

Memorandum

PARAMAX
A Unisys Company

PPM-92-159

DATE: May 15, 1992
TO: J. Lohr/311
FROM: K. Sahu/7809 KS
SUBJECT: Radiation Report on GGS/WIND/3D PLASMA Project
Part No. AD744TQ/883B (control no.6297)

cc: L. Rabb/406
A. Sharma/311
Library/300.1

A radiation evaluation was performed on the AD744TQ Op Amp 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, 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 steps were 5, 10, 15 and 20 krad (the term rad as used here means rad(Si)). After 20 krad, parts were annealed at +25°C for 168 hours. The dose rate was between 0.05 and 0.11 krad/hour, depending on the total dose level (see Table II for radiation schedule). After each radiation exposure and annealing treatment, parts were electrically tested at +25°C according to the test conditions and the specification limits listed in Table III.

The parts passed all tests on irradiation up to 10 krad. After the 15-krad irradiation, one part (S/N 73) marginally exceeded the specification limits for Vos; also, Ib+, Ib- and Ibias showed sensitivity to the radiation. Upon continued irradiation to 20 krad, S/N 72 exceeded specification limits for Ib+(0V), Ib-(0 and 10V), Ibias(0 and 10V), -PSRR and Vos.

After annealing for 168 hours at +25°C, S/N 72 recovered to within specification limits for Ib+, Ib-, Ibias and -PSRR, but no recovery in Vos was observed in either S/N 72 or 73. The other two parts remained within specification limits for all test parameters throughout all irradiation and annealing steps.

Table IV gives the mean and standard deviation values for each parameter after different irradiation exposures and annealing steps.

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:	AD744TQ
GGS/WIND/3D PLASMA Part Number:	AD744TQ/883B
Control Number:	6297
Charge Number:	C23766
Manufacturer:	Analog Devices
Lot Date Code:	8826A
Quantity Tested:	5
Serial Numbers of Radiation Samples:	72, 73, 74, 75
Serial Number of Control Sample:	71
Part Function:	Op Amp
Part Technology:	BiFET
Package Style:	8-pin DIP
Test Engineer:	A. Phung

TABLE II. Radiation Schedule for AD744TQ

EVENTS	DATE
1) INITIAL (PRE-IRRADIATION) ELECTRICAL MEASUREMENT	04/17/92
2) 5- KRAD IRRADIATION (0.11 krads/hour) POST-5-KRAD ELECTRICAL MEASUREMENT	04/21/92 04/23/92
3) 10-KRAD IRRADIATION (0.05 krads/hour) POST-10-KRAD ELECTRICAL MEASUREMENT	04/23/92 04/28/92
4) 15-KRAD IRRADIATION (0.11 krads/hour) POST-15-KRAD ELECTRICAL MEASUREMENT	04/28/92 04/30/92
5) 20-KRAD IRRADIATION (0.05 KRAD/HOUR) POST-20-KRAD ELECTRICAL MEASUREMENT	04/30/92 05/04/92
6) 168 HOURS ANNEALING AT +25°C POST-168-HOUR ELECTRICAL MEASUREMENTS	05/04/92 05/11/92

ALL ELECTRICAL MEASUREMENTS WERE PERFORMED AT +25°C.

ALL PARTS WERE IRRADIATED AND ANNEALED UNDER BIAS; SEE FIGURE 1.

Table III. Electrical Characteristics of AD744TQ

Unless Otherwise Specified: $T_A = 25^{\circ}\text{C}$, $V_{CC}=15\text{V}$, $-V_{CC}=-15\text{V}$

TEST	CONDITIONS	LIMIT		UNITS
		Min	Max	
$+I_{CC}$	$V_o = 0\text{V}$		4	mA
$-I_{CC}$	$V_o = 0\text{V}$		4	mA
V_{OS50}	$R_s = 500\text{Ohm}$	-0.5	.5	mV
V_{OS}	$R_s = 1000\text{Ohm}$	-0.5	.5	mV
I_{OS}		-50	50	pA
I_{b+}	$V_{CM} = 0\text{V}$	-100	100	pA
I_{b-}	$V_{CM} = 0\text{V}$	-100	100	pA
I_{bias}	$V_{CM} = 0\text{V}$	-100	100	pA
I_{b+}	$V_{CM} = 10\text{V} / 1$	-150	150	pA
I_{b-}	$V_{CM} = 10\text{V} / 1$	-150	150	pA
I_{bias}	$V_{CM} = 10\text{V} / 1$	-150	150	pA
A_{OL}	$V_o = +/- 10\text{V}, R_L=2\text{K Ohm}$	250		V/mV
CMRR	$V_{CM}=+/- 10\text{V}$	82		dB
CMRR	$V_{CM}=+/- 11\text{V}$	78		dB
+PSRR	$+V_{CC}=(15, 5)\text{V}; -V_{CC}=-15\text{V}$	88		dB
-PSRR	$+V_{CC}=15\text{V}; -V_{CC}=- (15, 5)\text{V}$	88		dB
+ V_o	$R_L=2\text{K Ohm}$	13		V
- V_o	$R_L=2\text{K Ohm}$		-12.5	V

TABLE IV: Summary of Electrical Measurements After Total Dose Exposures and Annealing Steps for AD744TQ 1/

Parameters	Spec. Limits		Total Dose Exposure (TDE) (krads)												Anneal	
	min	max	0 (Pre-Rad.)		5		10		15		20		168 hrs @25°C			
			mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd		
+ICC	mA	-	4	3.68	.06	3.65	.07	3.62	.08	3.59	.09	3.56	0.1	3.56	0.1	
-ICC	mA	-	4	3.68	.06	3.65	.07	3.62	.08	3.59	.09	3.56	0.1	3.56	0.1	
Vos@50	uV	-500	500	53.6	135	56.6	163	143	217	244	274	346	351	360	355	
Vos	uV	-500	500	53.6	135	56.6	163	143	217	244	274	346	351	360	355	
Ios	PA	-50	50	3.06	0.8	2.75	0.5	3.02	1.0	2.89	2.8	2.74	4.2	2.25	3.0	
Ib+	PA	-100	100	29.19	3.5	36.06	2.2	48.89	7.7	63.26	16	77.85	20	65.77	14	
Ib-	PA	-100	100	32.24	4.1	38.81	2.3	51.90	8.7	68.18	19	80.58	24	68.02	17	
Ibias	PA	-100	100	30.71	3.8	37.43	2.3	50.39	8.2	64.73	18	79.21	22	66.89	16	
Ib+	PA	-150	150	35.01	1.9	45.63	4.8	64.04	13	81.43	23	102.8	30	85.27	20	
Ib-	PA	-150	150	38.11	2.6	48.42	4.8	67.17	14	84.42	26	105.7	34	9.83	103	
Ibias	PA	-150	150	36.56	2.2	47.02	4.8	65.62	14	82.92	24	104.2	32	86.38	22	
Aol	KV/V	250	-	589.7	50	589.4	70	556.8	71	520.2	69	494.8	86	485.9	76	
CMRR(10V)	dB	82	-	106.8	14	110.4	19	100.0	6.8	95.62	4.5	95.02	4.0	92.87	4.1	
CMRR(11V)	dB	78	-	104.8	13	104.4	10	99.13	5.9	95.11	4.1	92.79	3.4	92.89	3.7	
PSRR	dB	88	-	110.6	2.1	110.8	2.4	111.0	2.1	111.1	2.1	111.3	2.1	111.4	2.0	
-PSRR	dB	88	-	101.2	7.8	105.0	12	101.6	9.1	100.3	12	97.44	12	97.73	13	
+Vo	V	13	-	13.93	.01	13.95	.01	13.92	.02	13.93	.02	13.96	.01	13.95	.01	
-Vo	V	-	-12.5	13.4	.01	13.4	0	-13.4	.01	13.4	.01	-13.4	.01	-13.4	.01	

Note:

1/ The mean and standard deviation values were calculated over the four parts irradiated in this testing. The control sample remained constant throughout the testing and is not included in this table.

Figure 1. Radiation Bias Circuit for AD744TQ

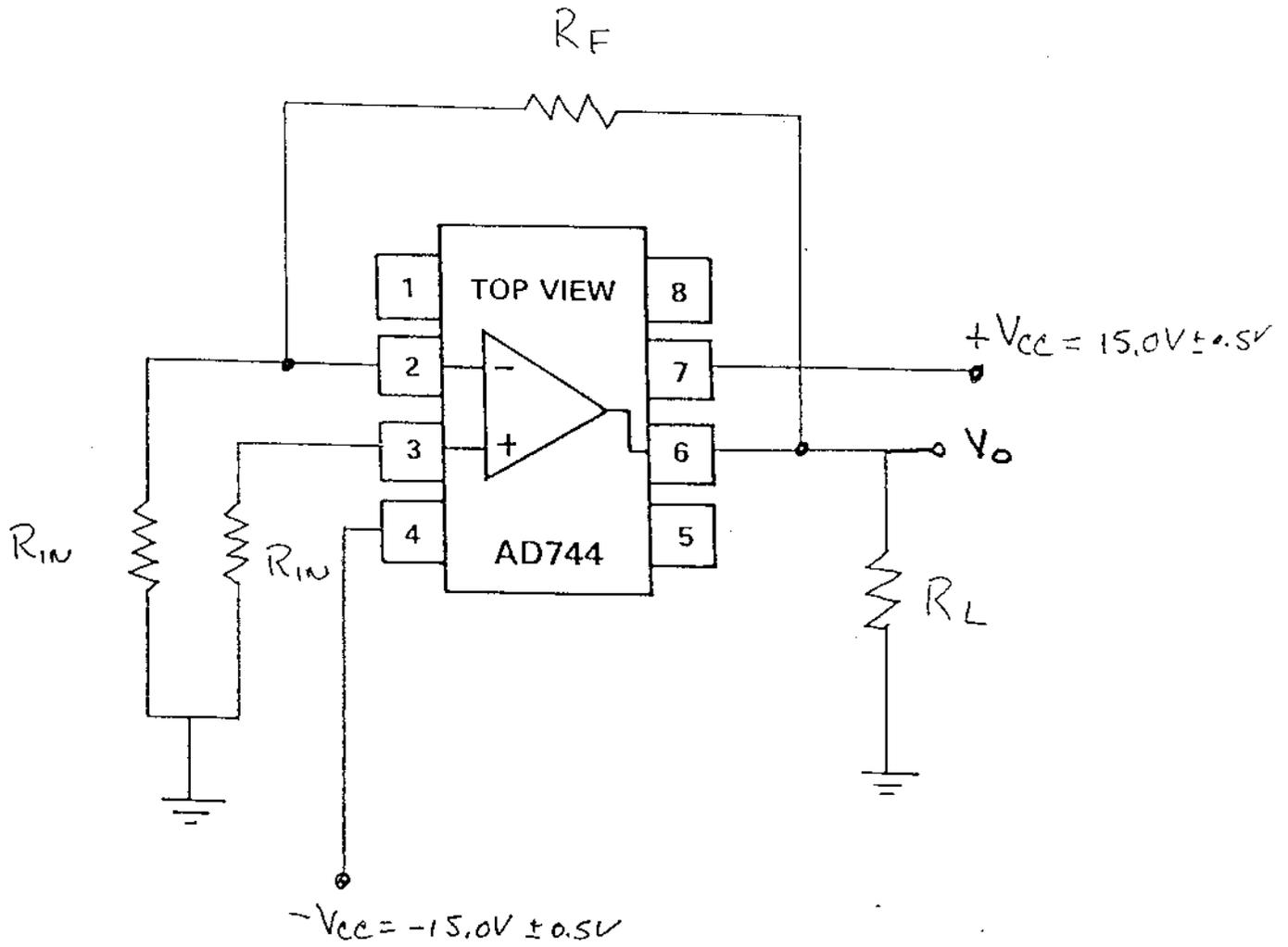


Figure 1. Radiation Bias Circuit for AD744TQ

