

REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Changes in accordance with N.O.R. 5962-R019-97.	96-10-17	R. MONNIN
B	Drawing updated to reflect current requirements. -ro	01-01-29	R. MONNIN
C	Five year review requirement. -rrp	08-07-07	R. HEBER
D	Update drawing to current MIL-PRF-38535 requirements. Removed class M references. -rrp	16-09-08	C. SAFFLE



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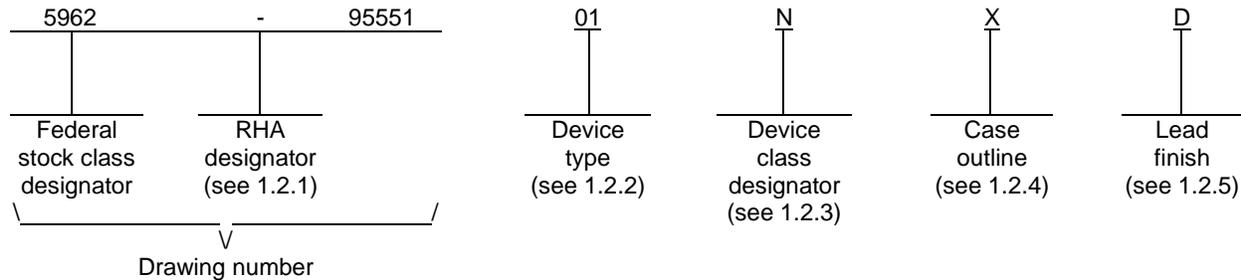
REV STATUS	REV	D	D	D	D	D	D	D	D	D	D	D						
OF SHEETS	SHEET	1	2	3	4	5	6	7	8	9	10							

PMIC N/A	PREPARED BY MARCIA B. KELLEHER	<p align="center">DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 http://www.landandmaritime.dla.mil</p>																
<p align="center">STANDARD MICROCIRCUIT DRAWING</p> <p>THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE</p> <p align="center">AMSC N/A</p>	CHECKED BY RAJESH PITHADIA																	
	APPROVED BY MICHAEL A. FRYE	<p align="center">MICROCIRCUIT, LINEAR, DUAL MICROPOWER VOLTAGE COMPARATORS, MONOLITHIC SILICON</p>																
	DRAWING APPROVAL DATE 94-12-27																	
	REVISION LEVEL D		SIZE A	CAGE CODE 67268	5962-95551													
SHEET 1 OF 10																		

1. SCOPE

1.1 Scope. This drawing documents three product assurance class levels consisting of space application (device class V), high reliability (device class Q), and nontraditional performance environment (device class N). 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 N, the user is cautioned to assure that the device is appropriate for the application environment.

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



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

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

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	TLC193M	Dual micropower voltage comparators

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>
N	Certification and qualification to MIL-PRF-38535 with a nontraditional performance environment (encapsulated in plastic)
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, JEDEC Publication 95, and as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>	<u>Document</u>
P	GDIP1-T8 or CDIP2-T8	8	Dual-in-line	MIL-STD-1835
X	MS-012-AA	8	Plastic small outline	JEP 95

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

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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 Microcircuit <u>1/</u> Drawing PIN	Manufacturer PIN
5962-9555101NXD	193M

1.3 Absolute maximum ratings. 1/

Supply voltage (VDD)	-0.3 V dc to +18 V dc <u>2/</u>
Differential input voltage (VID)	±18 V dc <u>3/</u>
Input voltage range (VI)	-0.3 V dc to VDD
Output voltage (VO)	-0.3 V dc to VDD
Input current (II)	±5 mA
Output current (IO) (each output)	+20 mA
Total supply current into VDD terminal	+40 mA
Total supply current out of ground terminal	+40 mA
Continuous total power dissipation (PD):	
Case P	1050 mW <u>4/</u>
Case X	725 mW <u>4/</u>
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+260°C

1.4 Recommended operating conditions.

Supply voltage (VDD)	+4 V dc min to +16 V dc max
Common mode input voltage (VIC)	0 V dc min to VDD – 1.5 V dc max
Low level output current (IOL)	+20 mA max
Operating free-air temperature (TA)	-55°C min to +125°C max

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/ All voltage values except differential voltages are with respect to network ground.

3/ Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.

4/ Above +25°C, derate at a factor of 8.4 mW/°C for case P and derate at a factor of 5.8 mW/°C for case X.

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

2.2 Non-Government publications. The following documents 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)

JEP 95 - Registered and Standard Outlines for Semiconductor Devices

(Copies of this document are available online at www.jedec.org or from JEDEC – Solid State Technology Association, 3103 North 10th Street, Suite 240-S, Arlington, VA 22201).

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 N, 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.

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

3.3 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. 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 N, Q, and V shall be in accordance with MIL-PRF-38535.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions <u>1/</u> -55°C ≤ TC ≤ +125°C unless otherwise specified	Group A <u>2/</u> subgroups	Device type	Limits		Unit
					Min	Max	
Input offset voltage <u>3/</u>	V _{IO}	V _{ICR} = 0 to V _{DD} - 1 V, V _{DD} = 5 V to 10 V	1	All		5	mV
		V _{ICR} = 0 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	2	All		15	nA
Input bias current	I _{IB}	V _{IC} = 2.5 V	2	All		30	nA
Common-mode input voltage range	V _{ICR}		1	All	0 to V _{DD} - 1		V
			2,3		0 to V _{DD} - 1.5		
Low level output voltage	V _{OL}	V _{ID} = -1 V, I _{OL} = 6 mA	1	All		400	mV
			2			800	
High-level output current	I _{OH}	V _{ID} = 1 V, V _{OH} = 5 V	1	All		40	nA
			2			1	μA
Supply current (both comparators)	I _{DD}	No load, outputs low	1	All		40	μA
			2,3			90	

1/ V_{DD} = 5 V, and zero common-mode input voltage.

2/ All subgroups 3 (-55°C) test limits are guaranteed but not tested.

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

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

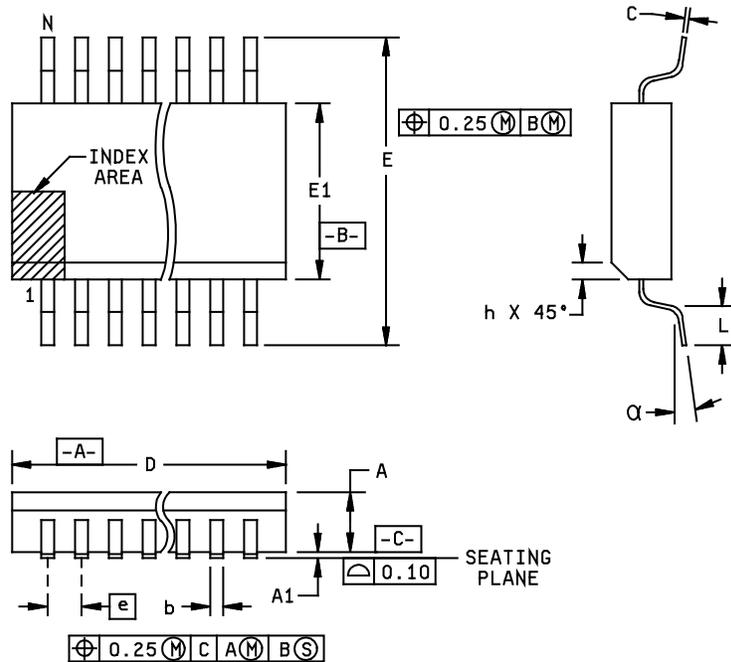
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Case X



Symbol	Dimensions		Note
	Min	Max	
A	1.35	1.75	
A1	0.10	0.21	
b	0.36	0.51	8
c	0.19	0.25	
D	4.80	5.00	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	8		6
Note	1, 7		

NOTES:

- Controlling dimension: millimeters
- 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.
- Dimension "E1" does not include inter-lead flash or protrusions. Inter-lead flash or protrusions shall not exceed 0.25 mm per side.
- The chamfer on the body is optional. If it is not present, a visual index feature must be located within the crosshatched area.
- "L" is the length of terminal for soldering to a substrate.
- N is the number of terminal positions.
- Terminal numbers are shown for reference only.
- 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.

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Device type	01
Case outlines	P and X
Terminal number	Terminal symbol
1	COMP1 OUT
2	COMP1 -IN
3	COMP1 +IN
4	GND
5	COMP2 +IN
6	COMP2 -IN
7	COMP2 OUT
8	VDD

FIGURE 2. Terminal connections.

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3.5.1 Certification/compliance mark. The certification mark for device classes N, Q, and V shall be a "QML" or "Q" as required in MIL-PRF-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 6.6 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 the requirements of MIL-PRF-38535 and herein.

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

4. VERIFICATION

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

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

4.2.1 Additional criteria.

- 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. Qualification inspection for device classes N, 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 N, Q, and V shall be in accordance with MIL-PRF-38535 including groups A, B, C, D, and E inspections and as specified.

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TABLE II. Electrical test requirements.

Test requirements	Subgroups (in accordance with MIL-PRF-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 <u>1/</u>	1,2,3 <u>1/</u>	1,2,3 <u>1/</u>
Group A test requirements (see 4.4)	1,2,3	1,2,3	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.

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 MIL-STD-883 shall be omitted.

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

4.4.2.1 Additional criteria. 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.

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

5. PACKAGING

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

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

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STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 16-09-08

Approved sources of supply for SMD 5962-95551 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 PIN <u>1/</u>	Vendor CAGE number	Vendor similar PIN <u>2/</u>	Manufacturer PIN <u>2/</u>
5962-9555101NXD	01295	TLC193MDQ	193M
5962-9555101QPA	01295	TLC193MJGB	---

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

01295

Vendor name
and address

Texas Instruments, Inc.
Semiconductor Group
8505 Forest Lane
P.O. Box 660199
Dallas, TX 75243

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