RIR IN:- 78305

RIR OUT:- 78305

PARTS HISTORY LOG

Radiation Testing

PROGRAMME:- XMM

PART TYPE:- 2N2222A

RADIATION REPORT:- RD 229

IGG TASK NUMBER:- 1500

SUMMARY OF TEST RESULTS

This component showed a substantial drift in both h_{FE1} and h_{FE2} but no failures in these or any other parameters were recorded. All other parameters showed no significant drift over the 100kRad(Si) total dose. There was minimal difference in the results of the biased and unbiased tests.

Radiation Report Number:- RD 229

Project:- XMM

Part Type:- 2N2222A Date Code:- 9710

Manufacturer:- STM IGG Task No:- 1500

Project Approval of Lot Traveller:-

Signed.....N.Y.Arnold..... Date..15/6/97...

Position.Component Engineer

Serial Number Range:-

964 Control
965 through 975 (non inclusive-biased)
976 through 980 (inclusive-unbiased)

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-0041 ISSUE- 2 DATE- Nov '96

Closed/Approved NCR No:- N N/A

Approved Waiver No:- WAR N/A

Signed.....P.A.Mussell..... Date.18/7/97.

Upscreening Engineer

Signed.....D.G.O'Sullivan..... Date.18/7/97

Upscreening Manager

RADIATION REPORT NUMBER:- RD 229 DATE:- 2.7.97

PROJECT:- XMM RIR IN:- 78305

PART NUMBER:- 2N2222A MANUFACTURER:- STM

PROCUREMENT LEVEL:- ESA/SCC5201/002-02B DATE CODE:- 9710

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

TEST PLAN:- XM-PL-IGG-0041 ISSUE- 2 DATE- Nov '96

START QUANTITY:- 11

No.	Test (Sample Size)	XM-PL-IGG-0041 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 964		16/6/97	11	16/6/97	10 + CONTROL SAMPLE	IGG 16 CT
2	Initial Electrical Measurements (100% read and record)	Table A Testing at IGG		16/6/97	10	16/6/97	10	IGG 16 CT
3	Initial Electrical Measurements (100% read and record)	Table A Testing at ERA UB=Unbiased B=Biased	UB	17/6/97	5	17/6/97	5	IGG 16 CT
			B	17/6/97	5	17/6/97	5	IGG 16 CT
4	Set-up and apply Bias per Figure 1	Verify Bias Circuit and conditions (in-situ) for the 5 biased test samples	UB	18/6/97	5	18/6/97	5	IGG 16 CT
			B	18/6/97	5	18/6/97	5	IGG 16 CT
5	Irradiation 1 (10 samples)	Dose=10kRADSi Rate= 10RADSi per second Time= 1000sec	UB	18/6/97	5	18/6/97	5	IGG 16 CT
			B	18/6/97	5	18/6/97	5	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	UB	18/6/97	5	18/6/97	5	IGG 16 CT
			B	18/6/97	5	18/6/97	5	IGG 16 CT

Report No: RD 229	Part Type: 2N2222A	Date: 2.7.97

No.	Test (Sample Size)	XM-PL-IGG-0041 Test Method and Conditions		Date in	Qty in	Date out	Qty out	SIGNED Op/QA
7	Irradiation 2 (10 samples)	As Test 5	UB	18/6/97	5	18/6/97	5	
			B	18/6/97	5	18/6/97	5	
8	Interim 2 Electrical Measurements (100% read and record)	As Test 6	UB	18/6/97	5	18/6/97	5	
			B	18/6/97	5	18/6/97	5	
9	Irradiation 3 (10 samples)	As Test 5	UB	18/6/97	5	18/6/97	5	
			B	18/6/97	5	18/6/97	5	
10	Interim 3 Electrical Measurements (100% read and record)	As Test 6	UB	18/6/97	5	18/6/97	5	
			B	18/6/97	5	18/6/97	5	
11	Irradiation 4 (10 samples)	Dose=20kRADSi Rate= 10RADSi per second Time=2000secs	UB	18/6/97	5	18/6/97	5	
			B	18/6/97	5	18/6/97	5	
12	Interim 4 Electrical Measurements (100% read and record)	As Test 6	UB	18/6/97	5	18/6/97	5	
			B	18/6/97	5	18/6/97	5	
13	Irradiation 5 (10 samples)	Dose=25kRADSi Rate= 10RADSi per second Time=2500secs	UB	18/6/97	5	18/6/97	5	
			B	18/6/97	5	18/6/97	5	
14	Interim 5 Electrical Measurements (100% read and record)	As Test 6	UB	18/6/97	5	18/6/97	5	
			B	18/6/97	5	18/6/97	5	

Report No: RD 229	Part Type: 2N2222A	Date: 2.7.97

No.	Test (Sample Size)	XM-PL-IGG-0041 Test Method and Conditions		Date in	Qty in	Date out	Qty out	SIGNED Op/QA
15	Irradiation 6 (10 samples)	As Test 13	UB	18/6/97	5	18/6/97	5	
			B	18/6/97	5	18/6/97	5	
16	Final Electrical Measurements (100% read and record)	As Test 6 At ERA	UB	18/6/97	5	18/6/97	5	
			B	18/6/97	5	18/6/97	5	
17	Annealing Test (10 samples)	UB or B-24hr min at +25°C (record exact time)	UB	18/6/97	5	19/6/97	5	
			B	18/6/97	5	19/6/97	5	
18	Post Annealing Electrical Measurements (100% read and record)	Table A	UB	19/6/97	5	19/6/97	5	
			B	19/6/97	5	19/6/97	5	
19	Accelerated Aging under bias (10 samples)	168 hours at +100±5°C unbiased or biased	UB	19/6/97	5	26/6/97	5	
			B	19/6/97	5	26/6/97	5	
20	Post Aging Electrical Measurements (100% read and record)	Table A	UB	26/6/97	5	26/6/97	5	
			B	26/6/97	5	26/6/97	5	
21	Test Report Collation	[redacted]		[redacted]	[redacted]	18/7/97	[redacted]	
22	Test Report Approval	[redacted]		[redacted]	[redacted]	18/7/97	[redacted]	
23	NOTES:-							

Report No: RD 229 Part Type: 2N2222A Date: 2.7.97

FAILURE LIST AND APPLICABLE NCR

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

Report No: RD 229 Part Type: 2N2222A Date: 2.7.97

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 Type No: M3000 Serial No: 884769	CT339	ATE	27 / 9 /1997
Item: KEITHLEY Type No: 2000 Serial No: 0600910	CT384	DMM	12 / 12 /1997
Item: FARNELL Type No: LT30 Serial No: 008969	CT140	PSU	- / - /199 - N/A
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 : 2N2222A

DESCRIPTION : LOW POWER NPN TRANSISTOR

REPORT NO. : RD 229

PARAMETERS PLOTTED :

hFE1
hFE2

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

e: 2.7.97

Calibration Due
1 / 1 /1998
27 / 9 /1997
12 / 12 /1997
– / – /199 – N/A
/ /199
/ /199
/ /199
/ /199
/ /199
/ /199
/ /199
/ /199

RADIATION TEST SUMMARY

PART TYPE : 2N2222A

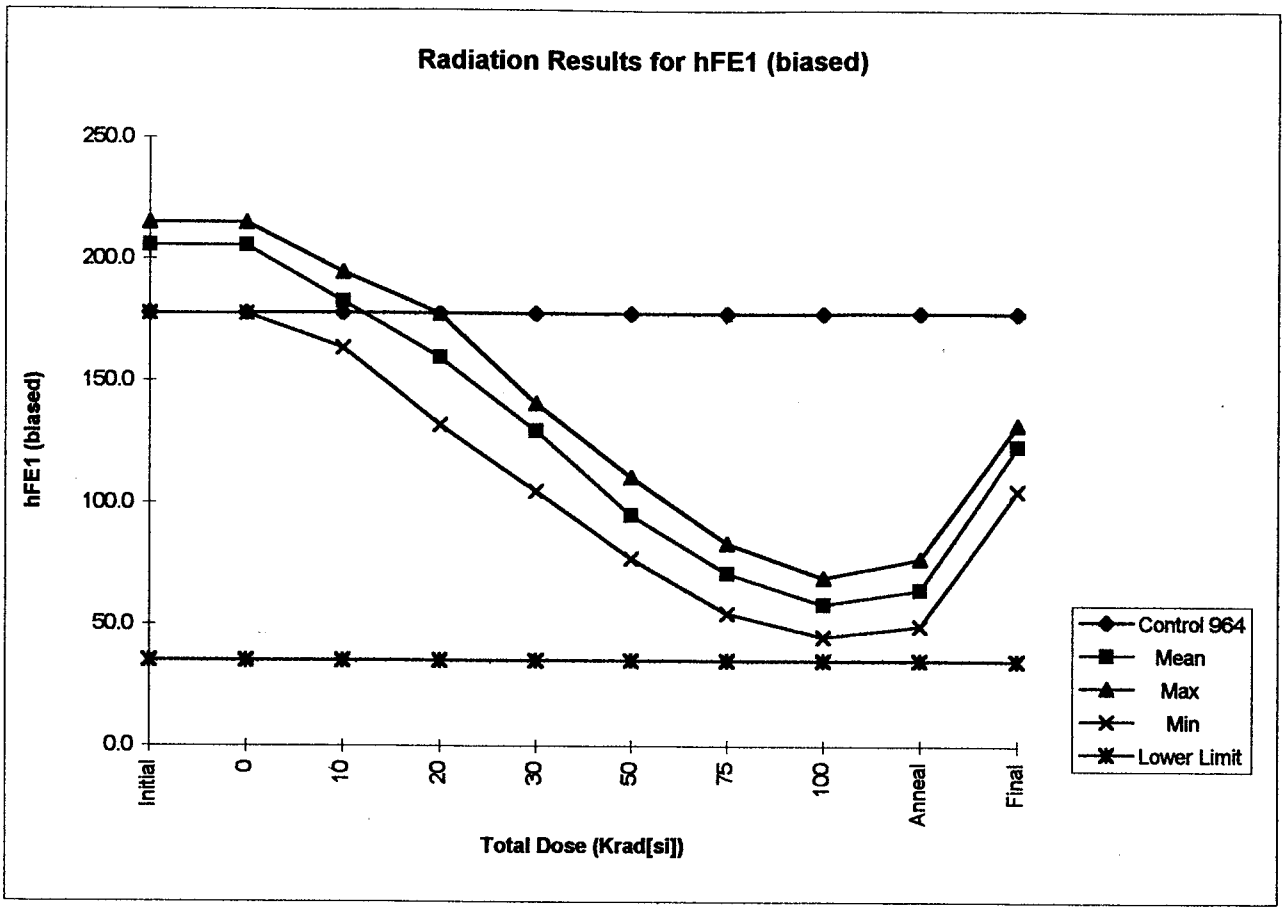
DESCRIPTION : LOW POWER NPN TRANSISTOR

REPORT NO. : RD 229

PARAMETERS PLOTTED :

hFE1
hFE2

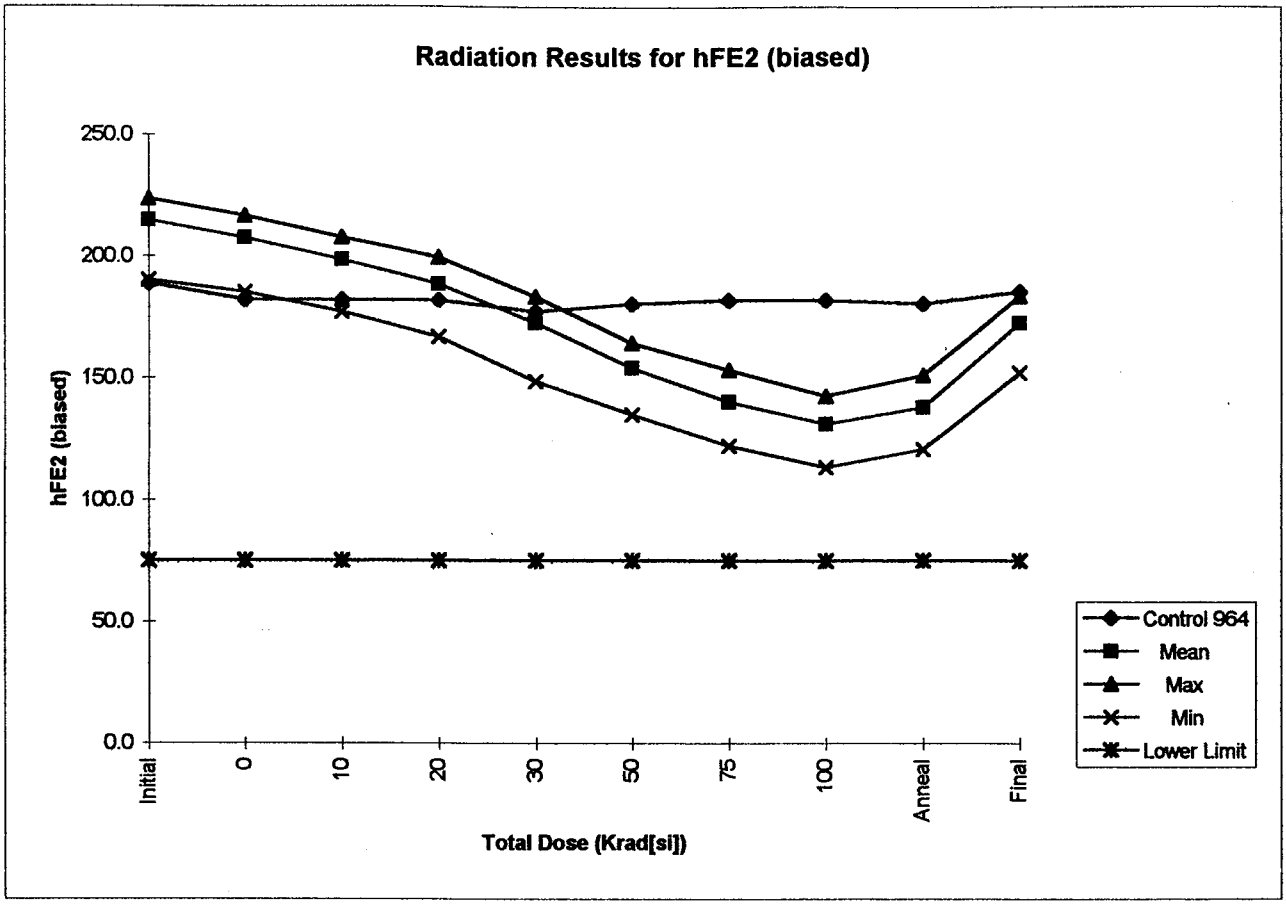
NOTE : The results for the remaining parameters showed no significant change and hence plots were not considered necessary.



Dose (kRad)	Control 964	Mean	Max	Min	Lower Limit	Upper Limit	Std.Dev.
Initial	177.8	205.8	215.1	177.8	35	-	18.65
0	177.8	205.8	215.1	177.8	35	-	18.65
10	177.8	182.7	194.7	163.6	35	-	15.02
20	177.8	159.8	177.8	132.0	35	-	22.28
30	177.8	129.7	141.0	104.9	35	-	17.09
50	177.8	95.0	110.6	77.2	35	-	15.50
75	177.8	71.2	83.5	54.6	35	-	14.67
100	177.8	58.3	69.4	45.0	35	-	11.83
Anneal	177.8	64.3	77.2	49.3	35	-	13.67
Final	177.8	123.2	132.0	104.9	35	-	12.79

Lot size for statistics : 5 devices

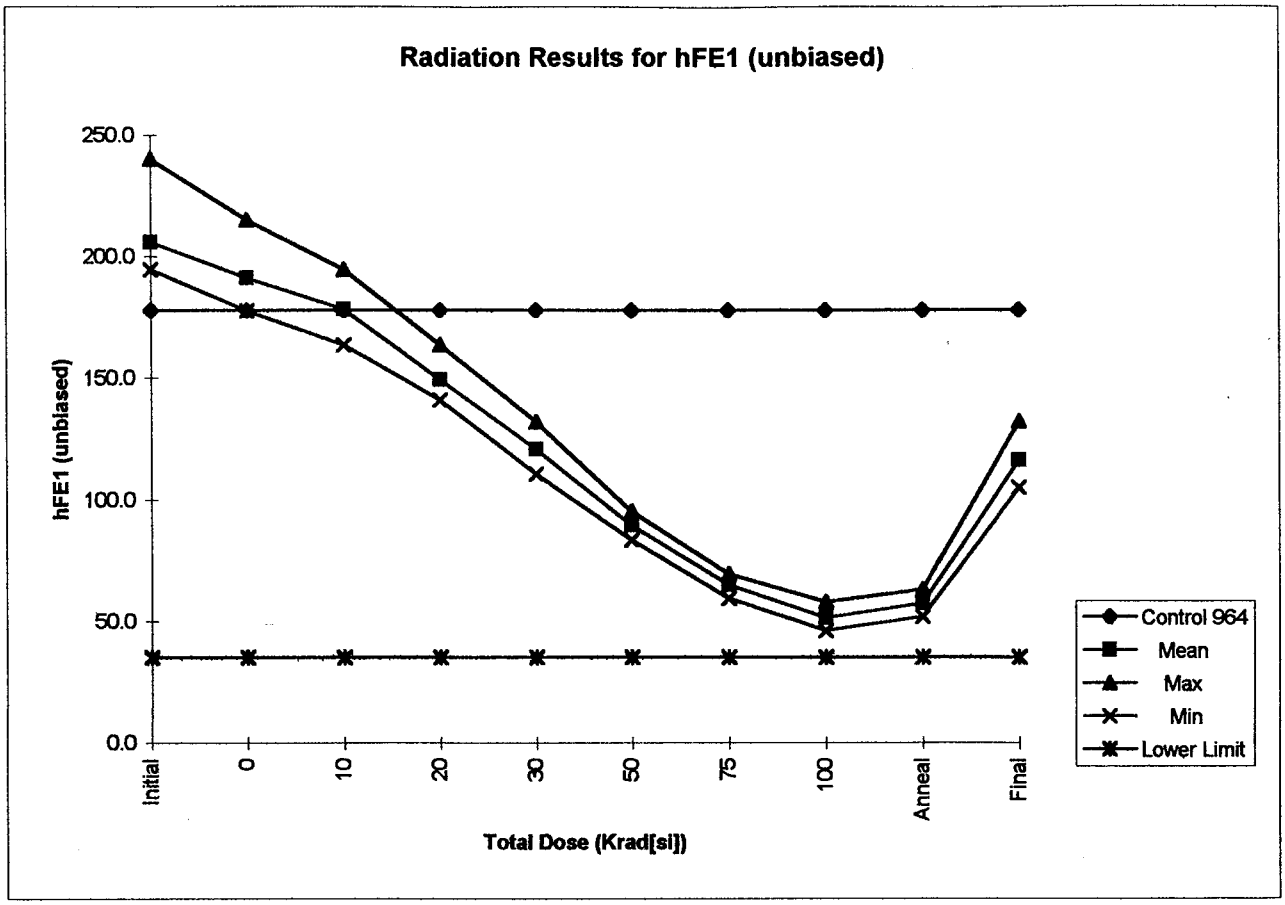
RD 229 Date code 9710



Dose (kRad)	Control 964	Mean	Max	Min	Lower Limit	Upper Limit	Std.Dev.
Initial	188.7	214.9	223.8	190.5	75	-	16.29
0	182.0	207.7	216.7	185.3	75	-	15.10
10	182.0	198.7	207.9	177.3	75	-	14.56
20	182.0	188.9	199.8	167.2	75	-	15.37
30	177.3	173.0	183.6	148.9	75	-	16.47
50	180.4	154.4	164.5	135.2	75	-	13.83
75	182.0	140.3	153.4	122.3	75	-	13.42
100	182.0	131.3	142.7	113.4	75	-	13.25
Anneal	180.4	138.1	151.1	120.8	75	-	14.07
Final	185.3	172.7	183.6	152.2	75	-	14.44

Lot size for statistics : 5 devices

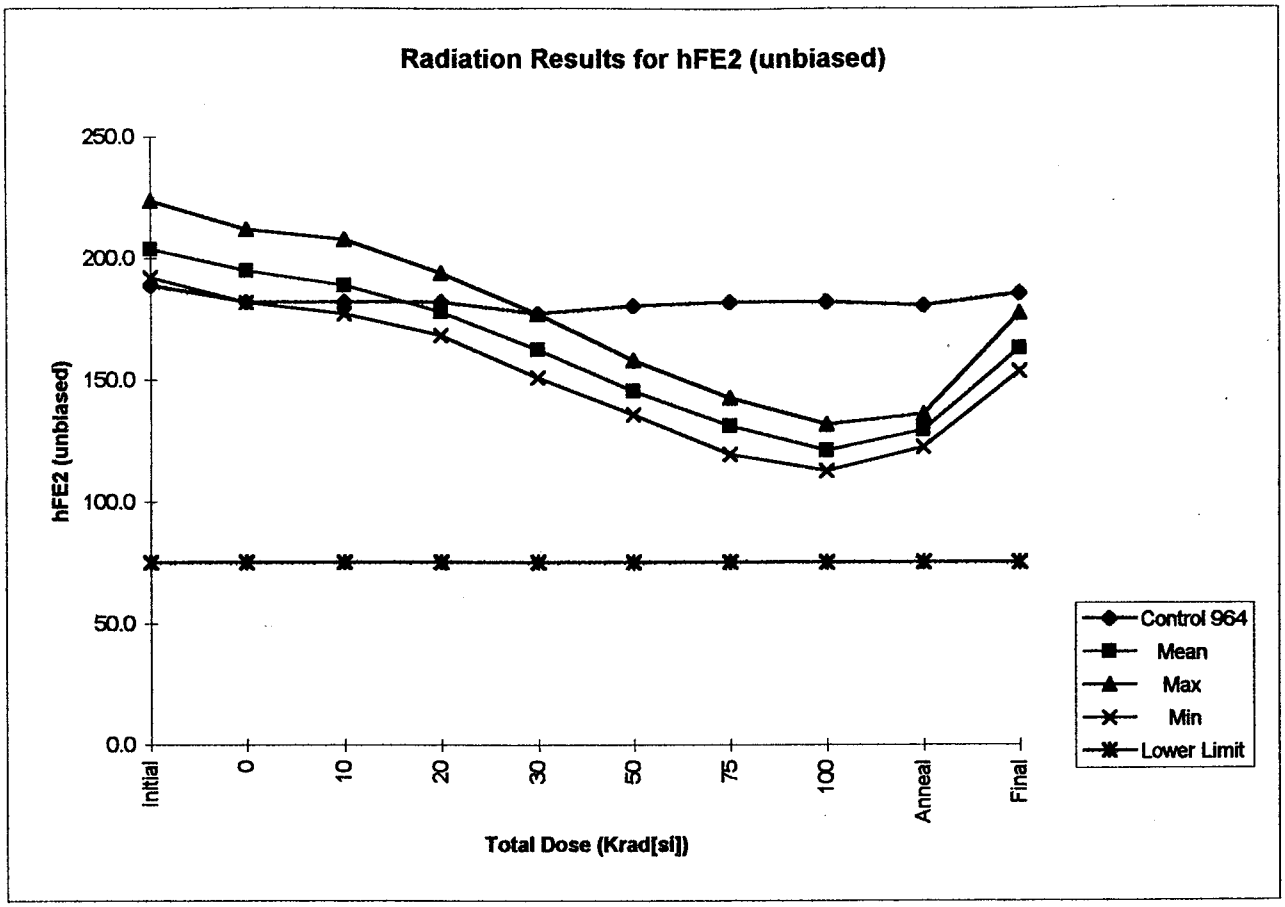
RD 229 Date code 9710



Dose (kRad)	Control 964	Mean	Max	Min	Lower Limit	Upper Limit	Std.Dev.
Initial	177.8	206.1	240.4	194.7	35	-	22.85
0	177.8	191.4	215.1	177.8	35	-	17.72
10	177.8	178.5	194.7	163.6	35	-	12.72
20	177.8	149.3	163.6	141.0	35	-	10.76
30	177.8	120.9	132.0	110.6	35	-	9.22
50	177.8	89.4	95.2	83.5	35	-	6.75
75	177.8	64.8	69.4	59.3	35	-	5.36
100	177.8	51.3	57.7	46.0	35	-	5.24
Anneal	177.8	57.3	63.0	51.8	35	-	5.60
Final	177.8	116.1	132.0	104.9	35	-	11.68

Lot size for statistics : 5 devices

RD 229 Date code 9710



Dose (kRad)	Control 964	Mean	Max	Min	Lower Limit	Upper Limit	Std.Dev.
Initial	188.7	203.9	223.8	192.3	75	-	14.08
0	182.0	195.2	212.2	182.0	75	-	12.73
10	182.0	189.0	207.9	177.3	75	-	13.26
20	182.0	178.2	194.1	168.5	75	-	11.07
30	177.3	162.7	177.3	151.1	75	-	10.84
50	180.4	145.7	158.1	136.1	75	-	9.15
75	182.0	131.2	142.7	119.4	75	-	9.57
100	182.0	121.1	131.7	112.8	75	-	8.09
Anneal	180.4	129.4	136.1	122.3	75	-	5.88
Final	185.3	163.0	177.3	153.4	75	-	10.14

Lot size for statistics : 5 devices

RD 229 Date code 9710

XMM RD229 RIR 78305	IRRADIATION TEST PLAN NO. XM-PL-IGG-0041 1	Issue No. 2 Date: November 1996 Page: 1/4 2

Component No. 520100202B 3	Component Designation: Transistor, Low Power, NPN, Type 2N2222A 4	Irradiation Spec No. N/A Iss. Rev. 5

Specification	Acceptance	Electrical Meas.	Project/Programme
Detail ESA/SCC 5201/002 Iss.3D 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:	Sample Size: 10	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:

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

19

Bias Requirements: During and after Exposure (for remote electrical measurements): YES (for 5 biased test units)

Bias Conditions:

Test Circuits: The Electrical Bias circuit for the 5 biased test units is 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 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 5 (unbiased test units), 6 to 10 (biased test units) 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).

S.T. 6.11.96

Irradiation Test Sequence (Cont.) 21

Test Step	Description	Requirements
5	Set-up Test	Verify Bias Circuit and Voltages (In-situ) for 5 biased test units. (See Remark 3).
6	Irradiation Exposure	Verify radiation dose rate and position in the chamber to achieve required dose for all 10 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 5 biased test units. 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 5 biased test units shall be replaced in bias circuit and all 10 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 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 5 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 11 parts at IGG. (See Remark 2).
25	Accelerated Aging (under Bias)	Bias shall be maintained during Aging for 5 biased test units. Aging shall be at T_{amb} = +100±5°C for 168 hours for all 10 test units. (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 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

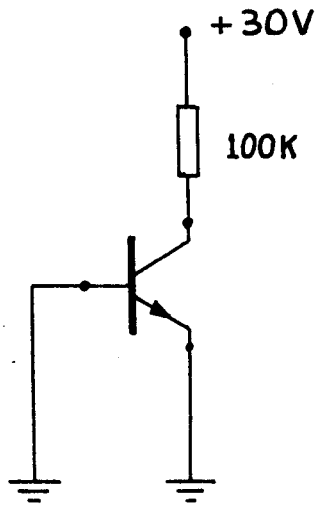
NO.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$	3001	I_C = 100μA	75	-	V
2	Collector-to-Emitter Breakdown Voltage	$V_{(BR)CEO}$	3011	I_C = 30mA	40	-	V
3	Emitter to Base Breakdown Voltage	$V_{(BR)EBO}$	3026	I_E = 100μA	6.0	-	V
4	Collector Cut-off Current	I_{CBO}	3036	V_{CB} = 60V	-	10	nA
5	Emitter Base Cut-off Current	I_{EBO}	3061	V_{EB} = 3V	-	10	nA
6	Collector Emitter (Saturated) Voltage	V_{CEsat}	3071	I_C = 150mA I_B = 15mA See Note 1	-	0.3	V
7	Base Emitter (Saturated) Voltage	V_{BEsat}	3066	I_C = 150mA I_B = 15mA See Note 1	-	1.2	V
8	D.C. Forward Current Transfer Ratio 1	h_{FE1}	3076	I_C = 100μA V_{CE} = 10V	35	-	-
9	D.C. Forward Current Transfer Ratio 2	h_{FE2}	3076	I_C = 10mA V_{CE} = 10V	75	-	-
10	D.C. Forward Current Transfer Ratio 3	h_{FE3}	3076	I_C = 150mA V_{CE} = 10V See Note 1	100	300	-
11	D.C. Forward Current Transfer Ratio 4	h_{FE4}	3076	I_C = 500mA V_{CE} = 10V See Note 1	40	-	-

NOTES:-

1. Pulse Measurement: Pulse length ≤ 300μs; Duty cycle ≤ 1%

FIGURE 1 - ELECTRICAL BIAS CIRCUIT FOR IRRADIATION TESTING

A) Biased Condition (5 Test Units)



B) Unbiased Condition (5 Test Units)

Device is unbiased with all leadouts open circuit.

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD229_2N2222A_INIT_EMS_@_I66 / V1.0 16/6/97 PAR

Results file : RD229_2N2222A_INIT_EMS_@_I66 from: 16.06.97 / 14:22:50
Operator : PAUL RUSSELL
Part number : 2N2222A
Lot number : RD229
Order number : D/C 9710
Vendor : SGS THOMSON
: CONTROL 964 ; 965,966,973-975 BIASED ; 976-980 UNBIASED
: INITIAL EMS @ I66
: 2N2222A XM-PL-I66-0041 ISS 2 / V1.0 16/6/97 PAR

Test steps

1.	VCB0		75.0	...	700.0	V
2.	VCE0 (BR)		40.0	...	700.0	V
3.	VEB0		6000	...	15000	mV
4.	ICB0	(	0.0	)...	10.0	nA
5.	-IEB0	(	0.0	)...	10.0	nA
6.	-VCE (sat)		0.0	...	300.0	mV
7.	-VBE (sat)		0.0	...	1200.0	mV
8.	hfe1 (DC)		35.0	...	200000.0	
9.	hfe1 (DC)		75.0	...	200000.0	
10.	hfe1 (DC)		100	...	300	
11.	hfe1 (DC)		40.0	...	200000.0	

	964	965	966	973	974	975
1.1 [V]	132.7	134.4	134.0	134.6	134.0	133.1
2.1 [V]	60.9	54.2	56.0	54.6	61.4	54.1
3.1 [mV]	7835	7832	7827	7849	7833	7797
4.1 [nA]	0.3	0.3	0.3	0.3	0.3	0.3
5.1 [nA]	0.1	0.1	0.1	0.1	0.1	0.1
6.1 [mV]	105.1	104.9	106.1	104.5	105.5	104.4
7.1 [mV]	848.9	849.2	850.2	846.3	849.4	847.8
8.1 []	177.8	215.1	215.1	215.1	177.8	215.1
9.1 []	188.7	223.8	223.8	221.4	190.5	221.4
10.1 []	154	200	200	199	179	198
11.1 []	106.1	115.7	115.7	113.1	107.2	115.7

	976	977	978	979	980
1.1 [V]	133.5	133.2	134.1	133.5	135.6
2.1 [V]	60.7	61.3	61.4	54.9	61.5
3.1 [mV]	7843	7798	7831	7845	7850
4.1 [nA]	0.3	0.3	0.3	0.3	0.3
5.1 [nA]	0.1	0.1	0.1	0.1	0.2
6.1 [mV]	106.1	105.7	106.7	105.5	105.9
7.1 [mV]	848.8	850.1	848.9	849.3	848.6
8.1 []	194.7	194.7	194.7	240.4	177.8
9.1 []	203.7	192.3	195.9	223.8	192.3
10.1 []	187	180	160	201	156
11.1 []	109.5	107.2	107.2	114.4	106.1

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD229_2N2222A_INIT_EMS_@_ERA / V1.0 16/6/97 PAR

Results file : RD229_2N2222A_INIT_EMS_@_ERA from: 17.06.97 / 12:04:06
Operator : PAUL RUSSELL
Part number : 2N2222A
Lot number : RD229
Order number : D/C 9710
Vendor : SGS THOMSON
: CONTROL 964 ; 965,966,973-975 BIASED ; 976-980 UNBIASED
: INITIAL EMS @ ERA
: 2N2222A XM-PL-IGG-0041 ISS 2 / V1.0 16/6/97 PAR

Test steps

1.	VCB0			75.0	...	700.0	V
2.	VCE0 (BR)			40.0	...	700.0	V
3.	VEB0			6000	...	15000	mV
4.	ICB0	(	0.0	) ...		10.0	nA
5.	-IEB0	(	0.0	) ...		10.0	nA
6.	-VCE (sat)			0.0	...	300.0	mV
7.	-VBE (sat)			0.0	...	1200.0	mV
8.	hfe1 (DC)			35.0	...	200000.0	
9.	hfe1 (DC)			75.0	...	200000.0	
10.	hfe1 (DC)			100	...	300	
11.	hfe1 (DC)			40.0	...	200000.0	

	964	965	966	973	974	975
1.1 [V]	132.6	133.7	133.5	133.7	133.5	133.7
2.1 [V]	61.0	54.2	56.6	54.6	61.8	55.0
3.1 [mV]	7813	7804	7802	7815	7809	7772
4.1 [nA]	0.3	0.3	0.3	0.3	0.3	0.3
5.1 [nA]	0.0	0.1	0.0	0.1	0.0	0.1
6.1 [mV]	103.9	104.2	105.3	102.5	104.6	103.8
7.1 [mV]	857.1	857.9	857.3	857.3	857.3	856.9
8.1 []	177.8	215.1	215.1	215.1	177.8	215.1
9.1 []	182.0	216.7	216.7	212.2	185.3	214.4
10.1 []	149	167	167	165	151	191
11.1 []	106.1	115.7	114.4	111.9	106.1	114.4

	976	977	978	979	980
1.1 [V]	133.3	133.5	133.6	133.7	133.7
2.1 [V]	61.3	61.3	61.6	55.1	61.7
3.1 [mV]	7811	7774	7800	7827	7822
4.1 [nA]	0.3	0.3	0.3	0.3	0.3
5.1 [nA]	0.0	0.1	0.0	0.0	0.1
6.1 [mV]	105.1	104.7	105.5	104.2	104.6
7.1 [mV]	857.6	856.7	857.2	858.3	856.8
8.1 []	194.7	177.8	177.8	215.1	177.8
9.1 []	195.9	182.0	190.5	212.2	185.3
10.1 []	156	151	160	194	151
11.1 []	108.3	106.1	106.1	113.1	105.0

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD229_2N2222A_EMS_@_10_KRAD / V1.0 16/6/97 PAR

Results file : RD229_2N2222A_EMS_@_10_KRAD from: 18.06.97 / 10:17:18
Operator : PAUL RUSSELL
Part number : 2N2222A
Lot number : RD229
Order number : D/C 9710
Vendor : SGS THOMSON
: CONTROL 964 ; 965,966,973-975 BIASED ; 976-980 UNBIASED
: EMS @ 10 KRAD
: 2N2222A XM-PL-IGG-0041 ISS 2 / V1.0 16/6/97 PAR

Test steps

1.	VCB0		75.0	...	700.0	V
2.	VCE0 (BR)		40.0	...	700.0	V
3.	VEB0		6000	...	15000	mV
4.	ICB0	(	0.0	)...	10.0	nA
5.	-IEB0	(	0.0	)...	10.0	nA
6.	-VCE (sat)		0.0	...	300.0	mV
7.	-VBE (sat)		0.0	...	1200.0	mV
8.	hfe1 (DC)		35.0	...	200000.0	
9.	hfe1 (DC)		75.0	...	200000.0	
10.	hfe1 (DC)		100	...	300	
11.	hfe1 (DC)		40.0	...	200000.0	

	964	965	966	973	974	975
1.1 [V]	131.9	125.9	126.2	126.0	124.8	125.7
2.1 [V]	60.9	54.5	57.8	55.1	62.3	56.2
3.1 [mV]	7809	7800	7802	7811	7808	7768
4.1 [nA]	0.2	0.2	0.2	0.2	0.2	0.2
5.1 [nA]	0.0	0.0	0.0	0.0	0.0	0.0
6.1 [mV]	103.7	103.3	104.4	102.7	104.1	103.2
7.1 [mV]	858.8	860.4	862.0	858.4	858.9	859.5
8.1 []	177.8	194.7	194.7	177.8	163.6	177.8
9.1 []	182.0	207.9	207.9	201.7	177.3	205.8
10.1 []	150	163	190	187	148	188
11.1 []	105.0	114.4	114.4	110.7	105.0	113.1

	976	977	978	979	980
1.1 [V]	130.7	130.8	132.7	131.1	131.3
2.1 [V]	61.4	61.9	61.7	55.4	61.7
3.1 [mV]	7814	7771	7799	7817	7816
4.1 [nA]	0.2	0.2	0.2	0.2	0.2
5.1 [nA]	0.0	0.0	0.0	0.0	0.0
6.1 [mV]	105.2	104.2	104.9	104.0	104.0
7.1 [mV]	860.6	858.6	858.9	859.7	858.7
8.1 []	177.8	163.6	177.8	194.7	163.6
9.1 []	187.0	177.3	183.6	207.9	178.8
10.1 []	176	147	172	189	169
11.1 []	106.1	105.0	105.0	111.9	105.0

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD229_2N2222A_EMS_@_20_KRAD / V1.0 16/6/97 PAR

Results file : RD229_2N2222A_EMS_@_20_KRAD from: 18.06.97 / 10:32:08
Operator : PAUL RUSSELL
Part number : 2N2222A
Lot number : RD229
Order number : D/C 9710
Vendor : SGS THOMSON
: CONTROL 964 ; 965,966,973-975 BIASED ; 976-980 UNBIASED
: EMS @ 20 KRAD
: 2N2222A XM-PL-IGG-0041 ISS 2 / V1.0 16/6/97 PAR

Test steps

1.	VCB0		75.0	...	700.0	V
2.	VCE0 (BR)		40.0	...	700.0	V
3.	VEB0		6000	...	15000	mV
4.	ICB0	(	0.0	)...	10.0	nA
5.	-IEB0	(	0.0	)...	10.0	nA
6.	-VCE (sat)		0.0	...	300.0	mV
7.	-VBE (sat)		0.0	...	1200.0	mV
8.	hfe1 (DC)		35.0	...	200000.0	
9.	hfe1 (DC)		75.0	...	200000.0	
10.	hfe1 (DC)		100	...	300	
11.	hfe1 (DC)		40.0	...	200000.0	

	964	965	966	973	974	975
1.1 [V]	132.5	124.2	125.0	123.7	123.5	124.4
2.1 [V]	60.9	54.6	55.1	55.1	63.0	54.5
3.1 [mV]	7809	7811	7813	7824	7827	7785
4.1 [nA]	0.2	0.2	0.2	0.2	0.2	0.2
5.1 [nA]	0.0	0.5	0.0	0.0	0.0	0.0
6.1 [mV]	103.8	103.6	105.7	103.6	104.7	103.9
7.1 [mV]	858.1	856.2	856.4	856.6	853.8	854.6
8.1 []	177.8	177.8	177.8	151.5	132.0	177.8
9.1 []	182.0	199.8	199.8	188.7	167.2	197.8
10.1 []	148	162	187	159	145	160
11.1 []	105.0	111.9	111.9	108.3	101.9	110.7

	976	977	978	979	980
1.1 [V]	130.3	129.8	130.5	130.3	130.7
2.1 [V]	60.7	62.3	61.7	55.4	62.3
3.1 [mV]	7833	7787	7814	7831	7831
4.1 [nA]	0.2	0.2	0.2	0.2	0.2
5.1 [nA]	0.0	0.0	0.0	0.0	0.0
6.1 [mV]	105.8	105.6	106.4	104.6	105.1
7.1 [mV]	854.8	854.6	855.1	855.3	854.2
8.1 []	141.0	141.0	151.5	163.6	141.0
9.1 []	175.8	168.5	174.3	194.1	169.9
10.1 []	171	144	148	184	167
11.1 []	103.9	101.9	103.9	109.5	101.9

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD229_2N2222A_EMS_@_30_KRAD / V1.0 16/6/97 PAR

Results file : RD229_2N2222A_EMS_@_30_KRAD from: 18.06.97 / 10:52:18
Operator : PAUL RUSSELL
Part number : 2N2222A
Lot number : RD229
Order number : D/C 9710
Vendor : SGS THOMSON
: CONTROL 964 ; 965,966,973-975 BIASED ; 976-980 UNBIASED
: EMS @ 30 KRAD
: 2N2222A XM-PL-IGG-0041 ISS 2 / V1.0 16/6/97 PAR

Test steps

1.	VCB0		75.0	...	700.0	V
2.	VCE0 (BR)		40.0	...	700.0	V
3.	VEB0		6000	...	15000	mV
4.	ICB0	(	0.0	)...	10.0	nA
5.	-IEB0	(	0.0	)...	10.0	nA
6.	-VCE (sat)		0.0	...	300.0	mV
7.	-VBE (sat)		0.0	...	1200.0	mV
8.	hfe1 (DC)		35.0	...	200000.0	
9.	hfe1 (DC)		75.0	...	200000.0	
10.	hfe1 (DC)		100	...	300	
11.	hfe1 (DC)		40.0	...	200000.0	

	964	965	966	973	974	975
1.1 [V]	132.3	124.5	125.3	125.1	123.5	124.3
2.1 [V]	60.7	54.9	55.2	55.6	63.6	54.8
3.1 [mV]	7811	7812	7814	7832	7816	7783
4.1 [nA]	0.3	0.2	0.2	0.2	0.2	0.2
5.1 [nA]	0.0	0.1	0.0	0.0	0.0	0.0
6.1 [mV]	104.2	103.8	105.7	103.9	104.7	103.7
7.1 [mV]	856.5	857.0	859.0	854.9	857.3	856.8
8.1 []	177.8	141.0	141.0	132.0	104.9	132.0
9.1 []	177.3	183.6	183.6	175.8	148.9	177.3
10.1 []	149	179	179	173	137	176
11.1 []	106.1	109.5	108.3	105.0	98.0	108.3

	976	977	978	979	980
1.1 [V]	129.2	130.0	129.8	128.8	128.9
2.1 [V]	59.6	62.8	62.3	55.6	63.2
3.1 [mV]	7821	7783	7813	7832	7830
4.1 [nA]	0.3	0.3	0.2	0.2	0.2
5.1 [nA]	0.0	0.0	0.0	0.0	0.1
6.1 [mV]	106.2	105.5	106.3	105.0	105.4
7.1 [mV]	858.2	856.7	856.5	857.8	856.6
8.1 []	116.9	110.6	124.0	132.0	124.0
9.1 []	160.6	151.1	161.9	177.3	158.1
10.1 []	161	156	161	174	159
11.1 []	99.9	98.0	100.9	105.0	98.9

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD229_2N2222A_EMS_@_50_KRAD / V1.0 16/6/97 PAR

Results file : RD229_2N2222A_EMS_@_50_KRAD from: 18.06.97 / 11:36:25
Operator : PAUL RUSSELL
Part number : 2N2222A
Lot number : RD229
Order number : D/C 9710
Vendor : SGS THOMSON
: CONTROL 964 ; 965,966,973-975 BIASED ; 976-980 UNBIASED
: EMS @ 50 KRAD
: 2N2222A XM-PL-IGG-0041 ISS 2 / V1.0 16/6/97 PAR

Test steps

1.	VCB0		75.0	...	700.0	V
2.	VCE0 (BR)		40.0	...	700.0	V
3.	VEB0		6000	...	15000	mV
4.	ICB0	(	0.0	)...	10.0	nA
5.	-IEB0	(	0.0	)...	10.0	nA
6.	-VCE (sat)		0.0	...	300.0	mV
7.	-VBE (sat)		0.0	...	1200.0	mV
8.	hfe1 (DC)		35.0	...	200000.0	
9.	hfe1 (DC)		75.0	...	200000.0	
10.	hfe1 (DC)		100	...	300	
11.	hfe1 (DC)		40.0	...	200000.0	

	964	965	966	973	974	975
1.1 [V]	131.9	123.8	124.4	124.2	122.9	124.1
2.1 [V]	60.7	55.3	55.9	56.2	61.4	55.2
3.1 [mV]	7809	7814	7815	7828	7819	7783
4.1 [nA]	0.2	0.2	0.2	0.2	0.2	0.2
5.1 [nA]	0.0	0.0	0.0	0.0	0.0	0.0
6.1 [mV]	103.9	104.5	105.9	104.2	105.5	104.4
7.1 [mV]	857.3	858.8	860.6	857.4	857.1	857.1
8.1 []	177.8	104.9	110.6	87.1	77.2	104.9
9.1 []	180.4	164.5	164.5	153.4	135.2	158.1
10.1 []	148	147	147	139	126	145
11.1 []	105.0	102.9	102.9	97.0	91.0	101.9

	976	977	978	979	980
1.1 [V]	127.6	128.8	128.5	129.0	127.4
2.1 [V]	57.4	60.3	60.1	56.4	61.6
3.1 [mV]	7829	7790	7815	7829	7824
4.1 [nA]	0.2	0.2	0.3	0.3	0.2
5.1 [nA]	0.0	0.0	0.0	0.0	0.0
6.1 [mV]	106.9	106.6	106.6	105.8	105.9
7.1 [mV]	857.7	856.6	857.8	857.8	857.6
8.1 []	83.5	83.5	95.2	95.2	90.9
9.1 []	143.7	136.1	144.7	158.1	137.9
10.1 []	129	126	132	140	147
11.1 []	92.7	91.8	94.4	98.0	93.5

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD229_2N2222A_EMS_@_75_KRAD / V1.0 16/6/97 PAR

Results file : RD229_2N2222A_EMS_@_75_KRAD from: 18.06.97 / 12:30:34
Operator : PAUL RUSSELL
Part number : 2N2222A
Lot number : RD229
Order number : D/C 9710
Vendor : SGS THOMSON
: CONTROL 964 ; 965,966,973-975 BIASED ; 976-980 UNBIASED
: EMS @ 75 KRAD
: 2N2222A XM-PL-IGG-0041 ISS 2 / V1.0 16/6/97 PAR

Test steps

1.	VCB0		75.0	...	700.0	V
2.	VCE0 (BR)		40.0	...	700.0	V
3.	VEB0		6000	...	15000	mV
4.	ICB0	(	0.0	)...	10.0	nA
5.	-IEB0	(	0.0	)...	10.0	nA
6.	-VCE (sat)		0.0	...	300.0	mV
7.	-VBE (sat)		0.0	...	1200.0	mV
8.	hfe1 (DC)		35.0	...	200000.0	
9.	hfe1 (DC)		75.0	...	200000.0	
10.	hfe1 (DC)		100	...	300	
11.	hfe1 (DC)		40.0	...	200000.0	

	964	965	966	973	974	975
1.1 [V]	132.4	123.7	123.9	123.7	123.2	123.5
2.1 [V]	60.7	55.8	56.3	56.7	59.3	55.8
3.1 [mV]	7813	7822	7820	7837	7825	7788
4.1 [nA]	0.3	0.2	0.2	0.2	0.2	0.2
5.1 [nA]	0.0	0.0	0.0	0.0	0.0	0.0
6.1 [mV]	104.2	105.5	106.9	105.4	106.9	105.1
7.1 [mV]	856.7	856.9	858.7	856.8	856.6	856.4
8.1 []	177.8	83.5	83.5	63.0	54.6	80.2
9.1 []	182.0	146.8	153.4	138.8	122.3	148.9
10.1 []	149	139	158	130	133	156
11.1 []	105.0	97.0	97.0	91.0	85.0	96.1

	976	977	978	979	980
1.1 [V]	127.4	125.1	128.6	126.7	127.8
2.1 [V]	57.0	58.9	58.9	56.8	59.3
3.1 [mV]	7832	7795	7821	7836	7830
4.1 [nA]	0.2	0.2	0.2	0.2	0.2
5.1 [nA]	0.0	0.0	0.0	0.0	0.0
6.1 [mV]	108.2	108.0	107.9	107.4	107.4
7.1 [mV]	856.5	857.0	856.4	857.2	856.9
8.1 []	61.1	59.3	69.4	69.4	69.4
9.1 []	130.0	119.4	132.5	142.7	130.0
10.1 []	137	133	125	131	138
11.1 []	86.4	85.0	88.6	91.0	87.9

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD229_2N2222A_EMS_@_100_KRAD / V1.0 16/6/97 PAR

Results file : RD229_2N2222A_EMS_@_100_KRAD from: 18.06.97 / 12:44:35
Operator : PAUL RUSSELL
Part number : 2N2222A
Lot number : RD229
Order number : D/C 9710
Vendor : SGS THOMSON
: CONTROL 964 ; 965,966,973-975 BIASED ; 976-980 UNBIASED
: EMS @ 100 KRAD
: 2N2222A XM-PL-IGG-0041 ISS 2 / V1.0 16/6/97 PAR

Test steps

1.	VCB0		75.0	...	700.0	V
2.	VCE0 (BR)		40.0	...	700.0	V
3.	VEB0		6000	...	15000	mV
4.	ICB0	(	0.0	)...	10.0	nA
5.	-IEB0	(	0.0	)...	10.0	nA
6.	-VCE (sat)		0.0	...	300.0	mV
7.	-VBE (sat)		0.0	...	1200.0	mV
8.	hfe1 (DC)		35.0	...	200000.0	
9.	hfe1 (DC)		75.0	...	200000.0	
10.	hfe1 (DC)		100	...	300	
11.	hfe1 (DC)		40.0	...	200000.0	

	964	965	966	973	974	975
1.1 [V]	132.6	122.9	123.5	122.9	122.4	122.8
2.1 [V]	60.7	56.2	56.6	57.1	58.8	56.0
3.1 [mV]	7816	7819	7829	7852	7835	7797
4.1 [nA]	0.3	0.2	0.2	0.1	0.1	0.2
5.1 [nA]	0.0	0.0	0.0	0.0	0.0	0.0
6.1 [mV]	104.1	106.2	107.7	106.9	107.6	105.6
7.1 [mV]	856.1	855.9	857.3	853.5	854.4	854.7
8.1 []	177.8	67.1	69.4	51.8	45.0	65.0
9.1 []	182.0	142.7	139.8	129.2	113.4	137.0
10.1 []	149	149	152	140	126	149
11.1 []	106.1	92.7	92.7	85.7	79.7	91.8

	976	977	978	979	980
1.1 [V]	125.8	125.5	125.8	126.7	127.0
2.1 [V]	57.5	58.5	58.4	57.2	58.9
3.1 [mV]	7843	7805	7832	7849	7838
4.1 [nA]	0.3	0.3	0.3	0.2	0.2
5.1 [nA]	0.0	0.0	0.0	0.1	0.0
6.1 [mV]	109.8	109.0	109.2	108.7	108.2
7.1 [mV]	854.3	853.0	853.9	855.4	853.6
8.1 []	48.2	46.0	57.7	53.2	56.1
9.1 []	117.4	112.8	122.3	131.7	121.5
10.1 []	130	127	134	142	132
11.1 []	81.6	79.7	84.3	85.7	82.9

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD229_2N2222A_END_POINT_EMS / V1.0 16/6/97 PAR

Results file : RD229_2N2222A_END_POINT_EMS from: 19.06.97 / 12:32:05
Operator : PAUL RUSSELL
Part number : 2N2222A
Lot number : RD229
Order number : D/C 9710
Vendor : SGS THOMSON
: CONTROL 964 ; 965,966,973-975 BIASED ; 976-980 UNBIASED
: END POINT EMS
: 2N2222A XM-PL-IGG-0041 ISS 2 / V1.0 16/6/97 PAR

Test steps

1.	VCB0		75.0	...	700.0		V
2.	VCE0 (BR)		40.0	...	700.0		V
3.	VEB0		6000	...	15000		mV
4.	ICB0	(	0.0	)...	10.0		nA
5.	-IEB0	(	0.0	)...	10.0		nA
6.	-VCE (sat)		0.0	...	300.0		mV
7.	-VBE (sat)		0.0	...	1200.0		mV
8.	hfe1 (DC)		35.0	...	200000.0		
9.	hfe1 (DC)		75.0	...	200000.0		
10.	hfe1 (DC)		100	...	300		
11.	hfe1 (DC)		40.0	...	200000.0		

	964	965	966	973	974	975
1.1 [V]	132.3	125.4	125.7	125.7	125.2	124.4
2.1 [V]	60.3	55.9	56.2	56.9	59.0	55.8
3.1 [mV]	7810	7828	7835	7847	7837	7803
4.1 [nA]	0.1	0.2	0.1	0.2	0.2	0.1
5.1 [nA]	0.2	0.2	0.2	0.2	0.2	0.2
6.1 [mV]	103.9	105.8	107.1	105.7	107.3	105.6
7.1 [mV]	857.7	855.1	856.1	854.9	854.9	855.3
8.1 []	177.8	74.4	77.2	56.1	49.3	71.8
9.1 []	180.4	151.1	147.8	132.5	120.8	143.7
10.1 []	148	158	160	149	134	156
11.1 []	105.0	97.0	97.0	90.2	84.3	96.1

	976	977	978	979	980
1.1 [V]	127.5	127.3	128.2	128.0	127.6
2.1 [V]	57.2	58.8	59.0	56.8	59.4
3.1 [mV]	7841	7806	7826	7845	7838
4.1 [nA]	0.1	0.1	0.1	0.1	0.1
5.1 [nA]	0.2	0.2	0.2	0.2	0.2
6.1 [mV]	109.2	108.4	108.4	107.6	108.2
7.1 [mV]	853.8	854.5	855.2	856.3	856.4
8.1 []	53.2	51.8	63.0	61.1	61.1
9.1 []	127.6	122.3	131.7	136.1	124.5
10.1 []	139	134	142	151	139
11.1 []	85.7	85.0	88.6	91.0	87.9

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA07T
RD229_2N2222A_FINAL_EMS / V1.0 16/6/97 PAR

Results file : RD229_2N2222A_FINAL_EMS from: 26.06.97 / 09:43:01
Operator : PAUL RUSSELL
Part number : 2N2222A
Lot number : RD229
Order number : D/C 9710
Vendor : SGS THOMSON
: CONTROL 964 ; 965,966,973-975 BIASED ; 976-980 UNBIASED
: FINAL EMS
: 2N2222A XM-PL-IGG-0041 ISS 2 / V1.0 16/6/97 PAR

Test steps

1.	VCB0		75.0	...	700.0	V
2.	VCE0 (BR)		40.0	...	700.0	V
3.	VEB0		6000	...	15000	mV
4.	ICB0	(	0.0	)...	10.0	nA
5.	-IEB0	(	0.0	)...	10.0	nA
6.	-VCE (sat)		0.0	...	300.0	mV
7.	-VBE (sat)		0.0	...	1200.0	mV
8.	hfe1 (DC)		35.0	...	200000.0	
9.	hfe1 (DC)		75.0	...	200000.0	
10.	hfe1 (DC)		100	...	300	
11.	hfe1 (DC)		40.0	...	200000.0	

	964	965	966	973	974	975
1.1 [V]	133.2	130.7	132.1	131.6	132.7	130.4
2.1 [V]	60.3	55.3	55.5	56.0	61.5	55.1
3.1 [mV]	7833	7866	7867	7890	7873	7837
4.1 [nA]	0.3	0.2	0.2	0.2	0.2	0.2
5.1 [nA]	0.0	0.1	0.0	0.0	0.0	0.1
6.1 [mV]	104.7	106.7	107.5	106.3	106.9	106.7
7.1 [mV]	844.9	843.6	844.2	840.2	841.3	841.7
8.1 []	177.8	132.0	132.0	124.0	104.9	132.0
9.1 []	185.3	182.0	183.6	172.8	152.2	180.4
10.1 []	152	156	156	150	136	155
11.1 []	106.1	105.0	105.0	100.9	95.2	105.0

	976	977	978	979	980
1.1 [V]	136.1	135.4	135.6	136.2	134.3
2.1 [V]	57.5	61.2	60.9	55.9	61.5
3.1 [mV]	7879	7839	7861	7879	7871
4.1 [nA]	0.2	0.2	0.3	0.2	0.3
5.1 [nA]	0.0	0.1	0.1	0.1	0.1
6.1 [mV]	109.0	108.2	108.8	108.0	107.9
7.1 [mV]	843.0	843.1	844.3	845.1	844.6
8.1 []	110.6	104.9	116.9	132.0	110.6
9.1 []	160.6	153.4	160.6	177.3	156.9
10.1 []	142	156	141	152	139
11.1 []	97.0	96.1	98.0	101.9	96.1