

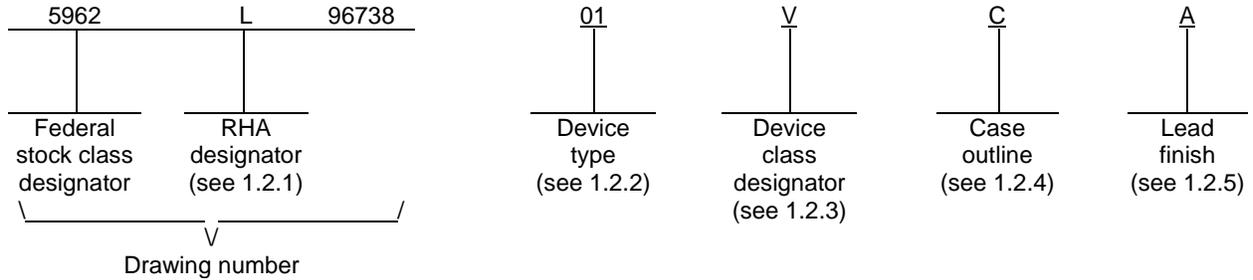
REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add I _{IO} parameter to Table IIB. Changes in accordance with NOR 5962-R050-96.	96-02-01	M. A Frye
B	Make changes to 1.2.3 and add footnote 1/. Changes in accordance with NOR 5962-R085-96.	96-03-21	M. A Frye
C	Under Table IIA, delete footnote 2/ from Final electrical parameters device class V block. In footnote 2/, delete "interim" and substitute "endpoint" under Table IIA. Delete footnote 1/ from Table IIB entirely. Changes in accordance with NOR 5962-R041-97.	96-11-04	R. Monnin
D	Under Table IIB, IIO parameter, delete "±5 nA" and substitute "±10 nA". Changes in accordance with NOR 5962-R174-97.	97-01-17	R. Monnin
E	Changes to the maximum limit on dimensions D and L on case outline X. Redrawn.	97-06-20	R. Monnin
F	Make changes to dimensions L, R, and R1 as specified under figure 1. - ro	97-12-01	R. Monnin
G	Add radiation hardness assurance requirements. - ro	98-11-03	R. Monnin
H	Add new footnotes to input current under 1.3 and to radiation features title under 1.5. Make changes to V _{IO} , V _{CM} , V _{DIFF} , and t _{RLH} RHA designator "R" tests limits as specified under table I. Delete figures 1 and 4. - ro	03-11-18	R. Monnin
J	Delete the words "at +25°C" from footnote 4/ as specified under Table I. - ro	04-06-18	R. Monnin
K	Add device type 02 tested at low dose rate. - ro	06-06-27	R. Monnin
L	Make correction to the V _{CM} test limit for subgroups 2 and 3 as specified under Table I. - ro	07-11-29	R. Heber
M	Change the dose rate from "12 mrad(Si) / s" to "10 mrad (Si) / s" for device type 02 under paragraph 1.5. Also under paragraph 1.5, third line of the paragraph, after method 1019, add the words, "condition D". Make changes to footnote 1/ as specified under Table I. Make a clarification to the second sentence of footnote 4/ as specified under Table I. - ro	08-03-11	R. Heber
N	Add paragraph 3.1.1 and die Appendix A. - ro	08-11-06	R. Heber
P	Add CAGE 01295. Add figure A-2 under Appendix A. - ro	11-01-25	C. Saffle
R	Add the "±" symbol to the Input offset voltage post rad hard limits as specified in Table I. Delete device class M references. - ro	13-11-07	C. Saffle

REV																				
SHEET																				
REV	R	R	R	R	R	R														
SHEET	15	16	17	18	19	20														
REV STATUS	REV			R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
OF SHEETS	SHEET			1	2	3	4	5	6	7	8	9	10	11	12	13	14			
PMIC N/A	PREPARED BY Rajesh Pithadia						DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 http://www.landandmaritime.dla.mil													
STANDARD MICROCIRCUIT DRAWING	CHECKED BY Rajesh Pithadia																			
THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE	APPROVED BY Michael A. Frye						MICROCIRCUIT, LINEAR, RADIATION HARDENED, QUAD VOLTAGE COMPARATOR, MONOLITHIC SILICON													
	DRAWING APPROVAL DATE 96-01-23																			
	REVISION LEVEL R																			
AMSC N/A							SHEET		1 OF 20											

1. SCOPE

1.1 Scope. This drawing documents two product assurance class levels consisting of high reliability (device class Q) and space application (device class V). A choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of Radiation Hardness Assurance (RHA) levels is reflected in the PIN.

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



1.2.1 RHA designator. Device classes Q and V RHA marked devices meet the MIL-PRF-38535 specified RHA levels and are marked with the appropriate RHA designator. 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	LM139A	Quad voltage comparator
02	LM139A	Quad voltage comparator

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>
Q or V	Certification and qualification to MIL-PRF-38535

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

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
C	GDIP1-T14 or CDIP2-T14	14	Dual-in-line
D	GDFP1-F14 or CDFP2-F14	14	Flat pack
X	GDFP1-G14	14	Flat pack with gullwing leads

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

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		<p align="center">REVISION LEVEL R</p>	<p align="center">SHEET 2</p>

1.3 Absolute maximum ratings. 1/

Input current	50 mA 2/
Supply voltage range	36 V dc or ±18 V dc
Input voltage range	-0.3 V dc to 36 V dc
Sink current	20 mA
Storage temperature range (T _{STG})	-65°C to 150°C
Maximum power dissipation (P _D)	900 mW 3/
Lead temperature (soldering, 10 seconds)	+300°C
Junction temperature (T _J)	+150°C
Thermal resistance, junction-to-case (θ _{JC})	23°C/W
Thermal resistance, junction-to-ambient (θ _{JA})	
Case outline C	103°C/W still air
	65°C/W 500 LFPM
Case outlines D and X	183°C/W still air
	120°C/W 500 LFPM

1.4 Recommended operating conditions.

Supply voltage range	5 V dc to 30 V dc
Ambient operating temperature range (T _A)	-55°C to +125°C

1.5 Radiation features.

Device type 01:	
Maximum total dose available (dose rate = 50 – 300 rads(Si)/s)	100 krad (Si) 4/
Device type 02:	
Maximum total dose available (dose rate = 10 m rads(Si)/s)	100 krad (Si) 5/

The manufacturer supplying RHA parts on this drawing has completed Lot Acceptance testing at Low Dose Rate (10 mrad/s) on these RHA marked parts. The Low Does Rate (LDR) testing that was performed demonstrates that these parts from the lot tested do not have an Enhanced Low Dose rate Sensitivity as defined by method 1019, condition D. Lot Acceptance Testing at LDR will continue to be performed on each wafer or wafer lot until characterization testing has been performed in accordance with method 1019 of MIL-STD-883. Since the redesigned part did not demonstrate ELDRS per method 1019 and the previously tested device was ELDRS, the part number will be changed to an 02 device to distinguish the 2 parts.

- 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/ This input current will only exist when the voltage at any of the input leads is driven negative. It is due to the collector-base junction of the input PNP transistors becoming forward biased and thereby acting as input diode clamps. In addition to this diode action, there is also lateral NPN parasitic transistor action on the IC chip. This transistor action can cause the output voltages of the comparator to go to the V+ voltage level (or to ground for a large overdrive) for the time duration that an input is driven negative. This is not destructive and normal output states will re-establish when the input voltage, which was negative, again returns to a value greater than -0.3 V dc at +25°C.
- 3/ Derate 10 mV/°C above T_A = 100°C.
- 4/ These parts may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects. Radiation end point limits for the noted parameters are guaranteed only for the conditions specified in MIL-STD-883, method 1019, condition A.
- 5/ For CAGE 27014, device type 02, these parts have been tested and do not demonstrate low dose rate sensitivity. Radiation end point limits for the noted parameters are guaranteed for the conditions specified in MIL-STD-883, test method 1019, condition D.

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

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements for device classes Q and V shall be in accordance with MIL-PRF-38535 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 of 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 and V.

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

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

3.2.3 Functional diagram. The functional diagram shall be as specified on figure 2.

3.2.4 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 ambient 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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions <u>1/ 2/ 3/</u> -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit	
					Min	Max		
Supply current	I _{CC}	R _L = ∞, V ₊ = 30 V	1,2,3	01, 02		2	mA	
Output leakage current	I _{CEX}	V ₊ = 30 V, V _{OUT} = 30 V	1,2,3	01, 02		1	μA	
Saturation voltage	V _{SAT}	I _{SINK} = 4 mA	1	01, 02		400	mV	
			2,3			700		
Output sink current	I _{SINK}	V _{OUT} = 1.5 V	1	01, 02	6		mA	
Input offset voltage	V _{IO}	V ₊ = 5 V, V _{CM} = 0 V	1	01, 02		±2	mV	
			2,3			±4		
			M,D,P,L		1			±2.5
			R		1			±4.0
		V ₊ = 30 V, V _{CM} = 0 V			1			±2
					2,3			±4
			M,D,P,L		1			±2.5
			R		1			±4.0
		V ₊ = 30 V, V _{CM} = 28.5 V, V _{OUT} = 1.5 V			1			±2
					M,D,P,L	1		
		R	1			±4.0		
		V ₊ = 30 V, V _{CM} = 28 V, V _{OUT} = 1.5 V			2,3			±4
					M,D,P,L	1		
		R	1			±4.0		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <u>1/ 2/ 3/</u> -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit	
					Min	Max		
Input offset current	I _{IO}	V _{OUT} = 1.5 V	1	01, 02		±25	nA	
			2,3			±100		
Power supply rejection ratio	PSRR	V ₊ = 5 V to 30 V	1	01, 02	60		dB	
Common mode rejection ratio	CMRR	V ₊ = 30 V, V _{CM} = 0 V to 28.5 V	1	01, 02	60		dB	
Voltage gain	A _V	V ₊ = 15 V, R _L ≥ 15 kΩ, V _{OUT} = 1 V to 11 V	1	01, 02	50		V/mV	
Common mode <u>4/</u> voltage range	V _{CM}	V ₊ = 30 V	1	01, 02	0	V ₊ - 1.5	V	
			2,3		0	V ₊ - 2.0		
Differential input <u>5/</u> voltage	V _{DIFF}	V ₊ = 30 V, V ₋ = 0 V, V _{IN+} = 36 V, V _{IN-} = 0 V	1,2,3	01, 02		500	nA	
		V ₊ = 30 V, V ₋ = 0 V, V _{IN+} = 0 V, V _{IN-} = 36 V				500		
Response time	t _{RLH}	V _{OD} (overdrive) = 5 mV	4	01, 02		5.0	μs	
	t _{RLH}	V _{OD} (overdrive) = 50 mV			4			0.8
			M,D,P,L		4			0.9
			R		4			1.0
	t _{RHL}	V _{OD} (overdrive) = 5 mV	4					2.5
	t _{RHL}	V _{OD} (overdrive) = 50 mV	4					0.8

- 1/ RHA devices supplied to this drawing meet and are tested to all levels M, D, P, L, and R. 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.
- 2/ V₊ = 5 V, V_{CM} = 0 V.
- 3/ The 01 device may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects. Radiation end point limits for the noted parameters are guaranteed only for the conditions specified in MIL-STD-883, method 1019, condition A for device type 01. For CAGE 27014, device type 02, has been tested at low dose rate and does not demonstrate low dose rate sensitivity (see 1.5 herein).
- 4/ The input common mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3 V. The upper end of the common mode voltage range is V₊ - 1.5 V for subgroup 1 or V₊ - 2.0 V for subgroups 2 and 3, but either or both inputs can go to +30 V dc without damage independent of the magnitude of V₊.
- 5/ Positive excursions of input voltage may exceed the power supply level. As long as the other voltage remains within the common mode range, the comparator will provide a proper output state. The low input voltage state must not be less than -0.3 V dc or 0.3 V dc below the magnitude of the negative power supply, if used.

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Device types	01 and 02
Case outlines	C, D, and X
Terminal number	Terminal symbol
1	OUT 2
2	OUT 1
3	V+
4	IN 1-
5	IN 1+
6	IN 2-
7	IN 2+
8	IN 3-
9	IN 3+
10	IN 4-
11	IN 4+
12	GND
13	OUT 4
14	OUT 3

FIGURE 1. Terminal connections.

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Device types 01 and 02

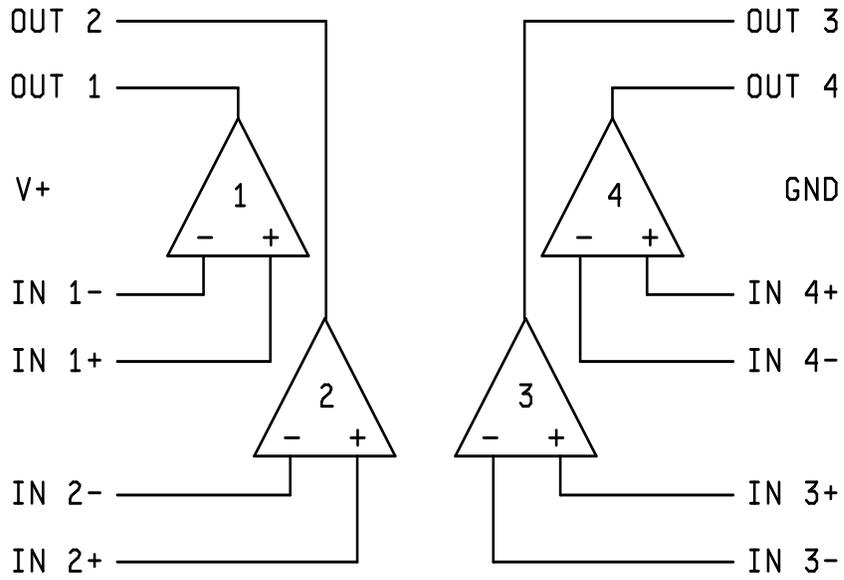


FIGURE 2. Functional diagram.

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3.5 Marking. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked. For packages where marking of the entire SMD PIN number is not feasible due to space limitations, the manufacturer has the option of not marking the "5962-" on the device. For RHA product using this option, the RHA designator shall still be marked. Marking for device classes Q and V shall be in accordance with MIL-PRF-38535.

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

3.6 Certificate of compliance. For device classes Q and V, a certificate of compliance shall be required from a QML-38535 listed manufacturer in order to supply to the requirements of this drawing (see 6.6.1 herein). The certificate of compliance submitted to DLA Land and Maritime-VA prior to listing as an approved source of supply for this drawing shall affirm that the manufacturer's product meets, for device classes Q and V, the requirements of MIL-PRF-38535 and herein.

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 microcircuits delivered to this drawing.

4. VERIFICATION

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

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.

4.2.1 Additional criteria for device classes Q and V.

- a. The burn-in test duration, test condition and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The burn-in test circuit shall be maintained under document revision level control of the device manufacturer's Technology Review Board (TRB) in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015 of MIL-STD-883.
- b. Interim and final electrical test parameters shall be as specified in table 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 and V. Qualification inspection for device classes Q and V shall be in accordance with MIL-PRF-38535. Inspections to be performed shall be those specified in MIL-PRF-38535 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.4).

4.4 Conformance inspection. Technology conformance inspection for classes Q and V shall be in accordance with MIL-PRF-38535 including groups A, B, C, D, and E inspections, and as specified herein.

4.4.1 Group A inspection.

- a. Tests shall be as specified in table IIA herein.
- b. Subgroups 5, 6, 7, 8, 9, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

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TABLE IIA. Electrical test requirements.

Test requirements	Subgroups (in accordance with MIL-PRF-38535, table III)	
	Device class Q	Device class V
Interim electrical parameters (see 4.2)	---	---
Final electrical parameters (see 4.2)	1,2,3,4 <u>1/</u>	1,2,3,4 <u>1/</u>
Group A test requirements (see 4.4)	1,2,3,4	1,2,3,4
Group C end-point electrical parameters (see 4.4)	1,2,3	1,2,3 <u>2/</u>
Group D end-point electrical parameters (see 4.4)	1,2,3	1,2,3
Group E end-point electrical parameters (see 4.4)	1,4	1,4

1/ PDA applies to subgroup 1.

2/ Delta limits as specified in table IIB shall be required where specified, and the delta limits shall be computed with reference to the previous endpoint electrical parameters.

TABLE IIB. Delta limits at +25°C.

Parameter	Device types	Limit
$\pm I_{BIAS}$	All	± 15 nA
V_{IO}	All	± 1 mV
I_{IO}	All	± 10 nA

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 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.

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

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4.4.4 Group E inspection. Group E inspection is required only for parts intended to be marked as radiation hardness assured (see 3.5 herein).

- a. End-point electrical parameters shall be as specified in table IIA herein.
- b. For device classes Q and V, the devices or test vehicle shall be subjected to radiation hardness assured tests as specified in MIL-PRF-38535 for the RHA level being tested. 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 IIA herein.

4.4.4.1 Total dose irradiation testing. Total dose irradiation testing shall be performed in accordance with MIL-STD-883 method 1019, condition A for device type 01, condition D for device type 02, and as specified herein.

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

4.4.4.2 Dose rate burnout. When required by the customer, test shall be performed on devices, standard evaluation circuit (SEC), or approved test structures at technology qualifications and after any design or process changes which may effect the RHA capability of the process. Dose rate burnout shall be performed in accordance with test method 1023 of MIL-STD-883 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 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 and V. Sources of supply for device classes Q and V are listed in MIL-HDBK-103 and QML-38535. The vendors listed in MIL-HDBK-103 and QML-38535 have submitted a certificate of compliance (see 3.6 herein) to DLA Land and Maritime-VA and have agreed to this drawing.

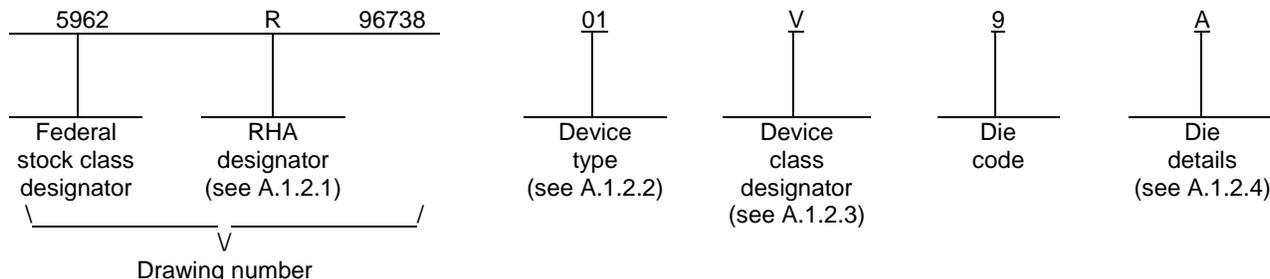
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APPENDIX A
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A.1 SCOPE

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.

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	LM139	Quad voltage comparator
02	LM139	Quad voltage comparator

A.1.2.3 Device class designator.

<u>Device class</u>	<u>Device requirements documentation</u>
Q or V	Certification and qualification to the die requirements of MIL-PRF-38535

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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.

<u>Die type</u>	<u>Figure number</u>
01	A-1
02	A-1, A-2

A.1.2.4.2 Die bonding pad locations and electrical functions.

<u>Die type</u>	<u>Figure number</u>
01	A-1
02	A-1, A-2

A.1.2.4.3 Interface materials.

<u>Die type</u>	<u>Figure number</u>
01	A-1
02	A-1, A-2

A.1.2.4.4 Assembly related information.

<u>Die type</u>	<u>Figure number</u>
01	A-1
02	A-1, A-2

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.

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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 Radiation exposure circuit. The radiation exposure circuit shall be as defined in paragraph 3.2.4 herein.

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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, 4.4.4.1.1, 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.

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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.

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DIE LAYOUT (H-STEP)

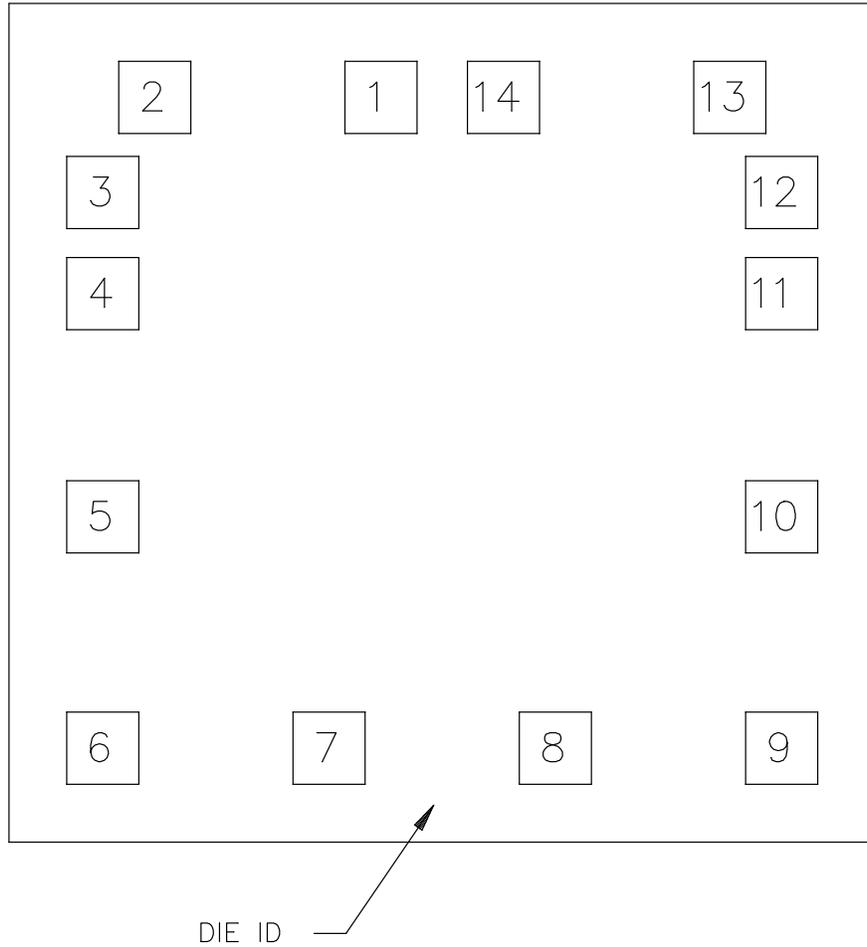


FIGURE A-1. Die bonding pad locations and electrical functions.

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Die bond pad coordinate locations (H-step)						
(Referenced to die center, coordinates in μm) NC = no connection, NU = not used						
Signal name	Pad number	X / Y coordinates		Pad size		
		X	Y	X		Y
OUTPUT 2	1	-77	407	92	x	92
OUTPUT 1	2	-333	407	92	x	92
V+	3	-420	280	92	x	92
-INPUT 1	4	-420	153	92	x	92
+INPUT 1	5	-420	-116	92	x	92
-INPUT 2	6	-420	-407	92	x	92
+INPUT 2	7	-152	-407	92	x	92
-INPUT 3	8	152	-407	92	x	92
+INPUT 3	9	420	-407	92	x	92
-INPUT 4	10	420	-116	92	x	92
+INPUT 4	11	420	153	92	x	92
GND	12	420	280	92	x	92
OUTPUT 4	13	335	407	92	x	92
OUTPUT 3	14	79	407	92	x	92

Die bonding pad locations and electrical functions for CAGE 27014.

Die physical dimensions.

Die size: 1068 μm x 1041.4 μm
42.0 mils x 41.0 mils

Die thickness: 330 μm nominal
Minimum pitch: 127 μm nominal

Interface materials.

Top metallization: Al 0.5% CU
Backside metallization: Bare back

Glassivation.

Type: Vapox over metal (VOM only)
Thickness: 8 μm – 12 μm

Substrate: Silicon

Assembly related information.

Substrate potential: Floating or GND
Special assembly instructions: None

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

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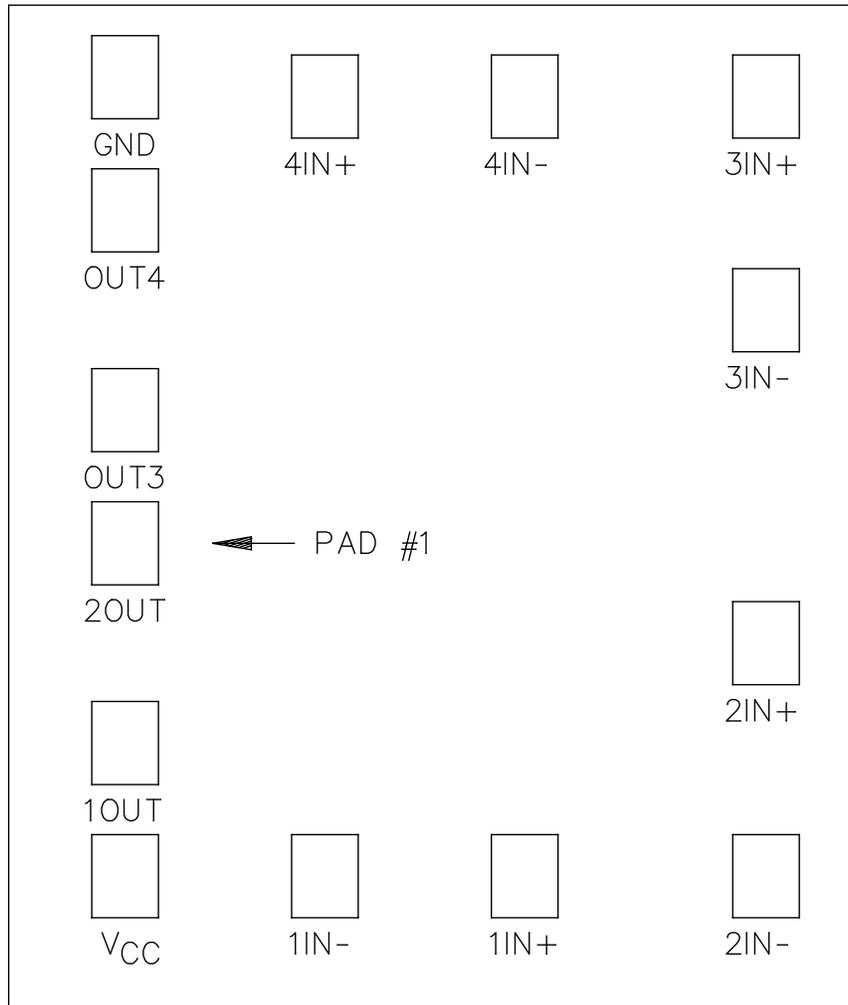


FIGURE A-2. Die bonding pad locations and electrical functions.

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Die bond pad coordinate locations					
(Coordinates in microns)					
Description	Pad number	X min	Y min	X max	Y max
2OUT	1	22.86	455.93	124.46	557.53
1OUT	2	22.86	203.2	124.46	304.8
V _{CC}	3	22.86	27.94	124.46	129.54
1IN-	4	345.44	53.34	447.04	154.94
1IN+	5	640.08	53.34	741.68	154.94
2IN-	6	981.71	53.34	1083.31	154.94
2IN+	7	958.85	347.98	1060.45	449.58
3IN-	8	948.69	713.74	1050.29	815.34
3IN+	9	961.39	1008.38	1062.99	1109.98
4IN-	10	605.79	1013.46	707.39	1115.06
4IN+	11	308.61	1013.46	410.21	1115.06
GND	12	22.86	1047.75	124.46	1149.35
OUT4	13	22.86	891.54	124.46	993.14
OUT3	14	22.86	638.81	124.46	740.41

Die bonding pad locations and electrical functions for CAGE 01295.

Die physical dimensions.

Die size: 1219.2 mm x 12700 mm

48 mils x 50 mils

Die thickness: 15 mils nominal

Interface materials.

Top metallization: Al 0.5% CU

Backside metallization: Silicon with backgrind

Glassivation.

Type: Compressive nitride

Thickness: 10 kÅ

Substrate: Silicon

Assembly related information.

Substrate potential: Floating

Special assembly instructions: None

FIGURE A-2. Die bonding pad locations and electrical functions - continued.

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STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 13-11-07

Approved sources of supply for SMD 5962-96738 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 <u>1</u> /	Vendor CAGE number	Vendor similar PIN <u>2</u> /
5962-9673801VCA	<u>3</u> /	LM139AJ-QMLV
5962-9673801VDA	27014	LM139AW-QMLV
5962-9673801VXA	27014	LM139AWG-QMLV
5962L9673801VCA	27014	LM139AJLQMLV
5962L9673801VDA	<u>3</u> /	LM139AWLQMLV
5962L9673801VXA	<u>3</u> /	LM139AWGLQMLV
5962R9673801VCA	27014	LM139AJRQMLV
5962R9673801VDA	27014	LM139AWRQMLV
5962R9673801VXA	27014	LM139AWGRQMLV
5962R9673801QCA	<u>3</u> /	LM139AJRQML
5962R9673801QDA	<u>3</u> /	LM139AWRQML
5962R9673801QXA	<u>3</u> /	LM139AWGRQML
5962-9673802VCA	01295	LM139AJQMLV
5962R9673802VCA	27014	LM139AJRLQMLV <u>4</u> /
5962R9673802VDA	27014	LM139AWRLQMLV <u>4</u> /
5962R9673802VXA	27014	LM139AWGRLQMLV <u>4</u> /

STANDARD MICROCIRCUIT DRAWING BULLETIN - CONTINUED.

DATE: 13-11-07

Standard microcircuit drawing PIN <u>1/</u>	Vendor CAGE number	Vendor similar PIN <u>2/</u>
5962R9673801V9A	27014	LM139 MDR
5962-9673802V9B	01295	LM139AKGD-SP
5962R9673802V9A	27014	LM139 MDE <u>4/</u>

- 1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the vendor to determine its availability.
- 2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.
- 3/ Not available from an approved source of supply.
- 4/ Low dose rate testing has been performed per test method 1019 condition D of MIL-STD-883 with no enhanced low dose rate sensitivity (ELDRS) effect.

Vendor CAGE
number

Vendor name
and address

01295

Texas Instruments, Inc.
Semiconductor Group
8505 Forest Lane
P.O. Box 660199
Dallas, TX 75243
Point of contact: U.S. Highway 75 South
P.O. Box 84, M/S 853
Sherman, TX 75090-9493

27014

National Semiconductor
2900 Semiconductor Drive
P.O. Box 58090
Santa Clara, CA 95052-8090

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