APM 92-0080

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UNISYS

Interoffice Memorandum

To

Department

From

Department

Subject

Date PPM-92-008

Location Feb. 25, 1992

Telephone GSFC

Location 731-8954

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Radiation Report on GGS/POLAR-UVI
Part No. ICL7667MJA/883B

A radiation evaluation was performed on ICL7667MJA/883B 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, 40, 50, 75 and 100 krads. After 100 krads, parts were annealed at +25°C for 168 hours, and then the irradiation was continued to 200 and 300 krads (cumulative). The dose rate was between 0.15 and 5.2 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. These tests included three functional tests at 1 MHz.

All (4) parts passed all tests on irradiation up to 30 krads. However, after the 40 krads exposure, all four irradiated parts began to exceed the specification limit of 7 mA for ICCH. After 100 krads, all parts exceeded the specification limits for ICCH. The ICCH readings were in the range from 21 to 25 mA. Parts also began to exceed the specification limits for TPHL, however, no functional failures were observed on irradiation up to 100 krads. Parts showed some recovery on annealing for 168 hours at 25°C. On continued irradiation to 200 krads, all parts failed functional tests 1 and 2. Parts also continued to show increasing degradation in ICCH and failed all AC tests. After 300 krads, 2 parts also failed functional test 3.

Table IV provides a summary of the functional test results, as well as 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 II. Radiation Schedule for ICL7667

EVENTS	DATE
1) Initial Electrical Measurements	01/22/92
2) 10 KRAD IRRADIATION (0.45 krads/hour)	01/22/92
POST-10 KRAD ELECTRICAL MEASUREMENT	07/23/92
3) 20 KRAD IRRADIATION (0.5 krads/hour)	01/23/92
POST-20 KRAD ELECTRICAL MEASUREMENT	01/24/92
4) 30 KRAD IRRADIATION (0.15 krads/hour)	01/24/92
POST-30 KRAD ELECTRICAL MEASUREMENT	01/27/92
5) 40 KRAD IRRADIATION (0.5 KRADS/HOUR)	01/27/92
POST-40 KRAD ELECTRICAL MEASUREMENT	01/28/92
6) 50 KRAD IRRADIATION (0.5 krads/hour)	01/28/92
POST-50 KRAD ELECTRICAL MEASUREMENT	01/29/92
7) 75 KRAD IRRADIATION (1 krad/hour)	01/29/92
POST-75 KRAD ELECTRICAL MEASUREMENT	01/30/92
8) 100 KRAD IRRADIATION (1.3 krads/hour)	01/30/92
POST-100 KRAD ELECTRICAL MEASUREMENT	01/31/92
9) POST-168 HOUR ANNEAL ELECTRICAL MEASUREMENT	02/13/92
10) 200 KRAD IRRADIATION (5.3 krads/hour)	02/13/92
POST-200 KRAD ELECTRICAL MEASUREMENT	02/14/92
11) 300 KRAD IRRADIATION (1.1 krads/hour)	02/14/92
POST-300 KRAD ELECTRICAL MEASUREMENT	02/18/92

Table III. Electrical Characteristics of ICL7667

PART NO : ICL7667MJA/883B	PART TYPE : DUAL FET DRIVERS (8-PIN DIP).
LOCATION	TEST SPECIFICATIONS
PIN NUMBER : 5X10+55A DISK LABEL : TEST4 DIRECTORY : DOAD:[PROGRAMS.4663]	MAXIM DATA SHEET (1989)

TESTS PERFORMED

PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
FUNCT #1	4.5V	0.0V	4.5V	FREQ = 1.0MHz	ALL I/O	VOL<2.50V / VOH>2.50V
FUNCT #2	5.5V	0.0V	5.5V	FREQ = 1.0MHz	ALL I/O	VOL<2.50V / VOH>5.50V
FUNCT #3	7.0V	0.0V	7.0V	FREQ = 1.0MHz	ALL I/O	VOL<2.50V / VOH>5.00V

PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
IIH	15.0V	0.00V	7.0V	VIN = 15.0V	INS	> -0.10UA / <+0.10UA
IIL	15.0V	0.00V	7.0V	VIN = 0.0V	INS	> -0.10UA / <+0.10UA

PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
ICCH	15.0V	0.00V	3.00V	V_IN = VIH	VCC	> 0.0mA / <7.0mA
ICCL	15.0V	0.00V	3.00V	V_IN = VIL	VCC	> 0.0mA / <0.4mA

AC PARAMETRIC TESTS PROPAGATION DELAY TIMING

PARAMETER	VCC	VIL	VIH	PINS	LIMITS @ +25C MIN	LIMITS @ +25C MAX
TPHL *	5.0V	0.4V	5.0V	OUT	0.0NS	50.0NS
TPLH *	5.0V	0.4V	5.0V	OUT	0.0NS	50.0NS
TTLH *	5.0V	0.4V	5.0V	OUT	0.0NS	50.0NS
TTHL *	5.0V	0.4V	5.0V	OUT	0.0NS	30.0NS

COMMENTS/EXCEPTIONS

(1) DUE TO LIMITATIONS OF THE ATE, FUNCTIONAL TESTS ARE PERFORMED ONLY AT VCC LESS THAN OR EQUAL TO 7.0V.

(2) THE FOLLOWING PARAMETERS COULD NOT BE TESTED DUE TO ATE LIMITATIONS: VIL, VIH, VOH, VOL AND ROUT.

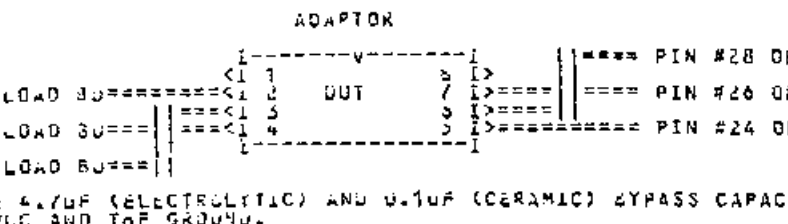
(3) IIL TEST PERFORMED WITH 7.0V BIAS ON INPUTS NOT BEING TESTED RATHER THAN 15V DUE TO ATE LIMITATION (V_DRIVE_MAX = 7.0V).

(4) AC TESTS ARE PERFORMED WITH (DUE TO LIMITATION ON ATE V_COMPARE_MAX = 7.0V):
TPLH : VCC = 5.0V, OUTPUT COMPARED AT 50% OF 5V SWING.
TPHL : VCC = 5.0V, OUTPUT COMPARED AT 50% OF 5V SWING.
TTLH : VCC = 5.0V, OUTPUT COMPARED AT 10% AND 90% OF 5V SWING.
TTHL : VCC = 5.0V, OUTPUT COMPARED AT 90% AND 10% OF 5V SWING.

THE AC TESTS SHOULD BE USED AS REFERENCE INFO ONLY NOT AS A "PASS/FAIL" CRITERIA

HARDWARE REQUIREMENTS	TEST TEMPERATURES		
DEVICE CONFIGURATION : 8-PIN DIP S-50 LOAD BOARD # 17 : PIN 8 JUMPERED TO GND. ** USE THE SPECIAL ADAPTOR.	+25 DEG. C. -55 DEG. C. +125 DEG. C.	X	ONLY

ADAPTOR INSTRUCTIONS



THERE ARE 4.7UF (ELECTROLYTIC) AND 0.1UF (CERAMIC) BYPASS CAPACITORS BETWEEN VCC AND THE GROUND.

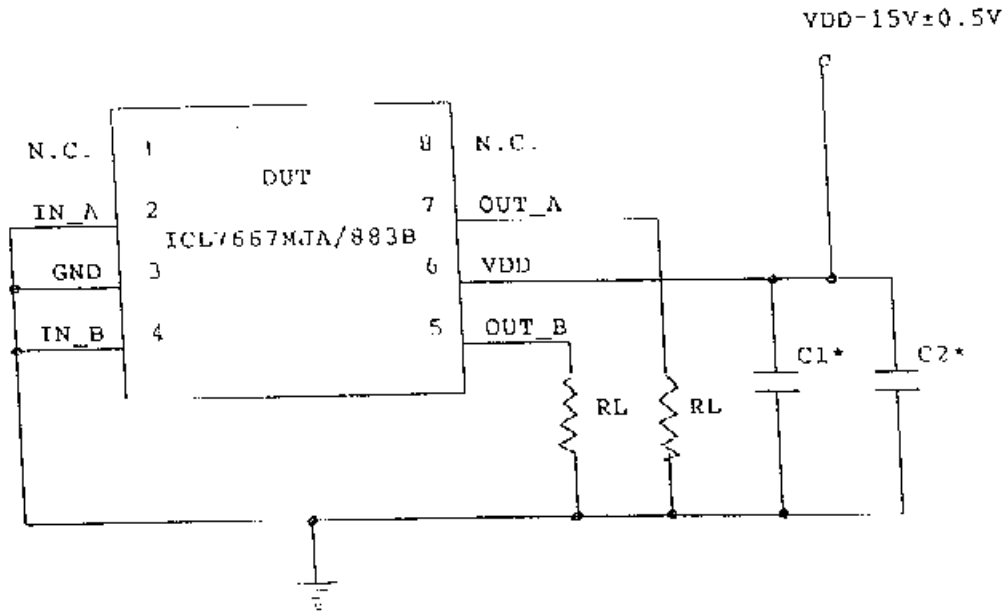
PROGRAMMER : AL KAM | DATE : 01-17-92

TABLE IV: Summary of Electrical Measurements After Total Dose Exposures and Annealing for ICL7667 1/2/

		Spec. Limits		Total Dose Exposure (TDE) (krads)																Annealin		TDE (krads)			
				Initial		10		20		30		40		50		75		100		168 hour		200		300	
Parameters		min	max	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
FUNC1				PASS		PASS		PASS		PASS		PASS		PASS		PASS		PASS		PASS		FAIL		FAIL	
FUNC2				PASS		PASS		PASS		PASS		PASS		PASS		PASS		PASS		PASS		FAIL		FAIL	
FUNC3				PASS		PASS		PASS		PASS		PASS		PASS		PASS		PASS		PASS		PASS		2P/2F	
IIH	nA	-100	100	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
IIL	nA	-100	100	0	-	-15.3	-	-0.8	2.0	-0.8	2.0	0	-	0	-	0	-	-0.9	0	0	-	-2.6	3.5	-1.8	2.6
ICCH	mA	0	7	5.2	0.3	5.4	0.1	6.1	0.1	6.1	0.1	9.2	0.2	11.9	0.4	15.9	5.3	23.3	1.0	20.5	0.8	32	0	32	0
ICCL	uA	0	400	36.3	7.4	44.8	7.4	49.3	12.4	49.3	12.4	106.5	7.8	119.8	12.4	115.3	33.1	132.8	14.1	70.3	7.4	321.5	7.8	221.5	35.5
VOH	V	4.95	-	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0
VOL	mV	-	50	0.8	0.1	0.8	0	1	0.2	0.8	0.2	1.5	0.3	1.9	0.5	2.9	0.4	3.3	0.3	3.8	1.1	15.3	14.4	41.3	43.4
TPHL	ns	0	30	17.6	0.7	18.2	0.5	19	0.5	19	0.5	21.2	0.6	22.4	0.7	27	0.7	32.9	0.7	25.3	1.0	>800	0	>800	0
TPLH 2/	ns	0	30	36.9	1.6	34.9	1.1	33.2	1.1	33.2	1.1	30	1.2	28.7	1.3	25.7	1.2	23.4	1.1	25.8	1.1	>800	0	>800	0
THL 2/	ns	0	30	8.0	0.3	7.8	0.1	7.8	0.2	7.8	0.2	7.9	0.2	7.8	0.2	7.8	0.2	7.9	0.2	7.7	0.2	*	-	*	-
TTEL	ns	0	30	7.6	0.3	8.2	0.1	8.8	0.1	8.8	0.1	10.2	0.1	11	0.1	14.4	0.1	19.8	0.4	14.1	0.4	*	-	*	-

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.
2/ >800 ns indicates that parts were exceeding 800 ns, the upper limit that the test equipment could measure for this parameter.
* Due to functional failure of the parts, these parameters could not be measured.

Figure 1. Radiation Bias Circuit for ICL7667



VDD = 15 V ± 0.5 V
RL= 2K OHM +/- 10%, 1/4 WATT
* C1 = 4.7 uF, 50V (OPTIONAL)
* C2 = 0.1 uF, 50V (OPTIONAL)

Ta = 25 °C.

** Outputs : Both Outputs High (~~15V).