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UNISYS

Interoffice Memorandum

PPM-91-120

Date

February 20, 1991

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Radiation Report on PM-1012AZ/883
SMEX Common Buy Part No. PM-1012AZ/883

A radiation evaluation was performed on PM-1012AZ/883 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, 30, 50, 75 and 100 krads. After 100 krads, parts were annealed at 25°C for 24 and 168 hours, and then the irradiation was continued to 200 and 300 krads (cumulative). The dose rate was between 0.25 - 5.5 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 according to the test conditions and the specification limits listed in Table III.

All (8) parts except one passed all tests on irradiation up to 5 krads. The failing part (SN 453) marginally exceeded the specification limit on VOS1 (the reading was 35.5uV against the specification limit of 35uV). At 10 krads, all parts exceeded the specification limits on VOS1, while two parts also exceeded the specification limits on VOS2. After 20 krads, all parts exceeded the specification limits on VOS1 and VOS2, while one part marginally exceeded the specification limit on CMRR.

The parts continued to deteriorate with more irradiation. At 30 and 50 Krads, parts exceeded the specification limits on VOS1, VOS2, VOS3, AOL, CMRR and Slew Rate. At 75 and 100 krads, parts began to exceed the specification limits on PSRR and Ibias also. Parts showed some recovery on annealing for 24 and 168 hours, but the recovery was not enough to bring any of the parameters within the specification limits. On continued irradiation to 200 and 300 krads, parts showed increased degradation in all of the above

parameters. 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 731-8954.

TABLE I. Part Information

Generic Part Number:	PM-1012AZ/883
SMEX Common Buy Part Number:	PM-1012AZ/883
SMEX Common Buy Control Number:	1689
Manufacturer:	PMI
Quantity Procured:	475
Lot Date Code:	9029
Quantity Tested:	10
Serial Numbers of Radiation Samples:	452, 453, 454, 455 456, 457, 458, 459
Serial Numbers of Control Samples:	450, 451
Part Function:	Low Power, Precision Operational Amplifier
Part Technology:	Bipolar
Package Style:	8-Pin DIP

TABLE II. Radiation Schedule

EVENTS	DATE
1) Initial Electrical Measurements	01/14/91
2) 5 krads irradiation @ 250 rads/hr Post 5 krads Electrical Measurements	01/14/91 01/15/91
3) 10 krads irradiation @ 250 rads/hr Post 10 krads Electrical Measurements	01/15/91 01/16/91
4) 20 krads irradiation @ 500 rads/hr Post 20 krads Electrical Measurements	01/16/91 01/17/91
5) 30 krads irradiation @ 500 rads/hr Post 30 krads Electrical Measurements	01/17/91 01/18/91
6) 50 krads irradiation @ 294 rads/hr Post 50 krads Electrical Measurements	01/18/91 01/21/91
7) 75 krads irradiation @ 1250 rads/hr Post 75 krads Electrical Measurements	01/21/91 01/22/91
8) 100 krads irradiation @ 1250 rads/hr Post 100 krads Electrical Measurements	01/22/91 01/23/91
9) 24 hrs annealing Post 24 hr Electrical Measurements	01/24/91
10) 168 hrs annealing Post 168 hr Electrical Measurements	01/30/91
11) 200 krads irradiation @ 5555 rads/hr Post 200 krads Electrical Measurements	01/30/91 01/31/91
12) 300 krads irradiation @ 5000 rads/hr Post 300 krads Electrical Measurements	01/31/91 02/01/91

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 was performed at 25°C under bias.

TABLE III. Electrical Characteristics of PM-1012AZ/883

Test	V _S	MIN	MAX
VOS1	±15V	-35.00uV	35.00uV
VOS2	±2V	-90.00uV	90.00uV
VOS3	±20V	-90.0uV	90.00uV
IOS1	±15V	-5.0nA	5.0nA
IOS2	±2V	-5.0nA	5.0nA
IOS3	±20V	-5.0nA	5.0nA
+IB1	±15V	-5.0nA	5.0nA
+IB2	±2V	-5.0nA	5.0nA
+IB3	±20V	-5.0nA	5.0nA
-IB1	±15V	-5.0nA	5.0nA
-IB2	±2V	-5.0nA	5.0nA
-IB3	±20V	-5.0nA	5.0nA
CMRR	±15V	-1000.00dB	-114.00dB
PSRR	±20V	-1000.00dB	-114.00dB
+IS1	±15V	-0.13uA	599.86uA
+IS2	±2V	-0.03uA	599.96uA
+IS3	±20V	-0.21uA	599.78uA
-IS1	±15V	-599.86uA	0.13uA
-IS2	±2V	-599.96uA	0.03uA
-IS3	±20V	-599.78uA	0.21uA
+VOUT	±15V	13.00V	22.87V
-VOUT	±15V	-22.87V	-13.00V
AOL1	±15V	300.01V/mV	3691349.00V/mV
AOL2	±15V	200.01V/mV	422213.10V/mV
+SR	±15V	0.10V/us	52.36V/us

Table IV. Summary of Electrical Measurements after
Total Dose Exposures and Annealing for PM-1012AZ/883

1/2/3/

Parameters	Spec. Limits		Initials		Total Dose Exposure (krads)											
	min	max	mean	sd	5		10		20		30		50		100	
					mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
VOS1 *	UV	-35 35	-3.0	4.8	27.0	7.6	60.3	13.0	>97	~	>97	-	>97	-	>97	-
VOS2 **	UV	-90 90	11.2	3.0	46.7	2.5	75.4	9.1	137	19.5	240	21.3	439	23.2	>700	-
ICS1	mA	-5 5	0	0.1	0	0	0.1	0.1	0	0.1	0.1	0.1	0	0.1	0	0.2
+IB1	mA	-5 5	0.2	0.1	0.1	0	0	0.1	-0.2	0.1	-0.4	0.1	-1.1	0.2	-5.0	0.5
-IB1	mA	-5 5	0.1	0.1	0	0	0	0	-0.3	0.1	-0.5	0.1	-1.4	0.1	-5.1	0.5
CMRR	dB	-1000 -114	-130	5	-130	10	-124	3	-116	2	-110	2	-103	2	-93.0	1.2
PSRR	dB	-1000 -114	-131	6	-126	4	-128	4	-124	6	-117	1	-108	1	-95.6	1.4
-IS1	uA	-.126 600	344	5	345	6	340	6	334	5	335	7	330	6	308	8
-IS1	uA	-600 .126	-343	4	-335	4	-333	5	-327	6	-331	7	-320	6	-300	6
+VOUT	V	13 22.9	14.1	0	14.0	0	14.0	0	14.0	0	14.0	0	14.0	0	14.0	0
-VOUT	V	-22.9 -13	-14.3	0	-14.3	0	-14.3	0	-14.2	0	-14.2	0	-14.2	0	-14.2	0
ACL1	V/mV	300 37E5	838	141	585	135	539	67	433	115	258	15	249	14	251	12
+SP	V/us	0.1 52.4	0.13	0	0.12	0	0.12	0	0.11	0	0.09	0.01	0.09	0.01	0.06	0.01

* After 20 krads, VOS1 readings for all eight parts were over the measurement range of 97uV.

** After 100 krads, VOS2 readings for all eight parts were over the measurement range of 700uV.

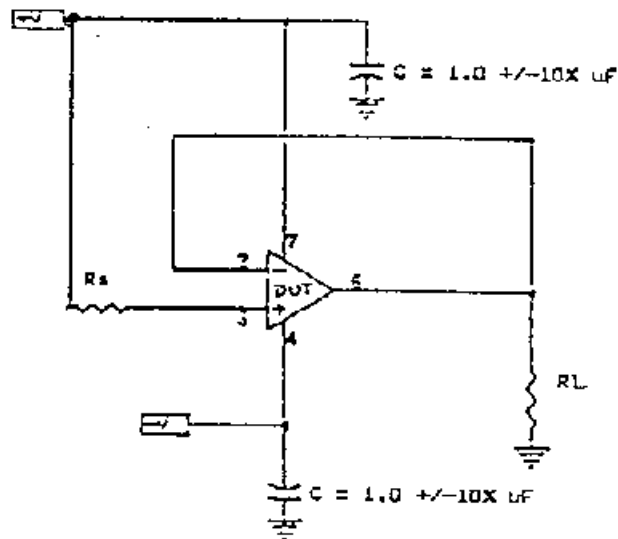
Table IV. (continued)

Parameters	Spec. Limits		Total Dose Exposure (krads)					
	min	max	168 hrs		200		300	
			mean	sd	mean	sd	mean	sd
VOS1	uV	-35 35	>97	-	>97	-	>97	-
VOS2	uV	-90 90	350	48.5	>700	-	>700	-
IOS1	nA	-5 5	0.1	0.1	-0.7	0.2	0.1	0.2
+IB1	nA	-5 5	-2.0	0.2	-7.0	0	-7.0	0
-IB1	nA	-5 5	-2.0	0.3	-7.0	0	-7.0	0
CMRR	dB	-1000 -114	-105	1	-92	0	-93	0.5
PSRR	dB	-1000 -114	-109	1	-94	0	-94	0
+IS1	uA	-.126 600	315	9	270	3	260	5
-IS1	uA	-600 .126	-309	5	-263	8	-250	4
+VOUT	V	13 22.9	14.0	0	14.0	0	14.0	0
-VOUT	V	-22.9 -13	-14.2	0	-13.3	0.2	-11.0	1.0
AOL1	V/mV	300 37E5	244	9	271	17	263	14
+SR	V/us	0.1 52.4	0.09	0.01	0.04	0	0.04	0

Notes:

- 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/ Table IV provides radiation characteristics of parts at selected total dose exposures and annealing treatments. The data at other radiation exposures and annealing treatments is available and can be obtained upon request.
- 3/ This table shows the trend in the degradation of VOS1, VOS2, IOS1, IB1, IS1 and AOL1 only. The degradation in VOS3, IOS2, IOS3, IB2, IB3, IS2 and IS3 was close to the respective parameters shown in Table IV.

Figure 1. Radiation Bias Circuit for PM-1012AZ/883



PACKAGE : 8 PIN DIP.

$R_S = R_L = 2 \text{ K}\Omega \text{ } 0.5 \text{ W } \pm 5\%$

$V^+ = 15.0 \text{ V } \pm 0.5 \text{ V}$

$V^- = -15.0 \text{ V } \pm 0.5 \text{ V}$

$T_A = 25^\circ \text{C}$

TOTAL # OF DUT : 8.