REVISIONS			
LTR	**DESCRIPTION**	**DATE**	**APPROVED**
A	Update document paragraphs to current requirements. - ro	17-11-06	C. SAFFLE

Prepared in accordance with ASME Y14.24

Vendor item drawing

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REV STATUS OF PAGES	**REV**		A	A	A	A	A	A	A	A	A	A									
	PAGE		1	2	3	4	5	6	7	8	9	10									

PMIC N/A

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Original date of drawing
YY-MM-DD

11-06-29

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TITLE

MICROCIRCUIT, LINEAR, CMOS, MICROPOWER, STEP UP SWITCHING VOLTAGE REGULATOR, MONOLITHIC SILICON

SIZE	**CODE IDENT. NO.**	**DWG NO.**
A	**16236**	**V62/09637**

REV **A**

PAGE 1 **OF** 10

AMSC N/A

5962-V064-17

DISTRIBUTION STATEMENT A. Approved for public release. *Distribution is unlimited*.

1. SCOPE

1.1 Scope. This drawing documents the general requirements of a CMOS micropower, step up switching voltage regulator microcircuit, with an operating temperature range of -55°C to +125°C.

1.2 Vendor Item Drawing Administrative Control Number. The manufacturer's PIN is the item of identification. The vendor item drawing establishes an administrative control number for identifying the item on the engineering documentation:

V62/09637	-	01	X	B
Drawing number		Device type (See 1.2.1)	Case outline (See 1.2.2)	Lead finish (See 1.2.3)

1.2.1 Device type(s).

Device type	Generic	Circuit function
01	MAX630	CMOS micropower, step up switching voltage regulator

1.2.2 Case outline(s). The case outline(s) are as specified herein.

Outline letter	Number of pins	JEDEC PUB 95	Package style
X	8	MS-012-AA	Small outline

1.2.3 Lead finishes. The lead finishes are as specified below or other lead finishes as provided by the device manufacturer:

Finish designator	Material
A	Hot solder dip
B	Tin-lead plate
C	Gold plate
D	Palladium
E	Gold flash palladium
Z	Other

1.3 Absolute maximum ratings. 1/

Supply voltage (V_S) ..... 18 V
Input voltage (LBR, C_X, I_C, V_{FB} pins) ..... -0.3 V to (+V_S + 0.3 V)
Output voltage, LX and LBD ..... 18 V
LX output current ..... 525 mA (peak)
LBD output current ..... 50 mA
Power dissipation (P_D) ..... 441 mW 2/
Junction temperature range (T_J) ..... 150°C
Storage temperature range (T_{STG}) ..... -65°C to +160°C
Lead temperature (soldering, 10 seconds) ..... +300°C
Electrostatic discharge (ESD):
Human body model (HBM) ..... 2,000 V
Moisture sensitivity level (MSL) ..... Level 1

1.4 Recommended operating conditions. 3/

Supply voltage (V_S) ..... +6.0 V
Operating free-air temperature range (T_A) ..... -55°C to +125°C

1.5 Thermal data table.

Case outline letter	X	X	Units
PC board	Single layer	Multi-layer 4/	
Power dissipation (P_D), maximum at +70°C	471	606	mW
Power dissipation (P_D) derating above +70°C	5.9	7.6	mW/°C
Thermal resistance, junction to case (θ_{JC})	40	38	°C/W
Thermal resistance, junction to ambient (θ_{JA})	170	132	°C/W

1/ Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

2/ Derate 5.88 mW/°C above +50°C.

3/ Use of this product beyond the manufacturers design rules or stated parameters is done at the user’s risk. The manufacturer and/or distributor maintain no responsibility or liability for product used beyond the stated limits.

4/ Package thermal resistances were obtained using the method described in JEDEC specification JESD51-7, using a four-layer board. For detailed information on package thermal considerations, contact the manufacturer.

2. APPLICABLE DOCUMENTS

JEDEC Solid State Technology Association

JEDEC 51-7 – High Effective Thermal Conductivity Test Board for Leaded Surface Mount Packages
JEDEC PUB 95 – Registered and Standard Outlines for Semiconductor Devices

(Applications for copies should be addressed to the Electronic Industries Alliance, 2500 Wilson Boulevard, Arlington, VA 22201-3834 or online at https://www.jedec.org)

3. REQUIREMENTS

3.1 Marking. Parts shall be permanently and legibly marked with the manufacturer's part number as shown in 6.3 herein and as follows:

A. Manufacturer's name, CAGE code, or logo
B. Pin 1 identifier
C. ESDS identification (optional)

3.2 Unit container. The unit container shall be marked with the manufacturer's part number and with items A and C (if applicable) above.

3.3 Electrical characteristics. The maximum and recommended operating conditions and electrical performance characteristics are as specified in 1.3, 1.4, and table I herein.

3.4 Design, construction, and physical dimension. The design, construction, and physical dimensions are as specified herein.

3.5 Diagrams.

3.5.1 Case outline. The case outline shall be as shown in 1.2.2 and figure 1.

3.5.2 Terminal connections. The terminal connections shall be as shown in figure 2.

TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions $+V_S$ = +6.0 V, I_C = 5.0 µA unless otherwise specified	Temperature, T_A	Device type	Limits		Unit
					Min	Max	
Supply voltage	$+V_S$	Operating	+25°C	01	2.0	16.5	V
		Startup			1.9		
			-55°C to +125°C		2.2	16.5	
Internal reference voltage	V_{REF}		+25°C	01	1.29	1.33	V
			-55°C to +125°C		1.25	1.37	
Switch current	I_{SW}	V_3 = 400 mV	+25°C	01	75		mA
Supply current at $+V_S$ pin	I_S	I_3 = 0 mA	+25°C	01		125	µA
			-55°C to +125°C			200	
Efficiency			+25°C	01	85 typical		%
Line regulation		0.5 V_{OUT} < V_S < V_{OUT} 2/	+25°C	01		0.2	$\%V_{OUT}$
			-55°C to +125°C			0.5	
Load regulation		V_S = +5 V, P_L = 0 to 150 mW 2/	+25°C	01		0.5	$\%V_{OUT}$
		V_S = 0.5V_O, P_L = 0 to 150 mW 2/	-55°C to +125°C			1.0	
Operating frequency range	F_O	3/	+25°C	01	0.1	75	kHz
Reference set internal pulldown resistance	R_{IC}	$V_6 = V_S$	+25°C	01	0.5	10	MΩ
			-55°C to +125°C		0.3	10	
Reference set input voltage threshold	V_{IC}		-55°C to +125°C	01	0.2	1.3	V
Switch current	I_{SW}	V_3 = 1.0 V	+25°C	01	100		mA
Switch leakage current	I_{CO}	V_3 = 16.5 V	+25°C	01		1.0	µA
			-55°C to +125°C			30	
Supply current (shutdown)	I_{SO}	I_C < 0.01 µA	+25°C	01		1.0	µA
			-55°C to +125°C			10	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions $+V_S$ = +6.0 V, I_C = 5.0 µA unless otherwise specified	Temperature, T_A	Device type	Limits		Unit
					Min	Max	
Low battery bias current	I_{LBR}		+25°C	01		10	nA
Capacitor charging current	I_{CX}		+25°C	01	30 typical		µA
C_{X+} threshold voltage			+25°C	01	$+V_S$ – 0.1 typical		V
C_{X-} threshold voltage			+25°C	01	0.1 typical		V
V_{FB} input bias current	I_{FB}		+25°C	01		10	nA
Low battery detector output current	I_{LBD}	V_8 = 0.4 V, V_1 = 1.1 V	-55°C to +125°C	01	250		µA
Low battery detector output leakage	I_{LBDO}	V_8 = 16.5 V, V_1 = 1.4 V	+25°C	01		5.0	µA

1/ Testing and other quality control techniques are used to the extent deemed necessary to assure product performance over the specified temperature range. Product may not necessarily be tested across the full temperature range and all parameters may not necessarily be tested. In the absence of specific parametric testing, product performance is assured by characterization and/or design.

2/ Guaranteed by correlation with DC pulse measurements.

3/ The operating frequency range is guaranteed by design and verified with sample testing.

Case X

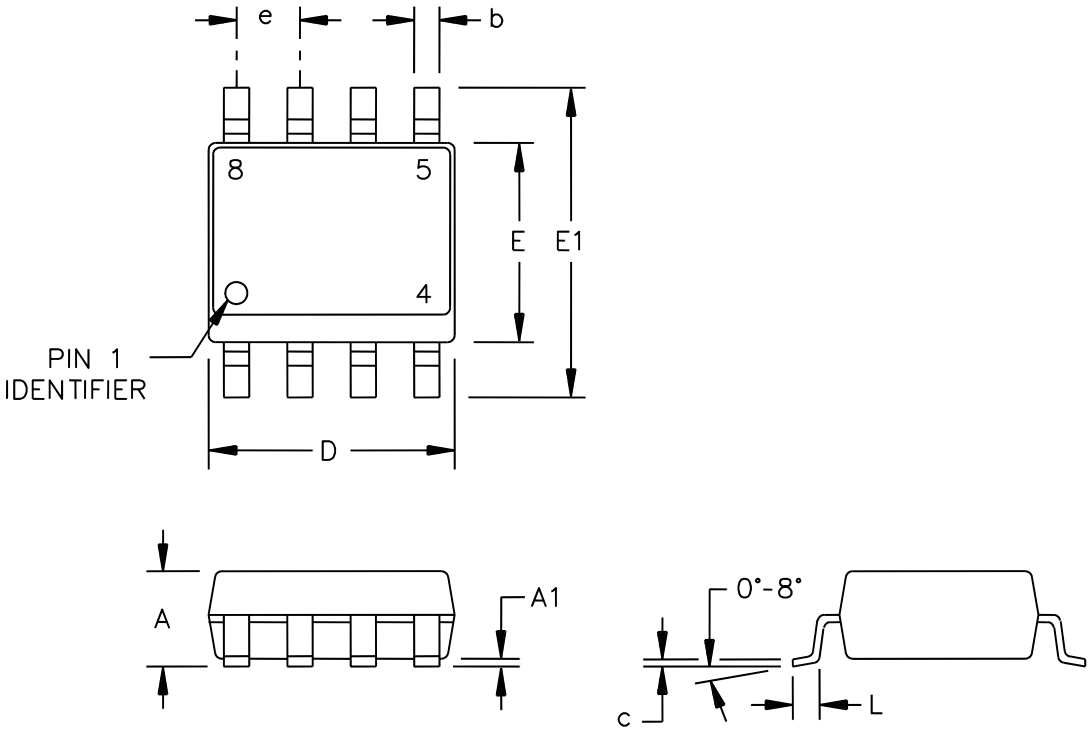

FIGURE 1. Case outline.

DLA LAND AND MARITIME COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/09637
		REV A	PAGE 7

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
b	0.014	0.019	0.35	0.49
c	0.007	0.010	0.19	0.25
D	0.189	0.197	4.80	5.00
e	0.050 BSC		1.27 BSC	
E	0.150	0.157	3.80	4.00
E1	0.228	0.244	5.80	6.20
L	0.016	0.050	0.40	1.27
n		8		8

NOTES:
1. Controlling dimensions are millimeter, inch dimensions are given for reference only.
2. Dimensions D and E do not include mold flash.
3. Mold flash or protrusions do not exceed 0.15 mm (0.006 inch).
4. Leads to be coplanar within 0.10 mm (.004 inch).
5. Falls within reference to JEDEC MS-012-AA.

FIGURE 1. Case outline - Continued.

Device type	01	
Case outline	X	
Terminal number	Terminal symbol	Description
1	LBR	Low battery detection comparator input. The LBD output, pin 8, sinks current whenever this pin is below the low battery detector threshold, typically 1.31 V
2	C_X	An external capacitor connected between this terminal and ground sets the oscillator frequency. 47 pF = 40 kHz.
3	L_X	This pin drives the external inductor. The internal N-channel metal oxide semiconductor field effect transistor (MOSFET) that drives L_X has an output resistance of 4 Ω and a peak current rating of 525 mA.
4	GND	Ground.
5	$+V_S$	The positive supply voltage, from 2.0 V to 16.5 V.
6	I_C	The device will shut down when this pin is left floating or is driven below 0.2 V. For normal operation, connect I_C directly to $+V_S$ or drive it high with either a CMOS gate or pullup resistor connected to $+V_S$. The supply current is typically 10 nA in the shutdown mode.
7	V_{FB}	The output voltage is set by an external resistive divider connected from the converter output to V_{FB} and ground. The device will pulse the L_X output whenever the voltage at this terminal is less than 1.31 V.
8	LBD	The low battery detector output is an open-drain N-channel MOSFET that sinks up to 600 μA (typical) whenever the LBR input, pin 1, is below 1.31 V.

FIGURE 2. Terminal connections.

4. VERIFICATION

4.1 Product assurance requirements. The manufacturer is responsible for performing all inspection and test requirements as indicated in their internal documentation. Such procedures should include proper handling of electrostatic sensitive devices, classification, packaging, and labeling of moisture sensitive devices, as applicable.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Preservation, packaging, labeling, and marking shall be in accordance with the manufacturer's standard commercial practices for electrostatic discharge sensitive devices.

6. NOTES

6.1 ESDS. Devices are electrostatic discharge sensitive and are classified as ESDS class 1 minimum.

6.2 Configuration control. The data contained herein is based on the salient characteristics of the device manufacturer's data book. The device manufacturer reserves the right to make changes without notice. This drawing will be modified as changes are provided.

6.3 Suggested source(s) of supply. Identification of the suggested source(s) of supply herein is not to be construed as a guarantee of present or continued availability as a source of supply for the item. DLA Land and Maritime maintains an online database of all current sources of supply at https://landandmaritimeapps.dla.mil/Programs/Smcr/.

Vendor item drawing administrative control number 1/	Device manufacturer CAGE code	Vendor part number 2/
V62/09637-01XB	1ES66	MAX630MSA/PR

1/ The vendor item drawing establishes an administrative control number for identifying the item on the engineering documentation.

2/ Add "-T" suffix for tape and reel.

CAGE code	Source of supply
1ES66	Maxim Integrated 160 Rio Robles San Jose, CA 95134