PPM 92-058

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UNISYS

RPM-92-058
Interoffice Memorandum

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To
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Department
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From
7809
Department
Radiation Report on GGS/POLAR-UVI
Part No. PA07M/883
Subject

February 10, 1992
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Location
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A radiation evaluation was performed on the PA07 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 10, 20, 30, 50, 75 and 100 krads*. After 100 krads, parts were annealed at +25°C for 168 hours, and then irradiation was continued to 200 and 300 krads (cumulative). The dose rate was between 0.5 and 5 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 at +25°C according to the test conditions and the specification limits listed in Table III.

All four parts passed all tests on irradiation up to 75 krads. On continued irradiation to 100 krads, two parts (SN 76 and 77) marginally exceeded the specification limits for Vos50 (readings were -2.2mV to -2.3mV against the specification limit of +/-2mV). After annealing the parts at +25°C for 168 hours, both parts showed some recovery for Vos50. One part (SN 76) recovered within the specification limits. On continued irradiation to 200 krads, all irradiated parts exceeded the specification limits for Vos50 with readings ranging from 3mV to 8mV. Also, all irradiated parts displayed an increase in IB+/, however no part ever exceeded the specification limit of +/-50pA. No significant degradation was observed in any other parameter throughout the radiation testing.

Table IV provides the mean and standard deviation values for each parameter after different irradiation 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.

*In this report, the term "rads" is used as an abbreviation for rads(Si).

TABLE I. Part Information

Generic Part Number:	PA07M/883
GGS Part Number:	Pa07M/883
GGS Control Number:	5521
Charge Number:	C23356
Manufacturer:	Ampex
Lot Date Code:	9108
Quantity Tested:	5
Serial Numbers of Radiation Samples:	75, 76, 77, 78, 79
Serial Number of Control Sample:	75
Part Function:	High Voltage/High Power Operational Amplifier
Part Technology:	Hybrid/BiPolar with JFET Inputs
Package Style:	TO-3 (8-pin)

TABLE II. Radiation Schedule for PA07M/883

EVENTS	DATE
1) Initial (Pre-Irradiation) Electrical Measurements	12/16/91
2) 10- KRAD IRRADIATION (0.5 krads/hour)	12/17/91
POST-10-KRAD ELECTRICAL MEASUREMENT	12/18/91
3) 20-KRAD IRRADIATION (0.5 krads/hour)	12/18/91
POST-20-KRAD ELECTRICAL MEASUREMENT	12/19/91
4) 30-KRAD IRRADIATION (0.5 krads/hour)	12/19/91
POST-30-KRAD ELECTRICAL MEASUREMENT	12/20/91
5) 50-KRAD IRRADIATION (.3 krads/hour)	12/20/91
POST-50-KRAD ELECTRICAL MEASUREMENT	12/23/91
6) 75-KRAD IRRADIATION (1.25 krads/hour)	12/23/91
POST-75-KRAD ELECTRICAL MEASUREMENT	12/24/91
7) 100-KRAD IRRADIATION (0.58 KRADS/HOUR)	12/24/91
POST-100-KRAD ELECTRICAL MEASUREMENT	12/26/91
8) 168 HOURS ANNEALING AT +25°C	12/26/91
POST-168-HOURS ELECTRICAL MEASUREMENT	01/02/92
9) 200-KRAD IRRADIATION (5.0 KRADS/HOUR)	01/02/92
POST-200-KRAD ELECTRICAL MEASUREMENTS	01/03/92
10) 300-KRAD IRRADIATION (1.5 KRADS/HOUR)	01/03/92
POST-300-KRAD ELECTRICAL MEASUREMENTS	01/06/92

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.
- Annealings performed under bias.

Table III. Electrical Characteristics of PA07M/883

Device: PA07M/883 High Voltage Power Operational Amplifier
Spec: APEX 1991 Data Book Date:June 1991
PCN: TI10275.0 GENRAD 1731
Programmer:Timothy K. Mondy Date:December 11, 1991
Reviewer: Date:
Electrical Test per APEX 1991 Data Book.

DC Electrical Characteristics:

T_A=25°C, Vcc+=+35V, Vcc-=-35V, Rs=50 Ohm, unless otherwise Specified.

TEST	CONDITIONS	LIMIT		UNITS
		Min	Max	
+Icc	Vo = 0V, Av = OPEN LOOP		30	mA
-Icc	Vo = 0V, Av = OPEN LOOP	-30		mA
Vos50	Vo = 0V		2	mV
	Vo = 0V, Vcc+=12V,Vcc-=-12V		4.3	mV
	Vo = 0V, Vcc+=50V,Vcc-=-50V		3.5	mV
Ios	Vo = 0V	-50	50	pA
Ib+	Vo = 0V	-50	50	pA
Ib-	Vo = 0V	-50	50	pA
I_{BIAS}	Vo = 0V	-50	50	pA
Av	dVo=50V, RL=500 Ohm, f<100Hz Ramp		39.8	V/mV
CMRR	Vcc+=34.5V,Vcc-=-34.5V			
	Vcm=+/-16.5V, RL=500 Ohm	80		dB

Note:
Common Mode Rejection Ratio test performed with Vcm = +/- 16.5V, rather than the specified Vcm = +/- 24.5V, due to the limitations of the tester.

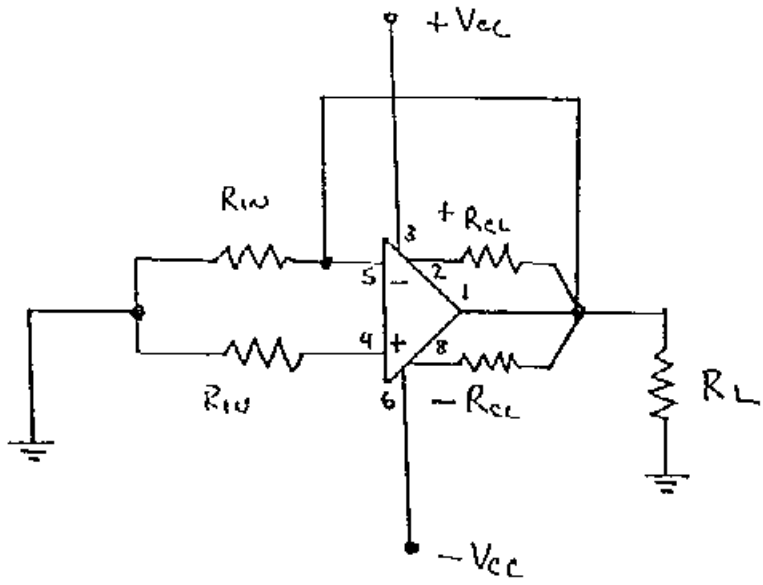
TABLE IV: Summary of Electrical Measurements After Total Dose Exposures and Annealing for PA07 1/

				Total Dose Exposure (TDE) (krads)														Anneal		TDE (krads)			
				Initial		10		20		30		50		75		100		168 hour		200		300	
Parameters		Spec. Limi min	max	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
+Icc	mA	-	30	18.3	.25	17.8	.13	17.9	.17	17.4	.13	17.5	.14	17.3	.17	17.2	.16	17.3	.13	16.9	.13	16.8	.18
-Icc	mA	-30	-	-18.2	.22	-17.7	.14	-17.8	.22	-17.3	.14	-17.5	.21	-17.2	.20	-17.2	.21	-17.2	.13	-16.8	.13	-16.7	.17
VOS @50	uV	-	2000	134	78	193	191	284	306	93.5	384	-201	591	-1148	602	-1884	664	-1005	1037	-4850	1878	-5870	854
Ios	pA	-50	50	-1.06	.14	-1.16	.34	-1.15	.29	-1.39	.58	-1.25	.50	-1.43	.62	-1.27	.70	-1.50	.47	-1.60	.57	-1.54	3.4
Ib+	pA	-50	50	-.150	.32	-4.32	.86	-3.47	.54	-9.15	2.3	-5.93	.57	-6.79	.74	-8.07	1.2	-10.2	2.0	-13.4	2.9	-22.3	3.7
Ib-	pA	-50	50	.911	.45	-3.16	.55	-2.32	.35	-7.66	1.7	-4.67	.41	-5.36	.52	-3.52	7.1	-8.73	1.7	-11.8	2.3	-20.8	4.9
Ibias	pA	-50	50	.441	.29	-3.74	.70	-2.90	.43	-8.40	2.0	-5.50	.43	-6.08	.56	-7.44	1.4	-9.48	1.8	-12.6	2.6	-21.6	4.0
Aol	kV/V	-	-	122	19	117	18	113	18	108	17	104	18	101	17	97.6	16	102	18	90.7	14	183.1	11
CMRR	dB	-	-	127	5.9	125	6.2	125	7.9	124	7.7	123	7.4	122	8.8	123	12	123	8.0	115	2.1	122	14

Note:

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

Figure 1. Radiation Bias Circuit for PA07M/883



Bias Conditions:

Ta=25°C

+Vcc = 15.0V +/- 0.5VDC
-Vcc = -15.0V +/- 0.5VDC
R_{IN} = 100 Ohm 1/4W @ 10%
R_L = 100 Ohm 1/4W @ 10%
R_{CL} = 1 Ohm 1/4W @ 10%