

| REVISIONS | | | |
|-----------|---|-----------------|-----------------|
| LTR | DESCRIPTION | DATE (YR-MO-DA) | APPROVED |
| A | Make change to 3.2.3 and delete the radiation exposure circuit as specified in figure 3. - ro | 00-10-31 | R. MONNIN |
| B | Drawing updated to reflect current requirements. - gt | 02-04-18 | R. MONNIN |
| C | Add device type 02 tested at Low Dose Rate. Make changes to 1.2.2, 1.5, table I, figure 2, table IIB, and 4.4.4.1. Deleted accelerated aging test. -rrp | 07-07-09 | ROBERT M. HEBER |
| D | Add paragraph 3.1.1 and die Appendix A. Make change to footnote 1/ as specified under Table I. - ro | 08-10-29 | ROBERT M. HEBER |
| E | Update drawing to current MIL-PRF-38535 requirements. Delete class M references. -rrp | 14-10-15 | C. SAFFLE |

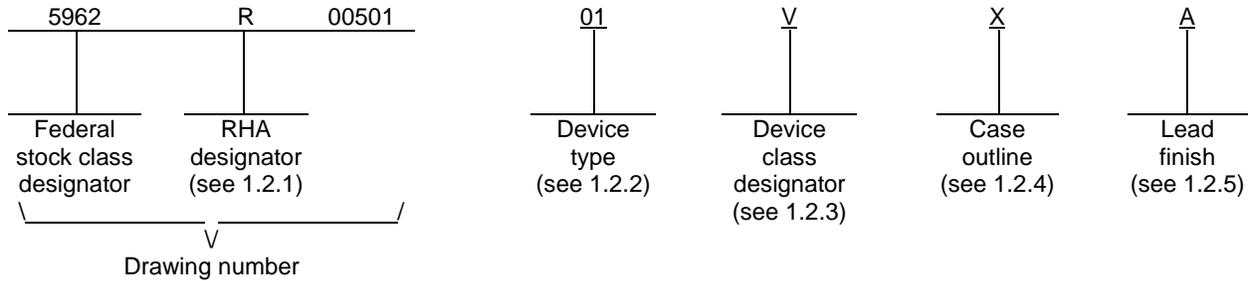
| | | | | | | | | | | | | | | | | | | | | |
|------------|-------|----|----|---|---|---|---|---|---|---|---|---|----|----|----|----|----|---|---|--|
| REV | | | | | | | | | | | | | | | | | | | | |
| SHEET | | | | | | | | | | | | | | | | | | | | |
| REV | E | E | E | | | | | | | | | | | | | | | | | |
| SHEET | 15 | 16 | 17 | | | | | | | | | | | | | | | | | |
| REV STATUS | REV | | | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | |
| OF SHEETS | SHEET | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|-----------------------------------|---|---|-----------|---------------------------|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| PMIC N/A | PREPARED BY RAJESH PITHADIA | <p align="center">DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 http://www.landandmaritime.dla.mil</p> | | | | | | | | | | | | | | | | | |
| <p align="center">STANDARD MICROCIRCUIT DRAWING</p> <p>THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE</p> <p align="center">AMSC N/A</p> | CHECKED BY RAJESH PITHADIA | | | | | | | | | | | | | | | | | | |
| | APPROVED BY RAYMOND MONNIN | <p align="center">MICROCIRCUIT, LINEAR, RADIATION HARDENED, PRECISION VOLTAGE REFERENCE, MONOLITHIC SILICON</p> | | | | | | | | | | | | | | | | | |
| | DRAWING APPROVAL DATE 00-01-13 | | | | | | | | | | | | | | | | | | |
| | REVISION LEVEL E | | <table border="1"> <tr> <td>SIZE A</td> <td>CAGE CODE 67268</td> <td>5962-00501</td> </tr> </table> | SIZE A | CAGE CODE 67268 | 5962-00501 | | | | | | | | | | | | | |
| SIZE A | CAGE CODE 67268 | 5962-00501 | | | | | | | | | | | | | | | | | |
| | | SHEET 1 OF 17 | | | | | | | | | | | | | | | | | |

1. SCOPE

1.1 Scope. This drawing documents two product assurance class levels consisting of high reliability (device class Q) and space application (device class V). A choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of Radiation Hardness Assurance (RHA) levels is reflected in the PIN.

1.2 PIN. The PIN is as shown in the following example:



1.2.1 RHA designator. Device classes Q and V RHA marked devices meet the MIL-PRF-38535 specified RHA levels and are marked with the appropriate RHA designator. A dash (-) indicates a non-RHA device.

1.2.2 Device type(s). The device type(s) identify the circuit function as follows:

| <u>Device type</u> | <u>Generic number</u> | <u>Circuit function</u> |
|--------------------|-----------------------|------------------------------------|
| 01 | LM136A | 2.5 V, precision voltage reference |
| 02 | LM136A | 2.5 V, precision voltage reference |

1.2.3 Device class designator. The device class designator is a single letter identifying the product assurance level as follows:

| <u>Device class</u> | <u>Device requirements documentation</u> |
|---------------------|--|
| Q or V | Certification and qualification to MIL-PRF-38535 |

1.2.4 Case outline(s). The case outline(s) are as designated in MIL-STD-1835 and as follows:

| <u>Outline letter</u> | <u>Descriptive designator</u> | <u>Terminals</u> | <u>Package style</u> |
|-----------------------|-------------------------------|------------------|----------------------|
| X | See figure 1 | 3 | TO-46 can |

1.2.5 Lead finish. The lead finish is as specified in MIL-PRF-38535 for device classes Q and V.

| | | | |
|--|------------------|----------------------------|-------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 2 |

1.3 Absolute maximum ratings. 1/

| | |
|--|-------------------|
| Reverse current | 15 mA |
| Forward current | 10 mA |
| Storage temperature range | -60°C to +150°C |
| Lead temperature (soldering, 10 seconds) | 300°C |
| Maximum junction temperature (T _J) | 150°C 2/ |
| Thermal resistance, junction-to-case (θ _{JC}) | 46°C/W |
| Thermal resistance, junction-to-ambient (θ _{JA}) | 354°C/W still air |

1.4 Recommended operating conditions.

Ambient operating temperature range (T_A) -55°C to +125°C

1.5 Radiation features. 3/

| | |
|--|--------------|
| Maximum total dose available (dose rate = 50 – 300 rad(Si)/s): | |
| Device class V (device type 01) | 100 Krad(Si) |
| Maximum total dose available (dose rate = 10 mrad(Si)/s): | |
| Device class V (device type 02) | 100 Krad(Si) |

The manufacturer supplying RHA parts on this drawing has performed a characterization test to demonstrate that the parts do not exhibit enhanced low dose rate sensitivity (ELDRS) according to MIL-STD-883 Method 1019 paragraph 3.13.1.1. Therefore this part may be considered ELDRS free. However, the manufacturer will continue to perform low dose rate lot acceptance testing on each wafer lot or wafer until characterization testing has been performed according to test method 1019 of MIL-STD-883. Since the redesigned part did not demonstrate ELDRS per Method 1019 and the previously tested device was ELDRS, the part number will be changed to an 02 to distinguish this part from the 01 device.

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATION

MIL-PRF-38535 - Integrated Circuits, Manufacturing, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 - Test Method Standard Microcircuits.
MIL-STD-1835 - Interface Standard Electronic Component Case Outlines.

- 1/ Stresses above the absolute maximum rating may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.
- 2/ The maximum power dissipation must be derated at elevated temperatures and is dictated by T_J, θ_{JA}, and T_A. The maximum allowable power dissipation at any temperature is P_D = (T_{JMAX} – T_A) / θ_{JA} or the number given in the absolute maximum ratings, whichever is lower.
- 3/ For device type 01, this part may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects. Radiation end point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition A. For device type 02, this part has been tested and does not demonstrate low dose rate sensitivity. Radiation end point limits for the noted parameters are guaranteed for the conditions specified in MIL-STD-883, method 1019, condition D.

| | | | |
|---|--------------------|---------------------|-------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 3 |

DEPARTMENT OF DEFENSE HANDBOOKS

- MIL-HDBK-103 - List of Standard Microcircuit Drawings.
- MIL-HDBK-780 - Standard Microcircuit Drawings.

(Copies of these documents are available online at <http://quicksearch.dla.mil/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements for device classes Q and V shall be in accordance with MIL-PRF-38535 as specified herein, or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

3.1.1 Microcircuit die. For the requirements of microcircuit die, see appendix A to this document.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535 and herein for device classes Q and V.

3.2.1 Case outline. The case outline shall be in accordance with 1.2.4 herein and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.2.3 Radiation exposure circuit. The radiation exposure circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing and acquiring activity upon request.

3.3 Electrical performance characteristics and postirradiation parameter limits. Unless otherwise specified herein, the electrical performance characteristics and postirradiation parameter limits are as specified in table I and shall apply over the full ambient operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table IIA. The electrical tests for each subgroup are defined in table I.

3.5 Marking. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked. For packages where marking of the entire SMD PIN number is not feasible due to space limitations, the manufacturer has the option of not marking the "5962-" on the device. For RHA product using this option, the RHA designator shall still be marked. Marking for device classes Q and V shall be in accordance with MIL-PRF-38535.

3.5.1 Certification/compliance mark. The certification mark for device classes Q and V shall be a "QML" or "Q" as required in MIL-PRF-38535.

3.6 Certificate of compliance. For device classes Q and V, a certificate of compliance shall be required from a QML-38535 listed manufacturer in order to supply to the requirements of this drawing (see 6.6.1 herein). The certificate of compliance submitted to DLA Land and Maritime-VA prior to listing as an approved source of supply for this drawing shall affirm that the manufacturer's product meets, for device classes Q and V, the requirements of MIL-PRF-38535 and herein.

3.7 Certificate of conformance. A certificate of conformance as required for device classes Q and V in MIL-PRF-38535 shall be provided with each lot of microcircuits delivered to this drawing.

| | | | |
|--|------------------|----------------------------|-------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 4 |

TABLE I. Electrical performance characteristics.

| Test | Symbol | Conditions <u>1/ 2/ 3/</u> -55°C ≤ T _A ≤ +125°C unless otherwise specified | Group A subgroups | Device type | Limits | | Unit |
|---------------------------|-------------------|---|----------------------|----------------|--------|-------|------|
| | | | | | Min | Max | |
| Adjust current | I _{ADJ} | V _{ADJ} = 0.7 V M, D, P, L, R | 1, 2, 3 | 01, 02 | -125 | +125 | μA |
| | | | 1 | | -125 | +125 | |
| Delta zener voltage | ΔZ | 400 μA ≤ I _Z ≤ 10 mA M, D, P, L, R | 1 | 01, 02 | | 6 | mV |
| | | | 2, 3 | | | 10 | |
| | | | 1 | | | 6 | |
| Zener voltage | V _Z | V _{ADJ} = Open M, D, P, L, R | 1 | 01, 02 | 2.465 | 2.515 | V |
| | | | 2, 3 | | 2.44 | 2.54 | |
| | | | 1 | | 2.465 | 2.515 | |
| | | V _{ADJ} = 0.7 V M, D, P, L, R | 1 | | 2.39 | 2.49 | |
| | | | 2, 3 | | 2.29 | 2.49 | |
| | | | 1 | | 2.39 | 2.49 | |
| | | V _{ADJ} = 1.9 V M, D, P, L, R | 1, 2, 3 | | 2.49 | 2.69 | |
| | | | 1 | | 2.49 | 2.69 | |
| Reverse dynamic impedance | Z _{RD} | <u>4/</u> | 1 | 01, 02 | | 0.6 | Ω |
| | | | 2, 3 | | | 1 | |
| Temperature stability | V _{STAB} | V _Z = Adjusted to 2.490 V | 2, 3 | 01, 02 | | 18 | mV |

- 1/ Devices supplied to this drawing have been tested through all levels M, D, P, L, R of irradiation. Pre and Post irradiation values are identical unless otherwise specified in Table I. When performing post irradiation electrical measurements for any RHA level, T_A = +25°C.
- 2/ For device type 01, this part may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects. Radiation end point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition A. For device type 02, this part has been tested and does not demonstrate low dose rate sensitivity. Radiation end point limits for the noted parameters are guaranteed for the conditions specified in MIL-STD-883, test method 1019, condition D.
- 3/ I_Z = 1 mA, unless otherwise specified.
- 4/ Parameter tested go-no-go only.

| | | | |
|--|------------------|----------------------------|-------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 5 |

Case X

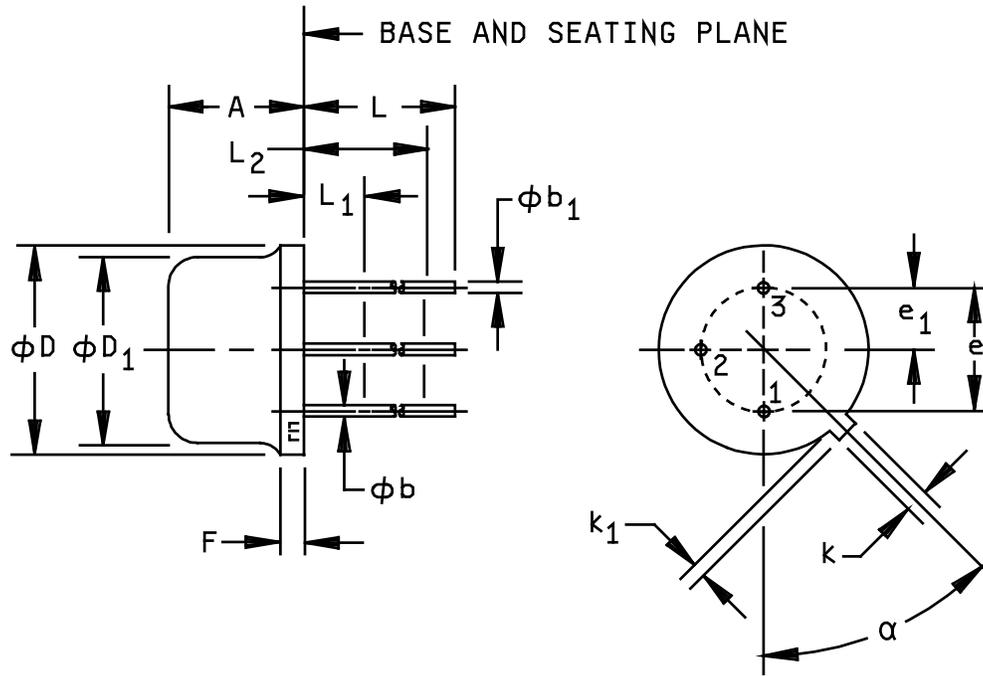


FIGURE 1. Case outline.

**STANDARD
MICROCIRCUIT DRAWING**
DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990

SIZE
A

5962-00501

REVISION LEVEL
E

SHEET
6

Case X

| Symbol | Inches | | | Millimeters | | |
|------------|----------|-------|------|-------------|------|------|
| | Min | Nom | Max | Min | Nom | Max |
| A | .080 | | .105 | 2.03 | | 2.67 |
| ϕb | .016 | .0175 | .019 | .406 | .445 | .483 |
| ϕb_1 | .016 | .0175 | .019 | .406 | .445 | .483 |
| ϕD | .209 | .212 | .215 | 5.31 | 5.38 | 5.45 |
| ϕD_1 | .183 | .185 | .187 | 4.65 | 4.70 | 4.75 |
| e | .100 NOM | | | 2.54 NOM | | |
| e_1 | .050 NOM | | | 1.27 NOM | | |
| F | | | .030 | | | 0.76 |
| k | .028 | .038 | .048 | .711 | .965 | 1.22 |
| k_1 | .028 | .038 | .048 | .711 | .965 | 1.22 |
| L | .500 | | | 12.70 | | |
| L_1 | | | .025 | | | 0.64 |
| L_2 | .250 | | | 6.35 | | |
| α | 45° T.P. | | | 45° T.P. | | |

NOTES:

1. The US government preferred system of measurement is the metric SI system. However, this item was originally designed using inch-pound units of measurement. In the event of conflict between the metric and inch-pound units, the inch-pound units shall take precedence.
2. ϕb applies between L_1 and beyond .500 inch (12.70 mm) from the seating plane (three leads). Diameter is uncontrolled in L_1 and beyond .500 inch (12.70 mm) from the seating plane.
3. Leads to be located within .007 inch (0.18 mm) of their true positions relative to a maximum width tab.

FIGURE 1. Case outline – Continued.

| | | | |
|--|------------------|----------------------------|-------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 7 |

| | |
|-----------------|-----------------|
| Device type | 01, 02 |
| Case outline | X |
| Terminal number | Terminal symbol |
| 1 | ADJUSTMENT |
| 2 | + |
| 3 | - |

FIGURE 2. Terminal connections.

| | | | |
|--|------------------|---------------------|-------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 8 |

4. VERIFICATION

4.1 Sampling and inspection. For device classes Q and V, sampling and inspection procedures shall be in accordance with MIL-PRF-38535 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

4.2 Screening. For device classes Q and V, screening shall be in accordance with MIL-PRF-38535, and shall be conducted on all devices prior to qualification and technology conformance inspection.

4.2.1 Additional criteria for device classes Q and V.

- a. The burn-in test duration, test condition and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The burn-in test circuit shall be maintained under document revision level control of the device manufacturer's Technology Review Board (TRB) in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015 of MIL-STD-883.
- b. Interim and final electrical test parameters shall be as specified in table IIA herein.
- c. Additional screening for device class V beyond the requirements of device class Q shall be as specified in MIL-PRF-38535, appendix B.

4.3 Qualification inspection for device classes Q and V. Qualification inspection for device classes Q and V shall be in accordance with MIL-PRF-38535. Inspections to be performed shall be those specified in MIL-PRF-38535 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.4).

4.4 Conformance inspection. Technology conformance inspection for classes Q and V shall be in accordance with MIL-PRF-38535 including groups A, B, C, D, and E inspections, and as specified herein.

4.4.1 Group A inspection.

- a. Tests shall be as specified in table IIA herein.
- b. Subgroups 4, 5, 6, 7, 8, 9, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

4.4.2 Group C inspection. The group C inspection end-point electrical parameters shall be as specified in table IIA herein.

4.4.2.1 Additional criteria for device classes Q and V. The steady-state life test duration, test condition and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The test circuit shall be maintained under document revision level control by the device manufacturer's TRB in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1005 of MIL-STD-883.

| | | | |
|--|------------------|----------------------------|-------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 9 |

TABLE IIA. Electrical test requirements.

| Test requirements | Subgroups (in accordance with MIL-PRF-38535, table III) | |
|---|---|-------------------|
| | Device class Q | Device class V |
| Interim electrical parameters (see 4.2) | 1 | 1 |
| Final electrical parameters (see 4.2) | 1, 2, 3 <u>1/</u> | 1, 2, 3 <u>1/</u> |
| Group A test requirements (see 4.4) | 1, 2, 3 | 1, 2, 3 |
| Group C end-point electrical parameters (see 4.4) | 1, 2, 3 | 1, 2, 3 <u>2/</u> |
| Group D end-point electrical parameters (see 4.4) | 1, 2, 3 | 1, 2, 3 |
| Group E end-point electrical parameters (see 4.4) | 1 | 1 |

1/ PDA applies to subgroup 1

3/ Delta limits as specified in Table IIB shall be required where specified, and the delta limits shall be computed with reference to the previous endpoint electrical parameters.

Table IIB. Group C end-point electrical parameters. $T_A = 25^\circ\text{C}$

| Parameter | Device type | Conditions | Delta limit | |
|----------------|-------------|--------------------------|-------------|-------|
| | | | Min | Max |
| V _Z | 01, 02 | V _{ADJ} = Open | -10 mV | 10 mV |
| | | V _{ADJ} = 0.7 V | -10 mv | 10 mV |
| | | V _{ADJ} = 1.9 V | -10 mV | 10 mV |

4.4.3 Group D inspection. The group D inspection end-point electrical parameters shall be as specified in table IIA herein.

4.4.4 Group E inspection. Group E inspection is required only for parts intended to be marked as radiation hardness assured (see 3.5 herein).

- a. End-point electrical parameters shall be as specified in table IIA herein.
- b. For device classes Q and V, the devices or test vehicle shall be subjected to radiation hardness assured tests as specified in MIL-PRF-38535 for the RHA level being tested. All device classes must meet the postirradiation end-point electrical parameter limits as defined in table I at $T_A = +25^\circ\text{C} \pm 5^\circ\text{C}$, after exposure, to the subgroups specified in table IIA herein.

4.4.4.1 Total dose irradiation testing. Total dose irradiation testing shall be performed in accordance with MIL-STD-883 method 1019, condition A for device type 01 and condition D for device type 02, and as specified herein.

4.4.4.2 Dose rate burnout. When required by the customer test shall be performed on devices, SEC, or approved test structures at technology qualifications and after any design or process changes which may effect the RHA capability of the process. Dose rate burnout shall be performed in accordance with test method 1023 of MIL-STD-883 and as specified herein.

| | | | |
|--|------------------|----------------------------|--------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 10 |

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38535 for device classes Q and V.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.1.1 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor prepared specification or drawing.

6.2 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished using DD Form 1692, Engineering Change Proposal.

6.3 Record of users. Military and industrial users should inform DLA Land and Maritime when a system application requires configuration control and which SMD's are applicable to that system. DLA Land and Maritime will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronic devices (FSC 5962) should contact DLA Land and Maritime-VA, telephone (614) 692-8108.

6.4 Comments. Comments on this drawing should be directed to DLA Land and Maritime-VA, Columbus, Ohio 43218-3990, or telephone (614) 692-0540.

6.5 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-PRF-38535 and MIL-HDBK-1331.

6.6 Sources of supply.

6.6.1 Sources of supply for device classes Q and V. Sources of supply for device classes Q and V are listed in MIL-HDBK-103 and QML-38535. The vendors listed in QML-38535 have submitted a certificate of compliance (see 3.6 herein) to DLA Land and Maritime-VA and have agreed to this drawing.

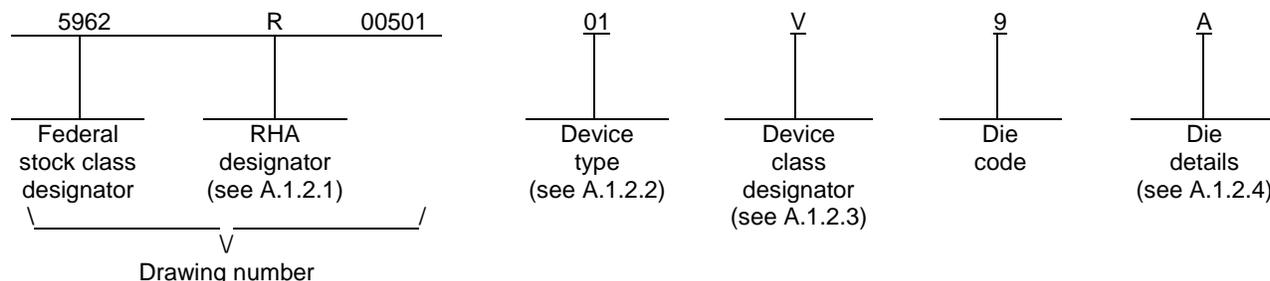
| | | | |
|--|------------------|----------------------------|--------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 11 |

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-00501

A.1 SCOPE

A.1.1 Scope. This appendix establishes minimum requirements for microcircuit die to be supplied under the Qualified Manufacturers List (QML) Program. QML microcircuit die meeting the requirements of MIL-PRF-38535 and the manufacturers approved QM plan for use in monolithic microcircuits, multi-chip modules (MCMs), hybrids, electronic modules, or devices using chip and wire designs in accordance with MIL-PRF-38534 are specified herein. Two product assurance classes consisting of military high reliability (device class Q) and space application (device class V) are reflected in the Part or Identification Number (PIN). When available, a choice of Radiation Hardiness Assurance (RHA) levels are reflected in the PIN.

A.1.2 PIN. The PIN is as shown in the following example:



A.1.2.1 RHA designator. Device classes Q and V RHA identified die meet the MIL-PRF-38535 specified RHA levels. A dash (-) indicates a non-RHA die.

A.1.2.2 Device type(s). The device type(s) identify the circuit function as follows:

| <u>Device type</u> | <u>Generic number</u> | <u>Circuit function</u> |
|--------------------|-----------------------|------------------------------------|
| 01 | LM136 | 2.5 V, precision voltage reference |
| 02 | LM136 | 2.5 V, precision voltage reference |

A.1.2.3 Device class designator.

| <u>Device class</u> | <u>Device requirements documentation</u> |
|---------------------|--|
| Q or V | Certification and qualification to the die requirements of MIL-PRF-38535 |

| | | | |
|--|------------------|----------------------------|--------------------------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | REVISION LEVEL E | 5962-00501 SHEET 12 |
|--|------------------|----------------------------|--------------------------------------|

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-00501

A.1.2.4 Die details. The die details designation is a unique letter which designates the die's physical dimensions, bonding pad location(s) and related electrical function(s), interface materials, and other assembly related information, for each product and variant supplied to this appendix.

A.1.2.4.1 Die physical dimensions.

| <u>Die type</u> | <u>Figure number</u> |
|-----------------|----------------------|
| 01 | A-1 |
| 02 | A-1 |

A.1.2.4.2 Die bonding pad locations and electrical functions.

| <u>Die type</u> | <u>Figure number</u> |
|-----------------|----------------------|
| 01 | A-1 |
| 02 | A-1 |

A.1.2.4.3 Interface materials.

| <u>Die type</u> | <u>Figure number</u> |
|-----------------|----------------------|
| 01 | A-1 |
| 02 | A-1 |

A.1.2.4.4 Assembly related information.

| <u>Die type</u> | <u>Figure number</u> |
|-----------------|----------------------|
| 01 | A-1 |
| 02 | A-1 |

A.1.3 Absolute maximum ratings. See paragraph 1.3 herein for details.

A.1.4 Recommended operating conditions. See paragraph 1.4 herein for details.

| | | | |
|--|------------------|---------------------|-------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 13 |

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-00501

A.2 APPLICABLE DOCUMENTS.

A.2.1 Government specification, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATION

MIL-PRF-38535 - Integrated Circuits, Manufacturing, General Specification for.

DEPARTMENT OF DEFENSE STANDARD

MIL-STD-883 - Test Method Standard Microcircuits.

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-103 - List of Standard Microcircuit Drawings.
MIL-HDBK-780 - Standard Microcircuit Drawings.

(Copies of these documents are available online at <http://quicksearch.dla.mil/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

A.2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

A.3 REQUIREMENTS

A.3.1 Item requirements. The individual item requirements for device classes Q and V shall be in accordance with MIL-PRF-38535 and as specified herein or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

A.3.2 Design, construction and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535 and herein and the manufacturer's QM plan for device classes Q and V.

A.3.2.1 Die physical dimensions. The die physical dimensions shall be as specified in A.1.2.4.1 and on figure A-1.

A.3.2.2 Die bonding pad locations and electrical functions. The die bonding pad locations and electrical functions shall be as specified in A.1.2.4.2 and on figure A-1.

A.3.2.3 Interface materials. The interface materials for the die shall be as specified in A.1.2.4.3 and on figure A-1.

A.3.2.4 Assembly related information. The assembly related information shall be as specified in A.1.2.4.4 and on figure A-1.

A.3.2.5 Radiation exposure circuit. The radiation exposure circuit shall be as defined in paragraph 3.2.3 herein.

A.3.3 Electrical performance characteristics and post-irradiation parameter limits. Unless otherwise specified herein, the electrical performance characteristics and post-irradiation parameter limits are as specified in table I of the body of this document.

A.3.4 Electrical test requirements. The wafer probe test requirements shall include functional and parametric testing sufficient to make the packaged die capable of meeting the electrical performance requirements in table I.

A.3.5 Marking. As a minimum, each unique lot of die, loaded in single or multiple stack of carriers, for shipment to a customer, shall be identified with the wafer lot number, the certification mark, the manufacturer's identification and the PIN listed in A.1.2 herein. The certification mark shall be a "QML" or "Q" as required by MIL-PRF-38535.

| | | | |
|--|------------------|----------------------------|--------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 14 |

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-00501

A.3.6 Certification of compliance. For device classes Q and V, a certificate of compliance shall be required from a QML-38535 listed manufacturer in order to supply to the requirements of this drawing (see A.6.4 herein). The certificate of compliance submitted to DLA Land and Maritime -VA prior to listing as an approved source of supply for this appendix shall affirm that the manufacturer's product meets, for device classes Q and V, the requirements of MIL-PRF-38535 and the requirements herein.

A.3.7 Certificate of conformance. A certificate of conformance as required for device classes Q and V in MIL-PRF-38535 shall be provided with each lot of microcircuit die delivered to this drawing.

A.4 VERIFICATION

A.4.1 Sampling and inspection. For device classes Q and V, die sampling and inspection procedures shall be in accordance with MIL-PRF-38535 or as modified in the device manufacturer's Quality Management (QM) plan. The modifications in the QM plan shall not affect the form, fit, or function as described herein.

A.4.2 Screening. For device classes Q and V, screening shall be in accordance with MIL-PRF-38535, and as defined in the manufacturer's QM plan. As a minimum, it shall consist of:

- a. Wafer lot acceptance for class V product using the criteria defined in MIL-STD-883, method 5007.
- b. 100% wafer probe (see paragraph A.3.4 herein).
- c. 100% internal visual inspection to the applicable class Q or V criteria defined in MIL-STD-883, method 2010 or the alternate procedures allowed in MIL-STD-883, method 5004.

A.4.3 Conformance inspection.

A.4.3.1 Group E inspection. Group E inspection is required only for parts intended to be identified as radiation assured (see A.3.5 herein). RHA levels for device classes Q and V shall be as specified in MIL-PRF-38535. End point electrical testing of packaged die shall be as specified in table IIA herein. Group E tests and conditions are as specified in paragraphs 4.4.4, 4.4.4.1, and 4.4.4.2 herein.

A.5 DIE CARRIER

A.5.1 Die carrier requirements. The requirements for the die carrier shall be accordance with the manufacturer's QM plan or as specified in the purchase order by the acquiring activity. The die carrier shall provide adequate physical, mechanical and electrostatic protection.

A.6 NOTES

A.6.1 Intended use. Microcircuit die conforming to this drawing are intended for use in microcircuits built in accordance with MIL-PRF-38535 or MIL-PRF-38534 for government microcircuit applications (original equipment), design applications, and logistics purposes.

A.6.2 Comments. Comments on this appendix should be directed to DLA Land and Maritime -VA, Columbus, Ohio, 43218-3990 or telephone (614)-692-0540.

A.6.3 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-PRF-38535 and MIL-HDBK-1331.

A.6.4 Sources of supply for device classes Q and V. Sources of supply for device classes Q and V are listed in QML-38535. The vendors listed within QML-38535 have submitted a certificate of compliance (see A.3.6 herein) to DLA Land and Maritime -VA and have agreed to this drawing.

| | | | |
|--|------------------|----------------------------|--------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 15 |

DIE LAYOUT (B-STEP)

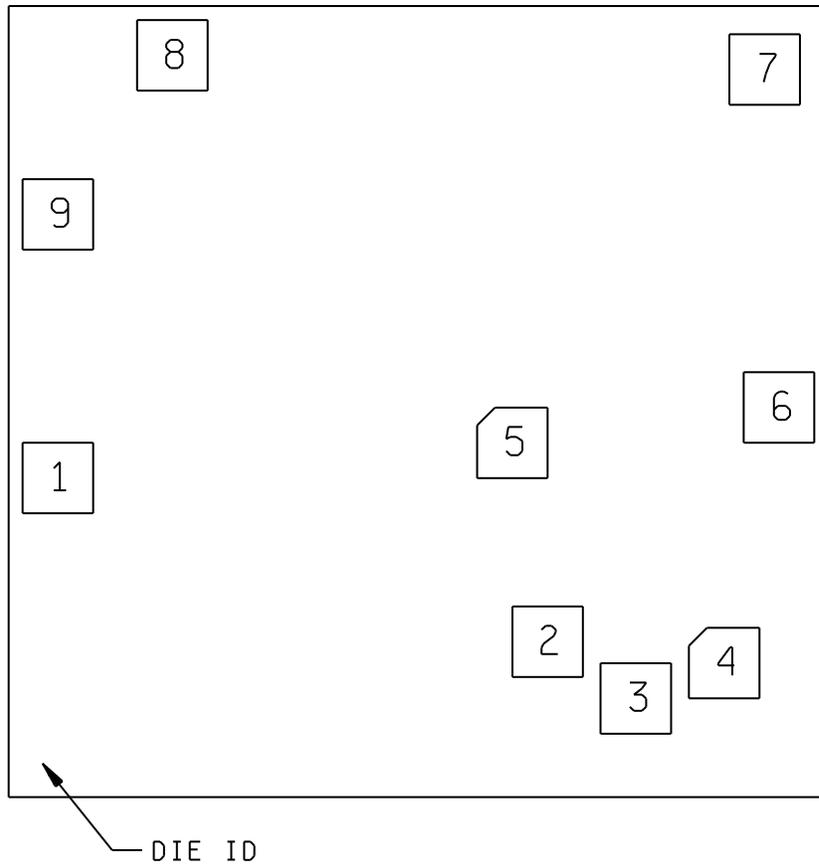


FIGURE A-1. Die bonding pad locations and electrical functions.

| | | | |
|---|------------------|----------------------------|-------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | | 5962-00501 |
| | | REVISION LEVEL E | SHEET 16 |

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-00501

| Die bond pad coordinate locations (B-step) | | | | | | |
|---|------------|-------------------|------|----------|---|-----|
| (Referenced to die center, coordinates in μm) NC = no connection, NU = not used | | | | | | |
| Signal name | Pad number | X / Y coordinates | | Pad size | | |
| | | X | Y | X | Y | |
| ADJ | 1 | -495 | -91 | 116 | x | 116 |
| NC | 2 | 154 | -431 | 91 | x | 116 |
| NC | 3 | 281 | -482 | 91 | x | 91 |
| NC | 4 | 406 | -459 | 86 | x | 91 |
| NC | 5 | 116 | -81 | 96 | x | 71 |
| + | 6 | 495 | -33 | 116 | x | 116 |
| NC | 7 | 431 | 491 | 187 | x | 119 |
| - | 8 | -363 | 520 | 111 | x | 116 |
| NC | 9 | -501 | 284 | 104 | x | 81 |

Die bonding pad locations and electrical functions

Die physical dimensions.

Die size: 1143.0 μm x 1193.8 μm

Die thickness: 254 μm nominal

Minimum pitch: 626 μm

Interface materials.

Top metallization: Al 0.5 % CU

Backside metallization: Gold

Glassivation.

Type: Vapox over metal (VOM only)

Thickness: 8 kÅ to 12 kÅ

Substrate: Silicon

Assembly related information.

Substrate potential: Floating or -

Special assembly instructions: None

FIGURE A-1. Die bonding pad locations and electrical functions – continued.

| | | |
|--|----------------------------|--------------------|
| STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 | SIZE A | 5962-00501 |
| | REVISION LEVEL E | SHEET 17 |

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 14-10-15

Approved sources of supply for SMD 5962-00501 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38535 during the next revision. MIL-HDBK-103 and QML-38535 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DLA Land and Maritime-VA. This information bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535. DLA Land and Maritime maintains an online database of all current sources of supply at <http://www.landandmaritime.dla.mil/Programs/Smcr/>.

| Standard microcircuit drawing PIN <u>1/</u> | Vendor CAGE number | Vendor similar PIN <u>2/</u> |
|--|--------------------------|------------------------------------|
| 5962-0050101QXA | <u>3/</u> | LM136AH-2.5-SMD |
| 5962R0050101QXA | <u>3/</u> | LM136AH-2.5RQML |
| 5962R0050101VXA | 27014 | LM136AH-2.5RQV |
| 5962R0050102VXA | 27014 | LM136AH-2.5RLQV <u>4/</u> |
| 5962R0050101V9A | 27014 | LM136-2.5 MDR |
| 5962R0050102V9A | 27014 | LM136-2.5 MDE <u>4/</u> |

- 1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the vendor to determine its availability.
- 2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.
- 3/ Not available from an approved source of supply.
- 4/ Low dose rate testing has been performed per test method 1019 condition D of MIL-STD-883 with no enhanced low dose rate sensitivity (ELDRS) effect.

Vendor CAGE
number

27014

Vendor name
and address

National Semiconductor
2900 Semiconductor Drive
P.O. Box 58090
Santa Clara, CA 95052-8090

The information contained herein is disseminated for convenience only and the Government assumes no liability whatsoever for any inaccuracies in the information bulletin.