These document and process conversion measures necessary to comply with this revision shall be completed by 24 April 1999.

INCH-POUND

MIL-PRF-38535E
Amendment 1
23 October 1998

PERFORMANCE SPECIFICATION

INTEGRATED CIRCUITS (MICROCIRCUITS) MANUFACTURING,
GENERAL SPECIFICATION FOR

This amendment forms a part of MIL-PRF-38535E, dated 1 December 1997, and is approved for use by all Departments and Agencies of the Department of Defense.

The attached insertable replacement pages listed below are replacements for the stipulated pages. When the new pages have been entered in the document, insert the amendments as the cover sheet to the specification.

Replacement Pages	Pages replaced
33	33
34	without change

Page 7

3.4.3, line 2, delete (class N, Q, or V) and substitute (class N, Q, V or T).

Page 8

Add new RHA designator as follows:

RHA level designator	Total dose (Rad (Si))
P	3×10^4

Add new paragraphs as follows:

3.4.8 Performance requirements for Class T devices. Manufacturers of Class T devices shall define a Class T flow within their Quality Management (QM) plan. The manufacturer of Class T devices shall be a certified QML supplier and the Class T flow shall be developed and approved through the manufacturer's TRB. As a minimum Class T product shall be capable of Class Q reliability unless otherwise delineated in the SMD. Copies of this technology flow including supporting documentation shall be submitted to and approved by the qualifying activity prior to listing as an approved source of supply. The technology flow and supporting documentation shall be made available to the systems manufacturers and government customers for review. The customer shall be notified of major changes which affect form, fit, or function of the device defined within the device specification or the manufacturer's QM plan as specified in 3.3.4 herein. The device manufacturer shall demonstrate that the failure mode and mechanisms of the technologies are considered when developing the technology flow.

3.4.8.1 Class T Radiation Requirements. The device specification shall define all the radiation features offered by the QML manufacturer for the Class T device. QML manufacturers supplying Class T devices shall establish the technical basis for compliance to MIL-STD-883 TM 1019 and shall be documented in the QM Plan for the radiation hardness assurance level specified for the device offered. All devices supplied to this product class shall be marked with a rad hard designator as specified in 3.4.3 herein. Traceability shall be established such that there is a technical basis for compliance to the specified RHA level designator as marked on the device.

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Page 9

3.6.2a, add “T” to list of Device class designators.

3.6.2a, add “P” to list of RHA designators.

Page 10

3.6.2.1, line 1, delete “Letters M, D, L, R, F, G, or H...” and substitute “Letters M, D, P, L, R, F, G, or H...”

3.6.2.3, delete Example PIN “5962-XXXXXZZ(N, Q, V (B or S))YY” and substitute as follows:
“5962-XXXXXZZ(N, Q, V, T (B or S))YY”

Page 13

Add new paragraph: 6.1.1 Class T. As the requirements for class level T are specified in the manufacturer’s Quality Management (QM) Plan for each technology, the user is cautioned to review the manufacturer's QM Plan to assure that the part being acquired meets the requirements/reliability of the system application.

Page 18

Add new paragraph: 6.2.31 Class T. Class T is a quality level whose requirements are defined by paragraph 3.4.8 herein and as documented on an SMD.

Page 30

A.3.4.1.3 Add new RHA designator as follows:

RHA level designator	Total dose (Rad (Si))
P	3×10^4

Page 40

A.3.6.2.2, line 1, delete “Letters M, D, L, R, F, G, or H...” and substitute “Letters M, D, P, L, R, F, G, or H...”

Page 41

A.3.6.2.7, delete “or H” 4 places under “Lead frame or terminal material and finish”.

Page 65

A.4.9.3.7, Add footnote 1/,

1/ The self-audit shall include any activities performed by a subcontractor, and shall ensure full compliance by the subcontractor to this appendix and the device specification or drawing. Any deviations or questionable areas shall be brought to the attention of the qualifying activity.

CONCLUDING MATERIAL

Custodians:
Army - CR
Navy - EC
Air Force - 17
NASA - NA

Civil agency coordinating activity:
DOT-FAA(RD-650)

Preparing activity:
DLA - CC

Review activities:
Army - AR, MI, PA, SM
Navy - MC, TD, AS, CG, OS, SH
Air Force - 19, 85, 99

(Project 5962-1821)

APPENDIX A

TABLE A-I. Testing guidelines for changes identified as major.

*

Major changes		Testing, MIL-STD-883, test method 5005 (All electrical parameters in accordance with the device specification or drawing 1/)
a.	Doping material source concentration Process technique	Group A and C-1 deltas (variables only when deltas are required)
b.	Diffusion profile	Group A and C-1 deltas (variables only when deltas are required)
c.	Die structure	Group A and C-1 deltas (variables only when deltas are required)
d.	Mask changes affecting die size or active element	Variable group A, C-1 prior to shipment, and notify qualifying activity if new area is smaller/larger in applicable package than previously qualified.
	Wafer diameter	Group A, C-1 prior to shipment
	Final die thickness	Group D-3
e.	Passivation/glassivation	Group A, C-1 and glass integrity test if current density is over 2×10^5
f.	Metallization changes	Group A, C-1, and B-5
g.	Die attach method	D-3 and D-4
h.	Die attach process	D-3 and D-4
i.	Bond process	B-5 and D-3
j.	Bond wire material/dimension	B-5 and D-3
k.	Package or lid structure	D-1 (variables), D-3, D-4, D-8 (lid torque) (variables)
	Package or lid material	D-3, D-4, D-5, D-6 (variables), and D-8 (lid torque) (variables)
	Package or lid dimension	D-1 (variables), D-2, and D-8 (lid torque) (variables)
	Lead frame material	See A.4.4.2.7
	Lead frame dimension	D-1 (variables) and D-2
	Cavity dimension	B-5, D-2, D-6 (variables), and D-8 (lid torque) (variables)
l.	Sealing profile	D-3, D-4, D-6 (variables), and D-8 (lid torque) (variables)
	Sealing material	D-3, D-4, D-6 (variables), and D-8 (lid torque) (variables)
	Frame attach	B-3, D-3, D-4, D-6 (variables), and D-7 (adhesion of lead finish) (variables)
	Frame cleaning	B-3, D-2, D-3, and D-7 (adhesion of lead finish)
m.	Implementation of test methods	Notify qualifying activity (may involve test demonstration)
n.	Critical documents (see A.4.8.1.3b)	Notify qualifying activity (may involve test demonstration)
o.	Fab move	Group A and C
p.	Assembly move	Group D per each package family (see A.3.1.3.30) prior to ship

APPENDIX A

TABLE A-I. Testing guidelines for changes identified as major - Continued.

Major changes		Testing, MIL-STD-883, test method 5005 (All electrical parameters in accordance with the device specification or drawing 1/)
q.	Test facility move	Notify qualifying activity
r.	Scribe/die separation	5 SEM photographs of randomly selected die showing one full edge of die front and back
s.	Qualification/QCI procedures	Notify qualifying activity
t.	Passivation for RHA	Group A, E, C-1, and glass integrity test if current density is over 2 x 10^5
u.	Diffusion profile for RHA	Group A, E, and C-1 deltas (variables only when deltas are required).
v.	Sinter/anneal for RHA	Group A, E, C-1, and B-5

1/ This table is for class level B subgroups only. For class level S, use the equivalent class level S subgroups.

The current density shall be calculated at the point(s) of maximum current density (i.e., greatest current (see A.3.5.5a) per unit cross section) for the specific device type and schematic or configuration. Individual device calculations are not required when appropriate documented design rules or requirements have been used, which limit or control the current density in the resulting design.

a. Use a current value equal to the maximum continuous current (at full fanout for digitals or at maximum load for linears) or equal to the simple time-averaged current obtained at maximum rated frequency and duty cycle with maximum load, whichever results in the greater current value at the point(s) of maximum current density. This current value shall be determined at the maximum recommended supply voltage(s) and with the current assumed to be uniform over the entire conductor cross-sectional area.

b. Use the minimum allowed metal thickness in accordance with manufacturing specifications and controls including appropriate allowance for thinning experienced in the metallization step. The thinning factor over a metallization step is not required unless the point of maximum current density is located at the step.

c. Use the minimum actual design conductor widths (not mask widths) including appropriate allowance for narrowing or undercutting experienced in metal etching.

d. Areas of barrier metals, not intended by design to contribute to current carrying capacity, and nonconducting material shall not be included in the calculation of conductor cross section.

Thick film conductors multichip substrates (metallization strips, bonding interfaces, etc.) shall be designated so that no properly fabricated conductor shall dissipate more than 4 watts/cm^2 when carrying, maximum design current.

A.3.5.5.1 Metallization thickness. For class level S microcircuits, the minimum metallization thickness shall be 8,000 C (800 nm) for single level metal and for the top level of multi-level metal, and 5,000 C (500 nm) for the lower level(s) of multi-level metal. In all cases, the current density requirements of A.3.5.5 shall also be satisfied.

A.3.5.5.2 Internal wire size and material. For class level S microcircuits, the internal wire diameter shall be .001 inch minimum (0.03 mm) and the internal lead wire shall be of the same metal as the die metallization.

A.3.5.5.3 Internal lead wires. Internal lead wires or other conductors which are not in thermal contact with a substrate along their entire length (such as wire or ribbon conductors) shall be designed to experience, at maximum rated current, a continuous current for direct current, or an RMS current (peak current divided by $\sqrt{2}$), for alternating or pulsed current, not to exceed the values established by the following relationship: