

| REVISIONS |                                                                                                                                                                                                   |                 |                    |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------|
| LTR       | DESCRIPTION                                                                                                                                                                                       | DATE (YR-MO-DA) | APPROVED           |
| A         | Add RHA data. Editorial changes throughout. - jak                                                                                                                                                 | 98-05-29        | Monica L. Poelking |
| B         | Update the boilerplate to current requirements as specified in MIL-PRF-38535. Editorial changes throughout. - jak                                                                                 | 07-08-09        | Thomas M. Hess     |
| C         | Updated DC output current (ICC, IGND) in section 1.3, add source of supply information cage 0C7V7. Update the boilerplate paragraphs to current requirements as specified in MIL-PRF-38535. - jwc | 13-03-29        | Thomas M. Hess     |
| D         | Update test condition of Vcc for V <sub>OH</sub> , V <sub>OL</sub> , VIC <sup>+</sup> , VIC <sup>-</sup> and propagation delay time subgroups test to table IA. Add RHA SEP table IB. - MAA       | 15-03-12        | Thomas M. Hess     |
| E         | Update vendor CAGE 0C7V7 information. Add device type 01 for vendor CAGE code 3V146. Update boilerplate to MIL-PRF-38535 requirements. - DRH                                                      | 21-12-02        | Muhammad A. Akbar  |



|                                                                                                                                                            |    |    |    |                                   |  |   |   |                                                                                                                                                           |                    |            |   |   |   |   |    |    |    |    |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|----|-----------------------------------|--|---|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------|---|---|---|---|----|----|----|----|----|
| REV                                                                                                                                                        |    |    |    |                                   |  |   |   |                                                                                                                                                           |                    |            |   |   |   |   |    |    |    |    |    |
| SHEET                                                                                                                                                      |    |    |    |                                   |  |   |   |                                                                                                                                                           |                    |            |   |   |   |   |    |    |    |    |    |
| REV                                                                                                                                                        | E  | E  | E  | E                                 |  |   |   |                                                                                                                                                           |                    |            |   |   |   |   |    |    |    |    |    |
| SHEET                                                                                                                                                      | 15 | 16 | 17 | 18                                |  |   |   |                                                                                                                                                           |                    |            |   |   |   |   |    |    |    |    |    |
| REV STATUS                                                                                                                                                 |    |    |    | REV                               |  | 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<br>Wanda L. Meadows   |  |   |   | <b>DLA LAND AND MARITIME</b><br><b>COLUMBUS, OHIO 43218-3990</b><br><a href="https://www.dla.mil/LandandMaritime">https://www.dla.mil/LandandMaritime</a> |                    |            |   |   |   |   |    |    |    |    |    |
| <b>STANDARD MICROCIRCUIT DRAWING</b><br><br>THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE<br><br>AMSC N/A |    |    |    | CHECKED BY<br>Thomas J. Ricciuti  |  |   |   |                                                                                                                                                           |                    |            |   |   |   |   |    |    |    |    |    |
|                                                                                                                                                            |    |    |    | APPROVED BY<br>Monica L. Poelking |  |   |   | MICROCIRCUIT, DIGITAL, ADVANCED CMOS, OCTAL BIDIRECTIONAL TRANSCEIVER WITH THREE-STATE INPUTS/OUTPUTS, TTL COMPATIBLE INPUTS, MONOLITHIC SILICON          |                    |            |   |   |   |   |    |    |    |    |    |
|                                                                                                                                                            |    |    |    | DRAWING APPROVAL DATE<br>93-04-09 |  |   |   |                                                                                                                                                           |                    |            |   |   |   |   |    |    |    |    |    |
|                                                                                                                                                            |    |    |    | REVISION LEVEL<br>E               |  |   |   | SIZE<br>A                                                                                                                                                 | CAGE CODE<br>67268 | 5962-92187 |   |   |   |   |    |    |    |    |    |
| SHEET 1 OF 18                                                                                                                                              |    |    |    |                                   |  |   |   |                                                                                                                                                           |                    |            |   |   |   |   |    |    |    |    |    |

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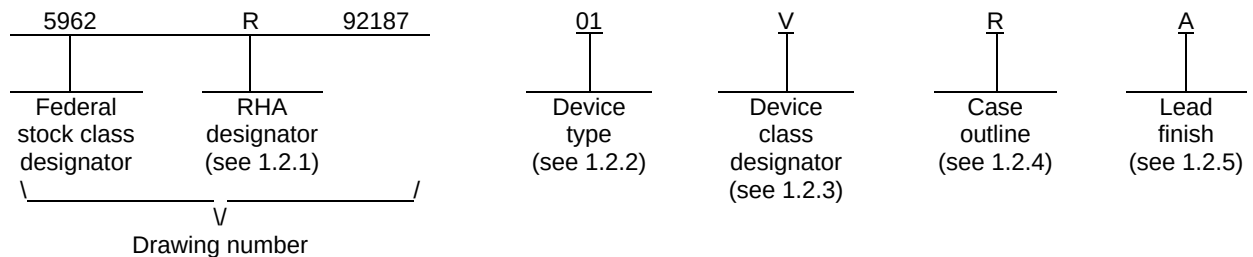
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5962-E567-21

## 1. SCOPE

1.1 Scope. This drawing documents two product assurance class levels consisting of high reliability (device classes Q and M) 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. Device class M RHA marked devices meet the MIL-PRF-38535, appendix A 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                 | 54ACTQ245             | Octal bidirectional transceiver with three-state inputs/outputs, TTL compatible inputs |

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>                                                                                                                  |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| M                   | Vendor self-certification to the requirements for MIL-STD-883 compliant, non-JAN class level B microcircuits in accordance with MIL-PRF-38535, appendix A |
| 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>         |
|-----------------------|-------------------------------|------------------|------------------------------|
| R                     | GDIP1-T20 or CDIP2-T20        | 20               | Dual-in-line                 |
| S                     | GDFP2-F20 or CDFP3-F20        | 20               | Flat pack                    |
| 2                     | CQCC1-N20                     | 20               | Square leadless chip carrier |

1.2.5 Lead finish. The lead finish is as specified in MIL-PRF-38535 for device classes Q and V or MIL-PRF-38535, appendix A for device class M.

|                                                                                                |                  |                            |                   |
|------------------------------------------------------------------------------------------------|------------------|----------------------------|-------------------|
| <b>STANDARD<br/>MICROCIRCUIT DRAWING</b><br>DLA LAND AND MARITIME<br>COLUMBUS, OHIO 43218-3990 | SIZE<br><b>A</b> |                            | <b>5962-92187</b> |
|                                                                                                |                  | REVISION LEVEL<br><b>E</b> | SHEET<br><b>2</b> |

### 1.3 Absolute maximum ratings. 1/ 2/ 3/

|                                                                                       |                                  |
|---------------------------------------------------------------------------------------|----------------------------------|
| Supply voltage range ( $V_{CC}$ ) .....                                               | -0.5 V dc to +7.0 V dc           |
| DC input voltage range ( $V_{IN}$ ) .....                                             | -0.5 V dc to $V_{CC} + 0.5$ V dc |
| DC output voltage range ( $V_{OUT}$ ) .....                                           | -0.5 V dc to $V_{CC} + 0.5$ V dc |
| DC input clamp current ( $I_{IK}$ ) ( $V_{IN} = -0.5$ V and $V_{CC} + 0.5$ V) .....   | $\pm 20$ mA                      |
| DC output clamp current ( $I_{OK}$ ) ( $V_{OUT} = -0.5$ V and $V_{CC} + 0.5$ V) ..... | $\pm 20$ mA                      |
| DC output current ( $I_{OUT}$ ) (per output pin) .....                                | $\pm 50$ mA                      |
| DC $V_{CC}$ or GND current ( $I_{CC}$ , $I_{GND}$ ) (per pin) .....                   | $\pm 50$ mA                      |
| Maximum power dissipation ( $P_D$ ) .....                                             | 500 mW                           |
| Storage temperature range ( $T_{STG}$ ) .....                                         | -65°C to +150°C                  |
| Lead temperature (soldering, 10 seconds) .....                                        | +300°C                           |
| Thermal resistance, junction-to-case ( $\Theta_{JC}$ ) .....                          | See MIL-STD-1835                 |
| Junction temperature ( $T_J$ ) .....                                                  | +175°C <u>4/</u>                 |

### 1.4 Recommended operating conditions. 2/ 3/

|                                                                               |                        |
|-------------------------------------------------------------------------------|------------------------|
| Supply voltage range ( $V_{CC}$ ) .....                                       | +4.5 V dc to +5.5 V dc |
| Input voltage range ( $V_{IN}$ ) .....                                        | 0.0 V dc to $V_{CC}$   |
| Output voltage range ( $V_{OUT}$ ) .....                                      | 0.0 V dc to $V_{CC}$   |
| Minimum high level input voltage ( $V_{IH}$ ) .....                           | 2.0 V dc               |
| Maximum low level input voltage ( $V_{IL}$ ) .....                            | 0.8 V dc               |
| Case operating temperature range ( $T_C$ ) .....                              | -55°C to +125°C        |
| Input rise or fall times ( $t_r$ , $t_f$ ) ( $V_{CC} = 4.5$ V to 5.5 V) ..... | 0 to 8 ns/V            |
| Maximum high level output current ( $I_{OH}$ ) .....                          | -24 mA                 |
| Maximum low level output current ( $I_{OL}$ ) .....                           | +24 mA                 |

### 1.5 Radiation features.

Maximum total dose available (dose rate = 50 – 300 rads (Si)/s)..... = 100 krad (Si)

Heavy ion Single event Phenomenon (SEP):

No SEL occurs at effective linear energy transfer (LET) (see 4.4.4.2) .....  $\leq 100$  MeV/(mg/cm<sup>2</sup>)

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/ Unless otherwise noted, all voltages are referenced to GND.

3/ The limits for the parameters specified herein shall apply over the full specified  $V_{CC}$  range and case temperature range of -55°C to +125°C.

4/ Maximum junction temperature shall not be exceeded except for allowable short duration burn-in screening conditions in accordance with method 5004 of MIL-STD-883.

|                                                                                                      |                  |                            |                   |
|------------------------------------------------------------------------------------------------------|------------------|----------------------------|-------------------|
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## 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.

### 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 <https://quicksearch.dla.mil/>.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

### JEDEC – SOLID STATE TECHNOLOGY ASSOCIATION (JEDEC)

JESD78 - IC Latch-Up Test.

JESD20 - Standard for Description of 54/74ACXXXX and 54/74ACTXXXX Advanced High-Speed CMOS Devices.

(Copies of these documents are available online at <https://www.jedec.org/>.)

### ASTM INTERNATIONAL (ASTM)

ASTM F1192 - Standard Guide for the Measurement of Single Event Phenomena (SEP) Induced by Heavy Ion Irradiation of semiconductor Devices.

(Copies of this document is available online at <https://www.astm.org/>.)

2.3 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 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. The individual item requirements for device class M shall be in accordance with MIL-PRF-38535, appendix A for non-JAN class level B devices and as specified herein.

|                                                                                                |                  |                            |                   |
|------------------------------------------------------------------------------------------------|------------------|----------------------------|-------------------|
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|                                                                                                |                  | REVISION LEVEL<br><b>E</b> | SHEET<br><b>4</b> |

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 or MIL-PRF-38535, appendix A and herein for device class M.

3.2.1 Case outlines. The case outlines shall be in accordance with 1.2.4 herein.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.3 Truth table. The truth table shall be as specified on figure 2.

3.2.4 Logic diagram. The logic diagram shall be as specified on figure 3.

3.2.5 Ground bounce waveforms and test circuit. The ground bounce waveforms and test circuit shall be as specified on figure 4.

3.2.6 Switching waveforms and test circuit. The switching waveforms and test circuit shall be as specified on figure 5.

3.2.7 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 or 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 IA and shall apply over the full case operating temperature range.

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

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. Marking for device class M shall be in accordance with MIL-PRF-38535, appendix A.

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. The compliance mark for device class M shall be a "C" as required in MIL-PRF-38535, appendix A.

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). For device class M, a certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in MIL-HDBK-103 (see 6.6.2 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 or for device class M, the requirements of MIL-PRF-38535, appendix A and herein.

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

3.8 Notification of change for device class M. For device class M, notification to DLA Land and Maritime -VA of change of product (see 6.2 herein) involving devices acquired to this drawing is required for any change that affects this drawing.

3.9 Verification and review for device class M. For device class M, DLA Land and Maritime, DLA Land and Maritime's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

3.10 Microcircuit group assignment for device class M. Device class M devices covered by this drawing shall be in microcircuit group number 37 (see MIL-PRF-38535, appendix A).

|                                                                                                |                   |                     |                   |
|------------------------------------------------------------------------------------------------|-------------------|---------------------|-------------------|
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TABLE IA. Electrical performance characteristics.

| Test and MIL-STD-883 test method <u>1/</u> | Symbol                          | Conditions <u>2/ 3/</u><br>-55°C ≤ T <sub>C</sub> ≤ +125°C<br>+4.5 V ≤ V <sub>CC</sub> ≤ +5.5 V<br>unless otherwise specified                                                                                               | Device type and device class <u>4/</u> | V <sub>CC</sub> | Group A subgroups | Limits <u>5/</u> |      | Unit |
|--------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------|-------------------|------------------|------|------|
|                                            |                                 |                                                                                                                                                                                                                             |                                        |                 |                   | Min              | Max  |      |
| High level output voltage<br>3006          | V <sub>OH</sub><br><u>6/ 7/</u> | For all inputs affecting output under test,<br>V <sub>IN</sub> =V <sub>IH</sub> =2.0V or V <sub>IL</sub> = 0.8V<br>For all other inputs,<br>V <sub>IN</sub> = V <sub>CC</sub> or GND<br>I <sub>OH</sub> = -50 μA            | All<br>All                             | 4.5 V           | 1, 2, 3           | 4.4              |      | V    |
|                                            |                                 |                                                                                                                                                                                                                             | All<br>All                             | 5.5 V           | 1, 2, 3           | 5.4              |      |      |
|                                            |                                 |                                                                                                                                                                                                                             | M, D, P, L, R<br>All<br>All            | 5.5 V           | 1                 | 5.4              |      |      |
|                                            |                                 | For all inputs affecting output under test,<br>V <sub>IN</sub> =V <sub>IH</sub> =2.0 V or V <sub>IL</sub> = 0.8 V<br>For all other inputs,<br>V <sub>IN</sub> = V <sub>CC</sub> or GND<br>I <sub>OH</sub> = -24 mA          | All<br>All                             | 4.5 V           | 1                 | 3.86             |      |      |
|                                            |                                 |                                                                                                                                                                                                                             | M, D, P, L, R<br>All<br>All            | 4.5 V           | 1                 | 3.86             |      |      |
|                                            |                                 |                                                                                                                                                                                                                             | All<br>All                             | 4.5 V           | 2, 3              | 3.7              |      |      |
|                                            |                                 |                                                                                                                                                                                                                             | All<br>All                             | 5.5 V           | 1                 | 4.86             |      |      |
|                                            |                                 |                                                                                                                                                                                                                             | All<br>All                             | 5.5 V           | 2, 3              | 4.7              |      |      |
|                                            |                                 | For all inputs affecting output under test<br>V <sub>IN</sub> =V <sub>IH</sub> =2.0 V or V <sub>IL</sub> = 0.8 V<br>For all other inputs,<br>V <sub>IN</sub> = V <sub>CC</sub> or GND<br>I <sub>OH</sub> = -50 mA <u>8/</u> | All<br>All                             | 5.5 V           | 1, 2, 3           | 3.85             |      |      |
|                                            |                                 |                                                                                                                                                                                                                             | M, D, P, L, R<br>All<br>All            |                 | 1                 | 3.85             |      |      |
| Low level output voltage<br>3007           | V <sub>OL</sub><br><u>6/ 7/</u> | For all inputs affecting output under test,<br>V <sub>IN</sub> =V <sub>IH</sub> =2.0 V or V <sub>IL</sub> = 0.8 V<br>For all other inputs,<br>V <sub>IN</sub> = V <sub>CC</sub> or GND<br>I <sub>OL</sub> = 50 μA           | All<br>All                             | 4.5 V           | 1, 2, 3           |                  | 0.1  | V    |
|                                            |                                 |                                                                                                                                                                                                                             | All<br>All                             | 5.5 V           | 1, 2, 3           |                  | 0.1  |      |
|                                            |                                 |                                                                                                                                                                                                                             | M, D, P, L, R<br>All<br>All            | 5.5 V           | 1                 |                  | 0.1  |      |
|                                            |                                 | For all inputs affecting output under test,<br>V <sub>IN</sub> =V <sub>IH</sub> =2.0 V or V <sub>IL</sub> = 0.8 V<br>For all other inputs,<br>V <sub>IN</sub> = V <sub>CC</sub> or GND<br>I <sub>OL</sub> = 24 mA           | All<br>All                             | 4.5 V           | 1                 |                  | 0.36 |      |
|                                            |                                 |                                                                                                                                                                                                                             | M, D, P, L, R<br>All<br>All            | 4.5 V           | 1                 |                  | 0.36 |      |
|                                            |                                 |                                                                                                                                                                                                                             | All<br>All                             | 4.5 V           | 2, 3              |                  | 0.5  |      |
|                                            |                                 |                                                                                                                                                                                                                             | All<br>All                             | 5.5 V           | 1                 |                  | 0.36 |      |
|                                            |                                 |                                                                                                                                                                                                                             | All<br>All                             | 5.5 V           | 2, 3              |                  | 0.5  |      |
|                                            |                                 | For all inputs affecting output under test<br>V <sub>IN</sub> =V <sub>IH</sub> =2.0 V or V <sub>IL</sub> = 0.8 V<br>For all other inputs,<br>V <sub>IN</sub> = V <sub>CC</sub> or GND<br>I <sub>OL</sub> = 50 mA <u>8/</u>  | All<br>All                             | 5.5 V           | 1, 2, 3           |                  | 1.65 |      |
|                                            |                                 |                                                                                                                                                                                                                             | M, D, P, L, R<br>All<br>All            | 5.5 V           | 1                 |                  | 1.65 |      |

See footnotes at end of table.

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

SIZE  
**A**

REVISION LEVEL  
**E**

**5962-92187**

SHEET  
**6**

TABLE IA. Electrical performance characteristics – Continued.

| Test and MIL-STD-883 test method <u>1/</u>      | Symbol                              | Conditions <u>2/ 3/</u><br>-55°C ≤ T <sub>C</sub> ≤ +125°C<br>+4.5 V ≤ V <sub>CC</sub> ≤ +5.5 V<br>unless otherwise specified | Device type and device class <u>4/</u> | V <sub>CC</sub> | Group A subgroups | Limits <u>5/</u> |       | Unit |
|-------------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------|-------------------|------------------|-------|------|
|                                                 |                                     |                                                                                                                               |                                        |                 |                   | Min              | Max   |      |
| Positive input clamp voltage<br>3022            | V <sub>IC+</sub><br><u>6/ 7/</u>    | For input under test, I <sub>IN</sub> = 18 mA                                                                                 | All<br>All                             | 4.5             | 1, 2, 3           |                  | 5.7   | V    |
|                                                 |                                     | M, D, P, L, R                                                                                                                 | All<br>All                             | 4.5             | 1                 |                  | 5.7   |      |
| Negative input clamp voltage<br>3022            | V <sub>IC-</sub><br><u>6/ 7/</u>    | For input under test, I <sub>IN</sub> = -18 mA                                                                                | All<br>All                             | 4.5             | 1, 2, 3           |                  | -1.2  |      |
|                                                 |                                     | M, D, P, L, R                                                                                                                 | All<br>All                             | 4.5             | 1                 |                  | -1.2  |      |
| Input leakage current high<br>3010              | I <sub>IH</sub><br><u>6/ 7/</u>     | For input under test, V <sub>IN</sub> = 5.5 V                                                                                 | All<br>All                             | 5.5 V           | 1                 |                  | 0.1   | μA   |
|                                                 |                                     | For all other inputs, V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                | M, D, P, L, R<br>All<br>All            | 5.5 V           | 1                 |                  | 1.0   |      |
|                                                 |                                     |                                                                                                                               | All<br>All                             | 5.5 V           | 2, 3              |                  | 1.0   |      |
| Input leakage current low<br>3009               | I <sub>IL</sub><br><u>6/ 7/</u>     | For input under test, V <sub>IN</sub> = 0.0 V                                                                                 | All<br>All                             | 5.5 V           | 1                 |                  | -0.1  | μA   |
|                                                 |                                     | For all other inputs, V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                | M, D, P, L, R<br>All<br>All            | 5.5 V           | 1                 |                  | -1.0  |      |
|                                                 |                                     |                                                                                                                               | All<br>All                             | 5.5 V           | 2, 3              |                  | -1.0  |      |
| Three-state output leakage current high<br>3021 | I <sub>OZH</sub><br><u>6/ 7/ 9/</u> | OE = 2.0 V                                                                                                                    | All<br>All                             | 5.5 V           | 1                 |                  | 0.5   | μA   |
|                                                 |                                     | For all other inputs, V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                | M, D, P, L, R<br>All<br>All            | 5.5 V           | 1                 |                  | 25.0  |      |
|                                                 |                                     | V <sub>OUT</sub> = 5.5 V                                                                                                      | All<br>All                             | 5.5 V           | 2, 3              |                  | 10.0  |      |
| Three-state output leakage current low<br>3020  | I <sub>OZL</sub><br><u>6/ 7/ 9/</u> | OE = 2.0 V                                                                                                                    | All<br>All                             | 5.5 V           | 1                 |                  | -0.5  | μA   |
|                                                 |                                     | For all other inputs, V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                | M, D, P, L, R<br>All<br>All            | 5.5 V           | 1                 |                  | -25.0 |      |
|                                                 |                                     | V <sub>OUT</sub> = 0.0 V                                                                                                      | All<br>All                             | 5.5 V           | 2, 3              |                  | -10.0 |      |
| Quiescent supply current, output high<br>3005   | I <sub>CCCH</sub><br><u>6/ 7/</u>   | OE = GND                                                                                                                      | All<br>All                             | 5.5 V           | 1                 |                  | 8.0   | μA   |
|                                                 |                                     | For all other inputs, V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                | All<br>All                             | 5.5 V           | 2, 3              |                  | 160   |      |
|                                                 |                                     | M                                                                                                                             | All<br>All                             | 5.5 V           | 1                 |                  | 100   | mA   |
|                                                 |                                     | D                                                                                                                             |                                        |                 |                   |                  | 1.0   |      |
|                                                 |                                     | P, L, R                                                                                                                       |                                        |                 |                   |                  | 3.5   |      |
| Quiescent supply current, output low<br>3005    | I <sub>CCCL</sub><br><u>6/ 7/</u>   | OE = GND                                                                                                                      | All<br>All                             | 5.5 V           | 1                 |                  | 8.0   | μA   |
|                                                 |                                     | For all other inputs, V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                | All<br>All                             | 5.5 V           | 2, 3              |                  | 160   |      |
|                                                 |                                     | M                                                                                                                             | All<br>All                             | 5.5 V           | 1                 |                  | 100   | mA   |
|                                                 |                                     | D                                                                                                                             |                                        |                 |                   |                  | 1.0   |      |
|                                                 |                                     | P, L, R                                                                                                                       |                                        |                 |                   |                  | 3.5   |      |

See footnotes at end of table.

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TABLE IA. Electrical performance characteristics – Continued.

| Test and MIL-STD-883 test method <u>1/</u>           | Symbol                                   | Conditions <u>2/ 3/</u><br>-55°C ≤ T <sub>C</sub> ≤ +125°C<br>+4.5 V ≤ V <sub>CC</sub> ≤ +5.5 V<br>unless otherwise specified                                                                                                        | Device type and device class <u>4/</u> | V <sub>CC</sub> | Group A subgroups | Limits <u>5/</u> |                          | Unit |
|------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------|-------------------|------------------|--------------------------|------|
|                                                      |                                          |                                                                                                                                                                                                                                      |                                        |                 |                   | Min              | Max                      |      |
| Quiescent supply current, output three-state 3005    | I <sub>CCZ</sub><br><u>6/ 7/ 9/</u>      | OE = V <sub>CC</sub><br>For all other inputs,<br>V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                                                                                            | All<br>All                             | 5.5 V           | 1                 |                  | 8.0                      | μA   |
|                                                      |                                          |                                                                                                                                                                                                                                      | All<br>All                             | 5.5 V           | 2, 3              |                  | 160                      |      |
|                                                      |                                          |                                                                                                                                                                                                                                      | All<br>All                             | 5.5 V           | 1                 |                  | 100                      | mA   |
|                                                      |                                          |                                                                                                                                                                                                                                      |                                        |                 |                   |                  | 1.0                      |      |
|                                                      |                                          |                                                                                                                                                                                                                                      |                                        |                 |                   |                  | 3.5                      |      |
| Quiescent supply current delta, TTL input level 3005 | ΔI <sub>CC</sub><br><u>6/ 7/ 10/</u>     | For inputs under test,<br>V <sub>IN</sub> = V <sub>CC</sub> - 2.1 V<br>For all other inputs,<br>V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                                             | All<br>All                             | 5.5 V           | 1                 |                  | 1.0                      | mA   |
|                                                      |                                          |                                                                                                                                                                                                                                      | All<br>All                             | 5.5 V           | 2, 3              |                  | 1.6                      |      |
|                                                      |                                          |                                                                                                                                                                                                                                      | All<br>All                             | 5.5 V           | 1                 |                  | 1.6                      |      |
|                                                      |                                          |                                                                                                                                                                                                                                      |                                        |                 |                   |                  | 3.5                      |      |
| Input capacitance 3012                               | C <sub>IN</sub>                          | 4.4.1d<br>T <sub>C</sub> = +25°C                                                                                                                                                                                                     | All<br>All                             | GND             | 4                 |                  | 10.0                     | pF   |
| Output capacitance 3012                              | C <sub>OUT</sub><br><u>9/</u>            | 4.4.1d<br>T <sub>C</sub> = +25°C                                                                                                                                                                                                     | All<br>All                             | 5.5 V           | 4                 |                  | 15.0                     | pF   |
| Power dissipation capacitance                        | C <sub>PD</sub><br><u>11/</u>            | 4.4.1d<br>T <sub>C</sub> = +25°C                                                                                                                                                                                                     | All<br>All                             | 5.0 V           | 4                 |                  | 80.0                     | pF   |
| Low level ground bounce noise                        | V <sub>OLP</sub><br><u>12/</u>           | V <sub>IH</sub> = 3.0 V, V <sub>IL</sub> = 0.0 V<br>T <sub>A</sub> = +25°C<br>See 4.4.1c<br>See figure 4.                                                                                                                            | All<br>All                             | 5.0 V           | 4                 |                  | 1650                     | mV   |
|                                                      | V <sub>OLV</sub><br><u>12/</u>           |                                                                                                                                                                                                                                      | All<br>All                             | 5.0 V           | 4                 |                  | -1200                    |      |
| High level V <sub>CC</sub> bounce noise              | V <sub>OHP</sub><br><u>12/</u>           |                                                                                                                                                                                                                                      | All<br>All                             | 5.0 V           | 4                 |                  | V <sub>OH</sub><br>+1000 | mV   |
|                                                      | V <sub>OHV</sub><br><u>12/</u>           |                                                                                                                                                                                                                                      | All<br>All                             | 5.0 V           | 4                 |                  | V <sub>OH</sub><br>-1800 |      |
| Latch-up input/output over-voltage                   | I <sub>CC</sub><br>(O/V1)<br><u>13/</u>  | t <sub>w</sub> ≥ 100 μs<br>t <sub>cool</sub> ≥ t <sub>w</sub><br>5 μs ≤ t <sub>r</sub> ≤ 5 ms<br>5 μs ≤ t <sub>r</sub> ≤ 5 ms<br>V <sub>test</sub> = 6.0 V<br>V <sub>CCQ</sub> = 5.5 V<br>V <sub>OVER</sub> = 10.5 V, See 4.4.1b     | All<br>Q, V                            | 5.5 V           | 2                 |                  | 200                      | mA   |
| Latch-up input/output positive over-current          | I <sub>CC</sub><br>(O/I1+)<br><u>13/</u> | t <sub>w</sub> ≥ 100 μs<br>t <sub>cool</sub> ≥ t <sub>w</sub><br>5 μs ≤ t <sub>r</sub> ≤ 5 ms<br>5 μs ≤ t <sub>r</sub> ≤ 5 ms<br>V <sub>test</sub> = 6.0 V<br>V <sub>CCQ</sub> = 5.5 V<br>I <sub>trigger</sub> = +120 mA, See 4.4.1b | All<br>Q, V                            | 5.5 V           | 2                 |                  | 200                      | mA   |

See footnotes at end of table

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TABLE IA. Electrical performance characteristics – Continued.

| Test and MIL-STD-883 test method <u>1/</u>                         | Symbol                                                  | Conditions <u>2/ 3/</u><br>-55°C ≤ T <sub>C</sub> ≤ +125°C<br>+4.5 V ≤ V <sub>CC</sub> ≤ +5.5 V<br>unless otherwise specified                                                                                                        | Device type and device class <u>4/</u> | V <sub>CC</sub> | Group A subgroups | Limits <u>5/</u> |      | Unit |
|--------------------------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------|-------------------|------------------|------|------|
|                                                                    |                                                         |                                                                                                                                                                                                                                      |                                        |                 |                   | Min              | Max  |      |
| Latch-up input/output negative over-current                        | I <sub>CC</sub><br>(O/I1-)<br><u>13/</u>                | t <sub>w</sub> ≥ 100 μs<br>t <sub>cool</sub> ≥ t <sub>w</sub><br>5 μs ≤ t <sub>r</sub> ≤ 5 ms<br>5 μs ≤ t <sub>f</sub> ≤ 5 ms<br>V <sub>test</sub> = 6.0 V<br>V <sub>CCQ</sub> = 5.5 V<br>I <sub>trigger</sub> = -120 mA, See 4.4.1b | All Q, V                               | 5.5 V           | 2                 |                  | 200  | mA   |
| Latch-up supply over-voltage                                       | I <sub>CC</sub><br>(O/V2)<br><u>13/</u>                 | t <sub>w</sub> ≥ 100 μs<br>t <sub>cool</sub> ≥ t <sub>w</sub><br>5 μs ≤ t <sub>r</sub> ≤ 5 ms<br>5 μs ≤ t <sub>f</sub> ≤ 5 ms<br>V <sub>test</sub> = 6.0 V<br>V <sub>CCQ</sub> = 5.5 V<br>V <sub>OVER</sub> = 9.0 V, See 4.4.1b      | All Q, V                               | 5.5 V           | 2                 |                  | 100  | mA   |
| Functional tests<br>3014                                           | <u>6/ 7/ 14/</u>                                        | V <sub>IH</sub> = 2.4 V, V <sub>IL</sub> = 0.4 V                                                                                                                                                                                     | All All                                | 5.5 V           | 7, 8              | L                | H    |      |
|                                                                    |                                                         | Verify output V <sub>OUT</sub> M, D, P, L, R                                                                                                                                                                                         | All All                                | 4.5 V           | 7                 | L                | H    |      |
|                                                                    |                                                         | See 4.4.1e                                                                                                                                                                                                                           | All All                                | 4.5 V           | 7, 8              | L                | H    |      |
| Propagation delay time, data to output, An to Bn, Bn to An<br>3003 | t <sub>PHL</sub> , t <sub>PLH</sub><br><u>6/ 7/ 15/</u> | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω<br>See figure 5                                                                                                                                                                      | All All                                | 4.5 V           | 9                 | 1.0              | 8.0  | ns   |
|                                                                    |                                                         | M, D, P, L, R                                                                                                                                                                                                                        | All All                                | 4.5 V           | 9                 | 1.0              | 8.0  |      |
|                                                                    |                                                         |                                                                                                                                                                                                                                      | All All                                | 4.5 V           | 10, 11            | 1.0              | 9.0  |      |
| Propagation delay time, output enable, OE to An or Bn<br>3003      | t <sub>PZH</sub> , t <sub>PZL</sub><br><u>6/ 7/ 15/</u> | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω<br>See figure 5                                                                                                                                                                      | All All                                | 4.5 V           | 9                 | 1.0              | 11.0 | ns   |
|                                                                    |                                                         | M, D, P, L, R                                                                                                                                                                                                                        | All All                                | 4.5 V           | 9                 | 1.0              | 11.0 |      |
|                                                                    |                                                         |                                                                                                                                                                                                                                      | All All                                | 4.5 V           | 10, 11            | 1.0              | 12.0 |      |
| Propagation delay time, output disable, OE to An or Bn<br>3003     | t <sub>PHZ</sub> , t <sub>PLZ</sub><br><u>6/ 7/ 15/</u> | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω<br>See figure 5                                                                                                                                                                      | All All                                | 4.5 V           | 9                 | 1.0              | 10.0 | ns   |
|                                                                    |                                                         | M, D, P, L, R                                                                                                                                                                                                                        | All All                                | 4.5 V           | 9                 | 1.0              | 10.0 |      |
|                                                                    |                                                         |                                                                                                                                                                                                                                      | All All                                | 4.5 V           | 10, 11            | 1.0              | 11.5 |      |

1/ For tests not listed in the referenced MIL-STD-883 (e.g. I<sub>CCZ</sub>), utilize the general test procedure under the conditions listed herein. All inputs and outputs shall be tested, as applicable, to the tests in table IA herein.

2/ Each input/output, as applicable, shall be tested at the specified temperature, for the specified limits. The V<sub>IH</sub> minimum and V<sub>IL</sub> maximum thresholds for any input that may affect the logic state of the output under test shall be verified during each V<sub>OL</sub> and V<sub>OH</sub> tests. Output terminals not designated shall be high level logic, low level logic, or open, except for the I<sub>CC</sub> and ΔI<sub>CC</sub> tests, the output terminals shall be open. When performing the I<sub>CC</sub> and ΔI<sub>CC</sub> tests, the current meter shall be placed in the circuit such that all current flows through the meter. Additional detailed information on qualified devices (i.e. pin for pin conditions and testing sequence) is available from the qualifying activity (DLA Land and Maritime -VQC) upon request.

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TABLE IA. Electrical performance characteristics – Continued.

- 3/ RHA devices supplied to this drawing have been characterized through all levels M, D, P, L, and R of irradiation. However, this device is only tested at the 'R' level. Pre and Post irradiation values are identical unless otherwise specified in table IA. When performing post irradiation electrical measurements for any RHA level,  $T_A = +25^\circ\text{C}$ .
- 4/ The word "All" in the device type and device class column, means limits for all device types and classes.
- 5/ For negative and positive voltage and current values, the sign designates the potential difference in reference to GND and the direction of current flow, respectively; and the absolute value of the magnitude, not the sign, is relative to the minimum and maximum limits, as applicable, listed herein. All devices shall meet or exceed the limits specified in table IA, as applicable, at  $4.5\text{ V} \leq V_{CC} \leq 5.5\text{ V}$ .
- 6/ RHA samples do not have to be tested at  $-55^\circ\text{C}$  and  $+125^\circ\text{C}$  prior to irradiation.
- 7/ When performing post irradiation electrical measurements for RHA level,  $T_A = +25^\circ\text{C}$ . Limits shown are guaranteed at  $T_A = +25^\circ\text{C} \pm 5\%$
- 8/ Transmission driving tests are performed at  $V_{CC} = 5.5\text{ V}$  dc with a 2 ms duration maximum. This test may be performed using  $V_{IN} = V_{CC}$  or GND. When  $V_{IN} = V_{CC}$  or GND is used, the test is guaranteed for  $V_{IN} = 2.0\text{ V}$  or  $0.8\text{ V}$ .
- 9/ Three-state output conditions are required.
- 10/ This is the increase in supply current for each input that is at one of the specific TTL voltage levels rather than  $0\text{ V}$  or  $V_{CC}$ . This test may be performed either one input at a time (preferred method) or with all input pins simultaneously at  $V_{IN} = V_{CC} - 2.1\text{ V}$  (alternate method). Classes Q and V shall use the preferred method. When the test is performed using the alternate test method, the maximum limit is equal to the number of inputs at a high TTL input level times  $1.0\text{ mA}$  or  $1.6\text{ mA}$ , as applicable; and the preferred method and limits are guaranteed.
- 11/ Power dissipation capacitance ( $C_{PD}$ ) determines the power consumption ( $P_D$ ) and the current consumption ( $I_S$ ).  

$$P_D = (C_{PD} + C_L)(V_{CC} \times V_{CC})f + (I_{CC} \times V_{CC}) + (n \times d \times \Delta I_{CC} \times V_{CC})$$

$$I_S = (C_{PD} + C_L)V_{CC}f + I_{CC} + (n \times d \times \Delta I_{CC})$$

For both  $P_D$  and  $I_S$ ,  $n$  is the number of device inputs at TTL levels;  $f$  is the frequency of the input signal and  $d$  is the duty cycle of the input signal.
- 12/ This test is for qualification only. Ground and  $V_{CC}$  bounce tests are performed on a non-switching (quiescent) output and are used to measure the magnitude of induced noise caused by other simultaneously switching outputs. The test is performed on a low noise bench test fixture. For the device under test, all outputs shall be loaded with  $500\Omega$  of load resistance and a minimum of  $50\text{ pF}$  of load capacitance (see figure 4). Only chip capacitors and resistors shall be used. The output load components shall be located as close as possible to the device outputs. It is suggested that, whenever possible, this distance be kept to less than  $0.25$  inches. Decoupling capacitors shall be placed in parallel from  $V_{CC}$  to ground. The device manufacturer shall determine the values of these decoupling capacitors. The low and high level ground and  $V_{CC}$  bounce noise is measured at the quiet output using a  $1\text{ GHz}$  minimum bandwidth oscilloscope with a  $50\Omega$  input impedance.  
  

The device inputs shall be conditioned such that all outputs are at a high nominal  $V_{OH}$  level. The device inputs shall then be conditioned such that they switch simultaneously and the output under test remains at  $V_{OH}$  as all other outputs possible are switched from  $V_{OH}$  to  $V_{OL}$ .  $V_{OHV}$  and  $V_{OHP}$  are then measured from the nominal  $V_{OH}$  level to the largest negative and positive peaks, respectively (see figure 4). This is then repeated with the same outputs not under test switching from  $V_{OL}$  to  $V_{OH}$ .

The device inputs shall be conditioned such that all outputs are at a low nominal  $V_{OL}$  level. The device inputs shall then be conditioned such that they switch simultaneously and the output under test remains at  $V_{OL}$  as all other outputs possible are switched from  $V_{OL}$  to  $V_{OH}$ .  $V_{OLP}$  and  $V_{OLV}$  are then measured from the nominal  $V_{OL}$  level to the largest positive and negative peaks, respectively (see figure 4). This is then repeated with the same outputs not under test switching from  $V_{OH}$  to  $V_{OL}$ .
- 13/ See JESD78 for electrically induced latch-up test methods and procedures. The values listed for  $I_{trigger}$  and  $V_{OVER}$ , are to be accurate within  $\pm 5$  percent.
- 14/ Tests shall be performed in sequence, attributes data only. Functional tests shall include the truth table and other logic patterns used for fault detection. Functional tests shall be performed in sequence as approved by the qualifying activity on qualified devices.  $H \geq 2.5\text{ V}$ ,  $L < 2.5\text{ V}$ , high inputs =  $2.4\text{ V}$  and low inputs =  $0.4\text{ V}$ . The input voltage levels have the allowable tolerances per MIL-STD-883 already incorporated.
- 15/ AC limits at  $V_{CC} = 5.5\text{ V}$  are equal to the limits at  $V_{CC} = 4.5\text{ V}$  and guaranteed by testing at  $V_{CC} = 4.5\text{ V}$ . Minimum AC limits at for  $V_{CC} = 5.5\text{ V}$  are  $1.0\text{ ns}$  and guaranteed by guardbanding the  $V_{CC} = 4.5\text{ V}$  minimum limits to  $1.5\text{ ns}$ . For propagation delay tests, all paths must be tested.

|                                                                                                      |                  |                            |                    |
|------------------------------------------------------------------------------------------------------|------------------|----------------------------|--------------------|
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TABLE IB. SEP test limits. 1/ 2/

| Device type | Bias $V_{CC} = 5.5 \text{ V}$ for SEL test<br>No SEL occurs at effective LET 3/ 4/ |
|-------------|------------------------------------------------------------------------------------|
| 01          | $\text{LET} \leq 100 \text{ MeV}/(\text{mg}/\text{cm}^2)$                          |

1/ For SEP test conditions, see 4.4.4.2 herein.

2/ Technology characterization and model verification supplemented by in-line data may be used in lieu of end-of-line testing. Test plan must be approved by TRB and qualifying activity.

3/ Worst case temperature is  $T_A = +125^\circ\text{C} \pm 10^\circ\text{C}$  for SEL

4/ Tested to effective  $\text{LET} = 100 \text{ MeV}/(\text{mg}/\text{cm}^2)$ , and no latch-up (SEL) occurs.

| Device type     | 01                      |
|-----------------|-------------------------|
| Case outlines   | R, S, and 2             |
| Terminal number | Terminal symbol         |
| 1               | $\overline{\text{T/R}}$ |
| 2               | A0                      |
| 3               | A1                      |
| 4               | A2                      |
| 5               | A3                      |
| 6               | A4                      |
| 7               | A5                      |
| 8               | A6                      |
| 9               | A7                      |
| 10              | GND                     |
| 11              | B7                      |
| 12              | B6                      |
| 13              | B5                      |
| 14              | B4                      |
| 15              | B3                      |
| 16              | B2                      |
| 17              | B1                      |
| 18              | B0                      |
| 19              | $\overline{\text{OE}}$  |
| 20              | $V_{CC}$                |

| Terminal descriptions                          |                                          |
|------------------------------------------------|------------------------------------------|
| Terminal symbol                                | Description                              |
| $A_n$ ( $n = 0$ to 7)<br>$B_n$ ( $n = 0$ to 7) | Data inputs/outputs                      |
| $\overline{\text{OE}}$                         | Output enable control input (active low) |
| $\overline{\text{T/R}}$                        | Transmit/receive control input           |

FIGURE 1. Terminal connections.

|                                                                                                |                  |                     |                    |
|------------------------------------------------------------------------------------------------|------------------|---------------------|--------------------|
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| Device type 01  |                  |                                |
|-----------------|------------------|--------------------------------|
| Inputs          |                  | Operation                      |
| $\overline{OE}$ | $T/\overline{R}$ |                                |
| L               | L                | Bus B data to bus A (Bn to An) |
| L               | H                | Bus A data to bus B (An to Bn) |
| H               | X                | High impedance state           |

L = Low voltage level  
H = High voltage level  
X = Irrelevant

FIGURE 2. Truth table.

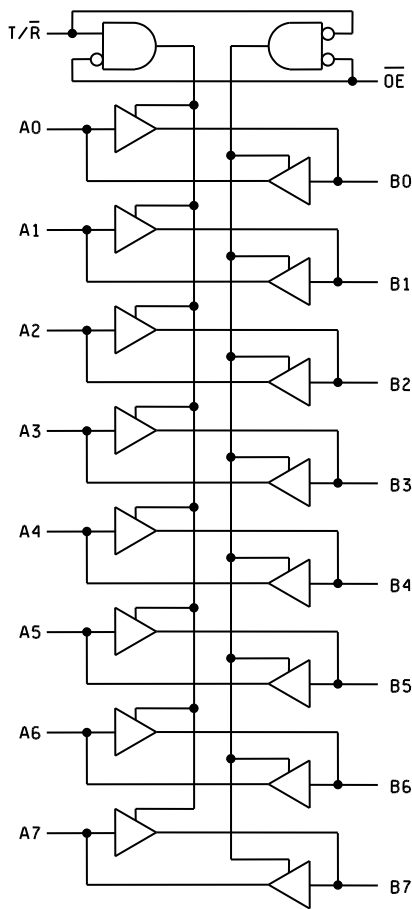
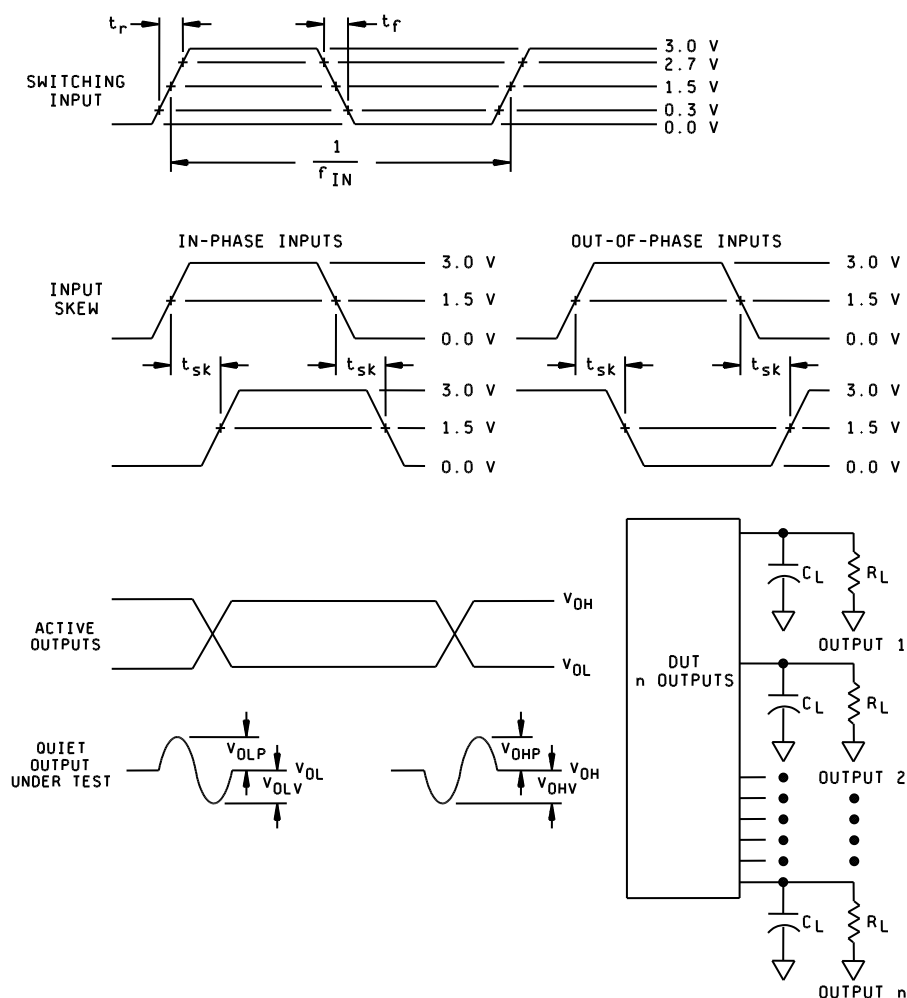


FIGURE 3. Logic diagram.

|                                                                                                |                  |                     |                    |
|------------------------------------------------------------------------------------------------|------------------|---------------------|--------------------|
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**NOTES:**

1.  $C_L$  includes a 47 pF chip capacitor (-0 percent, +20 percent) and at least 3 pF of equivalent capacitance from the test jig and probe.
2.  $R_L = 450\Omega \pm 1$  percent, chip resistor in series with a  $50\Omega$  termination. For monitored outputs, the  $50\Omega$  termination shall be the  $50\Omega$  characteristic impedance of the coaxial connector to the oscilloscope.
3. Input signal to the device under test:
  - a.  $V_{IN} = 0.0$  V to 3.0 V; duty cycle = 50 percent;  $f_{IN} \geq 1$  MHz.
  - b.  $t_r, t_f = 3.0$  ns  $\pm 1.0$  ns. For input signal generators incapable of maintaining these values of  $t_r$  and  $t_f$ , the 3.0 ns limit may be increased up to 10 ns, as needed, maintaining the  $\pm 1.0$  ns tolerance and guaranteeing the results at 3.0 ns  $\pm 1.0$  ns; skew between any two switching input signals ( $t_{sk}$ ):  $\leq 250$  ps.

FIGURE 4. Ground bounce waveforms and test circuit.

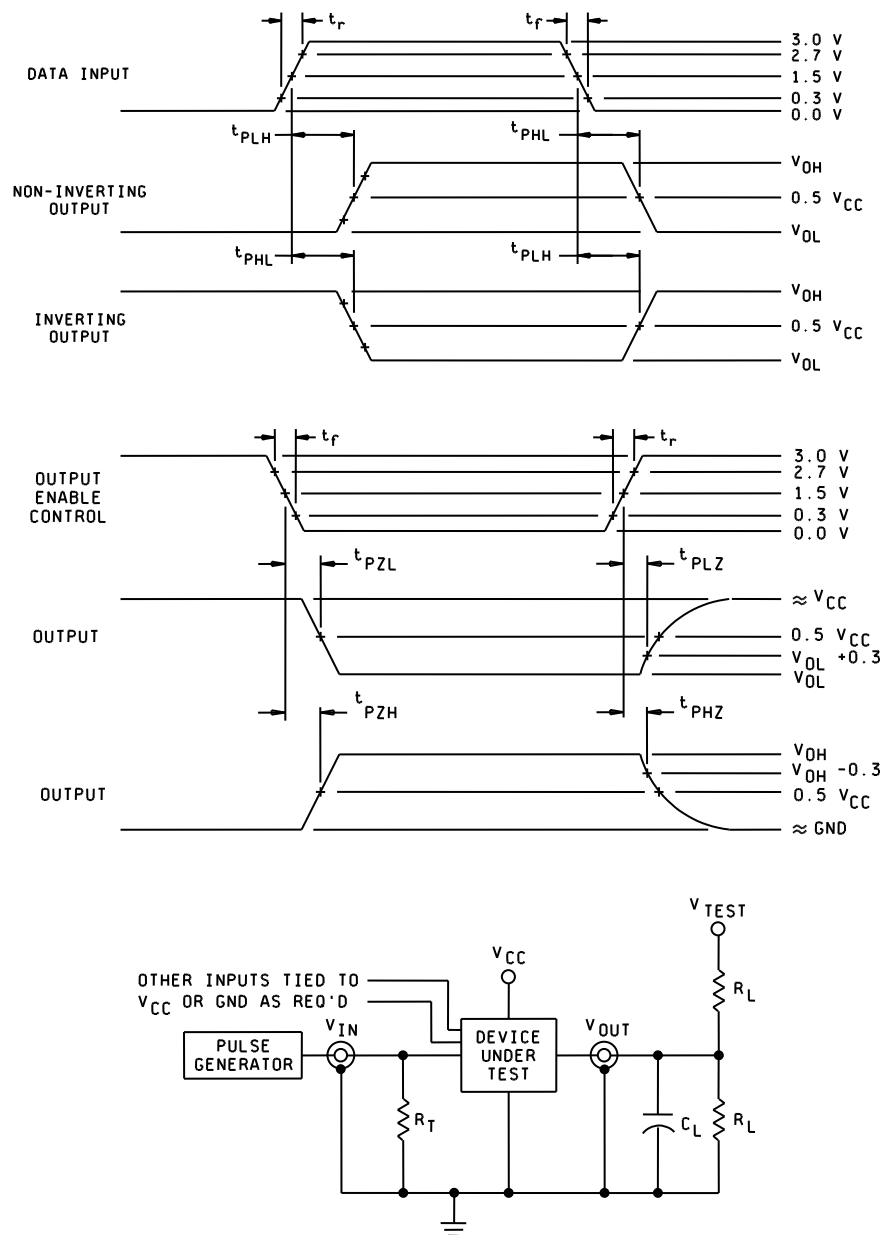
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MICROCIRCUIT DRAWING**  
DLA LAND AND MARITIME  
COLUMBUS, OHIO 43218-3990

SIZE  
**A**

REVISION LEVEL  
**E**

**5962-92187**

SHEET  
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NOTES:

1. When measuring  $t_{PLZ}$  and  $t_{PZL}$ :  $V_{TEST} = 2 \times V_{CC}$ .
2. When measuring  $t_{PHZ}$ ,  $t_{PZH}$ ,  $t_{PLH}$ , and  $t_{PHL}$ :  $V_{TEST} = \text{Open}$ .
3. The  $t_{PZL}$  and  $t_{PLZ}$  reference waveform is for the output under test with internal conditions such that the output is at  $V_{OL}$  except when disabled by the output enable control. The  $t_{PZH}$  and  $t_{PHZ}$  reference waveform is for the output under test with internal conditions such that the output is at  $V_{OH}$  except when disabled by the output enable control.
4.  $C_L = 50 \text{ pF}$  minimum or equivalent (includes test jig and probe capacitance).
5.  $R_L = 500\Omega$  or equivalent.  $R_T = 50\Omega$  or equivalent.
6. Input signal from pulse generator:  $V_{IN} = 0.0 \text{ V}$  to  $V_{CC}$ ;  $PRR \leq 10 \text{ MHz}$ ;  $t_r \leq 2.5 \text{ ns}$ ;  $t_f \leq 2.5 \text{ ns}$ ;  $t_r$  and  $t_f$  shall be measured from  $0.3 \text{ V}$  to  $2.7 \text{ V}$  and from  $2.7 \text{ V}$  to  $0.3 \text{ V}$ , respectively; duty cycle = 50 percent.
7. Timing parameters shall be tested at a minimum input frequency of  $1 \text{ MHz}$ .
8. The outputs are measured one at a time with one transition per measurement.

FIGURE 5. Switching waveforms and test circuit.

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#### 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. For device class M, sampling and inspection procedures shall be in accordance with MIL-PRF-38535, appendix A.

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. For device class M, screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection.

##### 4.2.1 Additional criteria for device class M.

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring 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.

(2)  $T_A = +125^{\circ}\text{C}$ , minimum.

b. Interim and final electrical test parameters shall be as specified in table II herein.

##### 4.2.2 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 II 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. Quality conformance inspection for device class M shall be in accordance with MIL-PRF-38535, appendix A and as specified herein. Inspections to be performed for device class M shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.4).

|                                                                                        |           |                     |             |
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#### 4.4.1 Group A inspection.

- a. Tests shall be as specified in table II herein.
- b. Latch-up tests are required for all device classes. These tests shall be performed only for initial qualification and after process or design changes which may affect the performance of the device. Latch-up tests shall be considered destructive. Test all applicable pins on five devices with zero failures.
- c. Ground and  $V_{CC}$  bounce tests are required for all device classes. These tests shall be performed only for initial qualification, after process or design changes which may affect the performance of the device, and any changes to the test fixture.  $V_{OLP}$ ,  $V_{OLV}$ ,  $V_{OHP}$ , and  $V_{OHV}$  shall be measured for the worst case outputs of the device. All other outputs shall be guaranteed, if not tested, to the limits established for the worst case outputs. The worst case outputs tested are to be determined by the manufacturer. Test 5 devices assembled in the worst case package type supplied to this document. All other package types shall be guaranteed, if not tested, to the limits established for the worst case package. The package type to be tested shall be determined by the manufacturer. The device manufacturer will submit to DLA Land and Maritime -VA data that shall include all measured peak values for each device tested and detailed oscilloscope plots for each  $V_{OLP}$ ,  $V_{OLV}$ ,  $V_{OHP}$ , and  $V_{OHV}$  from one sample part per function. The plot shall contain the waveforms of both a switching output and the output under test.

Each device manufacturer shall test product on the fixtures they currently use. When a new fixture is used, the device manufacturer shall inform DLA Land and Maritime -VA of this change and test the 5 devices on both the new and old test fixtures. The device manufacturer shall then submit to DLA Land and Maritime -VA data from testing on both fixtures that shall include all measured peak values for each device tested and detailed oscilloscope plots for each  $V_{OLP}$ ,  $V_{OLV}$ ,  $V_{OHP}$ , and  $V_{OHV}$  from one sample part per function. The plot shall contain the waveforms of both a switching output and the output under test.

For  $V_{OHP}$ ,  $V_{OHV}$ ,  $V_{OLP}$ , and  $V_{OLV}$ , a device manufacturer may qualify devices by functional groups. A specific functional group shall be composed of function types, that by design, will yield the same test values when tested in accordance with table IA, herein. The device manufacturer shall set a functional group limit for the  $V_{OHP}$ ,  $V_{OHV}$ ,  $V_{OLP}$ , and  $V_{OLV}$  tests. The device manufacturer may then test one device function from a functional group to the limits and conditions specified herein. All other device functions in that particular functional group shall be guaranteed, if not tested, to the limits and conditions specified in table IA, herein. The device manufacturer shall submit to DLA Land and Maritime -VA the device functions listed in each functional group and the test results, along with the oscilloscope plots, for each device tested.

- d.  $C_{IN}$ ,  $C_{OUT}$ , and  $C_{PD}$  shall be measured only for initial qualification and after process or design changes which may affect capacitance.  $C_{IN}$  and  $C_{OUT}$  shall be measured between the designated terminal and GND at a frequency of 1 MHz.  $C_{PD}$  shall be tested in accordance with the latest revision of JESD20 and table IA herein. For  $C_{IN}$ ,  $C_{OUT}$  and  $C_{PD}$ , test all applicable pins on five devices with zero failures.
- e. For device class M, subgroups 7 and 8 tests shall be sufficient to verify the truth table in figure 2 herein. The test vectors used to verify the truth table shall, at a minimum, test all functions of each input and output. All possible input to output logic patterns per function shall be guaranteed, if not tested, to the truth table in figure 2, herein. For device classes Q and V, subgroups 7 and 8 shall include verifying the functionality of the device.

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

4.4.2.1 Additional criteria for device class M. Steady-state life test conditions, method 1005 of MIL-STD-883:

- a. Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring 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.
- b.  $T_A = +125^{\circ}\text{C}$ , minimum.
- b. Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.4.2.2 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 test method 1005 of MIL-STD-883.

|                                                                                        |           |                     |             |
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TABLE II. Electrical test requirements.

| Test requirements                                    | Subgroups<br>(in accordance with<br>MIL-STD-883,<br>method 5005, table I) | Subgroups<br>(in accordance with<br>MIL-PRF-38535, table III) |                                       |
|------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------|
|                                                      | Device<br>class M                                                         | Device<br>class Q                                             | Device<br>class V                     |
| Interim electrical<br>parameters (see 4.2)           | - - -                                                                     | 1                                                             | 1                                     |
| Final electrical<br>parameters (see 4.2)             | <u>1/</u> 1, 2, 3, 7, 8, 9                                                | <u>1/</u> 1, 2, 3, 7,<br>8, 9, 10, 11                         | <u>2/</u> 1, 2, 3, 7,<br>8, 9, 10, 11 |
| Group A test<br>requirements (see 4.4)               | 1, 2, 3, 4, 7,<br>8, 9, 10, 11                                            | 1, 2, 3, 4, 7,<br>8, 9, 10, 11                                | 1, 2, 3, 4, 7,<br>8, 9, 10, 11        |
| Group C end-point electrical<br>parameters (see 4.4) | 1, 2, 3                                                                   | 1, 2, 3                                                       | 1, 2, 3                               |
| Group D end-point electrical<br>parameters (see 4.4) | 1, 2, 3                                                                   | 1, 2, 3                                                       | 1, 2, 3                               |
| Group E end-point electrical<br>parameters (see 4.4) | 1, 7, 9                                                                   | 1, 7, 9                                                       | 1, 7, 9                               |

1/ PDA applies to subgroup 1.

2/ PDA applies to subgroups 1 and 7.

4.4.3 Group D inspection. The group D inspection end-point electrical parameters shall be as specified in table II 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. For device class M, the devices shall be subjected to radiation hardness assured tests as specified in MIL-PRF-38535, appendix A for the RHA level being tested. All device classes must meet the post irradiation end-point electrical parameter limits as defined in table IA at  $T_A = +25^{\circ}\text{C} + 5^{\circ}\text{C}$ , after exposure, to the subgroups specified in table II 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, and as specified herein.

4.4.4.1.1 Accelerated annealing test. (MOS devices only) Accelerated annealing tests shall be performed on all devices requiring a RHA level greater than 5k rads (Si). The post-anneal end-point electrical parameter limits shall be as specified in table IA herein and shall be the pre-irradiation end-point electrical parameter limit at  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ . Testing shall be performed at initial qualification and after any design or process changes which may affect the RHA response of the device.

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4.4.4.2 Single event phenomena (SEP). When specified in the purchase order or contract, SEP testing shall be performed on class V devices. SEP testing shall be performed on the Standard Evaluation Circuit (SEC) or alternate SEP test vehicle as approved by the qualifying activity at initial qualification and after any design or process changes which may affect the upset or latchup characteristics. Test four devices with zero failures. ASTM F1192 may be used as a guideline when performing SEP testing. The test conditions for SEP are as follows:

- a. The ion beam angle of incidence shall be between normal to the die surface and 60° to the normal, inclusive (i.e.  $0^\circ \leq \text{angle} \leq 60^\circ$ ). No shadowing of the ion beam due to fixturing or package related effects is allowed.
- b. The fluence shall be  $\geq 100$  errors or  $\geq 10^7$  ions/cm<sup>2</sup>.
- c. The flux shall be between  $10^2$  and  $10^5$  ions/cm<sup>2</sup>/s. The cross-section shall be verified to be flux independent by measuring the cross-section at two flux rates which differ by at least an order of magnitude.
- d. The particle range shall be  $\geq 20$  microns in silicon.
- e. The latch-up test temperature shall be at the maximum rated operating temperature  $\pm 10^\circ\text{C}$ .
- f. Bias conditions shall be  $V_{CC} = 5.5$  V dc for the latch-up measurements.
- g. For SEP test limits, see table IB herein.

4.5 Methods of inspection. Methods of inspection shall be specified as follows:

4.5.1 Voltage and current. Unless otherwise specified, all voltages given are referenced to the microcircuit GND terminal. Currents given are conventional current and positive when flowing into the referenced terminal.

## 5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38535 for device classes Q and V or MIL-PRF-38535, appendix A for device class M.

## 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.

6.1.2 Substitutability. Device class Q devices will replace device class M devices.

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 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) 692-0591.

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 MIL-HDBK-103 and QML-38535 have submitted a certificate of compliance (see 3.6 herein) to DLA Land and Maritime -VA and have agreed to this drawing.

6.6.2 Approved sources of supply for device class M. Approved sources of supply for class M are listed in MIL-HDBK-103. The vendors listed in MIL-HDBK-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DLA Land and Maritime -VA.

|                                                                                                |                  |                            |                    |
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## STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 21-12-02

Approved sources of supply for SMD 5962-92187 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 <https://landandmaritimeapps.dla.mil/programs/smcr/>.

| Standard microcircuit drawing<br>PIN <u>1</u> / | Vendor<br>CAGE<br>number | Vendor<br>similar<br>PIN <u>2</u> / |
|-------------------------------------------------|--------------------------|-------------------------------------|
| 5962-9218701MRA                                 | 0C7V7                    | QP54ACTQ245DMQB                     |
|                                                 | 0C7V7                    | 54ACTQ245DMQB                       |
|                                                 | 3V146                    | 54ACTQ245/BRA                       |
| 5962-9218701MSA                                 | 0C7V7                    | QP54ACTQ245FMQB                     |
|                                                 | 0C7V7                    | 54ACTQ245FMQB                       |
|                                                 | 3V146                    | 54ACTQ245/BSA                       |
| 5962-9218701M2A                                 | 0C7V7                    | QP54ACTQ245LMQB                     |
|                                                 | 0C7V7                    | 54ACTQ245LMQB                       |
|                                                 | 3V146                    | 54ACTQ245/B2A                       |
| 5962R9218701MRA                                 | <u>3</u> /               | 54ACTQ245DMQB                       |
| 5962R9218701MSA                                 | <u>3</u> /               | 54ACTQ245FMQB                       |
| 5962R9218701M2A                                 | <u>3</u> /               | 54ACTQ245LMQB                       |
| 5962R9218701VRA                                 | <u>3</u> /               | 54ACTQ245JRQMLV                     |
| 5962R9218701VSA                                 | <u>3</u> /               | 54ACTQ245WRQMLV                     |
| 5962R9218701V2A                                 | <u>3</u> /               | 54ACTQ245ERQMLV                     |

- 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.

Vendor CAGE  
number

Vendor name  
and address

0C7V7

Teledyne e2v Hirel Electronic  
765 Sycamore Drive  
Milpitas, CA 95035

3V146

Rochester Electronics, LLC  
16 Malcolm Hoyt Drive  
Newburyport, MA 01950

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