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Radiation Report on 54ACT245  
SMEX Common Buy Part No. 5962-876603T2A  
3012

A radiation evaluation was performed on 54ACT245 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 5, 10, 15, 20, 30, 50, 75 and 100 krad. After 100 krad, parts were annealed at 25°C for 24 and 168 hours, and then irradiation was continued to 200 and 300 krad (cumulative). The dose rate was between 0.06 - 5.0 krad/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 a functional test (at 10 MHz) after each radiation and annealing step.

All parts passed all tests on irradiation up to 75 krad. At 100 krad, pin 16 of SNs 7 and 9 failed parametric test I1H with readings of 1.99uA and 1.04uA, respectively, against the specification limit of 1.0uA, while all other parts passed all parametric tests. After 168 hours of annealing, all parts passed all tests. At 200 krad, seven of the eight parts failed various parametric tests, but all parts passed the functional test (see Table IV). However, at the next radiation step of 300 krad, four parts failed the functional test while all (8) parts failed numerous parametric tests. Table IV provides the mean and standard deviation values for each parameter after different radiation exposures and annealing treatments. It also provides a summary of functional test results after each radiation/annealing step.

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

TABLE I. Part Information

Generic Part Number:	54ACT245
SMEX Common Buy Part Number:	5962-87663012A
SMEX Common Buy Control Number:	1414
Manufacturer:	National Semiconductor Corp
Quantity Procured:	800
Lot Date Code:	9036
Quantity Tested:	10
Serial Numbers of Radiation Samples:	3, 4, 5, 6 7, 8, 9, 10
Serial Numbers of Control Samples:	1, 2
Part Function:	Octal Bidirectional Transceiver
Part Technology:	CMOS
Package Style:	20-Pin LCC

TABLE II. Radiation Schedule

EVENTS	DATE
1) Initial Electrical Measurements	02/07/91
2) 5 krads irradiation @ 250 rads/hr Post 5 krads Electrical Measurements	02/11/91 02/13/91
3) 10 krads irradiation @ 250 rads/hr Post 10 krads Electrical Measurements	02/13/91 02/14/91
4) 15 krads irradiation @ 250 rads/hr Post 15 krads Electrical Measurements	02/14/91 02/15/91
5) 20 krads irradiation @ 55 rads/hr Post 20 krads Electrical Measurements	02/15/91 02/19/91
6) 30 krads irradiation @ 500 rads/hr Post 30 krads Electrical Measurements	02/19/91 02/20/91
7) 50 krads irradiation @ 1000 rads/hr Post 50 krads Electrical Measurements	02/20/91 02/21/91
8) 75 krads irradiation @ 1250 rads/hr Post 75 krads Electrical Measurements	02/21/91 02/22/91
9) 100 krads irradiation @ 368 rads/hr Post 100 krads Electrical Measurements	02/22/91 02/25/91
10) 48 hrs annealing Post 48 hr Electrical Measurements	02/25/91 02/27/91
11) 168 hrs annealing Post 168 hr Electrical Measurements	02/27/91 03/04/91
12) 200 krads irradiation @ 5000 rads/hr Post 200 krads Electrical Measurements	03/04/91 03/05/91
13) 300 krads irradiation @ 5000 rads/hr Post 300 krads Electrical Measurements	03/05/91 03/06/91

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 was performed at 25°C under bias.

TABLE III. Electrical Characteristics of 54ACT245

TESTS PERFORMED						
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
FUNCT #1	5.5V	0.0V	5.5V	FREQ = 1MHz	ALL I/O	VOL < 0.5V , VOH > 4.7V
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
VOH1	4.5V	0.80V	2.00V	LOAD = -50UA	OUTS	> 4.40V , < 5.50V
VOH2	5.5V	0.80V	2.00V	LOAD = -50UA	OUTS	> 5.40V , < 5.50V
VOH3	4.5V	0.80V	2.00V	LOAD = -24MA	OUTS	> 3.70V , < 5.50V
VOH4	5.5V	0.80V	2.00V	LOAD = -24MA	OUTS	> 4.70V , < 5.50V
VOH5	5.5V	0.80V	2.00V	LOAD = -50MA	OUTS	> 3.85V , < 5.50V
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
VOL1	4.5V	0.80V	2.00V	LOAD = +50UA	OUTS	> 0.00V , < 0.10V
VOL2	5.5V	0.80V	2.00V	LOAD = +50UA	OUTS	> 0.00V , < 0.10V
VOL3	4.5V	0.80V	2.00V	LOAD = +24MA	OUTS	> 0.00V , < 0.50V
VOL4	5.5V	0.80V	2.00V	LOAD = +24MA	OUTS	> 0.00V , < 0.50V
VOL5	5.5V	0.80V	2.00V	LOAD = +50MA	OUTS	> 0.00V , < 1.65V
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
I <sub>IH</sub>	5.5V	0.00V	5.50V	V <sub>IN</sub> = 5.5V	INS	> 0.0UA , < +1.0UA
I <sub>IL</sub>	5.5V	0.00V	5.50V	V <sub>IN</sub> = 0.0V	INS	> -1.0UA , < 0.0UA
I <sub>OZH</sub>	5.5V	0.00V	5.50V	V <sub>OUT</sub> = 5.5V	OUTS	> 0.0UA , < +10.0UA
I <sub>OZL</sub>	5.5V	0.00V	5.50V	V <sub>OUT</sub> = 0.0V	OUTS	> -10.0UA , < 0.0UA
I <sub>CCH</sub>	5.5V	0.00V	5.50V	V <sub>IN</sub> = 0.0V	VCC	> 0.0UA , < 160.0UA
I <sub>ACL</sub>	5.5V	0.00V	5.50V	V <sub>IN</sub> = 5.5V	VCC	> 0.0UA , < 160.0UA
I <sub>CCZ</sub>	5.5V	0.00V	5.50V	V <sub>IN</sub> = 5.5V	VCC	> 0.0UA , < 160.0UA
DLT_I <sub>CCH</sub>	5.5V	0.00V	5.50V	V <sub>IN</sub> = 3.4V	VCC	> 0.0UA , < 1.60MA
DLT_I <sub>ACL</sub>	5.5V	0.00V	5.50V	V <sub>IN</sub> = 0.4V	VCC	> 0.0UA , < 1.60MA

COMMENTS/EXCEPTIONS

- (1) THE FUNCTIONAL TEST WAS PERFORMED WITH I<sub>OH</sub> = -24.0mA AND I<sub>OL</sub> = 24mA
- (2) VIL & VIH ( FOR THE BIDIRECTIONAL PINS ) WERE TESTED DURING THE VOL & VOH TESTS AS GO/NO GO
- (3) OE AND DIR INPUTS WERE KEPT AT 0V AND VCC DURING THE VIH TESTS.
- (4) NO AC PARAMETERS WERE TESTED.

TABLE IV: Summary of Electrical Measurements  
after Total Dose Exposures and Annealing for 54ACT245 11. 21

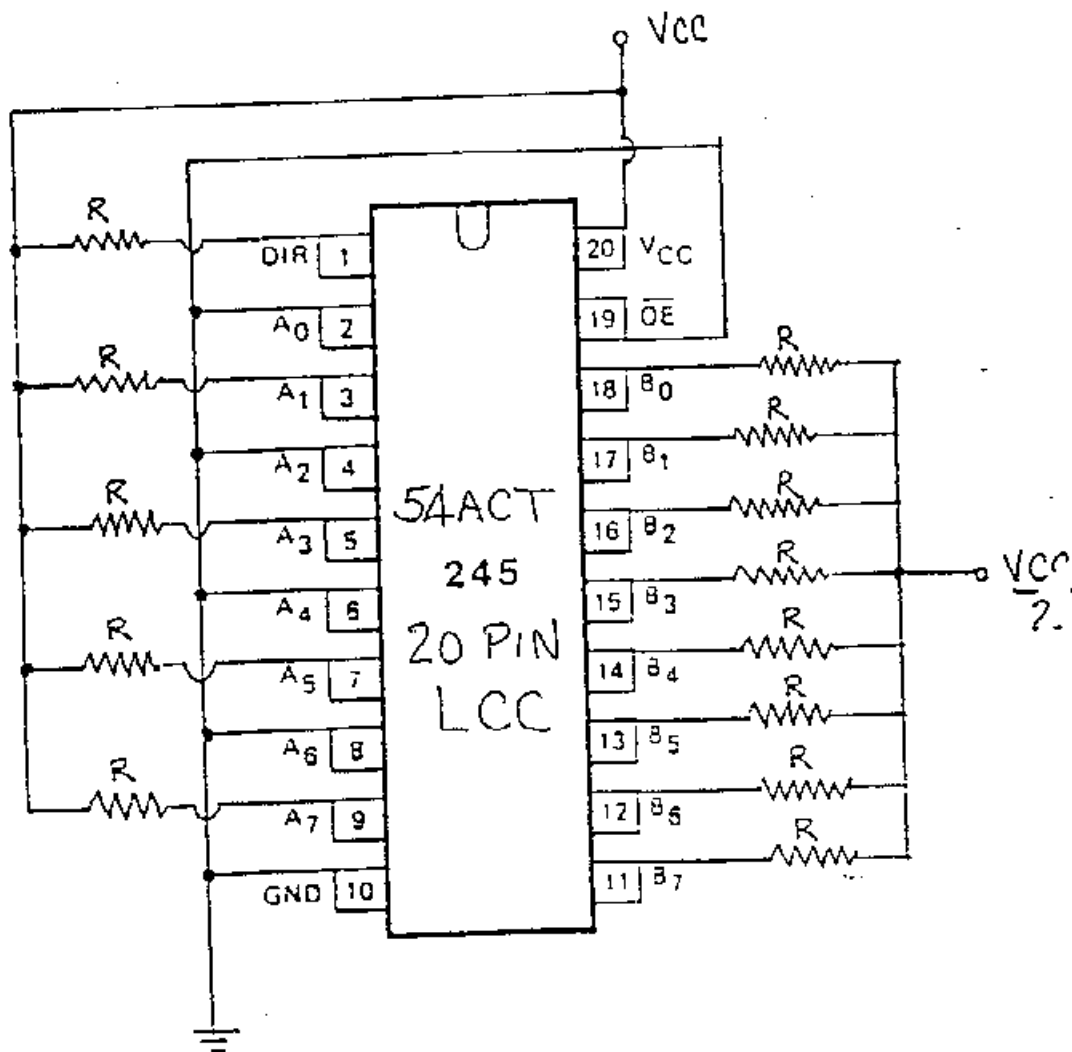
Parameters	Func @ 10MHz	Spec. Limits min max		Initials mean sd		Total Dose Exposure (krads)								Anneal		Total Dose (krads)			
						10		20		50		100		168 hrs		200		300	
						mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
V <sub>OH1</sub>	V	4.4	4.5	4.50	0	4.49	0	4.49	0	4.49	0	4.49	0	4.49	0	3.64	1.18	2.12	0.49
V <sub>OH2</sub>	V	5.4	5.5	5.50	0	5.50	0	5.50	0	5.50	0	5.50	0	5.50	0	5.26	0.91	2.76	1.56
V <sub>OH3</sub>	V	3.7	4.5	4.18	.01	4.18	.01	4.18	.01	4.17	.01	4.17	.01	4.16	.02	3.39	1.07	1.88	0.32
V <sub>OH4</sub>	V	4.7	5.5	5.23	.01	5.22	.01	5.22	.01	5.22	.01	5.21	.01	5.21	.03	5.01	0.83	2.63	1.54
V <sub>OH5</sub>	V	3.85	5.5	4.91	.01	4.91	.01	4.90	.01	4.90	.01	4.89	.04	4.87	.04	4.67	0.80	2.27	1.52
V <sub>OL1</sub>	mV	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	108	187
V <sub>OL2</sub>	mV	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V <sub>OL3</sub>	mV	0	500	193	5	193	5	194	5	194	5	194	9	201	18	195	8	378	326
V <sub>OL4</sub>	mV	0	500	165	4	166	4	167	4	167	5	167	10	174	18	169	8	245	354
V <sub>OL5</sub>	V	0	1.65	0.35	.01	0.36	.01	0.36	.01	0.36	.01	0.36	.06	0.38	.07	0.36	.02	2.45	0.35
I <sub>IH</sub>	nA	0	1000	5.5	14	.08	1.0	0.2	2.3	19	90	72	302	14	70	1E6	12E6	2E6	14E6
I <sub>IL</sub>	nA	-1000	0	-3.2	12	0	0	0	0	0	0	0	0	0	0	7E5	8E6	3.9	17.0
I <sub>OZH</sub>	uA	0	10	.03	.03	0	0	0	0	.02	0.1	.08	0.3	.02	.07	25.0	95.9	80	256
I <sub>OZL</sub>	uA	-10	0	0	.01	0	0	0	0	0	0	0	0	0	0	0	.02	-.02	.08
I <sub>CC1</sub>	uA	0	160	0	0	0	0	0	0	2.0	7.7	5.7	14	1.4	5.6	529	1E3	2E3	3E3
I <sub>CC2</sub>	uA	0	160	0	0	0	0	0	0	0	0	0	0	0	0	997	1E3	3E3	3E3
I <sub>CCZ</sub>	uA	0	160	0	0	0	0	0	0	0	0	0	0	0	0	985	1E3	3E3	3E3
D <sub>L1_ICCH</sub>	nA	0	1.6	0.24	0.11	0.23	0.11	0.22	0.1	0.21	0.1	0.19	.08	0.18	.08	1.11	1.14	3.3	2.9
D <sub>L1_ICCL</sub>	nA	0	1.6	0	0	0	0	0	0	0	0	0	0	0	0	1.0	1.2	3.4	3.1

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/ Table IV provides radiation characteristics of parts at selected total dose exposures and annealing treatments. The data at other radiation exposures and annealing treatments is available and can be obtained upon request.

Figure 1. Radiation Bias Circuit for 54ACT245



54ACT 245  
20 PIN LCC

$$V_{CC} = 5.0V \pm 10\% , \frac{V_{CC}}{2} = 2.5V \pm 10\%$$

$$R = 1.0K \text{ Ohm} , 5\% , \frac{1}{4}W$$

$$T_A = 25^\circ C$$