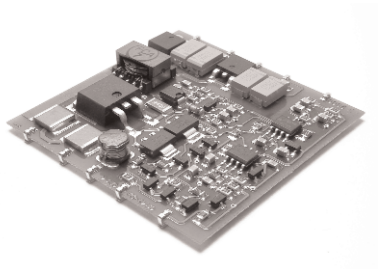
DC/DC CONVERTERS
28 VOLT INPUT

MSM SERIES
5 WATT

FEATURES
- **–55°C to +125°C operation**
- **16 to 40 VDC input**
- **Surface mountable**
- Will withstand solder reflow
- Transient protection up to 80V/120 ms, meets MIL-STD-704A requirements
- Inhibit function
- Fully isolated
- Ultra-wide bandwidth magnetic feedback
- Up to 82% efficiency
- Indefinite short circuit protection
- Undervoltage shutdown below 10 Vin



MODELS

VDC OUTPUT

SINGLES	DUALS
3.3	±12
5	±15
12	
15	

Size (max.): 2.01 x 2.01 x 0.312 inches (51.1 x 51.1 x 7.9 mm)
Weight: 20 grams maximum

DESCRIPTION
The MSM Series™ of DC/DC converters delivers up to 5 watts in a surface mountable package. The use of commercially available discrete components, printed wiring board construction, and surface mount technology keep costs low. Mature design technology and severe derating maintain high-reliability, providing full power operation over the full military temperature range of –55 to +125°C.

Output voltages of 3.3, 5, 5.2, 12, 15, ±12, or ±15 operate from an input range of 16 to 40 VDC. Operation below 16 volts is possible at reduced power while still maintaining output regulation. The converters are rated for input transients up to 80 V for up to 120 milliseconds which meets the requirements for MIL-STD-704A.

CONVERTER DESIGN
The converters incorporate a flyback topology with a constant frequency to minimize EMI and noise. The pulse-width-modulator is constructed of discrete devices to allow to the use of mature technologies and assure operation over the full temperature range. A proprietary magnetic isolator, designed with feed-forward and load correction, provides nearly instantaneous output control for good output regulation.

INHIBIT FUNCTION
MSM Series converters provide a TTL open collector-compatible 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 the TTL compatible 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 V. In the inhibit mode, a maximum of 0.5 mA must be sunk from the inhibit pin.

PROTECTION FEATURES
Undervoltage lockout prevents the MSM Series converters from operating below approximately 10 VDC input. This circuitry can prevent system shutdown problems in starting "constant power" devices at low input voltages. All models include a soft-start function to prevent large current draw and minimize overshoot under all load and line conditions. The MSM Series of converters also provide short circuit and overload protection. Short circuit internal dissipation is lower than the internal dissipation which occurs during full load conditions.

SURFACE MOUNTABLE PACKAGING
The MSM Series of DC/DC converters can be surface mounted or hand-soldered. Maximum reflow temperature for surface mounting the MSM converter is 230°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.

DC/DC CONVERTERS

ABSOLUTE MAXIMUM RATINGS

Input Voltage
- 16 to 40 VDC

Output Power
- 5 W

Power Dissipation
- 1.9 W

Lead Soldering Temperature (10 sec per lead)
- 300°C

Storage Temperature Range (Base plate)
- –55°C to +130°C

INHIBIT

Inhibit – TTL Open Collector
- Logic low (output disabled)
- Inhibit pin current 0.34 mA typ
- Referenced to input common
- Logic high (output enabled) open collector

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range
- 16 to 40 VDC continuous
- 80 V for 120 msec transient

Case Operating Temperature (Tc)
- –55°C to +125°C full power
- –55°C to +130°C absolute

Derating Output Power/Current (Tc)
- Linearly from 100% at 125°C to 0% at 130°C

TYPICAL CHARACTERISTICS

Output Voltage Temperature Coefficient
- 200 ppm/°C typical

Temperature Rise (Still Air)
- 18°C / watt dissipated, typical

Input to Output Capacitance
- 100 pF typical

Undervoltage Lockout
- 10 V input typical

Current Limit
- 160% of full load typical

Isolation
- 100 megohm minimum at 500 V

Conversion Frequency (kHz)
- 25°C, 200 min, 300 typ, 400 max

Inhibit Pin Voltage (unit enabled)
- 10 V, typical

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, unless otherwise specified.

SINGLE OUTPUT MODELS		MSM283R3S			MSM2805S			MSM2812S			MSM2815S			
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	UNITS
OUTPUT VOLTAGE	Tc = 25°C	3.25	3.3	3.35	4.93	5	5.08	11.82	12	12.18	14.78	15	15.23	VDC
OUTPUT CURRENT	V_{IN} = 16 TO 40 VDC	—	1.52	—	—	1.0	—	—	0.42	—	—	0.33	—	A
OUTPUT POWER	V_{IN} = 16 TO 40 VDC	0	—	5	0	—	5	0	—	5	0	—	5	W
OUTPUT RIPPLE VOLTAGE	10 kHz - 2 MHz	—	250	—	—	200	—	—	180	—	—	150	—	mV p-p
	Tc = –55°C TO +125°C	—	1800	—	—	1500	—	—	1200	—	—	1000	—	
LINE REGULATION	V_{IN} = 16 TO 40 VDC	—	60	—	—	80	—	—	120	—	—	150	—	mV
LOAD REGULATION	NO LOAD TO FULL	—	150	—	—	250	—	—	350	—	—	400	—	mV
INPUT VOLTAGE	CONTINUOUS	16	28	40	16	28	40	16	28	40	16	28	40	VDC
NO LOAD TO FULL	TRANSIENT 120 ms	0	—	80	0	—	80	0	—	80	0	—	80	V
INPUT CURRENT	NO LOAD	—	28	—	—	25	—	—	20	—	—	16	—	mA
	FULL LOAD	—	242	—	—	235	—	—	230	—	—	223	—	
	INHIBITED	—	4.5	—	—	4.5	—	—	4.5	—	—	4.5	—	
INPUT RIPPLE CURRENT	10k Hz - 10 MHz	—	30	—	—	25	—	—	20	—	—	15	—	mA p-p
	Tc = –55°C TO +125°C	—	180	—	—	150	—	—	120	—	—	100	—	
EFFICIENCY	Tc = 25°C	—	74	—	—	76	—	—	78	—	—	80	—	%
LOAD FAULT	POWER DISSIPATION OVERLOAD	—	1.9	—	—	1.8	—	—	1.7	—	—	1.5	—	W
	SHORT CIRCUIT[1]	—	1	—	—	0.9	—	—	0.8	—	—	0.7	—	
	RECOVERY[2]	—	9	—	—	8.5	—	—	8	—	—	7.5	—	ms
	OUTPUT CURRENT TRIP POINT	—	2.2	—	—	1.5	—	—	0.7	—	—	0.56	—	A
	SHORT CIRCUIT	—	2.3	—	—	1.6	—	—	0.8	—	—	0.6	—	
STEP LOAD RESPONSE	50 %–100%– 50% TRANSIENT[3]	—	350	—	—	350	—	—	400	—	—	400	—	mV pk
	RECOVERY[2]	—	0.8	—	—	0.8	—	—	1.0	—	—	1.0	—	ms
STEP LINE RESPONSE	16 TO 40 TO 16 V_{IN} TRANSIENT[3]	—	400	—	—	400	—	—	500	—	—	500	—	mV pk
	RECOVERY[2]	—	1.5	—	—	1.5	—	—	2.0	—	—	2.0	—	ms
START-UP	DELAY	—	4	—	—	4	—	—	4	—	—	4	—	ms
0 TO 28 VIN	OVERSHOOT	—	250	—	—	300	—	—	350	—	—	400	—	mV pk

Notes:
1. Short circuit is measured with a 50 mohm resistive load.
2. Time to settle within 1% of V_{OUT}
3. Transition ≥ 10 µs.

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Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, unless otherwise specified.

DUAL OUTPUT MODELS		MSM2812D			MSM2815D			
PARAMETER	**CONDITIONS**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**UNITS**
OUTPUT VOLTAGE	Tc = 25°C	±11.82	±12	±12.18	±14.78	±15	±15.23	VDC
OUTPUT CURRENT	V_{IN} = 16 TO 40 VDC	0	±208	—	0	±167	—	mA
OUTPUT POWER[1]	V_{IN} = 16 TO 40 VDC	0	—	5	0	—	5	W
OUTPUT RIPPLE VOLTAGE $+V_{OUT}$	10 kHz - 2 MHz	—	180	—	—	150	—	mV p-p
	Tc = –55°C TO +125°C	—	1200	—	—	1000	—	
$-V_{OUT}$	10 kHz - 2 MHz	—	180	—	—	150	—	
	Tc = –55°C TO +125°C	—	1200	—	—	1000	—	
LINE REGULATION	$+V_{OUT}$	—	120	—	—	150	—	mV
V_{IN} = 16 TO 40 VDC	$-V_{OUT}$	—	120	—	—	150	—	
LOAD REGULATION	$+V_{OUT}$	—	350	—	—	400	—	mV
NO LOAD TO FULL	$-V_{OUT}$	—	350	—	—	400	—	
INPUT VOLTAGE	CONTINUOUS	16	28	40	16	28	40	VDC
NO LOAD TO FULL	TRANSIENT 120 ms	0	—	80	0	—	80	V
INPUT CURRENT	NO LOAD	—	20	—	—	16	—	mA
	FULL LOAD	—	230	—	—	220	—	
	INHIBITED	—	4.5	—	—	4.5	—	
INPUT RIPPLE CURRENT	10 kHz - 2 MHz	—	20	—	—	15	—	mA p-p
	Tc = –55°C TO +125°C	—	120	—	—	100	—	
EFFICIENCY		—	80	—	—	82	—	%
LOAD FAULT	POWER DISSIPATION							
	OVERLOAD	—	1.7	—	—	1.5	—	W
	SHORT CIRCUIT[2]	—	0.8	—	—	0.7	—	
	RECOVERY[3]	—	8.0	—	—	7.5	—	ms
	OUTPUT CURRENT TRIP POINT	—	350	—	—	280	—	mA
	SHORT CIRCUIT	—	380	—	—	300	—	
STEP LOAD RESPONSE ± V_{OUT}	50 %–100%– 50% TRANSIENT[4]	—	400	—	—	400	—	mV pk
	RECOVERY[3]	—	1	—	—	1	—	ms
STEP LINE RESPONSE ± V_{OUT}	16 TO 40 TO 16 V_{IN} TRANSIENT[4]	—	500	—	—	500	—	mV pk
	RECOVERY[3]	—	2	—	—	2	—	ms
START–UP ± V_{OUT}	DELAY	—	4	—	—	3.5	—	ms
	OVERSHOOT	—	350	—	—	400	—	mV pk

Notes:

1. The maximum specification indicates the converter's total output power, Up to 75% of the total is available from either output providing the other output maintains a minimum of 25% of the total power.
2. Short circuit is measured with a 50 mohm resistive load.
3. Time to settle within 1% of V_{OUT}
4. Transition ≥ 10 µs.

PIN OUT

Pin	Single Output	Dual Output
1	Input Common	Input Common
2	Input Common	Input Common
3	Positive Input	Positive Input
4	No connection	No connection
5	Inhibit	Inhibit
6	No connection	No connection
7	Output Common	Output Common
8	Positive Output	Positive Output
9	Output Common	Output Common
10	No connection	Negative Output

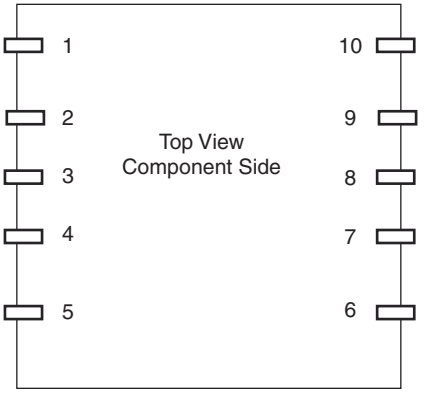
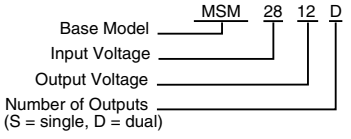


FIGURE 1: PIN OUT

MODEL NUMBERING KEY



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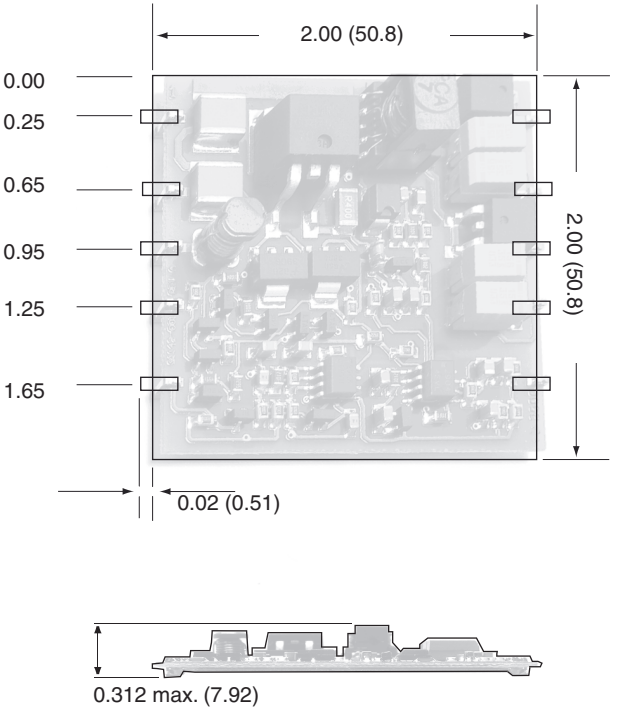

Case dimensions in inches (mm)
Tolerance ±0.005 (0.13) for three decimal places, ±0.01 (0.3) for two decimal places unless otherwise specified. Pin spacing tolerance is ±0.010

CAUTION
Maximum reflow temperature for surface mounting the MSM converter is 230°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.

Note: Although every effort has been made to render the case drawings at actual size, variations in the printing process may cause some distortion. Please refer to the numerical dimensions for accuracy.

FIGURE 2: MSM SERIES OUTLINE DRAWING

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27922 DTS Rev B This revision supercedes all previous releases.
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