PPM-91-393

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Interoffice Memorandum

PPM-91-393

Date
June 19, 1991

Location
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Location
Lanham

To
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Department
Code 300.1

From
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Department
7809

Subject
Radiation Report on ISTP
Non-Common Buy Part No. CMP01Z/883B

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A radiation evaluation was performed on CMP01Z 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 10, 20, 50 and 100 krads. After 100 krads, parts were annealed at 25°C for 24 and 168 hours. The dose rate was between 0.6 - 2.9 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 passed all tests on irradiation to 20 krads. After 50 krads, however, all parts except SN 73 failed to meet the maximum specification limit of 600nA for Ib+, Ib- and Ibias (readings for all three parameters ranged from approximately 600nA to 700nA). Continued degradation in IB± and Ibias was observed after the next radiation step of 100 krads. In addition, a marked increase in IOS, VOS50 and VOSRs was observed. Although some recovery was observed in IB± and IBias upon annealing the parts for 24 and 168 hours, all parts continued to fail these parametric tests. Also, after 168 hours of annealing, one part (SN 69) began failing IOS with a reading of 28nA against the maximum specification limit of 25nA, and two parts (SNs 68 and 69) failed VOSRs with readings of 815uV and 872uV, respectively, against the maximum specification limit of 800uV. 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 301-731-8954.

TABLE I. Part Information

Generic Part Number:	CMP01Z
ISTP Non-Common Buy Part Number:	CMP01Z/883
ISTP Non-Common Buy Control Number:	2003
Charge No.:	C04061
Manufacturer:	PMI
Quantity Procured:	28
Lot Date Code:	8838
Quantity Tested:	8
Serial Numbers of Radiation Samples:	68, 69, 70, 71, 72, 73
Serial Numbers of Control Samples:	66, 67
Part Function:	Voltage Comparator
Part Technology:	Bipolar
Package Style:	8-lead CERDIP

TABLE II. Radiation Schedule

EVENTS	DATE
1) Initial Electrical Measurements	05/20/91
2) 10 krads irradiation @ 541 rads/hr	05/22/91
Post 10 krads Electrical Measurements	05/23/91
3) 20 krads irradiation @ 541 rads/hr	05/23/91
Post 20 krads Electrical Measurements	05/24/91
4) 50 krads irradiation @ 333 rads/hr	05/24/91
Post 50 krads Electrical Measurements	05/28/91
5) 100 krads irradiation @ 2857 rads/hr	05/28/91
Post 100 krads Electrical Measurements	05/29/91
6) 24 hrs annealing	05/29/91
Post 24 hr Electrical Measurements	05/30/91
7) 168 hrs annealing	05/29/91
Post 168 hr Electrical Measurements	06/05/91

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 performed at 25°C under bias.

Table III. Electrical Characteristics of CMP01Z 1/

Test	Conditions*	Limits Min	Max	Units
+I1		-	8	mA
-I1		-	2.2	mA
VOS50	Vo = 0.1V	-	800	uV
Ib+		-	600	nA
Ib-		-	600	nA
IOS		-	25	nA
Ibias		-	600	nA
VOSRs	Rs = 10kOhm	-	800	uV
+Vout	I1 = 0.32mA	2.4	-	V
Vsat	I1 = 12mA	-	500	mV

* +V1 = 15V, -V1 = -15V
VOH = 2.4V, VOL = 0.4V

1/ Parts were tested under different conditions in four bins. This table lists the limits and conditions for BIN#1 only. For test conditions and limits for BIN#2, #3 and #4, see Appendix I.

TABLE IV: Summary of E. .rical Measurements after
Total Dose Exposures and Annealing for CMP01Z 1/, 2/

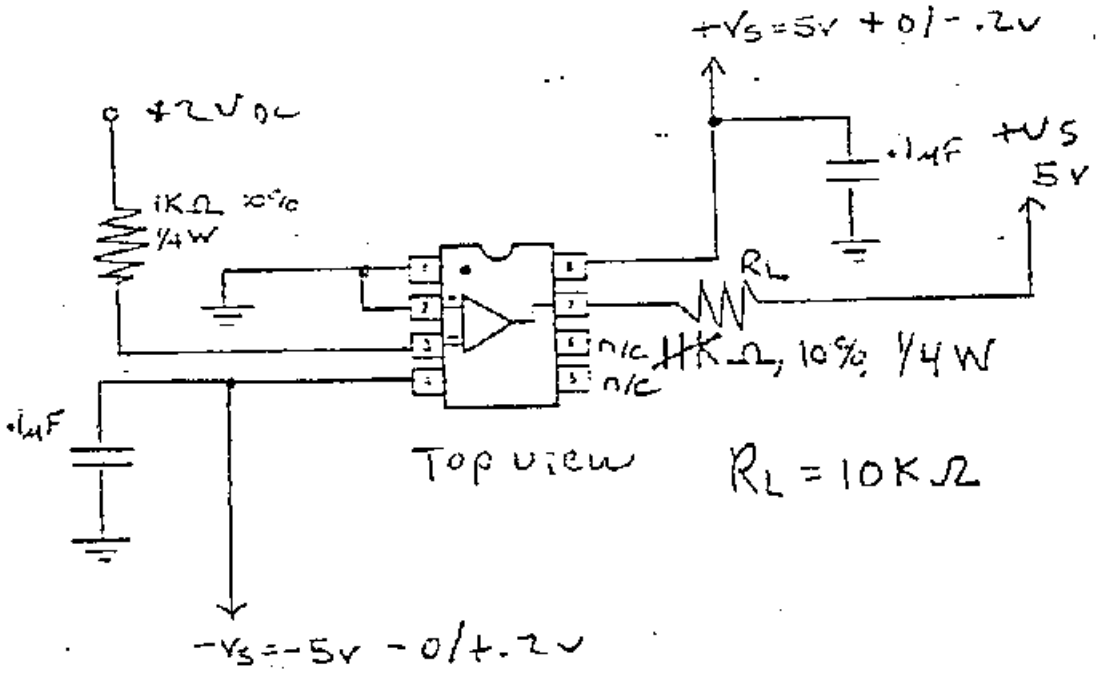
Parameters		Spec. Limits min	Spec. Limits max	Initials mean	Initials sd	Total Dose Exposure (krads) 10 mean	10 sd	20 mean	20 sd	50 mean	50 sd	100 mean	100 sd	Annealing 24 hrs. mean	24 hrs. sd	168 hrs. mean	168 hrs. sd
+I1	mA	-	8	3.6	.04	3.5	.05	3.5	.05	3.4	.06	3.4	.03	3.4	.03	3.4	.04
-I1	mA	-	2.2	1.3	.04	1.3	.04	1.2	.03	1.2	.03	1.2	.03	1.2	.03	1.2	.03
|VOS50|	uV	-	800	250	100	180	40	160	50	150	50	380	90	375	80	409	80
Ib+	nA	-	600	410	20	480	20	530	20	665	22	900	20	875	20	815	30
Ib-	nA	-	600	412	20	476	20	522	20	656	20	880	20	865	20	800	30
|IOS|	nA	-	25	2.5	1.0	1.8	0.6	5.0	1.0	9.9	1.5	16.5	2.0	15.5	2.0	16	5
Ibias	nA	-	600	425	15	470	20	530	20	660	20	905	27	860	20	810	25
|VOSRs|	uV	-	800	280	40	260	40	210	35	220	40	515	90	540	100	556	100
+Vout	V	2.4	-	4.6	.03	4.5	.03	4.5	.02	4.5	.03	4.5	.03	4.5	.03	4.5	.03
VSAT	mV	-	500	375	5	380	5	373	3	380	3	384	3	385	3	385	5

Note:

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

2/ Table IV includes a summary of test data from BIN#1 only; however, it is representative of the test data which was taken for all four bins.

Figure 1. Radiation Bias Circuit for CMP01Z



Appendix I

GENRAD SYSTEM TEST PROGRAM

1. PROGRAM CODE NUMBER..... > TI102060
2. DEVICE PART NUMBER..... > LM911 883
3. INTEGRATED CIRCUIT..... > COMPARATOR
4. DEVICE SELECT..... > SINGLE
5. NUMBER OF BINS..... > 4
6. TEST TEMPERATURE BIN #1..... > +025oC
7. TEST TEMPERATURE BIN #2..... > +025oC
8. TEST TEMPERATURE BIN #3..... > +025oC
9. TEST TEMPERATURE BIN #4..... > +025oC
11. POWER-UP SCAN DELAY AFTER TEST # 3.... > 00 msec
12. INTER-TEST DELAY..... > 04 msec
13. GENRAD SOCKET NUMBER..... > CMP 05
14. PCN LOCATION (TAPE OR DISK)..... > DATA DISK 5
15. SPECIAL SETUP REQUIRED :
SET POTENTIOMETER FOR 5K (RUP)

Bin #1

COMPARATOR LIMITS AND CONDITIONS SUMMARY
TEST TEMPERATURE :+025oC PCN :TI102060

1.	+Ii	=	6.000 mA	Rup	=NO		C1
2.	-Ii	=	0.200 nA	Sen	=		C1
3.	Vos@300OHMS	=	.500 mV	Vo	= .1 V		C1
5.	Ib+	=	300.00 nA				C1
6.	Ib-	=	500.00 nA				C1
7.	Ios	=	25.00 nA				C1
8.	Ibias	=	600.00 nA				C1
9.	VosRs	=	.500 mV	Rs	= 10.0 KOHM		C1
13.	+Vout	=	2.400 V	Ii	= .320 mA		C1
14.	Vsat	=	.300 V	Ii	= 12.000 mA		C1

Bin #3

COMPARATOR LIMITS AND CONDITIONS SUMMARY
TEST TEMPERATURE :+025oC PCN :TI102060

1.	+Ii	=	6.000 mA	Rup	=NO		C1
2.	-Ii	=	0.200 nA	Sen	=		C1
3.	Vos@300OHMS	=	.300 mV	Vo	= .1 V		C1
5.	Ib+	=	600.00 nA				C1
6.	Ib-	=	600.00 nA				C1
7.	Ios	=	25.00 nA				C1
8.	Ibias	=	600.00 nA				C1
9.	VosRs	=	.500 mV	Rs	= 10.0 KOHM		C1
13.	+Vout	=	2.400 V	Ii	= .320 mA		C1
14.	Vsat	=	.450 V	Ii	= 6.400 mA		C1

Bin #2

COMPARATOR LIMITS AND CONDITIONS SUMMARY
TEST TEMPERATURE :+025oC PCN :TI102060

1.	+Ii	=	3.200 mA	Rup	=NO		C2
2.	-Ii	=	0.200 nA	Sen	=		C1
3.	Vos@300OHMS	=	1.000 mV	Vo	= .1 V		C2
5.	Ib+	=	300.00 nA				C2
6.	Ib-	=	500.00 nA				C2
7.	Ios	=	21.00 nA				C2
8.	Ibias	=	500.00 nA				C2
9.	VosRs	=	1.000 mV	Rs	= 10.0 KOHM		C2
13.	+Vout	=	2.400 V	Ii	=		C1
14.	Vsat	=	.450 V	Ii	= 6.400 mA		C2

Bin #4

COMPARATOR LIMITS AND CONDITIONS SUMMARY
TEST TEMPERATURE :+025oC PCN :TI102060

1.	+Ii	=	6.000 mA	Rup	=NO		C1
2.	-Ii	=	0.200 nA	Sen	=		C1
3.	Vos@300OHMS	=	.500 mV	Vo	= .1 V		C1
5.	Ib+	=	600.00 nA				C1
6.	Ib-	=	600.00 nA				C1
7.	Ios	=	25.00 nA				C1
8.	Ibias	=	600.00 nA				C1
9.	VosRs	=	.500 mV	Rs	= 10.0 KOHM		C1
13.	+Vout	=	2.400 V	Ii	= .320 mA		C1
14.	Vsat	=	.400 V	Ii	= 8.000 mA		C1

COMPARATOR CONDITIONS SUMMARY
NUMBER OF BINS : 4 PCN : TI102060A

	+Vi (Volts)	-Vi (Volts)	Voh (Volts)	Vol (Volts)
C1	15	15	2.4	.4
C2	3	0	2.4	.4