| REVISIONS | | | |
|---|---|---|---|
| **LTR** | **DESCRIPTION** | **DATE** | **APPROVED** |
| A | Add JEDEC reference to section 2. Make clarifications to notes 2 and 3 as specified under figure 1. Add two footnotes under paragraph 6.3. Update document paragraphs to current requirements. - ro | 15-03-03 | C. SAFFLE |
| B | Under Figure 1,case X, make change to “c” min dimension, make corrections to “E”, “E1” dimension limits and delete second sentence under note 3. Update document paragraphs to current requirements. - ro | 20-09-03 | J. ESCHMEYER |

**CURRENT DESIGN ACTIVITY CAGE CODE 16236**
**HAS CHANGED NAMES TO:**
**DLA LAND AND MARITIME**
**COLUMBUS, OHIO 43218-3990**

Prepared in accordance with ASME Y14.24

Vendor item drawing

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

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|---|---|---|
| **PMIC N/A** | **PREPARED BY** RICK OFFICER | **DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43218-3990** |
| Original date of drawing YY-MM-DD 08-03-25 | **CHECKED BY** RAJESH PITHADIA | **TITLE** MICROCIRCUIT, LINEAR, DUAL, DIFFERENTIAL COMPARATOR, MONOLITHIC SILICON |
| | **APPROVED BY** ROBERT M. HEBER | |
| | **SIZE** A / **CODE IDENT. NO.** 16236 | **DWG NO.** **V62/07646** |
| | **REV** B | **PAGE** 1 **OF** 10 |

AMSC N/A

5962-V046-20

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

1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance dual differential comparator 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:

| V62/07646 | - | 01 | X | E |
|---|---|---|---|---|
| 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 | LM293-EP | Dual differential comparator |

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 | Plastic surface mount |

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

| Finish designator | Material |
|---|---|
| A | Hot solder dip |
| B | Tin-lead plate |
| C | Gold plate |
| D | Palladium |
| E | Gold flash palladium |
| F | Tin-lead alloy (BGA/CGA) |
| Z | Other |

1.3 Absolute maximum ratings. 1/

| | |
|---|---|
| Supply voltage ($V_{CC}$) | 36 V maximum 2/ |
| Differential input voltage ($V_{ID}$) | ±36 V maximum 3/ |
| Input voltage range (either input) | -0.3 V to 36 V |
| Output voltage ($V_O$) | 36 V maximum |
| Output current ($I_O$) | 20 mA maximum |
| Duration of output short circuit to ground | Unlimited 4/ |
| Package thermal impedance | 97°C/W 5/ 6/ |
| Operating virtual junction temperature ($T_J$) | +150°C |
| Storage temperature range | -65°C to +150°C |

1.4 Recommended operating conditions. 7/

| | |
|---|---|
| Supply voltage ($V_{CC}$) | 5 V |
| Operating free-air temperature range ($T_A$) | -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 GND.

3/ Differential voltages are at +INPUT terminal with respect to –INPUT terminal.

4/ Short circuits from outputs to $V_{CC}$ can cause excessive heating and eventual destruction.

5/ Maximum power dissipation is a function of $T_J(max)$, $\theta_{JA}$ and $T_A$. The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) – T_A) / \theta_{JA}$. Operating at the absolute maximum junction temperature ($T_J$) of +150°C can affect reliability.

6/ The package thermal impedance is calculated in accordance with JESD 51-7.

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.

2. APPLICABLE DOCUMENTS

JEDEC Solid State Technology Association

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

(Copies of these documents are available 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 2/ $V_{CC}$ = 5 V unless otherwise specified | Temperature, $T_A$ | Device type | Limits | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | | Min | Max | |
| Input offset voltage | $V_{IO}$ | $V_{CC}$ = 5 V to 30 V, | +25°C | 01 | | 5 | mV |
| | | $V_O$ = 1.4 V, $V_{IC}$ = $V_{IC}$(min) | -55°C to +125°C | | | 9 | |
| Input offset current | $I_{IO}$ | $V_O$ = 1.4 V | +25°C | 01 | | 50 | nA |
| | | | -55°C to +125°C | | | 250 | |
| Input bias current | $I_{IB}$ | $V_O$ = 1.4 V | +25°C | 01 | | -250 | nA |
| | | | -55°C to +125°C | | | -400 | |
| Common mode 3/ input voltage range | $V_{ICR}$ | | +25°C | 01 | 0 to $V_{CC}$ - 1.5 | | V |
| | | | -55°C to +125°C | | 0 to $V_{CC}$ - 2 | | |
| Large signal differential voltage amplification | $A_{VD}$ | $V_{CC}$ = 15. V, $V_O$ = 1.4 V to 11.4 V, $R_L \geq 15\ k\Omega$ to $V_{CC}$ | +25°C | 01 | 50 | | V/mV |
| High level output current | $I_{OH}$ | $V_{OH}$ = 5 V, $V_{ID}$ = 1 V | +25°C | 01 | | 50 | nA |
| | | $V_{OH}$ = 30 V, $V_{ID}$ = 1 V | -55°C to +125°C | | | 1 | µA |
| Low level output voltage | $V_{OL}$ | $I_{OL}$ = 4 mA, $V_{ID}$ = -1 V | +25°C | 01 | | 400 | mV |
| | | | -55°C to +125°C | | | 700 | |
| Low level output current | $I_{OL}$ | $V_{OL}$ = 1.5 V, $V_{ID}$ = -1 V | +25°C | 01 | 6 | | mA |
| Supply current | $I_{CC}$ | $V_{CC}$ = 5 V, $R_L$ = ∞ | +25°C | 01 | | 1 | mA |
| | | $V_{CC}$ = 30 V, $R_L$ = ∞ | -55°C to +125°C | | | 2.5 | |

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued. 1/

| Test | Symbol | Conditions 2/ $V_{CC}$ = 5 V unless otherwise specified | Temperature, $T_A$ | Device type | Limits | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | | Min | Max | |
| Response time | | 100 mV input step with 5 mV overdrive, 4/ 5/<br>$R_L$ connected to 5 V through 5.2 kΩ,<br>$C_L$ = 15 pF | +25°C | 01 | 1.3 typical | | µs |
| | | TTL level input step, 4/ 5/<br>$R_L$ connected to 5 V through 5.2 kΩ,<br>$C_L$ = 15 pF | | | 0.3 typical | | |

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/ Unless otherwise specified, all characteristics are measured with zero common mode input voltage.

3/ The voltage at either input or common mode should not be allowed to go negative by more than 0.3 V. The upper end of the common mode voltage range is $+V_{CC}$ – 1.5 V for the –INPUT terminal and the +INPUT terminal can exceed the $V_{CC}$ level; the comparator provides a proper output state. Either or both inputs can go to 30 V without damage.

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.

Case X

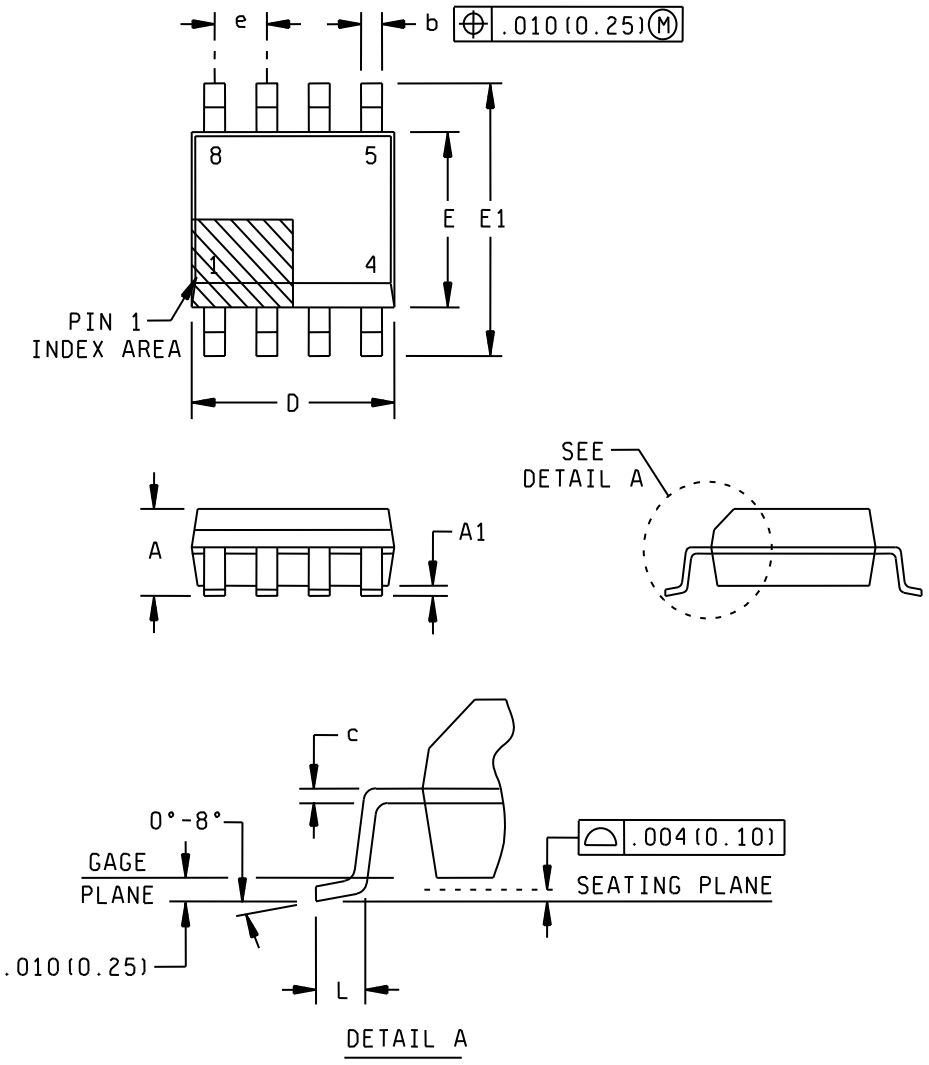


FIGURE 1. Case outline.

| DEFENSE SUPPLY CENTER, COLUMBUS<br>COLUMBUS, OHIO | SIZE<br>A | CODE IDENT NO.<br>16236 | DWG NO.<br>V62/07646 |
|---|---|---|---|
| | | REV B | PAGE 7 |

| Symbol | Dimensions | | | |
|---|---|---|---|---|
| | Inches | | Millimeters | |
| | Min | Max | Min | Max |
| A | --- | 0.069 | --- | 1.75 |
| A1 | 0.004 | 0.010 | 0.10 | 0.25 |
| b | 0.012 | 0.020 | 0.31 | 0.51 |
| c | 0.005 | 0.010 | 0.13 | 0.25 |
| D | 0.189 | 0.197 | 4.80 | 5.00 |
| E | 0.150 | 0.157 | 3.81 | 3.98 |
| E1 | 0.228 | 0.244 | 5.80 | 6.19 |
| e | 0.050 BSC | | 1.27 BSC | |
| L | 0.016 | 0.050 | 0.40 | 1.27 |
| n | 8 | | 8 | |

NOTES:
1. Controlling dimensions are inch, millimeter dimensions are given for reference only.
2. For dimension D, body length does not include mold flash, protrusion, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 inch (0.15 mm) per side.
3. For dimension E, body width does not include interlead flash.
4. Falls within JEDEC MS-012-AA.

FIGURE 1. Case outline - Continued.

| Device type | 01 |
|---|---|
| Case outline | X |
| Terminal number | Terminal symbol |
| 1 | OUTPUT 1 |
| 2 | -INPUT 1 |
| 3 | +INPUT 1 |
| 4 | GND |
| 5 | +INPUT 2 |
| 6 | -INPUT 2 |
| 7 | OUTPUT 2 |
| 8 | $V_{CC}$ |

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/ 2/ | Device manufacturer CAGE code | Package 3/ | Topside marking | Vendor part number |
|---|---|---|---|---|
| V62/07646-01XE | 01295 | Reel of 2500 | LM293E | LM293MDREP |

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

2/ For the most current package and ordering information, see the package option addendum at the end of the manufacturer's data sheet.

3/ Package drawings, thermal data, and symbolization are available from the manufacturer.

| CAGE code | Source of supply |
|---|---|
| 01295 | Texas Instruments, Inc.<br>Semiconductor Group<br>8505 Forest Lane<br>P.O. Box 660199<br>Dallas, TX 75243 |