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Interoffice Memorandum

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 Department
 Code 300.1
 From
 K. Sahu
 Department
 7809
 Subject
 Radiation Report on 2N6453
 ISTEP/NC/TGRS

PPM-91-707
 Date
 Nov. 26, 1991
 Location
 Lanham
 Telephone
 731-8954
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A radiation evaluation was performed on 2N6453 to determine the total dose tolerance of these parts. A brief summary of the test results is provided below. For detailed information, refer to Tables I through IV and Figure 1.

The total dose testing was performed using a cobalt-60 gamma ray source. During the radiation testing, eight parts were irradiated under bias (see Figure 1 for bias configuration), and two parts were used as control samples. The total dose radiation steps were 5, 10, 20, 50, and 100 krads*. After 100 krads, parts were annealed at +25°C for 168 hours with measurements taken at 24 and 168 hours. After this annealing, parts were irradiated to 200 krads and, finally, a total accumulated dose of 300 krads. The dose rate was between 0.1 and 5 krads/hour, depending on the total dose level (see Table II for radiation schedule). After each radiation exposure and annealing treatment, parts were electrically tested @ +25°C according to the test conditions and the specification limits listed in Table III.

All parts passed all parametric tests and stayed within the specified limits up to 5 krads of irradiation. After 10 krads, one part exceeded the maximum limit for Igss (actual reading was -0.68nA). After 20 krads of irradiation, 6 parts failed the Igss measurement (5 of the failures were marginal [average reading was -0.13 nA], the other failure was more obvious [actual reading was -0.62 nA]). All 8 parts failed the Igss measurement from 50 krads through 300 krads (readings ranged from -0.34 nA to -4.67 nA). There was no sign of recovery after annealing. All other parameters measured showed no signs of degradation through 300 krads of exposure.

Table IV provides a summary of the test results, as well as the mean and standard deviation values for each parameter after different irradiation exposures and annealing steps.

Any further details about this evaluation can be obtained upon request. If you have any questions, please call me at (301) 731-8954.

*In this report, the term rads is used as an abbreviation for rads (Si).

TABLE I. Part Information

Generic Part Number:	2N6453
ISTP/NC (TGRS) Control Number:	4030A
Charge Number:	C14416
Manufacturer:	Interfet
Lot Date Code:	04/23/90
Quantity Tested:	10
Serial Numbers of Radiation Samples:	192 - 199
Serial Number of Control Samples:	190, 191
Part Function:	N-Channel Silicon JFET
Package Style:	TO-72
Test Engineer:	A. Phung

TABLE II. Radiation Schedule for 2N6453

EVENTS	DATE
1) Initial (Pre-Irradiation) Electrical Measurements	09/27/91
2) 5-KRAD IRRADIATION (0.25 krads/hour) POST 5-KRAD ELECTRICAL MEASUREMENT	10/08/91 10/09/91
3) 10-KRAD IRRADIATION (0.25 krads/hour) POST 10-KRAD ELECTRICAL MEASUREMENT	10/10/91 10/11/91
4) 20-KRAD IRRADIATION (0.1 krads/hour) POST 20-KRAD ELECTRICAL MEASUREMENT	10/11/91 10/15/91
5) 50-KRAD IRRADIATION (1.5 KRADS/HOUR) POST 50-KRAD ELECTRICAL MEASUREMENT	10/15/91 10/16/91
6) 100-KRAD IRRADIATION (2.5 KRADS/HOUR) POST 100-KRAD ELECTRICAL MEASUREMENT	10/16/91 10/17/91
7) 24 HOURS ANNEALING AT +25°C UNDER BIAS POST 24-HOURS ELECTRICAL MEASUREMENT	10/17/91 10/18/91
8) 168 HOURS ANNEALING AT +25°C UNDER BIAS POST 168-HOURS ELECTRICAL MEASUREMENT	10/18/91 10/24/91
9) 200-KRAD IRRADIATION (5.0 KRADS/HOUR) POST 200-KRAD ELECTRICAL MEASUREMENTS	10/24/91 10/25/91
10) 300-KRAD IRRADIATION (1.5 KRADS/HOUR) POST 300-KRAD ELECTRICAL MEASUREMENTS	10/25/91 10/28/91

Table III. Electrical Characteristics of 2N6453

TEST NAME	TEST CONDITION	MIN	MAX	UNITS
VBRgss	Ig = 1 μ A Vds = 0 V	-20	0	V
VGS(off)	Vds = 10 V Id = 0.5 nA	-0.75	-5.0	V
Igss	Vgs = 10 V Vds = 0 V	-	-0.1	nA
Idss	Vds = 10 V Vgs = 0 V; pulsed*	15	50	mA
[Yfs]	Vds = 10 V; Id = 15 mA; f = 100 Hz - 1kHz	20	40	mS

* Test pulse width = 800 usec, duty cycle \leq 2%

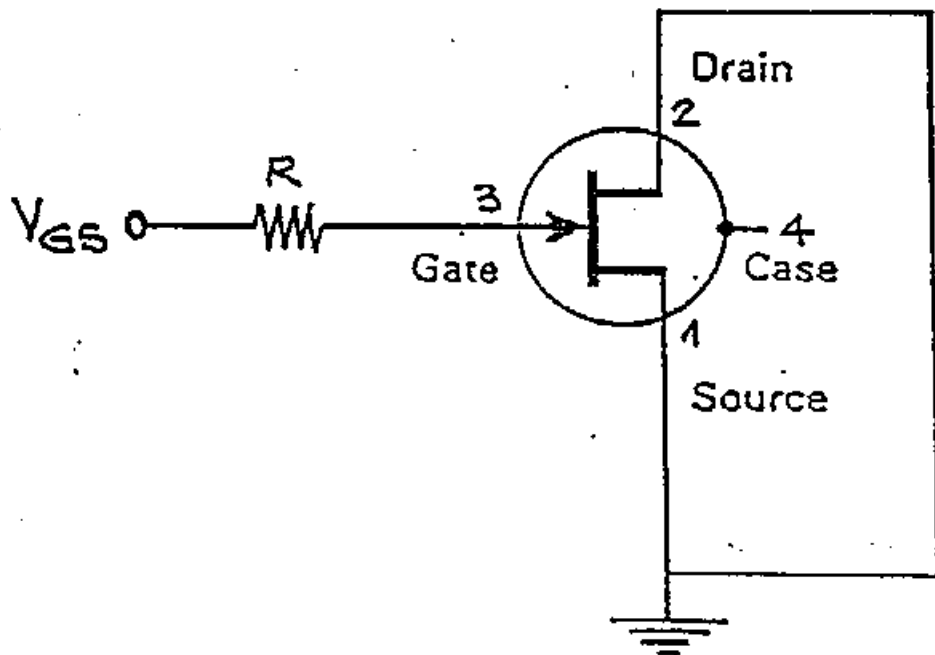
TABLE IV: Summary of Electric Measurements After
Total Dose Exposures and Annealing for 2N6453 1/

Parameters	Spec Limit min max	Total Dose Exposure (TDE) (krads)												Anneal				Total Dose (krads)			
		0 (Pre-Rad)		5		10		20		50		100		24 hrs		168 hrs		200		300	
		mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
VBR _{gss}	V	-20	-	20.01	0	20.01	0	20.01	0	20.01	0	20.01	0	20.01	0	20.01	0	20.01	0	20.01	0
VGS(off)	V	-0.75	-5.0	-1.95	0.49	-1.95	0.49	-1.95	0.49	-1.95	0.49	-1.94	0.49	-1.93	0.49	-1.94	0.49	-1.94	0.49	-1.92	0.49
I _{gss}	nA	-	-0.1	0.07	0.011	0.07	0.021	0.115	0.228	0.177	0.180	0.542	0.081	0.124	0.267	0.633	0.201	0.810	0.415	3.18	0.738
I _{dss}	mA	15	50	37.9	15.0	37.9	14.9	37.4	14.8	37.3	14.9	37.5	15.0	37.4	14.8	37.8	15.0	37.3	14.8	37.8	15.0
Yfs	mS	20	40	24.55	1.16	24.63	1.22	24.43	1.19	24.56	1.22	24.46	1.15	24.48	1.18	24.56	1.22	24.39	1.19	24.62	1.18

Notes:

1/ The mean and standard deviation values were calculated over the eight parts irradiated in this testing. The control samples remained constant throughout the testing and are not included in this table.

Figure 1. Radiation Bias Circuit for 2N6453



$$V_{GS} = -16V$$

$$V_{DS} = 0$$

$$R = 100K\Omega$$