RIR IN:- 78298

RIR OUT:- 78298

PARTS HISTORY LOG

Radiation Testing

PROGRAMME:- XMM

PART TYPE:- 3C91C

RADIATION REPORT:- RD 235

IGG TASK NUMBER:- 1500

SUMMARY OF TEST RESULTS

The Output Current, I_C, of all test samples drifted across the total dose but remained well within the specified limits. In addition, S/N 92 and 102 showed an increase in $V_{(BR)CEO}$ (tested as a leakage current due to ATE constraints) after 75kRads(Si) and similarly S/N 104 after 100kRads(Si). However, these parts were well within the specfied limit and recovered completely after annealing. No other parameters showed any significant change.

Radiation Report Number:- RD 235

Project:- XMM

Part Type:- 3C91C Date Code:- 9647B

Manufacturer:- MIT/S IGG Task No:- 1500

Project Approval of Lot Traveller:-

Signed..... IGG 6 CT ..... Date..1-09-97..

Position..PROJECT T.R.....

Serial Number Range:-

91	Control	- Unbiased
92	through 96 (inclusive)	- Bias A
97	through 101 (inclusive)	- Bias B
102	through 106 (inclusive)	- Bias C

I certify that the subject component has been tested in accordance with the following radiation specifications:-

Test Method - ESA/SCC22900 ISSUE- 4 DATE- Jan '95

Irradiation Test Plan- XM-PL-IGG-0011 ISSUE- 2 DATE- Nov '96

Closed/Approved NCR No:- N N/A

Approved Waiver No:- WAR N/A

Signed.....P.A. Mussell..... Date..29/8/97..

Upscreening Engineer

Signed.....D.F.Q.....Date..29/8/97..

Upscreening Manager

RADIATION REPORT NUMBER:- RD 235 DATE:- 27.8.97

PROJECT:- XMM RIR IN:- 78298

PART NUMBER:- 3C91C MANUFACTURER:- MIT/S

PROCUREMENT LEVEL:- ESA/SCC5401/001-02B DATE CODE:- 9647B

TEST METHOD:- ESA/SCC22900 ISSUE- 4 DATE- Jan '95

TEST PLAN:- XM-PL-IGG-0011 ISSUE- 2 DATE- Nov '96

START QUANTITY:- 16

No.	Test (Sample Size)	XM-PL-IGG-0011 Test Method and Conditions	Date in	Qty in	Date out	Qty out	SIGNED Op/QA
1	Serialisation and Selection of Control Sample (100%)	Control Sample= SN 91	21/7/97	16	21/7/97	15 + CONTROL SAMPLE	IGG 16 CT
2	Initial Electrical Measurements (100% read and record)	Table A Testing at IGG	21/7/97	15	21/7/97	15	IGG 16 CT
3	Initial Electrical Measurements (100% read and record)	Table A Testing at RMC	22/7/97	15	22/7/97	15	IGG 16 CT
4	Set-up and apply Bias per Figure 1 A), B) and C)	Verify Bias Circuits and conditions (in-situ) for all 15 test samples	23/7/97	15	23/7/97	15	IGG 16 CT
5	Irradiation 1 (15 samples)	Dose= 10kRAD(Si) Rate= 10RAD(Si) per second Time= 1000secs	23/7/97	15	23/7/97	15	IGG 16 CT
6	Interim 1 Electrical Measurements (100% read and record)	Table A. Bias to be maintained until testing is performed. Tdwell=10mins maximum	23/7/97	15	23/7/97	15	IGG 16 CT

Report No: RD 235		Part Type: 3C91C				Date: 27.8.97	
No.	Test (Sample Size)	XM-PL-IGG-0011 Test Method and Conditions	Date in	Qty in	Date out	Qty out	SIGNED Op/QA
7	Irradiation 2 (15 samples)	As Test 5	23/7/97	15	23/7/97	15	IGG 16 CT
8	Interim 2 Electrical Measurements (100% read and record)	As Test 6	23/7/97	15	23/7/97	15	IGG 16 CT
9	Irradiation 3 (15 samples)	As Test 5	23/7/97	15	23/7/97	15	IGG 16 CT
10	Interim 3 Electrical Measurements (100% read and record)	As Test 6	23/7/97	15	23/7/97	15	IGG 16 CT
11	Irradiation 4 (15 samples)	Dose= 20kRAD(Si) Rate= 10RAD(Si) per second Time=2000secs	23/7/97	15	23/7/97	15	IGG 16 CT
12	Interim 4 Electrical Measurements (100% read and record)	As Test 6	23/7/97	15	23/7/97	15	IGG 16 CT
13	Irradiation 5 (15 samples)	Dose= 25kRAD(Si) Rate= 10RAD(Si) per second Time=2500secs	23/7/97	15	23/7/97	15	IGG 16 CT
14	Interim 5 Electrical Measurements (100% read and record)	As Test 6	23/7/97	15	23/7/97	15	IGG 16 CT
15	Irradiation 6 (15 samples)	As Test 13	23/7/97	15	23/7/97	15	IGG 16 CT

Report No: RD 235	Part Type: 3C91C	Date: 27.8.97

No.	Test (Sample Size)	XM-PL-IGG-0011 Test Method and Conditions	Date in	Qty in	Date out	Qty out	SIGNED Op/QA
16	Final Electrical Measurements (100% read and record)	As Test 6 At RMC	23/7/97	15	23/7/97	15	IGG 16 CT
17	Annealing Test (15 samples)	Bias for 24hrs min at +25°C (record exact time)	23/7/97	15	24/7/97	15	IGG 16 CT
18	Post Annealing Electrical Measurements (100% read and record)	Table A	24/7/97	15	24/7/97	15	IGG 16 CT
19	Accelerated Aging under bias (15 samples)	168 hours bias at +100±5°C	24/7/97	15	31/7/97	15	IGG 16 CT
20	Post Aging Electrical Measurements (100% read and record)	Table A	31/7/97	15	31/7/97	15	IGG 16 CT
21	Test Report Collation	[redacted]	[redacted]	[redacted]	29/8/97	[redacted]	IGG 2 CT
22	Test Report Approval	[redacted]	[redacted]	[redacted]	29/8/97	[redacted]	IGG 2 CT
23	NOTES:-						

Report No: RD 235 Part Type: 3C91C Date: 27.8.97

FAILURE LIST AND APPLICABLE NCR

Test No.	Serial Number(s)	Failed Parameter and Failure Mode	Applicable NCR

Report No: RD 235 Part Type: 3C91C Date: 27.8.97

TEST EQUIPMENT LIST

Item, Type Number and Serial Number	CT Inventory Number	Function	Calibration Due
Item: Radiation Source Type No: Cobalt 60 Serial No: N/A	RMC's Facility	Irradiation	14 /02 /1998
Item: SZ Type No: M3000 Serial No: 884769	CT339	ATE	27 / 9 /1997
Item: THURLBY Type No: PL320 Serial No: 2GP0621	CT287	PSU	24 / 10 /1997
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199

RADIATION TEST SUMMARY

PART TYPE : 3C91C

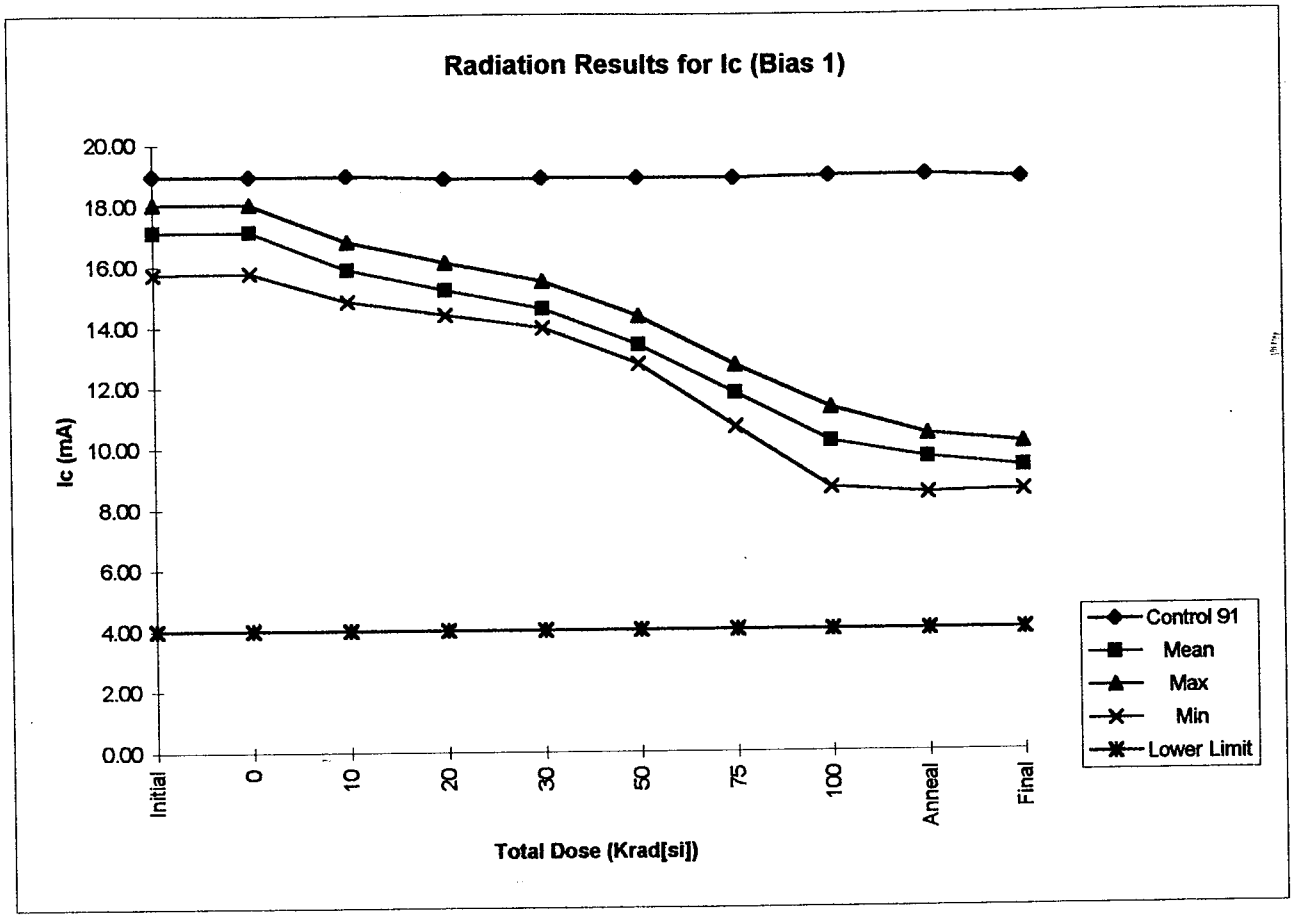
DESCRIPTION : OPTO ISOLATOR

REPORT NO. : RD 235

PARAMETERS PLOTTED :

Ic

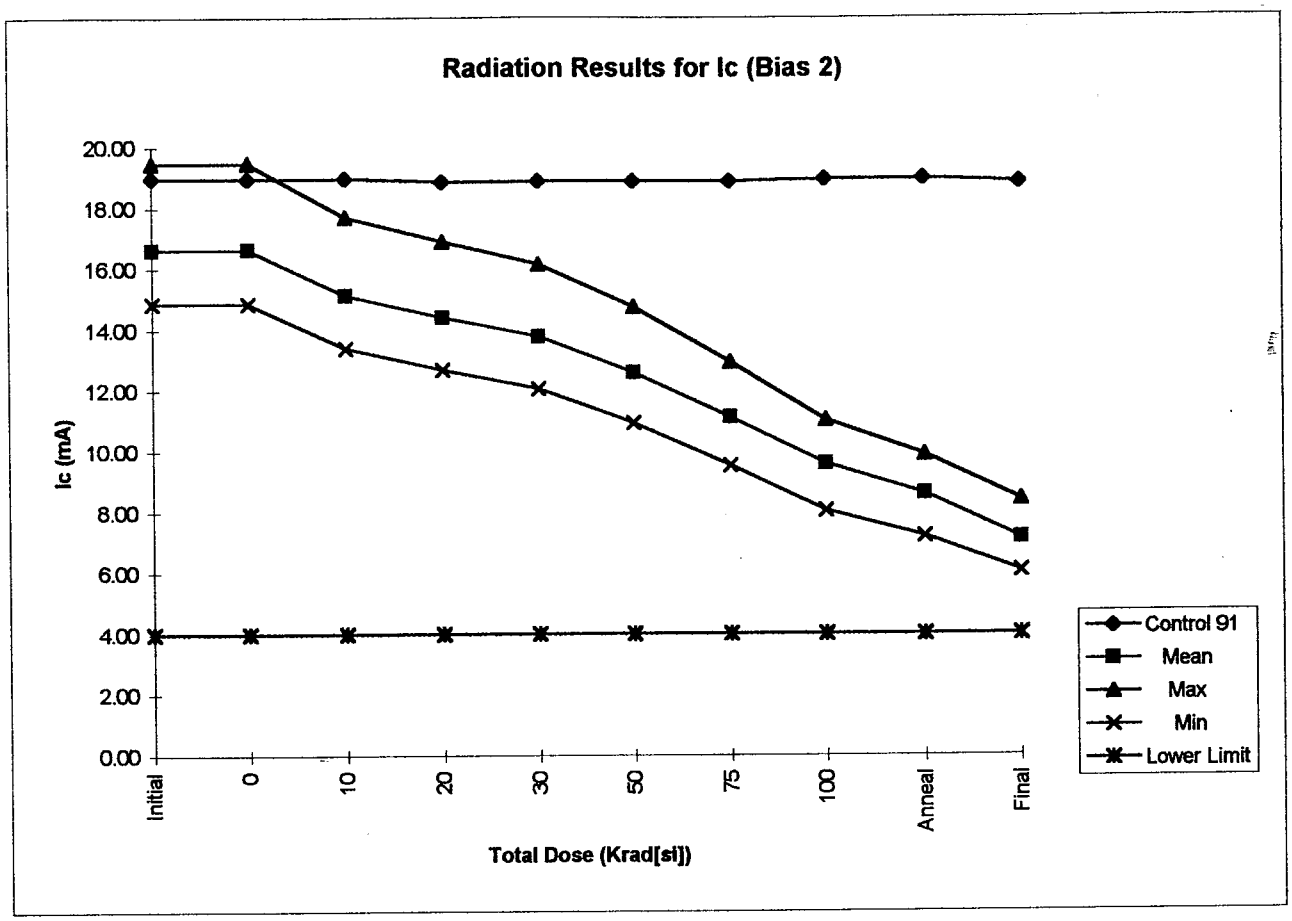
NOTE : The results for the remaining parameters showed no significant change and hence plots were not considered necessary.



Dose (kRad)	Control 91	Mean	Max	Min	Lower Limit	Upper Limit	Std.Dev.
	(mA)	(mA)	(mA)	(mA)	(mA)		
Initial	18.97	17.14	18.05	15.76	4.0	-	1.05
0	18.95	17.16	18.06	15.80	4.0	-	1.05
10	18.98	15.90	16.81	14.85	4.0	-	0.82
20	18.85	15.20	16.10	14.39	4.0	-	0.67
30	18.87	14.58	15.48	13.96	4.0	-	0.59
50	18.88	13.39	14.34	12.76	4.0	-	0.61
75	18.88	11.80	12.72	10.69	4.0	-	0.87
100	18.93	10.21	11.31	8.69	4.0	-	1.15
Anneal	18.96	9.66	10.44	8.49	4.0	-	0.82
Final	18.82	9.35	10.15	8.58	4.0	-	0.63

Lot size for statistics : 5 devices

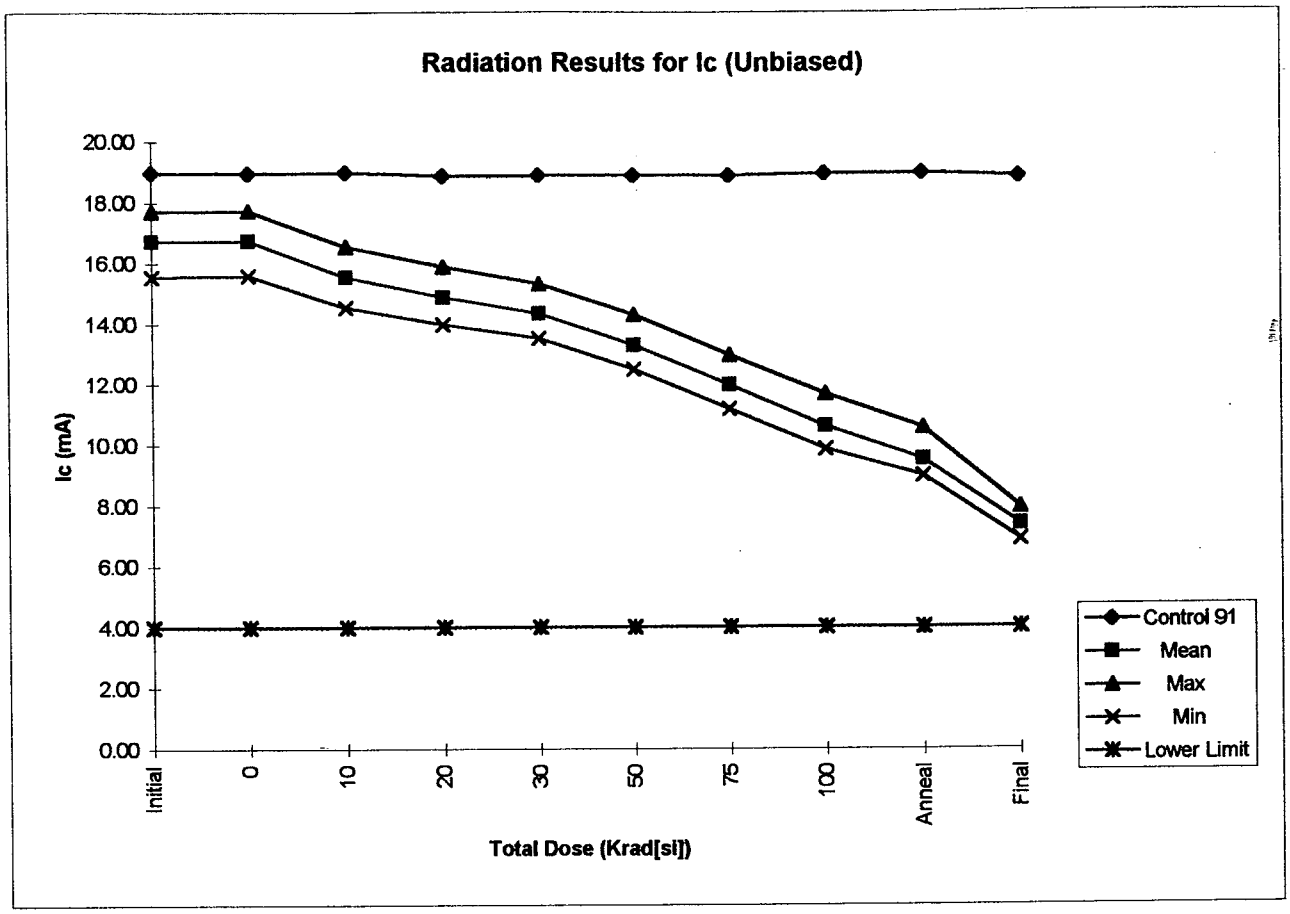
RD 235 Date code 9647B



Dose (kRad)	Control 91	Mean	Max	Min	Lower Limit	Upper Limit	Std.Dev.
	(mA)	(mA)	(mA)	(mA)	(mA)		
Initial	18.97	16.64	19.48	14.87	4.0	-	1.72
0	18.95	16.64	19.50	14.88	4.0	-	1.73
10	18.98	15.14	17.72	13.40	4.0	-	1.59
20	18.85	14.42	16.90	12.70	4.0	-	1.55
30	18.87	13.78	16.16	12.08	4.0	-	1.52
50	18.88	12.59	14.75	10.94	4.0	-	1.43
75	18.88	11.13	12.96	9.53	4.0	-	1.35
100	18.93	9.60	11.04	8.05	4.0	-	1.30
Anneal	18.96	8.62	9.91	7.21	4.0	-	1.18
Final	18.82	7.16	8.44	6.07	4.0	-	0.92

Lot size for statistics : 5 devices

RD 235 Date code 9647B



Dose (kRad)	Control 91	Mean	Max	Min	Lower Limit	Upper Limit	Std.Dev.
	(mA)	(mA)	(mA)	(mA)	(mA)		
Initial	18.97	16.73	17.72	15.57	4.0	-	0.98
0	18.95	16.75	17.75	15.60	4.0	-	0.98
10	18.98	15.53	16.55	14.54	4.0	-	0.85
20	18.85	14.88	15.88	13.98	4.0	-	0.82
30	18.87	14.32	15.32	13.52	4.0	-	0.78
50	18.88	13.28	14.29	12.48	4.0	-	0.74
75	18.88	11.99	12.98	11.20	4.0	-	0.68
100	18.93	10.63	11.69	9.87	4.0	-	0.70
Anneal	18.96	9.54	10.59	8.99	4.0	-	0.64
Final	18.82	7.38	7.96	6.89	4.0	-	0.42

Lot size for statistics : 5 devices

RD 235 Date code 9647B

XMM RD235	XM-PL-IGG-0011 1	Date: November 1996 Page: 1/4 2

Component No. 540100102B 3	Component Designation: Opto Isolator, Type 3C91C 4	Irradiation Spec No. N/A Iss. Rev. 5

Specification	Acceptance	Electrical Meas.	Project/Programme
Detail ESA/SCC 5401/001 Iss. 3D 6	Evaluation ___ Element Diffusion ___ Lot X 7	In-situ ___ Remote X 8	**XMM** 9

Manufacturer: Mitel Address: Jarfalla SWEDEN 10	Test Facility: ERA Address: Leatherhead Surrey ENGLAND 11	Originator: IGG CT Name: S. Thacker 12

Radiation Source:	Sample Size: 15	Exposure:	Annealing Test:	Radiation Level:
COBALT 60 13	Control Devices: 1 14	Single ___ Multiple X 15	YES X NO ___ 16	10kRAD(Si), 50kRAD(Si) 20kRAD(Si), 75kRAD(Si) 30kRAD(Si), 100kRAD(Si) 17

Single Exposure:
Dose [kRAD(Si)]
Dose Rate [RAD(Si)/s]
Exposure Time

Not Applicable 18

Multiple Exposure: 19

Irradiation Steps	1	2	3	4	5	6
Dose [kRAD(Si)]	10	10	10	20	25	25
Maximum Dose Rate [RAD(Si)/s]	10	10	10	10	10	10
Minimum Exposure Time[s]	1000	1000	1000	2000	2500	2500

Bias Requirements: During and after Exposure (for remote electrical measurements): YES (for 10 biased test units)

Bias Conditions:
Test Circuits: The Electrical Bias circuits for the 10 biased test units are given in Figure 1 herein. The 5 unbiased test units shall have all leadouts open circuit.

Shielding: Shielding is required to minimize dose enhancement effects caused by low energy, scattered radiation. The test specimens shall be enclosed in a Pb/Al container of Pb 1.5mm minimum, surrounding an inner shield of Al 0.7 to 1.0mm. 20

Irradiation Test Sequence 21

Test Step	Description	Requirements
1	Irradiation Test Samples	Quantity 16 devices shall be selected from the lot delivered to IGG.
2	Serialisation	Serialisation - (if the devices are not serialised). Test units shall be serialised 1 to 5 (unbiased test units), 6 to 15 (biased test units) and the control unit shall be 16.
3	Initial Electrical Measurements (at IGG)	Per Table A herein - (Read and Record) - on all 16 parts at IGG. (See Remarks 1 and 2).
4	Initial Electrical Measurements (at ERA)	Per Table A herein - (Read and Record) - on all 16 parts at ERA. (See Remarks 1 and 2).

S.T. 7.11.96

Irradiation Test Sequence (Cont.)

Test Step	Description	Requirements
5	Set-up Test	Verify Bias Circuit and Voltages (In-situ) for 10 biased test units. (See Remark 3).
6	Irradiation Exposure	Verify radiation dose rate and position in the chamber to achieve required dose for all 15 test units. Verify and witness duration of exposure to achieve required dose. (See Remark 4).
7	Intermediate Electrical Measurement (at ERA)	Bias to be maintained until test is performed for 10 biased test units. Test per Table A herein - (Read and Record) - on all 16 parts. Test to be performed immediately upon removal from chamber (less than 10 mins interval). Upon completion of test 10 biased test units shall be replaced in bias circuit and all 15 test units returned to chamber. Maximum interval between two consecutive exposures to be 30 mins. (See Remark 2).
8 to 22	Repeat Set-up/Exposure/Test sequence up to a Final Total Dose of 100kRAD(Si)	Repeat Steps 5, 6, 7 for a total of 6 cycles as per multiple exposure in Box No. 19. (See Remark 5).
23	Annealing	Bias shall be maintained during Annealing for 10 biased test units. Annealing shall be at room temperature for 24 hours. (See Remark 3).
24	Post Annealing Electrical Measurements (at IGG)	Per Table A herein - (Read and Record) - on all 16 parts at IGG. (See Remark 2).
25	Accelerated Aging (under Bias)	Bias shall be maintained during Aging for 10 biased test units. Aging shall be at T_{amb} = +100±5°C for 168 hours for all 15 test units. (See Remark 3).
26	Final Electrical Measurements (at IGG)	Per Table A herein - (Read and Record) - on all 16 parts at IGG (See Remark 2).
27	Total Dose Irradiation Test Report	ESA/SCC No. 22900.

Remarks

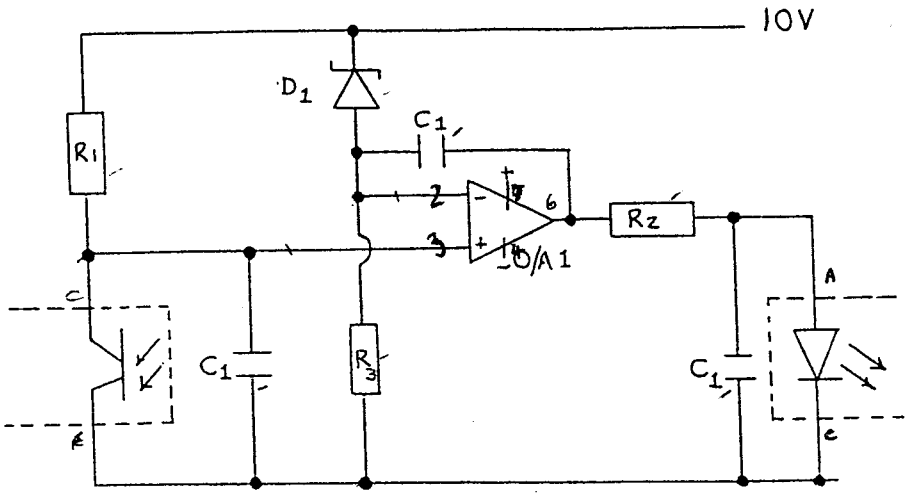
1. The initial electrical measurements performed at IGG (Test Step 3) shall be performed within 24 hours of the initial electrical measurements at ERA (Test Step 4).
2. All electrical testing shall be performed on the same set of equipment in order to achieve correlation of results both at IGG and ERA.
3. The control unit and the 5 unbiased test units shall not be biased during testing.
4. The dose rates and exposure times given above, may be adjusted during irradiation testing to achieve convenient test points but shall not exceed the limits specified in Box No. 19. The dose rates and exposure times used during the testing shall be recorded for each test step.
5. The set up/exposure/test sequence shall be stopped for any device that exhibits repeated functional failure.

TABLE A - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - T_{amb} = +25 ±5°C BEFORE, AT INTERMEDIATE POINTS AND ON COMPLETION OF IRRADIATION

NO.		CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
						MIN.	MAX.	
1	LED	Forward Voltage	V_F	4011	I_F = 2mA	-	1.3	V
2		Forward Voltage	V_F	4011	I_F = 50mA	-	1.8	V
3		Breakdown Voltage	V_{BR}	4021	I_R = 0.1mA	7	-	V
4	DETECTOR	Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	3011	I_C = 10mA	50	-	V
5		Dark Current	I_{CEO}	3036	V_{CE} = 5V I_F = 0	-	50	nA
6	COUPLED DEVICE	Output Current	I_C	3036	V_{CE} = 5V I_F = 10mA	4	-	mA
7		Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	3030	I_C = 2mA I_F = 50mA	-	0.4	V

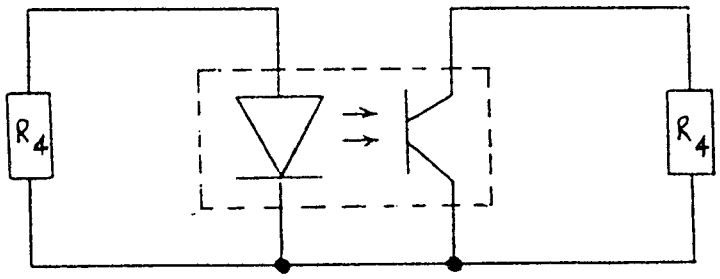
FIGURE 1 - ELECTRICAL BIAS CIRCUIT FOR IRRADIATION TESTING

A) Biased Condition 1 (5 Test Units)



R_1 = 43KΩ
R_2 = 1KΩ
R_3 = 7.5KΩ
C_1 = 10nF
D_1 = BZX79
O/A1 = OP AMP 741

B) Biased Condition 2 (5 Test Units)



R_4 = 10KΩ

C) Unbiased Condition (5 Test Units)

The device is unbiased with all leadouts open circuit.

```
SZ-TESTSYSTEME  Statistics 03   Vers. 2.15  for TA06
RD235_3C91C_INIT_EMS_@_IGG       / 1.0 IR 17JUL97
================================================================================
Results file    : RD235_3C91C_INIT_EMS_@_IGG   from: 21.07.97 / 14:04:08
Operator        : PAUL RUSSELL
Part number     : 3C91C
Lot number      : RD235
Order number    : D/C 9647B
Vendor          : MITEL
                : CONTROL 91 ; BIAS A 92-96, BIAS B 97-101, BIAS C 102-106
                : INITIAL EMS @ IGG
                : 3C91 XM-PL-IG6-0011 ISS2 RAD / 1.0 IR 17JUL97
--------------------------------------------------------------------------------
Test steps

  1. V(fwd)                          (      0.000 )...        1.300  V
  2. V(fwd)                          (      0.000 )...        1.800  V
  3. V(br)                                 7.000   ... (     15.000 )V
  4. I(OH)                           (      0.00  )...      250.00   uA
  5. I(OH)                           (      0.00  )...       50.00   nA
  6. CTR                                  40.0     ... (   5000.0   )%
  7. V(sat)                          (      0.000 )...        0.400  V
--------------------------------------------------------------------------------
```

	91	92	93	94	95	96
1.1 [V]	1.066	1.062	1.073	1.069	1.072	1.070
2.1 [V]	1.273	1.267	1.277	1.262	1.256	1.260
3.1 [V]	12.585	12.584	12.585	12.585	12.584	12.585
4.1 [uA]	0.90	0.85	0.95	0.85	0.95	1.00
5.1 [nA]	0.05	0.05	0.05	0.05	0.05	0.05
6.1 [%]	189.7	157.6	178.4	180.5	177.8	162.6
7.1 [V]	0.033	0.032	0.031	0.031	0.030	0.033

	97	98	99	100	101	102
1.1 [V]	1.071	1.070	1.070	1.075	1.067	1.072
2.1 [V]	1.265	1.261	1.265	1.284	1.255	1.257
3.1 [V]	12.585	12.585	12.585	12.585	12.585	12.585
4.1 [uA]	0.90	0.85	0.90	0.95	0.55	0.90
5.1 [nA]	0.05	0.05	0.05	0.00	0.00	0.00
6.1 [%]	163.1	159.2	166.0	194.8	148.7	177.2
7.1 [V]	0.032	0.034	0.031	0.030	0.033	0.031

	103	104	105	106
1.1 [V]	1.070	1.072	1.071	1.071
2.1 [V]	1.259	1.260	1.254	1.255
3.1 [V]	12.585	12.584	12.584	12.585
4.1 [uA]	0.85	0.85	0.90	1.00
5.1 [nA]	0.05	0.00	0.00	0.00
6.1 [%]	175.4	155.7	169.9	158.3
7.1 [V]	0.030	0.033	0.033	0.033

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA06
RD235_3C91C_INIT_EMS_@_RMC / 1.0 IR 17JUL97

Results file : RD235_3C91C_INIT_EMS_@_RMC from: 22.07.97 / 14:25:15
Operator : PAUL RUSSELL
Part number : 3C91C
Lot number : RD235
Order number : D/C 9647B
Vendor : MITEL
: CONTROL 91 ; BIAS A 92-96, BIAS B 97-101, BIAS C 102-106
: INITIAL EMS @ RMC
: 3C91C XM-PL-IG6-0011 ISS2 RAD / 1.0 IR 17JUL97

Test steps

1. V(fwd)	(	0.000	)...	1.300	V	
2. V(fwd)	(	0.000	)...	1.800	V	
3. V(br)		7.000	... (	15.000	)V	
4. I(OH)	(	0.00	)...	250.00	uA	
5. I(OH)	(	0.00	)...	50.00	nA	
6. CTR		40.0	... (	5000.0	)%	
7. V(sat)	(	0.000	)...	0.400	V	

	91	92	93	94	95	96
1.1 [V]	1.068	1.060	1.070	1.068	1.070	1.070
2.1 [V]	1.275	1.264	1.274	1.261	1.255	1.260
3.1 [V]	12.598	12.598	12.598	12.597	12.598	12.598
4.1 [uA]	0.85	0.95	0.95	1.00	0.95	0.90
5.1 [nA]	0.05	0.05	0.05	0.05	0.05	0.05
6.1 [%]	189.5	158.0	179.0	180.6	178.0	162.5
7.1 [V]	0.033	0.032	0.031	0.031	0.030	0.032

	97	98	99	100	101	102
1.1 [V]	1.072	1.069	1.068	1.073	1.066	1.070
2.1 [V]	1.265	1.261	1.263	1.283	1.253	1.256
3.1 [V]	12.598	12.598	12.598	12.598	12.598	12.598
4.1 [uA]	0.75	1.50	0.95	0.90	1.00	0.80
5.1 [nA]	0.05	0.05	0.05	0.05	0.05	0.05
6.1 [%]	162.9	159.3	166.2	195.0	148.8	177.5
7.1 [V]	0.032	0.034	0.031	0.030	0.033	0.031

	103	104	105	106
1.1 [V]	1.069	1.071	1.069	1.070
2.1 [V]	1.258	1.259	1.252	1.254
3.1 [V]	12.598	12.598	12.598	12.598
4.1 [uA]	1.05	0.95	0.95	0.95
5.1 [nA]	0.10	0.10	0.05	0.05
6.1 [%]	175.5	156.0	170.3	158.4
7.1 [V]	0.030	0.033	0.033	0.033

```
SZ-TESTSYSTEME  Statistics 03   Vers. 2.15  for TA06
RD235_3C91C_EMS_@_10_KRAD         / 1.0 IR 17JUL97
================================================================================
Results file    : RD235_3C91C_EMS_@_10_KRAD   from: 23.07.97 / 09:13:59
Operator        : PAUL RUSSELL
Part number     : 3C91C
Lot number      : RD235
Order number    : D/C 9647B
Vendor          : MITEL
                : CONTROL 91 ; BIAS A 92-96, BIAS B 97-101, BIAS C 102-106
                : EMS @ 10 KRAD
                : 3C91 XM-PL-IG6-0011 ISS2 RAD / 1.0 IR 17JUL97
--------------------------------------------------------------------------------
Test steps

  1. V(fwd)                          (     0.000 )...       1.300  V
  2. V(fwd)                          (     0.000 )...       1.800  V
  3. V(br)                                7.000  ... (    15.000 )V
  4. I(OH)                           (     0.00  )...     250.00   uA
  5. I(OH)                           (     0.00  )...      50.00   nA
  6. CTR                                 40.0    ... (  5000.0   )%
  7. V(sat)                          (     0.000 )...       0.400  V
--------------------------------------------------------------------------------
```

	91	92	93	94	95	96
1.1 [V]	1.067	1.057	1.068	1.063	1.067	1.067
2.1 [V]	1.274	1.263	1.273	1.258	1.253	1.258
3.1 [V]	12.584	12.584	12.584	12.585	12.584	12.584
4.1 [uA]	0.90	0.85	0.95	0.90	0.90	0.95
5.1 [nA]	0.05	0.05	0.05	0.05	0.05	0.05
6.1 [%]	189.8	148.5	161.4	168.1	164.5	152.7
7.1 [V]	0.033	0.032	0.032	0.031	0.030	0.033

	97	98	99	100	101	102
1.1 [V]	1.072	1.069	1.068	1.072	1.066	1.068
2.1 [V]	1.266	1.261	1.264	1.283	1.254	1.256
3.1 [V]	12.585	12.584	12.585	12.584	12.585	12.585
4.1 [uA]	0.90	0.95	0.80	0.95	0.95	0.95
5.1 [nA]	0.05	0.05	0.05	0.05	0.05	0.05
6.1 [%]	151.3	144.6	150.1	177.2	134.0	165.5
7.1 [V]	0.032	0.035	0.032	0.032	0.035	0.031

	103	104	105	106
1.1 [V]	1.067	1.069	1.067	1.068
2.1 [V]	1.257	1.258	1.252	1.254
3.1 [V]	12.585	12.584	12.585	12.584
4.1 [uA]	0.95	0.95	0.95	0.90
5.1 [nA]	0.00	0.00	0.00	0.05
6.1 [%]	160.3	145.4	157.8	147.7
7.1 [V]	0.032	0.034	0.033	0.034

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA06
RD235_3C91C_EMS_@_20_KRAD / 1.0 IR 17JUL97

Results file : RD235_3C91C_EMS_@_20_KRAD from: 23.07.97 / 10:09:18
Operator : PAUL RUSSELL
Part number : 3C91C
Lot number : RD235
Order number : D/C 9647B
Vendor : MITEL
: CONTROL 91 ; BIAS A 92-96, BIAS B 97-101, BIAS C 102-106
: EMS @ 20 KRAD
: 3C91 XM-PL-IGG-0011 ISS2 RAD / 1.0 IR 17JUL97

Test steps

1.	V(fwd)	(	0.000	)...	1.300	V
2.	V(fwd)	(	0.000	)...	1.800	V
3.	V(br)		7.000	... (	15.000	)V
4.	I(OH)	(	0.00	)...	250.00	uA
5.	I(OH)	(	0.00	)...	50.00	nA
6.	CTR		40.0	... (	5000.0	)%
7.	V(sat)	(	0.000	)...	0.400	V

	91	92	93	94	95	96
1.1 [V]	1.071	1.057	1.066	1.063	1.066	1.066
2.1 [V]	1.279	1.264	1.272	1.258	1.252	1.258
3.1 [V]	12.585	12.585	12.585	12.585	12.585	12.585
4.1 [uA]	0.95	0.95	0.85	0.90	0.90	0.85
5.1 [nA]	0.05	0.05	0.05	0.05	0.05	0.05
6.1 [%]	188.5	143.9	151.0	161.0	156.3	148.0
7.1 [V]	0.033	0.032	0.035	0.033	0.032	0.033

	97	98	99	100	101	102
1.1 [V]	1.071	1.068	1.066	1.071	1.064	1.069
2.1 [V]	1.265	1.261	1.263	1.283	1.253	1.257
3.1 [V]	12.585	12.585	12.586	12.585	12.585	12.585
4.1 [uA]	0.95	0.95	0.95	0.95	0.95	0.95
5.1 [nA]	0.05	0.05	0.05	0.05	0.05	0.05
6.1 [%]	145.5	137.1	142.4	169.0	127.0	158.8
7.1 [V]	0.033	0.036	0.034	0.033	0.036	0.031

	103	104	105	106
1.1 [V]	1.066	1.069	1.068	1.068
2.1 [V]	1.257	1.259	1.252	1.254
3.1 [V]	12.585	12.586	12.585	12.587
4.1 [uA]	0.90	0.95	0.95	0.95
5.1 [nA]	0.05	0.05	0.05	0.05
6.1 [%]	153.2	139.8	151.2	140.9
7.1 [V]	0.033	0.034	0.033	0.035

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA06
RD235_3C91C_EMS_@_30_KRAD / 1.0 IR 17JUL97

Results file : RD235_3C91C_EMS_@_30_KRAD from: 23.07.97 / 10:35:32
Operator : PAUL RUSSELL
Part number : 3C91C
Lot number : RD235
Order number : D/C 9647B
Vendor : MITEL
: CONTROL 91 ; BIAS A 92-96, BIAS B 97-101, BIAS C 102-106
: EMS @ 30 KRAD
: 3C91 XM-PL-IG6-0011 ISS2 RAD / 1.0 IR 17JUL97

Test steps

1.	V(fwd)	(	0.000	)...	1.300	V
2.	V(fwd)	(	0.000	)...	1.800	V
3.	V(br)		7.000	... (	15.000	)V
4.	I(OH)	(	0.00	)...	250.00	uA
5.	I(OH)	(	0:00	)...	50.00	nA
6.	CTR		40.0	... (	5000.0	)%
7.	V(sat)	(	0.000	)...	0.400	V

	91	92	93	94	95	96
1.1 [V]	1.070	1.056	1.066	1.063	1.064	1.065
2.1 [V]	1.278	1.263	1.272	1.258	1.251	1.257
3.1 [V]	12.587	12.586	12.587	12.586	12.587	12.587
4.1 [uA]	0.95	0.95	0.95	0.95	0.95	0.95
5.1 [nA]	0.05	0.05	0.05	0.05	0.10	0.05
6.1 [%]	188.7	139.6	142.9	154.8	148.1	143.6
7.1 [V]	0.033	0.032	0.037	0.034	0.034	0.034

	97	98	99	100	101	102
1.1 [V]	1.069	1.066	1.065	1.069	1.063	1.067
2.1 [V]	1.264	1.260	1.263	1.281	1.253	1.256
3.1 [V]	12.587	12.587	12.587	12.587	12.588	12.587
4.1 [uA]	0.85	0.90	0.90	0.90	1.00	0.95
5.1 [nA]	0.05	0.05	0.05	0.05	0.15	0.05
6.1 [%]	140.4	130.7	135.4	161.6	120.8	153.2
7.1 [V]	0.034	0.038	0.035	0.035	0.038	0.032

	103	104	105	106
1.1 [V]	1.065	1.065	1.065	1.066
2.1 [V]	1.257	1.256	1.250	1.253
3.1 [V]	12.587	12.587	12.587	12.588
4.1 [uA]	0.95	0.95	0.80	0.95
5.1 [nA]	0.05	0.05	0.05	0.05
6.1 [%]	146.8	135.3	145.7	135.2
7.1 [V]	0.034	0.035	0.034	0.036

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA06
RD235_3C91C_EMS_@_50_KRAD / 1.0 IR 17JUL97

Results file : RD235_3C91C_EMS_@_50_KRAD from: 23.07.97 / 11:09:01
Operator : PAUL RUSSELL
Part number : 3C91C
Lot number : RD235
Order number : D/C 9647B
Vendor : MITEL
: CONTROL 91 ; BIAS A 92-96, BIAS B 97-101, BIAS C 102-106
: EMS @ 50 KRAD
: 3C91 XM-PL-IGG-0011 ISS2 RAD / 1.0 IR 17JUL97

Test steps

1. V(fwd)	(	0.000	)...	1.300	V	
2. V(fwd)	(	0.000	)...	1.800	V	
3. V(br)		7.000	... (	15.000	)V	
4. I(OH)	(	0.00	)...	250.00	uA	
5. I(OH)	(	0.00	)...	50.00	nA	
6. CTR		40.0	... (	5000.0	)%	
7. V(sat)	(	0.000	)...	0.400	V	

	91	92	93	94	95	96
1.1 [V]	1.070	1.054	1.064	1.060	1.064	1.064
2.1 [V]	1.277	1.262	1.270	1.256	1.252	1.257
3.1 [V]	12.591	12.591	12.590	12.590	12.590	12.590
4.1 [uA]	0.95	0.95	1.00	0.95	0.95	0.95
5.1 [nA]	0.05	0.05	0.10	0.10	0.15	0.05
6.1 [%]	188.8	130.9	127.6	143.4	131.7	135.8
7.1 [V]	0.033	0.034	0.042	0.037	0.038	0.036

	97	98	99	100	101	102
1.1 [V]	1.067	1.064	1.063	1.068	1.061	1.064
2.1 [V]	1.263	1.259	1.262	1.282	1.252	1.255
3.1 [V]	12.590	12.591	12.590	12.590	12.590	12.590
4.1 [uA]	1.00	0.95	0.90	1.00	1.00	1.00
5.1 [nA]	0.05	0.05	0.10	0.05	0.05	0.05
6.1 [%]	130.9	119.0	122.9	147.5	109.4	142.9
7.1 [V]	0.035	0.040	0.038	0.037	0.041	0.033

	103	104	105	106
1.1 [V]	1.063	1.065	1.064	1.064
2.1 [V]	1.256	1.258	1.250	1.253
3.1 [V]	12.590	12.591	12.590	12.591
4.1 [uA]	1.00	1.00	1.00	1.00
5.1 [nA]	0.05	0.05	0.05	0.05
6.1 [%]	135.0	126.2	135.2	124.8
7.1 [V]	0.037	0.036	0.036	0.038

```
SZ-TESTSYSTEME  Statistics 03   Vers. 2.15  for TA06
RD235_3C91C_EMS_@_75_KRAD         / 1.0 IR 17JUL97
================================================================================
Results file    : RD235_3C91C_EMS_@_75_KRAD   from: 23.07.97 / 11:37:54
Operator        : PAUL RUSSELL
Part number     : 3C91C
Lot number      : RD235
Order number    : D/C 9647B
Vendor          : MITEL
                : CONTROL 91 ; BIAS A 92-96, BIAS B 97-101, BIAS C 102-106
                : EMS @ 75 KRAD
                : 3C91 XM-PL-IGG-0011 ISS2 RAD / 1.0 IR 17JUL97
--------------------------------------------------------------------------------
Test steps

  1. V(fwd)                          (     0.000 )...       1.300  V
  2. V(fwd)                          (     0.000 )...       1.800  V
  3. V(br)                                7.000  ... (    15.000 )V
  4. I(OH)                           (     0.00  )...     250.00   uA
  5. I(OH)                           (     0:00  )...      50.00   nA
  6. CTR                                 40.0    ... (  5000.0   )%
  7. V(sat)                          (     0.000 )...       0.400  V
--------------------------------------------------------------------------------
```

	91	92	93	94	95	96
1.1 [V]	1.070	1.051	1.064	1.060	1.063	1.063
2.1 [V]	1.278	1.260	1.272	1.258	1.252	1.257
3.1 [V]	12.593	12.593	12.594	12.593	12.593	12.593
4.1 [uA]	0.95	1016.60 F	0.95	0.95	1.00	0.95
5.1 [nA]	0.05	0.10	0.15	0.10	0.15	0.05
6.1 [%]	188.8	119.6	106.9	127.2	111.3	124.9
7.1 [V]	0.033	0.037	0.048	0.042	0.044	0.039

	97	98	99	100	101	102
1.1 [V]	1.066	1.062	1.060	1.066	1.059	1.060
2.1 [V]	1.263	1.259	1.261	1.281	1.252	1.251
3.1 [V]	12.594	12.594	12.593	12.594	12.593	12.593
4.1 [uA]	0.95	1.00	0.95	1.00	1.00	225.55
5.1 [nA]	0.05	0.05	0.10	0.05	0.05	0.05
6.1 [%]	119.8	104.4	107.5	129.6	95.3	129.8
7.1 [V]	0.038	0.045	0.042	0.042	0.045	0.036

	103	104	105	106	92
1.1 [V]	1.060	1.061	1.059	1.060	1.050
2.1 [V]	1.255	1.255	1.248	1.250	1.260
3.1 [V]	12.594	12.594	12.594	12.593	12.594
4.1 [uA]	0.95	0.95	1.00	0.95	1002.00 F
5.1 [nA]	0.05	0.05	0.05	0.10	0.10
6.1 [%]	119.5	115.6	122.5	112.0	120.0
7.1 [V]	0.041	0.038	0.038	0.042	0.037

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA06
RD235_3C91C_EMS_@_100_KRAD / 1.0 IR 17JUL97

Results file : RD235_3C91C_EMS_@_100_KRAD from: 23.07.97 / 13:01:41
Operator : PAUL RUSSELL
Part number : 3C91C
Lot number : RD235
Order number : D/C 9647B
Vendor : MITEL
: CONTROL 91 ; BIAS A 92-96, BIAS B 97-101, BIAS C 102-106
: EMS @ 100 KRAD
: 3C91C XM-PL-IGG-0011 ISS2 RAD / 1.0 IR 17JUL97

Test steps

1.	V(fwd)	(	0.000	)...	1.300	V
2.	V(fwd)	(	0.000	)...	1.800	V
3.	V(br)		7.000	... (	15.000	)V
4.	I(OH)	(	0.00	)...	250.00	uA
5.	I(OH)	(	0.00	)...	50.00	nA
6.	CTR		40.0	... (	5000.0	)%
7.	V(sat)	(	0.000	)...	0.400	V

	91	92	93	94	95	96
1.1 [V]	1.068	1.050	1.061	1.058	1.061	1.062
2.1 [V]	1.275	1.260	1.270	1.256	1.251	1.256
3.1 [V]	12.597	12.596	12.596	12.597	12.596	12.597
4.1 [uA]	1.00	992.55 F	1.00	0.95	1.05	1.15
5.1 [nA]	0.05	0.15	0.20	0.15	0.60	0.15
6.1 [%]	189.3	108.0	86.9	109.5	92.8	113.1
7.1 [V]	0.033	0.040	0.055	0.047	0.050	0.044

	97	98	99	100	101	102
1.1 [V]	1.064	1.058	1.058	1.064	1.056	1.060
2.1 [V]	1.262	1.257	1.260	1.281	1.251	1.253
3.1 [V]	12.597	12.597	12.596	12.597	12.597	12.597
4.1 [uA]	1.00	1.20	1.05	1.05	1.00	542.75 F
5.1 [nA]	0.10	0.15	0.15	0.15	0.15	0.10
6.1 [%]	108.5	89.1	91.4	110.4	80.5	116.9
7.1 [V]	0.041	0.050	0.048	0.048	0.051	0.038

	103	104	105	106
1.1 [V]	1.060	1.060	1.060	1.060
2.1 [V]	1.256	1.255	1.250	1.251
3.1 [V]	12.597	12.597	12.597	12.597
4.1 [uA]	1.00	706.45 F	1.05	1.00
5.1 [nA]	0.15	0.10	0.10	0.10
6.1 [%]	102.8	104.2	109.0	98.7
7.1 [V]	0.046	0.041	0.041	0.045

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA06
RD235_3C91C_POST_ANNEAL_EMS / 1.0 IR 17JUL97

Results file : RD235_3C91C_POST_ANNEAL_EMS from: 24.07.97 / 14:29:27
Operator : PAUL RUSSELL
Part number : 3C91C
Lot number : RD235
Order number : D/C 9647B
Vendor : MITEL
: CONTROL 91 ; BIAS A 92-96, BIAS B 97-101, BIAS C 102-106
: POST ANNEAL EMS
: 3C91 XM-PL-IGG-0011 ISS 2 RAD / 1.0 IR 17JUL97

Test steps

1. V(fwd)	(	0.000	)...	1.300		V
2. V(fwd)	(	0.000	)...	1.800		V
3. V(br)		7.000	... (	15.000	)	V
4. I(OH)	(	0.00	)...	250.00		uA
5. I(OH)	(	0.00	)...	50.00		nA
6. CTR		40.0	... (	5000.0	)	%
7. V(sat)	(	0.000	)...	0.400		V

	91	92	93	94	95	96
1.1 [V]	1.068	1.054	1.066	1.063	1.066	1.067
2.1 [V]	1.276	1.264	1.275	1.261	1.255	1.261
3.1 [V]	12.583	12.584	12.584	12.584	12.584	12.583
4.1 [uA]	0.85	0.90	0.80	0.80	0.85	0.85
5.1 [nA]	0.05	0.10	0.15	0.10	0.20	0.10
6.1 [%]	189.6	98.5	84.9	103.3	91.9	104.4
7.1 [V]	0.033	0.044	0.056	0.049	0.053	0.047

	97	98	99	100	101	102
1.1 [V]	1.067	1.062	1.061	1.066	1.060	1.063
2.1 [V]	1.265	1.261	1.263	1.283	1.253	1.256
3.1 [V]	12.584	12.584	12.582	12.583	12.584	12.583
4.1 [uA]	0.85	0.70	0.80	0.85	0.80	0.85
5.1 [nA]	0.05	0.10	0.10	0.10	0.10	0.05
6.1 [%]	97.8	80.1	82.1	99.1	72.1	105.9
7.1 [V]	0.045	0.053	0.051	0.051	0.054	0.042

	103	104	105	106
1.1 [V]	1.062	1.063	1.062	1.061
2.1 [V]	1.257	1.258	1.252	1.252
3.1 [V]	12.584	12.583	12.583	12.583
4.1 [uA]	0.80	0.90	0.85	0.85
5.1 [nA]	0.10	0.05	0.05	0.10
6.1 [%]	91.0	93.4	96.9	89.9
7.1 [V]	0.050	0.045	0.045	0.048

```
SZ-TESTSYSTEME  Statistics 03   Vers. 2.15  for TA06
RD235 3C91C FINAL EMS             / 1.0 IR 17JUL97
================================================================================
Results file    : RD235 3C91C FINAL EMS    from: 31.07.97 / 15:34:31
Operator        : PAUL RUSSELL
Part number     : 3C91C
Lot number      : RD235
Order number    : D/C 9647B
Vendor          : MITEL
                : CONTROL 91 ; BIAS A 92-96, BIAS B 97-101, BIAS C 102-106
                : FINAL EMS @ IGG
                : 3C91 XM-PL-IGG-0011 ISS 2 RAD / 1.0 IR 17JUL97
--------------------------------------------------------------------------------
Test steps

  1. V(fwd)                          (      0.000 )...        1.300  V
  2. V(fwd)                          (      0.000 )...        1.800  V
  3. V(br)                                 7.000   ... (     15.000 )V
  4. I(OH)                           (      0.00  )...      250.00   uA
  5. I(OH)                           (      0.00  )...       50.00   nA
  6. CTR                                  40.0     ... (   5000.0   )%
  7. V(sat)                          (      0.000 )...        0.400  V
--------------------------------------------------------------------------------
```

	91	92	93	94	95	96
1.1 [V]	1.074	1.063	1.074	1.071	1.074	1.074
2.1 [V]	1.281	1.268	1.278	1.265	1.258	1.263
3.1 [V]	12.581	12.581	12.580	12.580	12.581	12.580
4.1 [uA]	0.80	0.70	0.80	0.70	0.60	0.95
5.1 [nA]	0.00	0.05	0.10	0.05	0.05	0.05
6.1 [%]	188.2	85.8	94.5	101.5	97.0	88.6
7.1 [V]	0.032	0.050	0.059	0.055	0.056	0.057

	97	98	99	100	101	102
1.1 [V]	1.069	1.065	1.063	1.069	1.062	1.066
2.1 [V]	1.267	1.263	1.265	1.286	1.255	1.258
3.1 [V]	12.581	12.581	12.581	12.581	12.582	12.582
4.1 [uA]	0.80	0.75	0.75	0.65	0.80	0.75
5.1 [nA]	0.05	0.05	0.05	0.05	0.05	0.05
6.1 [%]	76.8	66.7	69.2	84.4	60.7	79.6
7.1 [V]	0.052	0.059	0.057	0.056	0.060	0.051

	103	104	105	106
1.1 [V]	1.064	1.066	1.065	1.066
2.1 [V]	1.259	1.260	1.254	1.256
3.1 [V]	12.581	12.581	12.581	12.581
4.1 [uA]	0.80	0.80	0.80	0.75
5.1 [nA]	0.05	0.05	0.05	0.05
6.1 [%]	74.3	68.9	75.6	70.8
7.1 [V]	0.057	0.054	0.054	0.056

IGG Component Technology Ltd

INTERNAL STOCK REQUEST NOTE

** TO : TOM ENGLER, IGG CORP. FAX No. .....

RAISED BY..ANNALI COURT..... SRN NUMBER...18911.....

DATE..20:6:97

TRANSFER FROM TASK No:...1500.... (** Held at CORP (CT)) TO..RON FIDLER...

ITEM	PART TYPE & SPECIFICATION/OPTION	LEVEL	QTY	RIR	D/C	PRE-CAP	DPA	NCR	MFR/C
150069	3C91C	—	16	78298	9647B	P50728	050871	—	MITEL
COMMENTS	FOR RADIATION TESTING IN ACCORDANCE WITH XM-PL-IGG-011								
COMMENTS									
COMMENTS									

** Delete as applicable