| REVISIONS | | | |
|---|---|---|---|
| LTR | DESCRIPTION | DATE (YR-MO-DA) | APPROVED |
| A | Drawing updated to reflect current requirements. - gt | 02-06-17 | Raymond Monnin |
| B | Remove class M requirements throughout. Update paragraphs to current MIL-PRF-38535 requirements. - drw | 14-07-07 | Charles F. Saffle |
| C | Add device type 03 and 04. Delete figure 4 radiation exposure circuit and paragraph 4.4.4.2 Single event phenomena (SEP). Delete device class M references. Add paragraph 3.2.5. - ro | 15-04-14 | Charles F. Saffle |
| D | Make changes to the $I_{IL}$ and $I_{IH}$ maximum test limits for device types 01 and 02 as specified under Table I. - ro | 15-06-02 | Charles F. Saffle |
| E | Add device type 05. Make change to Supply voltage ($V_S$) limit and footnote 4/ as specified under paragraph 1.3. Make change to $\theta_{JC}$ and $\theta_{JA}$ limits and test measurement. - ro | 15-09-03 | Charles F. Saffle |
| F | Add device type 06. - ro | 16-04-21 | Charles F. Saffle |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REV | | | | | | | | | | | | | | | | | | | | |
| SHEET | | | | | | | | | | | | | | | | | | | | |
| REV | F | F | F | F | F | | | | | | | | | | | | | | | |
| SHEET | 15 | 16 | 17 | 18 | 19 | | | | | | | | | | | | | | | |
| REV STATUS | | | | REV | | | F | F | F | F | F | F | F | F | F | F | F | F | F | F |
| OF SHEETS | | | | SHEET | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |

PMIC N/A

PREPARED BY
RICK OFFICER

**DLA LAND AND MARITIME**
**COLUMBUS, OHIO 43218-3990**
**http://www.landandmaritime.dla.mil**

**STANDARD MICROCIRCUIT DRAWING**

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

CHECKED BY
RAJESH PITHADIA

APPROVED BY
RAYMOND MONNIN

DRAWING APPROVAL DATE
99-06-02

MICROCIRCUIT, DIGITAL-LINEAR, RADIATION HARDENED DUAL NON-INVERTING MOSFET DRIVER, MONOLITHIC SILICON

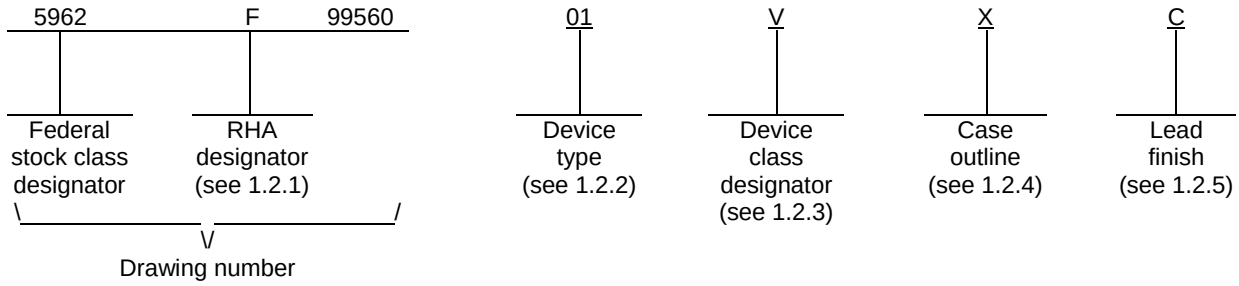
| REVISION LEVEL | SIZE | CAGE CODE | |
|---|---|---|---|
| F | A | **67268** | **5962-99560** |

SHEET 1 OF 19

1. SCOPE

1.1 Scope. This drawing documents three product assurance class levels consisting of high reliability (device class Q), space application (device class V) and for appropriate satellite and similar applications (device class T). 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. For device class T, the user is encouraged to review the manufacturer's Quality Management (QM) plan as part of their evaluation of these parts and their acceptability in the intended application.

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




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

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

| Device type | Generic number | Circuit function |
|---|---|---|
| 01 | HS-4424RH | Radiation hardened dual non-inverting MOSFET drivers with < 10 V lockout voltage |
| 02 | HS-4424BRH | Radiation hardened dual non-inverting MOSFET drivers with < 7.5 V lockout voltage |
| 03 | HS-4424EH | Radiation hardened dual non-inverting MOSFET drivers with < 10 V lockout voltage |
| 04 | HS-4424BEH | Radiation hardened dual non-inverting MOSFET drivers with < 7.5 V lockout voltage |
| 05 | HS-4424DRH | Radiation hardened dual non-inverting MOSFET drivers with < 8.0 V lockout voltage |
| 06 | HS-4424DEH | Radiation hardened dual non-inverting MOSFET drivers with < 8.0 V lockout voltage |

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

| Device class | Device requirements documentation |
|---|---|
| Q, V | Certification and qualification to MIL-PRF-38535 |
| T | Certification and qualification to MIL-PRF-38535 with performance as specified in the device manufacturers approved quality management plan. |

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

| Outline letter | Descriptive designator | Terminals | Package style |
|---|---|---|---|
| X | CDFP4-F16 | 16 | Flat pack |

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

1.3 Absolute maximum ratings. 1/

Supply voltage ($V_S$) ..... 20 V
Input voltage range ($V_{IN}$) ..... -0.3 V to +V 2/
Output short circuit duration (single supply) ..... Continuous 3/
Maximum junction temperature ($T_J$) ..... 175°C
Maximum storage temperature ..... -65°C to +150°C
Maximum lead temperature (soldering 10 seconds) ..... 265°C
Thermal resistance, junction-to-case ($\theta_{JC}$) ..... 5°C/W 4/
Thermal resistance, junction-to-ambient ($\theta_{JA}$) ..... 34°C/W 4/

1.4 Recommended operating conditions.

Supply voltage range ($V_S$) :
  Device types 01, 02, 03, 04 ..... 12 V to 18 V
  Device types 05 and 06 ..... 8 V to 18 V
Low voltage lockout voltage:
  Device types 01 and 03 ..... < 10.0 V
  Device types 02 and 04 ..... < 7.5 V
  Device types 05 and 06 ..... < 8.0 V
Operating temperature range ..... -55°C to +125°C

1.5 Radiation features.

Maximum total dose available (dose rate = 50 – 300 rads(Si)/s):
  Device types 01 and 02:
    Device classes Q and V ..... 300 krads(Si) 5/
    Device class T ..... 100 krads(Si) 5/
  Device types 03, 04, and 06 ..... 300 krads(Si) 6/
  Device type 05 ..... 300 krads(Si) 5/
Maximum total dose available (dose rate ≤ 0.01 rad(Si)/s):
    Device types 03, 04, and 06 ..... 50 krads(Si) 6/

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/ Inputs must not go more negative than -0.3 V.
3/ Short circuit from the output to $V_S$ can cause excessive heating and eventual destruction.
4/ $\theta_{JA}$ is measured in free air with the component mounted on a high effective thermal conductivity test board with “direct attach” features. For $\theta_{JC}$, the “case temperature” location is the center of the package underside.
5/ Device types 01, 02, and 05 may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects. Device types 01, 02, and 05 radiation end point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition A to a maximum total dose of 300 krads(Si) for class Q or V and 100 krads(Si) for class T.
6/ Device types 03, 04, and 06 radiation end point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition A to a maximum total dose of 300 krads(Si), and condition D to a maximum total dose of 50 krads(Si).

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 http://quicksearch.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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

3. REQUIREMENTS

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

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

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

3.2.1 Case outline. The case outline 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 Logic diagram. The logic diagram shall be as specified on figure 2.

3.2.4 Truth table. The truth table shall be as specified in figure 3.

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

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

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

TABLE I. Electrical performance characteristics.

| Test | Symbol | Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified | Group A subgroups | Device type | Limits | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | | Min | Max | |
| Power supply current, low | $I_{CCSB}$ low | $V_S$ = 18 V, inputs = 0 V | 1 | 01,02, 03,04, 05,06 | | 3.5 | mA |
| | | | 2,3 | | | 4.0 | |
| | | M,D,P,L,R,F 2/ | 1 | | | 4.0 | |
| | | $V_S$ = 8 V, inputs = 0 V | 1 | 05,06 | | 3.5 | |
| | | | 2,3 | | | 4.0 | |
| | | M,D,P,L,R,F 2/ | 1 | | | 4.0 | |
| Power supply current, high | $I_{CCSB}$ high | $V_S$ = 18 V, inputs = 18 V | 1 | 01,02, 03,04, 05,06 | | 3.5 | mA |
| | | | 2,3 | | | 4.0 | |
| | | M,D,P,L,R,F 2/ | 1 | | | 4.0 | |
| | | $V_S$ = 8 V, inputs = 8 V | 1 | 05,06 | | 3.5 | |
| | | | 2,3 | | | 4.0 | |
| | | M,D,P,L,R,F 2/ | 1 | | | 4.0 | |
| Input current, low | $I_{IL}$ | $V_S$ = 18 V | 1 | 01,02, 03,04, 05,06 | | ±5 | µA |
| | | | 2,3 | | | ±10 | |
| | | M,D,P,L,R,F 2/ | 1 | | | ±10 | |
| | | $V_S$ = 8 V | 1 | 05,06 | | ±5 | |
| | | | 2,3 | | | ±10 | |
| | | M,D,P,L,R,F 2/ | 1 | | | ±10 | |
| Input current, high | $I_{IH}$ | $V_S$ = 18 V | 1 | 01,02, 03,04, 05,06 | | ±5 | µA |
| | | | 2,3 | | | ±10 | |
| | | M,D,P,L,R,F 2/ | 1 | | | ±10 | |
| | | $V_S$ = 8 V | 1 | 05,06 | | ±5 | |
| | | | 2,3 | | | ±10 | |
| | | M,D,P,L,R,F 2/ | 1 | | | ±10 | |
| Voltage output | $V_{OL}$, $V_{OH}$ | $V_S$ = 12 V | 1 | 01,02, 03,04 | $V_S$ – 0.75 | 0.8 | V |
| | | | 2,3 | | $V_S$ – 0.75 | 0.8 | |
| | | M,D,P,L,R,F 2/ | 1 | | $V_S$ – 0.75 | 0.8 | |

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

| Test | Symbol | Conditions 1/<br>$-55°C \le T_C \le +125°C$<br>unless otherwise specified<br>unless otherwise specified | Group A subgroups | Device type | Limits | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | | Min | Max | |
| Voltage output high | $V_{OH}$ | $V_S$ = 8 V, $I_{OUT}$ = 5 mA | 1 | 05,06 | $V_S$ – 0.75 | | V |
| | | | 2,3 | | $V_S$ – 0.90 | | |
| | | M,D,P,L,R,F 2/ | 1 | | $V_S$ – 0.90 | | |
| | | $V_S$ = 12 V, $I_{OUT}$ = 5 mA,<br>$V_S$ = 18 V, $I_{OUT}$ = 5 mA | 1 | | $V_S$ – 0.75 | | |
| | | | 2,3 | | $V_S$ – 0.75 | | |
| | | M,D,P,L,R,F 2/ | 1 | | $V_S$ – 0.75 | | |
| | | $V_S$ = 8 V, $I_{OUT}$ = 50 mA,<br>$V_S$ = 12 V, $I_{OUT}$ = 50 mA,<br>$V_S$ = 18 V, $I_{OUT}$ = 50 mA | 1 | | $V_S$ – 0.95 | | |
| | | | 2,3 | | $V_S$ – 1.1 | | |
| | | M,D,P,L,R,F 2/ | 1 | | $V_S$ – 1.1 | | |
| Voltage output low | $V_{OL}$ | $V_S$ = 8 V, $I_{OUT}$ = 5 mA,<br>$V_S$ = 12 V, $I_{OUT}$ = 5 mA,<br>$V_S$ = 18 V, $I_{OUT}$ = 5 mA | 1,2,3 | 05,06 | | 0.8 | V |
| | | M,D,P,L,R,F 2/ | 1 | | | 0.8 | |
| | | $V_S$ = 8 V, $I_{OUT}$ = 50 mA,<br>$V_S$ = 12 V, $I_{OUT}$ = 50 mA,<br>$V_S$ = 18 V, $I_{OUT}$ = 50 mA | 1 | | | 0.95 | |
| | | | 2,3 | | | 1.1 | |
| | | M,D,P,L,R,F 2/ | 1 | | | 1.1 | |
| Input voltage | $V_{IL}$,<br>$V_{IH}$ | $V_S$ = 12 V,<br>limits applied during functional test | 1 | 01,02,<br>03,04 | 3.0 | 0.4 | V |
| | | | 2,3 | | 3.5 | 0.4 | |
| | | M,D,P,L,R,F 2/ | 1 | | 3.5 | 0.4 | |

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

| Test | Symbol | Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified unless otherwise specified | Group A subgroups | Device type | Limits | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | | Min | Max | |
| Input voltage high threshold | $V_{IH}$ | $V_S$ = 8 V, | 1 | 05,06 | 3.0 | | V |
| | | $V_S$ = 12 V, $V_S$ = 18 V | 2,3 | | 3.1 | | |
| | | M,D,P,L,R,F 2/ | 1 | | 3.1 | | |
| Input voltage low threshold | $V_{IL}$ | $V_S$ = 8 V, | 1,2,3 | 05,06 | | 0.8 | V |
| | | $V_S$ = 12 V, $V_S$ = 18 V | | | | | |
| | | M,D,P,L,R,F 2/ | 1 | | | 0.8 | |
| Input voltage threshold hysteresis | VIHYS | $V_S$ = 8 V, $V_S$ = 12 V, $V_S$ = 18 V | 1 | 05,06 | 100 | | mV |
| Functional test | $F_T$ | $V_S$ = 12 V, $V_S$ = 18 V, See 4.4.1c | 7,8A,8B | 01, 02, 03, 04 | | | |
| | | M,D,P,L,R,F 2/ | 7 | | | | |
| Rising undervoltage lockout | UVLOR | | 1 | 05,06 | 7.2 | 7.8 | V |
| | | | 2,3 | | 6.9 | 7.95 | |
| | | M,D,P,L,R,F 2/ | 1 | | 6.9 | 7.95 | |
| Falling undervoltage lockout | UVLOF | | 1 | 05,06 | 7.1 | 7.75 | V |
| | | | 2,3 | | 6.8 | 7.9 | |
| | | M,D,P,L,R,F 2/ | 1 | | 6.8 | 7.9 | |
| Propagation delay, low | $t_{PHL}$ | $V_S$ = 12 V, $C_L$ = 4300 pF | 9 | 01,02, 03,04 | | 250 | ns |
| | | | 10,11 | | | 350 | |
| | | M,D,P,L,R,F 2/ | 9 | | | 350 | |

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

| Test | Symbol | Conditions 1/<br>$-55°C \le T_C \le +125°C$<br>unless otherwise specified | Group A subgroups | Device type | Limits | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | | Min | Max | |
| Propagation delay, low | $t_{PHL}$ | $V_S$ = 8 V, $C_L$ = 4300 pF | 9 | 05,06 | | 300 | ns |
| | | | 10,11 | | | 400 | |
| | | M,D,P,L,R,F 2/ | 9 | | | 400 | |
| | | $V_S$ = 12 V, $C_L$ = 4300 pF | 9 | | | 250 | |
| | | | 10,11 | | | 350 | |
| | | M,D,P,L,R,F 2/ | 9 | | | 350 | |
| | | $V_S$ = 18 V, $C_L$ = 4300 pF | 9 | | | 200 | |
| | | | 10,11 | | | 300 | |
| | | M,D,P,L,R,F 2/ | 9 | | | 300 | |
| Propagation delay, high | $t_{PLH}$ | $V_S$ = 12 V, $C_L$ = 4300 pF | 9 | 01,02, 03,04 | | 250 | ns |
| | | | 10,11 | | | 350 | |
| | | M,D,P,L,R,F 2/ | 9 | | | 350 | |
| | | $V_S$ = 8 V, $C_L$ = 4300 pF | 9 | 05,06 | | 300 | |
| | | | 10,11 | | | 400 | |
| | | M,D,P,L,R,F 2/ | 9 | | | 400 | |
| | | $V_S$ = 12 V, $C_L$ = 4300 pF | 9 | | | 250 | |
| | | | 10,11 | | | 350 | |
| | | M,D,P,L,R,F 2/ | 9 | | | 350 | |
| | | $V_S$ = 18 V, $C_L$ = 4300 pF | 9 | | | 200 | |
| | | | 10,11 | | | 300 | |
| | | M,D,P,L,R,F 2/ | 9 | | | 300 | |
| Response time, rise | TR | $V_S$ = 12 V, $C_L$ = 4300 pF | 9 | 01,02, 03,04 | | 75 | ns |
| | | | 10,11 | | | 95 | |
| | | M,D,P,L,R,F 2/ | 9 | | | 95 | |
| | | $V_S$ = 8 V, $C_L$ = 4300 pF,<br>$V_S$ = 12 V, $C_L$ = 4300 pF,<br>$V_S$ = 18 V, $C_L$ = 4300 pF | 9 | 05,06 | | 75 | |
| | | | 10,11 | | | 95 | |
| | | M,D,P,L,R,F 2/ | 9 | | | 95 | |

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

| Test | Symbol | Conditions 1/<br>$-55°C \le T_C \le +125°C$<br>unless otherwise specified | Group A subgroups | Device type | Limits | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | | Min | Max | |
| Response time, fall | TF | $V_S$ = 12 V, | 9 | 01,02, 03,04 | | 75 | ns |
| | | $C_L$ = 4300 pF | 10,11 | | | 95 | |
| | | M,D,P,L,R,F 2/ | 9 | | | 95 | |
| | | $V_S$ = 8 V, $C_L$ = 4300 pF, | 9 | 05,06 | | 75 | |
| | | $V_S$ = 12 V, $C_L$ = 4300 pF, $V_S$ = 18 V, $C_L$ = 4300 pF | 10,11 | | | 95 | |
| | | M,D,P,L,R,F 2/ | 9 | | | 95 | |

1/ $V_S$ = 12 V to 18 V for device types 01, 02, 03, and 04. $V_S$ = 8 V to 18 V for device types 05 and 06.

2/ RHA device types 01, 02, and 05 supplied to this drawing will meet all levels M, D, P, L, R and F of irradiation for device class Q or V and levels M, D, P, L, and R of irradiation for device class T. However, device types 01, 02 and 05 are only tested at the “F” level for device class Q or V and the “R” level for device class T in accordance with MIL-STD-883 method 1019 condition A (see 1.5 herein).

RHA device types 03, 04, and 06 supplied to this drawing will meet all levels M, D, P, L, R, and F of irradiation for condition A and irradiation of M, D, P, and L levels for condition D. However, device types 03, 04, and 06 are only tested at the “F” level in accordance with MIL-STD-883, method 1019, condition A, and tested at the “L” level in condition D (see 1.5 herein).

Pre and post irradiation values are identical unless otherwise specified in table I. When performing post irradiation electrical measurements for any RHA level, $T_A$ = +25°C.

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, T and V shall be in accordance with MIL-PRF-38535.

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

3.6 Certificate of compliance. For device classes Q, T and V, a certificate of compliance shall be required from a QML-38535 listed manufacturer in order to supply to the requirements of this drawing (see 6.6.1 herein). The certificate of compliance submitted to DLA Land and Maritime-VA prior to listing as an approved source of supply for this drawing shall affirm that the manufacturer's product meets, for device classes Q, T and V, the requirements of MIL-PRF-38535 and herein.

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

| Device types | 01, 02, 03, 04, 05, and 06 |
|---|---|
| Case outline | X |
| Terminal number | Terminal symbol |
| 1 | NC |
| 2 | INPUT A |
| 3 | NC |
| 4 | GND |
| 5 | GND |
| 6 | NC |
| 7 | INPUT B |
| 8 | NC |
| 9 | NC |
| 10 | OUTPUT B |
| 11 | OUTPUT B |
| 12 | $V_S$ |
| 13 | $V_S$ |
| 14 | OUTPUT A |
| 15 | OUTPUT A |
| 16 | NC |

FIGURE 1. Terminal connections.

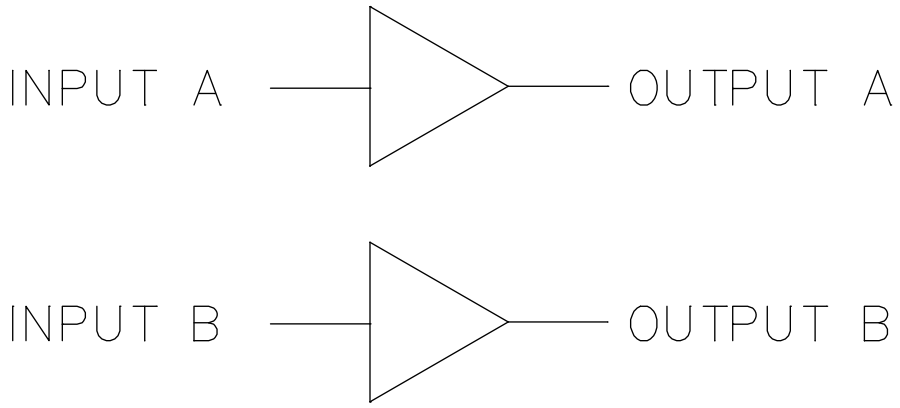



FIGURE 2. Logic diagram.

| INPUT A | OUTPUT A |
|---|---|
| 1 | 1 |
| 0 | 0 |
| INPUT B | OUTPUT B |
| 1 | 1 |
| 0 | 0 |

FIGURE 3. Truth table.

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, including screening (4.2), qualification (4.3), and conformance inspection (4.4). The modification in the QM plan shall not affect the form, fit, or function as described herein. For device class T, sampling and inspection procedures shall be in accordance with MIL-PRF-38535 and the device manufacturer's QM plan including screening, qualification, and conformance inspection. The performance envelope and reliability information shall be as specified in the manufacturer's QM plan.

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 T, screening shall be in accordance with the device manufacturer's Quality Management (QM) plan, and shall be conducted on all devices prior to qualification and technology conformance inspection.

4.2.1 Additional criteria for device classes Q, T 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. For device classes Q, T and V interim and final electrical test parameters shall be as specified in table IIA herein.

c. Additional screening for device class V beyond the requirements of device class Q shall be as specified in MIL-PRF-38535, Appendix B.

4.3 Qualification inspection for device classes Q, T and V. Qualification inspection for device classes Q and V shall be in accordance with MIL-PRF-38535. Qualification inspection for device class T shall be in accordance with the device manufacturer's Quality Management (QM) plan. 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. Technology conformance inspection for class T shall be in accordance with the device manufacturer's Quality Management (QM) plan.

4.4.1 Group A inspection.

a. Tests shall be as specified in table IIA herein.

b. Subgroups 4, 5, and 6 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. 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 IIA herein.

4.4.2.1 Additional criteria for device classes Q, T and V. The steady-state life test duration, test condition and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The test circuit shall be maintained under document revision level control by the device manufacturer's TRB in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1005 of MIL-STD-883.

TABLE IIA. Electrical test requirements.

| Test requirements | Subgroups (in accordance with MIL-PRF-38535, table III) | | |
|---|---|---|---|
| | Device class Q | Device class V | Device class T |
| Interim electrical parameters (see 4.2) | 1,7 | 1,7 | As specified in QM plan |
| Final electrical parameters (see 4.2) | 1,2,3,7,8A, 1/ 8B,9,10,11 | 1,2,3, 2/ 3/ 7,8A,8B,9,10, 11 | As specified in QM plan |
| Group A test requirements (see 4.4) | 1,2,3,7,8A,8B, 9,10,11 | 1,2,3,7,8A, 8B,9,10,11 | As specified in QM plan |
| Group C end-point electrical parameters (see 4.4) | 1,2,3,7,8A,8B, 9,10,11 | 1,2,3,7,8A, 8B,9,10,11 | As specified in QM plan |
| Group D end-point electrical parameters (see 4.4) | 1,7,9 | 1,7,9 | As specified in QM plan |
| Group E end-point electrical parameters (see 4.4) | 1,7,9 | 1,7,9 | As specified in QM plan |

1/ PDA applies to subgroup 1 and 7.
2/ PDA applies to subgroups 1, 7, and $\Delta$'s.
3/ Delta limits (see table IIB) shall be required and the delta values shall be computed with reference to the zero hour electrical parameters (see table I).

TABLE IIB. Burn-in delta parameters $T_A$ = +25°C

| Parameters | Symbol | Min | Max | Units |
|---|---|---|---|---|
| Power supply current | $I_{CCSB}$ low | | 175 | µA |
| | $I_{CCSB}$ high | | 175 | µA |
| Input current | $I_{IL}$ | | 1 | µA |
| | $I_{IH}$ | | 1 | µA |

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

4.4.4 Group E inspection. Group E inspection is required only for parts intended to be marked as radiation hardness assured (see 3.5 herein). RHA levels for device classes M, Q and V shall be as specified in MIL-PRF-38535 and the end-point electrical parameters shall be as specified in table IIA herein.

4.4.4.1 Group E inspection for device class T. For device class T, the RHA requirements shall be in accordance with the class T radiation requirements of MIL-PRF-38535. End-point electrical parameters shall be as specified in table IIA herein.

4.4.4.2 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 for device types 01, 02, 03, 04, 05, and 06. In addition, for device types 03, 04, and 06, a low dose rate test shall be performed in accordance with MIL-STD-883 method 1019, condition D and as specified herein.

5. PACKAGING

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

6. NOTES

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

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

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

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

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

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

6.6 Sources of supply.

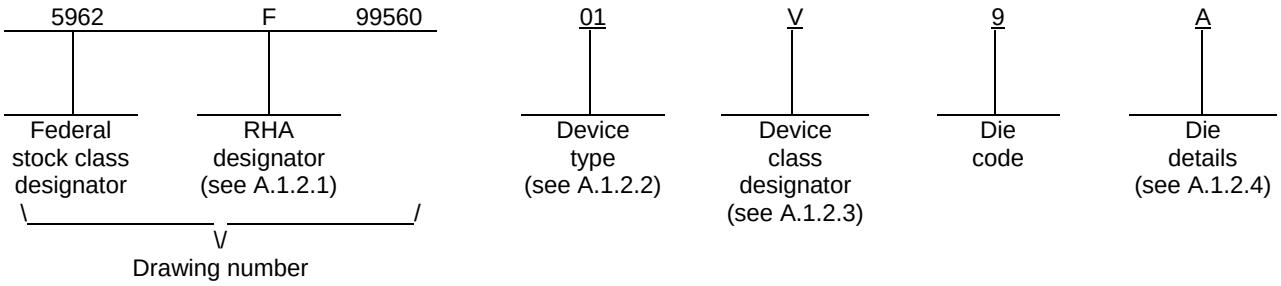
6.6.1 Sources of supply for device classes Q, T and V. Sources of supply for device classes Q, T and V are listed in MIL-HDBK-103 and QML-38535. The vendors listed in MIL-HDBK-103 and QML-38535 have submitted a certificate of compliance (see 3.6 herein) to DLA Land and Maritime-VA and have agreed to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

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-99560

A.1 SCOPE

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

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




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

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

| Device type | Generic number | Circuit function |
|---|---|---|
| 01 | HS-4424RH | Radiation hardened dual non-inverting MOSFET driver with < 10 V lockout voltage |
| 02 | HS-4424BRH | Radiation hardened dual non-inverting MOSFET driver with < 7.5 V lockout voltage |
| 03 | HS-4424EH | Radiation hardened dual non-inverting MOSFET driver with < 10 V lockout voltage |
| 04 | HS-4424BEH | Radiation hardened dual non-inverting MOSFET driver with < 7.5 V lockout voltage |
| 05 | HS-4424DRH | Radiation hardened dual non-inverting MOSFET driver with < 8.0 V lockout voltage |
| 06 | HS-4424DEH | Radiation hardened dual non-inverting MOSFET driver with < 8.0 V lockout voltage |

A.1.2.3 Device class designator.

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

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

A.1.2.4.1 Die physical dimensions.

| Die type | Figure number |
|---|---|
| 01 | A-1 |
| 02 | A-1 |
| 03 | A-1 |
| 04 | A-1 |
| 05 | A-1 |
| 06 | A-1 |

A.1.2.4.2 Die bonding pad locations and electrical functions.

| Die type | Figure number |
|---|---|
| 01 | A-1 |
| 02 | A-1 |
| 03 | A-1 |
| 04 | A-1 |
| 05 | A-1 |
| 06 | A-1 |

A.1.2.4.3 Interface materials.

| Die type | Figure number |
|---|---|
| 01 | A-1 |
| 02 | A-1 |
| 03 | A-1 |
| 04 | A-1 |
| 05 | A-1 |
| 06 | A-1 |

A.1.2.4.4 Assembly related information.

| Die type | Figure number |
|---|---|
| 01 | A-1 |
| 02 | A-1 |
| 03 | A-1 |
| 04 | A-1 |
| 05 | A-1 |
| 06 | A-1 |

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

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

A.2 APPLICABLE DOCUMENTS.

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

DEPARTMENT OF DEFENSE SPECIFICATION

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

DEPARTMENT OF DEFENSE STANDARD

MIL-STD-883 - Test Method Standard Microcircuits.

DEPARTMENT OF DEFENSE HANDBOOKS

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

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

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

A.3 REQUIREMENTS

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

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

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

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

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

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

A.3.2.5 Truth table. The truth table shall be as defined in paragraph 3.2.4 herein.

A.3.2.6 Radiation exposure circuit. The radiation exposure circuit shall be as defined in paragraph 3.2.5 herein.

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

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

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

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

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

A.4 VERIFICATION

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

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

a. Wafer lot acceptance for class V product using the criteria defined in MIL-STD-883, method 5007.

b. 100% wafer probe (see paragraph A.3.4 herein).

c. 100% internal visual inspection to the applicable class Q or V criteria defined in MIL-STD-883, method 2010 or the alternate procedures allowed in MIL-STD-883, method 5004.

A.4.3 Conformance inspection.

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

A.5 DIE CARRIER

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

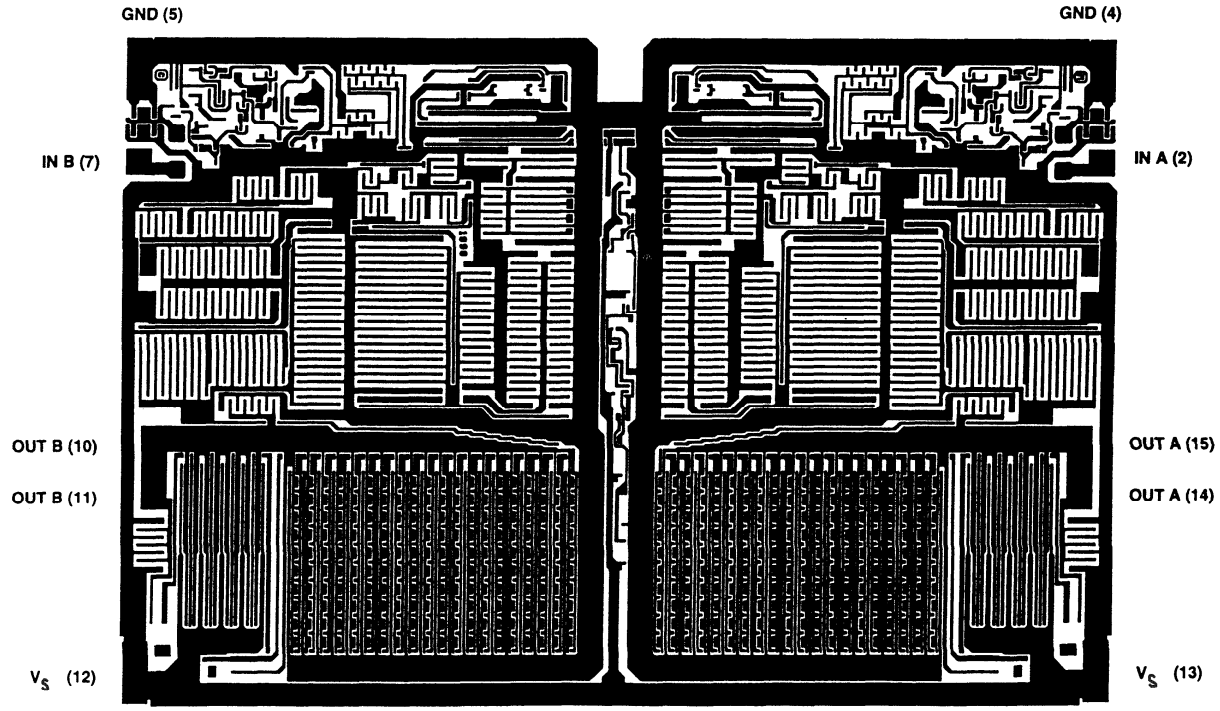
A.6 NOTES

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

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

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

A.6.4 Sources of supply for device classes Q and V. Sources of supply for device classes Q and V are listed in MIL-HDBK-103 and QML-38535. The vendors listed within MIL-HDBK-103 and QML-38535 have submitted a certificate of compliance (see A.3.6 herein) to DLA Land and Maritime -VA and have agreed to this drawing.




NOTE: Pad numbers reflect terminal numbers when placed in case outline X (see figure 1).

Die physical dimensions.
Die size: 3370 microns x 4890 microns.
Die thickness: 19 ± 1 mils.

Interface materials.
Top metallization: Al Si Cu 16.0 kÅ ±2 kÅ
Backside metallization: None

Glassivation.
Type: PSG
Thickness: 8.0 kÅ ±1.0 kÅ

Substrate: DI (dielectric isolation)

Assembly related information.
Substrate potential: Unbiased
Special assembly instructions: None

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

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 16-04-21

Approved sources of supply for SMD 5962-99560 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38535 during the next revision. MIL-HDBK-103 and QML-38535 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DLA Land and Maritime-VA. This information bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535. DLA Land and Maritime maintains an online database of all current sources of supply at http://www.landandmaritime.dla.mil/Programs/Smcr/.

| Standard microcircuit drawing PIN 1/ | Vendor CAGE number | Vendor similar PIN 2/ |
|---|---|---|
| 5962F9956001VXC | 34371 | HS9-4424RH-Q |
| 5962F9956001QXC | 34371 | HS9-4424RH-8 |
| 5952R9956001TXC | 34371 | HS9-4424RH-T |
| 5962F9956001V9A | 34371 | HS0-4424RH-Q |
| 5962F9956002VXC | 34371 | HS9-4424BRH-Q |
| 5962F9956002QXC | 34371 | HS9-4424BRH-8 |
| 5962R9956002TXC | 34371 | HS9-4424BRH-T |
| 5962F9956002V9A | 34371 | HS0-4424BRH-Q |
| 5962F9956003VXC | 34371 | HS9-4424EH-Q |
| 5962F9956003V9A | 34371 | HS0-4424EH-Q |
| 5962F9956004VXC | 34371 | HS9-4424BEH-Q |
| 5962F9956004V9A | 34371 | HS0-4424BEH-Q |
| 5962F9956005VXC | 34371 | HS9-4424DRH-Q |
| 5962F9956005V9A | 34371 | HS0-4424DRH-Q |
| 5962F9956006VXC | 34371 | HS9-4424DEH-Q |
| 5962F9956006V9A | 34371 | HS0-4424DEH-Q |

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.

| Vendor CAGE number | Vendor name and address |
|---|---|
| 34371 | Intersil Corporation<br>1650 Robert J. Conlan Blvd. NE<br>Palm Bay, FL 32905-3406 |