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LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED

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	SHEET	1	2	3	4	5	6	7	8	9	10	11				

PMIC N/A

STANDARD MICROCIRCUIT DRAWING

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

AMSC N/A

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DRAWING APPROVAL DATE
94-12-27

REVISION LEVEL

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, LINEAR, QUAD MICROPOWER COMPARATORS, MONOLITHIC SILICON

SIZE	CAGE CODE	5962-95550
A	67268	

SHEET 1 OF 11

DESC FORM 193
JUL 94

5962-E078-95

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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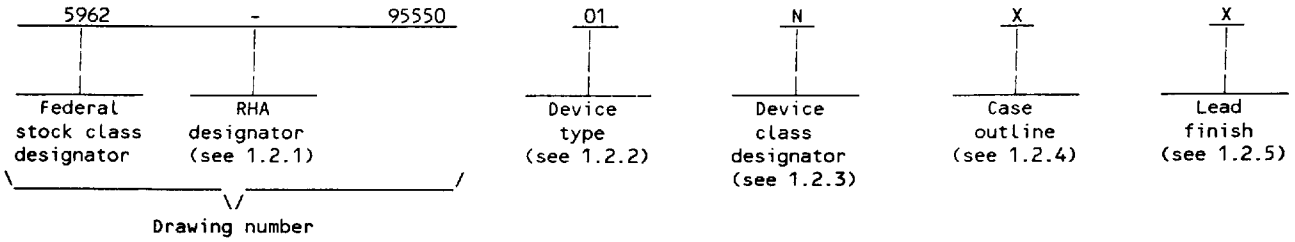
1. SCOPE

1.1 Scope. This drawing forms a part of a one part - one part number documentation system (see 6.6 herein). Three product assurance classes consisting of space application (device class V), military high reliability (device classes M and Q), and non-traditional military (device class N) with 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". For device class N, the user is cautioned to assure that the device is appropriate for the application environment. 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 classes N, 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	TLC139M	Quad differential comparators

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 1/
N	Certification and qualification to MIL-I-38535 with a non-traditional performance environment 2/
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	See figure 1	14	Plastic small outline

1/ For this drawing device class M shall not apply. See 6.1.2 herein, 6.6 herein and SMD 5962-87659 for MIL-STD-883 1.2.1 compliant devices.
2/ Any device outside the traditional performance environment (i.e., an operating temperature range of -55°C to +125°C and which requires hermetic packaging).

1.2.5 Lead finish. The lead finish shall be as specified in MIL-I-38535 for device 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. For device class N, lead finish shall be in accordance with 1.2.5.1 herein.

1.2.5.1 Lead finish D. Lead finish D shall be designated by a single letter as follows:

Finish letter	Process
D	Palladium

1.2.6 Device class N manufacturer PIN. For device class N, plastic encapsulated microcircuits (PEMs) the following manufacturer PIN (see 3.5.1 herein) shall be marked:

Standard 1/ Microcircuit Drawing PIN	Manufacturer PIN
5962-9555001NXD	TLC139M

1.3 Absolute maximum ratings. 2/

Supply voltage range (V_{DD}) 3/ . . . . . -0.3 V dc to +18 V dc
Differential input voltage (V_{ID}) 4/ . . . . . ±18 V dc
Input voltage range (V_{IN}) . . . . . -0.3 V dc to +V_{DD}
Output voltage (V_{OUT}) . . . . . -0.3 V dc to V_{DD}
Input current (I_{IN}) . . . . . ±5 mA
Output current (I_{OUT}) (each output) . . . . . +20 mA
Total supply current into V_{DD} terminal . . . . . +40 mA
Total current out of ground terminal . . . . . +60 mA
Continuous total power dissipation (P_D) 5/ . . . . . 950 mW
Storage temperature range . . . . . -65°C to +150°C
Lead temperature (soldering, 10 seconds) . . . . . +260°C

1.4 Recommended operating conditions.

Supply voltage (V_{DD}) . . . . . +4 V dc minimum to +16 V dc maximum
Common mode input voltage (V_{IC}) . . . . . 0 V dc minimum to V_{DD} - 1.5 V dc maximum
Low level output current (I_{OL}) . . . . . +20 mA
Operating free-air temperature range (T_A) . . . . . -55°C to +125°C

1/ The SMD PIN is provided for cross reference information. see 3.5.1 herein.
2/ 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.
3/ All voltage values except differential voltages are with respect to network ground.
4/ Differential voltages are at the noninverting input terminal with respect to the inverting input terminal.
5/ Above +25°C, derate at a factor of 7.6 mW/°C.

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, bulletin, and handbook. Unless otherwise specified, the following specification, 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.

SPECIFICATION

MILITARY

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

STANDARDS

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.
MIL-STD-973 - Configuration Management
MIL-STD-1835 - 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 specification, 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.)

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 classes N, Q, and V shall be in accordance with MIL-I-38535, the device manufacturer's Quality Management (QM) plan, and as specified 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 class M and MIL-I-38535 for device classes N, Q, and V and herein.

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

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

3.2.3 Radiation exposure circuit. The radiation exposure circuit shall be 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 ambient 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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$, unless otherwise specified	Group A 2/ subgroups	Device type	Limits 3/ Min	Limits 3/ Max	Unit
Input offset voltage 4/	V_{IO}	V_{ICR} = 0 V to V_{DD} - 1 V, V_{DD} = 5 V to 10 V	1	01		5	mV
		V_{ICR} = 0 V to V_{DD} - 1.5 V, V_{DD} = 5 V to 10 V	2,3			10	
Input offset current	I_{IO}	V_{IC} = 2.5 V, T_A = +125°C	2	01		15	nA
Input bias current	I_{IB}	V_{IC} = 2.5 V, T_A = +125°C	2	01		30	nA
Common-mode input voltage range	V_{ICR}		1	01	0 to V_{DD} - 1		V
			2,3		0 to V_{DD} - 1.5		
High-level output current	I_{OH}	V_{ID} = 1 V, V_{OH} = 5 V, T_A = +25°C, -55°C	1	01		40	nA
			2			1	µA
Low-level output voltage	V_{OL}	V_{ID} = -1 V, I_{OL} = 6 mA, T_A = +25°C, -55°C	1	01		400	mV
			2			800	
Supply current (four comparators)	I_{DD}	No load, outputs low	1	01		80	µA
			2,3			175	

1/ Unless otherwise specified, V_{DD} = 5 V and V_{ICR} = 0 V.

2/ All group A subgroup 3 (T_A = -55°C) test limits are guaranteed but not tested.

3/ The algebraic convention, whereby the most negative value is a minimum and the most positive is a maximum, is used in this table. Negative current shall be defined as conventional current flow out of a device terminal.

4/ The offset voltage limits given are the maximum values required to drive the output above 4.5 V or down 0.3 mV with a 2.5 kΩ load to V_{DD}.

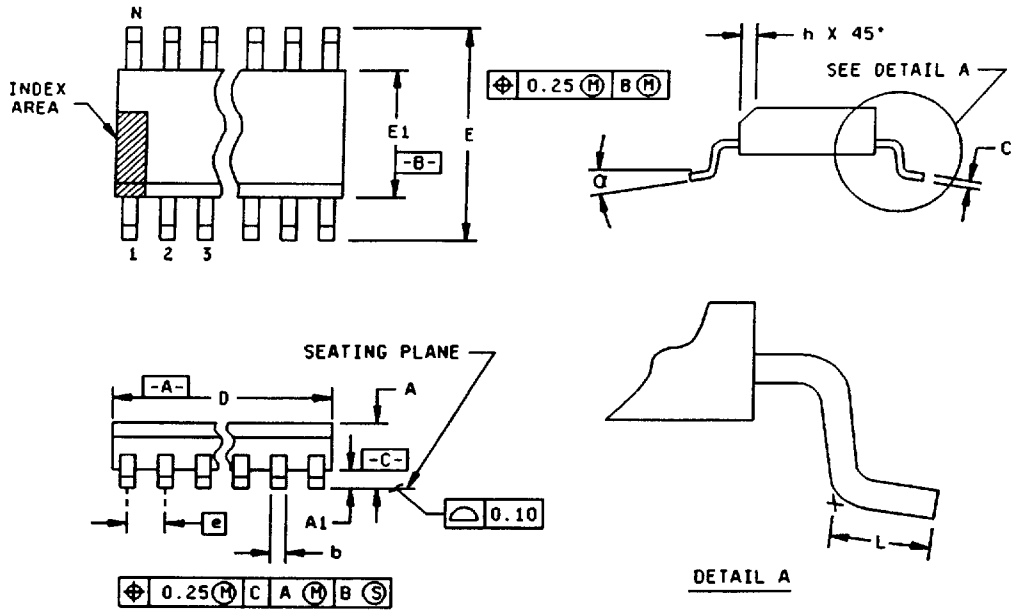


FIGURE 1. Case outline X.

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Symbol	Dimensions		
	Min	Max	Note
A	1.35	1.75	
A1	0.10	0.21	
b	0.36	0.51	8
c	0.19	0.25	
D	8.55	8.75	2
E	5.80	6.20	
E1	3.80	4.00	3
e	1.27 BSC		
h	0.25	0.50	4
α	0°	8°	
L	0.50	1.15	5
N	14		6
Note	1, 7		

NOTES:

1. Controlling dimension: millimeters.
2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusions and gate burrs shall not exceed 0.25 mm per side.
3. Dimension "E1" does not include inter-lead flash or protrusions. Inter-lead flash or protrusions shall not exceed 0.25 mm per side.
4. The chamfer on the body is optional. If it is not present, a visual index feature must be located within the crosshatched area.
5. "L" is the length of terminal for soldering to a substrate.
6. N is the number of terminal positions.
7. Terminal numbers are shown for reference only.
8. The lead width "b", as measured 0.36 mm or greater above the seating plane, shall not exceed a maximum value of 0.61 mm.

FIGURE 1. Case outline X - Continued.

Device type	01
Case outline	X
Terminal number	Terminal symbol
1	OUTPUT 1
2	OUTPUT 2
3	V_{DD}
4	-INPUT 2
5	+INPUT 2
6	-INPUT 1
7	+INPUT 1
8	-INPUT 3
9	+INPUT 3
10	-INPUT 4
11	+INPUT 4
12	GND
13	OUTPUT 4
14	OUTPUT 3

FIGURE 2. Terminal connections.

TABLE II. Electrical test requirements.

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

1/ PDA applies to subgroup 1.

3.5 Marking. The part shall be marked with the PIN listed in 1.2 herein. In addition, the vendor'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 Marking for device class N. For PEM packages the SMD PIN in 1.2 herein and the MIL-I-38535 marking is not required. Marking on the device shall include; a traceable date code, country of origin, pin one indicator, and manufacturers identification. In addition, the QML certification mark and the manufacturer PIN as shown in 1.2.6 herein shall be marked on the topside of the package. Manufacturer may at their option place the QML certification mark adjacent to the manufacturer PIN. In all cases, the purchase order shall reflect the SMD PIN as shown in 1.2 herein.

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

3.6 Certificate of compliance. 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 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 the requirements of MIL-I-38535 and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-I-38535 shall be provided with each lot of microcircuits delivered to this drawing.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. For device classes N, Q, and V, sampling and inspection procedures shall be in accordance with MIL-I-38535 and the device manufacturer's QM plan.

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

4.2.1 Additional criteria.

a. Final electrical test parameters shall be as specified in table II herein.

b. 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. Qualification inspection for device classes N, Q, and V shall be in accordance with MIL-I-38535 and the device manufacturer's QM plan. 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).

4.4 Conformance inspection. Technology conformance inspection for classes N, Q, and V shall be in accordance with MIL-I-38535 including groups A, B, C, D, and E inspections as specified herein and the device manufacturer's QM plan 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. Subgroups 4, 5, 6, 7, 8, 9, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging for device classes N, Q, and V shall be in accordance with MIL-I-38535 and the device manufacturer's QM plan.

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 SMD 5962-8765902 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 45444-5270, or telephone (513) 296-5377.

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.

Military documentation format	Example PIN under new system	Manufacturing source listing	Document listing
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(N, 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. Sources of supply for device classes N, 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.