

Unisys

DATE: July 14, 1997
TO: J. Shaw/312
FROM: K. Sahu/300.1 *K.Sahu*
SUBJECT: Radiation Report on: W48C20
Project: Advanced Interconnect Technology
Job #: EV78173
Project part #: W48C20-02G

PPM-97-026/Revised

cc: H. Shaw/311
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A radiation evaluation was performed on W48C20-02G 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 Co⁶⁰ 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 levels were 5.0, 10.0, 20.0, 25.0, 50.0, 75.0, 100.0, and 150.0 kRads.* The dose rate was between 0.125 and 0.625 kRads/hour (see Table II for radiation schedule). After each radiation exposure the parts were electrically tested according to the test conditions and the specification limits** listed in Table III.

Initial electrical measurements were made on 5 samples. Four samples (SN's 2, 3, 4, and 5) were used as radiation samples while SN 1 was used as a control sample. All parts passed all tests during initial electrical measurements except for some duty factor readings that were very slightly (<2.9%) above the maximum specification limit.

All parts passed all tests upon irradiation to 150.0 kRads. No significant degradation was noted in any parameter for any of the parts. No duty factor exceeded the maximum specification limit of 55.0% by more than 2.9%.

Table IV provides a summary of the test results with the mean and standard deviation values for each parameter after each irradiation exposure and annealing step.

Any further details about this evaluation can be obtained upon request. If you have any questions, please call me at (301) 731-8954.

* The term Rads, as used in this document, means Rads(silicon). All radiation levels cited are cumulative.

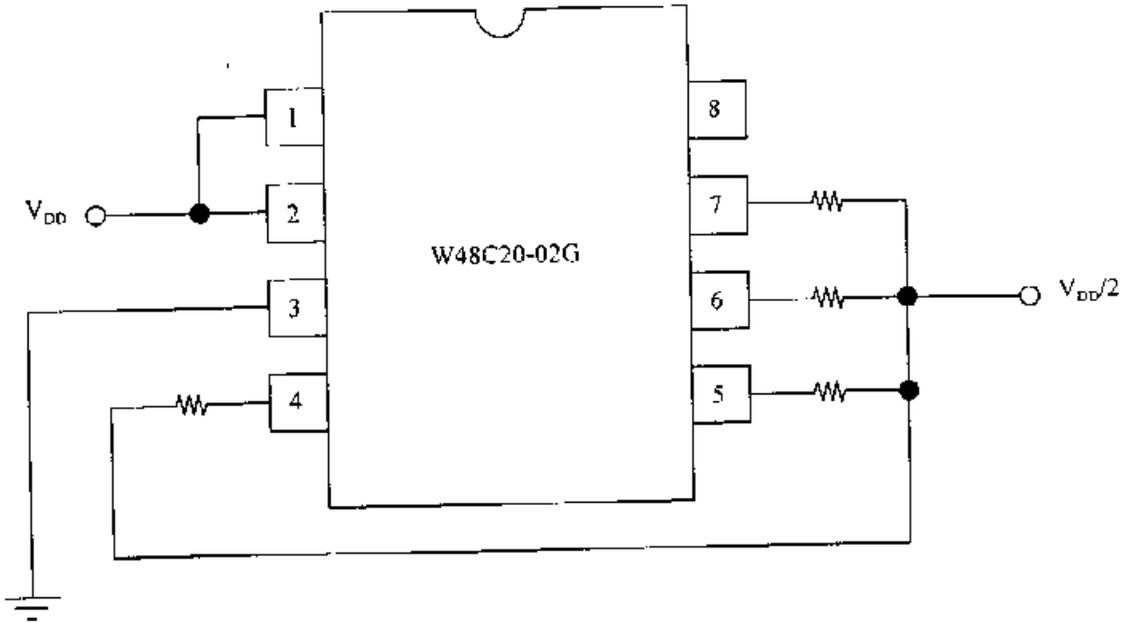
** These are manufacturer's pre-irradiation data specification limits. The manufacturer provided no post-irradiation limits at the time these tests were performed.

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Figure 1. Radiation Bias Circuit for W48C20



Notes:

1. Resistors are all $2k\Omega \pm 5\%$, $\frac{1}{2}$ W.
2. $V_{DD} = 5.0V \pm 0.5V$
3. Use 8 pin LCC to 14 pin DIP socket adapters with 14 pin DIP radiation bias boards.
4. The frequency at Pin #7 is 45.158MHz for part # W48C20-02G and 14.318MHz for part # W48C20-01G. For further information on this parameter, call ICWorks (408) 992-0202 ext. 1179 (Dave Christianberry, App. Engr.) Only part # W48C20-02G was tested for this report.

Pin Configuration List per Manufacturer's Data Sheet:

1: X1 2: V_{CC} 3: GND 4: 16.934MHz 5: 24.576MHz 6: 33.868MHz 7: 45.158MHz 8: X2

TABLE 1. Part Information

Generic Part Number:	W48C20
Advanced Interconnect Technology Part Number	W48C20-02G
Charge Number:	EV78173
Manufacturer:	IC WORKS
Lot Date Code (LDC):	None Given
Quantity Tested:	5
Serial Number of Control Samples:	1
Serial Numbers of Radiation Samples:	2, 3, 4, 5
Part Function:	Audio Subsystem Clock Generator
Part Technology:	Clock Generator
Package Style:	8 Pin SOIC
Test Equipment:	A540
Test Engineer:	J. Fogle

- No radiation tolerance/hardness was guaranteed by the manufacturer for this part.

TABLE II. Radiation Schedule for W48C20

EVENT	DATE
1) INITIAL ELECTRICAL MEASUREMENTS	05/16/97
2) 5.0 KRAD IRRADIATION (0.125 KRADS/HOUR)	05/18/97
POST-5.0 KRAD ELECTRICAL MEASUREMENT	05/19/97
3) 10.0 KRAD IRRADIATION (0.125 KRADS/HOUR)	05/19/97
POST-10.0 KRAD ELECTRICAL MEASUREMENT	05/20/97
4) 20.0 KRAD IRRADIATION (0.25 KRADS/HOUR)	05/20/97
POST-20.0 KRAD ELECTRICAL MEASUREMENT	05/21/97
5) 25.0 KRAD IRRADIATION (0.25 KRADS/HOUR)	05/21/97
POST-25.0 KRAD ELECTRICAL MEASUREMENT	05/22/97
6) 50.0 KRAD IRRADIATION (0.500 KRADS/HOUR)	05/22/97
POST-50.0 KRAD ELECTRICAL MEASUREMENT	05/23/97
7) 75.0 KRAD IRRADIATION (0.625 KRADS/HOUR)	05/23/97
POST-75.0 KRAD ELECTRICAL MEASUREMENT	05/27/97
8) 100.0 KRAD IRRADIATION (0.625 KRADS/HOUR)	05/27/97
POST-100.0 KRAD ELECTRICAL MEASUREMENT	05/28/97
9) 44 DAY ANNEALING @25°C, UNBIASED	05/28/97
POST-44 DAY ANNEAL ELECTRICAL MEASUREMENT	07/11/97
10) 150.0 KRAD IRRADIATION (0.625 KRADS/HOUR)	07/11/97
POST-150.0 KRAD ELECTRICAL MEASUREMENT	07/14/97

Effective Dose Rate = 100,000 RADS/10 DAYS = 416.7 RADS/HOUR=0.116 RADS/SEC
 Effective Dose Rate does not include the 150 kRad run due to the length of time between runs.

PARTS WERE IRRADIATED AND ANNEALED UNDER BIAS, SEE FIGURE 1.

Table III. Electrical Characteristics of W48C20 /1

Test #	Parameters	Units	Test Conditions	Spec. Lim.	
				min	max
1	ICC	mA	$V_{CC} = 5V \pm 0.5V$	0.0	50.0
2	F1 16.93MHZ	MHz		16.89	16.96
3	$\Delta F1$ target /2	%		-0.20	0.20
4	F2 24.58MHZ	MHz		24.53	24.63
5	$\Delta F2$ target /2	%		-0.20	0.20
6	F3 33.87MHZ	MHz		33.80	33.94
7	$\Delta F3$ target /2	%		-0.20	0.20
8	F4 45.16MHZ	MHz		45.07	45.25
9	$\Delta F4$ target /2	%		-0.20	0.20
10	D 16MHZ	%	Time above 1.5V	40.0	60.0
11	D 24MHZ	%	Time above 1.5V	45.0	55.0
12	D 33MHZ	%	Time above 1.5V	45.0	55.0
13	D 45MHZ	%	Time above 1.5V	45.0	55.0

Notes:

1/ These are the manufacturer's non-irradiated data sheet specification limits. No post-irradiation limits were provided by the manufacturer at the time the tests were performed

2/ These measurements give the variance from the expected exact frequency specified by the manufacturer.

**TABLE IV: Summary of Electrical Measurements after
Total Dose Exposures for W48C20 /1**

Test #	Parameters	Units	Spec. Lim. /2		Total Dose Exposure (kRads)																Annealing		TDE (kRads)	
					Initial		5.0		10.0		20.0		25.0		50.0		75.0		100.0		44days unbiased @25°C		150.0	
					mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
1	ICC	mA	0.0	50.0	11.2	0.2	11.2	0.2	11.3	0.3	11.3	0.3	11.5	0.1	11.6	0.1	12.1	0.4	12.8	0.6	18.7	0.3	19.0	0.6
2	F1_16.93MHZ	MHz	16.89	19.96	16.92	0	16.92	0	16.92	0	16.92	0	16.92	0	16.92	0	16.92	0	16.92	0	16.92	0	16.92	0
3	ΔF1_target /3	%	-0.20	0.20	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0
4	F2_24.58MHZ	MHz	24.53	24.63	24.55	0	24.55	0	24.55	0	24.55	0	24.55	0	24.55	0	24.55	0	24.55	0	24.55	0	24.55	0
5	ΔF2_target /3	%	-0.20	0.20	-0.13	0	-0.13	0	-0.13	0	-0.13	0	-0.13	0	-0.13	0	-0.13	0	-0.13	0	-0.13	0	-0.13	0
6	F3_33.87MHZ	MHz	33.80	33.94	33.84	0	33.84	0	33.84	0	33.84	0	33.84	0	33.84	0	33.84	0	33.84	0	33.84	0	33.84	0
7	ΔF3_target /3	%	-0.20	0.20	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0
8	F4_45.16MHZ	MHz	45.07	45.25	45.12	0	45.12	0	45.12	0	45.12	0	45.12	0	45.12	0	45.12	0	45.12	0	45.12	0	45.12	0
9	ΔF4_target /3	%	-0.20	0.20	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0	-0.08	0
10	D_16MHZ /4	%	40.0	60.0	57.2	0.9	52.3	0.8	51.8	0	52.4	0.3	52.9	0.8	52.0	0.3	52.5	0.7	52.2	0.4	57.2	0.9	52.0	0.3
11	D_24MHZ /4	%	45.0	55.0	53.0	0.6	52.6	0	53.0	0.6	53.0	0.6	52.7	1.0	53.1	0.7	52.3	0.5	53.0	0.6	52.7	1.0	52.7	1.0
12	D_33MHZ /4	%	45.0	55.0	55.2	0.8	53.9	0	52.9	1.0	53.3	1.5	53.7	1.9	55.2	0.7	53.8	1.3	53.8	1.3	54.8	0.9	53.9	0
13	D_45MHZ /4	%	45.0	55.0	53.9	2.3	55.9	2.2	55.7	2.3	57.2	2.3	55.9	2.2	56.6	2.3	57.9	0	57.2	1.3	57.2	1.3	56.6	2.3

- Notes:
- 1/ The mean and standard deviation values were calculated over the four parts irradiated in this testing. The control sample remained constant and is not included in this table.
 - 2/ These are manufacturer's pre-irradiation data sheet specification limits. No post-irradiation limits were provided by the manufacturer at the time the tests were performed.
 - 3/ These parameters show the variance from the expected exact frequency specified by the manufacturer.
 - 4/ These parameters show the duty factor for each frequency.
- Radiation-sensitive parameters: None.