REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add device class T device and requirements. - ro	98-12-04	R. MONNIN
B	Make changes to 1.5. - ro	99-01-05	R. MONNIN
C	Add level P to table I. Make changes to 1.5 and glassivation as specified under APPENDIX A. - ro	99-04-13	R. MONNIN
D	Drawing updated to reflect current requirements. – gt	03-03-11	R. MONNIN
E	Add device type 02. Make changes to 1.2.2, table I, figure 1, figure 4, 4.4, and A4.3.1. - ro	04-01-06	R. MONNIN
F	Add enhanced low dose rate effects (ELDRS) paragraph to 1.5 and table I. - rrp	05-10-14	R. MONNIN
G	Add 30 V test conditions to Table I. Add a date code sentence to footnote 1/ as specified under Table I. Add CMRR and I_{OZ} tests under Table I. Make change to Table IIB. Delete Accelerated aging test. - ro	07-06-25	R. HEBER
H	Make correction by deleting the minimum limit from the I_{IO} test as specified under Table I. - ro	09-10-15	C. SAFFLE
J	Add device type 03. Delete dose rate upset from paragraph 1.5. Add ASTM F1192 information under section 2. Delete radiation exposure circuit. - ro	12-10-01	C. SAFFLE
K	Delete footnote from the Input current (I_{IN}) (V_{IN} < -0.3 V) rating in 1.3. Update drawing to current MIL-PRF-38535 requirements. -rrp	16-10-13	C. SAFFLE
L	Make change to the Input offset voltage test limits for device types 01 and 03 as specified under Table IA. Make change to the Input offset voltage test limits as specified under Table IIB. - ro	17-01-27	C. SAFFLE

REV																				
SHEET																				
REV	L	L	L	L	L	L	L													
SHEET	15	16	17	18	19	20	21													

REV STATUS	REV	L	L	L	L	L	L	L	L	L	L	L	L	L	L
OF SHEETS	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14

PMIC N/A

PREPARED BY
RICK OFFICER

DLA LAND AND MARITIME
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STANDARD MICROCIRCUIT DRAWING

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

AMSC N/A

CHECKED BY
RAJESH PITHADIA

APPROVED BY
RAYMOND MONNIN

DRAWING APPROVAL DATE
98-06-26

REVISION LEVEL
L

MICROCIRCUIT, LINEAR, RADIATION HARDENED, QUAD VOLTAGE COMPARATOR, MONOLITHIC SILICON

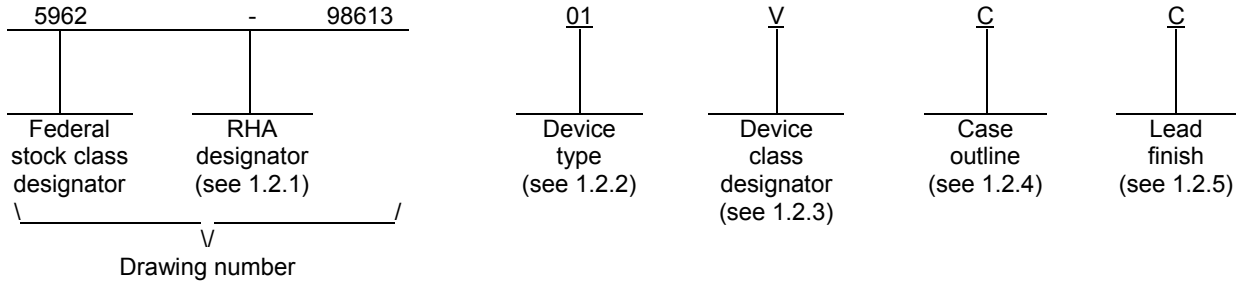
SIZE	CAGE CODE	
A	**67268**	**5962-98613**

SHEET 1 OF 21

1. SCOPE

1.1 Scope. This drawing documents three product assurance class levels consisting of high reliability (device class Q), space application (device class V) and for appropriate satellite and similar applications (device class T). A choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of Radiation Hardness Assurance (RHA) levels is reflected in the PIN. For device class T, the user is encouraged to review the manufacturer's Quality Management (QM) plan as part of their evaluation of these parts and their acceptability in the intended application.

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



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

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

Device type	Generic number	Circuit function
01	HS-139RH	Radiation hardened quad voltage comparator
02	HS-139BRH	Radiation hardened quad voltage comparator
03	HS-139EH	Radiation hardened quad voltage comparator

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

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

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

Outline letter	Descriptive designator	Terminals	Package style
C	CDIP2-T14	14	Dual-in-line
X	CDFP3-F14	14	Flat pack

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

1.3 Absolute maximum ratings. 1/

Supply voltage range (+V)	36 V dc
Input voltage range (V_{IN})	-0.3 V dc to 36 V dc
Input current (I_{IN}) (V_{IN} < -0.3 V)	50 mA
Output short circuit duration (single supply)	Continuous 2/
Maximum storage temperature range	-65°C to +150°C
Maximum power dissipation (P_D):	
Case outline C	0.67 W
Case outline X	0.43 W
Lead temperature (soldering, 10 seconds)	+265°C maximum
Junction temperature (T_J)	+175°C maximum
Thermal resistance, junction-to-case (θ_{JC}):	
Case outline C	22°C/W
Case outline X	28°C/W
Thermal resistance, junction-to-ambient (θ_{JA}): 3/	
Case outline C	75°C/W
Case outline X	115°C/W

1.4 Recommended operating conditions.

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

1.5 Radiation features.

Maximum total dose available (dose rate = 50 – 300 rads(Si)/s):	
Device type 01:	
Classes Q or V	300 krads(Si) 4/
Class T	100 krads(Si) 4/
Device type 02	300 krads(Si) 4/
Device type 03	300 krads(Si) 5/
Maximum total dose available (dose rate ≤ 0.01 rads(Si)/s):	
Device type 03	50 krads(Si) 5/
Single event phenomenon (SEP) :	
No Single event upset (SEU) occurs at effective LET (see 4.4.4.3)	≤ 20 MeV / (mg/cm^2) 6/
Single event latch up (SEL)	No latch up 7/

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/ Short circuit from the output to +V can cause excessive heating and eventual destruction. The maximum output current independent of +V is approximately 20 mA.
3/ θ_{JA} is measured with the component mounted on an evaluation PC board in free air.
4/ Device types 01 and 02 may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects. The radiation end point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition A to a maximum total dose of 300 krads(Si) for device classes V and Q, and 100 krads(Si) for device class T.
5/ Device type 03 radiation end point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition A to a maximum total dose of 300 krads(Si), and condition D to a maximum total dose of 50 krads(Si).
6/ Limits are guaranteed by process or design but not production test.
7/ Device types 01, 02, and 03 used dielectrically isolated (DI) technology and latch-up is physically not possible.

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 document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents are the issues of the documents cited in the solicitation or contract.

ASTM INTERNATIONAL (ASTM)

ASTM F1192 - Standard Guide for the Measurement of Single Event Phenomena (SEP) Induced by Heavy Ion Irradiation of semiconductor Devices.

(Copies of these documents are available online at http://www.astm.org or from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA, 19428-2959).

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

3.1.1 Microcircuit die. For the requirements 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, T 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 Block diagram. The block diagram shall be as specified on figure 2.

3.2.4 Timing diagrams. The timing diagrams shall be as specified on figure 3.

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

3.3 Electrical performance characteristics and postirradiation parameter limits. Unless otherwise specified herein, the electrical performance characteristics and postirradiation parameter limits are as specified in table IA 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 IA.

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

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

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

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

TABLE IA. Electrical performance characteristics.

Test	Symbol	Conditions 1/ 2/ $-55°C \le T_A \le +125°C$, +V = 5 V, unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input offset voltage	V_{IO}	V_{REF} = 1.4 V, R_S = 0 Ω, output switch point = 1.4 V, +V = 5 V, +V = 30 V	1	01,03	-3	3	mV
				02	-3	3	
			2,3	All	-5	5	
		M,D,P,L,R,F	1		-8	8	
Saturation voltage	V_{SAT1}	$-V_{IN}$ = 1 V, $+V_{IN}$ = 0 V, $I_{SINK} \le$ 1 mA	1,2,3	All		400	mV
		M,D,P,L,R,F	1	01,03		400	
				02		600	
Saturation voltage	V_{SAT2}	$-V_{IN}$ = 1 V, $+V_{IN}$ = 0 V, $I_{SINK} \le$ 4 mA	1,2,3	All		800	mV
		M,D,P,L,R,F	1	01,03		800	
				02		1000	
Common mode input 3/ voltage range	V_{ICR}	+V = 30 V	1,2,3	All	0	$+V_S$ -2.5	V
		M,D,P,L,R,F	1			$+V_S$ -2.5	
Input offset current	I_{IO}	$+I_{IN}$ - $-I_{IN}$	1	All	-25	25	nA
		+V = 5 V, +V = 30 V	2,3		-100	100	
		M,D,P,L,R,F	1		-600	600	
Input bias current	I_{IB}	$+I_{IN}$ or $-I_{IN}$ with output in linear range, +V = 5 V, +V = 30 V	1	All	-100	100	nA
			2,3		-300	300	
		M,D,P,L,R,F	1		-1000	1000	
Total supply current	$+I_S$	R_L = infinite on all comparators, +V = 30 V	1	All		2	mA
			2,3			3	
		M,D,P,L,R,F	1			3	

See footnotes at end of table.

TABLE IA. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ 2/ $-55°C \le T_A \le +125°C$ +V = 5 V unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input voltage common mode rejection ratio	CMRR	+V = +30 V, $R_L > 15$ kΩ, V_{CM} = 0 V to 27.5 V	1,2,3	All		60	dB
		M,D,P,L,R,F	1			60	
Output leakage current	I_{OZ}	+V = +30 V, V_{OUT} = 30 V dc	1,2,3	All	-0.5	0.5	µA
		M,D,P,L,R,F	1		-0.5	0.5	
Output sink current	I_{OSK}	$-V_{IN} > 1$ V, $+V_{IN}$ = 0 V, $V_{OUT} < 1.5$ V	1,2,3	All	6		mA
		M,D,P,L,R,F	1		6		
Voltage gain	AOL	$R_L > 15$ kΩ, $+V_S$ = 15 V	1,2,3	01,03	50		V/mV
				02	25		
		M,D,P,L,R,F	1	01,03	50		
				02	25		
Response time 4/	t_{PHL}	$V_{IN} = V_{IO}$ + 5 mV, V_{REF} = 1.4 V, V_{RL} = 5 V, R_L = 5.1 kΩ, see figure 3	4	01,03		5	µs
				02		7	
			5,6	01,03		7	
				02		12	
		M,D,P,L,R,F	4	01,03		7	
				02		12	
	t_{PLH}	$V_{IN} = V_{IO}$ + 5 mV, V_{REF} = 1.4 V, V_{RL} = 5 V, R_L = 5.1 kΩ, see figure 3	4	01,03		5	µs
				02		7	
			5,6	01,03		7	
				02		12	
		M,D,P,L,R,F	4	01,03		7	
				02		12	

See footnotes at end of table.

TABLE IA. Electrical performance characteristics - Continued.

1/ RHA device types 01 and 02 (device classes Q and V) supplied to this drawing will meet all levels L, R and F of irradiation, and device type 01 (device class T) will meet all levels L and R of irradiation. However, device types 01 and 02 (device classes Q and V) are only tested at the "F" level, and device type 01 (device class T) is only tested at the "R" level in accordance with MIL-STD-883 method 1019 condition A (see 1.5 herein). Device types 01 and 02 may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects.

RHA device type 03 supplied to this drawing will meet all levels L, R, and F of irradiation for condition A and "L" level for condition D. However, device type 03 is only tested at the "F" level in accordance with MIL-STD-883, method 1019, condition A and tested at the "L" level in accordance with MIL-STD-883, method 1019, condition D (see 1.5 herein).

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

All material beginning with a lot date code of "0710" and after will have been screened to the revised table IA electrical limits for the implementation of the 30 V test conditions.

2/ The comparator will provide a proper output state even if the positive swing of the inputs exceeds the power supply voltage level, if the other input remains within the common mode voltage range. The low input voltage state must not be less than -0.3 V (or 0.3 V below the magnitude of the negative power supply, if used).

3/ The upper end of the common mode voltage range is (+V) - 2.5 V, but either or both inputs can go to +30 V without damage.

4/ If not tested, shall be guaranteed to the limits specified in table IA herein.

TABLE IB. SEP test limits. 1/ 2/

Device type	Supply voltage V+ = 5.0 V 3/
	No SEU at effective LET [MeV/(mg/cm^2)]
All	LET ≤ 20

1/ For single event phenomena (SEP) test conditions, see 4.4.4.3 herein.
2/ Technology characterization and model verification supplemented by in-line data may be used in lieu of end-of-line testing. Test plan must be approved by technical review board and qualifying activity.
3/ Tested for upsets at worse case temperature, T_A = +25°C ± 10°C.

Device types	01, 02, and 03
Case outlines	C and X
Terminal number	Terminal symbol
1	OUTPUT 2
2	OUTPUT 1
3	+V
4	-INPUT 1
5	+INPUT 1
6	-INPUT 2
7	+INPUT 2
8	-INPUT 3
9	+INPUT 3
10	-INPUT 4
11	+INPUT 4
12	GND
13	OUTPUT 4
14	OUTPUT 3

FIGURE 1. Terminal connections.

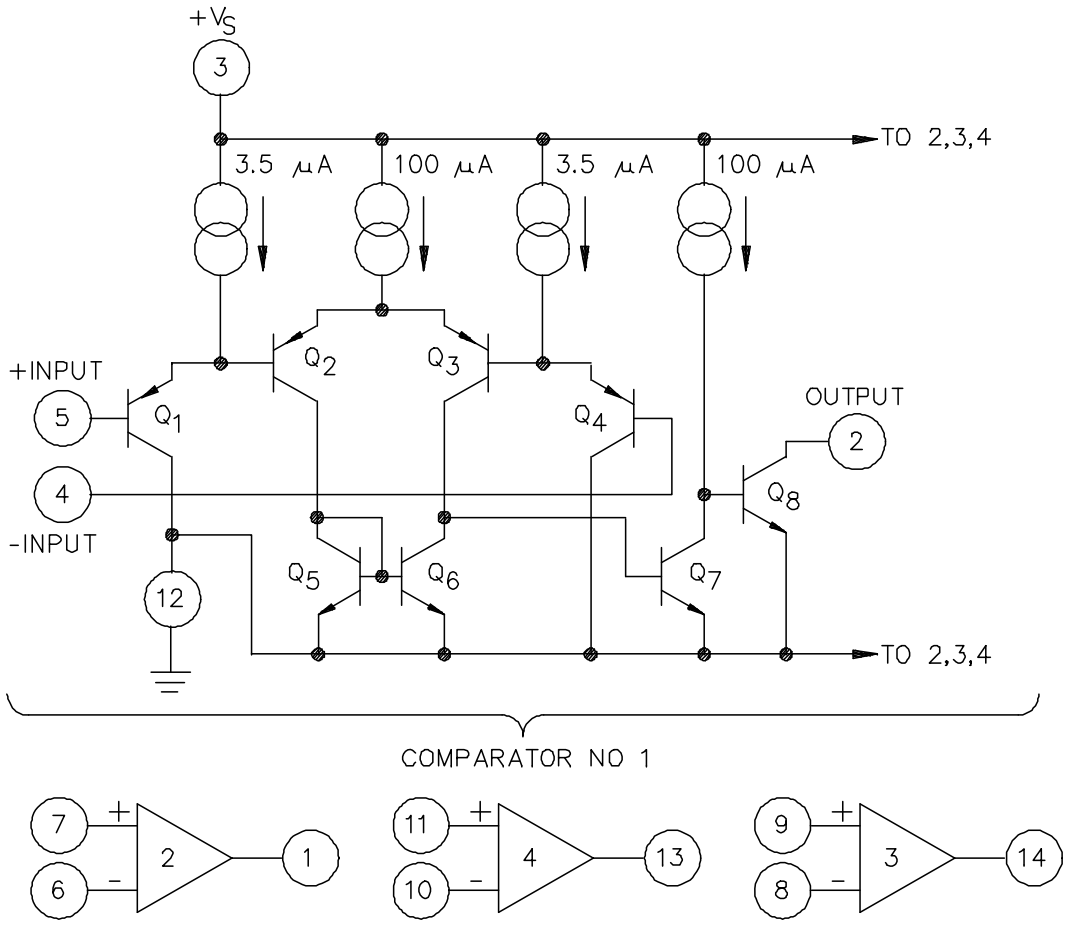
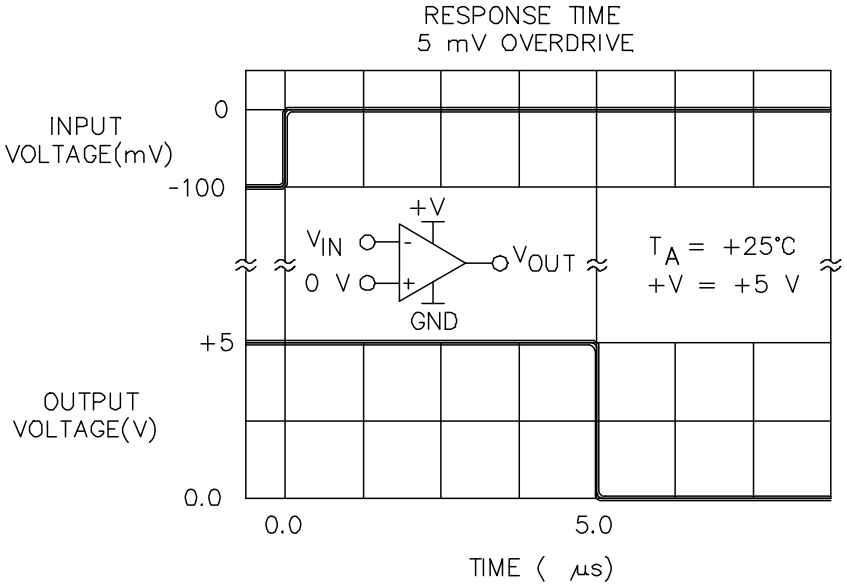


FIGURE 2. Block diagram.



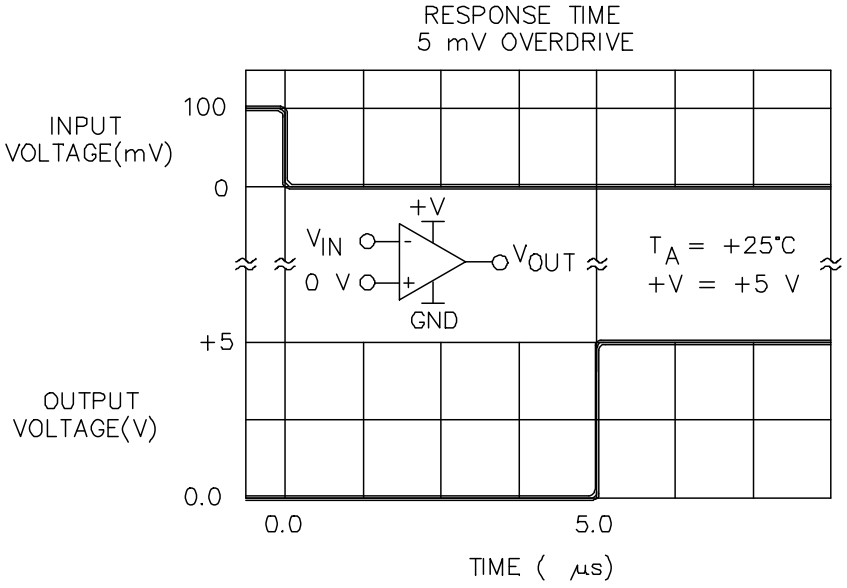


FIGURE 3. Timing waveforms.

4. VERIFICATION

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

4.2 Screening. For device classes Q and V, screening shall be in accordance with MIL-PRF-38535, and shall be conducted on all devices prior to qualification and technology conformance inspection. For device class T, screening shall be in accordance with the device manufacturer's Quality Management (QM) plan, and shall be conducted on all devices prior to qualification and technology conformance inspection.

4.2.2 Additional criteria for device classes Q, T and V.

a. The burn-in test duration, test condition and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The burn-in test circuit shall be maintained under document revision level control of the device manufacturer's Technology Review Board (TRB) in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015 of MIL-STD-883.

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

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

4.3 Qualification inspection for device classes Q, T and V. Qualification inspection for device classes Q and V shall be in accordance with MIL-PRF-38535. Qualification inspection for device class T shall be in accordance with the device manufacturer's Quality Management (QM) plan. Inspections to be performed shall be those specified in MIL-PRF-38535 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.4).

4.4 Conformance inspection. Technology conformance inspection for classes Q and V shall be in accordance with MIL-PRF-38535 including groups A, B, C, D, and E inspections, and as specified herein. Technology conformance inspection for class T shall be in accordance with the device manufacturer's Quality Management (QM) plan.

4.4.1 Group A inspection.

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

b. Subgroups 7, 8, 9, 10, and 11 in table I, method 5005 of 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 IIA herein.

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

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

TABLE IIA. Electrical test requirements.

Test requirements	Subgroups (in accordance with MIL-PRF-38535, table III)		
	Device class Q	Device class V	Device class T
Interim electrical parameters (see 4.2)	1,4	1,4	As specified in QM plan
Final electrical parameters (see 4.2)	1,2,3,4,5,6 1/	1,2,3, 1/ 2/ 4,5,6	As specified in QM plan
Group A test requirements (see 4.4)	1,2,3,4,5,6	1,2,3,4,5,6	As specified in QM plan
Group C end-point electrical parameters (see 4.4)	1,2,3,4,5,6	1,2,3,4,5,6 2/	As specified in QM plan
Group D end-point electrical parameters (see 4.4)	1,4	1,4	As specified in QM plan
Group E end-point electrical parameters (see 4.4)	1,4	1,4	As specified in QM plan

1/ PDA applies to subgroup 1 for class Q. For class V, PDA applies to subgroup 1 and deltas.
2/ Delta limits as specified in table IIB shall be required and the delta values shall be computed with reference to the zero hour electrical parameters (see table IA).

TABLE IIB. Burn-in and life test delta parameters. (T_A = +25°C). 1/

Parameters	Symbol	Min	Max	Units
Input offset voltage (+V = 5 V)	V_{IO}	-1.5	+1.5	mV
Input bias current (+V = 5 V)	$\pm I_{IB}$	-15	+15	nA
Input offset current (+V = 5 V)	I_{IO}	-10	+10	nA

1/ If device is tested at or below delta limits, no deltas are required. Deltas are performed at room temperature.

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 as specified in MIL-PRF-38535. End-point electrical parameters shall be as specified in table IIA herein.

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

4.4.4.2 Total dose irradiation testing. Total dose irradiation testing shall be performed in accordance with MIL-STD-883 method 1019, condition A, and as specified herein for device types 01, 02, and 03. In addition, for device type 03 a low dose rate test shall be performed in accordance with MIL-STD-883 method 1019, condition D and as specified herein. For device class T, the total dose requirements shall be in accordance with the class T radiation requirements of MIL-PRF-38535.

4.4.4.3 Single event phenomena (SEP). When specified in the purchase order or contract, SEP testing shall be performed on class V devices. SEP testing shall be performed on the Standard Evaluation Circuit (SEC) or alternate SEP test vehicle as approved by the qualifying activity at initial qualification and after any design or process changes which may affect the upset or latchup characteristics. Test four devices with zero failures. ASTM F1192 may be used as a guideline when performing SEP testing. The recommended test conditions for SEP are as follows:

a. The ion beam angle of incidence shall be between normal to the die surface and 60° to the normal, inclusive (i.e. $0° \leq$ angle $\leq 60°$). No shadowing of the ion beam due to fixturing or package related affects is allowed.

b. The fluence shall be ≥ 100 errors or $\geq 10^7$ ions/cm^2.

c. The flux shall be between 10^2 and 10^5 ions/cm^2/s. The cross-section shall be verified to be flux independent by measuring the cross-section at two flux rates which differ by at least an order of magnitude.

d. The particle range shall be ≥ 20 micron in silicon.

e. The test temperature shall be +125°C ±10% for SEL and 25°C ±10% for SEU.

f. Bias conditions for V_{CC} shall be as listed in Table IB.

g. For SEU test limits, see Table IB herein.

5. PACKAGING

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

6. NOTES

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

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

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

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

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

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

6.6 Sources of supply.

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

6.7 Additional information. When applicable, a copy of the following additional data shall be maintained and available from the device manufacturer:

a. RHA upset levels.

b. Test conditions (SEP).

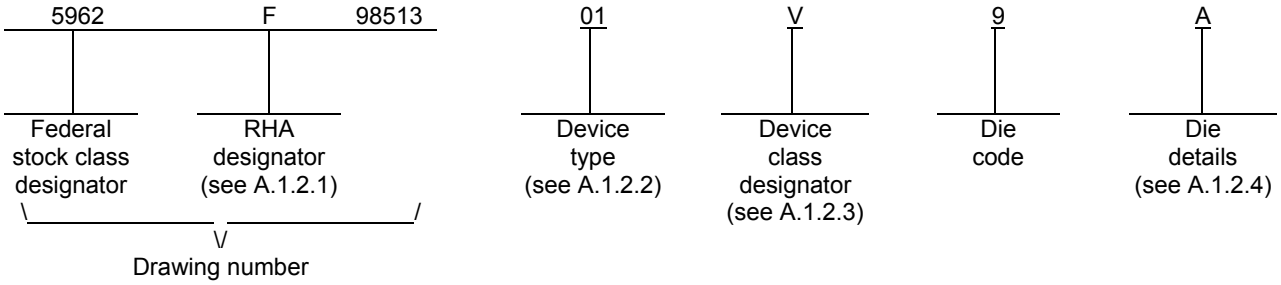
c. Number of upsets (SEU).

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-98613

A.1 SCOPE

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

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



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

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

Device type	Generic number	Circuit function
01	HS-139RH	Radiation hardened quad voltage comparator
02	HS-139BRH	Radiation hardened quad voltage comparator
03	HS-139EH	Radiation hardened quad voltage comparator

A.1.2.3 Device class designator.

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

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

A.1.2.4.1 Die physical dimensions.

Die type	Figure number
01, 02, 03	A-1

A.1.2.4.2 Die bonding pad locations and electrical functions.

Die type	Figure number
01, 02, 03	A-1

A.1.2.4.3 Interface materials.

Die type	Figure number
01, 02, 03	A-1

A.1.2.4.4 Assembly related information.

Die type	Figure number
01, 02, 03	A-1

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

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

A.1.5 Radiation features. See paragraph 1.5 herein for details.

A.2 APPLICABLE DOCUMENTS.

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

DEPARTMENT OF DEFENSE SPECIFICATION

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

DEPARTMENT OF DEFENSE STANDARD

MIL-STD-883 - Test Method Standard Microcircuits.

DEPARTMENT OF DEFENSE HANDBOOKS

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

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

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

A.3 REQUIREMENTS

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

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

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

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

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

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

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

A.3.3 Electrical performance characteristics and post-irradiation parameter limits. Unless otherwise specified herein, the electrical performance characteristics and post-irradiation parameter limits are as specified in table IA 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 IA.

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, 4.4.4.2, and 4.4.4.3 herein.

A.5 DIE CARRIER

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

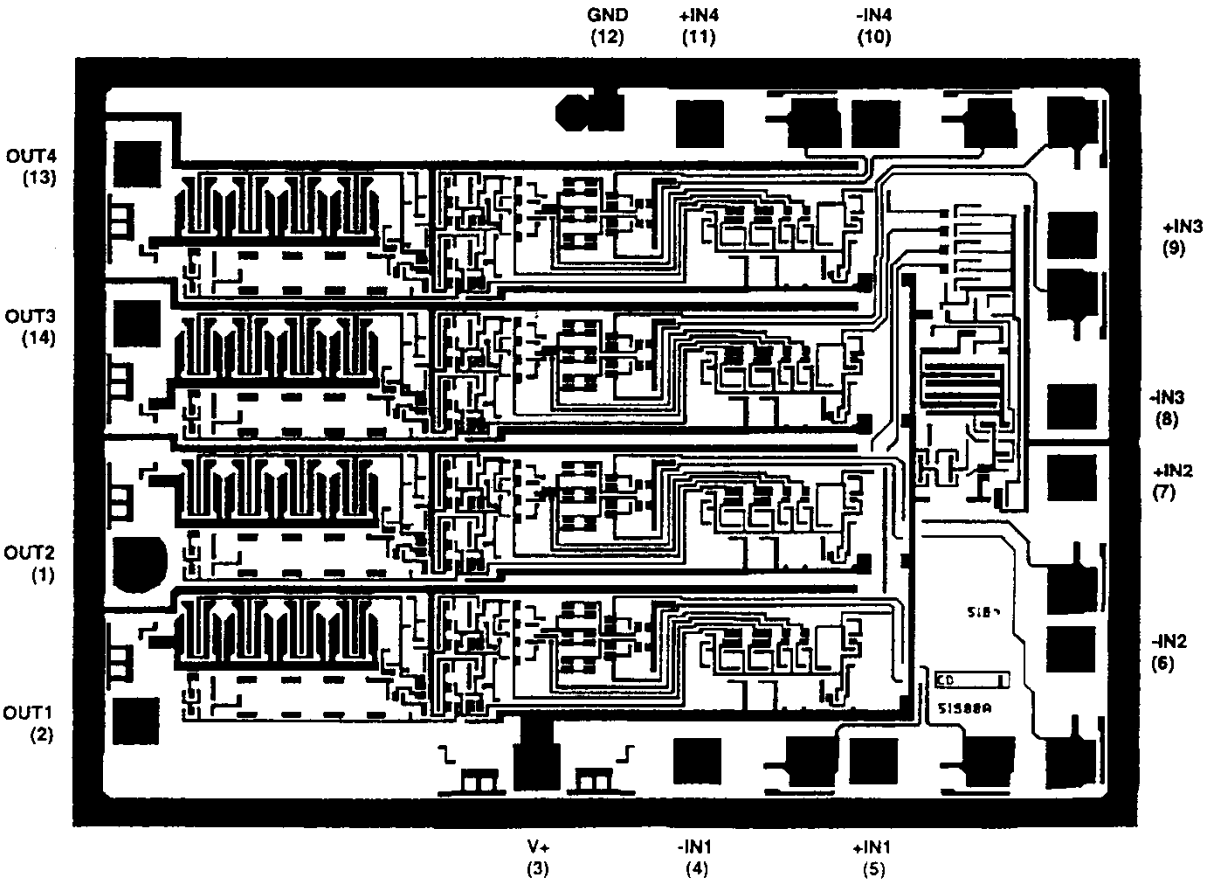
A.6 NOTES

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

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

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

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



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

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

Die physical dimensions.
Die size: 3750 microns x 2820 microns
Die thickness: 19 ±1 mils

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

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

Substrate: Dielectrically Isolated (D.I.)

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

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

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 17-01-27

Approved sources of supply for SMD 5962-98613 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 1/	Vendor CAGE number	Vendor similar PIN 2/
5962F9861301QCC	34371	HS1-139RH-8
5962F9861301QXC	34371	HS9-139RH-8
5962F9861301V9A	34371	HS0-139RH-Q
5962F9861301VCC	34371	HS1-139RH-Q
5962F9861301VXC	34371	HS9-139RH-Q
5962R9861301TCC	3/	HS1-139RH-T
5962R9861301TXC	3/	HS9-139RH-T
5962F9861302QCC	3/	HS1-139BRH-8
5962F9861302QXC	3/	HS9-139BRH-8
5962F9861302V9A	3/	HS0-139BRH-Q
5962F9861302VCC	3/	HS1-139BRH-Q
5962F9861302VXC	3/	HS9-139BRH-Q
5962F9861303V9A	34371	HS0-139EH-Q
5962F9861303VCC	34371	HS1-139EH-Q
5962F9861303VXC	34371	HS9-139EH-Q

1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the vendor to determine its availability.
2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.
3/ Not available from an approved source of supply.

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