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DATE: October 29, 1997 PPM-97-048
TO: S. Hull/562
FROM: K. Sahu/300.1
SUBJECT: Radiation Report on: UC1707
Project: SMEX/LITE
Job #: C78111
Project part #: UC1707 (5962-87619012A)

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A radiation evaluation was performed on UC1707 (5962-87619012A) 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 Co^{60} gamma ray source. During the radiation testing, four parts were irradiated under bias (see Figure 1 for bias configuration) and one part was used as a control sample. The total dose radiation levels were 5.0, 10.0, 15.0, 20.0, 30.0, 50.0, and 100.0 kRads.* The dose rate was between 0.062 and 0.625 kRads/hour (0.017 to 0.174 Rads/s). See Table II for the radiation schedule and effective dose rate calculation. After the 50.0 kRad exposure, the parts were annealed for 336 hours at 25°C. After the 100 kRad exposure, the parts were annealed for 168 hours at 25°C. After each radiation exposure and annealing treatment, parts were electrically tested according to the test conditions and the specification limits** listed in Table III.

Initial electrical measurements were made on 5 samples. Four samples (SN's 194, 196, 197, and 198) were used as radiation samples while SN 195 was used as a control sample. All parts passed all tests during initial electrical measurements.

All parts passed all tests up to 100.0 kRads and through the final annealing for 168 hours at 25°C with no significant degradation in any parameter.

Table IV provides a summary of the test results with the mean and standard deviation values for each parameter after each irradiation exposure and annealing step.

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

* The term Rads, as used in this document, means Rads (silicon). All radiation levels cited are cumulative.
** These are manufacturer's pre-irradiation data specification limits. The manufacturer provided no post-irradiation limits at the time these tests were performed.

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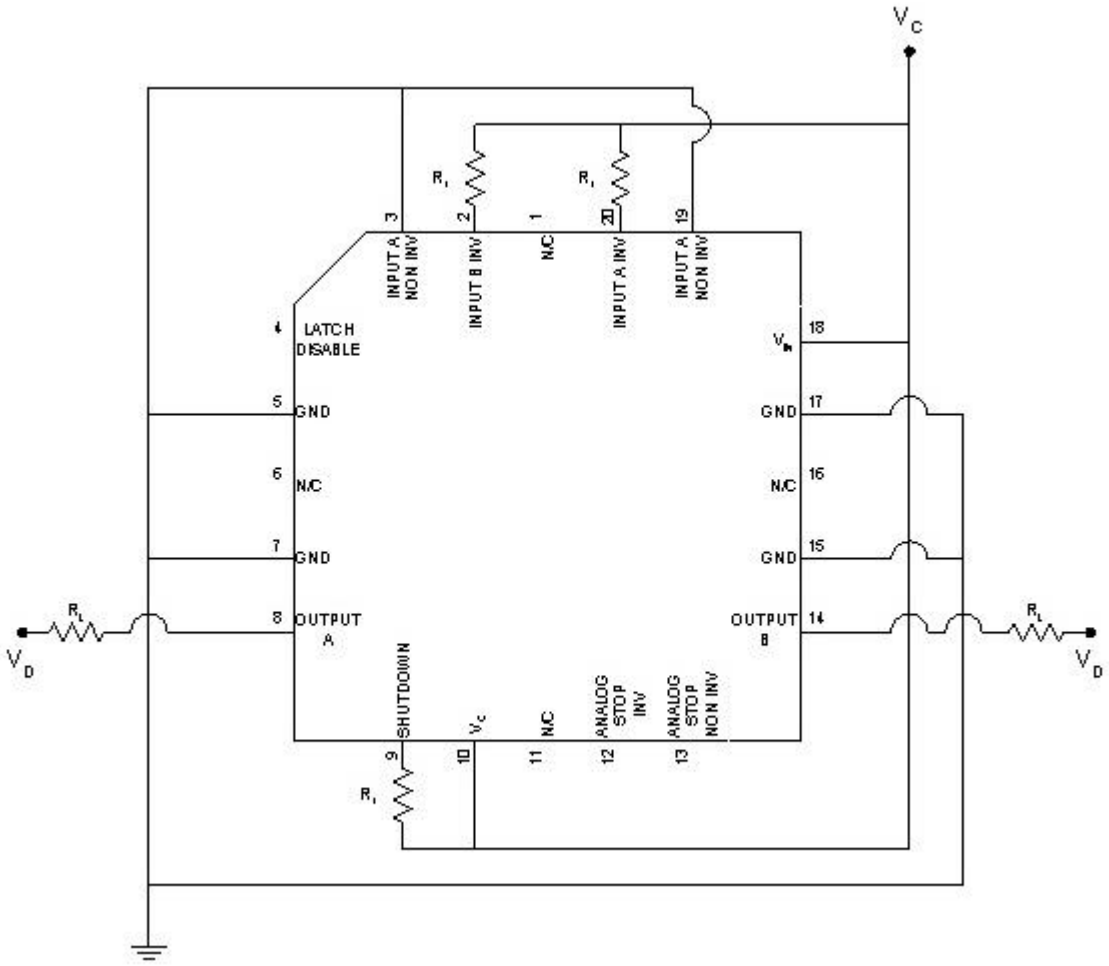
Figure 1. Radiation Bias Circuit for UC1707



Notes:

1. $V_C = V_{IN} = 20VDC \pm 0.5V$.
2. $V_D = 2.5V \pm 0.3V$.
3. $R_1 = 20k\Omega \pm 5\%$, ½ W.
4. $R_L = 2.0k\Omega \pm 5\%$, ½ W.
5. $I_{20V} \leq 21.5mA$ (for one DUT).
6. $I_{2.5V} \leq 2.5mA$ (for one DUT).

TABLE I. Part Information

Generic Part Number:	UC1707
SMEX/LITE Part Number	UC1707 (5962-87619012A)
Charge Number:	C78111
Manufacturer:	Unitrode
Lot Date Code (LDC):	9649
Quantity Tested:	5
Serial Number of Control Sample:	195
Serial Numbers of Radiation Samples:	194, 196, 197, and 198
Part Function:	Linear Driver
Part Technology:	Bipolar
Package Style:	20 Pin LCC
Test Equipment:	A540
Test Engineer:	D. Davis

- The manufacturer for this part guaranteed no radiation tolerance/hardness.

TABLE II. Radiation Schedule for UC1707

EVENT	DATE
1) INITIAL ELECTRICAL MEASUREMENTS	09/09/97
2) 2.5 KRAD IRRADIATION (0.062 KRADS/HOUR)	09/21/97
POST-2.5 KRAD ELECTRICAL MEASUREMENT	09/23/97
3) 5.0 KRAD IRRADIATION (0.0.62 KRADS/HOUR)	09/23/97
POST-5.0 KRAD ELECTRICAL MEASUREMENT	09/24/97
4) 10.0 KRAD IRRADIATION (0.125 KRADS/HOUR)	09/24/97
POST-10.0 KRAD ELECTRICAL MEASUREMENT	09/26/97
5) 15.0 KRAD IRRADIATION (0.125 KRADS/HOUR)	09/26/97
POST-15.0 KRAD ELECTRICAL MEASUREMENT	09/29/97
6) 20.0 KRAD IRRADIATION (0.125 KRADS/HOUR)	09/29/97
POST-20.0 KRAD ELECTRICAL MEASUREMENT	10/02/97
7) 30.0 KRAD IRRADIATION (0.250 KRADS/HOUR)	10/02/97
POST-30.0 KRAD ELECTRICAL MEASUREMENT	10/04/97
8) 50.0 KRAD IRRADIATION (0.500 KRADS/HOUR)	10/04/97
POST-50.0 KRAD ELECTRICAL MEASUREMENT	10/07/97
11) 336 HOUR ANNEALING @25°C	10/07/97
POST-336 HOUR ANNEAL ELECTRICAL MEASUREMENT	10/21/97
10) 100.0 KRAD IRRADIATION (0.625 KRADS/HOUR)	10/22/97
POST-100.0 KRAD ELECTRICAL MEASUREMENT	10/24/97
11) 168 HOUR ANNEALING @25°C	10/24/97
POST-168 HOUR ANNEAL ELECTRICAL MEASUREMENT	10/30/97

Effective Dose Rate = 100,000 RADS/33 DAYS=126.3 RADS/HOUR=0.035 RADS/SEC
The effective dose rate is lower than that of the individual radiation steps as it takes into account the interim-annealing step.

PARTS WERE IRRADIATED AND ANNEALED UNDER BIAS, SEE FIGURE 1.

Table III. Electrical Characteristics of UC1707 /1

Test #	Parameter	Units	Test Conditions /2	Spec. min	Lim. max
1	ICC_in	mA	V_{IN} = 40V		12.0
2	ICC_coll	mA	V_C = 40V, inputs low		5.0
3	IC_leak	mA	V_{IO} = 0V, V_C = 30V		100
4	V_input	mA	V_{IN} = 0V	-1000	
5	B_INV	mA	Inverting input to output		100
6	B_NI	mA	Non-inverting input to output		100
7	A_INV	mA	Inverting input to output		100
8	A_NI	mA	Non-inverting input to output		100
9	A_inv_t_rise	ns	C_L = 2.2nf, Inverting input to output		70.0
10	A_inv_t_fall	ns	C_L = 2.2nf, Inverting input to output		70.0
11	B_inv_t_rise	ns	C_L = 2.2nf, Inverting input to output		70.0
12	B_inv_t_fall	ns	C_L = 2.2nf, Inverting input to output		70.0
13	A_ni_t_rise	ns	C_L = 2.2nf, non-inverting input to output		70.0
14	A_ni_t_fall	ns	C_L = 2.2nf, non-inverting input to output		70.0
15	B_ni_t_rise	ns	C_L = 2.2nf, non-inverting input to output		70.0
16	B_ni_t_fall	ns	C_L = 2.2nf, non-inverting input to output		70.0
17	V_shutdown	V	Pin 7 Input	0.40	2.20
18	Analog_shutdown	mV	0V £ V_{CM} £ 15V	100	150

Note:

1/ These are the manufacturer's non-irradiated data sheet specification limits. The manufacturer provided no post-irradiation limits at the time the tests were performed.

2/ -41.25V < V_{IN} < -4.25V unless otherwise noted.

3/ The functional performance of the parts is verified by the timing tests (#9-16). If the timing can be measured, then the part passes the functional test. If no timing measurement can be made, then the part has failed functionally.