

Unisys

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SUBJECT: Radiation Report on **DAC08A (Analog Devices) (LDC 9910)**
PROJECT: HST/COS

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A radiation evaluation was performed on **DAC08A (M38510/11302BCA) 8-Bit High Speed, Multiplying D/A Converter (Analog Devices)** to determine the total dose tolerance of these parts. The total dose testing was performed using a Co⁶⁰ gamma ray source. During the radiation testing, five 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, 20.0, 30.0, and 50.0kRads.¹ The average dose rate was 0.14kRads/hour (0.04Rads/s). See Table II for the radiation schedule and average dose rate calculation. After the 50.0kRad irradiation, the parts were annealed under bias at 25°C for 168 hours.² After each radiation exposure and annealing treatment, parts were electrically tested according to the test conditions and the specification limits³ listed in Table III. An executive summary of the test results is provided below in bold, followed by a detailed summary of the test results after each radiation level and annealing step.

All parts passed all tests up to 50kRads. After annealing the parts at 25°C for 168 hours, the parts showed no significant change in any parameter.

Initial electrical measurements were made on 6 samples. Five samples (SN's 21, 22, 23, 24, and 25) were used as radiation samples while SN 20 was used as a control sample. All parts passed all tests during initial electrical measurements.

All parts passed all tests up to 50.0kRads.

After annealing the parts for 168 hours at 25°C, the parts showed no significant change 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 us at (301) 731-8954.

¹ The term Rads, as used in this document, means Rads (silicon). All radiation levels cited are cumulative.

² The temperature 25°C as used in this document implies room temperature.

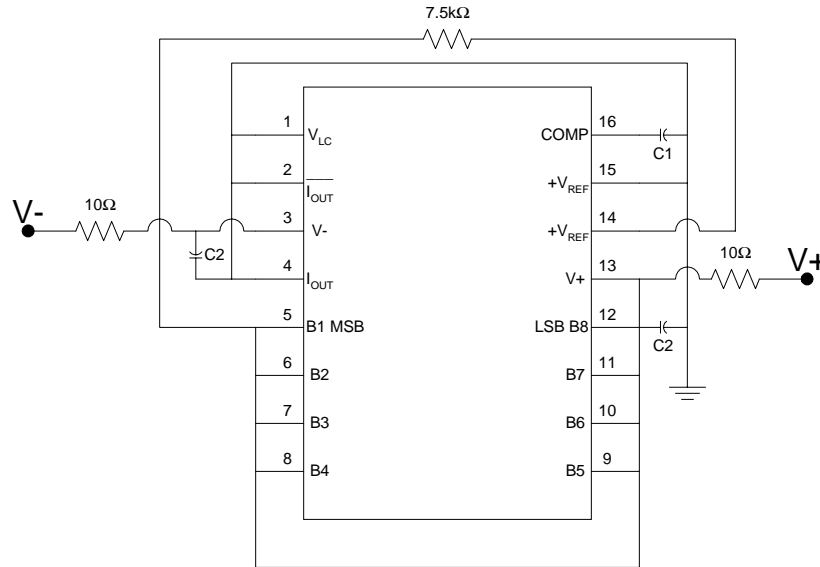
³ These are manufacturer's pre-irradiation data specification limits. The manufacturer provided no post-irradiation specification limits or radiation tolerance guarantees at the time these tests were performed.

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Figure 1. Radiation Bias Circuit for DAC08A



Notes:

1. $V+ = 15.0V \pm 0.5V$.
2. $V- = -15.0V \pm 0.5V$.
3. All Resistors are 5%, $\frac{1}{2}W$.
4. $C_1 = 0.001\mu F, 35V$.
5. $C_2 = 0.1\mu F, 35V$.

TABLE I. Part Information

Generic Part Number:	DAC08A
HST/COS Part Number	M38510/11302BCA
HST/COS TID Requirement	10kRads (RDM = 5)
Charge Number:	C00176
Manufacturer:	Analog Devices
Lot Date Code (LDC):	9910
Quantity Tested:	6
Serial Number of Control Sample:	20
Serial Numbers of Radiation Samples:	21, 22, 23, 24, 25
Part Function:	8-Bit High Speed, Multiplying D/A Converter
Part Technology:	Bipolar
Package Style:	16 Pin DIP
Test Equipment:	A540
Test Engineer:	S. Archer-Davies

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

TABLE II. Radiation Schedule for DAC08A

EVENT	DATE
1) INITIAL ELECTRICAL MEASUREMENTS	12/02/99
2) 5.0 KRAD IRRADIATION (0.125 KRADS/HOUR).....	12/14/99
POST-5.0 KRAD ELECTRICAL MEASUREMENT	12/16/99
3) 10.0 KRAD IRRADIATION (0.294 KRADS/HOUR).....	12/16/99
POST-10.0 KRAD ELECTRICAL MEASUREMENT	12/17/99
4) 20.0 KRAD IRRADIATION (0.152 KRADS/HOUR).....	12/17/99
POST-20.0 KRAD ELECTRICAL MEASUREMENT	12/20/99
5) 30.0 KRAD IRRADIATION (0.152 KRADS/HOUR).....	12/20/99
POST-30.0 KRAD ELECTRICAL MEASUREMENT	12/23/99
6) 50.0 KRAD IRRADIATION (0.225 KRADS/HOUR).....	12/23/99
POST-50.0 KRAD ELECTRICAL MEASUREMENT	12/27/99
7) 168 HOUR ANNEALING @25°C.....	12/27/99
POST-168 HOUR ANNEAL ELECTRICAL MEASUREMENT.....	01/03/00

Average Dose Rate = 50,000 RADS/356 HOURS=140.4 RADS/HOUR=0.04RADS/SEC

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

Table III. Electrical Characteristics DAC08A (1)

Test #	Parameter	Units	Spec. Limit		Test Conditions
			min	max	
10	I _{cc_15V}	mA	0.4	3.8	
11	I _{cc_5V}	mA	0.4	3.8	V _{CC} = 5V, V _{SS} = -5V, I _{REF} = 1mA
12	I _{ss_15V}	mA	-7.8	-0.8	
13	I _{ss_5V}	mA	-7.8	-0.8	V _{CC} = 5V, V _{SS} = -5V, I _{REF} = 1mA
14	PD_15V	mW	0	174	
15	PD_5V	mW	0	48	V _{CC} = 5V, V _{SS} = -5V, I _{REF} = 1mA
20	+I _{fr}	mA	-2.00	-1.98	all inputs = 15V, V _{REF} = 10V
21	-I _{fr}	mA	-2.00	-1.98	all inputs = 0V, V _{REF} = -10V
22	+I _{zs}	μA	-1.00	1.00	all inputs = 0V, V _{REF} = 10V
23	-I _{zs}	μA	-1.00	1.00	all inputs = 15V, V _{REF} = -10V
24	I _{frs}	μA	0	8.00	I _{fr} - avg(I _{fr})
30	PSS_IFS1	μA	-4.00	4.00	V _{CC} = 4.5V to 18V, V _{SS} = -18V
31	PSS_IFS2	μA	-4.00	4.00	V _{SS} = -4.5V to -18V, V _{CC} = 18V
32	PSS_IFS1	μA	-8.00	8.00	
33	PSS_IFS2	μA	-8.00	8.00	
34	PSS_IFS1	μA	-8.00	8.00	
35	PSS_IFS2	μA	-8.00	8.00	
50-57	I _{ih} B1-B8	μA	-10.0	10.0	V _{IN} = 18V, V _{IL} = 0.8V
58-65	I _{il} B1-B8	μA	-10.0	10.0	V _{IN} = -10V, V _{IL} = 2.0V
70	NL+ (2)	lsb	0	1.15	all codes, V _{REF} = 10V
71	RA+ (2)	lsb	0	1.15	all codes, V _{REF} = 10V
72	NL-	lsb	0	1.15	all codes, V _{REF} = 10V
73	RA-	lsb	0	1.15	all codes, V _{REF} = 10V

Notes:

(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) NL = Differential Non-Linearity, RA = (Relative Accuracy) Integral Non-Linearity.

