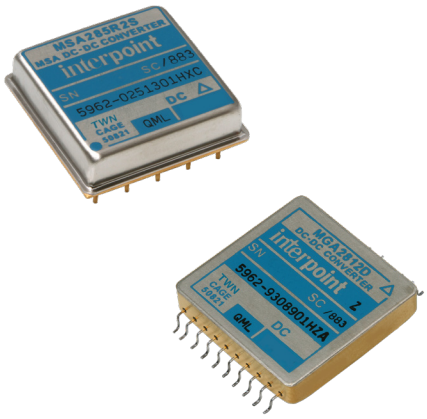
MSA and MGA Single and Dual DC-DC Converters

16 TO 40 VOLT INPUT - 5 WATT

FEATURES

- Small size, 1.14 in^2 (7.31 cm^2) - MSA
- Surface mount package - MGA
- -55° to +125°C operation
- 16 to 40 volt input
- 50 volts for 50 ms transient protection
- Fully isolated
- Fixed high frequency switching
- Inhibit function
- Indefinite short circuit protection
- Up to 76% efficiency
- Soft-start function limits inrush current during start-up



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

DESCRIPTION

The Interpoint® MSA Series™ and MGA Series™ of DC-DC converters offers up to 5 watts of power. The low profile MSA and MGA converters are manufactured in our fully certified and qualified MIL-PRF-38534 Class H production facility and packaged in hermetically sealed steel cases. Thick-film hybrid techniques provide military/aerospace reliability levels and optimum miniaturization. The hermetically sealed case is 1.070 by 1.070 inches with a height of 0.270 inches. Power density for the MSA/MGA Series converters is 16 watts per cubic inch.

The converters are offered with standard screening, “ES” screening, or fully compliant to “883” MIL-PRF-38534 Class H screening. Standard microcircuit drawings (SMD) are available. See Table 6 on page 5 and Table 8 on page 6. For screening options and descriptions See Table 14 on page 15.

CONVERTER DESIGN

The converters are switching regulators that use a flyback converter design with a constant switching frequency of 550 kHz typical. They are regulated, isolated units using a pulse width modulated topology and are built as high reliability thick-film hybrids. Isolation between input and output circuits is provided with a transformer in the forward power path 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. For dual outputs, negative output regulation is maintained by tightly coupled magnetics. Up to 4 watts, 80% of the total output power, is available from either output, provided that the opposite output is simultaneously carrying 20% of the total power in order to maintain the specified regulation on the negative output.

A predictable current limit is accomplished by direct monitoring of the output load current, which results in a constant current output. Internal input and output filters eliminate the need for external capacitors for stable operation. Output filter examples in Figure 3 and Figure 4 on page 3 provide suggested solutions for systems where very low output ripple is required.

WIDE VOLTAGE RANGE

The MSA and MGA converters are designed to provide full power operation over a 16 to 40 volt input range. Operation below 16 volts, including MIL-STD-704E emergency power conditions is possible with derated power.

IMPROVED DYNAMIC RESPONSE

The feed-forward compensation system provides excellent dynamic response and audio rejection. Audio rejection is typically 50 dB. The minimum to maximum step line transient response is typically less than 1%.

SPAN VOLTAGE

Our duals can be configured as a single output where 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. 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. In all cases Output Common of the converter is not connected. The maximum capacitance when using a span voltage on a dual is half the value specified for each output.

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Inhibit Function

The inhibit feature 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 the inhibit pin is pulled below 0.8 volts and enabled when its inhibit pin is left floating. An external inhibit interface should used to pull the converter's inhibit pin below 0.8 volts while sinking the maximum inhibit current and also allowing the inhibit pin to float high to enable the converter. A voltage should not be applied to the inhibit pin. 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. See Figure 2 on page 3.

Undervoltage Lockout and Transient Protection

Undervoltage lockout helps keep system current levels low during initialization or re-start operations. They can withstand short term transients of up to 50 volts without damage. A low voltage lockout feature keeps the converter shutdown below approximately 13 volts to ensure smooth initialization.

MIL-STD-461

Use our FMSA-461 (down-leaded) or our FMGA-461 (surface mount) EMI filter to pass the CE03 requirements of MIL-STD-461C.

Packaging

MSA Series - Down-leaded package

The MSA Series converters are packaged in hermetically sealed, projection-welded metal cases which provide EMI/RFI shielding. The small size, 1.075 x 1.075 x 0.270 inches (27.31 x 27.31 x 6.86 mm), saves space and weight in critical applications. See Figure 24 on page 13.

MGA Series - Surface mount package

The surface mount MGA DC-DC converters can be mounted with pick-and-place equipment or manually. See Figure 26 on page 14 for more information.

Internal components are soldered with Sn96 (melting temperature 221°C) to prevent damage during reflow. Maximum reflow temperature for surface mounting the MGA converter is 220°C for a maximum of 30 seconds. Sn60, 62, or 63 are the recommended types of solder. Hand soldering should not exceed 300°C for 10 seconds per pin.

The hermetically sealed metal cases are available in two different lead configurations. See Figure 25 and Figure 26 on page 14.

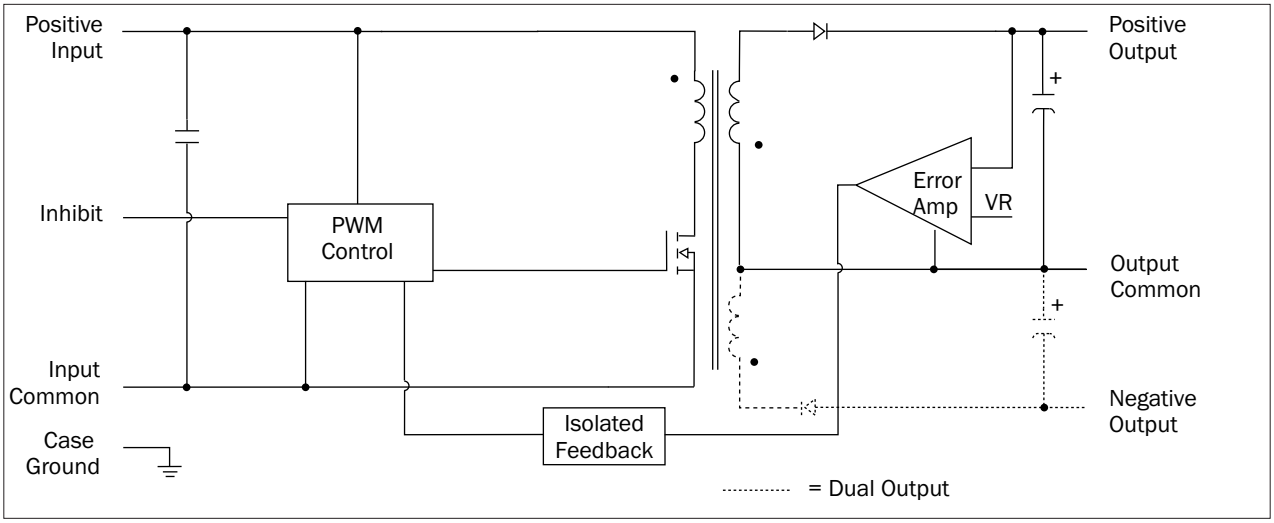

Figure 1: Block Diagram MSA and MGA

MSA and MGA Single and Dual DC-DC Converters

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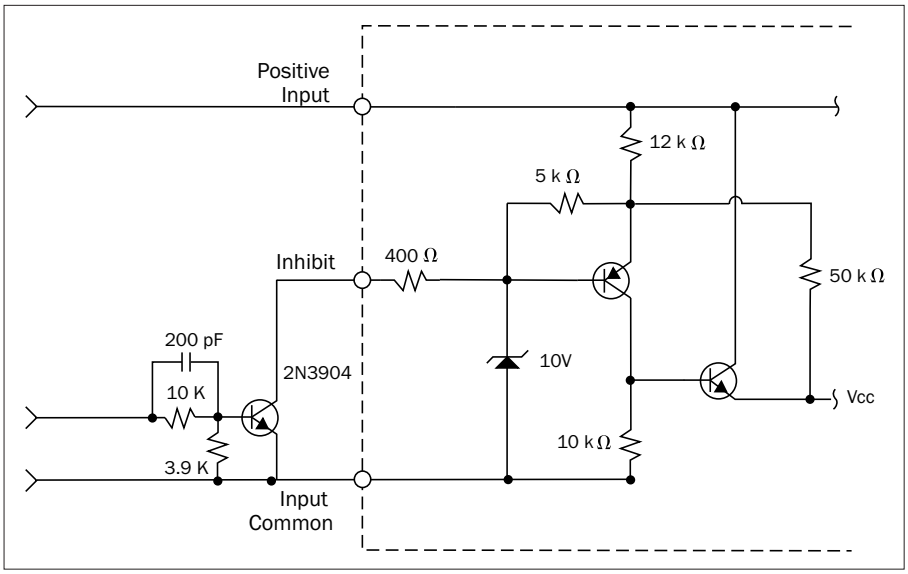

FIGURE 2: INHIBIT INTERFACE MSA AND MGA

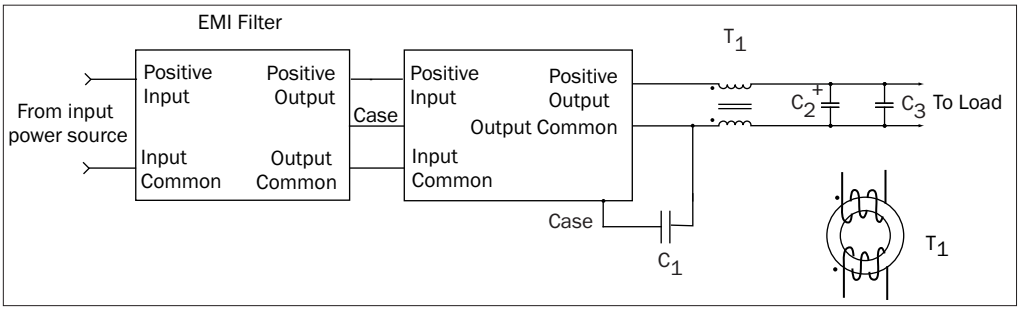

FIGURE 3: LOW NOISE OUTPUT FILTER MSA AND MGA SINGLE OUTPUT MODELS

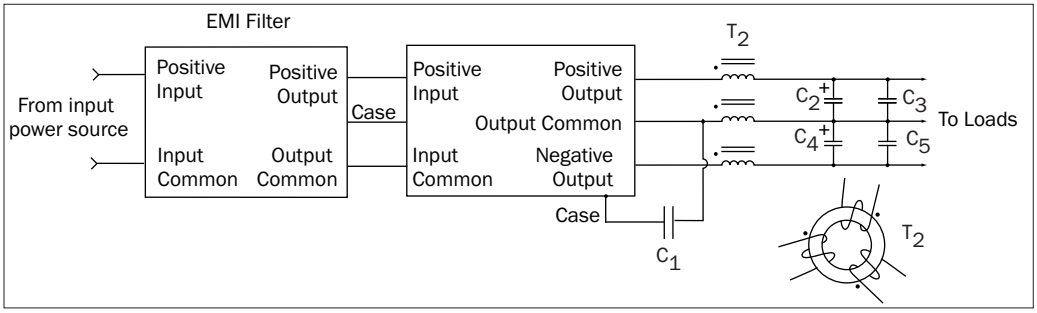

FIGURE 4: LOW NOISE OUTPUT FILTER MSA AND MGA DUAL OUTPUT MODELS

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 = 5000

Dual output:
T2 = 10T #28 AWG winding on toroid, µ = 5000

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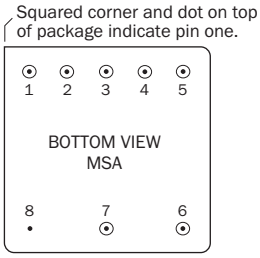
PIN OUT MSA MODELS		
Pin	**Single Output**	**Dual Output**
1	Positive Output	Positive Output
2	Output Common	Output Common
3	No Connection	Negative Output
4	No Connection	No Connection
5	Inhibit	Inhibit
6	Positive Input	Positive Input
7	Input Common	Input Common
8	Case Ground	Case Ground

TABLE 1: MSA PIN OUT



See Figure 24 on page 13.

FIGURE 5: MSA PIN OUT BOTTOM VIEW

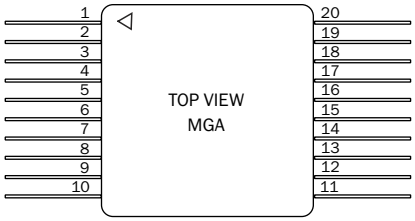
MSA PINS NOT IN USE	
Inhibit	Leave unconnected
“No Connection” pin	Leave unconnected

TABLE 2: MSA PINS NOT IN USE

PIN OUT MGA MODELS		
Pin	**Single Output**	**Dual Output**
1	Inhibit	Inhibit
2, 3	Positive Input	Positive Input
4	No Connection	No Connection
5, 6	Input Common	Input Common
7, 8	Case Ground	Case Ground
9, 10	No Connection	No Connection
11, 12	Positive Output	Positive Output
13	Positive Output	Output Common
14	Output Common	Output Common
15, 16	Output Common	Negative Output
17, 18	No Connection	No Connection
19, 20	Case Ground	Case Ground

To meet specified performance for the MGA, all pins must be connected except “No Connection” pins and Inhibit pin.

TABLE 3: MGA PIN OUT



Triangle in upper left corner of cover indicates pin one.

See Figure 25 on page 14.

FIGURE 6: MGA PIN OUT TOP VIEW

MGA PINS NOT IN USE	
Inhibit	Leave unconnected
“No Connection” pins	Connect to case ground for best EMI performance.

TABLE 4: MGA PINS NOT IN USE

MSA and MGA Single and Dual DC-DC Converters

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MODEL NUMBERING KEY

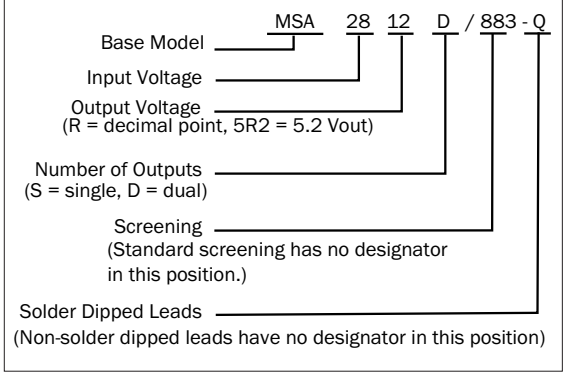

TABLE 5: MODEL NUMBERING KEY

SMD NUMBERS

STANDARD MICROCIRCUIT DRAWING (SMD)	MSA SIMILAR PART
5962-9309201HXC	MSA2805S/883
5962-0251301HXC	MSA285R2S/883
5962-9309301HXC	MSA2812S/883
5962-9309401HXC	MSA2815S/883
5962-0052201HXC	MSA2805D/883
5962-9308901HXC	MSA2812D/883
5962-9309001HXC	MSA2815D/883

SMD numbers shown are for screening level Class H, standard case (X), standard pin seal and non-solder dipped pins (C). For other options please refer to the SMD for the SMD number and the vendor similar number. All SMD numbers are listed on the SMD in the "Bulletin" which is the last page of the SMD. For exact specifications for an SMD product, refer to the SMD. SMDs can be downloaded from https://landandmaritimeapps.dla.mil/programs/smcr

TABLE 6: MSA SMD NUMBERS

MODEL NUMBER OPTIONS

TO DETERMINE THE MODEL NUMBER ENTER ONE OPTION FROM EACH CATEGORY IN THE FORM BELOW.

CATEGORY	Base Model and Input Voltage	Output Voltage [1]	Number of Outputs [2]	Screening [3]
OPTIONS	MSA28	05, 5R2, 12, 15	S	(standard, leave blank)
		05, 12, 15	D	ES
				883
FILL IN FOR MODEL # [4]	MSA28	_____	_____	/ _____

Notes
1. 5R2 is a 5.2 output model. 5R2S is only available as an MSA.
2. Number of Outputs: S is a single output and D is a dual output
3. Screening: For standard screening leave the screening option blank. For other screening options, insert the desired screening level. For more information see Table 14 on page 15.
4. If ordering by model number add suffix "-Q" to request solder dipped leads (MSA2805S/883-Q).

TABLE 7: MSA MODEL NUMBER OPTIONS

MSA and MGA Single and Dual DC-DC Converters

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MODEL NUMBERING KEY

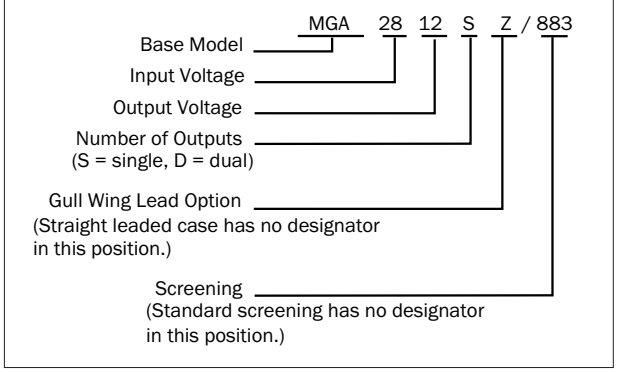

FIGURE 7: MGA MODEL NUMBERING KEY

SMD NUMBERS	
STANDARD MICROCIRCUIT DRAWING (SMD)	**MGA SIMILAR PART**
5962-9309201HZA	MGA2805SZ/883
5962-9309301HZA	MGA2812SZ/883
5962-9309401HZA	MGA2815SZ/883
5962-0052201HZA	MGA2805DZ/883
5962-9308901HZA	MGA2812DZ/883
5962-9309001HZA	MGA2815DZ/883
SMD numbers shown are for screening level Class H, MGA (flat pack, gull wing) case (Z), standard pin seal and solder dipped pins (A). For other options please refer to the SMD for the SMD number and the vendor similar number. All SMD numbers are listed on the SMD in the "Bulletin" which is the last page of the SMD. For exact specifications for an SMD product, refer to the SMD. SMDs can be downloaded from https://landandmaritimeapps.dla.mil/programs/smcr	

TABLE 8: MGA SMD NUMBERS

MODEL NUMBER OPTIONS

TO DETERMINE THE MODEL NUMBER ENTER ONE OPTION FROM EACH CATEGORY IN THE FORM BELOW.

CATEGORY	Base Model and Input Voltage	Output Voltage	Number of Outputs [1]	Case Options [2]	Screening [3]
OPTIONS	MGA28	05 12, 15	S	MGA – straight leads: leave blank	(standard, leave blank)
		05, 12, 15	D	MGA – solder-dipped gull wings: Z	ES
					883
FILL IN FOR MODEL #	MGA28	_____	_____	_____	/ _____

Notes
1. Number of Outputs: S is a single output and D is a dual output
2. Case Options: For the MSA down-leaded case leave the case option blank. For the MGA straight-lead case, leave the case option blank. For the MGA, surface mount gull-wing case, insert the letter "Z" in the case option position.
3. Screening: For standard screening leave the screening option blank. For other screening options, insert the desired screening level. For more information see Table 14 on page 15.

TABLE 9: MGA MODEL NUMBER OPTIONS

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TABLE 10: OPERATING CONDITIONS - ALL MODELS, 25°C CASE, 28 VIN, UNLESS OTHERWISE SPECIFIED.

		ALL MODELS			
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
LEAD SOLDERING TEMPERATURE	10 SECONDS MAX. PER LEAD	—	—	300	°C
MGA, SURFACE MOUNT SOLDER REFLOW [2]	Sn 60, 62 OR 63 RECOMMENDED	220°C for max. of 30 seconds			
STORAGE TEMPERATURE [1]		-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: INPUT TO OUTPUT, INPUT TO CASE, OUTPUT TO CASE [3]	@ 500 VDC AT 25°C	100	—	—	Megohms
INPUT TO OUTPUT CAPACITANCE [1]		—	50	—	pF
UNDERVOLTAGE LOCKOUT [1]		—	13	—	V
CURRENT LIMIT [1, 4]	% OF FULL LOAD	—	115%	—	%
AUDIO REJECTION [1]		—	50	—	dB
SWITCHING FREQUENCY	-55° TO +125°C	400	—	600	kHz
INHIBIT ACTIVE LOW (OUTPUT DISABLED) Do not apply a voltage to the inhibit pin. [5]	INHIBIT PIN PULLED LOW	—	—	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. [5]	INHIBIT PIN CONDITION	OPEN COLLECTOR OR UNCONNECTED			
	OPEN PIN VOLTAGE [1]	9	—	11	V

Notes
1. Guaranteed by qualification test and/or analysis. Not an in-line test.
2. See Figure 26 on page 14 for more information
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%.
   Dual outputs: The over-current limit will trigger when the sum of the currents from both outputs reaches 115% (typical value) of the maximum rated "total" current of both outputs.
5. An external inhibit interface should be used to pull the inhibit low or leave it floating. The inhibit pin can be left unconnected if not used.

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TABLE 11: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

MSA AND MGA SINGLE OUTPUT MODELS		MSA2805S MGA2805S			MSA285R2S (no MGA285R2S)			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		4.80	5.00	5.20	4.99	5.20	5.41	V
OUTPUT CURRENT	V_{IN} = 16 TO 40	0	—	1000	0	—	962	mA
OUTPUT POWER	V_{IN} = 16 TO 40	0	—	5	0	—	5	W
OUTPUT RIPPLE	T_C = 25°C	—	125	350	—	110	335	mV p-p
10 kHz TO 2 MHz	T_C = -55°C TO +125°C	—	—	525	—	—	525	
LINE REGULATION	V_{IN} = 16 TO 40	—	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 50 ms [1]	—	—	50	—	—	50	
INPUT CURRENT	NO LOAD	—	27	40	—	28	40	mA
	INHIBITED	—	3	5	—	3	4	
INPUT RIPPLE CURRENT [2]	10 kHz TO 10 MHz	—	30	150	—	30	150	mA p-p
EFFICIENCY	T_C = 25°C	66	71	—	66	71	—	%
	T_C = -55°C TO +125°C	64	—	—	64	—	—	
LOAD FAULT [3, 4]	POWER DISSIPATION	—	—	2.2	—	—	2.2	W
SHORT CIRCUIT	RECOVERY [1]	—	—	75	—	—	75	ms
STEP LOAD RESPONSE [4, 5]	TRANSIENT	—	—	±750	—	—	±750	mV pk
50% - 100% - 50%	RECOVERY	—	—	1500	—	—	1500	µs
STEP LINE RESPONSE [1, 4, 6]	TRANSIENT	—	—	±500	—	—	±500	mV pk
V_{IN} = 16 - 40 - 16	RECOVERY	—	—	900	—	—	900	µs
START-UP [4]	DELAY	—	—	30	—	—	75	ms
V_{IN} = 0 TO 28	OVERSHOOT [1]	—	—	200	—	—	500	mV pk
CAPACITIVE LOAD [1, 7]	T_C = 25°C	—	—	300	—	—	300	µF

Notes
1. Guaranteed by qualification test and/or analysis. Not an in-line test.
2. An external 2 µH inductor, added in series to the input, is necessary to maintain specifications.
3. Indefinite short circuit protection not guaranteed above 125°C (case).
4. Recovery time is measured from application of the transient to point at which Vout is within 1% of Vout at final value.
5. Step load test is performed at 10 microseconds typical.
6. Step line test is performed at 100 microseconds ± 20 microseconds.
7. No effect on dc performance.

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TABLE 12: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

MSA AND MGA SINGLE OUTPUT MODELS		MSA2812S MGA2812S			MSA2815S MGA2815S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		11.52	12.00	12.48	14.40	15.00	15.60	V
OUTPUT CURRENT	V_{IN} = 16 TO 40	0	—	417	0	—	333	mA
OUTPUT POWER	V_{IN} = 16 TO 40	0	—	5	0	—	5	W
OUTPUT RIPPLE	T_C = 25°C	—	50	200	—	50	170	mV p-p
10 kHz - 2 MHz	T_C = -55°C TO +125°C	—	—	300	—	—	250	
LINE REGULATION	V_{IN} = 16 TO 40	—	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 50 ms [1]	—	—	50	—	—	50	
INPUT CURRENT	NO LOAD	—	29	42	—	31	44	mA
	INHIBITED	—	3	5	—	3	5	
INPUT RIPPLE CURRENT [2]	10 kHz - 10 MHz	—	30	150	—	30	150	mA p-p
EFFICIENCY	T_C = 25°C	70	76	—	71	76	—	%
	T_C = -55°C TO +125°C	68	—	—	69	—	—	
LOAD FAULT [3, 4]	POWER DISSIPATION	—	—	2.1	—	—	2.0	W
SHORT CIRCUIT	RECOVERY [1]	—	—	30	—	—	30	ms
STEP LOAD RESPONSE [4, 5]	TRANSIENT	—	—	±1100	—	—	±1500	mV pk
50% - 100% - 50%	RECOVERY	—	—	3000	—	—	3500	µs
STEP LINE RESPONSE [1, 4, 6]	TRANSIENT	—	—	±800	—	—	±500	mV pk
V_{IN} = 16 - 40 - 16	RECOVERY	—	—	1300	—	—	1300	µs
START-UP [4]	DELAY	—	—	30	—	—	30	ms
V_{IN} = 0 - 28	OVERSHOOT [1]	—	—	500	—	—	500	mV pk
CAPACITIVE LOAD [1, 7]	T_C = 25°C	—	—	300	—	—	300	µF

Notes
1. Guaranteed by qualification test and/or analysis. Not an in-line test.
2. An external 2 µH inductor, added in series to the input, is necessary to maintain specifications.
3. Indefinite short circuit protection not guaranteed above 125°C (case).
4. Recovery time is measured from application of the transient to point at which Vout is within 1% of Vout at final value.
5. Step load test is performed at 10 microseconds typical.
6. Step line test is performed at 100 microseconds ± 20 microseconds.
7. No effect on dc performance.

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TABLE 13: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

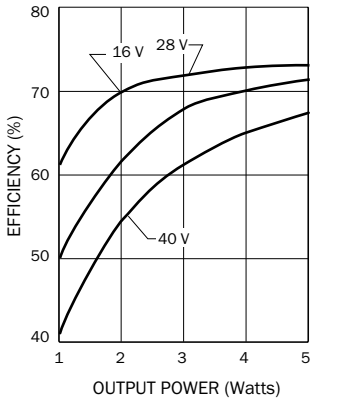
MSA AND MGA DUAL OUTPUT MODELS		MSA2805D MGA2805D			MSA2812D MGA2812D			MSA2815D MGA2815D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	$+V_{OUT}$	4.80	5.00	5.20	11.52	12.00	12.48	14.40	15.00	15.60	V
	$-V_{OUT}$	4.75	5.00	5.25	11.04	12.00	12.96	13.80	15.00	16.20	
OUTPUT CURRENT [2]	EITHER OUTPUT	—	±500	800	—	±208	333	—	±167	267	mA
V_{IN} = 16 TO 40	TOTAL OUTPUT	—	—	1000	—	—	416	—	—	334	
OUTPUT POWER [2]	EITHER OUTPUT	—	±2.50	4	—	±2.50	4	—	±2.50	4	W
V_{IN} = 16 TO 40	TOTAL OUTPUT	—	—	5	—	—	5	—	—	5	
OUTPUT RIPPLE, ± V_{OUT}	T_C = 25°C	—	—	150	—	40	140	—	60	150	mV p-p
10 kHz - 2 MHz	T_C = -55°C TO +125°C	—	—	300	—	—	250	—	—	250	
LINE REGULATION	$+V_{OUT}$	—	10	25	—	10	50	—	10	50	mV
V_{IN} = 16 TO 40 V	$-V_{OUT}$	—	40	75	—	40	180	—	40	180	
LOAD REGULATION	$+V_{OUT}$	—	10	50	—	10	50	—	10	50	mV
NO LOAD TO FULL	$-V_{OUT}$	—	50	200	—	50	200	—	50	200	
CROSS REGULATION [1, 3]	FIGURE 22 ON PAGE 12	—	10	—	—	4	—	—	3	—	%
EFFECT ON $-V_{OU}$	(20 TO 80%)										
	FIGURE 23 ON PAGE 12	—	5	8	—	3.7	6	—	3	6	
	(50 TO 20%)										
INPUT VOLTAGE	CONTINUOUS	16	28	40	16	28	40	16	28	40	V
NO LOAD TO FULL	TRANSIENT 50 ms [1]	—	—	50	—	—	50	—	—	50	
INPUT CURRENT	NO LOAD	—	30	35	—	33	58	—	38	60	mA
	INHIBITED	—	3	5	—	3	5	—	3	5	
INPUT RIPPLE CURRENT [4]	10 kHz - 10 MHz	—	30	160	—	30	150	—	30	150	mA p-p
EFFICIENCY	T_C = 25°C	68	72	—	69	75	—	70	75	—	%
	T_C = -55°C TO +125°C	65	—	—	67	—	—	68	—	—	
LOAD FAULT [5, 6]	POWER DISSIPATION	—	—	2.0	—	—	1.9	—	—	1.8	W
SHORT CIRCUIT	RECOVERY [1]	—	—	50	—	—	30	—	—	50	ms
STEP LOAD RESPONSE [6, 7]	TRANSIENT	—	—	±500	—	—	±1400	—	—	±1400	mV pk
50% - 100% - 50%	RECOVERY	—	—	1000	—	—	4500	—	—	4500	µs
STEP LINE RESPONSE [1, 6, 8]	TRANSIENT	—	—	±750	—	—	±500	—	—	±1500	mV pk
V_{IN} = 16 - 40 - 16	RECOVERY	—	—	1.2	—	—	2.0	—	—	1.2	ms
START-UP [6]	DELAY	—	—	25	—	—	30	—	—	25	ms
V_{IN} = 0 TO 28	OVERSHOOT [1]	—	—	750	—	—	500	—	—	500	mV pk
CAPACITIVE LOAD [1, 9, 10]	T_C = 25°C	—	—	100	—	—	100	—	—	100	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 defined cross loading conditions. See Figure 22 and Figure 23 on page 12.
4. An external 2 µH inductor, added in series to the input, is necessary to maintain specifications.
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 Vout is within 1% of Vout 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. Each output.
10. No effect on dc performance.

MSA and MGA Single and Dual DC-DC Converters

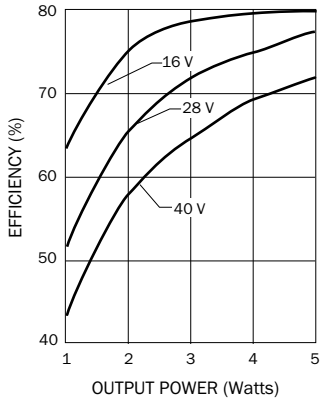
16 TO 40 VOLT INPUT - 5 WATT

TYPICAL PERFORMANCE PLOTS: 28 VIN, 25°C CASE, 100% LOAD, UNLESS OTHERWISE SPECIFIED.
THESE ARE EXAMPLES FOR REFERENCE ONLY AND ARE NOT GUARANTEED SPECIFICATIONS.



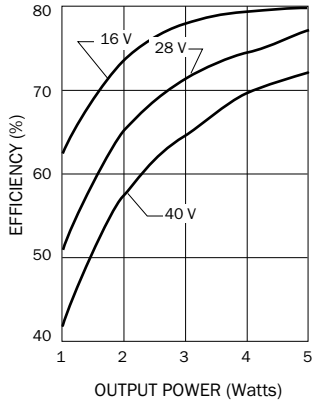
MSA and MGA2805S EFFICIENCY

FIGURE 8



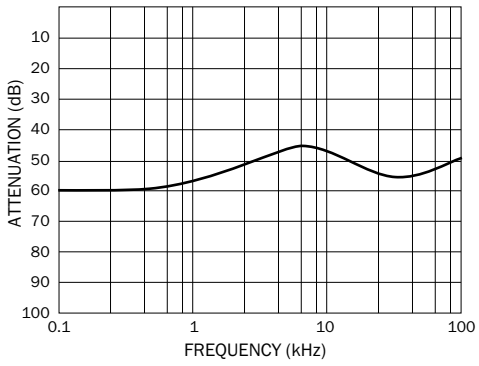
MSA and MGA2812S EFFICIENCY

FIGURE 9



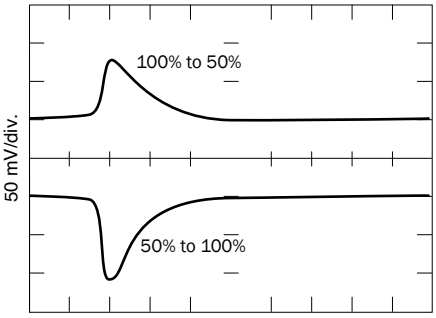
MSA and MGA2815S EFFICIENCY

FIGURE 10



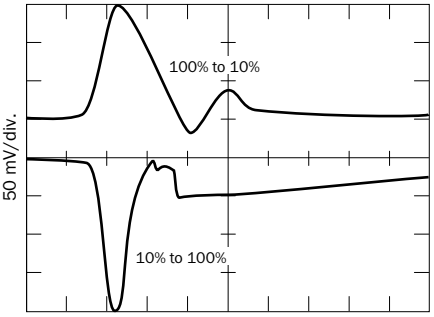
MSA SERIES AUDIO REJECTION

FIGURE 11



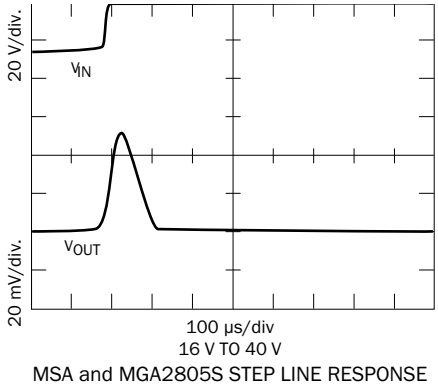
MSA and MGA2805S STEP LOAD RESPONSE

FIGURE 12



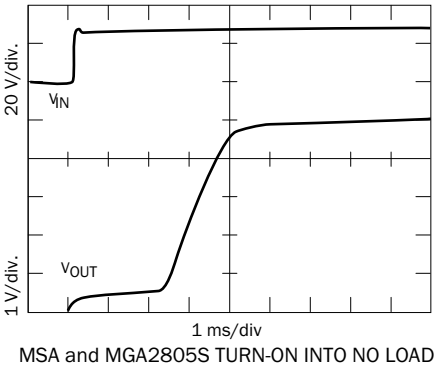
MSA and MGA2805S STEP LOAD RESPONSE

FIGURE 13



MSA and MGA2805S STEP LINE RESPONSE

FIGURE 14



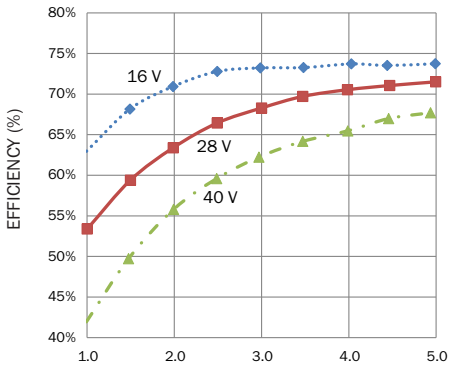
MSA and MGA2805S TURN-ON INTO NO LOAD

FIGURE 15

MSA and MGA Single and Dual DC-DC Converters

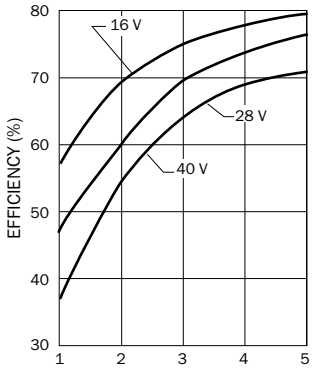
16 TO 40 VOLT INPUT - 5 WATT

TYPICAL PERFORMANCE PLOTS: 28 VIN, 25°C CASE, 100% LOAD, UNLESS OTHERWISE SPECIFIED.
THESE ARE EXAMPLES FOR REFERENCE ONLY AND ARE NOT GUARANTEED SPECIFICATIONS.



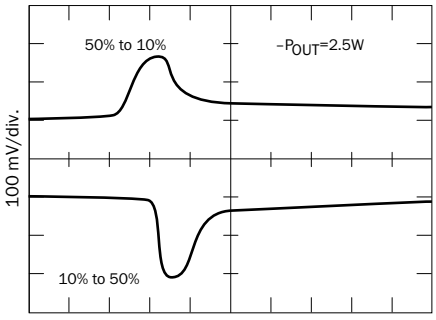
MSA and MGA2805D EFFICIENCY

FIGURE 16



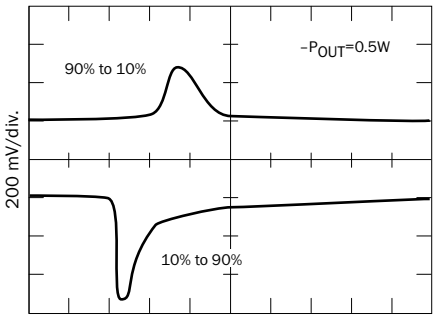
MSA and MGA2815D EFFICIENCY

FIGURE 17



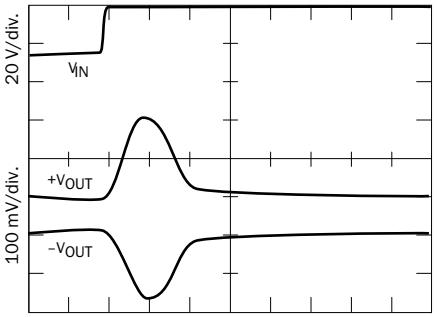
100 µs/div
10% ↔ 50%)
MSA and MGA2815D
+VO STEP LOAD RESPONSE

FIGURE 18



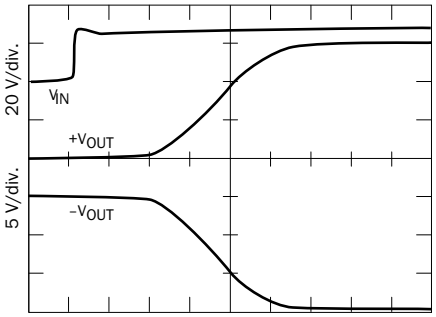
200 µs/div
10% ↔ 90%
MSA and MGA2815D
+VO STEP LOAD RESPONSE

FIGURE 19



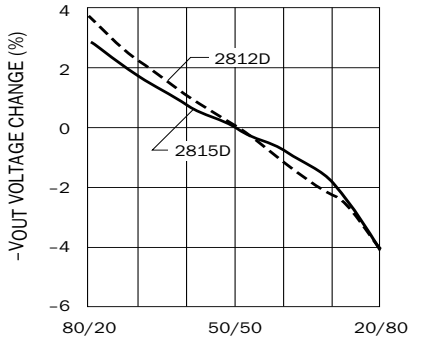
200 µs/div
16 V TO 40 V
MSA and MGA2815D
INPUT STEP LINE RESPONSE

FIGURE 20



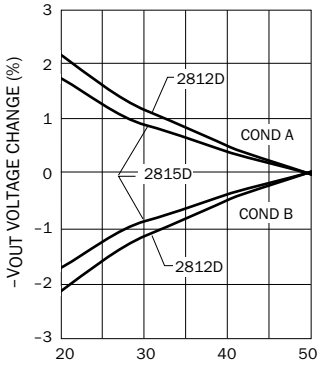
500 µs/div
MSA and MGA2815D
TURN-ON INTO NO LOAD

FIGURE 21



OUTPUT LOAD (+VOUT% / –VOUT%)
80-20% LOAD on +V, 20-80% LOAD on –V
MSA and MGA DUAL
CROSS REGULATION

FIGURE 22



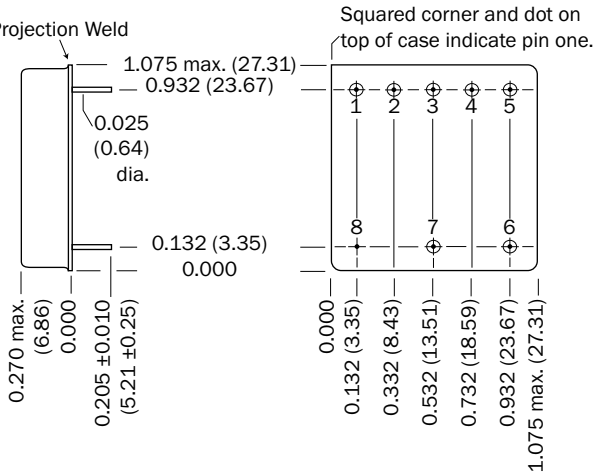
COND. A: 50% LOAD +V; 10% to 50% –V
COND. B: 50% LOAD –V; 10% to 50% +V
MSA DUAL CROSS REGULATION

FIGURE 23

MSA and MGA Single and Dual DC-DC Converters

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 - 100 microinches included in pin diameter Seal hole: 0.070 ±0.003 (1.78 ±0.08)

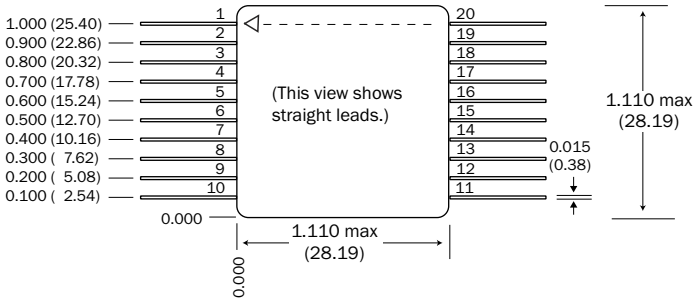
Please refer to the numerical dimensions for accuracy.

FIGURE 24: MSA CASE DIMENSIONS

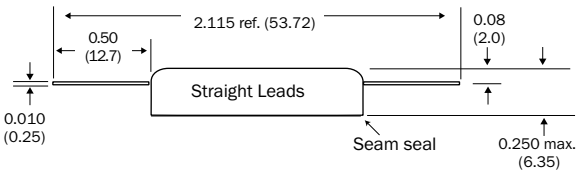
MSA and MGA Single and Dual DC-DC Converters

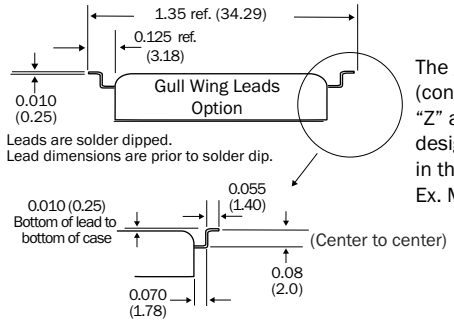
16 TO 40 VOLT INPUT - 5 WATT

TOP VIEW CASE D1



The triangle (ESD) marking on the cover indicates pin one. Cover marking is oriented with pin one at the upper right corner. The straight lead configuration does not require a “case designator” in the model number. Ex. MGA2805S





The gull wing option (configuration) requires “Z” as a “case designator” in the model number. Ex. MGA2805SZ

Weight: 15 grams max.

Dimensions in inches (mm)
Tolerance ±0.005 (0.13) for three decimal places,
±0.01 (0.3) for two decimal places, unless otherwise specified
Please refer to the numerical dimensions for accuracy.

CAUTION
Maximum reflow temperature is 220°C for a maximum of 30 seconds. SN60, SN62, or SN63 are the recommended types of solder. See MGA gull-wing solder pads layout. Hand soldering should not exceed 300°C for 10 seconds per pin.

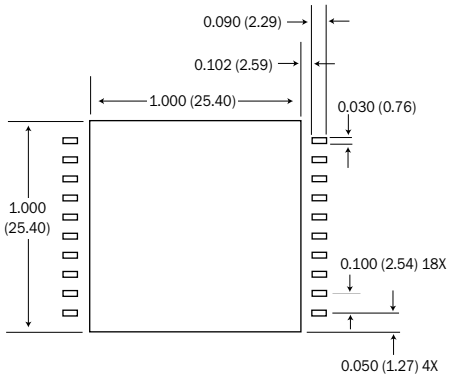
Materials

Header	Kovar/Nickel/Gold
Cover	Kovar/Nickel
Pins	Kovar/Nickel/Gold matched glass seal
	Gold plating of 50 - 150 microinches is included in pin diameter
	Seal hole: 0.040 ±0.002 (1.02 ±0.05)

Please refer to the numerical dimensions for accuracy.

FIGURE 25: MGA CASE DIMENSIONS

CASE D1 GULL-WING PADS



Dimensions in inches (mm)
Tolerance ±0.005 (0.13) for three decimal places ±0.01 (0.3) for two decimal places, unless otherwise specified.
Please refer to the numerical dimensions for accuracy.

CAUTION:
Internal components are soldered with SN96 (melting temperature 221°C) to prevent damage during reflow. Maximum reflow temperature for surface mounting the MGA converter is 220°C for a maximum of 30 seconds. SN60, 62, or 63 are the recommended types of solder.

Hand soldering should not exceed 300°C for 10 seconds per pin.

SOLDER MASK NOTES

1. Pad dimensions are for the solder mask. Leads common to each other can be connected to each other as desired.
2. Ground (case) pins should be connected to the center pad for improved grounding.
3. Connect "no connection" pins to case ground to reduce EMI.
4. Center pad should not have a solder mask. Solder, copper, or Au/Ni plate are preferred over solder mask for adhesive attach.
5. Pre-tin base of converter prior to soldering.
6. If less rotation of case is desired, reduce the width of the large case pad by 0.020 inches (0.51 mm). Pad length can be extended 0.010 inches (0.25 mm) towards the case body and an as-desired dimension away from the case body.
7. Do not exceed 220°C as measured on the body of the converter (top or bottom).
8. Attach the body of the case to the board with a thermally conductive adhesive or SN60, 62, or 63 solder. The adhesive can be electrically conductive as well. It can be applied as an underfill post solder or dispensed and cured prior or during solder.
9. In the presence of vibration, to ensure reliable mechanical attachment, the body of the case should be attached with adhesive or solder as noted above (note 8). The leads alone do not provide sufficient mechanical attachment.

FIGURE 26: MGA GULL-WING SOLDER PAD LAYOUT

SURFACE MOUNT CASE AND LEAD OPTIONS

MSA and MGA Single and Dual DC-DC Converters

16 TO 40 VOLT INPUT - 5 WATT

ELEMENT EVALUATION TABLES FOR QML PRODUCTS ARE IN "APP-009 QUALITY AND CERTIFICATION", APPENDIX A, IN COMPLIANCE WITH MIL-PRF-38534 REVISION L. (LINK HTTPS://WWW.CRANEAE.COM/QUALITY-ASSURANCE-MODULAR-POWER)

ENVIRONMENTAL SCREENING HIGH RELIABILITY STANDARD, /ES, /SX AND /883 (CLASS H)

	NON-QML [1]			CLASS H QML [2, 3]
TEST PERFORMED	**STANDARD**	**/ES**	**/SX [4]**	**/883**
Pre-cap Inspection, Method 2017, 2032	■	■	■	■
Temperature Cycle (10 times)				
Method 1010, Cond. C, -65°C to +150°C, ambient			■	■
Method 1010, Cond. B, -55°C to +125°C, ambient		■		
Constant Acceleration				
Method 2001, 3000 g			■	■
Method 2001, 500 g		■		
PIND, Test Method 2020, Cond. A			■ [5]	■ [5]
Burn-in Method 1015, +125°C case, typical [6]				
96 hours		■		
160 hours			■	■
Final Electrical Test, MIL-PRF-38534, Group A,				
Subgroups 1 through 6, -55°C, +25°C, +125°C case			■	■
Subgroups 1 and 4, +25°C case	■	■		
Hermeticity Test, Method 1014				
Gross Leak, Cond. C_1, fluorocarbon		■	■	■
Fine Leak, Cond. A_2, helium		■	■	■
Gross Leak, Dip	■			
Final visual inspection, Method 2009	■	■	■	■

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

Notes
1. Non-QML products may not meet all of the requirements of MIL-PRF-38534.
2. All processes are QML qualified and performed by certified operators.
3. A QML products which has an SMD number is marked "QML". A QML product which does not have an SMD number is marked per MIL-PRF-38534 table III.

TABLE 14: ENVIRONMENTAL SCREENING HUGH RELIABILITY STANDARD, /ES AND /883 (CLASS H)