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UNISYS

ISTP/CB

(2)

To
C.S. Eveland
Department
Code 311
From
K. Sahu
Department
7813
Subject
Radiation Report on
ISTP Common Buy Part No. 54RHSC161CS0

Interoffice Memorandum

PPM-91-008

Date
January 3, 1991

Location
GSFC

Telephone
731-8661

Location
Danham

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A radiation evaluation was performed on 54RHSC161CS0 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 doses 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 20, 50 and 105 krads. After 105 krads, parts were annealed at 25°C for 24 and 168 hours, and then the irradiation was continued up to 200 and 300 krads (cumulative). The dose rate was between 1-5 krads/hour, depending on the total dose level (see Table I 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 parts passed all electrical tests and were well within the specification limits for irradiation up to 300 krads. 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 731-8661.

TABLE I. Part Information

Generic Part Number:	54RHSC161CS0
ISTP Common Buy Part Number:	54RHSC161CS0
ISTP Common Buy Control Number:	169
Manufacturer:	Marconi Electronic Devices
Quantity Procured:	265
Lot Date Code:	9022
Quantity Tested:	10
Serial Numbers of Radiation Samples:	493 thru 500
Serial Numbers of Control Samples:	491,492
Part Function:	Synchronous 4-bit Binary Counter
Part Technology:	CMOS/SOS - Radiation Hardened
Package Style:	16 Pin DIP

TABLE II. Radiation Schedule

EVENTS	DATE
1) Initial Electrical Measurements	12/03/90
2) 20 krads irradiation @ 1 krads/hr	12/03/90
Post 20krads Electrical Measurements	12/05/90 *
3) 50 krads irradiation @ 1.5 krads/hr	12/05/90
Post 50krads Electrical Measurements	12/06/90
4) 105 krads irradiation @ 1.2 krads/hr	12/07/90
Post 105krads Electrical Measurements	12/10/90
5) 24 hrs annealing	12/10/90
Post 24 hr Electrical Measurements	12/11/90
6) 168 hrs annealing	12/11/90
Post 168 hr Electrical Measurements	12/17/90
7) 200 krads irradiation @ 5 krads/hr	12/17/90
Post 200krads Electrical Measurements	12/18/90
8) 300 krads irradiation @ 5 krads/hr	12/18/90
Post 300krads Electrical Measurements	12/21/90 *

Notes:

- 1) All parts were radiated under bias at the cobalt-60 gamma ray facility at GSFC.
- 2) All electrical measurements were performed off-site at 25°C.
- 3) Annealing performed at 25°C under bias.

*Anomalous Event: At the second and eighth radiation steps, the automatic tester (S-50) was down when the parts came out of the radiation chamber on 12-4-90 and 12-19-90. The parts were kept under bias from 12-4-90 to 12-5-90 and from 12-19-90 to 12-21-90, and then the electrical measurements were made. These events did not significantly effect the test results of this evaluation.

TABLE III. Electrical Characteristics of 54RHSC161CS0

FUNCTIONAL TESTS PERFORMED						
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS AT +25C ONLY
===== FUNCT 1 FUNCT 2 FUNCT 3 =====	4.5V 5.0V 5.5V	0.0V 0.0V 0.0V	3.0V 3.0V 3.5V	FREQ = 1.000MHZ FREQ = 1.000MHZ FREQ = 1.000MHZ I _{OH} = -5.0MA V _{REF} = 1.5V I _{OL} = +5.0MA	ALL I/O ALL I/O ALL I/O	VOL < 1.5V / VOH > 1.5V VOL < 1.5V / VOH > 1.5V VOL < 1.5V / VOH > 1.5V

DC PARAMETRIC TESTS PERFORMED						
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS AT +25C ONLY
===== VOH1 VOH2 VOH3 =====	4.5V 4.5V 4.5V	1.5V 1.5V 1.5V	3.5V 3.5V 3.5V	LOAD = -20UA LOAD = -6MA LOAD = -11MA	OUTS OUTS OUTS	> +4.4V / < +5.5V > +3.7V / < +5.5V > +2.5V / < +5.5V
VOL1 VOL2 VOL3	4.5V 4.5V 4.5V	1.5V 1.5V 1.5V	3.5V 3.5V 3.5V	LOAD = +20UA LOAD = +6MA LOAD = +9MA	OUTS OUTS OUTS	> +0.0V / < +0.1V > +0.0V / < +0.2V > +0.0V / < +0.4V
I _{IL}	5.5V 5.5V	0.0V 0.0V	5.5V 5.5V	VIH = 5.5V VIH = 0.0V	INS INS	> +0.0UA / < +10UA > -10UA / < +0.0UA
I _{CC}	5.5V	0.0V	5.5V	VIH = 5.5V	VCC	> +0.0UA / < +300UA

AC PARAMETRIC TESTS						
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
===== CP_QN_LH CP_TC_LH CP_QN_HL CP_TC_HL TE_TC_LH MR_QN_HL MR_TC_HL =====	5.0V 5.0V 5.0V 5.0V 5.0V 5.0V 5.0V 5.0V	0.0V 0.0V 0.0V 0.0V 0.0V 0.0V 0.0V	3.0V 3.0V 3.0V 3.0V 3.0V 3.0V 3.0V	F = 1 MHZ / F = 1 MHZ / F = 1 MHZ / F = 1 MHZ / F = 1 MHZ / F = 1 MHZ / F = 1 MHZ /	Q TC Q TC TC Q OUTPUTS	> 0NS / < 30NS > 0NS / < 30NS > 0NS / < 30NS > 0NS / < 30NS > 0NS / < 20NS > 0NS / < 35NS > 0NS / < 35NS

Note: VIL and VIH were tested during VOL and VOH tests as GO/NOGO.

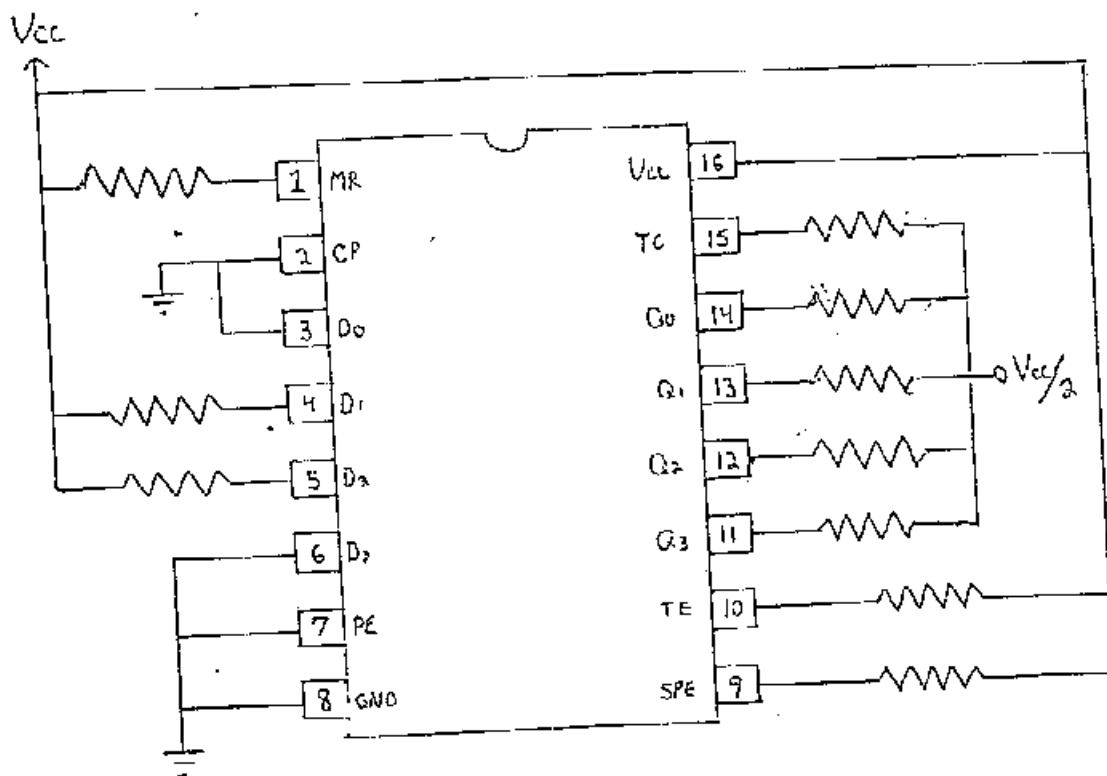
TABLE IV: Summary of Electrical Measurements after Total Dose Exposures and Annealing for 54RHSC101CS0 1/, 2/.

Parameters	Spec. Limits min max	Initials mean sd	Total Dose Exposure (krads)						Annealing at 25°C				Total Dose Exposure (krads)						
			20		50		105		24 hrs.		168 hrs.		200		300				
			mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd			
Func, 4.5V, 1MHz		Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	
Func, 5.0V, 1MHz		Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	
Func, 5.5V, 1MHz		Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	
VOH2	V 3.7 5.5	4.2	0	4.2	0	4.2	0	4.2	0	4.2	0	4.2	0	4.2	0	4.2	0	4.2	0
VOL2	mV 0 200	129	5	129	5	126	5	125	5	125	5	125	5	126	5	124	6	125	7
IIN	nA 0 1E4	57	119	9	39	7	18	17	71	8	23	11	46	11.5	33	7	17		
IIL	nA -1E4 0	-54	113	-9	38	-7	18	-16	69	-8	23	-12	45	-11	32	-7	16		
ICC	uA 0 300	0	0	0	0	0	0	2.0	5.3	2.0	5.3	0	0	22.6	7.7	42.1	5.0		
TPLH-Q	ns 0 30	16.1	0.6	14.5	0.6	14.0	0.6	13.6	0.6	13.8	0.6	13.9	0.6	15.4	0.8	15.7	0.8		
TPLH-TC	ns 0 30	23.4	0.8	21.7	0.8	21.4	0.9	21.2	0.8	21.4	0.8	21.7	0.8	24.0	0.8	23.8	0.8		
TPHL-Q	ns 0 30	18.4	1.8	16.7	1.9	16.0	1.8	15.5	1.8	15.7	1.8	15.8	1.8	17.1	1.8	17.4	1.9		
TPHL-TC	ns 0 30	23.7	0.6	21.7	0.6	21.2	0.6	20.8	0.7	21.0	0.7	21.1	0.7	22.8	0.7	22.7	0.8		
TPHL-TE	ns 0 20	11.4	0.4	9.9	0.3	9.5	0.3	9.1	0.3	9.1	0.3	9.2	0.3	10.0	0.3	10.0	0.3		
TPHL-MRQ	ns 0 35	9.9	0.5	11.2	0.7	11.0	0.5	11.2	0.6	11.2	0.5	11.2	0.6	11.0	0.6	11.3	0.8		
TPHL-MRTC	ns 0 35	16.6	0.6	17.6	0.6	17.7	0.6	17.8	0.6	17.8	0.6	17.9	0.6	17.8	0.8	17.8	0.7		

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/ All parts passed VOH1, VOH3, VOL1, and VOL3 without any significant degradation. The data on these tests is available upon request.

Figure 1. Radiation Bias Circuit for 54RHSC16JCS0



$$V_{CC} = 5.0V \pm 0.5V$$

$$V_{CC}/2 = 2.5V \pm 0.25V$$

All resistors = 1 kOhm \pm 10% 1/4 watt