REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Make changes to 1.3, 1.4, and line regulation test as specified in table I. - ro	99-08-23	R. MONNIN
B	Add case outline Y. Make changes to 1.2.4, 1.3, figure 1, and table IIB. - ro	99-10-08	R. MONNIN
C	Make changes to figure 2. - ro	99-12-17	R. MONNIN
D	Make changes to case Y, dimension D2 as specified in figure 1. - ro	00-01-21	R. MONNIN
E	Make changes to case Y, dimensions A and E2 as specified in figure 1. - ro	00-04-06	R. MONNIN
F	Make changes to VREF, RLINE, IADJ, ΔIADJ tests as specified in TABLE I herein. - ro	00-12-07	R. MONNIN
G	Add case outline U. Make changes to 1.2.4, 1.3, table I, and figure 1. - ro	01-06-06	R. MONNIN
H	Add Input-output voltage differential limit under 1.3 and SET limits under 1.5. - ro	04-12-21	R. MONNIN
J	Add enhanced low dose rate effects (ELDRS) paragraph to 1.5 and table I. Deleted dose rate induced latchup testing paragraph in section 4. - rrp	06-05-09	R. MONNIN
K	Delete the output voltage range limit from paragraph 1.3 and the accelerated aging test paragraph under section 4. - ro	08-04-22	R. HEBER
L	Add device types 02 and 03. Make changes to 1.2.2, 1.5, Table I, figure 2, 4.4.4.2, and Appendix A. -rrp	11-09-06	C. SAFFLE
M	Delete class M requirements. Update drawing to current MIL-PRF-38535 requirements. -rrp	17-05-17	C. SAFFLE
N	Make correction to the backside metallization material in Appendix A, figure A-1 from N to Ni. -rrp	18-05-02	C. SAFFLE

REV																				
SHEET																				
REV	N	N	N																	
SHEET	15	16	17																	

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

PMIC N/A

PREPARED BY
RICK OFFICER

DLA LAND AND MARITIME
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STANDARD MICROCIRCUIT DRAWING

CHECKED BY
RAJESH PITHADIA

APPROVED BY
RAYMOND MONNIN

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

DRAWING APPROVAL DATE
99-07-23

MICROCIRCUIT, LINEAR, RADIATION HARDENED, ADJUSTABLE POSITIVE VOLTAGE REGULATOR, MONOLITHIC SILICON

AMSC N/A

REVISION LEVEL
N

SIZE	CAGE CODE	
A	**67268**	**5962-99547**

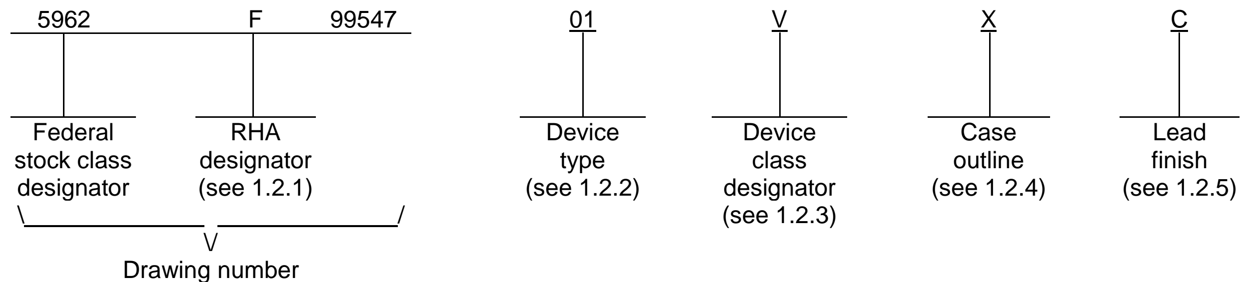
SHEET 1 OF 17

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.

1. SCOPE

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

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



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

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

Device type	Generic number	Circuit function
01	HS-117RH	Radiation hardened (HDR), adjustable positive voltage regulator
02	HS-117EH	Radiation hardened (HDR and LDR), adjustable positive voltage regulator
03	HS-117	Adjustable 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
Q, V	Certification and qualification to MIL-PRF-38535
T	Certification and qualification to MIL-PRF-38535 with performance as specified in the device manufacturers approved quality management plan.

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

Outline letter	Descriptive designator	Terminals	Package style
U	See figure 1	3	Can
X	MSFM1-P3	3	Single row flange mount with isolated tab and ceramic sealed.
Y	CBCC1-N3	3	Bottom terminal chip carrier

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

1.3 Absolute maximum ratings. 1/

Input-output voltage differential .... 40 V dc

Maximum output current (I_{MAX}) .... 1.5 A

Maximum power dissipation (P_D): 2/

T_C = +25°C:
- Case U .... 8 W
- Case X .... 50 W
- Case Y .... 27.5 W

T_C = +100°C:
- Case U .... 3.3 W
- Case X .... 20 W
- Case Y .... 11 W

Junction temperature maximum (T_J) .... 175°C

Lead temperature (soldering, 10 seconds) .... 265°C

Storage temperature range .... -65°C to +150°C

Thermal resistance, junction-to-case (θ_{JC}):
- Case U .... 15°C/W
- Case X .... 2.5°C/W
- Case Y .... 4.5°C/W

1.4 Recommended operating conditions.

Output voltage range .... 1.25 V dc to 37 V dc

Input voltage range .... 4.25 V dc to 40 V dc

Ambient operating temperature range (T_A) .... -55°C to +125°C

1.5 Radiation features.

Maximum total dose available (dose rate = 50 – 300 Rad(Si)/s):
- Device types 01 and 02 .... 3 x 10^5 Rad(Si)
- Device type 01 class T .... 1 x 10^5 Rad(Si)

ELDRS test (low dose rate $\leq$ 10m Rad(Si)/s):
- Device class V:
- Device type 01 .... Not production tested 3/
- Device type 02 .... 50K Rad(Si) 3/ 4/

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 linear derating factor for case U is 0.067 W/°C, case X is 0.4 W/°C and case Y it is 0.22 W/°C.

3/ For device types 01 and 02, the manufacturer supplying RHA parts on this drawing has performed characterization testing to a level of 50K Rad(Si) that demonstrates the parts do not exhibit enhanced low dose rate sensitivity (ELDRS) according to MIL-STD-883 method 1019 paragraph 3.13.1.1. Radiation end point limits for the noted parameters are guaranteed only for the conditions specified in MIL-STD-883, method 1019, condition A and/or D as applicable.

4/ Device type 02 is production lot acceptance tested on a wafer by wafer basis to 50K Rad(Si) at low dose rate ($\leq$ 10m Rad(Si)/s).

1.5 Radiation features – continued.

Single event phenomena (SEP) (Device types 01 and 02):
No single event transients (SET) (at 100 mV)
at effective linear energy transfer (LET) .... $\leq$ 15 MeV/mg/cm^2 5/
No single event burn-out (SEB) to an
effective linear energy transfer (LET) .... $\leq$ 87.4 MeV/mg/cm^2
Latch up immune (Device types 01 and 02) .... None 6/

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

3.1.1 Microcircuit die. For the requirements of microcircuit die, see appendix A to this document.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535 and herein for device classes Q, T and V.

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

____

5/ Input voltage $\geq$ 9 V and output capacitance $\geq$ 44 μF.
6/ Guaranteed by process or design.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ 2/ -55°C ≤ T_A ≤ +125°C unless otherwise specified		Group A subgroups	Device type	Limits		Unit
						Min	Max	
Reference voltage	V_{REF}	V_{DIFF} = 3.0 V, V_{DIFF} = 40 V, 5.0 mA ≤ I_L ≤ 5.5 mA		1,2,3	01, 02, 03	1.2	1.3	V
			M,D,P,L,R,F	1	01, 02	1.2	1.3	
Line regulation	R_{LINE}	V_{REF} = V_{OUT} - V_{ADJ}, 3.0 V ≤ V_{DIFF} ≤ 40 V, 5.0 mA ≤ I_L ≤ 5.5 mA		1,2,3	01, 02, 03		±0.02	%/V
			M,D,P,L,R,F	1	01, 02		±0.02	
Load regulation 3/	R_{LOAD}	V_{DIFF} = 3 V, 4/ 5 mA ≤ I_L ≤ 500 mA, 5 mA ≤ I_L ≤ 1.25 A		1,2,3	01, 02, 03		±1.5	%
			M,D,P,L,R,F	1	01, 02		±1.5	
		V_{DIFF} = 3 V, 5/ 5 mA ≤ I_L ≤ 500 mA		1,2,3	01, 02, 03		±1.5	
			M,D,P,L,R,F	1	01, 02		±1.5	
Adjustment pin current	I_{ADJ}	V_{DIFF} = 3.0 V, V_{DIFF} = 40 V, 5.0 mA ≤ I_L ≤ 5.5 mA		1,2,3	01, 02, 03		100	μA
			M,D,P,L,R,F	1	01, 02		100	
Adjustment pin current change	ΔI_{ADJ}	I_{ADJ} 3 V – I_{ADJ} 40 V, 5.0 mA ≤ I_L ≤ 5.5 mA		1	01, 02, 03		±5	μA
				2,3			±6	
			M,D,P,L,R,F	1	01, 02		±6	
Output current	I_{OUT}	4/		1,2,3	01, 02, 03	1.25		A
			M,D,P,L,R,F	1	01, 02	1.25		
		5/		1,2,3	01, 02, 03	0.50		
			M,D,P,L,R,F	1	01, 02	0.50		

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

1/ Device types 01 and 02 supplied to this drawing meet all levels M, D, P, L, R and F of irradiation for classes M, Q, and V and levels M, D, P, L, and R for class T. However, device types 01 and 02 (classes M, Q, and V) are only tested at the F level, and class T is only tested at the R level (see paragraph 1.5) in accordance with MIL-STD-883 method 1019 condition A (high dose rate). In addition, device type 02 (device class V) supplied to this drawing is production lot acceptance tested on a wafer by wafer basis to the “L” level (50 krads(Si)) in accordance with MIL-STD-883 method 1019 condition D (low dose rate).

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 01 and 02, the manufacturer supplying RHA parts on this drawing has performed characterization testing to a level of 50 krad(Si) that demonstrates the parts do not exhibit enhanced low dose rate sensitivity (ELDRS) according to MIL-STD-883 method 1019 paragraph 3.13.1.1. Radiation end point limits for the noted parameters are guaranteed only for the conditions specified in MIL-STD-883, method 1019, condition A and/or D as applicable.

3/ Regulation is measured at a constant junction temperature, using pulse testing with a low duty cycle. Changes in output voltage due to heating effects are covered under the specification for thermal regulation. Measurements taken at the output lead must be adjusted for lead resistance.

4/ Applies to case outlines X and Y only.

5/ Applies to case outline U only.

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 case 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.

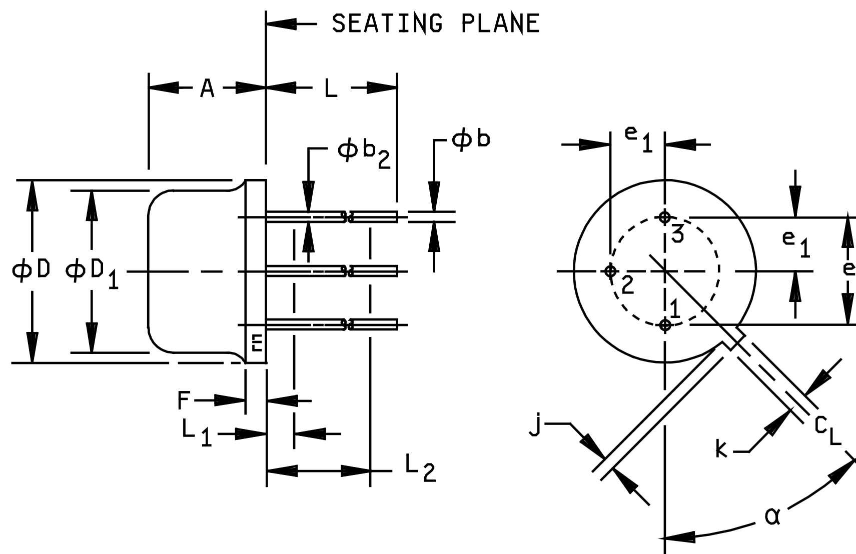
3.5 Marking. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked. For packages where marking of the entire SMD PIN number is not feasible due to space limitations, the manufacturer has the option of not marking the "5962-" on the device.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

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

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

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

Case U



Symbol	Inches		Millimeters		Notes
	Min	Max	Min	Max	
A	.160	.180	4.07	4.58	
ϕb	.016	.021	0.41	0.53	1
$ϕb_2$	.016	.019	0.41	0.48	1
ϕD	.350	.370	8.89	9.40	
$ϕD_1$	.315	.335	8.00	8.51	
e	.200 BSC		5.08 BSC		
e_1	.100 BSC		2.54 BSC		
F	.009	.050	0.23	1.27	
k	.027	.034	0.69	0.86	
j	.027	.045	0.69	1.14	2
L	.500	.750	12.70	19.05	1
L_1	---	.050	---	1.27	1
L_2	.250	---	6.35	---	1
α	45° BSC		45° BSC		3
N	3		3		4

NOTES:

1. All leads, ϕb2 applies between L_1 and L_2. ϕb applies between L_2 and 0.500 from the reference plane. Diameter is uncontrolled in L_1 and beyond 0.500 from the reference plane.
2. Measured from maximum diameter of the product.
3. α is the basic spacing from the centerline of the tab to terminal 1 looking at the bottom of the package.
4. N is the maximum number of terminal positions.

FIGURE 1. Case outline.

Device types	01, 02, 03		
Case outlines	U	X	Y
Terminal number	Terminal symbol		
1	INPUT	ADJUST	ADJUST
2	ADJUST	OUTPUT	INPUT
3	OUTPUT	INPUT	OUTPUT

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

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

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

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

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

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

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

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

4.4.1 Group A inspection.

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

b. Subgroups 4, 5, 6, 7, 8, 9, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

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

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

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

TABLE IIA. Electrical test requirements.

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

1/ PDA applies to subgroup 1.
2/ PDA applies to subgroup 1 and Δ.
3/ Delta limits as specified in table IIB herein shall be required where specified, and the delta values 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).

Parameters 1/	Delta limits
V_{REF}	0.05 V
I_{ADJ}	5 μA

1/ These parameters shall be recorded before and after the required burn-in and life test to determine delta limits.

4.4.4 Group E inspection. Group E inspection is required only for parts intended to be marked as radiation hardness assured (see 3.5 herein). RHA levels for device classes Q and V shall be as specified in MIL-PRF-38535. End-point electrical parameters shall be as specified in table IIA herein.

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

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

4.4.4.3 Single event phenomena (SEP). When specified in the purchase order or contract SEP testing shall be required on class T and V devices (see 1.5 herein). SEP testing shall be performed on a technology process on the Standard Evaluation Circuit (SEC) or alternate SEP test vehicle as approved by the qualifying activity at initial qualification and after any design or process changes which may affect the upset or latchup characteristics. The recommended test conditions for SEP are as follows:

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

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

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

d. The particle range shall be $\geq$ 20 micron in silicon.

e. The test temperature shall be +25°C and the maximum rated operating temperature ±10°C.

f. Bias conditions shall be defined by the manufacturer for the latchup measurements.

g. Test four devices with zero failures.

5. PACKAGING

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

6. NOTES

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

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

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

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

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

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

6.6 Sources of supply.

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

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

a. RHA test conditions (SEP).

b. Occurrence of burnouts (SEB).

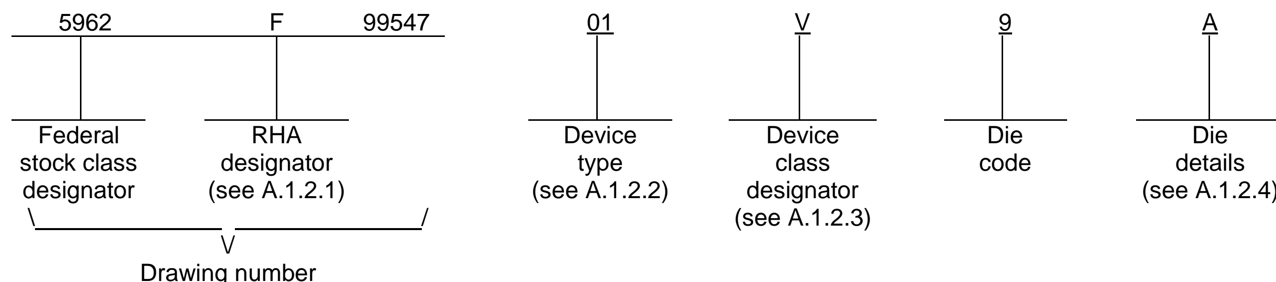
c. Occurrence of transients (SET).

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-99547

A.1 SCOPE

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

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



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

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

Device type	Generic number	Circuit function
01	HS-117RH	Radiation hardened (HDR), adjustable positive voltage regulator
02	HS-117EH	Radiation hardened (HDR and LDR), adjustable 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
01, 02	A-1

A.1.2.4.2 Die bonding pad locations and electrical functions.

Die type	Figure number
01, 02	A-1

A.1.2.4.3 Interface materials.

Die type	Figure number
01, 02	A-1

A.1.2.4.4 Assembly related information.

Die type	Figure number
01, 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.1.5 Radiation features. See paragraph 1.5 herein for details.

A.2 APPLICABLE DOCUMENTS.

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

DEPARTMENT OF DEFENSE SPECIFICATION

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

DEPARTMENT OF DEFENSE STANDARD

MIL-STD-883 - Test Method Standard Microcircuits.

DEPARTMENT OF DEFENSE HANDBOOKS

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

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

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

A.3 REQUIREMENTS

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

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

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

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

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

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

A.3.2.5 Radiation exposure circuit. The radiation exposure circuit shall be as defined in paragraph 3.2.3 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 IA of the body of this document.

A.3.4 Electrical test requirements. The wafer probe test requirements shall include functional and parametric testing sufficient to make the packaged die capable of meeting the electrical performance requirements in table IA.

A.3.5 Marking. As a minimum, each unique lot of die, loaded in single or multiple stack of carriers, for shipment to a customer, shall be identified with the wafer lot number, the certification mark, the manufacturer's identification and the PIN listed in A.1.2 herein. The certification mark shall be a "QML" or "Q" as required by MIL-PRF-38535.

A.3.6 Certification of compliance. For device classes Q and V, a certificate of compliance shall be required from a QML-38535 listed manufacturer in order to supply to the requirements of this drawing (see A.6.4 herein). The certificate of compliance submitted to DLA Land and Maritime -VA prior to listing as an approved source of supply for this appendix shall affirm that the manufacturer's product meets, for device classes Q and V, the requirements of MIL-PRF-38535 and the requirements herein.

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

A.4 VERIFICATION

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

A.4.2 Screening. For device classes Q and V, screening shall be in accordance with MIL-PRF-38535, and as defined in the manufacturer's QM plan. As a minimum, it shall consist of:

a. Wafer lot acceptance for class V product using the criteria defined in MIL-STD-883, method 5007.

b. 100% wafer probe (see paragraph A.3.4 herein).

c. 100% internal visual inspection to the applicable class Q or V criteria defined in MIL-STD-883, method 2010 or the alternate procedures allowed in MIL-STD-883, method 5004.

A.4.3 Conformance inspection.

A.4.3.1 Group E inspection. Group E inspection is required only for parts intended to be identified as radiation assured (see A.3.5 herein). RHA levels for device classes Q and V shall be as specified in MIL-PRF-38535. End point electrical testing of packaged die shall be as specified in table IIA herein. Group E tests and conditions are as specified in paragraphs 4.4.4, 4.4.4.1, 4.4.4.2, and 4.4.4.3 herein.

A.5 DIE CARRIER

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

A.6 NOTES

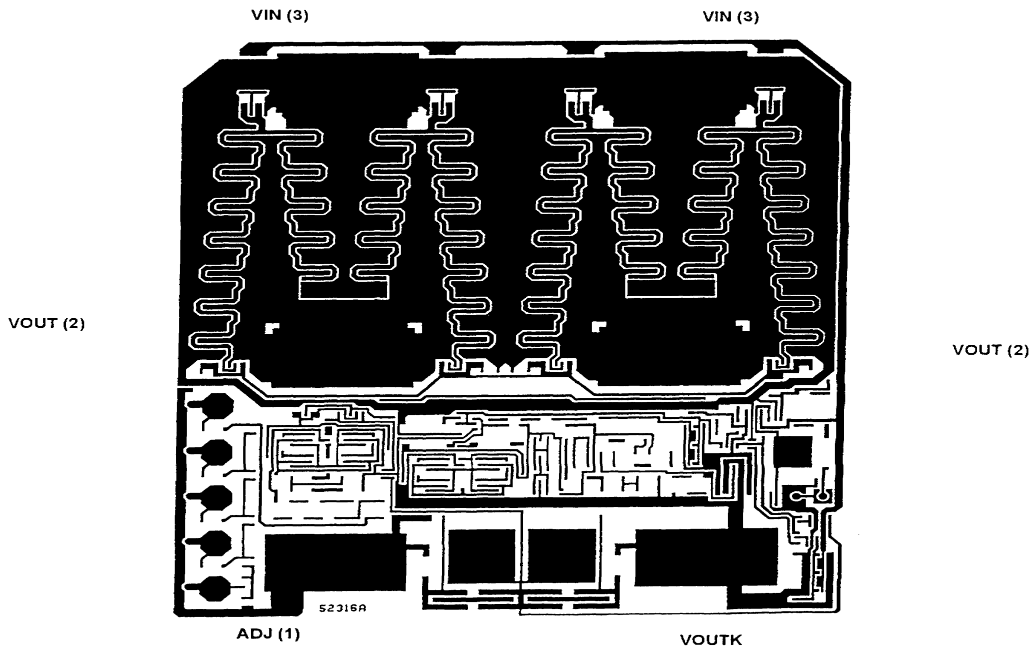
A.6.1 Intended use. Microcircuit die conforming to this drawing are intended for use in microcircuits built in accordance with MIL-PRF-38535 or MIL-PRF-38534 for government microcircuit applications (original equipment), design applications, and logistics purposes.

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

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

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

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-99547



NOTE: Pad numbers reflect terminal numbers when placed in case outline X (see figure 2).

Die bonding pad locations and electrical functions

Die physical dimensions.
Die size: 103 mils x 110 mils.
Die thickness: 19 mils ± 1 mils.

Interface materials.
Top metallization: Al Si Cu 16.0 kÅ ± 2 kÅ
Backside metallization: Al,Ti, Ni, Au

Glassivation.
Type: PSG
Thickness: 8 kÅ ± 1 kÅ

Substrate: DI (dielectric isolation)

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

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

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 18-05-02

Approved sources of supply for SMD 5962-99547 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/
5962F9954701QXC	34371	HS9S-117RH-8
5962F9954701VXC	34371	HS9S-117RH-Q
5962F9954701V9A	34371	HS0-117RH-Q
5962R9954701TXC	3/	HS9S-117RH-T
5962F9954701QYC	34371	HSYE-117RH-8
5962F9954701VYC	34371	HSYE-117RH-Q
5962R9954701TYC	3/	HSYE-117RH-T
5962F9954701VUC	34371	HS2-117RH-Q
5962F9954701QUC	34371	HS2-117RH-8
5962F9954702VXC	34371	HS9S-117EH-Q
5962F9954702V9A	34371	HS0-117EH-Q
5962F9954702VYC	34371	HSYE-117EH-Q
5962F9954702VUC	34371	HS2-117EH-Q
5962-9954703QYC	34371	HSYE-117-8

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

Vendor CAGE number	Vendor name and address
34371	Renesas Electronics America, Inc. 1650 Robert J. Conlan Blvd. NE Palm Bay, FL 32905-3406

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