PPM-91-478

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Interoffice Memorandum

PPM-91-478

To
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Department
Code 300.1
From
K. Sahu KS
Department
7809
Subject
Radiation Report on ISTP
Non-Common Buy Part No. HA1-5134/883

Date
July 25, 1991
Location
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Telephone
731-8954
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A radiation evaluation was performed on HA1-5134 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 24 and 168 hours (cumulative). The dose rate was between 0.3 - 1.6 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, except one, passed all tests on irradiation to 100 krads. SN 74 marginally exceeded the maximum specification limit of 50 nA for IB- and IBIAS after 100 krads of exposure. The readings for IB- and IBIAS were -59nA and -54nA, respectively. After 24 and 168 hours of annealing, SN 74 continued to marginally exceed the maximum specification limit for IB-. 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:	HA1-5134
ISTP Non-Common Buy Part Number:	HA1-5134
ISTP Non-Common Buy Control Number:	2012
Charge Number:	C04007
Manufacturer:	Harris Corp.
Quantity Procured:	60
Lot Date Code:	9036
Quantity Tested:	10
Serial Numbers of Radiation Samples:	72, 73, 74, 75 76, 77, 78, 79
Serial Numbers of Control Samples:	70, 71
Part Function:	Precision Quad Operational Amplifier
Part Technology:	Bipolar
Package Style:	14-Pin DIP

TABLE II. Radiation Schedule

EVENTS	DATE
1) Initial Electrical Measurements	05/23/91
2) 5 krads irradiation @ 270 rads/hr	05/23/91
Post 5 krads Electrical Measurements*	05/24/91
3) 10 krads irradiation @ 250 rads/hr	06/18/91
Post 10 krads Electrical Measurements	06/19/91
4) 20 krads irradiation @ 525 rads/hr	06/19/91
Post 20 krads Electrical Measurements	06/20/91
5) 50 krads irradiation @ 1580 rads/hr	06/20/91
Post 50 krads Electrical Measurements	06/21/91
6) 100 krads irradiation @ 750 rads/hr	06/21/91
Post 100 krads Electrical Measurements	06/24/91
7) 24 hour annealing	06/24/91
Post 24 hr Electrical Measurements	06/25/91
8) 168 hour annealing	06/24/91
Post 168 hr Electrical Measurements	07/01/91

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.

* The test fixture was broken after post 5 krad electrical measurements. Thus, the next radiation step was delayed until the fixture was repaired.

Table III. Electrical Characteristics of HA1-5134

T_A=25°C, Vcc+=+15V, Vcc-=-15V, Rs=500hm R_L=100KOhm unless otherwise Specified.

TEST	CONDITIONS	LIMIT		UNITS
		Min	Max	
+Icc	Vcc+=+15V,Vcc-=-15V,Vo=0V		6.8	mA
-Icc	Vcc+=+15V,Vcc-=-15V,Vo=0V		6.8	mA
Vos50	Vcm = 0V	-200	200	uV
Ios	Rs=10K Ohm, Vcm=0V	-50	50	nA
Ib+	Rs=10K Ohm, Vcm=0V	-50	50	nA
Ib-	Rs=10K Ohm, Vcm=0V	-50	50	nA
Av	Vo=+/-10V,RL=2KOhm	1200		V/mV
CMRR	dVcm=+/-10V, Vout=+/-10V	100		dB
+PSRR	dVcc+=+/-5V	100		dB
-PSRR	dVcc-=-/+5V	100		dB
V_{OUT}	RL=2KOhm	-12	12	V

TABLE IV: Summary of Electri Measurements after
Total Dose Exposures and Annealing for HA1-5134 1/, 2/, 3/

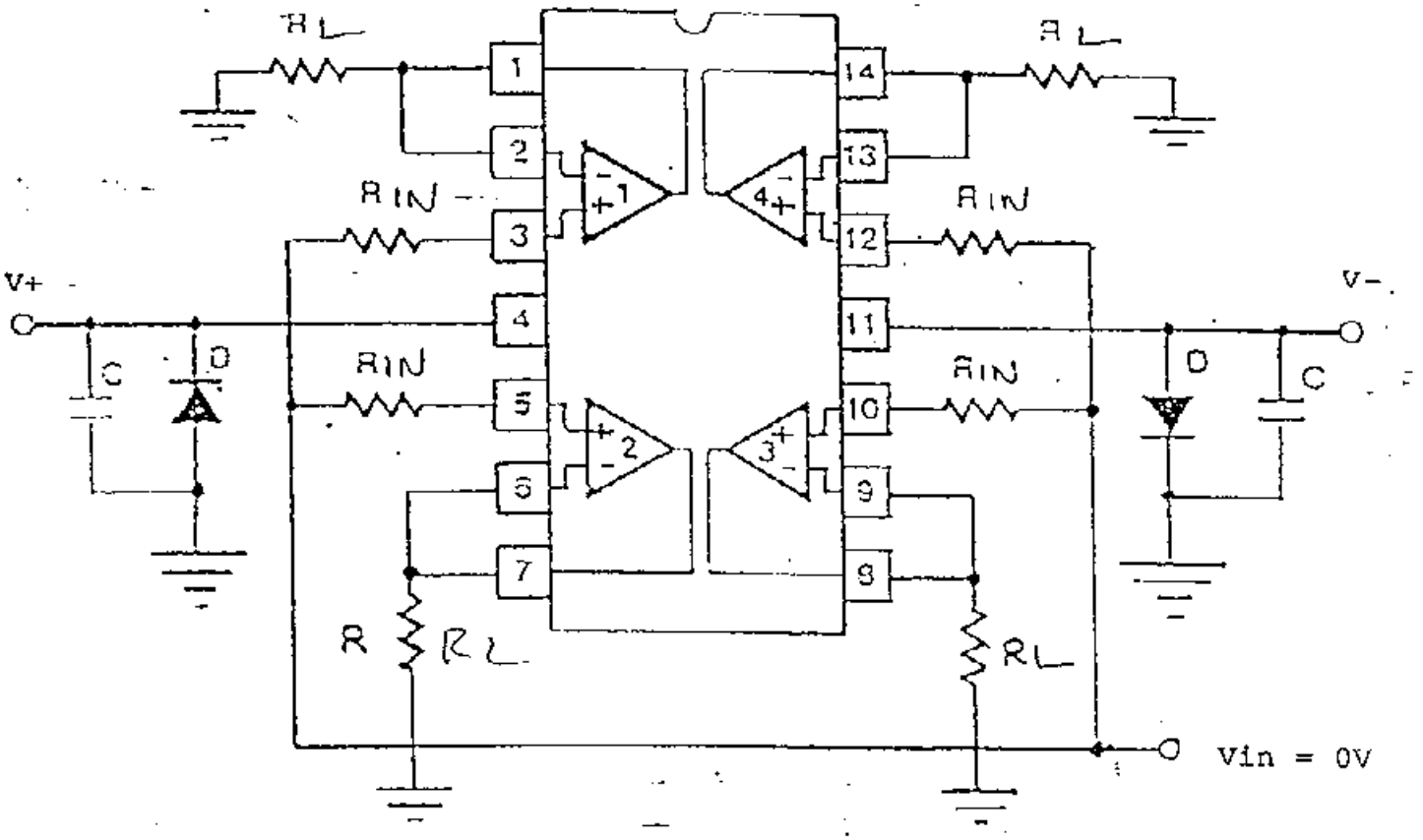
		Spec. Limits		Initials		Total Dose Exposure (krads)										Annealing			
						5		10		20		50		100		24 hrs		168 hrs	
Parameters		min	max	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
+ICC	mA		6.8	5.1	0.2	5.1	0.2	5.1	0.2	5.1	0.2	5.0	0.2	5.0	0.2	5.0	0.2	5.0	0.2
-ICC	mA		6.8	5.1	0.2	5.1	0.2	5.1	0.2	5.1	0.2	5.0	0.2	5.0	0.2	5.0	0.2	5.0	0.2
|VOS@50|	uV		200	72.0	25.0	77.6	24.7	81.0	24.4	76.4	24.0	82.0	24.2	76.8	26.0	83.8	25.8	78.7	24.6
|IOS|	nA		50	7.7	3.0	8.4	3.0	8.8	3.1	8.6	3.3	7.3	3.6	7.1	3.7	7.3	3.7	7.5	3.7
|IB+|	nA		50	1.8	0.7	2.7	1.7	2.2	1.8	4.0	1.8	12.0	7.6	20.7	14.2	19.6	13.4	17.5	12.3
|IB-|	nA		50	7.1	2.4	6.2	3.5	7.2	4.5	9.1	6.5	16.3	12.8	24.9	19.6	23.9	19.0	21.8	17.9
|IBIAS|	nA		50	3.3	1.5	2.8	0.8	3.9	1.7	6.1	3.7	14.1	9.9	22.9	16.8	21.8	16.1	19.6	14.9
ACL	MV/V	1.2		3.7	0.5	3.6	0.5	3.6	0.5	3.2	0.5	2.8	0.4	2.3	0.4	2.3	0.4	2.3	0.3
CMRR	dB	100		>159	-	145	6	143	3	142	3	139	3	143	10	139	5	145	9
+PSRR	dB	100		126	3	125	3	125	3	125	3	125	3	125	3	125	3	126	3
-PSRR	dB	100		124	3	123	3	124	3	124	3	123	3	123	3	123	2	123	2
+VO	V	12		14.0	0.0	13.9	0.0	13.9	0.0	14.0	0.0	14.0	0.0	13.9	0.0	13.9	0.0	13.9	0.0
|-VO|	V	12		13.6	0.0	13.6	0.0	13.6	0.0	13.7	0.1	13.7	0.0	13.7	0.0	13.7	0.0	13.7	0.0

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/ The statistical data in Table IV includes test data from section #1 of the Quad Op Amp only; however, this data was characteristic of the test data from all four sections.

3/ Parts exceeded the upper limit (159dB) of the testing range of the ATE for CMRR during initial electrical measurements.

Figure 1. Radiation Bias Circuit for HA1-5134



Rin = 47 kOhm ±5% 1/4W
RL = 1 kOhm ±5% 1/2W
V+ = +15V ±0.5V
V- = -15V ±0.5V
C = 0.01uF/Socket or 0.1uF/Row, 50V
D = 1N4002 or equivalent per Board
GND = Vin = 0V