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Research and Development Technical Report

DELET-TR-76-8105-8

IC FABRICATION USING ELECTRON-BEAM TECHNOLOGY

Gilbert L. Varnell
Shang-Yi Chiang
Jack Reynolds
TEXAS INSTRUMENTS INCORPORATED
P.O. Box 225012
Dallas, TX 75265

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All of the required environmental and electrical tests of the first article 256-bit Bipolar RAM devices (50) were completed this quarter. These units passed all of the electrical measurements at 0°C, 25°C, and 70°C. However, the maximum operating speed of the units was about 20% slower than desired due to the electron resist being inadvertently removed during the contact oxide etch step. Fabrication of the pilot production units has begun and these units should pass all specifications including operating speed.

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PREFACE

This project has been accomplished as part of the U.S. Army Manufacturing and Technology Program, which has as its objective the timely establishment of manufacturing processes, techniques or equipment to ensure the efficient production of current or future defense programs.

TABLE OF CONTENTS

SECTION I
PURPOSE

The overall objective of the program is to implement e-beam writing technology for the fabrication of microcircuits. The technical and economic impact of electron-beam direct slice printing will be demonstrated on 256-bit bipolar RAMs. The elimination of mask masters, masks, and the masking process will eliminate the most significant source of yield loss. This will permit greater circuit design complexity and flexibility which will lead to lower device costs with increased reliability. The complete implementation program is divided into three tasks. Task A, Yield Improvement Through Direct E-Beam Writing, is directed toward developing the manufacturing technology required for e-beam writing with existing equipment and existing resist processes and demonstrating the yield benefits of this technique. Task B, Cost Reduction for E-Beam Writing Through High Speed Resist Implementation, is directed toward implementing identified high speed e-beam resists in order to significantly decrease cycle time and thus reduce the IC bar cost. Task C, Cost Reduction for E-Beam Writing Through Automatic Beam Diameter Control and Automatic Handling, is directed toward utilizing EBMIII's capability of computer-controlled beam size (large and small) on high density circuit (<0.1 mil) geometries. This program also included implementation of an automated handling system for slices to reduce cycle time and thus further reduce bar cost.

SECTION II
TECHNICAL DISCUSSION

A. INTRODUCTION

All of the required environmental and electrical tests of the first article devices (50) were completed this quarter. These devices and a technical report on the tests have been delivered. After acceptance of the first article devices, material was started in the Pilot Line for manufacturing the pilot production units (500). The test plan, which contains descriptions and schedules of the test to be performed on the pilot production units, was also prepared and submitted to the customer this quarter.

B. FIRST ARTICLE UNITS

After completion of the 1000-hour operating and storage life tests, all of the first article units were electrically tested with the High Speed Measurements (HSM) system and the Numerical Exerciser for Memories (NEM) system. These units passed all of the electrical measurements at 0°C, 25°C, and 70°C. However, the maximum operating speed of the units was about 20% slower than desired. It is noted that the units were expected to be slow due to the resist being inadvertently removed during the contact oxide etch step. The removal of the resist resulted in the field oxide being reduced in thickness by about 20%. This, in turn, caused the lead capacitance of the circuit to increase by 20% since that capacitance varies inversely as the oxide thickens. This capacitive loading of the circuit was expected to slow the devices switching times.

A complete discussion of these tests and their results may be found in "Test of First Article Units" dated July 14, 1978. A copy of this document is included as Appendix A.

C. SLICE PROCESSING

Prior to completing the environmental and electrical tests on the first article units several other lots were started in the line. Of these, lots 101, 102, and 103 were all lost at DUF and isolation O.R. due to removal of the resist during oxide etch. The resist was removed from lot 104 during isolation O.R. causing about 1500 Å to be removed from the field oxide. Processing of this lot as a test vehicle was continued through metal and leads patterning. Lot 105, which preceded lot 104 in the line, was lost at DUF O.R. due to pinholes.

The four lots remaining in the line look good at this point. Lot 106 is at contact O.R. and should satisfy the requirements for the pilot production devices. Lot 107 is at base O.R. and should be adequate backup for lot 106. Two additional lots, 108 and 109, were started in the line during the last month of this quarter as additional backup.

These lots are being processed using TI-303 positive electron resist instead of TI-313. The TI-303 is the same basic composition but has a lower molecular weight and a much greater exposure latitude. In addition, C_5F_{12} has been substituted for C_4F_8/CO_2 as the plasma etching gas for oxides. The resist removal rates are much more favorable with the C_5F_{12} and provide a much greater margin for error.

D. PILOT PRODUCTION TEST PLAN

A test plan was prepared for conducting the screening tests and quality conformance tests as required by MIL-STD-883, Methods 5004 and 5005. The table of test in this plan includes all the required tests and the methods by which they will be conducted. A list of equipment that will be used to conduct these tests is also given along with calibration schedules. Included in the test plan are the procedures and schedules for conducting the screening and quality conformance tests. For convenience, a copy of the test plan appears in Appendix B.

SECTION III
MANPOWER

The following professionals worked on this program 1 June 1978 – 1 September 1978. The percentage of time worked is also shown.

Dr. G. L. Varnell	10%
Dr. J. L. Bartelt	20%
Dr. S. Y. Chiang	100%
Dr. R. A. Owens	20%
Dr. J. Reynolds	50%
Dr. R. A. Robbins	Consultant
Mr. C. D. Winborn	Consultant

In addition, three technicians worked on the program.

DATE: JULY 14, 1978

APPENDIX A

TEST OF FIRST ARTICLE UNITS

PERFORMANCE TEST UNDER LABORATORY CONDITIONS

FOR

MICROCIRCUIT DIGITAL

256 BIT BIPOLAR RANDOM ACCESS MEMORY (RAM)

MONOLITHIC SILICON

CONTRACT-NO. DAAB07-76-C-8105

MANUFACTURER - TEXAS INSTRUMENTS

ENGINEER - JACK REYNOLDS

Total pages in this procedure - 9

TABLE OF TESTS

FOR

PERFORMANCE TEST UNDER LABORATORY CONDITIONS

256 BIT BIPOLAR RANDOM ACCESS MEMORY

TEST	NAME	SPECIFICATION
1.1	LOW LEVEL OUTPUT VOLTAGE	
1.2	HIGH LEVEL OUTPUT VOLTAGE	
1.3	SHORT CIRCUIT OUTPUT CURRENT	
1.4	INPUT LOW CURRENT	MIL-STD 883
1.5	INPUT HIGH CURRENT (1)	and SCS-517
1.6	INPUT HIGH CURRENT (2)	DATED 27 APRIL,
1.7	INPUT CLAMP DIODE VOLTAGE	1978
1.8	POWER SUPPLY CURRENT	
1.9	OUTPUT LEAKAGE	
2.1	ADDRESS ACCESS TIME	
2.2	ENABLE ACCESS TIME	
2.3	ENABLE RECOVERY TIME	
2.4	MINIMUM WRITE PULSE WIDTH	
2.5	PROPAGATION DELAY LOW TO HIGH	
2.6	PROPAGATION DELAY HIGH TO LOW	

LIST OF TEST EQUIPMENT

1. High Speed Measurements (HSM) System:

   The HSM is a dc parametric measurement unit. It was used to perform test 1.1 through 1.9 shown in the Table of Test. It also performs functional testing on the memory cells and peripheral circuits.

2. Numerical Exerciser for Memories (NEM) System:

   The NEM is a functional memory tester with timing measurements capability. It was used to perform test 2.1 through 2.6 shown in the Table of Test.

3. Environmental Test:

   All environmental test were performed in the Environmental Laboratory of the Quality and Reliability Assurance Department (QRA).

4. Burn-in, Storage, and Life Test:

   The burn-in, storage, and life test were performed in the Linear and Military Product Branch of QRA.

TEST PROCEDURES

1. GENERAL: All test were performed on packaged units, dc test were performed on an HSM, and ac test were performed on a NEM.

2. Methods of Examination and Test

Methods of examination and test were as specified in SCS-517, dated April 27, 1978, and as follows:

2.1 VOLTAGE AND CURRENT

All voltages given are referenced in the microcircuit ground terminal. Currents given are conventional current and positive when flowing into the referenced terminal.

2.2 LIFE-TEST COOLDOWN PROCEDURE

When devices are measured at 25°C following application of the operating life or burn-in test condition, they were cooled to room temperature prior to removal of the bias.

3. Electrical Performance Characteristics

The electrical performance characteristics are specified in Table 1 of SCS 517, dated April 27, 1978, and apply over the full recommended ambient operating temperature range.

4. Electrical Test Requirements

Electrical test requirements are as specified in Table-II and Table-III of SCS 517, dated April 27, 1978, The subgroups of Table-III which constitute the minimum electrical test requirements for screening, qualification, and quality conformance by device class are specified in Table-II.

5. Screening:

Screening was conducted on all devices in accordance with Class B of Method 5004 of MIL-STD-883 and SCS-517 (April 27, 1978). Five devices for the bond strength test specified in Method 5005 of MIL-STD-883 were randomly selected immediately following the internal visual inspection and prior to sealing. The test conducted were as follows.

	TEST	METHOD
1)	Internal visual	2010, test condition B
2)	Stabilization Bake	1008, 24 hrs, test condition C
3)	Temperature cycling	1010, test condition C
4)	Centrifuge	2001, test condition E Y_1 plane
5)	Hermeticity, fine and gross	1014, test condition B and C_2
6)	Burn-in test	1015, 168 hrs. @70°C
7)	Final electrical test	per SCS-517 (April 27, 1978)

The internal visual inspect was conducted in the assembly and package area. The stabilization bake, temperature cycling, centrifuge and hermeticity tests were performed in the Environmental Laboratory of the Quality and Reliability Assurance Department. The burn-in test at 70°C for 168 hours was performed in the Linear and Military Products Branch of QRA. All interim and final electrical test were made with the HSM and NEM. All devices selected for the first article units passed these tests.

FIRST ARTICLE INSPECTION

After screening all units 50 devices were selected as first Article Units. These 50 devices were then tested in accordance with paragraphs 4.5 and 4.6 of SCS-517, dated April 27, 1978, and Method 5005 of MIL-STD-883. In compliance with the first of these documents the inspection was carried forth in 3 groups, Group A, Group B, and Group C.

Group A. Inspection.:

All 50 First Article Units were tested in accordance with Table 1 of Method 5005 MIL-STD-883 with subgroup 4,5 and 6 omitted. As specified therein all electrical measurements in the enclosed Table of Test were performed at 0°C, 25°C, and 70°C. All units passed this test.

Group B. Inspection:

The Group B inspection was conducted in accordance with Table II of Method 5005 of MIL-STD-883. The test conducted were as follows:

SUB GROUP	TEST	METHOD	UNITS TESTED
1	Physical Dimension	2016	50
2a	Resistance to solvents	2015	2
2b	Bond Strength	2011	5
3	Solderability	2003	5
4	Lead integrity and seal	2004 1014	5

The physical dimensions of the packages were measured as a part of receiving inspect and found to pass the above test. Bond strength test were successfully performed on the 5 units which, as previously mentioned, were pulled from the lot prior to packaging. The results of these tests are shown on page 9. The Table there shows the failures mechanism and the pull in grams which caused the failure. As seen all bonds pass the required 3 gram pull minimum. The units readily passed the resistance to solvents, solderability, and lead integrity and seal test.

Group C Inspection:

The remaining 33 devices were divided into 7 groups, five of which consisted of 5 devices each, and two groups with 4 devices each. These groups were tested as follows as required by SCS-517, dated 27 April, 1978 and Table III of Method 5005 of MIL-STD-883.

SUB GROUP	TEST	METHOD	UNITS TESTED
1	Thermal Shock Temp. Cycling Moisture Resistance Seal	1011 Cond. B 1010 Cond. C 1004 1014	5
2	Mechanical Shock Vibration Acceleration Seal	2002 Cond. B 2009 Cond. A 2001 Cond. E 1014	5
3	Salt Atmosphere	1009	5
4	High Temp. Storage	1008,SCS-517	5
5	Operating Life Test	1005,SCS-517	5
6	Omit	SCS-517	0
7	Switching Test at 70°C	SCS-517	4
8	Switching Test at 0°C	SCS-517	4

The devices in sub-groups 1,2, and 3 passed all of the environmental test. The devices in sub-groups 7 and 8 had previously been tested during the Group A Inspection and found to be good. After completion of the environmental test on subgroups 1 and 2 all of those devices were electrically tested as required by Table II of SCS-517, dated 17 April, 1978. All units passed the dc test performed with the HSM at 0°, 25°C, and 70°C. They also appeared to pass the ac test performed with the NEM at 0°C, 25°C, and 70°C.

Just prior to removing subgroups 4 and 5 from their 1000 hour test it was discovered that the NEM was malfunctioning and perhaps had been since the first of the year. The measurements laboratory did not know initially to what extent this malfunction had affected the previous measurements on the devices tney had tested tor this program. It was known, however, that the devices were definately good and that the maltunction only related to timing measurements.

After the NEM was repaired all units manufactured for this program were re-tested. The results of these test verified that all of the units initially found to be good were indeed good, but failed some of the timing specifications of SCS-517. For convenience the timing measurements specified in Table 1 of SCS-517 are as follows:

TEST	LIMITS MIN.	MAX.	LIMITS
Address Access Time		100 (120)	ns
Enable Access Time		45 (55)	ns
Enable Recovery Time		35	ns
Minimum Write Pulse Width	120 (180)		ns
Propagation Delay Low to High (From R/W)		110 (120)	ns
Propagation Delay High to Low (From R/W)		55 (70)	ns

The original specifications in the test programs were altered in order to pass all of the previously tested units at room temperature. These changes are shown in parenthesis in the above table. These units also passed these extended specifications at 0°C, and 70°C.

When sub-groups 4 and 5 completed their 1000 hour tests they were submitted for complete dc and ac electrical test along with sub-groups 7 and 8. These units passed all of the measurements at 0°C, 25°C, and 70°C except the original timing specification. However, they readily passed the relaxed timing specifications at these temperatures. These extended time specifications indicate the units will operate at a speed about 20% lower than desired.

It is noted that it was initially expected that these units would be slow due to a process error at contact oxide removal. At this process step the resist was inadvertantly removed during oxide etch causing 1500 A° to be removed over the entire surface of all slices. This resulted in the field oxide thickness being reduced by about 20%. This in turn caused the metal lead to substrate capacitance to increase by 20% since that capacitance varies inversely as the oxide thickness. This capacitive loading of the entire circuit would certainly slow the devices switching times.

The control lot which was processed in the same time frame as the e-beam material, but did not have its field oxide thinned, readily passed all of the original specifications. This verifies that it was not a problem with the diffusion process which caused the time delay associated with the e-beam material.

QRAS 62953

MINUTE-MAN BOND STRENGTH DATA SHEET

74S201A ATTACHMENT 1 Lot #100

LINE # ______

MACHINE # ______

BONDING TYPE: ULTRASONIC [ ] BALL [X]

LEAD MATERIAL: GOLD [X] ALUM. [ ]

LEGEND: | I | II |
I. READING
II. FAILURE MODE

FAILURE MODE
(WB) Wire Broke
(BB) Wire Broke at Bar Bond
(BP) Wire Broke at Hdr. Bond
(PU) Bar Bond Pulled Up
(LM) Lead Material Pulled Up
(SB) header Bond Pulled Up
(PS) Pulled Up Silicon
(EG) Exceeds Limits of Gage

DATE																								
TECH/OPER																								
DEVICE																								
LOT NO	1				2				3				4				5							
READINGS 1	5.7	WB			5.6	WB	6.3	PU	5.3	BB	5.1	BB	4.1	WB	4.0	WB	4.1	WB	4.6	WB				
	4.2	BB	4.4	BB	4.8	BB	7.1	WB	5.2	BB	5.5	WB	4.1	WB	4.5	WB	4.5	WB	5.2	WB				
	4.9	BB	6.2	WB	5.5	BB	5.2	BB	5.6	WB	5.2	WB	4.0	WB	5.5	WB	3.8	WB	5.6	WB				
	5.4	BB	5.2	WB	5.7	BB	7.2	WB	4.5	WB	4.8	BB	4.7	WB	5.1	WB	4.6	WB	4.7	WB				
	5.0	WB	5.2	WB	4.3	BB	5.9	BB	6.3	BB	4.9	BB	4.1	BB	4.1	WB	4.7	WB	4.1	WB				
	4.9	WB	5.5	WB	4.8	BB	5.5	BB	4.7	BB	3.7	WB	4.1	BB	3.8	BB	3.0	WB	4.9	WB				
	5.4	BB			5.4	BB			5.5	WB			4.7	WB			5.7	WB						
	4.7	BB			6.1	WB			4.7	WB			4.3	WB			5.2	WB						
	4.7	BB			5.9	WB			5.0	WB			4.1	BB			4.4	WB						
	5.0	WB			5.1	PU			4.1	WB			3.B	BB			4.7	WB						
X																								
R																								
REJ. #																								

BOND STRENGTH (GRAMS): 15, 10, 5, 1

RANGE: 15, 10, 5

July 20, 1978

APPENDIX B

TEST OF PILOT PRODUCTION UNITS

PERFORMANCE TEST UNDER LABORATORY CONDITIONS
FOR
MICROCIRCUIT DIGITAL
256 BIT BIPOLAR RANDOM ACCESS MEMORY (RAM)
MONOLITHIC SILICON

CONTRACT-NO. DAAB07-76-C-8105

MANUFACTURER - TEXAS INSTRUMENTS

ENGINEER - JACK REYNOLDS

Total pages in this procedure - 10

TABLE OF TEST

FOR

PERFORMANCE TEST UNDER LABORATORY CONDITIONS

SCREENING TEST

TEST	NAME	SPECIFICATION REQUIREMENT MIL-STD-883, Method 5004, Class B. Method
1.1	Internal visual	2010, condition B
1.2	Stabilization bake	1008, 24 hrs, min, condition C min
1.3	Temperature Cycling	1010, Condition C
1.4	Centrifuge	2001, Condition E Y_1 plane
1.5	Hermeticity a. fine b. gross	1014
1.6	Burn-in	1015, 168 hrs @ 70°C
1.7	Final electrical test a. Static tests 1. 25°C 2. 0°C 3. 70°C b. Functional test 1. 25°C c. Switching test 1. 25°C	Per SCS-517 dated 27 April, 1978 Table II, Subgroups 1,2,3,7,9,
1.8	External visual	2009

QUALITY CONFORMANCE INSPECTION

GROUP A INSPECTION

TEST	NAME	SPECIFICATION REQUIREMENT MIL-STD-883, METHOD 5005 Class B, Method
2.1	Electrical tests a. Static test 1. 25°C 2. 70°C 3. 0°C b. Functional test 1. 25°C 2. 70°C 3. 0°C c. Switching test 1. 25°C	Per SCS-517 dated 27 April, 1978 and Table 1 of Method 5005, Subgroups 1,2,3,7,8,9

GROUP B INSPECTION

TEST	NAME	SPECIFICATION REQUIREMENT MIL-STD-883,Method 5005 Class B, Method
3.1	Physical dimensions	2016
3.2.1	Resistance to solvents	2015, 2014
3.2.2	Bond strength Thermocompression	2011, condition C or D
3.3	Solderability	2003, Soldering temperature of 260±10°C
3.4	Lead integrity	2004, Condition B_2
	Hermeticity (a) Fine (b) Gross	1014

GROUP C INSPECTION

TEST	NAME	SPECIFICATION REQUIREMENT MIL-STD-883, METHOD 5005 Class B, Method
4.1.1	Thermal shock	1011, condition B
4.1.2	Temperature cycling	1010, condition C
4.1.3	Moisture resistance	1004
4.1.4	Seal, fine, gross	1014
4.1.5	End point electrical parameters	Per SCS-517, dated 27 April, 1978, Table II
4.2.1	Mechanical shock	2002, condition B
4.2.2	Vibration	2007, condition A
4.2.3	Constant acceleration	2001, condition C
4.2.4	Seal, fine, gross	1014
4.2.5	End Point electrical parameters	Per SCS-517, dated 27 April, 1978, Table II
4.3	Salt atmosphere	1009, condition A
4.4.1	High temperature storage	1008, condition C 1000 hrs.
4.4.2	End point electrical parameters	Per SCS-517, dated 27 April, 1978, Table II
4.5.1	Operating life testing	1005, 70°C storage 1000 hrs.
4.5.2	End point electrical parameters	Per SCS-517, dated 27 April, 1978, Table II

LIST OF TEST EQUIPMENT

1. High Speed Measurements (HSM) System:

The HSM is a dc parametric measurement unit. It will be used to perform the Static Electrical Test listed in the Table of Test. It also performs functional testing on the memory cells and periferral circuits. Diagnostic and calibration test are ran daily and the equipment certified every 10 working days by Quality Control.

2. Numerical Exerciser for Memories (NEM) System:

The NEM is a functional memory tester with timing measurements capability. It is used to perform the Dynamic and Functional Test shown in the Table of Test. Diagnostic and calibration test are ran daily and the equipment certified every 10 working days by Quality Control.

3. Environmental Test:

All environmental test and measurements will be performed in the Environmental Laboratory of the Quality and Reliability Assurance Department (QRA). All of the equipment in the environmental laboratory is calibrated and certified on a regular basis for use on military programs.

4. Burnin, Storage, and Life Test:

The burnin, storage, and life test will be performed by Reliability Inc. of Houston, Texas. This company has their own Quality Control personnel and are qualified for doing testing on military programs.

TEST PROCEDURES

1. GENERAL: All electrical test will be performed on packaged units, dc test will be performed on an HSM, and ac test will be performed on a NEM.

2. Methods of Examination and Test

Methods of examination and test are as specified in SCS-517, and as follows:

2.1 VOLTAGE AND CURRENT

All voltages given are referenced to the microcircuit ground terminal. Currents given are conventional current and positive when flowing into the referenced terminal.

2.2 LIFE-TEST COOLDOWN PROCEDURE

When devices are measured at 25°C following application of the operating life or burn-in test condition, they will be cooled to room temperature prior to removal of the bias.

3. Electrical Performance Characteristics

The required electrical performance characteristics are specified in Table 1 of SCS-517, and apply over the full recommended ambient operating temperature range.

4. Electrical Test Requirements

Electrical Test Requirements are specified in Table-II and Table-III of SCS-517. The subgroups of Table-III which constitute the minimum electrical test requirements for screening, qualification, and quality conformance by device class are specified in Table-II.

SCREENING

Screening will be conducted on all of the devices in accordance with Class B of Method 5004 of MIL-STD-883 and SCS-517. The devices for the bond strength test specified in Method 5005 of MIL-STD-883 will be randomly selected immediately following the internal visual inspection and prior to sealing. The test will be conducted in accordance with the schedule shown in Table III.

The internal visual inspect will be conducted in the assembly and package area. The stabilization bake, temperature cycling, centrifuge and hermeticity tests will be performed in the Environmental Laboratory. The burn-in test at 70°C for 168 hours will be performed at Reliability Inc., of Houston, Texas. All interim and final electrical test will be made with the HSM and NEM.

In accordance with 4.4(7) of SCS-517, a recent defective allowable (PDA) at 10 per cent based on failures from group A, subgroup 1 test after burn-in must be met for the lot to be accepted.

QUALITY CONFORMANCE INSPECTION

After screening test are completed 500 devices will be selected as the Pilot Production Units. These units will be tested in accordance with paragraph 4.6 of SCS-517 and Method 5005 of MIL-STD-883. The sample size and acceptance number for these tests, specified in the Table of Test, are listed in Table II. The time schedule for conducting them is given in Table IV.

TABLE II

GROUP	TEST #	LTPD	SAMPLE SIZE	Acceptance Number
A	2.1,a,1	5	77	1
	2.1,a,2	7	55	1
	2.1,a,3	7	55	1
	2.1,b,1	5	77	1
	2.1,b.2	10	39	1
	2.1,c,1	7	55	1
B	3.1	15	25	1
	3.2.1	4 Devices no failures	4	0
	3.2.2	15	43 bonds (3 Units)	3
	3.3	15	43 Leads (3 Units)	3
	3.4	15	25	1
C	4.1,1 to 4.1.5	15	25	1
	4.2.1 to 4.2.5	15	25	1
	4.3	15	25	1
	4.4.1 and 4.4.2	7	55	1
	4.5.1 and 4.5.2	5	77	1

TABLE III

MIL-STD-883, METHOD 5004

SCREEN	METHOD	WEEK			
		1	2	3	4
3.1.1 Internal visual (Precap)	2010, test condition B				
3.1.2 Stabilization bake	1008 24 hrs, min, test condition C min (see 3.3.1)				
3.1.4 Temperature cycling	1010, test condition C min (see 3.3.2)				
3.1.6 Centrifuge	2001, test condition E Y_1 plane				
3.1.7 Hermeticity a. fine b. gross	1014				
3.1.9 Burn-in test (see 3.3.3)	1015 168 hrs. @ 70°C				
3.1.12 Final electrical test a. Static tests 1. 25°C 2. Maximum and minimum rated operating temp. b. Dynamic tests 25°C c. Functional test (see 3.4.3) 25°C	Per applicable procurement document				
3.1.15 External visual	2009				

TABLE IV

	MIL-STD-883 METHOD 5005		WEEK 5	6	7	8	9	10	11	12	13			
1	Group A Inspection													
2	Electrical Tests													
3	HSM, 0°C, 25°C, 70°C													
4	NEM,0°C, 25°C, 70°C													
5														
6	Group B Inspection													
7	Physical dimensions													
8	Resistance to solvents													
9	Bond Strength													
10	Solderability													
11	Lead integrity													
12	and seal test													
13														
14	Group C Inspection													
15	Subgroup 1													
16	Thermal shock													
17	Temperature cycling													
18	Moisture resistance													
19	Seal, Fine, Gross													
20	visual examination													
21	Electrical tests													
22	HSM AND NEM													
23	0°C, 25°C, 70°C													
24														
25														
26														
27														
28														

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TABLE IV (CONT)

	MIL-STD - 883 METHOD 5005		WEEK 5	6	7	8	9	10	11	12	13			
1	Group C Inspection													
2	Sub Group 2													
3	Mechanical shock													
4	Vibration													
5	Constant acceleration													
6	Seal, Fine, Gross													
7	Visual examination													
8	Electrical tests													
9	HSM and NEM													
10	0°C, 25°C, 70°C													
11														
12	SUB GROUP 3													
13	Salt atmosphere													
14	visual examination													
15														
16	SUB GROUP 4													
17	High Temperature storage													
18	Electrical tests													
19	HSM and NEM													
20	0°C, 25°C, 70°C													
21														
22	SUB GROUP 5													
23	Operating Life tests													
24	Electrical tests													
25	HSM and NEM													
26	0°C, 25°C, 70°C													
27														
28														

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