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Interoffice Memorandum

To
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Department
Code 300.1
From
K. Sahu KS
Department
7809
Subject
Radiation Report on HI1-506A
(TIROS/BASG Project)

Rad-91-6
Date
April 23, 1991
Location
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Telephone
731-8954
Location
Lanham
cc
C. Allen
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S. Esmacher

A radiation evaluation was performed on HI1-506A 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, parts were separated into two test groups, Test Group A (TGA) and Test Group B (TGB). In each group, two parts were irradiated under bias (see Figure 1 for bias configuration). Two parts (SNs 15 and 16) were used as control samples for both groups. TGA parts (SNs 17 and 18) were irradiated to 1.0 krad and then annealed for 24 and 168 hours (cumulative) at 25°C. Parts were then annealed for an additional 192 hours at 100°C. TGB parts (SNs 19 and 20) were irradiated to total dose steps of 1.0, 2.0 and 4.0 krads, followed by the same annealing process as TGA. The dose rate for TGA was 50 rads/hour, while the dose rate for TGB varied between 50 - 100 rads/hour depending on the total dose level (see Table II for radiation schedule). After each radiation exposure and annealing treatment, parts from both test groups were electrically tested according to the test conditions and the specification limits listed in Table III.

All parts from both test groups passed all tests on irradiation and annealing, without any significant degradation in any of the electrical parameters. Tables IVA and IVB provide the mean and standard deviation values for each parameter after different radiation exposures and annealing treatments of TGA and TGB, respectively. It also provides a summary of functional test results for both groups 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:	HI1-506A
Manufacturer:	Harris Corp.
Lot Date Code:	8825
Quantity Tested:	6
Serial Numbers of Radiation Samples:	17, 18 (TGA) 19, 20 (TGB)
Serial Numbers of Control Samples:	15, 16
Part Function:	16 Channel Analog Multiplexer
Part Technology:	CMOS
Package Style:	28-Pin DIP

TABLE II. Radiation Schedule

EVENTS	DATE
Test Group A	
1) Initial Electrical Measurements	03/19/91
2) 1 krad irradiation @ 50 rads/hour	03/19/91
Post 1 krad Electrical Measurements	03/20/91
3) 24 hrs annealing at 25°C	03/20/91
Post 24 hr Electrical Measurements	03/21/91
4) 168 hrs annealing at 25°C	03/22/91
Post 168 hr Electrical Measurements	03/28/91
5) 192 hrs annealing at 100°C	03/29/91
Post 192 hr Electrical Measurements	04/06/91
Test Group B	
1) Initial Electrical Measurements	03/19/91
2) 1 krad irradiation at 50 rads/hr	03/19/91
Post 1 krad Electrical Measurements	03/20/91
3) 2 krads irradiation at 50 rads/hr	03/20/91
Post 2 krad Electrical Measurements	03/21/91
4) 4 krads irradiation at 100 rads/hr	03/21/91
Post 4 krad Electrical Measurements	03/22/91
5) 24 hrs annealing at 25°C	03/22/91
Post 24 hr Electrical Measurements	03/23/91
6) 168 hrs annealing at 25°C	03/22/91
Post 168 hr Electrical Measurements	03/29/91
7) 192 hrs annealing at 100°C	03/29/91
Post 192 hr Electrical Measurements	04/06/91

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.

TABLE III. Electrical Characteristics of HI1-506A

+V = +15V ; -V = -15V ; VREF = OPEN UNLESS OTHERWISE SPECIFIED

PARA.	TEST CONDITIONS	PINS	25°C		UNIT
			MIN	MAX	
FUNC #1	VS = 0,15V VAH = 4V VAL = 0,8V f = 10KHz	OUT			
RON1	VAH = 4V VAL = 0,8V Io = -100μA Vo = ±10V	CHANNEL	0	1,5	KΩ
RON2	VAH = 4V VAL = 0,8V Io = -100μA Vo = ±10V	CHANNEL	0	1,5	KΩ
ISOFF1	VAH = 4V VAL = 0,8V VS = ±10V	CHANNEL	-50	50	nA
IDOFF1	VAH = 4V VAL = 0,8V VS = ±10V Vo = ±10V	OUT	-300	300	nA
IDON1	VAH = 4V VAL = 0,8V VS = ±10V Vo = ±10V	OUT	-300	300	nA
I IH	VIN = 4V	CTRL	0	1	μA
I IL	VIN = 0V	CTRL	-1	0	μA
I CCP	VEN = 0,8V	YSP	0	2	mA
I CCN	VEN = 0,8V	YSN	-2	0	mA
I CCSP	VEN = 4V	VSP	0	1	mA
I CCEN	VEN = 4V	VSN	-1	0	mA
TA	VAH = 4V VAL = 0,8V VS = 0,10V	OUT	0	1	μS
TON	VAH = 4V VAL = 0,8V VS = 0,10V	OUT	0	500	nS
TOFF	VAH = 4V VAL = 0,8V VS = 0,10V	OUT	0	500	nS

EXCEPTIONS: Topen, Settling Time, Off Isolation, Cs, Cd, Ca, Cds ARE NOT PERFORMED DUE TO THE LIMITATION OF S-3260.

TABLE IVA: Summary of Electrical Measurements after
Total Dose Exposures and Annealing for HI1-506A

GROUP A

Parameters	spec. Limits min max	Initials						Annealing											
		Total Dose (krads)			25°C			100°C			25°C			100°C					
		1.0		24 hrs.		168 hrs.		24 hrs.		168 hrs.		192 hrs.		24 hrs.		168 hrs.		192 hrs.	
		mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
Functional		Pass		Pass		Pass		Pass		Pass		Pass		Pass		Pass		Pass	
RON1 kOhm	0 1.5	1.13	.03	1.14	.03	1.14	.04	1.14	.04	1.14	.04	1.14	.04	1.14	.04	1.15	.03	1.15	.03
RON2 kOhm	0 1.5	1.12	.03	1.11	.03	1.11	.04	1.10	.03	1.10	.03	1.10	.03	1.12	.03	1.12	.03	1.12	.03
ISOFF1 nA	-50 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IDOFF1 nA	-300 300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IDON1 nA	-300 200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IIH uA	-1 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IIL uA	-1 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ICCP mA	0 2.0	.47	.01	.48	.01	.47	0	.47	0	.47	.01	.47	.01	.47	.01	.47	.01	.47	.01
ICCN mA	-2.0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ICCSN mA	0 1.0	.47	.01	.48	.01	.47	0	.47	0	.47	.01	.47	.01	.47	.01	.47	.01	.47	.01
ICCSN mA	-1.0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TA us	0 1.0	.28	.01	.28	.01	.29	.01	.28	.01	.28	.01	.28	.01	.29	.01	.29	.01	.29	.01
TON us	0 500	305	10	315	10	318	12	318	12	318	12	318	12	318	12	312	8	312	8
TOFF us	0 500	455	20	460	20	460	20	460	20	460	20	460	20	460	20	462	17	462	17

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

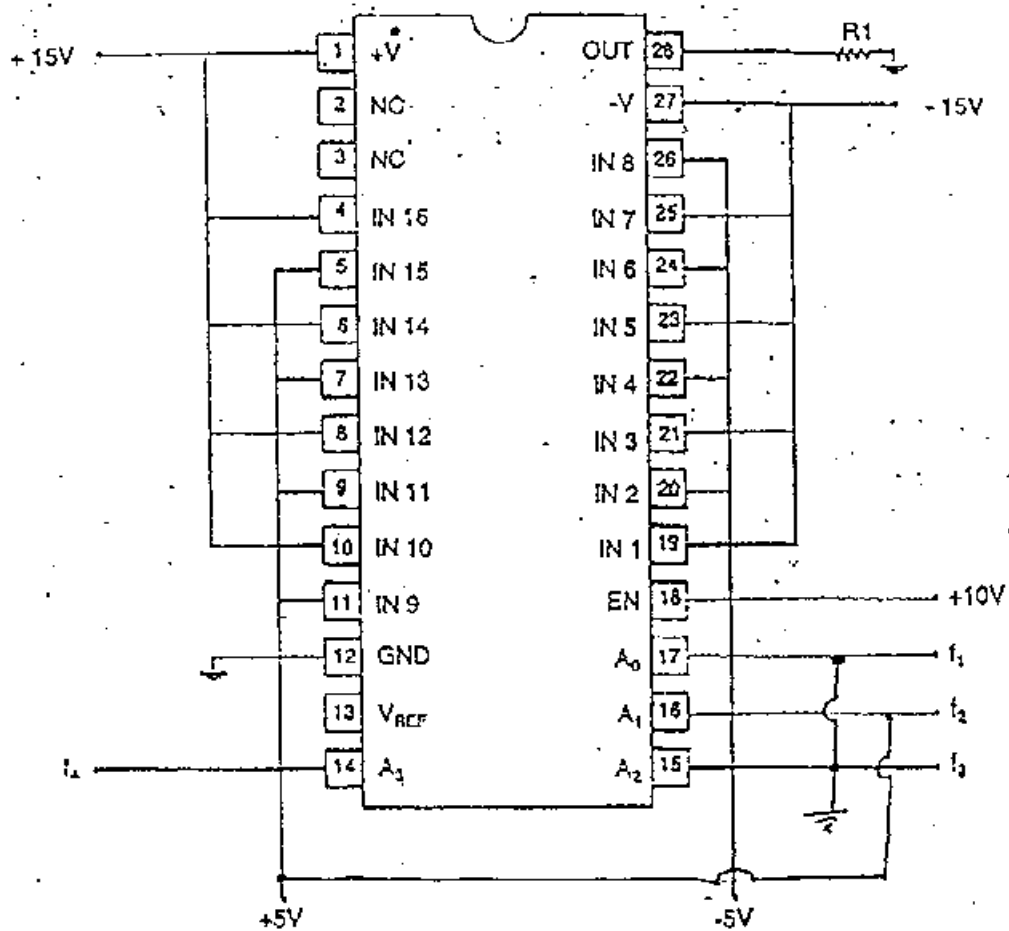
TABLE IVB: Summary of Electrical Measurements after
Total Dose Exposures and Annealing for HI1-506A 1/

GROUP B

Parameters	Spec. Limits min max	Initials	Total Dose Exposure (krads)												Annealing					
			1.0			2.0			4.0			24 hrs.			168 hrs.			100°C 192 hrs.		
			mean	sd	Pass	mean	sd	Pass	mean	sd	Pass	mean	sd	Pass	mean	sd	Pass	mean	sd	Pass
Functional			Pass			Pass			Pass			Pass			Pass			Pass		
RON1 kohm	0 1.5		1.18	.02	1.20	.04	1.19	.03	1.21	.04	1.18	.03	1.19	.03	1.20	.03	1.17	.02	1.17	.02
RON2 kohm	0 1.5		1.17	.03	1.16	.03	1.16	.03	1.15	.04	1.15	.04	1.16	.05	1.17	.02	1.17	.02	1.17	.02
ISOFF1 nA	-50 50		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IDOFF1 nA	-300 300		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IDON1 nA	-300 200		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I1H uA	-1 1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I1L uA	-1 1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ICCP mA	0 2.0		.43	.03	.44	.02	.45	.02	.45	.02	.45	.02	.44	.02	.44	.02	.43	.03	.43	.03
ICCN mA	-2.0 0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ICCSN mA	-1.0 0		.43	.05	.44	.02	.45	.02	.45	.02	.45	.02	.44	.02	.44	.02	.43	.03	.43	.03
TA uS	0 1.0		.30	0	.30	.01	.30	.01	.31	.01	.31	.01	.32	.01	.34	.01	.34	.02	.34	.02
TON uS	0 500		320	5	327	3	335	5	342	3	355	5	368	7	375	20	375	20	375	20
TOFF uS	0 500		475	0	480	0	480	0	487	3	487	3	487	3	490	0	490	0	490	0

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

Figure 1. Radiation Bias Circuit for HI1-506A



NOTES:

1. $R_1 = 10 \text{ k}\Omega \pm 10\%$, 1/2 or 1/4 W.
2. Input signal requirements:
 - a. Square wave, 50% duty cycle.
 - b. $f_1 = 0.5 \text{ Hz}$, 0V
 - $f_2 = 0.25 \text{ Hz}$, 5V
 - $f_3 = 0.125 \text{ Hz}$, 0V
 - $f_4 = 0.0625 \text{ Hz}$, 5V