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Interoffice Memorandum

To W. Beyah  
Department Code 300.1  
From K. Sahu *KS*  
Department 7809  
Subject Radiation Report on ISTP  
Non-Common Buy Part No. 2N4117A-1

PPM-91-335  
Date May 10, 1991  
Location Lanham  
Telephone 731-8954  
Location Lanham  
cc G. Krishnan/311  
V. Edson  
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G. Smith/663  
B. Teegarden/661

A radiation evaluation was performed on 2N4117A-1 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 10, 20, 30, 50, 75 and 100 krads. After 100 krads, parts were annealed at 25°C for 24 and 168 hours, and then the irradiation was continued to 200 and 300 krads (cumulative). The dose rate was between 0.5 - 5.6 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 according to the test conditions and the specification limits listed in Table III.

All parts passed all tests except one (IGSS) on irradiation up to 300 krads. Except for IGSS, no significant degradation was observed in any of the other electrical parameters. The degradation in IGSS was observed at the first radiation step of 10 krads, when all parts exceeded the specification limit of 1.0pA on this parameter (average initial readings were approx 0.5 pA and average post 300 krads readings were approximately 30pA for IGSS). Table IV provides the mean and standard deviation values for each parameter after different radiation exposures and annealing treatments.

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

TABLE I. Part Information

Generic Part Number:	2N4117A-1
ISTP Non-Common Buy Part Number:	2N4117A-1
ISTP Non-Common Buy Control Number:	1965
Manufacturer:	Siliconix
Quantity Procured:	267
Lot Date Code:	9042
Quantity Tested:	10
Serial Numbers of Radiation Samples:	103, 104, 105, 106 107, 108, 109, 110
Serial Numbers of Control Samples:	101, 102
Part Function:	N-Channel JFET
Part Technology:	JFET
Package Style:	TO-72

TABLE II. Radiation Schedule

EVENTS	DATE
1) Initial Electrical Measurements	03/08/91
2) 10 krads irradiation @ 500 rads/hr Post 10 krads Electrical Measurements	04/08/91 04/09/91
3) 20 krads irradiation @ 500 rads/hr Post 20 krads Electrical Measurements	04/09/91 04/10/91
4) 30 krads irradiation @ 500 rads/hr Post 30 krads Electrical Measurements	04/10/91 04/11/91
5) 50 krads irradiation @ 1111 rads/hr Post 50 krads Electrical Measurements	04/11/91 04/12/91
6) 75 krads irradiation @ 1250 rads/hr Post 75 krads Electrical Measurements	04/12/91 04/13/91
7) 100 krads irradiation @ 570 rads/hr Post 100 krads Electrical Measurements	04/13/91 04/15/91
8) 24 hrs annealing Post 24 hr Electrical Measurements	04/15/91 04/16/91
9) 168 hrs annealing Post 168 hr Electrical Measurements	04/16/91 04/23/91
10) 200 krads irradiation @ 5263 rads/hr Post 200 krads Electrical Measurements	04/23/91 04/24/91
11) 300 krads irradiation @ 5556 rads/hr Post 300 krads Electrical Measurements	04/24/91 04/25/91

Notes:

- All parts were radiated under bias at the cobalt-60 gamma ray facility at GSFC.
- All electrical measurements were performed off-site at 25°C.
- Annealing performed at 25°C under bias.



TABLE IV: Summary of Electrical Measurements after  
Total Dose Exposures and Annealing for 2N4117 1/, 2/

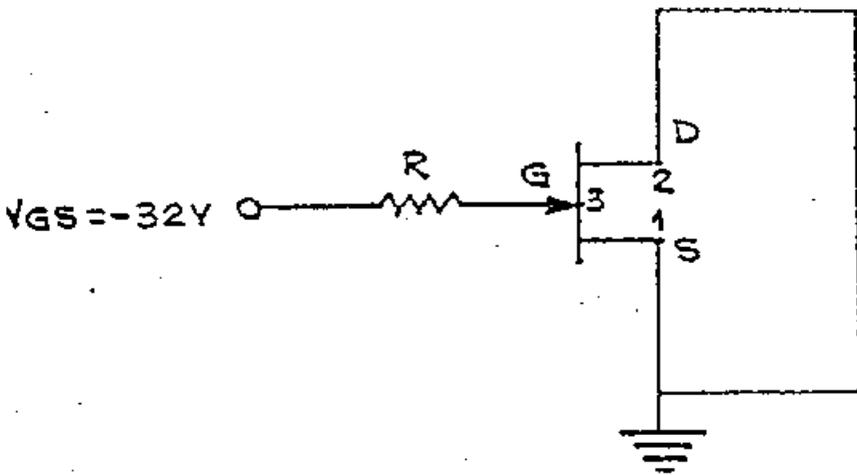
Parameters		Spec. Limits min max		Initials mean sd		Total Dose Exposure (krads)								Anneal		Total Dose (krads)			
						10		20		50		100		24 hrs		200		300	
						mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
-VBRGSS	V	40	-	Pass		Pass		Pass		Pass		Pass		Pass		Pass		Pass	
IDSS	uA	15	90	52	10	54	10	53	10	55	11	53	10	53	10	52	10	54	10
gos	uS	0	3	1.4	0	1.4	0	1.4	0	1.4	0	1.4	0	1.4	0	1.4	0	1.4	0
-VGS off	V	0.6	1.8	1.0	0.1	0.9	0.1	0.9	0.1	0.9	0.1	0.9	0.1	0.9	0.1	0.9	0.1	0.9	0.1
-IGSS	uA	-	1.0	0.5	0.1	1.6	0.2	2.4	0.2	4.4	0.6	7.4	2.0	7.8	3.0	20	5	29	10
gfs	uS	70	210	110	10	104	12	105	10	100	20	106	8	105	8	104	6	104	6

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.

2/ Table IV provides radiation characteristics of parts at selected total dose exposures and annealing treatments. The data at other radiation exposures and annealing treatments is available and can be obtained upon request.

Figure 1. Radiation Bias Circuit for 2N4117A-1



PIN# 1 = SOURCE  
# 2 = DRAIN  
# 3 = GATE  
# 4 = CASE

$V_{GS} = -32V$

$V_{DS} = 0V$

$R = 100K\Omega, \frac{1}{2}W$