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PMIC N/A	PREPARED BY Larry T. Gauder	<b>DEFENSE ELECTRONICS SUPPLY CENTER</b> <b>DAYTON, OHIO 45444</b>									
<b>STANDARD MICROCIRCUIT DRAWING</b>  THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE  AMSC N/A	CHECKED BY Thomas M. Hess										
	APPROVED BY Monica L. Poelking	MICROCIRCUIT, DIGITAL, ECL, LOW POWER QUAD DRIVER, MONOLITHIC SILICON									
	DRAWING APPROVAL DATE 96-01-04										
		REVISION LEVEL	SIZE <b>A</b>	CAGE CODE <b>67268</b>	<b>5962-96732</b>						
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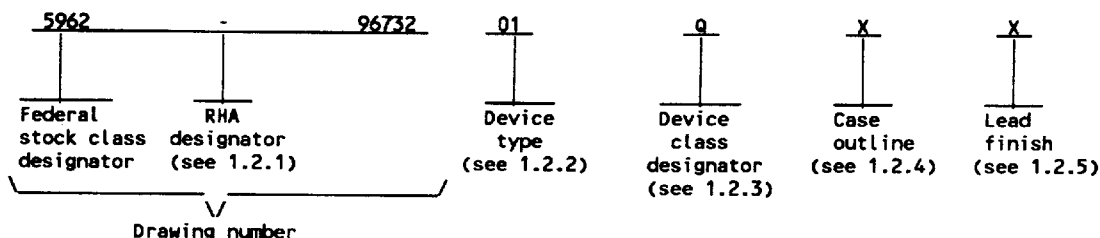
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## 1. SCOPE

1.1 Scope. This drawing forms a part of a one part - one part number documentation system (see 6.6 herein). Two product assurance classes consisting of military high reliability (device classes Q, and M) and space application (device class V), and a choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN). Device class M microcircuits represent non-JAN class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices". When available, a choice of Radiation Hardness Assurance (RHA) levels are reflected in the PIN.

1.2 PIN. The PIN shall be as shown in the following example:



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

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

Device type	Generic number	Circuit function
01	100313	Low power quad driver

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

Device class	Device requirements documentation
M	Vendor self-certification to the requirements for non-JAN class B microcircuits in accordance with 1.2.1 of MIL-STD-883
Q or V	Certification and qualification to MIL-I-38535

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

Outline letter	Descriptive designator	Terminals	Package style
X	GDIP5-T24 or CDIP6-T24	24	dual-in-line package
Y	See figure 1	24	quad-flat package

1.2.5 Lead finish. The lead finish shall be as specified in MIL-STD-883 (see 3.1 herein) for class M or MIL-I-38535 for classes Q and V. Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finishes A, B, and C are considered acceptable and interchangeable without preference.

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### 1.3 Absolute maximum ratings. 1/

Negative supply voltage range ( $V_{EE}$ )	-7.0 V dc to +0.5 V dc
DC input voltage range ( $V_{IN}$ )	$V_{EE}$ to +0.5 V
DC input current range ( $I_{IN}$ )	-30 mA to +5.0 mA
Maximum dc output current ( $I_{OUT}$ )	-50 mA
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Junction temperature ( $T_J$ )	+175°C
Maximum power dissipation ( $P_D$ )	500 mW
Thermal resistance, junction-to-case ( $\theta_{JC}$ )	See MIL-STD-1835

### 1.4 Recommended operating conditions.

Negative supply voltage range ( $V_{EE}$ )	-5.7 V dc minimum to -4.2 V dc maximum
High level input voltage range ( $V_{IH}$ )	-1165 V dc minimum to -870 V dc maximum
Low level input voltage range ( $V_{IL}$ )	-1830 V dc minimum to -1475 V dc maximum
Case operating temperature range ( $T_C$ )	-55°C to +125°C

### 1.5 Digital logic testing for device classes Q and V.

Fault coverage measurement of manufacturing logic tests (MIL-STD-883, test method 5012) - - - - - 2/ percent

## 2. APPLICABLE DOCUMENTS

2.1 Government specifications, standards, bulletin, and handbook. Unless otherwise specified, the following specifications, standards, bulletin, and handbook of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

#### SPECIFICATIONS

##### MILITARY

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

#### STANDARDS

##### MILITARY

MIL-STD-973 - Configuration Management.  
MIL-STD-883 - Test Methods and Procedures for Microelectronics.  
MIL-STD-883C - Microcircuit Case Outlines.

#### BULLETIN

##### MILITARY

MIL-BUL-103 - List of Standardized Military Drawings (SMD's).

#### HANDBOOK

##### MILITARY

MIL-HDBK-780 - Standardized Military Drawings.

(Copies of the specifications, standards, bulletin, and handbook required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

- 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/ Values will be added when they become available.

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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 shall take precedence.

### 3. REQUIREMENTS

3.1 Item requirements. The individual item requirements for device class M shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein. The individual item requirements for device classes Q and V shall be in accordance with MIL-I-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 effect the form, fit, or function as described herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-STD-883 (see 3.1 herein) for device classe M and MIL-I-38535 for device classes Q and V and herein.

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

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

3.2.3 Truth table. The truth table shall be as specified on figure 3.

3.2.4 Logic diagram. The logic diagram shall be as specified on figure 4.

3.2.5 Test circuit and switching waveforms. The test circuit and switching waveforms shall be as specified on figure 5.

3.2.6 Radiation exposure circuit. The radiation exposure circuit shall be as specified when available.

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 II. The electrical tests for each subgroup are defined in table I.

3.5 Marking. The part shall be marked with the PIN listed in 1.2 herein. Marking for device class M shall be in accordance with MIL-STD-883 (see 3.1 herein). In addition, the manufacturer's PIN may also be marked as listed in MIL-BUL-103. Marking for device classes Q and V shall be in accordance with MIL-I-38535.

3.5.1 Certification/compliance mark. The compliance mark for device class M shall be a "C" as required in MIL-STD-883 (see 3.1 herein). The certification mark for device classes Q and V shall be a "QML" as required in MIL-I-38535.

3.6 Certificate of compliance. 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-BUL-103 (see 6.7.2 herein). 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 6.7.2 herein). The certificate of compliance submitted to DESC-EC prior to listing as an approved source of supply for this drawing shall affirm that the manufacturer's product meets, for device class M, the requirements of MIL-STD-883 (see 3.1 herein), or for device classes Q and V, the requirements of MIL-I-38535 and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required for device class M in MIL-STD-883 (see 3.1 herein) for device classes Q and V in MIL-I-38535 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 DESC-EC of change of product (see 6.2 herein) involving devices acquired to this drawing is required for any change as defined in MIL-STD-973.

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Table I. Electrical performance characteristics

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C 5.7 V ≤ V <sub>EE</sub> ≤ -4.2 V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
High level output voltage	V <sub>OH</sub>	V <sub>EE</sub> = -4.2 V, -5.7 V V <sub>IH</sub> = -0.87 V V <sub>IL</sub> = -1.83 V Loading 50Ω to -2.0 V	1, 2 3	-1025 -1085	-870 -870	mV
Low level output voltage	V <sub>OL</sub>		1, 2 3	-1830 -1830	-1620 -1555	mV
High level threshold output voltage	V <sub>OHC</sub>	V <sub>EE</sub> = -4.2 V, -5.7 V V <sub>IH</sub> = -1.165 V V <sub>IL</sub> = -1.475 V Loading 50Ω to -2.0 V	1, 2 3	-1035 -1085		mV
Low level threshold output voltage	V <sub>OLC</sub>		1, 2 3		-1610 -1555	mV
Negative power supply drain current	I <sub>EE</sub>	V <sub>EE</sub> = -5.7 V, -4.2 V	1, 2, 3	-65	-20	mA
Low level input current	I <sub>IL</sub>	V <sub>EE</sub> = -4.2 V V <sub>IN</sub> = -1.83 V	1, 2, 3	0.5		μA
High level input current	I <sub>IH</sub>	V <sub>EE</sub> = -5.7 V V <sub>IN</sub> = -0.87	Enable Input	1, 2 3	240 340	μA
			Data Input	1, 2 3	350 500	μA
Functional tests		V <sub>EE</sub> = -4.2 V, -5.7 V V <sub>IH</sub> = -1165 V V <sub>IL</sub> = -1830 V See 4.4.1b	7, 8			
Propagation delay time, data to output	t <sub>PLH1</sub> t <sub>PHL1</sub>	V <sub>EE</sub> = -4.2 V, -5.7 V See figure 5	9 10 11	0.30 0.30 0.30	1.80 2.30 2.00	ns
Propagation delay time, enable to output	t <sub>PLH2</sub> t <sub>PHL2</sub>		9 10 11	0.60 0.60 0.50	2.30 2.70 2.40	ns
Transition time, 20% to 80% 1/ 80% to 20%	t <sub>TLH</sub> t <sub>THL</sub>		9 10 11	0.30 0.30 0.30	1.90 2.00 2.00	ns

1/ This parameter is provided as design information only (not tested but guaranteed).

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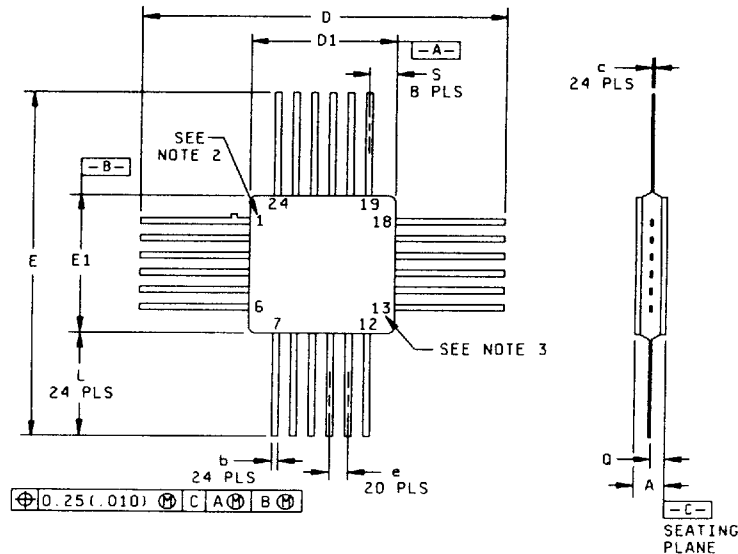
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# Case Y



Dimensions Note 1	Millimeters		Inches		Notes
	Min	Max	Min	Max	
A		2.16		.085	
b	0.41	0.46	.016	.018	
c	0.10	0.15	.004	.006	
D	22.10	28.45	.870	1.120	
D1	9.40	10.16	.370	.400	4
E	22.10	28.45	.870	1.120	
E1	9.40	10.16	.370	.400	4
e	1.14	1.40	.045	.055	
L	6.35	9.14	.250	.360	
Q	0.89	1.27	.035	.050	5
S		1.91		.075	

## NOTES:

1. The preferred unit of measurement is millimeters. However, this item was designed using inch-pound units of measurements. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall rule.
2. Lead number 1 is identified by a tab located on the lead.
3. Lead numbers are shown for reference only and do not appear on package.
4. Dimensions D1 and E1 allow glass meniscus.
5. Dimension Q shall be measured at the point of exit of the lead from the body.

FIGURE 1. Case outline.

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Device Type	01	01
Case outline	X	Y
Terminal Connection	Terminal symbol	Terminal Symbol
1	$\overline{O_{2d}}$	$O_{1d}$
2	$\overline{O_{2c}}$	$O_{2d}$
3	$\overline{O_{1c}}$	$\overline{O_{1d}}$
4	$O_{2c}$	$\overline{O_{2d}}$
5	$O_{1c}$	$\overline{O_{2c}}$
6	$V_{CC}$	$\overline{O_{1c}}$
7	$V_{CCA}$	$O_{2c}$
8	$O_{1b}$	$O_{1c}$
9	$\overline{O_{2b}}$	$V_{CC}$
10	$\overline{O_{1b}}$	$V_{CCA}$
11	$\overline{O_{2b}}$	$O_{1b}$
12	$\overline{O_{2a}}$	$O_{2b}$
13	$\overline{O_{1a}}$	$\overline{O_{1b}}$
14	$O_{2a}$	$\overline{O_{2b}}$
15	$O_{1a}$	$\overline{O_{2a}}$
16	$D_a$	$\overline{O_{1a}}$
17	$D_b$	$O_{2a}$
18	$V_{EE}$	$O_{1a}$
19	E	$D_a$
20	$D_c$	$D_b$
21	$D_d$	$V_{EE}$
22	$O_{1d}$	E
23	$\overline{O_{2d}}$	$D_c$
24	$\overline{O_{1d}}$	$D_d$

FIGURE 2. Terminal connections.

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Inputs		Outputs			
$D_n$	E	$O_{1n}$	$O_{2n}$	$\bar{O}_{1n}$	$\bar{O}_{2n}$
L	L	L	L	H	H
L	H	H	H	L	L
H	L	H	H	L	L
H	H	H	H	L	L

H = High voltage level.  
L = Low voltage level.

FIGURE 3. Truth tables.

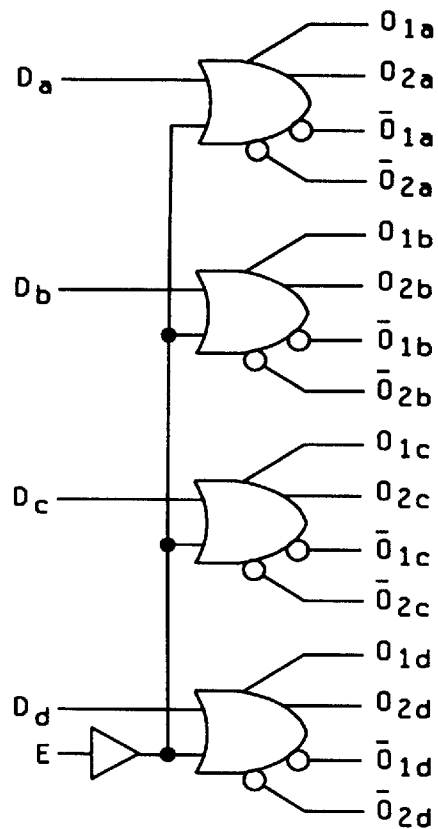


FIGURE 4. Logic diagram.

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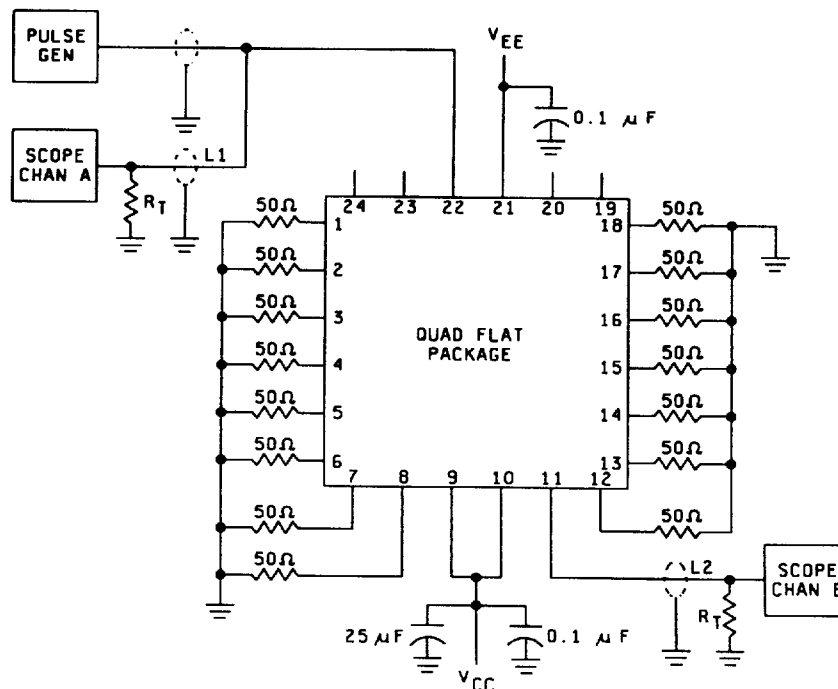
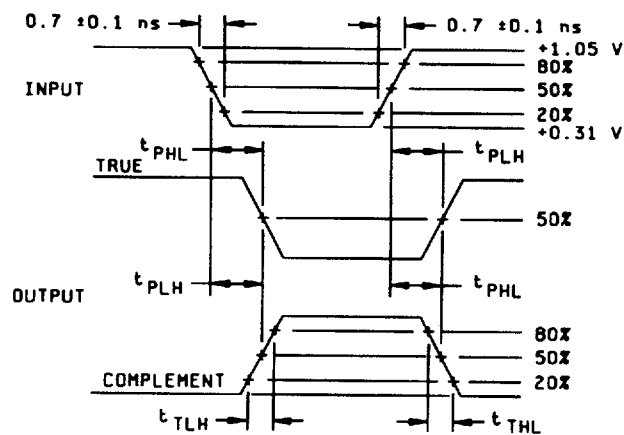
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NOTES:

1.  $V_{CC}$ ,  $V_{CCA} = +2$  V,  $V_{EE} = -2.5$  V.
2.  $L1$  and  $L2$  = equal length  $50\Omega$  impedance lines.
3.  $R_T = 50\Omega$  Terminator internal to scope.
4. Decoupling  $0.1\mu F$  from GND to  $V_{CC}$  and  $V_{EE}$ .
5. All unused outputs are loaded with  $50\Omega$  to GND.
6.  $C_L$  = fixture and stray capacitance  $\leq 3$  pF.

FIGURE 5. Test circuit and switching waveforms.

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TABLE II. Electrical test requirements.

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

1/ PDA applies to subgroup 1.

2/ PDA applies to subgroups 1 and 7.

3.9 Verification and review for device class M. For device class M, DESC, DESC'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 30 (see MIL-I-38535, appendix A).

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. For device class M, sampling and inspection procedures shall be in accordance with MIL-STD-883 (see 3.1 herein). For device classes Q and V, sampling and inspection procedures shall be in accordance with MIL-I-38535 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not effect the form, fit, or function as described herein.

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

##### 4.2.1 Additional criteria for device classes 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 test method 1015.

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

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

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#### 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-I-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-I-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 1015.
- 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 appendix B of MIL-I-38535.

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

4.4 Conformance inspection. Quality conformance inspection for device class M shall be in accordance with MIL-STD-883 (see 3.1 herein) and as specified herein. Inspections to be performed for device classe 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). Technology conformance inspection for classes Q and V shall be in accordance with MIL-I-38535 including groups A, B, C, D, and E inspections and as specified herein except where option 2 of MIL-I-38535 permits alternate in-line control testing.

#### 4.4.1 Group A inspection.

- a. Tests shall be as specified in table II herein.
- b. For device class M, subgroups 7 and 8 tests shall be sufficient to verify the truth table. For device classes Q and V, subgroups 7 and 8 shall include verifying the functionality of the device; these tests shall have been fault graded in accordance with MIL-STD-883, test method 5012 (see 1.5 herein).

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 classes 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 test method 1005.
- b.  $T_A = +125^{\circ}\text{C}$ , minimum.
- c. 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-I-38535. The test circuit shall be maintained under document revision level control by the device manufacturer's TRB in accordance with MIL-I-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.

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). RHA levels for device classes Q and V shall be M, D, L, R, F, G, and H and for device class M shall be M and D.

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

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## 5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-STD-883 (see 3.1 herein) for device class M and MIL-I-38535 for device classes Q and V.

## 6. NOTES

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

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

6.1.2 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 in accordance with MIL-STD-973 using DD Form 1692, Engineering Change Proposal.

6.3 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and which SMD's are applicable to that system. DESC 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 DESC-EC, telephone (513) 296-6047.

6.4 Comments. Comments on this drawing should be directed to DESC-EC, Dayton, Ohio 45444, or telephone (513) 296-8525.

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

6.6 One part - one part number system. The one part - one part number system described below has been developed to allow for transitions between identical generic devices covered by the three major microcircuit requirements documents (MIL-H-38534, MIL-I-38535, and 1.2.1 of MIL-STD-883) without the necessity for the generation of unique PIN's. The three military requirements documents represent different class levels, and previously when a device manufacturer upgraded military product from one class level to another, the benefits of the upgraded product were unavailable to the Original Equipment Manufacturer (OEM), that was contractually locked into the original unique PIN. By establishing a one part number system covering all three documents, the OEM can acquire to the highest class level available for a given generic device to meet system needs without modifying the original contract parts selection criteria.

<u>Military documentation format</u>	<u>Example PIN under new system</u>	<u>Manufacturing source listing</u>	<u>Document listing</u>
New MIL-H-38534 Standard Microcircuit Drawings	5962-XXXXXZZ(H or K)YY	QML-38534	MIL-BUL-103
New MIL-I-38535 Standard Microcircuit Drawings	5962-XXXXXZZ(Q or V)YY	QML-38535	MIL-BUL-103
New 1.2.1 of MIL-STD-883 Standard Microcircuit Drawings	5962-XXXXXZZ(M)YY	MIL-BUL-103	MIL-BUL-103

## 6.7 Sources of supply.

6.7.1 Sources of supply for device classes Q and V. Sources of supply for device classes Q and V are listed in QML-38535. The vendors listed in QML-38535 have submitted a certificate of compliance (see 3.6 herein) to DESC-EC and have agreed to this drawing.

6.7.2 Approved sources of supply for device class M. Approved sources of supply for class M are listed in MIL-BUL-103. The vendors listed in MIL-BUL-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-EC.

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