RIR IN:- 77177

RIR OUT:- 77177

PARTS HISTORY LOG

Radiation Testing

PROGRAMME:- XMM

PART TYPE:- 2N5154

RADIATION REPORT:- RD 220

IGG TASK NUMBER:- 1500

SUMMARY OF TEST RESULTS

This component showed a moderate drift in the h_{FE1} but no failures in this or any other parameters were recorded. All other parameters showed no significant drift over the 100kRad(Si) total dose.

Radiation Report Number:- RD 220

Project:- XMM

Part Type:- 2N5154 Date Code:- 9701

Manufacturer:- STM IGG Task No:- 1500

Project Approval of Lot Traveller:-

Signed...[signature]..... Date..22/4/97...

Position..Component Engineer..

Serial Number Range:-

161 through 174 (not inclusive)

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-0038 ISSUE- 2 DATE- Nov '96

Closed/Approved NCR No:- N

Approved Waiver No:- WAR N/A

Signed...[signature]..... Date..18/4/97..

Upscreening Engineer

Signed...[signature]..... Date..18/4/97..

Upscreening Manager

RADIATION REPORT NUMBER:- RD 220 DATE:- 17.4.97

PROJECT:- XMM RIR IN:- 77177

PART NUMBER:- 2N5154 MANUFACTURER:- STM

PROCUREMENT LEVEL:- ESA/SCC5203/010 DATE CODE:- 9701

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

TEST PLAN:- XM-PL-IGG-0038 ISSUE- 2 DATE- Nov '96

START QUANTITY:- 11

No.	Test (Sample Size)	XM-PL-IGG-0038 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 174	18/3/97	11	18/3/97	10 + CONTROL SAMPLE	IGG 16 CT
2	Initial Electrical Measurements (100% read and record)	Table A Testing at IGG	18/3/97	10	18/3/97	10	IGG 16 CT
3	Initial Electrical Measurements (100% read and record)	Table A Testing at ERA	19/3/97	10	19/3/97	10	IGG 16 CT
4	Set-up and apply Bias per Figure 1	Verify Bias Circuit and conditions (in-situ) for all 10 test samples	19/3/97	10	19/3/97	10	IGG 16 CT
5	Irradiation 1 (10 samples)	Dose= 10kRAD(Si) Rate= 10RAD(Si) per second Time= 1000secs	19/3/97	10	19/3/97	10	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	19/3/97	10	19/3/97	10	IGG 16 CT

Report No: RD 220	Part Type: 2N5154	Date: 17.4.97

No.	Test (Sample Size)	XM-PL-IGG-0038 Test Method and Conditions	Date in	Qty in	Date out	Qty out	SIGNED Op/QA
7	Irradiation 2 (10 samples)	As Test 5	19/3/97	10	19/3/97	10	IGG 16 CT
8	Interim 2 Electrical Measurements (100% read and record)	As Test 6	19/3/97	10	19/3/97	10	IGG 16 CT
9	Irradiation 3 (10 samples)	As Test 5	19/3/97	10	19/3/97	10	IGG 16 CT
10	Interim 3 Electrical Measurements (100% read and record)	As Test 6	19/3/97	10	19/3/97	10	IGG 16 CT
11	Irradiation 4 (10 samples)	Dose= 20kRAD(Si) Rate= 10RAD(Si) per second Time=2000secs	19/3/97	10	19/3/97	10	IGG 16 CT
12	Interim 4 Electrical Measurements (100% read and record)	As Test 6	19/3/97	10	19/3/97	10	IGG 16 CT
13	Irradiation 5 (10 samples)	Dose= 25kRAD(Si) Rate= 10RAD(Si) per second Time=2500secs	19/3/97	10	19/3/97	10	IGG 16 CT
14	Interim 5 Electrical Measurements (100% read and record)	As Test 6	19/3/97	10	19/3/97	10	IGG 16 CT
15	Irradiation 6 (10 samples)	As Test 13	19/3/97	10	19/3/97	10	IGG 16 CT

Report No: RD 220	Part Type: 2N5154	Date: 17.4.97

No.	Test (Sample Size)	XM-PL-IGG-0052 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 ERA	19/3/97	10	19/3/97	10	IGG 16 CT
17	Annealing Test (10 samples)	Bias for 24hrs min at +25°C (record exact time)	19/3/97	10	20/3/97	10	IGG 16 CT
18	Post Annealing Electrical Measurements (100% read and record)	Table A	20/3/97	10	20/3/97	10	IGG 16 CT
19	Accelerated Aging under bias (10 samples)	168 hours bias at +100±5°C	20/3/97	10	27/3/97	10	IGG 16 CT
20	Post Aging Electrical Measurements (100% read and record)	Table A	27/3/97	10	27/3/97	10	IGG 16 CT
21	Test Report Collation	[redacted]	[redacted]	[redacted]	18/4/97	[redacted]	IGG 2 CT
22	Test Report Approval	[redacted]	[redacted]	[redacted]	18/4/97	[redacted]	IGG 2 CT
23	NOTES:-						

Report No: RD 220 Part Type: 2N5154 Date: 17.4.97

FAILURE LIST AND APPLICABLE NCR

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

Report No: RD 220 Part Type: 2N5154 Date: 17.4.97

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	ERA's Facility	Irradiation	1 / 1 /1998
Item: SZ ATE System 2 Type No: M3000 Serial No: 884769	CT339	Electrical Test	28 / 3 /1997
Item: Farnell PSU Type No: E350 Serial No: 001161	CT358	PSU	- / - /199 N/A
Item: Thurlby DMM Type No: 1503-HA Serial No: B8825	CT139	DMM	5 / 9 /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 : 2N5154

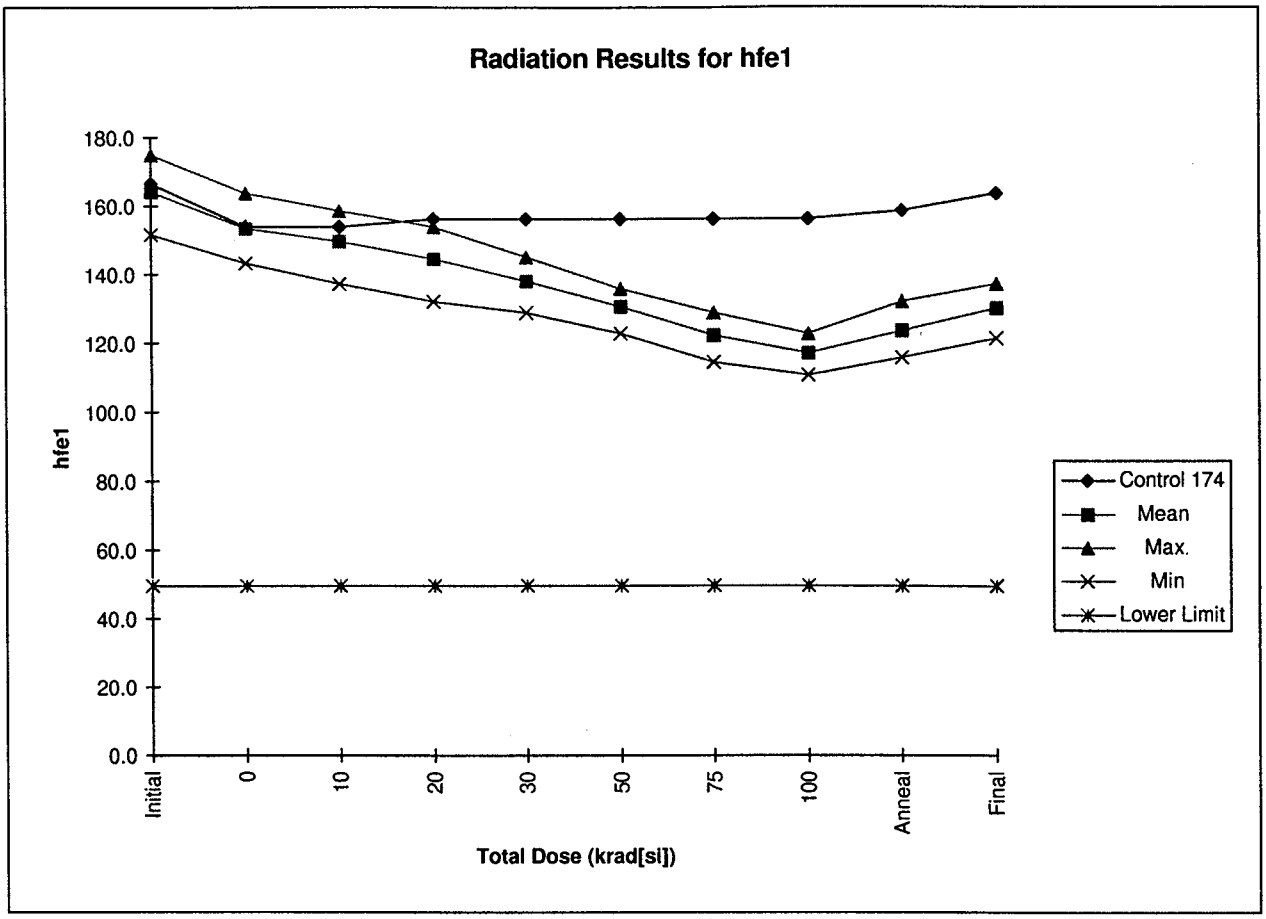
DESCRIPTION : HIGH POWER NPN TRANSISTOR

REPORT NO. : RD 220

PARAMETERS PLOTTED :

hfe1

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



Dose (kRad)	Control 174	Mean	Max	Min	Lower Limit	Upper Limit	Std.Dev.
Initial	166.4	164.3	175.0	151.7	50	-	6.95
0	153.9	153.6	163.8	143.2	50	-	7.07
10	153.9	149.8	158.7	137.4	50	-	7.34
20	156.3	144.5	153.9	132.1	50	-	6.68
30	156.3	138.0	145.2	128.8	50	-	5.65
50	156.3	130.6	135.6	122.6	50	-	4.63
75	156.3	122.5	128.8	114.4	50	-	4.55
100	156.3	117.4	122.6	110.7	50	-	4.81
Anneal	158.7	123.9	132.1	115.7	50	-	5.92
Final	163.8	130.1	137.4	121.2	50	-	5.17

Lot size for statistics : 10 devices

RD 220 Date code 9701

XMM RD220 RIR 77177	IRRADIATION TEST PLAN NO. XM-PL-IGG-0038 (1)	Issue No. 2 Date: November 1996 Page: 1/4 (2)

Component No. 520301002B (3)	Component Designation: Transistor, High Power, NPN, Type 2N5154 (4)	Irradiation Spec No. N/A Iss. Rev. (5)

Specification	Acceptance	Electrical Meas.	Project/Programme
Detail ESA/SCC 5203/010 Iss. 2D (6)	Evaluation ___ Element ___ Diffusion ___ Lot X (7)	In-situ ___ Remote X (8)	XMM (9)

Manufacturer: SGS Thomson Address: Avenue De Suisse BP 4199 35041 Rennes-Cedex FRANCE (10)	Test Facility: ERA Address: Leatherhead Surrey ENGLAND (11)	Originator: IGG CT Name: S. Thacker (12)

Radiation Source: COBALT 60 (13)	Sample Size: 10 Control Devices: 1 (14)	Exposure: Single ___ Multiple X (15)	Annealing Test: YES X NO ___ (16)	Radiation Level: 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

Bias Conditions:
Test Circuits: The Electrical Bias circuit is given in Figure 1 herein.

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 11 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 10 and the control unit shall be 11.
3	Initial Electrical Measurements (at IGG)	Per Table A herein - (Read and Record) - on all 11 parts at IGG. (See Remarks 1 and 2).
4	Initial Electrical Measurements (at ERA)	Per Table A herein - (Read and Record) - on all 11 parts at ERA. (See Remarks 1 and 2).

ST 6.11.96

Irradiation Test Sequence (Cont.) 21

Test Step	Description	Requirements
5	Set-up Test	Verify Bias Circuit and Voltages (In-situ) for 10 test units. (See Remark 3).
6	Irradiation Exposure	Verify radiation dose rate and position in the chamber to achieve required dose. 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. Test per Table A herein - (Read and Record) - on all 11 parts. Test to be performed immediately upon removal from chamber (less than 10 mins interval). Upon completion of test 10 test units shall be replaced in bias circuit and 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 upto 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 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 11 parts at IGG. (See Remark 2).
25	Accelerated Aging under Bias	Bias shall be maintained during Aging for 10 test units. Aging shall be at T_{amb} = +100±5°C for 168 hours. (See Remark 3).
26	Final Electrical Measurements (at IGG)	Per Table A herein - (Read and Record) - on all 11 parts at IGG (See Remark 2).
27	Total Dose Irradiation Test Report	ESA/SCC No. 22900.

Remarks 22

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 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.

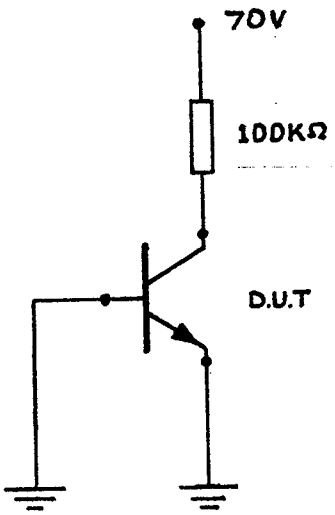
TABLE A - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - $T_{amb.} = +25 \pm 5°C$ BEFORE, AT INTERMEDIATE POINTS AND ON COMPLETION OF IRRADIATION

NO.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS MIN.	LIMITS MAX.	UNIT
1	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	3011	I_C = 100mA I_B = 0 (1)	80	-	V
2	Collector-emitter cut-off current	I_{CES}	3041	V_{CE} = 60V V_{BE} = 0	-	1	μA
3		I_{CEO}		V_{CE} = 40V I_B = 0	-	50	μA
4	Emitter-to-base cut-off current	I_{EBO1}	3061	V_{EB} = 5V I_C = 0	-	1	μA
5		I_{EBO2}		V_{EB} = 6V I_C = 0	-	1	mA
6	D.C. Forward current transfer ratio	h_{FE1}	3076	I_C = 50mA V_{CE} = 5V (1)	50	-	-
7		h_{FE2}		I_C = 2.5A V_{CE} = 5V (1)	70	200	-
8		h_{FE3}		I_C = 5A V_{CE} = 5V (1)	40	-	-
9	Collector Saturation Voltage	V_{CEsat1}	3071	I_C = 5A I_B = 0.5A (1) (2)	-	1.5	V
10		V_{CEsat2}		I_C = 2.5A I_B = 0.25A (1) (2)	-	1.45	V
11	Base Saturation Voltage	V_{BEsat1}	3066	I_C = 2.5A I_B = 0.25A (1) (2)	-	1.45	V
12		V_{BEsat2}		I_C = 5A I_B = 0.5A (1) (2)	-	2.2	V

NOTES:-

1. Pulse Measurement: Pulse length ≤ 300μs; Duty cycle ≤ 2%.
2. Saturation Voltages measured 6mm from header.

FIGURE 1 - ELECTRICAL BIAS CIRCUIT FOR IRRADIATION TESTING



SZ-TESTSYSTEME Statistics 03   Vers. 2.15 for TA07T
RD220_2N5154_INIT_EMS_@_IGG   / V 1.0 16-AUG-95 IR

Results file   : RD220_2N5154_INIT_EMS_@_IGG   from: 18.03.97 / 09:49:13
Operator   : PAUL RUSSELL
Part number   : 2N5154
Lot number   : RD220
Order number   : D/C 9701
Vendor   : SGS THOMSON
               : CONTROL 174 ; RAD 161-170
               : INITIAL EMS @ IGG
               : 2N5154 (SCC 5203.010) ISS 2D / V1.0 16-AUG-95 IR

Test steps

1.	-VCE0 (BR)		80.0	...	250.0	V
2.	-ICES	(	0	)...	1000	nA
3.	-ICE0	(	0.0	)...	50.0	uA
4.	-IEB0	(	0	)...	1000	nA
5.	-IEB0	(	0	)...	1000	uA
6.	hfe1 (DC)		50.0	...	500.0	
7.	hfe1 (DC)		70.0	...	200.0	
8.	hfe1 (DC)		40.0	...	500.0	
9.	-VCE (sat)		0.0	...	1500.0	mV
10.	VCE (sat)		0.0	...	1450.0	mV
11.	-VBE (sat)		0.0	...	1450.0	mV
12.	-VBE (sat)		0.0	...	2200.0	mV

	174	161	162	163	164	165
1.1 [V]	83.2	81.2	82.1	82.7	83.8	82.0
2.1 [nA]	1	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	0	0	0	0
5.1 [uA]	0	0	0	0	1	0
6.1 []	166.4	166.4	163.8	161.2	151.7	163.8
7.1 []	132.8	132.5	131.8	129.8	122.0	130.8
8.1 []	60.4	62.2	62.6	61.1	59.4	62.6
9.1 [mV]	391.0	391.7	386.6	392.4	377.3	383.6
10.1 [mV]	204.1	204.2	201.6	203.9	197.1	200.6
11.1 [mV]	901.6	903.7	906.2	906.3	904.5	904.2
12.1 [mV]	1014.1	1016.6	1018.6	1018.9	1015.3	1014.6

	166	167	168	169	170
1.1 [V]	82.2	83.0	83.5	81.7	82.7
2.1 [nA]	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	0	0	0
5.1 [uA]	1	0	0	0	0
6.1 []	175.0	169.2	156.3	163.8	172.0
7.1 []	137.1	133.8	124.1	129.1	135.3
8.1 []	61.9	61.1	58.7	61.5	61.1
9.1 [mV]	391.5	387.6	392.8	395.9	393.0
10.1 [mV]	204.1	201.7	204.9	205.6	204.5
11.1 [mV]	906.9	905.6	905.2	905.2	906.5
12.1 [mV]	1020.9	1016.8	1017.8	1018.6	1019.2

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD220_2N5154_INIT_EMS_@_ERA / V 1.0 16-AUG-95 IR

Results file : RD220_2N5154_INIT_EMS_@_ERA from: 19.03.97 / 10:33:12
Operator : PAUL RUSSELL
Part number : 2N5154
Lot number : RD220
Order number : D/C 9701
Vendor : SGS THOMSON
: CONTROL 174 ; RAD 161-170
: INITIAL EMS @ ERA
: 2N5154 9SCC 5203.010) ISS 2D / V1.0 16-AUG-95 IR

Test steps

1.	-VCE0 (BR)		80.0	...	250.0	V
2.	-ICES	(	0	)...	1000	nA
3.	-ICE0	(	0.0	)...	50.0	uA
4.	-IEB0	(	0	)...	1000	nA
5.	-IEB0	(	0	)...	1000	uA
6.	hfe1 (DC)		50.0	...	500.0	
7.	hfe1 (DC)		70.0	...	200.0	
8.	hfe1 (DC)		40.0	...	500.0	
9.	-VCE (sat)		0.0	...	1500.0	mV
10.	VCE (sat)		0.0	...	1450.0	mV
11.	-VBE (sat)		0.0	...	1450.0	mV
12.	-VBE (sat)		0.0	...	2200.0	mV

	174	161	162	163	164	165
1.1 [V]	83.2	81.5	82.7	83.0	83.9	82.2
2.1 [nA]	1	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	0	0	0	0
5.1 [uA]	0	0	0	1	1	1
6.1 []	153.9	156.3	153.9	151.7	143.2	151.7
7.1 []	123.5	124.4	125.0	123.5	116.5	123.8
8.1 []	60.4	62.2	62.6	61.1	59.0	62.6
9.1 [mV]	385.1	384.0	382.9	398.0	372.0	378.5
10.1 [mV]	200.2	199.0	198.9	206.7	194.6	197.1
11.1 [mV]	913.5	912.0	924.7	928.9	910.7	912.3
12.1 [mV]	1021.9	1022.3	1046.2	1053.0	1019.8	1021.3

	166	167	168	169	170
1.1 [V]	82.4	82.9	84.3	82.0	82.6
2.1 [nA]	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	1	0	0	0
5.1 [uA]	1	1	0	1	1
6.1 []	163.8	156.3	143.2	151.7	163.8
7.1 []	129.8	127.2	117.0	122.6	128.2
8.1 []	61.9	61.1	58.7	61.5	61.1
9.1 [mV]	386.8	382.5	385.9	389.6	384.5
10.1 [mV]	200.6	199.0	200.3	201.9	200.5
11.1 [mV]	915.1	913.2	912.7	922.6	923.4
12.1 [mV]	1026.7	1022.9	1024.6	1043.3	1044.8

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD220_2N5154_EMS_@_10_KRAD / V 1.0 16-AUG-95 IR

Results file : RD220_2N5154_EMS_@_10_KRAD from: 19.03.97 / 10:39:45
Operator : PAUL RUSSELL
Part number : 2N5154
Lot number : RD220
Order number : D/C 9701
Vendor : SGS THOMSON
: CONTROL 174 ; RAD 161-170
: EMS @ 10 KRAD
: 2N5154 (SCC 5203.101) ISS 2D / V1.0 16-AUG-95 IR

Test steps

1.	-VCE0 (BR)		80.0	...	250.0	V
2.	-ICES	(	0	)...	1000	nA
3.	-ICE0	(	0.0	)...	50.0	uA
4.	-IEB0	(	0	)...	1000	nA
5.	-IEB0	(	0	)...	1000	uA
6.	hfe1 (DC)		50.0	...	500.0	
7.	hfe1 (DC)		70.0	...	200.0	
8.	hfe1 (DC)		40.0	...	500.0	
9.	-VCE (sat)		0.0	...	1500.0	mV
10.	VCE (sat)		0.0	...	1450.0	mV
11.	-VBE (sat)		0.0	...	1450.0	mV
12.	-VBE (sat)		0.0	...	2200.0	mV

	174	161	162	163	164	165
1.1 [V]	83.2	81.7	82.6	82.7	84.1	82.1
2.1 [nA]	1	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	1	0	0	0	0	1
5.1 [uA]	0	1	0	0	1	0
6.1 []	153.9	151.7	147.3	151.7	137.4	147.3
7.1 []	124.7	123.5	123.8	124.4	115.2	123.8
8.1 []	60.4	61.9	61.9	60.8	58.7	61.9
9.1 [mV]	386.6	383.7	383.7	389.1	372.8	379.6
10.1 [mV]	200.7	199.9	199.4	202.1	195.2	197.7
11.1 [mV]	912.4	912.9	916.4	913.3	912.4	912.4
12.1 [mV]	1022.3	1023.1	1026.0	1024.3	1020.6	1021.0

	166	167	168	169	170
1.1 [V]	82.7	83.1	84.2	82.1	82.6
2.1 [nA]	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	1	0	0
5.1 [uA]	1	1	1	0	0
6.1 []	158.7	156.3	139.3	149.4	158.7
7.1 []	129.1	127.5	116.0	122.3	128.5
8.1 []	61.5	60.8	58.3	61.1	60.4
9.1 [mV]	388.2	385.7	382.7	391.5	388.7
10.1 [mV]	201.3	202.0	200.6	203.8	201.8
11.1 [mV]	923.7	911.9	924.2	923.4	912.2
12.1 [mV]	1047.5	1022.3	1045.3	1045.4	1024.2

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD220_2N5154_EMS_@_20_KRAD / V 1.0 16-AUG-95 IR

Results file : RD220_2N5154_EMS_@_20_KRAD from: 19.03.97 / 11:08:55
Operator : PAUL RUSSELL
Part number : 2N5154
Lot number : RD220
Order number : D/C 9701
Vendor : SGS THOMSON
: CONTROL 174 ; RAD 161-170
: EMS @ 20 KRAD
: 2N5154 (SCC 5203.010) ISS 2D / V1.0 16-AUG-95 IR

Test steps

1.	-VCE0 (BR)		80.0	...	250.0	V
2.	-ICES	(	0	)...	1000	nA
3.	-ICE0	(	0.0	)...	50.0	uA
4.	-IEB0	(	0	)...	1000	nA
5.	-IEB0	(	0	)...	1000	uA
6.	hfe1 (DC)		50.0	...	500.0	
7.	hfe1 (DC)		70.0	...	200.0	
8.	hfe1 (DC)		40.0	...	500.0	
9.	-VCE (sat)		0.0	...	1500.0	mV
10.	VCE (sat)		0.0	...	1450.0	mV
11.	-VBE (sat)		0.0	...	1450.0	mV
12.	-VBE (sat)		0.0	...	2200.0	mV

	174	161	162	163	164	165
1.1 [V]	83.1	82.0	82.9	83.2	84.4	82.4
2.1 [nA]	1	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	0	0	0	0
5.1 [uA]	0	0	1	0	0	0
6.1 []	156.3	145.2	143.2	145.2	132.1	143.2
7.1 []	125.0	121.5	122.0	121.2	113.4	121.5
8.1 []	60.4	61.5	61.9	60.4	58.3	61.5
9.1 [mV]	388.0	388.0	383.4	387.2	372.7	384.1
10.1 [mV]	202.4	200.9	199.7	201.6	195.0	199.3
11.1 [mV]	912.7	916.5	916.0	926.1	913.4	913.5
12.1 [mV]	1021.8	1028.5	1027.9	1048.8	1021.4	1025.8

	166	167	168	169	170
1.1 [V]	83.1	83.5	84.4	82.4	83.1
2.1 [nA]	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	0	0	1
5.1 [uA]	0	0	0	0	0
6.1 []	153.9	149.4	135.6	145.2	151.7
7.1 []	127.8	125.3	114.7	120.9	125.6
8.1 []	60.8	60.4	58.0	60.4	60.1
9.1 [mV]	387.9	386.2	386.2	395.4	389.0
10.1 [mV]	202.1	201.5	202.6	204.9	202.0
11.1 [mV]	914.3	913.6	913.7	912.0	914.7
12.1 [mV]	1025.7	1024.4	1023.9	1023.7	1027.1

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD220_2N5154_EMS_@_30_KRAD / V 1.0 16-AUG-95 IR

Results file : RD220_2N5154_EMS_@_30_KRAD from: 19.03.97 / 11:28:35
Operator : PAUL RUSSELL
Part number : 2N5154
Lot number : RD220
Order number : D/C 9701
Vendor : SGS THOMSON
: CONTROL 174 ; RAD 161-170
: EMS @ 30 KRAD
: 2N5154 (SCC 5203.010) ISS 2D / V1.0 16-AUG-95 IR

Test steps

1.	-VCE0 (BR)		80.0	...	250.0	V
2.	-ICES	(	0	)...	1000	nA
3.	-ICE0	(	0.0	)...	50.0	uA
4.	-IEB0	(	0	)...	1000	nA
5.	-IEB0	(	0	)...	1000	uA
6.	hfe1 (DC)		50.0	...	500.0	
7.	hfe1 (DC)		70.0	...	200.0	
8.	hfe1 (DC)		40.0	...	500.0	
9.	-VCE (sat)		0.0	...	1500.0	mV
10.	VCE (sat)		0.0	...	1450.0	mV
11.	-VBE (sat)		0.0	...	1450.0	mV
12.	-VBE (sat)		0.0	...	2200.0	mV

	174	161	162	163	164	165
1.1 [V]	83.1	82.0	83.0	83.5	84.8	82.9
2.1 [nA]	1	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	1	0	0	0	0	0
5.1 [uA]	1	0	0	0	1	0
6.1 []	156.3	141.2	137.4	137.4	128.8	137.4
7.1 []	125.0	118.9	120.3	118.9	111.4	118.7
8.1 []	60.4	61.1	61.1	60.1	58.0	61.1
9.1 [mV]	385.7	385.7	382.6	388.8	371.9	383.5
10.1 [mV]	201.8	200.9	199.4	201.9	195.0	198.5
11.1 [mV]	911.6	917.1	916.9	917.7	914.5	916.4
12.1 [mV]	1021.4	1027.5	1027.0	1029.1	1023.2	1026.5

	166	167	168	169	170
1.1 [V]	83.8	83.9	84.6	82.7	83.5
2.1 [nA]	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	0	0	0
5.1 [uA]	1	0	0	0	0
6.1 []	143.2	143.2	128.8	137.4	145.2
7.1 []	123.2	122.0	112.4	118.4	122.6
8.1 []	60.4	59.7	57.4	60.1	59.4
9.1 [mV]	388.7	390.7	387.8	391.7	386.5
10.1 [mV]	201.5	201.9	201.4	202.4	201.2
11.1 [mV]	929.3	928.4	916.2	924.8	915.9
12.1 [mV]	1052.2	1051.0	1027.0	1046.4	1026.5

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD220_2N5154_EMS_@_50_KRAD / V 1.0 16-AUG-95 IR

Results file : RD220_2N5154_EMS_@_50_KRAD from: 19.03.97 / 11:58:43
Operator : PAUL RUSSELL
Part number : 2N5154
Lot number : RD220
Order number : D/C 9701
Vendor : SGS THOMSON
: CONTROL 174 ; RAD 161-170
: EMS @ 50 KRAD
: 2N5154 (SCC 5203.010) ISS 2D / V1.0 16-AUG-95 IR

Test steps

1.	-VCE0 (BR)		80.0	...	250.0	V
2.	-ICES	(	0	)...	1000	nA
3.	-ICE0	(	0.0	)...	50.0	uA
4.	-IEB0	(	0	)...	1000	nA
5.	-IEB0	(	0	)...	1000	uA
6.	hfe1 (DC)		50.0	...	500.0	
7.	hfe1 (DC)		70.0	...	200.0	
8.	hfe1 (DC)		40.0	...	500.0	
9.	-VCE (sat)		0.0	...	1500.0	mV
10.	VCE (sat)		0.0	...	1450.0	mV
11.	-VBE (sat)		0.0	...	1450.0	mV
12.	-VBE (sat)		0.0	...	2200.0	mV

```
SZ-TESTSYSTEME  Statistics 03   Vers. 2.15  for TA07T
RD220_2N5154_EMS_@_75_KRAD        / V 1.0 16-AUG-95 IR
================================================================================
Results file    : RD220_2N5154_EMS_@_75_KRAD   from: 19.03.97 / 12:20:52
Operator        : PAUL RUSSELL
Part number     : 2N5154
Lot number      : RD220
Order number    : D/C 9701
Vendor          : SGS THOMSON
                : CONTROL 174 ; RAD 161-170
                : EMS @ 75 KRAD
                : 2N5154 (SCC 5203-010) ISS 2D / V1.0 16-AUG-95 IR
--------------------------------------------------------------------------------
Test steps

  1. -VCE0 (BR)                          80.0    ...     250.0    V
  2. -ICES                          (     0    )...    1000     nA
  3. -ICE0                          (     0.0  )...      50.0    uA
  4. -IEB0                          (     0    )...    1000     nA
  5. -IEB0                          (     0    )...    1000     uA
  6.  hfe1 (DC)                          50.0    ...     500.0
  7.  hfe1 (DC)                          70.0    ...     200.0
  8.  hfe1 (DC)                          40.0    ...     500.0
  9. -VCE (sat)                           0.0    ...    1500.0    mV
 10.  VCE (sat)                           0.0    ...    1450.0    mV
 11. -VBE (sat)                           0.0    ...    1450.0    mV
 12. -VBE (sat)                           0.0    ...    2200.0    mV
--------------------------------------------------------------------------------
```

	174	161	162	163	164	165
1.1 [V]	83.0	83.4	84.1	84.1	85.7	83.7
2.1 [nA]	1	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	0	0	0	0
5.1 [uA]	1	0	1	0	1	0
6.1 []	156.3	128.8	124.1	124.1	114.4	122.6
7.1 []	125.6	113.1	113.6	112.6	105.7	112.2
8.1 []	60.4	59.0	59.0	58.3	55.8	58.7
9.1 [mV]	388.5	386.9	382.9	387.3	371.8	379.5
10.1 [mV]	202.5	199.8	199.5	202.7	194.7	197.3
11.1 [mV]	911.3	917.8	929.3	919.3	925.4	926.3
12.1 [mV]	1022.0	1028.1	1049.9	1029.6	1043.2	1046.1

	166	167	168	169	170
1.1 [V]	85.3	85.1	85.6	83.7	84.8
2.1 [nA]	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	0	0	0
5.1 [uA]	1	0	0	0	0
6.1 []	119.7	125.6	115.7	124.1	125.6
7.1 []	113.4	114.9	106.8	112.4	114.7
8.1 []	57.0	57.4	55.5	58.0	57.0
9.1 [mV]	388.9	383.0	387.9	391.9	389.7
10.1 [mV]	202.2	199.3	201.4	202.9	202.8
11.1 [mV]	918.7	916.6	916.6	926.3	917.8
12.1 [mV]	1030.3	1026.0	1026.3	1046.4	1030.8

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD220_2N5154_EMS_@_100_KRAD / V 1.0 16-AUG-95 IR

Results file : RD220_2N5154_EMS_@_100_KRAD from: 19.03.97 / 13:11:17
Operator : PAUL RUSSELL
Part number : 2N5154
Lot number : RD220
Order number : D/C 9701
Vendor : SGS THOMSON
: CONTROL 174 ; RAD 161-170
: EMS @ 100 KRAD
: 2N5154 (SCC 5203.010) ISS 2D / V1.0 16-AUG-95 IR

Test steps

1.	-VCE0 (BR)		80.0	...	250.0	V
2.	-ICES	(	0	)...	1000	nA
3.	-ICE0	(	0.0	)...	50.0	uA
4.	-IEB0	(	0	)...	1000	nA
5.	-IEB0	(	0	)...	1000	uA
6.	hfe1 (DC)		50.0	...	500.0	
7.	hfe1 (DC)		70.0	...	200.0	
8.	hfe1 (DC)		40.0	...	500.0	
9.	-VCE (sat)		0.0	...	1500.0	mV
10.	VCE (sat)		0.0	...	1450.0	mV
11.	-VBE (sat)		0.0	...	1450.0	mV
12.	-VBE (sat)		0.0	...	2200.0	mV

	174	161	162	163	164	165
1.1 [V]	83.0	83.4	84.4	84.7	86.3	84.1
2.1 [nA]	1	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	0	0	0	0
5.1 [uA]	0	0	0	0	1	0
6.1 []	156.3	122.6	121.2	121.2	110.7	118.4
7.1 []	126.9	112.2	112.4	111.4	104.2	110.2
8.1 []	60.4	58.3	58.3	57.4	54.6	57.7
9.1 [mV]	389.8	386.2	384.2	388.7	375.2	380.3
10.1 [mV]	203.1	199.8	200.3	202.5	195.9	198.1
11.1 [mV]	911.2	917.1	917.3	917.9	923.8	914.8
12.1 [mV]	1022.0	1028.0	1027.3	1028.3	1042.6	1023.4

	166	167	168	169	170
1.1 [V]	86.3	85.6	86.3	84.1	85.7
2.1 [nA]	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	0	1	0
5.1 [uA]	0	0	0	1	0
6.1 []	110.7	118.4	110.7	121.2	118.4
7.1 []	109.7	112.4	105.0	110.9	112.4
8.1 []	55.2	56.1	54.3	57.0	55.8
9.1 [mV]	389.6	386.2	386.2	393.3	393.4
10.1 [mV]	202.4	200.1	200.9	204.1	204.4
11.1 [mV]	918.2	915.5	924.8	924.1	915.4
12.1 [mV]	1028.8	1026.2	1045.4	1043.2	1029.5

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD220_2N5154_POST_ANNEAL_EMS / V 1.0 16-AUG-95 IR

Results file : RD220_2N5154_POST_ANNEAL_EMS from: 20.03.97 / 13:17:43
Operator : PAUL RUSSELL
Part number : 2N5154
Lot number : RD220
Order number : D/C 9701
Vendor : SGS THOMSON
: CONTROL 174 ; RAD 161-170
: POST ANNEAL EMS
: 2N5154 (SCC 5203.010) ISS 2D / V1.0 16-AUG-95 IR

Test steps

1.	-VCE0 (BR)		80.0	...	250.0	V
2.	-ICES	(	0	)...	1000	nA
3.	-ICE0	(	0.0	)...	50.0	uA
4.	-IEB0	(	0	)...	1000	nA
5.	-IEB0	(	0	)...	1000	uA
6.	hfe1 (DC)		50.0	...	500.0	
7.	hfe1 (DC)		70.0	...	200.0	
8.	hfe1 (DC)		40.0	...	500.0	
9.	-VCE (sat)		0.0	...	1500.0	mV
10.	VCE (sat)		0.0	...	1450.0	mV
11.	-VBE (sat)		0.0	...	1450.0	mV
12.	-VBE (sat)		0.0	...	2200.0	mV

	174	161	162	163	164	165
1.1 [V]	83.0	83.4	84.3	84.7	86.1	84.1
2.1 [nA]	1	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	0	0	0	0
5.1 [uA]	0	0	0	0	0	0
6.1 []	158.7	132.1	128.8	128.8	115.7	125.6
7.1 []	127.8	117.0	117.8	116.5	108.1	114.9
8.1 []	60.4	58.0	58.3	57.0	54.6	57.4
9.1 [mV]	388.6	389.9	389.4	394.3	380.0	385.7
10.1 [mV]	203.5	203.2	203.0	205.6	199.4	201.7
11.1 [mV]	908.2	908.3	922.6	910.9	907.8	907.0
12.1 [mV]	1020.4	1021.0	1048.7	1023.9	1018.7	1019.3

	166	167	168	169	170
1.1 [V]	86.3	85.5	86.2	84.0	85.6
2.1 [nA]	1	1	1	1	1
3.1 [uA]	0.0	0.0	0.0	0.0	0.0
4.1 [nA]	0	0	0	0	0
5.1 [uA]	0	0	1	0	0
6.1 []	115.7	125.6	117.0	127.2	122.6
7.1 []	112.9	116.8	108.6	114.4	115.7
8.1 []	54.3	55.8	54.0	56.7	55.2
9.1 [mV]	393.6	395.7	393.9	401.4	394.5
10.1 [mV]	205.1	205.0	205.2	207.5	205.4
11.1 [mV]	920.1	909.9	918.4	918.3	907.9
12.1 [mV]	1044.2	1024.2	1043.1	1040.7	1022.4