

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

Prepared in accordance with ASME Y14.24

Vendor item drawing

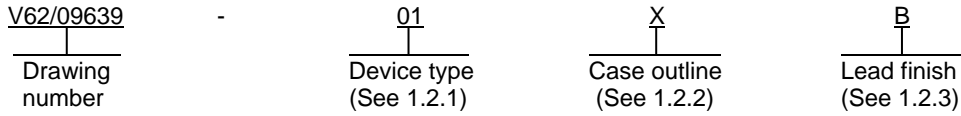
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PMIC N/A	PREPARED BY RICK OFFICER	DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	
Original date of drawing YY-MM-DD  11-07-07	CHECKED BY RAJESH PITHADIA	TITLE MICROCIRCUIT, LINEAR, QUAD, 1.2 μA, SINGLE SUPPLY OPERATIONAL AMPLIFIER, MONOLITHIC SILICON	
	APPROVED BY CHARLES F. SAFFLE		
	SIZE A	CODE IDENT. NO. 16236	DWG NO.  V62/09639
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1. SCOPE

1.1 Scope. This drawing documents the general requirements of a quad, 1.2  $\mu$ A, single supply operational amplifier microcircuit, with an operating temperature range of -55°C to +125°C.

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



1.2.1 Device type(s).

<u>Device type</u>	<u>Generic</u>	<u>Circuit function</u>
01	MAX418	Quad, 1.2 $\mu$ A, single supply operational amplifier

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

<u>Outline letter</u>	<u>Number of pins</u>	<u>JEDEC PUB 95</u>	<u>Package style</u>
X	14	MS-012-AB	Small outline

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

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

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1.3 Absolute maximum ratings. 1/ 2/

Total supply voltage (+V to -V) .....	12 V
Input voltage .....	(+V + 0.3 V) to (-V - 0.3 V)
Continuous current:	
All input pins .....	10 mA
All other pins .....	50 mA
Short-circuit duration .....	Continuous
Junction temperature (T <sub>J</sub> ) .....	150°C
Storage temperature range (T <sub>STG</sub> ).....	-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 = +2.5 V, -V = -2.5 V
Operating free-air temperature range (T <sub>A</sub> ) .....	-55°C to +125°C

1.5 Thermal data table.

Case outline letter	X	X	Units
PC board	Single layer	Multi-layer <u>4/</u>	
Power dissipation (P <sub>D</sub> ), maximum at +70°C	667	988	mW
Power dissipation (P <sub>D</sub> ) derating above +70°C	8.3	12.3	mW/°C
Thermal resistance, junction to case (θ <sub>JC</sub> )	37	32	°C/W
Thermal resistance, junction to ambient (θ <sub>JA</sub> )	120	81	°C/W

1/ Stresses beyond those listed under “absolute maximum rating” 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/ The absolute maximum ratings do not apply to devices supplied in die or wafer form.

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, refer to [www.maxim-ic.com/thermal-tutorial](http://www.maxim-ic.com/thermal-tutorial)

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## 2. APPLICABLE DOCUMENTS

- JEDEC PUB 95 – Registered and Standard Outlines for Semiconductor Devices
- JEDEC JESD51-7 – High Effective Thermal Conductivity Test Board for Leaded Surface Mount Packages

(Applications for copies should be addressed to the Electronic Industries Alliance, 2500 Wilson Boulevard, Arlington, VA 22201-3834 or online at <http://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.

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TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions +V = 2.5 V, -V = -2.5 V unless otherwise specified	Temperature, T <sub>A</sub>	Device type	Limits		Unit
					Min	Max	
Input offset voltage	V <sub>OS</sub>		+25°C	01		4.0	mV
			-55°C to +125°C			6.0	
Offset voltage temperature coefficient	TC <sub>VOS</sub>		-55°C to +125°C	01		10	μV/°C
Input bias current	I <sub>B</sub>	V <sub>CM</sub> = 0 V <u>2/</u>	+25°C	01		10.0	pA
		V <sub>CM</sub> = 0 V	-55°C to +125°C			1.0	nA
Large signal voltage gain	A <sub>VOL</sub>	V <sub>OUT</sub> = ±2 V, R <sub>L</sub> = 1 MΩ	+25°C	01	10		V/mV
			-55°C to +125°C		5		
Gain bandwidth	GBW		+25°C	01	4		kHz
Input common mode range	CMR		+25°C	01	-V	+V - 1.2	V
Output voltage swing	V <sub>O</sub>	R <sub>L</sub> = 1 MΩ	+25°C	01	±2.45		V
			-55°C to +125°C		±2.45		
Common mode rejection ratio	CMRR	<u>3/</u>	+25°C	01	60		dB
			-55°C to +125°C		60		
Power supply rejection ratio	PSRR	V <sub>IN</sub> = 0 V, +V = 2.5 V to 7.5 V	+25°C	01		800	μV/V
			-55°C to +125°C			800	
Slew rate	SR		+25°C	01	3		V/ms
Supply current per amplifier	I <sub>SY</sub>		+25°C	01		1.6	μA
			-55°C to +125°C			2.0	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions +V = 2.5 V, -V = -2.5 V unless otherwise specified	Temperature, T <sub>A</sub>	Device type	Limits		Unit
					Min	Max	
Output sink current	I <sub>OSINK</sub>	V <sub>OUT</sub> = 0 V	+25°C	01	50		μA
			-55°C to +125°C		20		
Output source current	I <sub>SOURCE</sub>	V <sub>OUT</sub> = 0 V	+25°C	01	250		μA
			-55°C to +125°C		200		
Supply voltage (+V to -V)	V <sub>S</sub>		+25°C	01	2.5	10.0	V
Input noise voltage	e <sub>n</sub>	f <sub>O</sub> = 1 kHz	+25°C	01	150 typical		nV / √Hz
		f <sub>O</sub> = 0.1 Hz to 10 Hz			6 typical		μV <sub>p-p</sub>

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/ Production-automated test equipment cannot resolve input bias currents below 1 pA. Lab equipment has shown the device typical input bias current below 0.1 pA.

3/ V<sub>CM</sub> = -V to (+V - 1.2 V).

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Case X

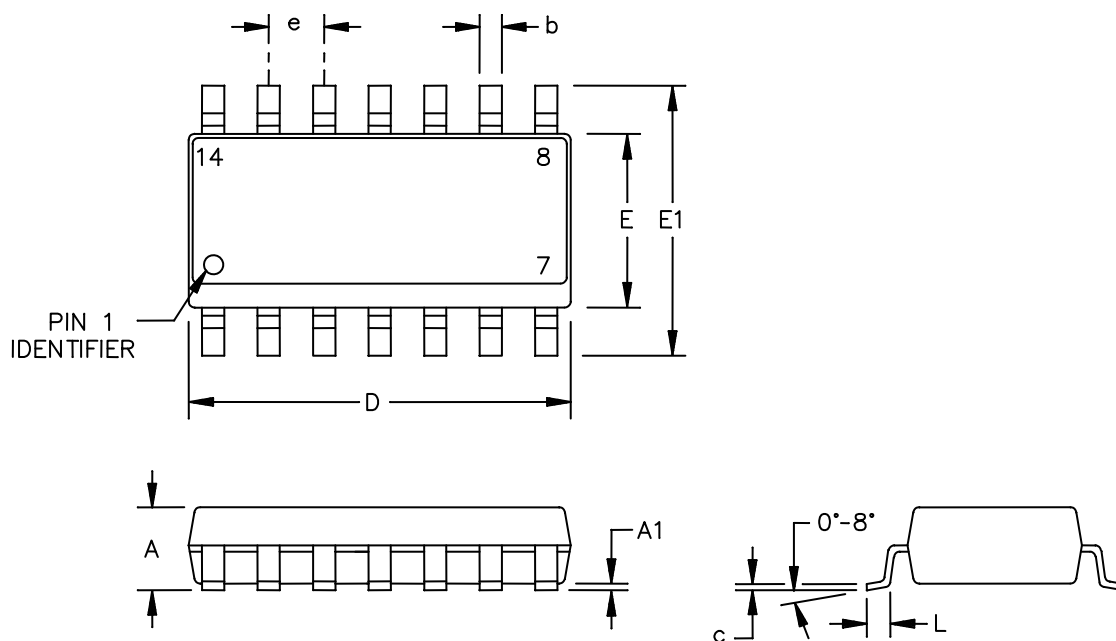


FIGURE 1. Case outline

<p>DLA LAND AND MARITIME COLUMBUS, OHIO</p>	<p>SIZE A</p>	<p>CODE IDENT NO. 16236</p>	<p>DWG NO. <b>V62/09639</b></p>
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Case X – continued.

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	0.337	0.344	8.55	8.75
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	14		14	

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 (0.004 inch).
5. Falls within reference to JEDEC MS-012-AB.

FIGURE 1. Case outline - Continued.

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Device type	01	
Case outline	X	
Terminal number	Terminal symbol	Description
1	OUTA	Amplifier output A
2	-INA	Inverting input A
3	+INA	Noninverting input A
4	+V	Positive supply pin. Connect to (+) terminal of power supply.
5	+INB	Noninverting input B
6	-INB	Inverting input B
7	OUTB	Amplifier output B
8	OUTC	Amplifier output C
9	-INC	Inverting input C
10	+INC	Noninverting input C
11	-V	Negative power supply pin. Connect to (-) terminal of power supply or ground.
12	+IND	Noninverting input D
13	-IND	Inverting input D
14	OUTD	Amplifier output D

FIGURE 2. Terminal connections.

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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 1C 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.

Vendor item drawing administrative control number <u>1/</u>	Device manufacturer CAGE code	Vendor part number <u>2/</u>
V62/09639-01XB	1ES66	MAX418MSD/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

1ES66

Source of supply

Maxim Integrated Products  
120 San Gabriel Drive  
Sunnyvale, CA 94086-5125

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