REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add case outline Y, which is a 16 lead flat pack. Make changes to 1.2.4, 1.3, and figure 1. - ro	99-02-10	R. MONNIN
B	Make change to dropout voltage test as specified in table I. - ro	99-08-13	R. MONNIN
C	Make change to short circuit current test as specified in table I. - ro	01-02-05	R. MONNIN
D	Add device class V devices and table IIB. - ro	01-05-01	R. MONNIN
E	Drawing updated to reflect current requirements. -rrp	06-12-04	R. MONNIN
F	Add device type 02 tested at low dose rate. Add paragraphs 1.5, 3.2.3, and 4.4.4.1. Add one footnote to Table IIB. Make changes to 1.2, 1.2.2, Table I, and figure 2. Add paragraph 3.1.1 and microcircuit die appendix A. - ro	09-04-21	J. RODENBECK
G	Add device type 03 and 04. Add footnote to paragraph 1.2.4. Make changes to paragraphs 1.3, 1.5, A.1.2, A.1.2.2, Table I, and Figure 2. Make change to table IIB footnote and title.	11-12-13	C. SAFFLE

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

REV STATUS	REV	G	G	G	G	G	G	G	G	G	G	G	G	G	G
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
COLUMBUS, OHIO 43218-3990
http://www.landandmaritime.dla.mil

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
97-04-25

REVISION LEVEL
G

MICROCIRCUIT, LINEAR, ADJUSTABLE, 1 A, POSITIVE VOLTAGE REGULATOR, MONOLITHIC SILICON

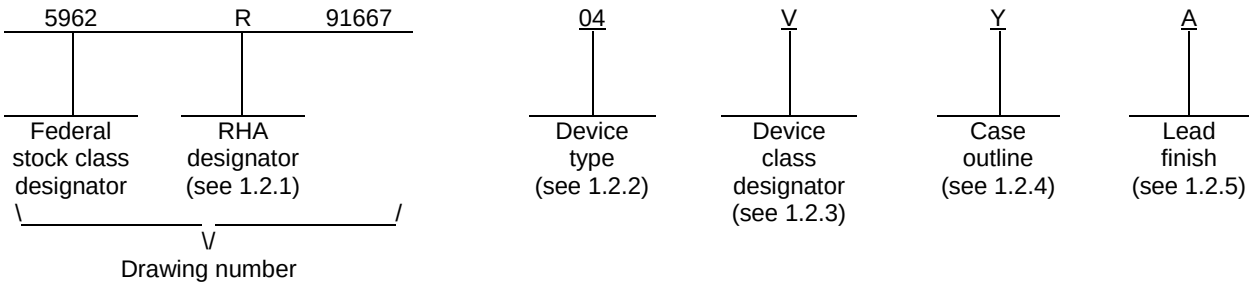
SIZE	CAGE CODE	
A	**67268**	**5962-91667**

SHEET 1 OF 21

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 is reflected in the PIN.

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



1.2.1 RHA designator. Device classes Q and V RHA marked devices meet the MIL-PRF-38535 specified RHA levels and are marked with the appropriate RHA designator. 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
01	LM2941	Adjustable, 1 amp, positive voltage regulator
02	LM2941	Radiation hardened adjustable, 1 amp, positive voltage regulator
03	LM2941	Adjustable, 1 amp, positive voltage regulator
04	LM2941	Radiation hardened adjustable, 1 amp, positive voltage regulator

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
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
E	GDIP1-T16 or CDIP2-T16	16	Dual-in-line
X	See figure 1	4	Flange mount
Y 1/	GDFP1-G16	16	Flat pack with gull wing leads

1/ For case outline letter Y, device types 01 and 02 package material is aluminum nitride and the device types 03 and 04 package material is aluminum oxide.

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. 2/

Input voltage (V_{IN}) (survival voltage ≤ 100 ms) ..... 60 V
Internal power dissipation ..... Internally limited 3/
Maximum junction temperature (T_J) ..... 150°C
Storage temperature range ..... -65°C ≤ T_J ≤ +150°C
Lead temperature (soldering, 10 seconds) ..... 300°C
Thermal resistance, junction-to-case (θ_{JC}):
  Device types 01 and 02:
    Case E ..... 3°C/W
    Cases X and Y ..... 5°C/W
  Device types 03 and 04:
    Case Y 1/ ..... 13°C/W
Thermal resistance, junction-to-ambient (θ_{JA}):
  Device types 01 and 02:
    Case E ..... 73°C/W
    Case X ..... 40°C/W
    Case Y ..... 122°C/W
  Device types 03 and 04:
    Case Y 1/ ..... 136°C/W (still air)
    87°C/W (linear feet per minute air flow)

1.4 Recommended operating conditions.

Maximum input voltage (V_{IN}) ..... 26 V
Ambient operating temperature range (T_A) ..... -55°C ≤ T_A ≤ +125°C

1.5 Radiation features.

Device types 02 and 04:
  Maximum total dose available (dose rate = 10 mrads (Si)/s) ..... ≥100 krads (Si) 4/

The manufacturer supplying RHA parts on this drawing has completed Lot Acceptance testing at Low Dose Rate (LDR) (10 mrad/s) on these RHA marked parts. The Low Does Rate testing that was performed demonstrates that these parts from the lot tested do not have an Enhanced Low Dose rate Sensitivity as defined by Method 1019, condition D. Lot Acceptance Testing at LDR will continue to be performed on each wafer or wafer lot until characterization testing has been performed in accordance with Method 1019 of MIL-STD-883. Since the redesigned part did not demonstrate ELDRS per Method 1019 and the previously tested device was ELDRS, the part number will be changed to 02 and 04 devices to distinguish the 4 parts.

_____

1/ For case outline letter Y, device types 01 and 02 package material is aluminum nitride and the device types 03 and 04 package material is aluminum oxide.
2/ 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.
3/ The maximum power dissipation must be derated at elevated temperatures and is dictated by maximum junction temperature, package junction to ambient thermal resistance, and ambient temperature. The maximum allowable power dissipation at any temperature is P_D maximum = (T_J maximum - T_A) / θ_{JA} or the number given in the absolute maximum ratings, whichever is lower.
4/ For device types 02 and 04, these parts have been tested and do not demonstrate low dose rate sensitivity. Radiation end point limits for the noted parameters are guaranteed for the conditions specified in MIL-STD-883, test method 1019, conditions A and D.

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

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

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements for device classes Q and V shall be in accordance with MIL-PRF-38535 as specified herein, or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein. 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 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 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 52 (see MIL-PRF-38535, appendix A).

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ 2/ 3/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Reference voltage	V_{REF}	I_{OUT} = 5 mA to 1 A	1	01, 02,	1.237	1.313	V
			2,3	03, 04	1.211	1.339	
Line regulation	V_{LN}	$V_{IN} = V_{OUT}$ + 2 V to 26 V, I_{OUT} = 5 mA	1,2,3	01, 02, 03, 04		10	mV/V
Load regulation	V_{LD}	I_{OUT} = 50 mA to 1 A	1,2,3	01, 02, 03, 04		10	mV/V
Quiescent current	I_Q	$V_{IN} = V_{OUT}$ + 2 V to 26 V,	1	01, 02,		15	mA
		I_{OUT} = 5 mA	2,3	03, 04		20	
		$V_{IN} = V_{OUT}$ + 5 V,	1			45	
		I_{OUT} = 1 A	2,3			60	
Dropout voltage	V_{DO}	I_{OUT} = 1 A	1	01, 02,		0.8	V
			2,3	03, 04		1.0	
		I_{OUT} = 100 mA	1			200	mV
			2,3			300	
Short circuit current	I_{SC}	V_{IN} max = 26 V	1	01, 02,	1.6	3.5	A
			2,3	03, 04	1.3	3.7	
Maximum operational input voltage	V_{IN}		1,2,3	01, 02, 03, 04		26	V dc
Reverse polarity dc input voltage	V_{IN}	$V_{OUT} \ge -0.6$ V, 4/	1,2,3	01, 02,	-15		V
		$R_{OUT} = 100\ \Omega$		03, 04			
ON / OFF threshold voltage on	$V_{(TO)}$	$I_{OUT} \le 1$ A 4/	1,2,3	01, 02, 03, 04		0.8	V
ON / OFF threshold voltage off	$V_{(TO)}$	$I_{OUT} \le 1$ A 4/	1,2,3	01, 02, 03, 04	2.0		V
ON / OFF threshold current	I_T	$V_{ON / OFF}$ = 2.0 V,	1	01, 02,		100	µA
		$I_{OUT} \le 1$ A	2,3	03, 04		300	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions 1/ 2/ 3/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Maximum line transient	V_{LT}	V_{OUT} max 1 V above nominal V_{OUT}, R_{OUT} = 100 Ω, T ≤ 100 ms	4,5,6	01, 02, 03, 04	60		V
Reverse polarity transient input voltage	V_{RT}	R_{OUT} = 100 Ω, T ≤ 100 ms	4,5,6	01, 02, 03, 04	-50		V
Ripple rejection 5/	RR	f_{OUT} = 1 kHz, 1 V_{RMS}, I_L = 100 mA	4	01, 02, 03, 04		0.02	%/V
			5,6			0.04	

1/ For device types 02 and 04, RHA devices supplied to this drawing are tested through all levels M, D, P, L, and R of irradiation. 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/ For device types 02 and 04, radiation end point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, conditions A and D. Device types 02 and 04, have been tested at low dose rate and does not demonstrate low dose rate sensitivity (see 1.5 herein).

3/ V_{OUT} = 5 V to 20 V, V_{IN} = V_{OUT} + 5 V, and C_{OUT} = 22 μF.

4/ Functional test, go no go only.

5/ % / V = % of V_{IN} per volt of V_{OUT}.

Case X

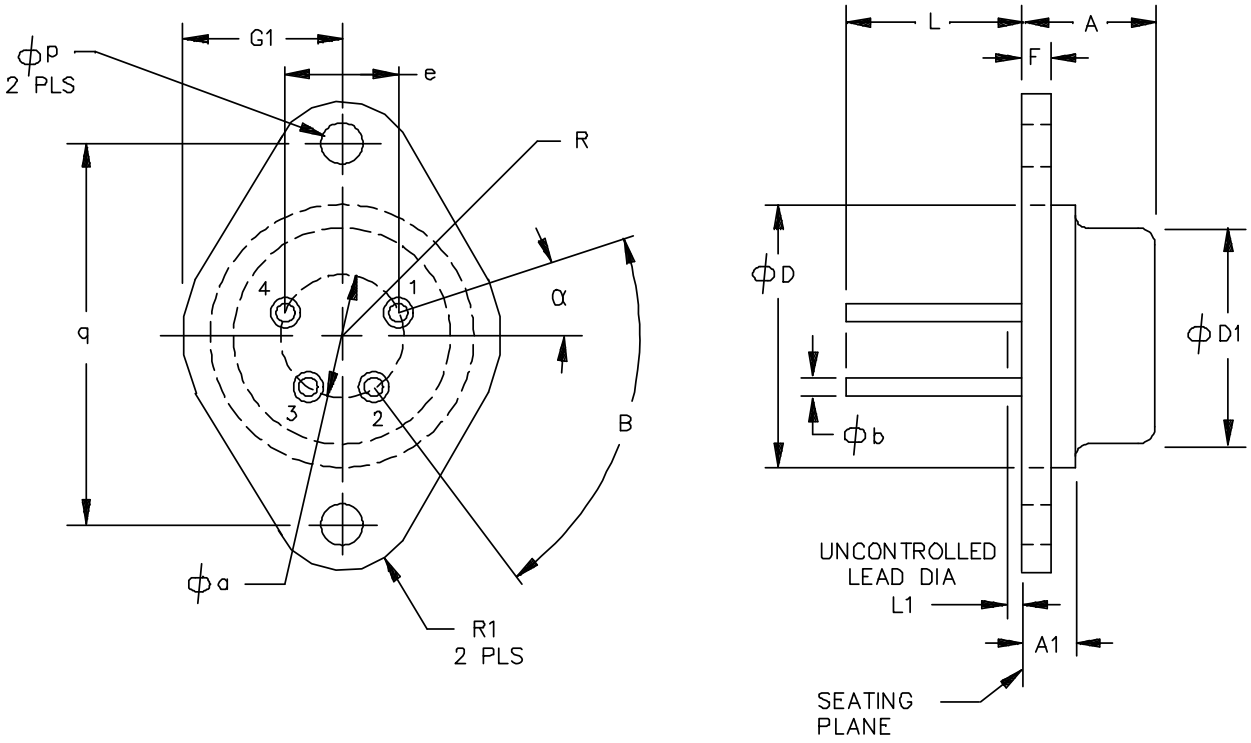


FIGURE 1. Case outline.

Case X – continued.

Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
A	.285	.305	7.24	7.75	
A1	---	.085	---	2.16	
ϕa	.460	.480	11.68	12.19	
ϕb	.038	.043	.97	1.09	3,5
ϕD	.880	.915	22.35	23.24	
ϕD1	.760	.775	19.30	19.69	
e	.460	.480	11.68	12.19	2
F	.060	.070	1.52	1.78	
G1	.490	.510	12.45	12.95	
L	.420	.500	10.67	12.70	
L1	---	.025	---	.64	5
ϕp	.151	.161	3.84	4.09	3
q	1.177	1.197	29.90	30.40	
R	.490	.510	12.45	12.95	3
R1	.168	.178	4.27	4.52	3
α	18°		18°		
β	72°		72°		
N	4		4		
Notes	1,4				

NOTES:

1. The U.S. government preferred system of measurement is the metric SI system. However, since this item was originally designed using inch pound units of measurement, in the event of conflict between the metric and inch-pound units, the inch-pound units shall take precedence.
2. These dimensions should be measured at points .050 inch (1.27 mm) + .005 inch (0.13 mm) - .00 inch (0.00 mm) below seating plane. When a gauge is not used, measurement will be made at the seating plane.
3. Two places.
4. The seating plane of the header shall be flat within .001 inch (0.03 mm) concave to .004 inch (0.10 mm) convex inside a .930 inch (23.62 mm) diameter circle on the center on the header and flat within .001 inch (0.03 mm) concave to .006 inch (0.15 mm) convex overall.
5. Lead diameter and glass menicus shall not exceed twice ϕb within L1.

FIGURE 1. Case outline – Continued.

Device types	01 , 02, 03, and 04		
Case outlines	E	X	Y
Terminal number	Terminal symbol		
1	NC	OUTPUT	NC
2	NC	ADJ	NC
3	OUTPUT	ON / OFF	OUTPUT
4	ADJ	V_{IN}	ADJ
5	GND	---	GND
6	NC	---	NC
7	NC	---	NC
8	NC	---	NC
9	ON / OFF	---	ON / OFF
10	NC	---	NC
11	GND	---	GND
12	GND	---	GND
13	GND	---	NC
14	GND	---	NC
15	NC	---	NC
16	V_{IN}	---	V_{IN}

NC = No connection.
For case outline X, case is ground.

FIGURE 2. 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 of MIL-STD-883.

(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 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 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)	1	1	1
Final electrical parameters (see 4.2)	1,2,3,4,5,6 1/	1,2,3,4,5,6 1/	1,2,3, 1/ 4,5,6
Group A test requirements (see 4.4)	1,2,3,4,5,6	1,2,3,4,5,6	1,2,3,4,5,6
Group C end-point electrical parameters (see 4.4)	1,2,3	1,2,3	1,2,3 2/
Group D end-point electrical parameters (see 4.4)	1,2,3	1,2,3	1,2,3
Group E end-point electrical parameters (see 4.4)	---	1,4	1,4

1/ PDA applies to subgroup 1.
2/ Delta limits as specified in table IIB shall be required where specified, and the delta limits shall be computed with reference to the previous endpoint electrical parameters.

Table IIB. Delta electrical parameters. T_A = +25°C 1/

Parameter	Conditions	Delta limit	
		Min	Max
V_{REF}	5 mA < I_O < 1 A	-25 mV	+25 mV

1/ Deltas performed on QMLV devices at Group B, subgroup 5, only. 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 for device types 02, 04, 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.

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 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) 692-0544.

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 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.

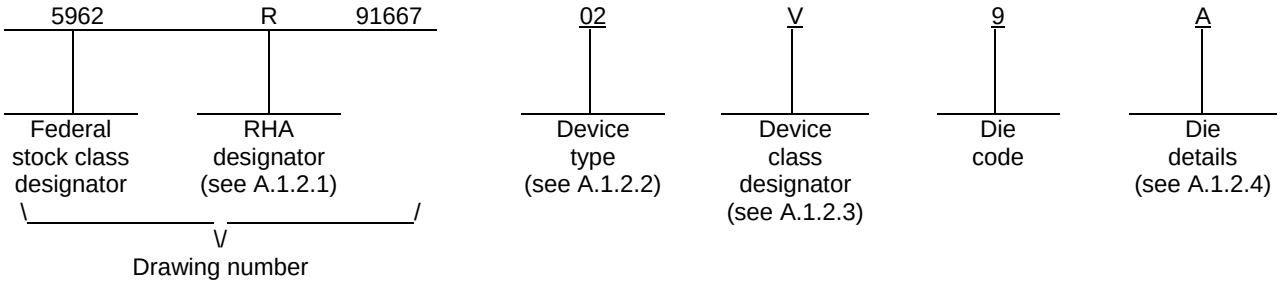
6.6.2 Approved sources of supply for device class M. Approved sources of supply for class M are listed in MIL-HDBK-103. The vendors listed in MIL-HDBK-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DLA Land and Maritime -VA.

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-91667

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
02	LM2941	Radiation hardened adjustable, 1 amp, positive voltage regulator

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.1.3 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 https://assist.daps.dla.mil/quicksearch/ 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 and 4.4.4.1 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.

DIE LAYOUT (F-STEP)

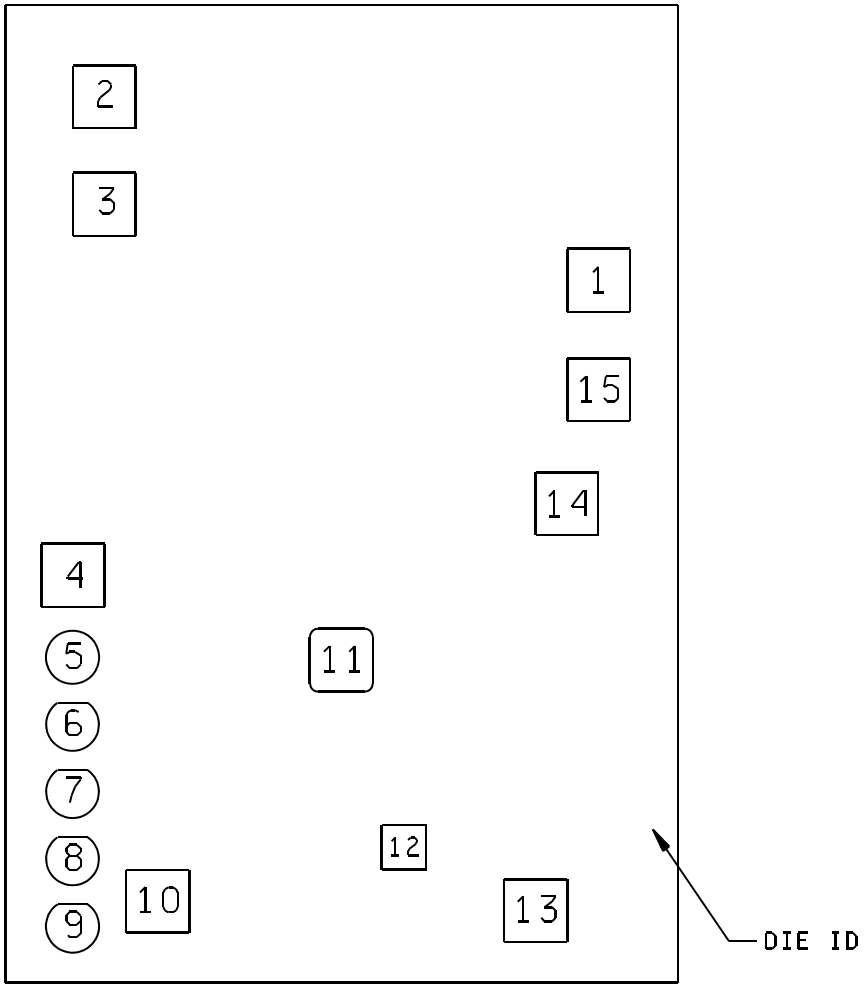


FIGURE A-1. Die bonding pad locations and electrical functions.

Die bond pad coordinate locations (F-step)						
(Referenced to die center, coordinates in μm) NC = no connection, NU = not used						
Signal name	Pad number	X / Y coordinates		Pad size		
		X	Y	X		Y
V_{IN}	1	741	427	135	x	140
OUTPUT	2	-652	1007	130	x	140
OUTPUT	3	-652	717	130	x	140
GND	4	-739	-422	139	x	140
NC	5	-763	-636	90	x	90
NC	6	-763	-760	90	x	78
NC	7	-763	-878	90	x	78
NC	8	-763	-997	90	x	78
NC	9	-763	-1120	90	x	78
ADJ	10	-583	-1064	139	x	139
NC	11	7	-601	153	x	109
NC	12	148	-957	88	x	78
ON / OFF	13	555	-1094	140	x	140
GND	14	637	-133	140	x	140
V_{IN}	15	741	137	135	x	140

Die bonding pad locations and electrical functions

Die physical dimensions.
Die size: 1752.6 μmils x 2463.8 μmils
Die thickness: 304.8 μmils
Minimum pitch: 290.00 μmils

Interface materials.
Top metallization: Al 0.5% CU
Backside metallization: Bare back

Glassivation.
Type: Vapox over metal (VOM only)
Thickness: 8K – 12K

Substrate: Silicon

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

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

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 11-12-13

Approved sources of supply for SMD 5962-91667 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38535 during the next revision. MIL-HDBK-103 and QML-38535 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DLA Land and Maritime -VA. This information bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535. DLA Land and Maritime maintains an online database of all current sources of supply at http://www.landandmaritime.dla.mil/Programs/Smcr/.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/
5962-9166701QEA	3/	LM2941J/883
5962-9166701QXA	3/	LM2941K/883
5962-9166701QYA	3/	LM2941WG/883
5962-9166701VEA	3/	LM2941J-QMLV
5962-9166701VYA	3/	LM2941WG-QMLV
5962R9166702VYA	3/	LM2941WGRLQMLV
5962R9166702V9A	27014	LM2941 MDE
5962-9166703QYA	27014	LM2941GW/883
5962-9166703VYA	27014	LM2941GW-QMLV
5962R9166704VYA	27014	LM2941GWRLQMLV

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
27014	National Semiconductor 2900 Semiconductor Drive P.O. Box 58090 Santa Clara, CA 95052-8090