ESA-QCA9971T-C

Johlander DOC

Envisat-1	TOTAL DOSE RADIATION TEST PLAN No. PO-PL-TLG-PL-2023	Issue: 1 Rev.: A Date: 21/01/95 Page: 1/5

SCC Component No.: 520500303B	Component Designation: 2N4393	Irradiation Spec. No.: PO-PL-TLG-PL-0500 Iss. 2
Gen. Spec.: SCC 5000 7 B Det. Spec.: SCC 5205/003 2 B Amend.:	Evaluation: - Acceptance Wafer: - Acceptance Lot: X	Project/Programme: ENVISAT-1
Family/Group: 12/05 — Technology: JFET	Functional Assignment: FIELD-EFFECT, N-CHANNEL TRT.	Package: TO-18
Manuf.Name: MOT F Address: TOULOUSE	Test House: TECNOLOGICA Address: MADRID (SPAIN)	Origin. Name: TECNOLOGICA Address: SEVILLA (SPAIN)
Radiation Source: Cobalt-60 Facility Name: CIEMAT Address: MADRID (SPAIN)	Sample Size: 5 Irradiation Devices: 4 Control Devices: 1	Level of Interest: 10 to 20 KRads(Si)

EXPERIMENTAL STEPS	1	2	3	4	5	6	7	8
PROCESS	Irrad.	Irrad.	Irrad.	Irrad.	Ann.	Ann.		
Dose [KRad (Si)]	5	5	10	10	--	--		
Cumulative Dose [KRad(Si)]	5	10	20	30	--	--		
Dose Rate [KRad(Si)/Hr]	20	20	20	20	--	--		
Exposure Time (Hr)	0.25	0.25	0.5	0.5	24	168		
Temperature (°C)	25	25	25	25	25	25		

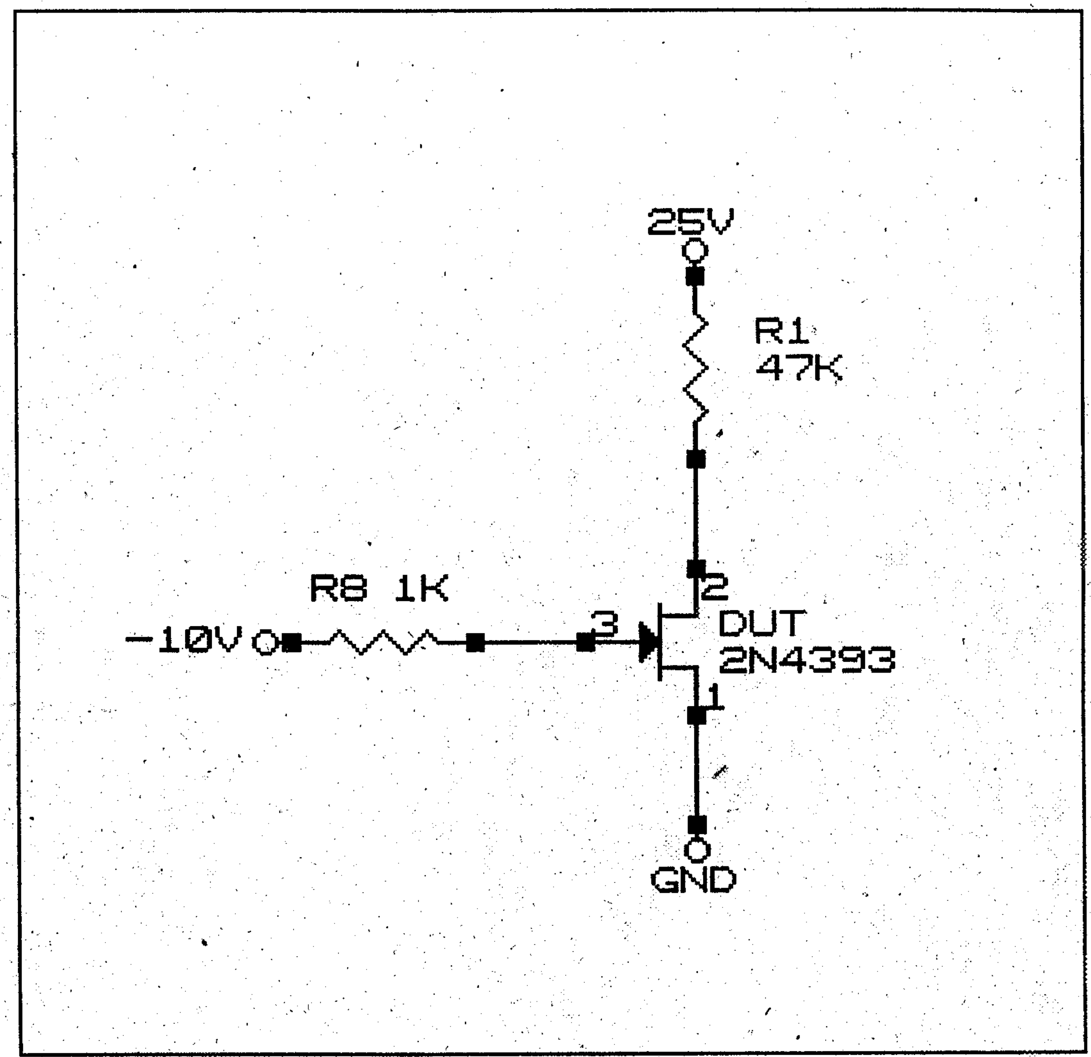
Irradiation Conditions: Biased: X Unbiased: - Test Circuit: Figure 1	Irradiation Measurements Interval: Remote Test: - In situ Test: X	Annealing Conditions: Biased: X Unbiased: - Test Circuit: Figure 1

Electrical parameters to be tested:

I_{GSS}, $V_{(BR)GSS}$, I_{DSS}, V_{GSOFF}, V_{DSAT}

Prepared by: J.A. VALVERDE Date: 21/01/95 Signature: [signature]	Checked by: JOSÉ Mª VALVERDE Date: 01/02/95 Signature: [signature]	Approved by: I. ALARCÓN Date: 06/02/95 Signature: [signature]

FIGURE 1.-TEST CIRCUIT



IRRADIATION TEST SEQUENCE

Test Step	Description	Requirements
1	Sample serialization	
2	Initial Electrical Measurements	Per Table A herein.
3	Set-up of Test	Verify bias circuit for all test samples.
4	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.
5	Intermediate Electrical Measurements	Test per Table B herein. Read & Record. Test to be performed immediately upon removal from chamber. Disconnect bias immediately after leaving irradiation chamber. Maximum interval between two consecutive exposures to be 2 hours.
6 to 14	Repeat Set-Up / Exposure / Electrical Measurements up to Total Dose of 30 KRad(Si)	Repeat steps 3, 4 and 5 for a total of 4 cycles up to the Total Dose of 30 KRad(Si) at cumulative dose: 5, 10, 20 and 30 Krads.
15	Annealing 24 hours at Room Temperature	Within 2 hour after the last irradiation step, the device shall be biased according to the circuit of Figure 1 and placed during 24 hours in a chamber at 25°C.
16	Electrical Measurements	After the first annealing period, bias shall be disconnected, and electrical measurements per Table B herein taken (Read & Record).
17	Annealing 168 hours at Room Temperature	Within 1 hour after the first annealing, the devices shall be biased according to the circuit of Figure 1 and placed during 24 hours in a chamber at 25°C.
18	Electrical Measurements	After the second annealing period, bias shall be disconnected, and electrical measurements per Table A herein taken (Read & Record).
19	Test Report	

TABLE A - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE BEFORE AND ON COMPLETION OF IRRADIATION TESTING

No.	CHARACTERISTIC	Symbol	MIL-ST-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN	MAX	
1	Total gate leakage current	I_{GSS}	3411	V_{DS} = 0 V V_{GS} = -20V	-	-0.1	nA
2	Gate source breakdown voltage	$V_{(BR)GSS}$	3401	V_{DS} = 0 V I_G = -1 µA	-40	-	V
4	Drain current	I_{DSS}	3413	V_{DS} = 20 V V_{GS} = 0 V (See Note 1)	5	30	mA
5	Gate source cut-off voltage	V_{GSOFF}	3403	V_{DS} = 20 V I_D = 1 nA	-0.5	-3	V
6	Drain Source saturation voltage	V_{DSAT}	3405	V_{GS} = 0 V I_D = 6 mA	-	0.4	V

NOTES:

1. Pulse measurement: Pulse length ≤ 300 µs; Duty Cycle: ≤ 2 %.

TABLE B - ELECTRICAL MEASUREMENTS AT INTERMEDIATE POINTS OF IRRADIATION TESTING (NOTE 1)

No.	CHARACTERISTIC	Symbol	MIL-ST-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN	MAX	
1	Total gate leakage current	I_{GSS}	3411	V_{DS} = 0 V V_{GS} = -20V	-	-10	nA

NOTES:

1 : Other measurements as per table A.

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2N4393	N CHANNEL FET		MOT
GfW IC 302/1	8426	TO 18	4 | 3
	HMI-BERLIN No. 01308		19.03.86

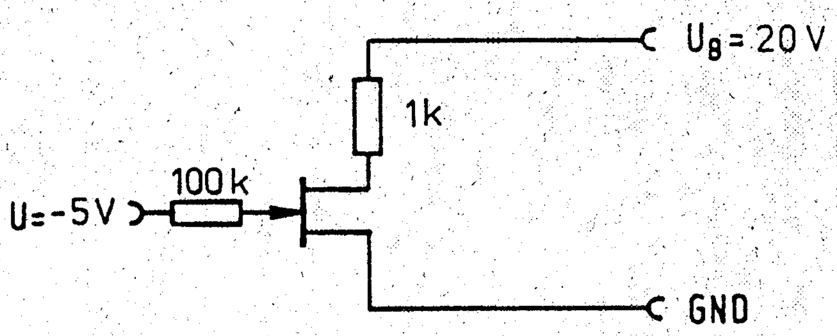
Tested Characteristics:

IDS(off) IDS(on)

Radiation Source: Co 60 Energy: 1.3MeV

Irradiation No	1	2	3	4	5	6
Dose[Krad(Si)]	50	100	300	Anneal		
Doserate[rad(Si)/s]	22	22	22			

BIAS CONDITIONS DURING IRRADIATION



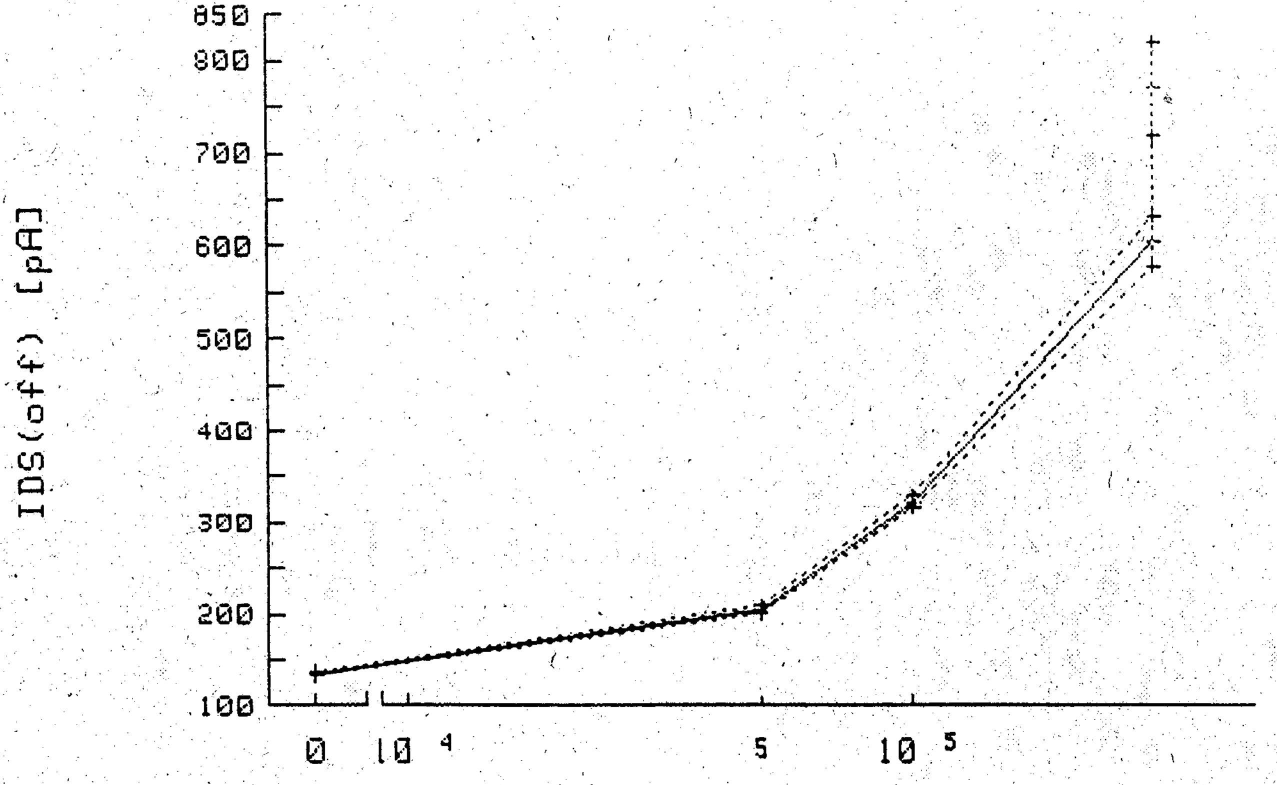
REMARKS:

	DATA COMPILATION OF IRRADIATION TESTED ELECTRONIC COMPONENTS		0 1 3 0 8 2/3
2N4393	N CHANNEL FET		MOT
GfW IC 302/1	8426	TO 18	4 | 3
	HMI-BERLIN No. 01308		19.03.86

Characteristic : IDS(off) Specification Limit : 100 [pA]

Test Condition : UDS : 12 [V] UGS : -5 [V]

Ambient Temperature : 25 [C] Radiation Source : Co 60
Energy : 1.3MeV



	Dose [Krad(Si)]	Mean-Value	St. Deviation	Min-Value	Max-Value
0	0	135.333	1.856	133.333	137.000
1	50	205.444	3.977	201.000	208.667
2	100	322.222	6.257	316.667	329.000
3	300	605.111	27.197	580.000	634.000
4	Anneal	768.222	50.656	711.000	807.333

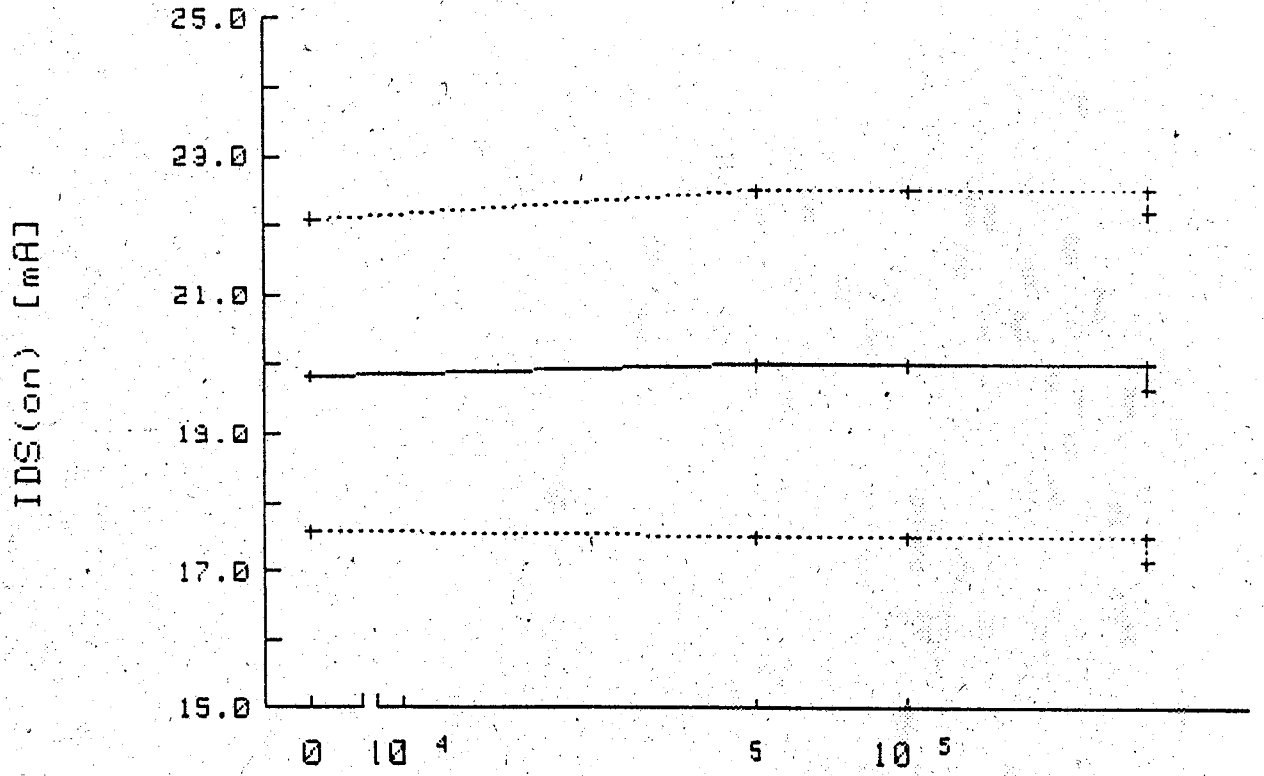
used for Statistics : 3 Samples

	DATA COMPILATION OF IRRADIATION TESTED ELECTRONIC COMPONENTS	0 1 3 0 8 3/3
2N4393	N CHANNEL FET	MOT
GfW IC 302/1	8426 / TO 18	4 | 3
	HMI-BERLIN No. 01308	19.03.86

Characteristic : IDS(on)   Specification Limit : 30 [mA]

Test Condition : UDS : 12 [V]   UGS : 0 [V]

Ambient Temperature : 25 [C]   Radiation Source : Co 60
Energy : 1.3MeV



Dose [Krad(Si)]		Mean-Value	St. Deviation	Min-Value	Max-Value
0	0	19.833	2.255	17.500	22.000
1	50	20.000	2.500	17.500	22.500
2	100	20.000	2.500	17.500	22.500
3	300	20.000	2.500	17.500	22.500
4	Anneal	19.667	2.517	17.000	22.000

used for Statistics : 3 Samples