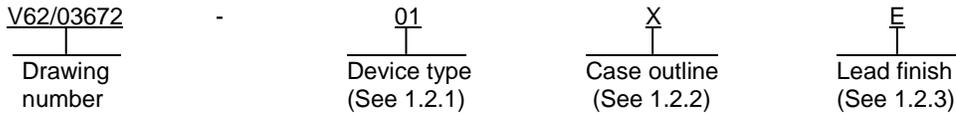


1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance quad differential comparator microcircuit, with an operating temperature range of -40°C to +125°C for device type 01, and an operating temperature range of -55°C to +125°C for device type 02.

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:



1.2.1 Device type(s).

<u>Device type</u>	<u>Generic</u>	<u>Circuit function</u>
01	LM239A-EP	Quad differential comparator
02	LM239A-EP	Quad differential comparator

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	Plastic small outline
Y	14	MO-153	Plastic small outline

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

<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

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03672
		REV D	PAGE 2

1.3 Absolute maximum ratings. 1/ 2/

Supply voltage (V _{CC})	36 V
Differential input voltage (V _{ID})	±36 V 3/
Input voltage range (V _{IN}) (either input)	-0.3 V to 36 V
Output voltage (V _O)	36 V
Output current (I _O)	20 mA
Duration of output short circuit to ground	Unlimited 4/
Package thermal impedance (θ _{JA})	86°C/W 5/
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds	260°C
Maximum operating junction temperature (T _J)	136°C
Storage temperature range (T _{STG})	-65°C to 150°C 6/

1.4 Recommended operating conditions. 7/

Operating free-air temperature range (T_A):

Device type 01	-40°C to +125°C
Device type 02	-55°C to +125°C

-
- 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/ All voltage values, except differential voltages, are with respect to network ground.
 - 3/ Differential voltages are at IN+ with respect to IN-.
 - 4/ Short circuits from outputs to V_{CC} can cause excessive heating and eventual destruction.
 - 5/ The package thermal impedance is calculated in accordance with JESD 51-7.
 - 6/ Long term high temperature storage and/or extended use at maximum recommended operating conditions may result in a reduction of overall device life.
 - 7/ 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.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03672
		REV D	PAGE 3

2. APPLICABLE DOCUMENTS

JEDEC – SOLID STATE TECHNOLOGY ASSOCIATION (JEDEC)

- JEP95 – Registered and Standard Outlines for Semiconductor Devices
- 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.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03672
		REV D	PAGE 4

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions <u>1/</u> <u>2/</u> $V_{CC} = 5\text{ V}$	Temperature, <u>3/</u> T_A	Device type	Limits		Unit	
					Min	Max		
Input offset voltage	V_{IO}	$V_{CC} = 5\text{ V to }30\text{ V}, V_O = 1.4\text{ V},$ $V_{IC} = V_{ICR(\min)}$	+25°C	All		2.5	mV	
			-40°C to +125°C	01		5.5		
			-55°C to +125°C	02		5.5		
Input offset current	I_{IO}	$V_O = 1.4\text{ V}$	+25°C	All		50	nA	
			-40°C to +125°C	01		150		
			-55°C to +125°C	02		150		
Input bias current	I_{IB}	$V_O = 1.4\text{ V}$	+25°C	All		-250	nA	
			-40°C to +125°C	01		-400		
			-55°C to +125°C	02		-400		
Common mode input voltage range	V_{ICR}		+25°C	All	0 to V_{CC} -1.5		V	
			-40°C to +125°C	01	0 to V_{CC} -2			
			-55°C to +125°C	02	0 to V_{CC} -2			
Large signal differential voltage amplification	AVD	$V_{CC} = 15\text{ V}, V_O = 1.4\text{ V to }11.4\text{ V},$ $R_L \geq 15\text{ k}\Omega\text{ to }V_{CC}$	+25°C	All	50		V/mV	
High level output current	I_{OH}	$V_{OH} = 5\text{ V}, V_{ID} = 1\text{ V}$ $V_{OH} = 30\text{ V}, V_{ID} = 1\text{ V}$	+25°C	All		50	nA	
			-40°C to +125°C	01		1		μA
			-55°C to +125°C	02		1		
Low level output voltage	V_{OL}	$I_{OL} = 4\text{ mA}, V_{ID} = -1\text{ V}$	+25°C	All		400	mV	
			-40°C to +125°C	01		700		
			-55°C to +125°C	02		700		
Low level output current	I_{OL}	$V_{OL} = 1.5\text{ V}, V_{ID} = -1\text{ V}$	+25°C	All	6		mA	
Supply current (four comparators)	I_{CC}	$V_O = 2.5\text{ V}, \text{ no load}$	+25°C	All		2	mA	

See footnotes at end of table.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03672
		REV D	PAGE 5

TABLE I. Electrical performance characteristics – continued.

Test	Symbol	Conditions <u>1/</u> <u>2/</u> V _{CC} = 5 V	Temperature, <u>3/</u> T _A	Device type	Limits		Unit
					Min	Max	
Response time		C _L = 15 pF, <u>4/</u> <u>5/</u> R _L connected to 5 V through 5.1 kΩ, 100 mV input step with 5 mV overdrive	+25°C	All	1.3 typical		μs
		C _L = 15 pF, <u>4/</u> <u>5/</u> R _L connected to 5 V through 5.1 kΩ, TTL level input step			0.3 typical		

1/ All characteristics are measured with zero common mode input voltage, unless otherwise specified.

2/ 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.

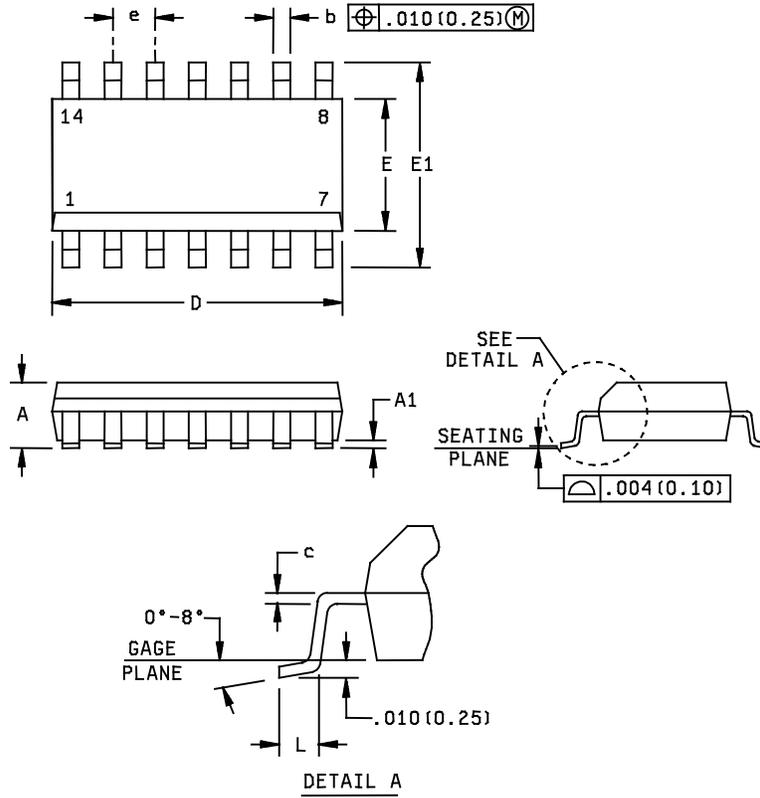
3/ Full range (MIN to MAX) for device type 01 is –40°C to +125°C. Full range (MIN to MAX) for device type 02 is –55°C to +125°C. All characteristics are measured with zero common mode input voltage, unless otherwise specified.

4/ C_L includes probe and jig capacitance.

5/ The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03672
		REV D	PAGE 6

Case X



Dimensions									
Symbol	Inches		Millimeters		Symbol	Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
A	---	.069	---	1.75	E	.150	.157	3.81	4.00
A1	.004	.010	0.10	0.25	E1	.228	.244	5.80	6.20
b	.014	.020	0.35	0.51	e	.050		1.27	
c	.008 nominal		0.20 nominal		L	.016	.044	0.40	1.12
D	.337	.344	8.55	8.75					

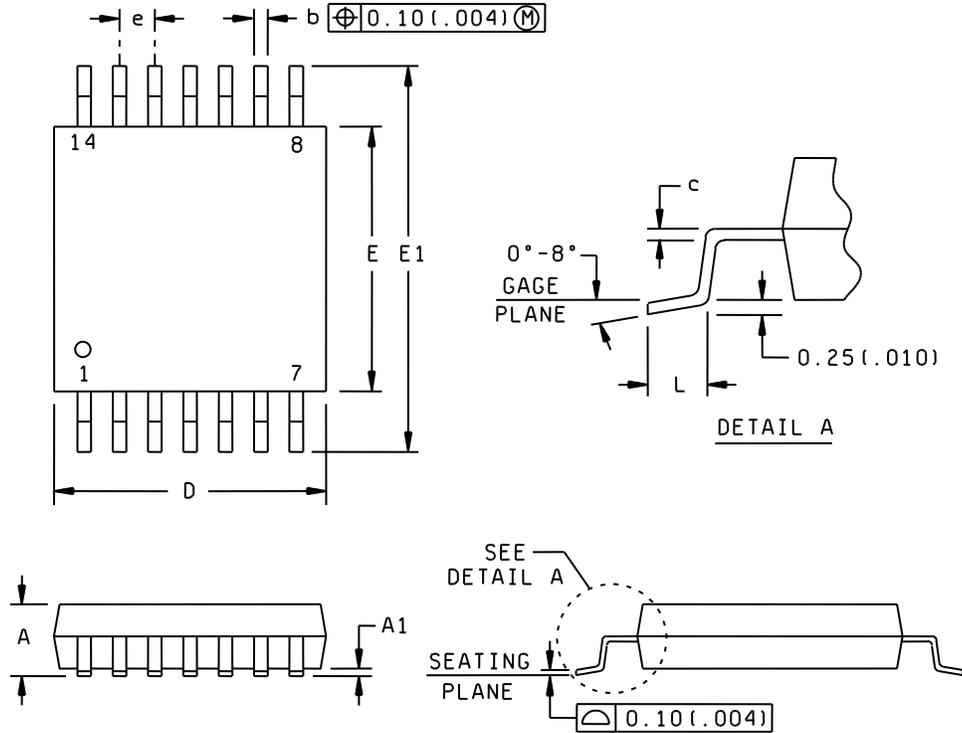
NOTES:

1. All linear dimensions are in inches (millimeters are shown for reference).
2. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0.15).
3. Fall within JEDEC MS-012 variation AB.

FIGURE 1. Case outlines.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03672
		REV D	PAGE 7

Case Y



Dimensions									
Symbol	Inches		Millimeters		Symbol	Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
A	---	.047	---	1.20	E	.169	.177	4.30	4.50
A1	.002	.006	0.05	0.15	E1	.244	.260	6.20	6.60
b	.007	.012	0.19	0.30	e	.026		0.65	
c	.006 nominal		0.15 nominal		L	.020	.030	0.50	0.75
D	.193	.201	4.90	5.10					

NOTES:

1. All linear dimensions are in millimeters (inches are shown for reference).
2. Body dimensions do not include mold flash or protrusion not to exceed 0.15 (0.006).
3. Fall within JEDEC MO-153.

FIGURE 1. Case outlines - continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03672
		REV D	PAGE 8

Device type:	01	02
Case outline:	X	X and Y
Terminal number	Terminal symbol	Terminal symbol
1	1 OUT	1 OUT
2	2 OUT	2 OUT
3	V _{CC}	V _{CC}
4	2 IN-	2 IN-
5	2 IN+	2 IN+
6	1 IN-	1 IN-
7	1 IN+	1 IN+
8	3 IN-	3 IN-
9	3 IN+	3 IN+
10	4 IN-	4 IN-
11	4 IN+	4 IN+
12	GND	GND
13	4 OUT	4 OUT
14	3 OUT	3 OUT

FIGURE 2. Terminal connections.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03672
		REV D	PAGE 9

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 <http://www.landandmaritime.dla.mil/Programs/Smcr/>.

Vendor item drawing administrative control number <u>1/</u>	Device manufacturer CAGE code	Vendor part number	Top side marking
V62/03672-01XE	01295	LM239AQDREP <u>2/</u>	LM239AEP
V62/03672-02XE	01295	LM239AMDREP <u>2/</u>	LM239AME
V62/03672-02YE	01295	LM239AMPWREP	LM239AE

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

2/ This package is only available taped and reeled with standard quantities of 2500 pieces per reel.

CAGE code

01295

Source of supply

Texas Instruments, Inc.
 Semiconductor Group
 8505 Forest Lane
 P.O. Box 660199
 Dallas, TX 75243
 Point of contact: U.S. Highway 75 South
 P.O. Box 84, M/S 853
 Sherman, TX 75090-9493

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03672
		REV D	PAGE 10