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UNISYS

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Subject Radiation Report on ISTEP
Non-Common Buy Part No. MCM1609-21.86 kHz

Interoffice Memorandum

PPM-91-0382

Date June 4, 1991

Location Lanham

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A radiation evaluation was performed on MCM1609-21.86 kHz oscillator 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, five 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 2.5, 5, 11, 16, 21, 51, and 101 krads. After 101 krads, parts were annealed at 25°C for 168 hours (cumulative). The dose rate was between 0.125 - 2.5 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 (5) parts passed the initial electrical measurements. Parts continued to stay within the specification limits without any significant degradation throughout all radiation steps up to 101 krads, and on subsequent annealing for 168 hours. 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:	MCM1609-21.86 kHz
ISTP Non-Common Buy Part Number:	MCM1609-21.86 kHz
ISTP Non-Common Buy Control Number:	2114
Manufacturer:	Q-Tech Corporation
Quantity Procured:	38
Lot Date Codes:	9107
Quantity Tested:	7
Serial Numbers of Radiation Samples:	5003, 5008, 5014, 5020, 5026
Serial Numbers of Control Samples:	4994, 4998
Part Function:	Crystal Oscillator
Part Technology:	Hybrid/CMOS
Package Style:	14 pin DIP

TABLE II. Radiation Schedule

EVENTS	DATE
1) Initial Electrical Measurements	05/03/91
2) 2.5 krads irradiation @ 131.6 rads/hr	05/09/91
Post 2.5 krads Electrical Measurements	05/10/91
3) 5 krads irradiation @ 125 rads/hr	05/10/91
Post 5 krads Electrical Measurements	05/11/91
4) 11 krads irradiation (See Note 1)	05/11/91
Post 11 krads Electrical Measurements	05/13/91
5) 16 krads irradiation @ 263.2 rads/hr	05/13/91
Post 16 krads Electrical Measurements	05/14/91
6) 21 krads irradiation @ 263.15 rads/hr	05/14/91
Post 21 krads Electrical Measurements	05/15/91
6) 51 krads irradiation @ 1666.7 rads/hr	05/15/91
Post 51 krads Electrical Measurements	05/16/91
7) 101 krads irradiation @ 2777.8 rads/hr	05/16/91
Post 101 krads Electrical Measurements	05/17/91
8) 168 hour annealing (See Note 2)	05/17/91
Post 168 hr Electrical Measurements	05/24/91

Notes:

1) The test and inspection lab was locked on 5/12/91, therefore, the parts could not be tested. This resulted in the parts being exposed for 19 hours under 263.2 rads/hr. and for 23 hours under 43.5 rads/hr. Therefore the parts received a net dose of 6 krads instead of 5 krads. The remaining radiation steps have received 1 krad more than they were scheduled to receive.

2) The parts were originally scheduled to be tested after 24 hours annealing but were accidentally left under bias last the scheduled day. As a result, the 24 hour annealing step was omitted and the parts were left under bias for a total of 168 hours.

3) All parts were radiated under bias at the cobalt-60 gamma ray facility at GSFC.

4) All electrical measurements were performed off-site at 25°C.

5) Annealing performed at 25°C under bias.

Table III. Electrical Characteristics of MCM1609-21.86 kHz
 Conditions

$$V_{DD} = 5 \text{ V} \pm 0.5 \text{ V}, T_A = +25^\circ\text{C}$$

<u>Test</u>	<u>MIN</u>	<u>MAX</u>
Supply Current (I_{DD})		50 mA
frequency (f)	21859.814 Hz	21862.186 Hz
Duty Cycle (DC)	45 %T	55 %T
Rise Time (t_r)		10 ns
Fall Time (t_f)		10 ns
V_{OH}	4.9 V	
V_{OL}		100 mV

TABLE IV: Summary of Electrical Measurements after
Total Dose Exposures and Annealing for MCM1609-21.86 Hz

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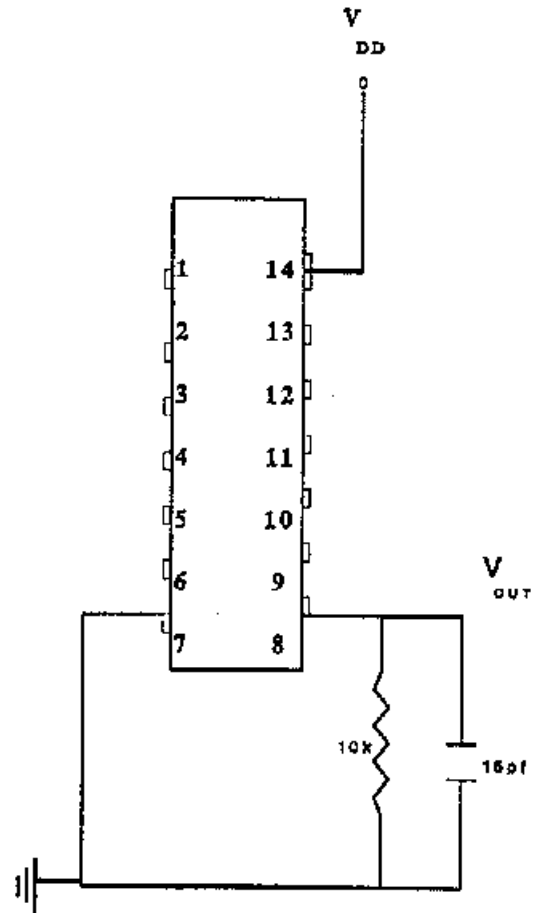
Parameters		Spec. Limits		Initials	Total Dose Exposure (krads)																Annealing	
					2.5		5		11		16		21		51		101		168 hrs			
					mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
IDD	mA	50		32	.3	32	.3	32	.2	32	.1	31	.5	32	.1	32	.1	31	.2	33	.7	
freq	Hz	21859	21862	21859	.7	21859	.2	21859	.4	21859	.2	21860	.2	21860	.1	21860	.1	21860	.1	21860	.1	
DC	%T	45	55	50	0	50	.01	50	0	50	0	50	0	50	0	50	0	50	0	50	0	
tr	ns	10		3	.01	3	.2	3.8	.2	3.2	.1	3	0	4.5	.1	4.5	.3	4.8	.2	4.7	.1	
tf	ns	10		3	.1	3	0	3.24	.2	2.8	.2	3	0	3.9	.1	4	0	4.8	.1	4.7	.1	
VOH	V	4.9		4.9	0	5.06	.01	5.67	.01	5.76	.1	5.71	.1	5.1	.02	4.98	.1	5.02	.02	5.37	.07	
VOL	mV	100		17	14	24	10	*		*		*		8	20	12	7	85	40	90	20	

Notes:

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

* The VOL readings at each steps were mistakenly taken at their peak negative values rather than their stable value. Hence, no reliable measurements were available for VOL at these radiation steps. However, parts were noted to have passed all parameters at these radiation steps.

Figure 1: Radiation Bias Circuit for MC1609 21.86 kHz



$V_{DD} = 5V \pm 0.5V$

$I_{DD} < 30 \text{ mA}$