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Code 310.1  
From  
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7809  
Subject  
Radiation Report on ISTD  
(University of Maryland) Part No.  
LP2951H/883

PPM-91-156  
Date  
March 13, 1991  
Location  
GSFC  
Telephone  
731-8954  
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A radiation evaluation was performed on LP2951H/883 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, two parts were irradiated under bias (see Figure 1 for bias configuration), and one part was used as a control sample. The total dose radiation steps were 2, 5, 10, 20, 45, 70 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 krads (cumulative). The dose rate was between 0.1 - 5.0 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 (2) parts passed all tests on irradiation up to 45 krads. At 70 krads, both parts significantly exceeded the specification limits on Ground Current IQ+, (readings were 18.08 and 32.17 mA against the specification limit of 12 mA). Also, both parts failed (marginally) to meet the minimum specification limit for Output Voltage (VO/m). At 100 krads, parts showed increased degradation in both of the above parameters. Additionally, the parts also exceeded the specification limits on Load Regulation and Error Output Low Voltage (VREF/M). On annealing for 24 and 168 hours, the parts showed partial recovery. 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 731-8954.

TABLE I. Part Information

Generic Part Number:	LP2951H/883B
ISTP Common Buy Part Number:	LP2951H/883B
ISTP Common Buy Control Number:	3845
Manufacturer:	National Semiconductor Corp.
Lot Date Code:	8811
Quantity Tested:	3
Serial Numbers of Radiation Samples:	85, 86
Serial Numbers of Control Sample:	84
Part Function:	Adjustable Micropower Voltage Regulator
Part Technology:	Bipolar
Package Style:	8-Lead Can

TABLE II. Radiation Schedule

EVENTS	DATE
1) Initial Electrical Measurements	12/12/90
2) 2 krads irradiation @ 100 rads/hr Post 2 krads Electrical Measurements	12/26/90 12/27/90
3) 5 krads irradiation @ 150 rads/hr Post 5 krads Electrical Measurements	12/27/90 12/28/90
4) 10 krads irradiation @ 74 rads/hr Post 10 krads Electrical Measurements	12/28/90 12/31/90
5) 20 krads irradiation @ 227 rads/hr Post 20 krads Electrical Measurements	12/31/90 01/02/91
6) 45 krads irradiation @ 1250 rads/hr Post 45 krads Electrical Measurements	01/02/91 01/03/91
7) 70 krads irradiation @ 1250 rads/hr Post 70 krads Electrical Measurements	01/03/91 01/04/91
8) 100 krads irradiation @ 441 rads/hr Post 100 krads Electrical Measurements	01/04/91 01/07/91
9) 24 hrs annealing Post 24 hr Electrical Measurements	01/08/91
10) 168 hrs annealing Post 168 hr Electrical Measurements	01/14/91
11) 200 krads irradiation @ 5000 rads/hr Post 200 krads Electrical Measurements	01/14/91 01/15/91

Notes:

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

Table III. Electrical Characteristics of LP2951H/883

( $T_A = 25^\circ\text{C}$ ,  $V_{IN} = 6\text{V}$ ,  $C_1 = 1\mu\text{F}$  unless otherwise specified.)

Test	Conditions	Limits		Units
		Min	Max	
$I_{q+}$	$I_1 = 100\mu\text{A}$		120	$\mu\text{A}$
$I_{Q+}$	$I_1 = 100\text{mA}$		12	$\text{mA}$
$V_{O/m}$		4.97		V
$V_{O/M}$			5.03	V
$V_{REF/m}$		3.0		V
$V_{REF/M}$	$V_{IN} = 4.5\text{V}$		250	mV
$REG/1d$	$100\mu\text{A} < I_1 < 100\text{mA}$		5.0	mV
$REG/1n$	$6\text{V} < V_{IN} < 30\text{V}$		5.0	mV
$V_{DIF/m}$	$V_{IN} - V_{OUT} = 100\text{mV}$		80	mV

TABLE IV: Summary of Electrical Measurements after  
Total Dose Exposures and Annealing for LP2951H/883

1/1, 2/

Parameters	Spec. Limits	min	max	Initials	Total Dose Exposure (krads)												Total Dose	
					10		20		45		70		100		168 hrs		200k	
					mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
Iq+	uA	120		70.4	0.2	98.2	0.2	91.0	9.0	57.1	0	48.0	1.0	43.9	0.3			
IQ+	mA	12		6.5	0.5	8.3	0.4	9.0	0.1	25	7	120		128	-			
VO/m	V	4.97		5.01	0	5.0	0	4.98	.01	4.95	.01	4.82	.02	4.73	.03			
VO/M	V	5.03		5.01	0	4.99	0	4.98	.01	4.94	.01	4.83	.02	4.72	.02			
VREF/m	V	3.0		4.26	0	4.27	.01	4.26	0	4.28	0	4.26	0	4.26	0			
VREF/M	MV	250		141	1	150	1	153	1	163	4	700	400	355	130			
REG/ld	MV	5		-0.6	0.2	-0.9	0.2	2.1	0.3	4.0	1.5	13.0	1.2	6.31	.03			
REG/ln	MV	5		1.4	0.4	1.1	0.3	1.8	0.1	1.2	1.2	2.1	1.2	1.9	0.2			
VDIF/m	MV	80		PASS		PASS		PASS		PASS		PASS		PASS				

Notes:

- 1/ The mean and standard deviation values were calculated over the two parts irradiated in this testing. The control sample remained constant throughout the testing and is 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 LP2951H/883

