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UNISYS

Interoffice Memorandum

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Date  
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Code 300.1

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Subject  
Radiation Report on 54AC245  
SMEX Common Buy Part No. 5962-8775801KA

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A radiation evaluation was performed on 54AC245 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 10, 20, 30, 50, 75, and 100 krads. After 100 krads, parts were annealed at 25°C for 24 and 168 hours, and then the irradiation was continued to 200 and 300 krads (cumulative). The dose rate was between 0.5 - 5.5 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. These tests included two functional tests (1 MHz) at 3.0 V and 5.5 V

All parts passed all initial tests, and stayed within the specification limits for all parameters on irradiation up to 30 krads. Some parametric failures were observed for  $I_{CC1}$ ,  $I_{CC2}$  and  $I_{CC3}$  after radiation exposures to 50, 75, and 100 krads. After 100 krads, the readings for these parameters ( $I_{CC1}$ ,  $I_{CC2}$  and  $I_{CC3}$ ) ranged from 0 to 376 uA, 0 to 1.26 mA, and 0 to 516 uA, respectively against a maximum specification limit of 160 uA for all three parameters. However, all parts passed both functional tests (at 3.0 and 5.5V) on irradiation up to 100 krads.

On annealing for 24 and 168 hours, parts showed some recovery in  $I_{CC1}$ ,  $I_{CC2}$ , and  $I_{CC3}$ , but overall, most parts continued to exceed the specification limits for these parameters. On continued irradiation to 200 krads, parts exceeded the specification limits

on a number of parameters including  $I_{IHZ}$ ,  $I_{OZH}$ ,  $I_{IL}$ ,  $I_{OZL}$ , VOL2, and VOL3. However, all parts passed both functional tests. However, after 300 krads 7 parts failed functionally as well. 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 (301) 731-8954.

TABLE I. Part Information

Generic Part Number:	54AC245
SMEX Common Buy Part Number:	5962-8775801RA (HA124239)
SMEX Common Buy Control Number:	1658
Charge Number:	C90099
Manufacturer:	National Semiconductor Corp.
Quantity Procured:	197
Lot Date Codes:	9036A
Quantity Tested:	10
Serial Numbers of Radiation Samples:	402, 403, 404, 405, 406, 407, 408, 409
Serial Numbers of Control Samples:	400, 401
Part Function:	Octal Bidirectional Transceiver
Part Technology:	CMOS
Package Style:	20 Pin DIP

TABLE II. Radiation Schedule

EVENTS	DATE
1) Initial Electrical Measurements	05/01/91
2) 10 krads irradiation @ 555 rads/hr Post 10 krads Electrical Measurements	05/16/91 05/17/91
3) 20 krads irradiation @ 555 rads/hr Post 20 krads Electrical Measurements	05/17/91 05/18/91
4) 30 krads irradiation @ 500 rads/hr Post 30 krads Electrical Measurements	05/18/91 05/19/91
5) 50 krads irradiation @ 1050 rads/hr Post 50 krads Electrical Measurements	05/19/91 05/20/91
6) 75 krads irradiation @ 1350 rads/hr Post 75 krads Electrical Measurements	05/20/91 05/21/91
7) 100 krads irradiation @ 1350 rads/hr Post 100 krads Electrical Measurements	05/21/91 05/22/91
8) 24 hour annealing Post 24 hr Electrical Measurements	05/22/91 05/23/91
9) 168 hour annealing Post 168 hr Electrical Measurements	05/22/91 05/29/91
10) 200 krads irradiation @ 5550 rads/hr Post 200 krads Electrical Measurements	05/29/91 05/30/91
11) 300 krads irradiation @ 5550 rads/hr Post 300 krads Electrical Measurements	05/30/91 05/31/91

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.

Table III. Electrical Characteristics of 54AC245

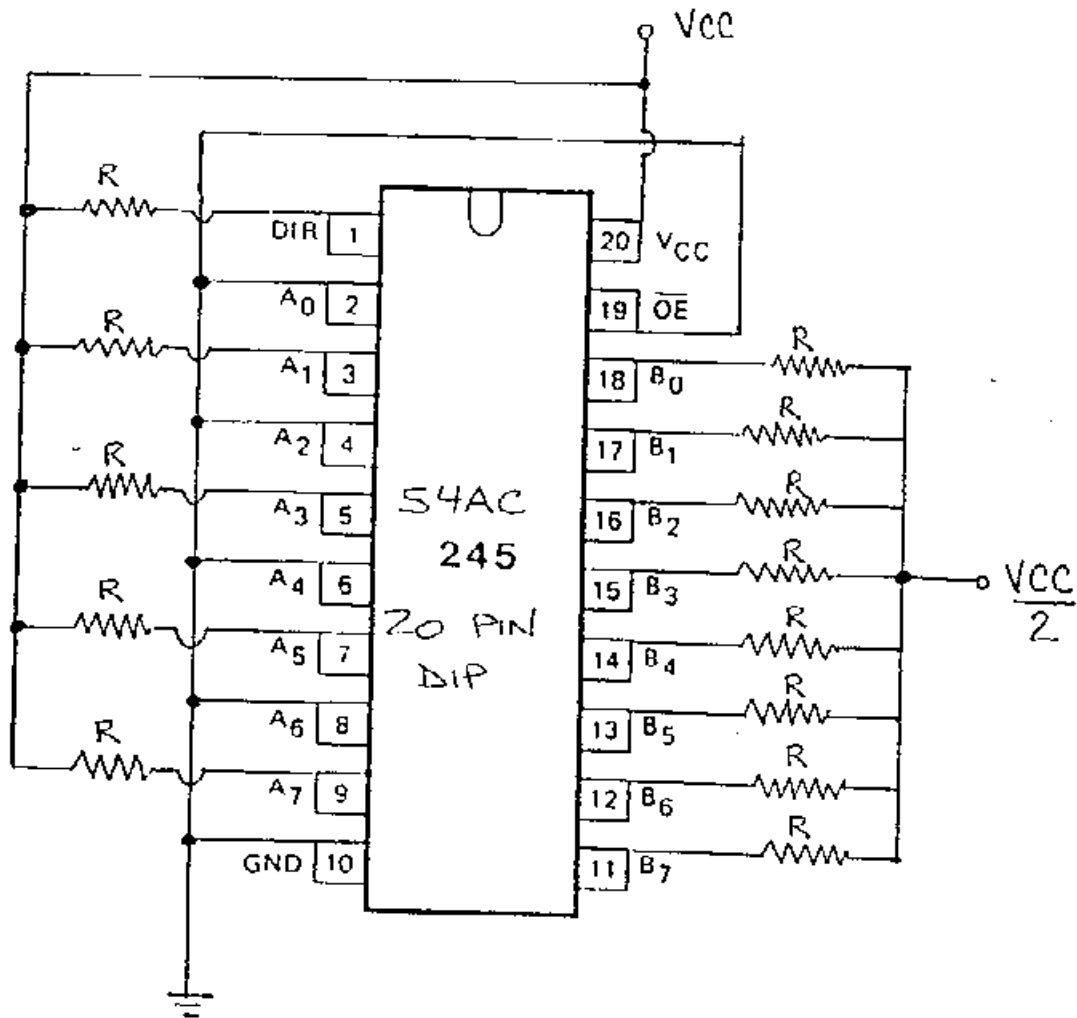
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
FUNCT #1	3.0V	0.0V	3.0V	FREQ = 1MHZ	ALL I/O	VOL < 1.50V / VOH > 1.50V
FUNCT #2	5.5V	0.0V	5.5V	FREQ = 1MHZ	ALL I/O	VOL < 2.75V / VOH > 2.75V
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
VOH1	3.0V	0.90V	2.10V	LOAD = -50UA	OUTS	> 2.90V / < 5.50V
VOH2	4.5V	1.35V	3.15V	LOAD = -50UA	OUTS	> 4.40V / < 5.50V
VOH3	5.5V	1.65V	3.85V	LOAD = -50UA	OUTS	> 5.40V / < 5.50V
VOH4	3.0V	0.90V	2.10V	LOAD = -4MA	OUTS	> 2.40V / < 5.50V
VOH5	4.5V	1.35V	3.15V	LOAD = -24MA	OUTS	> 3.70V / < 5.50V
VOH6	5.5V	1.65V	3.85V	LOAD = -24MA	OUTS	> 4.70V / < 5.50V
VOH7	5.5V	1.65V	3.85V	LOAD = -50MA	OUTS	> 3.85V / < 5.50V
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
VOL1	3.0V	0.90V	2.10V	LOAD = +50UA	OUTS	> 0.00V / < 0.10V
VOL2	4.5V	1.35V	3.15V	LOAD = +50UA	OUTS	> 0.00V / < 0.10V
VOL3	5.5V	1.65V	3.85V	LOAD = +50UA	OUTS	> 0.00V / < 0.10V
VOL4	3.0V	0.90V	2.10V	LOAD = +12MA	OUTS	> 0.00V / < 0.50V
VOL5	4.5V	1.35V	3.15V	LOAD = +24MA	OUTS	> 0.00V / < 0.50V
VOL6	5.5V	1.65V	3.85V	LOAD = +24MA	OUTS	> 0.00V / < 0.50V
VOL7	5.5V	1.65V	3.85V	LOAD = +50MA	OUTS	> 0.00V / < 1.65V
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
I <sub>IH1</sub>	5.5V	0.00V	5.50V	V <sub>IN</sub> = 5.5V	DE, DIR	> 0.0UA / < +1.0UA
I <sub>IH2</sub>	5.5V	0.00V	5.50V	V <sub>IN</sub> = 5.5V	OTHER INPUTS	> 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>CC1</sub>	5.5V	0.00V	5.50V	V <sub>IN</sub> = 5.5V	VCC	> 0.0UA / < 160.0UA
I <sub>CC2</sub>	5.5V	0.00V	5.50V	V <sub>IN</sub> = 5.5V	VCC	> 0.0UA / < 160.0UA
I <sub>CC3</sub>	5.5V	0.00V	5.50V	V <sub>IN</sub> = 5.5V	VCC	> 0.0UA / < 160.0UA

COMMENTS/EXCEPTIONS

- (1) FUNCTIONAL TEST #1 WAS PERFORMED WITH I<sub>OH</sub> = -4.0MA AND I<sub>OL</sub> = 12MA
- (2) FUNCTIONAL TEST #2 WAS PERFORMED WITH I<sub>OH</sub> = -24.0MA AND I<sub>OL</sub> = 24MA
- (3) V<sub>IL</sub> & V<sub>IH</sub> ( FOR THE BIDIRECTIONAL PINS ) WERE TESTED DURING THE V<sub>OL</sub> & V<sub>OH</sub> TESTS AS GO/NO GO
- (4) DE<sub>1</sub> AND DIR INPUTS WERE KEPT AT 0V AND VCC DURING THE V<sub>OH</sub> TESTS.
- (5) NO AC PARAMETERS WERE TESTED.



Figure 1. Radiation Bias Circuit for 54AC245



54AC245  
20 PIN DIP

$$V_{CC} = 5.0V \pm 10\%$$

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

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

$$T_A = 25^\circ C$$