(Si) total dose		■		■	
RHA R: 100 krad(Si) total dose			■		■
SEE LET 40 MeV-cm^2/mg		■	■	■	■
(Note: SMRT 78.2 and MFP 85 MeV-cm^2/mg)					

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

Notes:
1. Our Redmond facility has a DLA approved RHA plan for Interpoint power products. Our SMD products with RHA “P” or “R” code meet DLA requirements.
2. “OO” prototypes are non-QML products and may not meet all of the requirements of MIL-PRF-38534. “O” in the RHA designator position in Interpoint model numbers indicates DLA RHA “-” defined as no RHA.
3. All processes are QML qualified and performed by certified operators.
4. Not required by DLA but performed to assure product quality.
5. 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