REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Drawing updated to reflect current requirements. - ro	01-12-11	R. MONNIN
B	Delete footnote 1/ as specified under 1.3. - ro	04-07-28	R. MONNIN
C	Update paragraphs to current MIL-PRF-38535 requirements. -rrp	11-01-19	C. SAFFLE
D	Add radiation assurance requirements, case outline H, paragraph 3.1.1, and Appendix A for microcircuit die. - ro	16-12-19	C. SAFFLE

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

REV																				
SHEET																				
REV	D	D	D	D																
SHEET	15	16	17	18																

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

PMIC N/A

PREPARED BY
CHARLES E. BESORE

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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
RAY MONNIN

APPROVED BY
MICHAEL A. FRYE

DRAWING APPROVAL DATE
88-10-31

REVISION LEVEL
D

MICROCIRCUIT, LINEAR, PRECISION, 5 VOLT, VOLTAGE REFERENCE, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	**67268**	**5962-88762**

SHEET 1 OF 18

DSCC FORM 2233
APR 97

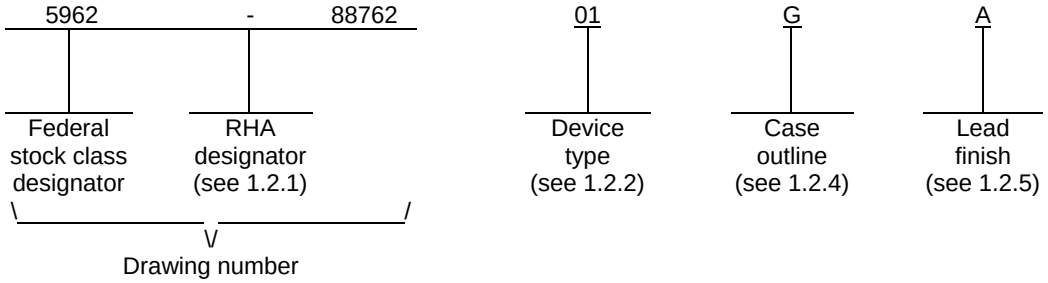
5962-E097-17

1. SCOPE

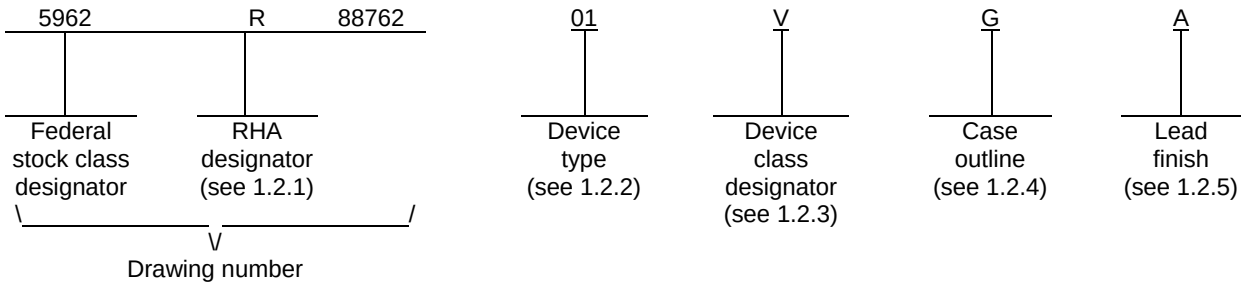
1.1 Scope. This drawing documents two product assurance class levels consisting of high reliability (device class Q and M) and space application (device class V). A choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN). When available, a choice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

1.2 PIN. The PIN is as shown in the following examples.

For device class M and Q:



For device class V:



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:

Device type	Generic number	Circuit function	ΔV_{OUT} (V)	$\Delta V_{OUT} / \Delta T$ (ppm/°C)
01	LT1021BM-5	5.0 V voltage reference	±0.05 V	5.0
02	LT1021CM-5	5.0 V voltage reference	±0.025 V	20.0
03	LT1021DM-5	5.0 V voltage reference	±0.05 V	20.0

1.2.3 Device class designator. The device class designator is a single letter identifying the product assurance level as listed below. Since the device class designator has been added after the original issuance of this drawing, device classes M and Q designators will not be included in the PIN and will not be marked on the device.

Device class	Device requirements documentation
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:

Outline letter	Descriptive designator	Terminals	Package style
G	MACY1-X8	8	Can
H	GDFP1-F10	10	Flat pack

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.

1.3 Absolute maximum ratings. 1/

Input voltage ..... 40 V dc
Input-output voltage differential ..... 35 V dc
Output to ground voltage ..... 10 V dc
Trim pin to ground voltage:
  Positive ..... Equal to V_{OUT}
  Negative ..... -20 V dc
Output short-circuit duration:
  at V_{IN} = 35 V ..... 10 seconds
  at $V_{IN} \leq$ 20 V ..... Indefinite
Power dissipation (P_D) :
  Case G ..... 500 mW
  Case H ..... 500 mW
Junction temperature (T_J) ..... +175°C
Storage temperature range ..... -65°C to +150°C
Lead temperature (soldering, 10 seconds) ..... +300°C
Thermal resistance, junction-to-ambient (θ_{JA}) :
  Case G ..... +150°C/W
  Case H ..... +170°C/W
Thermal resistance, junction-to-case (θ_{JC}) ..... See MIL-STD-1835

1.4 Recommended operating conditions.

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) ..... 100 krads(Si) 2/
Maximum total dose available (dose rate = 10 mrad(Si)/s) ..... 50 krads(Si) 2/

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/ The manufacturer supplying device types 01, 02 and 03 has performed high dose rate irradiation test in accordance with MIL-STD-883 method 1019 condition A, and low dose rate irradiation test condition D. The device types 01, 02 and 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 100 krads(Si), and condition D to a maximum total dose of 50 krads(Si).

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 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 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 or MIL-PRF-38535, appendix A and herein for device class M.

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 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.

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 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 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 DLA Land and Maritime-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, DLA Land and Maritime, DLA Land and Maritime '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 59 (see MIL-PRF-38535, appendix A).

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ 2/ $-55°C \le T_A \le +125°C$, V_{IN} = 10 V, I_{OUT} = 0 mA unless otherwise specified		Group A subgroups	Device type	Limits		Unit
						Min	Max	
Output voltage 3/	V_{OUT}	T_A = +25°C		1	01,03	4.95	5.05	V
			D			4.95	5.05	
			L			4.942	5.058	
			R			4.94	5.06	
					02	4.9975	5.0025	
			D			4.9945	5.0055	
			L			4.991	5.009	
			R			4.9875	5.0125	
Output voltage temperature coefficient 4/	$\Delta V_{OUT}/\Delta T$	T_A = +125°C, -55°C		2,3	01		5.0	ppm / °C
			D,L	1			5.0	
			R				7.0	
				2,3	02,03		20	
			D,L	1			20	
			R				22	
Line regulation 5/	V_{RLN}	7.2 V $\le V_{IN} \le$ 10 V		1	All		12	ppm / V
				2,3			20	
			D	1			12	
			L				13.5	
			R				15	
		10 V $\le V_{IN} \le$ 40 V		1			6.0	
				2,3			10	
			D,L	1			6	
			R				7	
Load regulation 5/ (sourcing current)	V_{RLD1}	0 mA $\le I_{OUT} \le$ 10 mA		1	All		20	ppm / mA
				2,3			35	
			D,L,R	1			20	
Load regulation 5/ (sinking current)	V_{RLD2}	0 mA $\le I_{OUT} \le$ 10 mA		1	All		100	ppm / mA
				2,3			150	
			D,L,R	1			100	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions 1/ 2/ $-55°C \le T_A \le +125°C$, V_{IN} = 10 V, I_{OUT} = 0 mA unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Supply current (series mode)	I_{CC}		1	All		1.2	mA
			2,3			1.5	
		D,L,R	1			1.2	
Output voltage noise 6/	N_O	10 Hz $\le f_O \le$ 1.0 kHz, T_A = +25°C	4	All		3.5	µV rms
Long term stability of output voltage 7/	$\Delta V_{OUT} / \Delta t$	t = 1,000 hours, T_A = +25°C	4	All		60	ppm

1/ RHA devices supplied to this drawing have been characterized through all levels D, L, and R of irradiation. However, this device is tested at RHA level L and R level. 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/ The manufacturer supplying device types 01, 02 and 03 has performed high dose rate irradiation test in accordance with MIL-STD-883 method 1019 condition A, and low dose rate irradiation test condition D. The device types 01, 02 and 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 100 krads(Si), and condition D to a maximum total dose of 50 krads(Si).

3/ Output voltage is measured immediately after turn-on. Changes due to chip warm-up are typically less than 0.005 percent.

4/ Temperature coefficient is measured by dividing the change in output voltage over the temperature range by the change in temperature. Separate tests are done for hot and cold: -55°C to +25°C, and +25°C to +125°C. Incremental slope is also measured at +25°C.

5/ Line and load regulation are measured on a pulse basis. Output changes due to die temperature change must be taken into account separately. Package thermal resistance is 150°C/W for case G and 170°C/W for case H.

6/ RMS noise is measured with a 2-pole high pass filter at 10 Hz and a 2-pole low pass filter at 1 kHz. The resulting output is full wave rectified and then integrated for a fixed period, making the final reading an average as opposed to RMS. Correction factors are used to convert from average to RMS and to correct for the non-ideal bandpass of the filters.

7/ Guaranteed if not tested to the limits specified.

Device types	01, 02, 03	02
Case outlines	G	H
Terminal number	Terminal symbol	
1	No connection 1/	No connection 1/
2	Input voltage	Input voltage
3	No connection 1/	No connection 1/
4	Ground	Ground
5	Trim	No connection
6	Output voltage	No connection
7	No connection 1/	Trim
8	No connection 1/	Output voltage
9	---	No connection 1/
10	---	No connection 1/

1/ These pins are connected internally. Do not connect external circuitry to these pins.

FIGURE 1. Terminal connections.

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°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.

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. 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, 8, 9, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

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)	---	---	---
Final electrical parameters (see 4.2)	1, 2, 3, 4 1/	1, 2, 3, 4 1/	1, 2, 3, 4 1/ 2/
Group A test requirements (see 4.4)	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4
Group C end-point electrical parameters (see 4.4)	1	1, 2, 3	1, 2, 3 2/
Group D end-point electrical parameters (see 4.4)	1	1, 2, 3	1, 2, 3
Group E end-point electrical parameters (see 4.4)	---	---	1

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 completed with reference to the zero hour electrical parameters (see table I).

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

Parameters	Symbol	Device type	Endpoint limit		Delta limits		Units
			Min	Max	Min	Max	
Output voltage	V_{OUT}	01, 03	4.95	5.05	-0.003	0.003	V
		02	4.9975	5.0025	-0.003	0.003	

1/ Deltas are performed at room temperature.

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°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).

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. For device class M, the devices shall be subjected to radiation hardness assured tests as specified in MIL-PRF-38535, appendix A 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°C ±5°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 conditions A and D 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 krads(Si). The post-anneal end-point electrical parameter limits shall be as specified in table IA herein and shall be the pre-irradiation end-point electrical parameter limit at +25°C ±5°C. Testing shall be performed at initial qualification and after any process or design changes which may affect the RHA response of the device.

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.

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 QML-38535 have submitted a certificate of compliance (see 3.6 herein) to DLA Land and Maritime-VA and have agreed to this drawing.

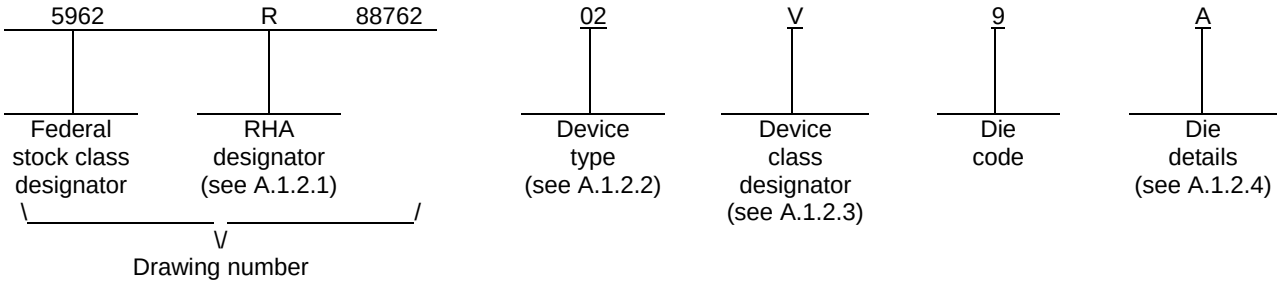
6.6.2 Approved sources of supply for device class M. Approved sources of supply for class M are listed in MIL-HDBK-103. The vendors listed in MIL-HDBK-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DLA Land and Maritime-VA.

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-88762

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 Hardness 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	ΔV_{OUT} (V)
02	RH1021C-5 DICE	5.0 V voltage reference	±0.0025 V

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
02	A-1

A.1.2.4.2 Die bonding pad locations and electrical functions.

Die type	Figure number
02	A-1

A.1.2.4.3 Interface materials.

Die type	Figure number
02	A-1

A.1.2.4.4 Assembly related information.

Die type	Figure number
02	A-1

A.1.2.4.5 Special handling of dice. Radiation hardened dice require special handling as compared to standard integrated circuit dice. Radiation hardened dice are susceptible to surface damage due to the absence of silicon nitride passivation that is present on most standard dice. Silicon nitride protects the dice surface from scratches by its hard and dense properties. The passivation on radiation hardened dice is silicon dioxide which is much “softer” than silicon nitride. During the visual and preparation for shipment, electrostatic discharge (ESD) safe tweezers are used and only the edge of the die are touched.

It is recommended that dice handling be performed with extreme care so as to protect the die surface from scratches. If the need arises to move the die in or out of the chip shipment tray (waffle pack), use an ESD safe plastic tipped bent metal vacuum probe, preferably .020 inch outside diameter x .010 inch inside diameter (for use with tiny parts). The wand should be compatible with continuous air vacuums. The tip material should be static dissipative Delrin (or equivalent) plastic.

During die attach, care must be exercised to ensure no tweezers, or other equipment, touch the top of the dice.

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.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 3.2.3 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 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, and 4.4.4.1.1 herein.

A.5 DIE CARRIER

A.5.1 Die carrier requirements. The requirements for the die carrier shall be in 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.

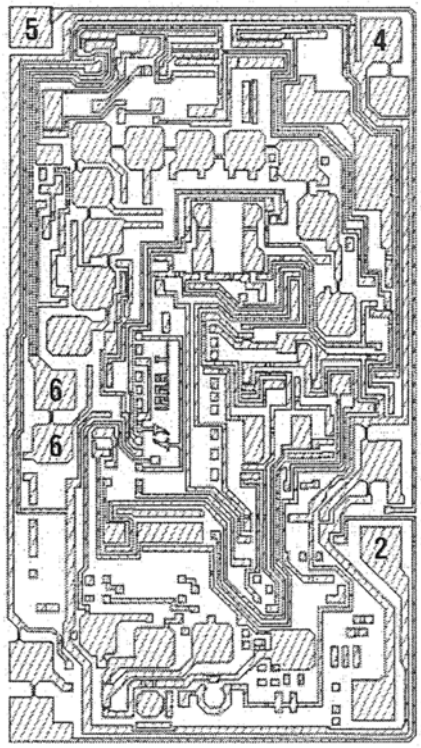
A.6 NOTES

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 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.



Die bonding pad locations and electrical functions.

Die physical dimensions.
Die size: 94 mils x 55 mils
Die thickness: 12 mils

Interface materials.
Top metallization: AL
Backside metallization: Gold

Glassivation.
Type: SiO_2
Thickness: Minimum of 4 kÅ

Substrate: Si

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

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

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 16-12-19

Approved sources of supply for SMD 5962-88762 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/	Reference military specification PIN
5962-8876201GA	64155	LT1021BMH-5/883B	MIL-M-38510/12407BGA
5962-8876202GA	64155	LT1021CMH-5/883B	
5962-8876203GA	64155	LT1021DMH-5/883B	
5962R8876201VGA	64155	RH1021BMH-5	
5962R8876202VGA	64155	RH1021CMH-5	
5962R8876202VHA	64155	RH1021CMW-5	
5962R8876203VGA	64155	RH1021DMH-5	
5962R8876202V9A	64155	RH1021C-5 DICE	

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	Vendor name and address
64155	Linear Technology Corporation 1630 McCarthy Boulevard Milpitas, CA 95035-7417

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