

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Make changes to VIO, IIB, IIO, AVOL, CMRR, IOUT, ICC, CLSG, SR, tR, tF, and OS tests as specified under TABLE I. Also make changes to FIGURE 4. -ro	97-09-12	R. MONNIN
B	Add 3.1.1 and APPENDIX A. -ro	98-12-17	R. MONNIN
C	Drawing updated to reflect current requirements. -gt	03-01-16	R. MONNIN
D	Add enhanced low dose rate effects (ELDRS) paragraph to 1.5 and table I. -rrp	05-10-14	R. MONNIN



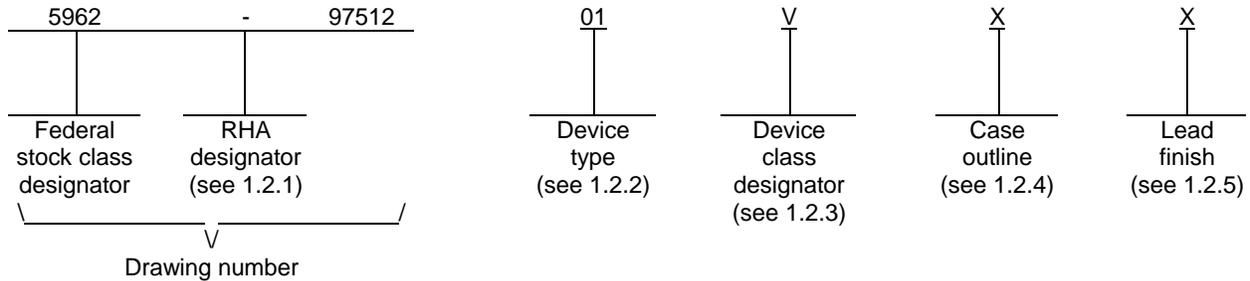
REV																				
SHEET																				
REV	D	D	D	D	D	D	D	D												
SHEET	15	16	17	18	19	20	21	22												
REV STATUS OF SHEETS	REV			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	SHEET			1	2	3	4	5	6	7	8	9	10	11	12	13	14			

PMIC N/A	PREPARED BY RICK C. OFFICER	<b>DEFENSE SUPPLY CENTER COLUMBUS</b> <b>COLUMBUS, OHIO 43218-3990</b> <a href="http://www.dscc.dla.mil">http://www.dscc.dla.mil</a>																	
<b>STANDARD MICROCIRCUIT DRAWING</b>  THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS  AND AGENCIES OF THE DEPARTMENT OF DEFENSE  AMSC N/A	CHECKED BY RAJESH R. PITHADIA																		
	APPROVED BY RAYMOND MONNIN	MICROCIRCUIT, LINEAR, RADIATION HARDENED, DUAL WIDEBAND, HIGH INPUT IMPEDANCE UNCOMPENSATED OPERATIONAL AMPLIFIER, MONOLITHIC SILICON																	
	DRAWING APPROVAL DATE 97-03-20																		
	REVISION LEVEL D		SIZE A	CAGE CODE <b>67268</b>	<b>5962-97512</b>														
		SHEET	1 OF 22																

1. SCOPE

1.1 Scope. This drawing documents two product assurance class levels consisting of high reliability (device classes Q and M) 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 are 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. Device class M RHA marked devices meet the MIL-PRF-38535, appendix A 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	HS-22620	Radiation hardened, S.O.I. dual wideband, high input impedance, uncompensated operational amplifier

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>
M	Vendor self-certification to the requirements for MIL-STD-883 compliant, non-JAN class level B microcircuits in accordance with MIL-PRF-38535, appendix A
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>
X	See figure 1	18	Flat package

1.2.5 Lead finish. The lead finish is as specified in MIL-PRF-38535 for device classes Q and V or MIL-PRF-38535, appendix A for device class M.

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1.3 Absolute maximum ratings. 1/

Voltage between +V <sub>S</sub> and -V <sub>S</sub> .....	+40 V
Differential input voltage (V <sub>IND</sub> ) .....	12 V
Voltage at either input terminal .....	+V <sub>S</sub> to -V <sub>S</sub>
Peak output current .....	Short circuit protected
Junction temperature (T <sub>J</sub> ) .....	+175°C
Storage temperature range.....	-65°C to +150°C
Lead temperature (soldering, 10 seconds) .....	+300°C
Thermal resistance, junction-to-case (θ <sub>JC</sub> ).....	21°C/W
Thermal resistance, junction-to-ambient (θ <sub>JA</sub> ).....	83°C/W

1.4 Recommended operating conditions.

Supply voltage range (±V <sub>S</sub> ).....	±15 V
Common mode input voltage.....	≤ 1/2 (+V <sub>S</sub> - -V <sub>S</sub> )
Load resistance (R <sub>L</sub> ).....	≥ 2 kΩ
Ambient operating temperature range (T <sub>A</sub> ).....	-55°C to +125°C

1.5 Radiation features.

Neutron (20 ns pulse) .....	3/
Maximum total dose available (dose rate = 50 – 300 rads(si)/s).....	> 300 Krads (Si) 4/
Latch-up 5/ .....	None

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

- 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/ Guaranteed by process design, but not tested, unless specified in table I herein.
- 3/ Values to be specified when testing is required by a customer
- 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/ Guaranteed by process or design, not tested.

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2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing 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 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. The individual item requirements for device class M shall be in accordance with MIL-PRF-38535, appendix A for non-JAN class level B devices and as specified herein.

3.1.1 Microcircuit die. For the requirements for microcircuit die, see Appendix A in 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 or MIL-PRF-38535, appendix A and herein for device class M.

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

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

3.2.3 Radiation exposure circuit. The radiation exposure circuit shall be as specified in table III.

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.

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. Marking for device class M shall be in accordance with MIL-PRF-38535, appendix A.

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. The compliance mark for device class M shall be a "C" as required in MIL-PRF-38535, appendix A.

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). For device class M, a certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in MIL-HDBK-103 (see 6.6.2 herein). The certificate of compliance submitted to DSCC-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 or for device class M, the requirements of MIL-PRF-38535, appendix A and herein.

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

3.8 Notification of change for device class M. For device class M, notification to DSCC-VA of change of product (see 6.2 herein) involving devices acquired to this drawing is required for any change that affects this drawing.

3.9 Verification and review for device class M. For device class M, DSCC, DSCC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

3.10 Microcircuit group assignment for device class M. Device class M devices covered by this drawing shall be in microcircuit group number 49 (see MIL-PRF-38535, appendix A).

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions <u>1/ 2/ 3/</u> -55°C ≤ T <sub>A</sub> ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input offset voltage	V <sub>IO</sub>	V <sub>CM</sub> = 0 V M, D, P, L, R, F	1, 2, 3	01	-6	6	mV
			1		-6	6	
Input bias current	+I <sub>IB</sub>	V <sub>CM</sub> = 0 V, +R <sub>S</sub> = 100 kΩ, -R <sub>S</sub> = 100 Ω M, D, P, L, R, F	1	01	-50	50	nA
			2, 3		-175	175	
			1		-400	400	
	-I <sub>IB</sub>	V <sub>CM</sub> = 0 V, +R <sub>S</sub> = 100 Ω, -R <sub>S</sub> = 100 kΩ M, D, P, L, R, F	1		-50	50	
			2, 3		-175	175	
			1		-400	400	
Input offset current	I <sub>IO</sub>	V <sub>CM</sub> = 0 V, +R <sub>S</sub> = 100 kΩ, -R <sub>S</sub> = 100 kΩ M, D, P, L, R, F	1	01	-75	75	nA
			2, 3		-200	200	
			1		-300	300	
Large signal voltage gain	+A <sub>VO</sub> L	V <sub>OUT</sub> 0 V and +10 V, R <sub>L</sub> = 2 kΩ M, D, P, L, R, F	4	01	80		kV/V
			5, 6		60		
			4		40		
	-A <sub>VO</sub> L	V <sub>OUT</sub> 0 V and -10 V, R <sub>L</sub> = 2 kΩ M, D, P, L, R, F	4		80		
			5, 6		60		
			4		40		
Common mode rejection ratio	CMRR	+V <sub>S</sub> = +5V, +25 V -V <sub>S</sub> = -25 V, -5 V M, D, P, L, R, F	1	01	80		dB
			2, 3		74		
			1		74		
Output voltage swing	+V <sub>OUT</sub>	R <sub>L</sub> = 2 kΩ	4, 5, 6	01	10		V
	-V <sub>OUT</sub>					-10	
Output current	+I <sub>OUT</sub>	V <sub>OUT</sub> = -10 V M, D, P, L, R, F	4	01	15		mA
			5, 6		10		
			4		10		
	-I <sub>OUT</sub>	V <sub>OUT</sub> = +10 V M, D, P, L, R, F	4			-15	
			5, 6			-10	
			4			-10	

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 <sub>A</sub> ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit	
					Min	Max		
Quiescent power supply current	+I <sub>CC</sub>	I <sub>OUT</sub> = 0 mA  M, D, P, L, R, F	1	01		6	mA	
			2, 3			8		
			1			8		
	-I <sub>CC</sub>	I <sub>OUT</sub> = 0 mA <u>4/</u>  M, D, P, L, R, F	1	01		12	mA	
			2, 3			16		
			1			16		
Power supply rejection ratio	+PSRR	V <sub>S</sub> = ± 5 V, +V <sub>S</sub> = +10 V, -V <sub>S</sub> = -15 V, +V <sub>S</sub> = +20 V, -V <sub>S</sub> = -15 V	1	01	80		dB	
			2, 3		75			
	-PSRR	V <sub>S</sub> = ± 5 V, +V <sub>S</sub> = +15 V, -V <sub>S</sub> = -10 V, +V <sub>S</sub> = +15 V, -V <sub>S</sub> = -20 V	1	01	80		dB	
			2, 3		75			
	Differential input resistance <u>5/</u>	R <sub>IN</sub>	V <sub>CM</sub> = 0 V, R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 50 pF, T <sub>A</sub> = +25°C	4	01	65		MΩ
	Full power bandwidth <u>5/ 6/</u>	FPBW	V <sub>PEAK</sub> = 10 V, R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 50 pF, T <sub>A</sub> = +25°C	4	01	400		kHz
Minimum closed loop stable gain <u>5/</u>	CLSG	R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 50 pF	4, 5, 6	01	10		V/V	
Output short circuit current <u>5/</u>	+I <sub>SC</sub>	V <sub>OUT</sub> = 1 V, R <sub>L</sub> = 10 Ω, C <sub>L</sub> = 50 pF	1	01		50	mA	
			2			45		
			3			60		
	-I <sub>SC</sub>	V <sub>OUT</sub> = -1 V, R <sub>L</sub> = 10 Ω, C <sub>L</sub> = 50 pF	1	01	-50		mA	
			2		-45			
			3		-60			
Output resistance <u>5/</u>	R <sub>OUT</sub>	R <sub>L</sub> = 10 Ω, C <sub>L</sub> = 50 pF, Open loop, T <sub>A</sub> = +25°C	4	01		30	Ω	
Quiescent power <u>5/ 7/</u> consumption per op amp	PC	V <sub>OUT</sub> = 0 V, I <sub>OUT</sub> = 0 mA	1, 2, 3	01		240	mW	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued

Test	Symbol	Conditions <u>1/</u> <u>2/</u> <u>3/</u> -55°C ≤ T <sub>A</sub> ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit		
					Min	Max			
Slew rate <u>8/</u>	+SR	V <sub>OUT</sub> = -5 V to +5 V, R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 50 pF, R <sub>S</sub> = 50 Ω, A <sub>VCL</sub> = +10 V/V	9, 10	01	+SR	20		V/μs	
			11			15			
			M, D, P, L, R, F			9	15		
	-SR	V <sub>OUT</sub> = +5 V to -5 V, R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 50 pF, R <sub>S</sub> = 50 Ω, A <sub>VCL</sub> = +10 V/V	9, 10			20			
			11			15			
			M, D, P, L, R, F			9	15		
Rise and fall time <u>8/</u>	t <sub>R</sub>	V <sub>OUT</sub> = 0 mV to +400 mV, R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 50 pF, R <sub>S</sub> = 50 Ω, A <sub>VCL</sub> = +10 V/V measured at 20% and 80% points	9	01			150	ns	
			10, 11						200
			M, D, P, L, R, F				9		
	t <sub>F</sub>	V <sub>OUT</sub> = 0 mV to -400 mV, R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 50 pF, R <sub>S</sub> = 50 Ω, A <sub>VCL</sub> = +10 V/V measured at 20% and 80% points	9						150
			10, 11						200
			M, D, P, L, R, F				9		
Overshoot <u>8/</u>	+OS	V <sub>OUT</sub> = 0 mV to +400 mV, R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 50 pF, R <sub>S</sub> = 50 Ω, A <sub>VCL</sub> = +10 V/V	9, 10, 11	01			70	%	
	-OS	V <sub>OUT</sub> = 0 mV to -400 mV, R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 50 pF, R <sub>S</sub> = 50 Ω, A <sub>VCL</sub> = +10 V/V							70

- 1/ Unless otherwise specified, V<sub>S</sub> = ±15 V, source resistance (R<sub>S</sub>) = 100 Ω, R<sub>L</sub> = 500 kΩ, and V<sub>OUT</sub> = 0 V.
- 2/ Devices supplied to this drawing meet all levels M, D, P, L, R, and F of irradiation, however, this device is only tested at the F level. When performing post irradiation measurements for any RHA level, T<sub>A</sub> = +25°C. Pre and post irradiation values are identical unless otherwise specified in table I.
- 3/ 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.
- 4/ -I<sub>CC</sub> is tested with -V<sub>S</sub>A and -V<sub>S</sub>B externally tied together.
- 5/ This parameter is controlled via design or process parameters and is not directly tested at final production.
- 6/ Full power bandwidth guaranteed based on slew rate measurement using FPBW = slew rate / (2 × π × V<sub>PEAK</sub>).
- 7/ Quiescent power consumption based upon quiescent supply current test maximum. (No load on outputs).
- 8/ See figure 4.

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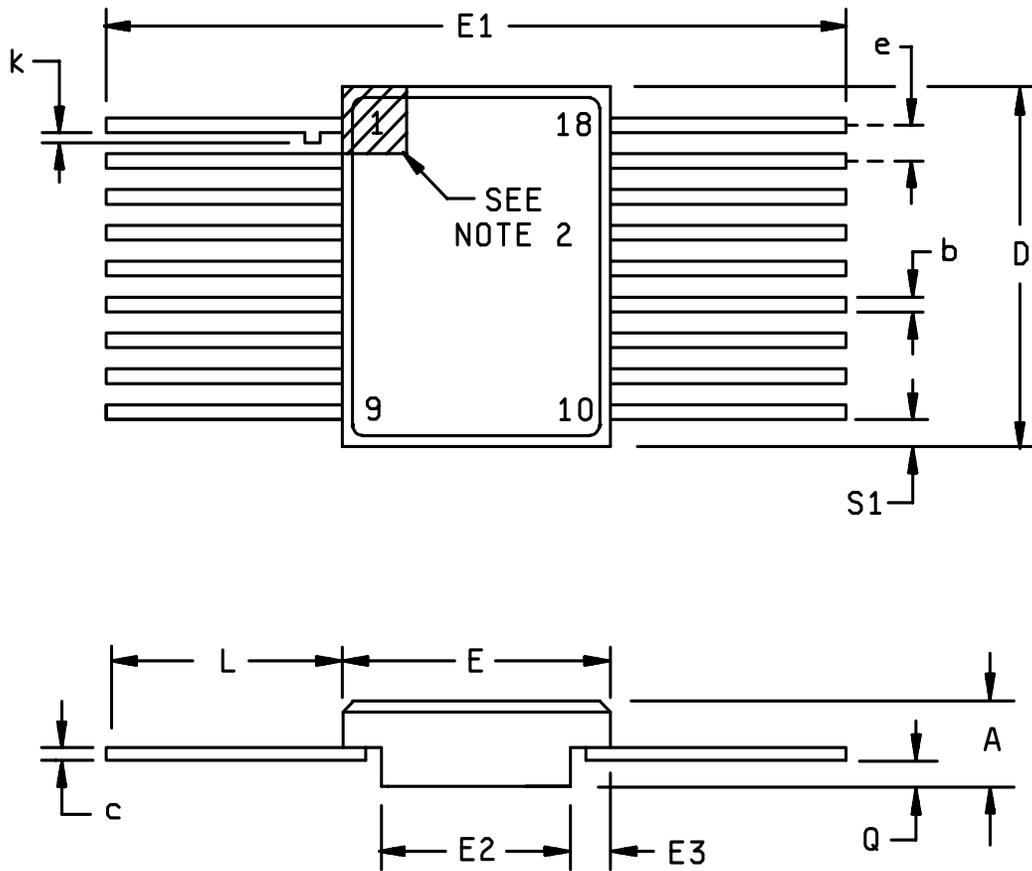


FIGURE 1. Case outline X.

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Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
A	---	.115	---	2.92	
b	.015	.019	.38	.48	5,11,12
c	.004	.007	.10	.18	5,11,12
D	.430	.450	10.92	11.43	4
E	.320	.340	8.13	8.64	
E1	.910	.950	23.11	24.13	
E2	.220	.240	5.59	6.10	
E3	.030	---	.76	---	7
e	.050 BSC		1.27 BSC		9,10
k	.008	.015	.20	.38	3
L	.280	.320	7.11	8.13	
Q	.026	.040	.66	1.02	8
S1	.000	---	.00	---	6,13

Notes:

- 1 The U.S. Government preferred system of measurement is the metric S.I. system. However, since this item was originally designed using inch-pound units of measurements, in the event of conflict between the metric and inch-pound units, the inch-pound units shall take precedence.
- 2 Index area: A terminal 1 identification mark shall be located adjacent to pin one on the top (lid) side within the shaded area shown. Terminal numbers shall increase in a counterclockwise direction when viewed from the top of the device. The manufacturer's identification shall not be used as a pin one identification mark. Alternatively, a tab (dimension k) may be used to identify pin one.
- 3 If a pin one identification mark is used in addition to a tab, only the maximum limit of dimension k applies.
- 4 This dimension allows for off-center lid, meniscus, and glass overrun.
- 5 18 places.
- 6 Measure dimension S1 at all four corners.
- 7 For bottom-brazed lead packages, no organic or polymeric materials shall be molded to the bottom of the package to cover the leads.
- 8 Dimension Q shall be measured at that point of exit (beyond the meniscus) of the lead from the body. Dimension Q minimum shall be reduced by .0015 inch maximum when solder dip lead finish is applied.
- 9 16 places.
- 10 Basic dimension (BSC).
- 11 (For information only) increase maximum limit by .003" when solder dip or tin plate lead finish applies.
- 12 Lead finish shall be as specified in 1.2.5 herein.
- 13 This dimension includes braze pads.

FIGURE 1. Case outline X - Continued.

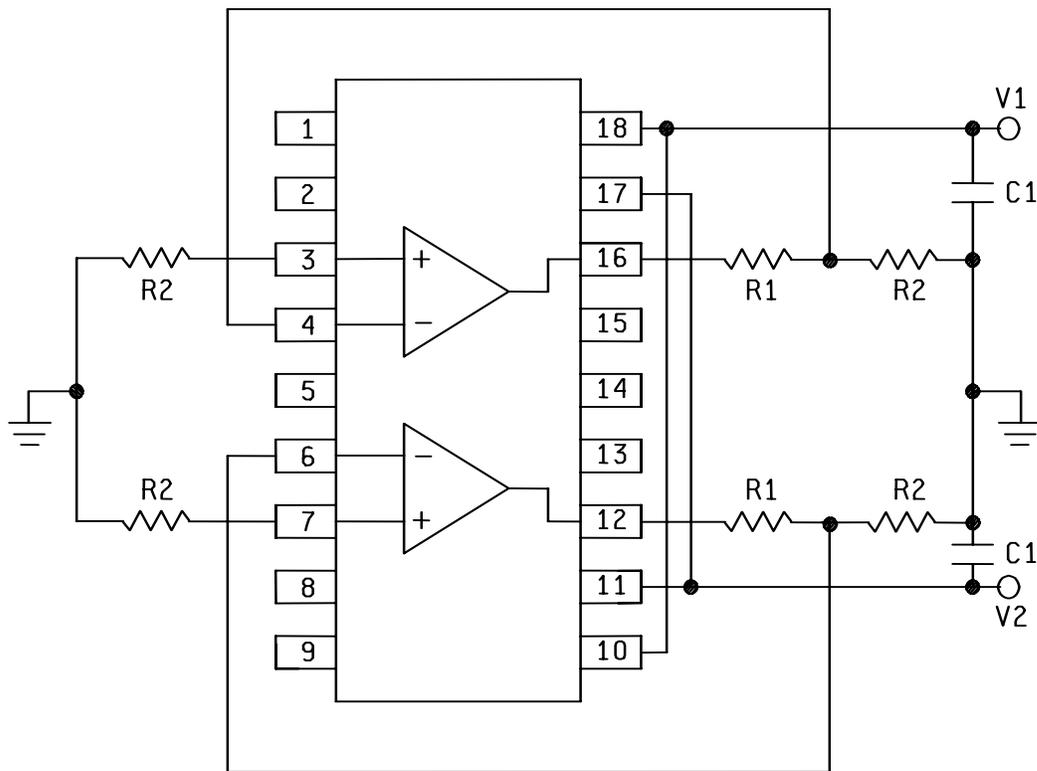
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Device type	01
Case outline	X
Terminal number	Terminal symbol
1	BALANCE 2A
2	BALANCE 1A
3	+INPUT A
4	-INPUT A
5	NC
6	-INPUT B
7	+INPUT B
8	BALANCE 1B
9	BALANCE 2B
10	+V <sub>S</sub> B
11	-V <sub>S</sub> B
12	OUTPUT B
13	COMPENSATION B
14	NC
15	COMPENSATION A
16	OUTPUT A
17	-V <sub>S</sub> A
18	+V <sub>S</sub> A

NC = No connection

FIGURE 2. Terminal connection.

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NOTES:

1.  $V1 = +15\text{ V} \pm 0.5\text{ V}$  and  $V2 = -15\text{ V} \pm 0.5\text{ V}$ .
2.  $R1 = 2.2\text{ k}\Omega$ , 1/8 W minimum (5 %) and  $R2 = 50\ \Omega$ , 1/8 W minimum (2 %).
3.  $C1 = 0.1\ \mu\text{F}$ ,  $\pm 10\%$ , one cap per V per socket.

FIGURE 3. Radiation exposure circuit.

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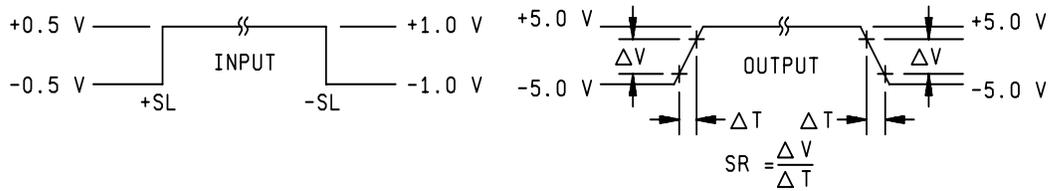
SIZE  
**A**

REVISION LEVEL  
**D**

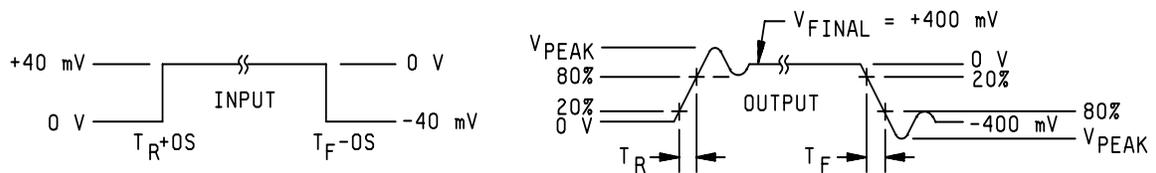
**5962-97512**

SHEET  
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SLEW RATE WAVEFORMS



OVERSHOOT, RISE AND FALL TIME



NOTE: Measurements made on both positive and negative transitions. No capacitance on compensation pin. Stray capacitance should be minimized.

FIGURE 4. Timing diagrams.

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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. For device class M, sampling and inspection procedures shall be in accordance with MIL-PRF-38535, appendix A.

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 M, screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection.

4.2.1 Additional criteria for device class M.

- a. Burn-in test, method 1015 of MIL-STD-883.
  - (1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015.
  - (2)  $T_A = +125^{\circ}\text{C}$ , minimum.
- b. Interim and final electrical test parameters shall be as specified in table IIA herein.

4.2.2 Additional criteria for device classes Q and V.

- a. The burn-in test duration, test condition and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-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 or as modified in the device manufacturer's Quality Management (QM) plan.

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. Quality conformance inspection for device class M shall be in accordance with MIL-PRF-38535, appendix A and as specified herein. Inspections to be performed for device class M shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.4).

4.4.1 Group A inspection.

- a. Tests shall be as specified in table IIA herein.
- b. Subgroups 5, 6, 7, and 8 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-STD-883, method 5005, table I)	Subgroups (in accordance with MIL-PRF-38535, table III)	
	Device class M	Device class Q	Device class V
Interim electrical parameters (see 4.2)	1,9	1,9	1,9
Final electrical parameters (see 4.2)	1,2,3,4,5,6, <u>1/</u> 9,10,11	1,2,3,4,5,6 <u>1/</u> 9,10,11	1,2,3,4,5,6,9, 10,11 <u>1/ 2/</u>
Group A test requirements (see 4.4)	1,2,3,4,5,6,9,10,11	1,2,3,4,5,6, 9,10,11	1,2,3,4,5,6, 9,10,11
Group C end-point electrical parameters (see 4.4)	1,2,3,4,5,6	1,2,3,4,5,6	1,2,3,4,5,6 <u>2/</u>
Group D end-point electrical parameters (see 4.4)	1,4,9	1,4,9	1,4,9
Group E end-point electrical parameters (see 4.4)	1,4,9	1,4,9	1,4,9

1/ PDA applies to subgroup 1. For class V to subgroup 1 and Δ.

2/ Delta limits (see table IIB) shall be required and the delta values shall be computed with reference to the zero hour electrical parameters (see table I).

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

Parameters	Symbol	Delta limits
Input offset voltage	$V_{IO}$	±2 mV
Positive input bias current	+ $I_{IB}$	±20 nA
Negative input bias current	- $I_{IB}$	±20 nA

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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 class M. Steady-state life test conditions, method 1005 of MIL-STD-883:

- a. Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1005 of MIL-STD-883.
- b.  $T_A = +125^{\circ}\text{C}$ , minimum.
- c. Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.4.2.2 Additional criteria for device classes Q and V. The steady-state life test duration, test condition and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-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.

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 M, 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 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.

4.4.4.1.1 Accelerated aging test. Accelerated aging tests shall be performed on all devices requiring a RHA level greater than 5k rads(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 Neutron testing. Neutron testing shall be performed in accordance with test method 1017 of MIL-STD-883 and herein (see 1.5). All device classes must meet the post irradiation end-point electrical parameter limits as defined in table I, for the subgroups specified in Table IIA herein at  $T_A = +25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  after an exposure of  $2 \times 10^{12}$  neutrons/cm<sup>2</sup> (minimum).

4.4.4.3 Dose rate burnout. When required by the customer, test shall be performed on devices, 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 or MIL-PRF-38535, appendix A for device class M.

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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.

6.1.2 Substitutability. Device class Q devices will replace device class M devices.

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

6.3 Record of users. Military and industrial users should inform Defense Supply Center Columbus (DSCC) when a system application requires configuration control and which SMD's are applicable to that system. DSCC 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 DSCC-VA, telephone (614) 692-0544.

6.4 Comments. Comments on this drawing should be directed to DSCC-VA , Columbus, Ohio 43218-3990, or telephone (614) 692-0547.

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 QML-38535. The vendors listed in QML-38535 have submitted a certificate of compliance (see 3.6 herein) to DSCC-VA and have agreed to this drawing.

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

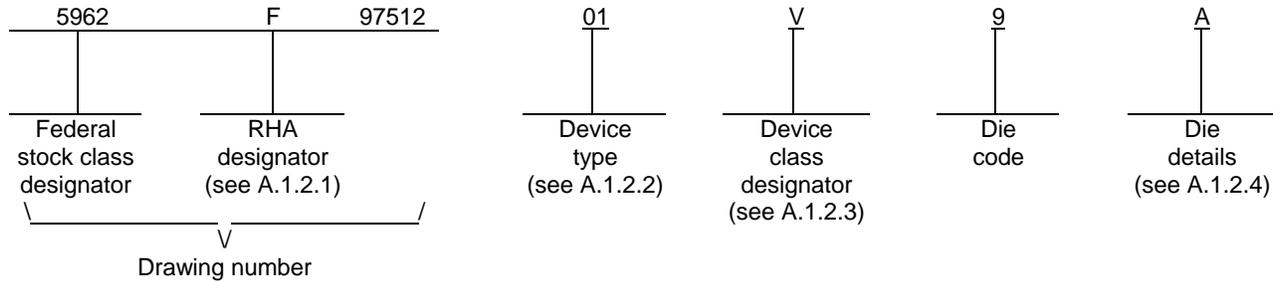
<b>STANDARD MICROCIRCUIT DRAWING</b> DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43218-3990	SIZE <b>A</b>		<b>5962-97512</b>
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A.1 SCOPE

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.

A.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	HS-22620	Radiation hardened, SOI, dual wideband, high input impedance, uncompensated operational amplifier

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

A.1.2.4.2 Die bonding pad locations and electrical functions.

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

A.1.2.4.3 Interface materials.

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

A.1.2.4.4 Assembly related information.

<u>Die type</u>	<u>Figure number</u>
01	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.

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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://assist.daps.dla.mil/quicksearch/> or <http://assist.daps.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 3.2.3 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 DSCC-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 II herein. Group E tests and conditions are as specified in paragraphs 4.4.4, 4.4.4.1.1, 4.4.4.2, 4.4.4.3, and 4.4.4.4 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 DSCC-VA, Columbus, Ohio, 43216-5000 or telephone (614)-692-0547.

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 DSCC-VA and have agreed to this drawing.

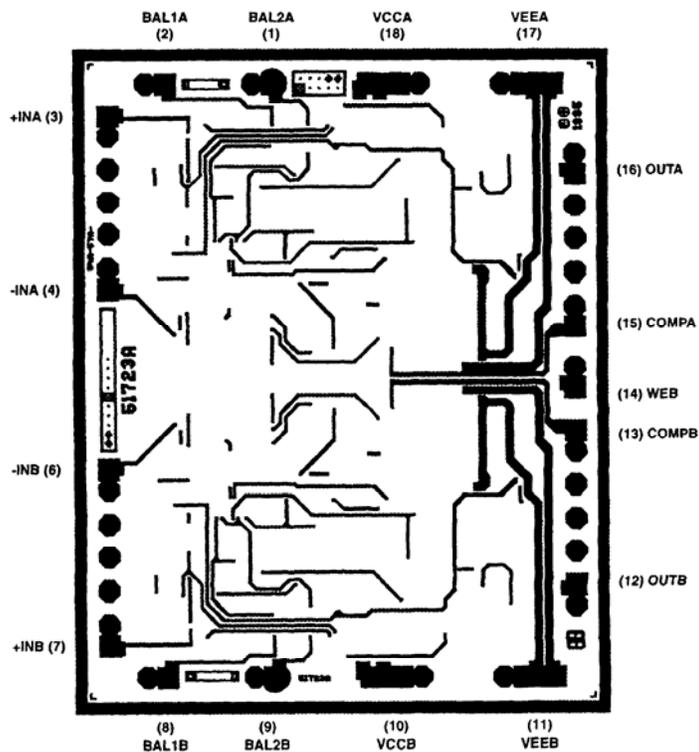
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Die bonding pad locations and electrical functions

FIGURE A-1



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

Die physical dimensions.

Die size: 2950 microns x 3750 microns.

Die thickness: 19 ± 1 mils.

Interface materials.

Top metallization: Al Cu 12.0 kÅ - 16.0 kÅ

Backside metallization: None.

Glassivation.

Type: Nitride over silox

Nitride thickness: 2.0 kÅ - 5.0 kÅ

PSG thickness: 10.0 kÅ - 14.0 kÅ

Substrate: Bonded wafer

Assembly related information.

Substrate potential: floating

NOTE: Web pad (14) provided for substrate tie-off.

Special assembly instructions: Double bond wires used for bond pads number 10, 11, 17, and 18.

Package part has NC on pins 5 and 14.

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STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 05-10-14

Approved sources of supply for SMD 5962-97512 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 DSCC-VA. This information bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535. DSCC maintains an online database of all current sources of supply at <http://www.dscclia.mil/Programs/Smcr/>.

Standard microcircuit drawing PIN <u>1/</u>	Vendor CAGE number	Vendor similar PIN <u>2/</u>
5962F9751201VXC	34371	HS9-22620RH-Q
5962F9751201V9A	34371	HS0-22620RH-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.

Vendor CAGE number

34371

Vendor name and address

Intersil  
2401 Palm Bay Blvd  
PO Box 883  
Melbourne, FL 32902-0883

The information contained herein is disseminated for convenience only and the Government assumes no liability whatsoever for any inaccuracies in the information bulletin.