

Memorandum

PARAMAX
A Unisys Company

DATE: September 2, 1993
TO: D. Kapoor/311.1
FROM: K. Sahu/300.1 *KS*
SUBJECT: Radiation Report on HST/COP
Part No. 8002300

PPM-93-078

cc: A.Sharma/311.0
Library/311

A radiation evaluation was performed on 8002300 (Five Tap Delay Line) to determine the total dose tolerance of these parts. The total dose testing was performed using a cobalt-60 gamma ray source. During the radiation testing, four parts were irradiated under bias (see Figure 1 for bias configuration), and one part was used as a control sample. The total dose radiation levels were 2.5, 5, 10 and 20 krads*. The dose rate was between 0.13 and 0.25 krads/hour, depending on the total dose level (see Table II for radiation schedule). After 20 krads, parts were annealed at 25°C for 168 hours. After each radiation exposure and annealing treatment, parts were electrically tested according to the test conditions and the specification limits listed in Table III. Electrical tests included two functional tests at 1.25 MHz, one at Vcc = 4.5 V and one at Vcc = 5.5 V.

All parts passed initial electrical measurements. All four irradiated parts passed all electrical tests throughout all irradiation and annealing steps. No significant sensitivity to radiation was observed in any test parameters.

Table IV provides a summary of the mean and standard deviation values for each parameter after different irradiation exposures and annealing steps.

Any further details about this evaluation can be obtained upon request. If you have any questions, please call me at (301) 731-8954.

*The term rads, as used in this document, means rads(silicon). All radiation levels cited are cumulative.

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TABLE I. Part Information

Generic Part Number:	8002300
Part Number:	8002300*
Control Number:	8767
Charge Number:	C33669
Manufacturer:	Hytck
Lot Date Code:	9305
Quantity Tested:	5
Serial Numbers of Radiation Samples:	216, 217, 218, 219
Serial Numbers of Control Sample:	215
Part Function:	Five Tap Delay Line
Part Technology:	Schottky TTL
Package Style:	14-pin DIP
Test Equipment:	S-50
Test Engineer:	T. Scharer

*No radiation tolerance/hardness was guaranteed by the manufacturer for this part.

TABLE II. Radiation Schedule for 8002300

EVENTS	DATE
1) INITIAL ELECTRICAL MEASUREMENTS	08/05/93
2) 2.5 KRAD IRRADIATION (0.13 KRADS/HOUR)	08/10/93
POST-2.5 KRAD ELECTRICAL MEASUREMENT	08/11/93
3) 5 KRAD IRRADIATION (0.13 KRADS/HOUR)	08/11/93
POST-5 KRAD ELECTRICAL MEASUREMENT	08/12/93
4) 10 KRAD IRRADIATION (0.25 KRADS/HOUR)	08/12/93
POST-10 KRAD ELECTRICAL MEASUREMENT	08/13/93
5) 20 KRAD IRRADIATION (0.15 KRADS/HOUR)	08/13/93
POST-20 KRAD ELECTRICAL MEASUREMENT	08/16/93
6) 168 HOUR ANNEALING @25°C	08/16/93
POST-168 HOUR ANNEAL ELECTRICAL MEASUREMENT	08/23/93

PARTS WERE IRRADIATED AND ANNEALED UNDER BIAS; SEE FIGURE 1.

Table III. Electrical Characteristics of 8002300

FUNCTIONAL TESTS PERFORMED						
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS AT +25C ONLY
FUNCT 1	4.5V	0.0V	3.3V	FREQ=1.250MHZ	ALL I/O	VOL<1.5V / VOH>1.5V
FUNCT 2	5.5V	0.0V	3.3V	FREQ=1.250MHZ	ALL I/O	VOL<1.5V / VOH>1.5V
LOAD USED <= { IOH = -500.0uA { VREF = 1.5V { ICL = +10.0mA						
DC PARAMETRIC TESTS PERFORMED						
PARAMETER	VCC	VIL	VIH	CONDITIONS	PINS	LIMITS @ +25C
VOH	4.5V	0.0V	2.0V	LOAD=-1mA	OUTS	>+2.5V / <+4.5V
VOL	4.5V	0.8V	4.5V	LOAD=+20MA	OUTS	>+0.0V / <+0.5V
VIC-	4.5V	0.0V	4.5V	I1 = -18MA	IN	>-1.2V / < 0.0V
I1H1	5.5V	0.0V	5.5V	VTEST = 2.7V	IN	> 0.0UA / <+50.0UA
I1H2	5.5V	0.0V	5.5V	VTEST = 5.5V	IN	> 0.0UA / <+1000.0UA
I1L	5.5V	0.0V	5.5V	VTEST = 0.5V	INS	>-2.0MA / < 0.0UA
I0S	5.5V	0.0V	5.5V	VTST= 0.0V	OUTS	>-150.0MA / <-40MA
ICCL	5.5V	0.0V	5.5V	VIN = 0.0V	VCC	>+0.0MA / <+75.0MA
AC PARAMETRIC TESTS						
PARAMETER	VCC	VIL	VIH	CONDITIONS	PIN	LIMITS @ +25C
TPLH20	5.0V	0.0V	3.3V	F=1.25MHZ	12	>57ns / <63ns
TPLH40	5.0V	0.0V	3.3V	F=1.25MHZ	4	>114ns / <126ns
TPLH60	5.0V	0.0V	3.3V	F=1.25MHZ	10	>171ns / <189ns
TPLH80	5.0V	0.0V	3.3V	F=1.25MHZ	6	>228ns / <252ns
TPLH100	5.0V	0.0V	3.3V	F=1.25MHZ	8	>285ns / <315ns
TPHL20	5.0V	0.0V	3.3V	F=1.25MHZ	12	>57ns / <63ns
TPHL40	5.0V	0.0V	3.3V	F=1.25MHZ	4	>114ns / <126ns
TPHL60	5.0V	0.0V	3.3V	F=1.25MHZ	10	>171ns / <189ns
TPHL80	5.0V	0.0V	3.3V	F=1.25MHZ	6	>228ns / <252ns
TPHL100	5.0V	0.0V	3.3V	F=1.25MHZ	8	>285ns / <315ns

TABLE IV: Summary of Electrical Measurements After
Total Dose Exposures and Annealing Steps for 8002300 1/

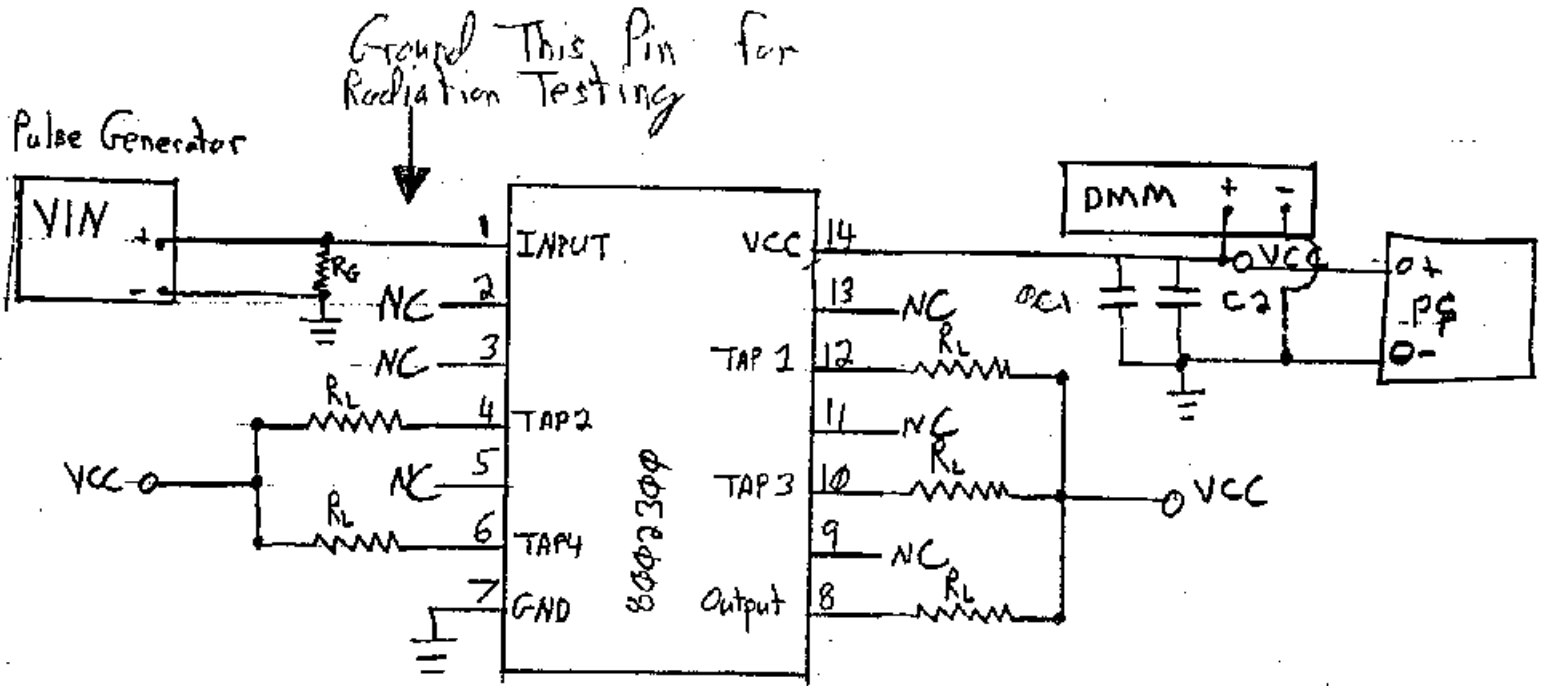
Parameters	Spec.Lim. 2/ min max		Total Dose Exposure (TDE) (krads)										Anneal	
			0 (Pre-Rad.)		2.5		5		10		20		168 hrs. @25°C	
			mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
FUNC1, 1.25MHz, 4.5V			PASS		PASS		PASS		PASS		PASS		PASS	
FUNC2, 1.25MHz, 5.5V			PASS		PASS		PASS		PASS		PASS		PASS	
VOH V	2.50	4.50	2.91	0	2.94	.01	2.91	.01	2.92	.01	2.92	.01	2.93	0
VOL mV	0	500	362	7.5	363	8.3	365	11	364	9.2	365	8.6	367	12
VIC- mV	-1200	0	-879	1.1	-866	3.1	-875	1.3	-873	3.5	-873	1.6	-877	1.1
I IH1 μA	0	50	0.38	.04	0.32	.03	0.40	.04	0.43	.04	0.43	.04	0.40	.04
I IH2 μA	0	1000	0.48	.05	0.55	.03	0.51	.05	0.54	.05	0.55	.05	0.50	.05
I IL mA	-2.0	0	-1.38	.01	-1.37	.01	-1.38	.01	-1.37	.01	-1.38	.01	-1.38	.01
I OS mA	-150	-40	-119	2.5	-117	2.6	-117	2.6	-117	2.4	-117	2.5	-117	2.2
I CCL mA	0	75	57.4	.18	57.4	.23	57.8	.17	57.4	.15	57.4	.20	57.4	.22
T PLH20 ns	57	63	61.4	.32	61.6	.27	61.4	.33	61.4	.32	61.4	.34	61.4	.32
T PLH40 ns	114	126	121	.24	122	.18	125	.22	122	.20	122	.19	121	.20
T PLH60 ns	171	189	180	1.0	180	.94	180	.98	180	.98	180	.95	180	.98
T PLH80 ns	228	252	239	1.3	240	1.3	239	1.3	239	1.3	239	1.3	238	1.3
T PLH100 ns	285	315	299	1.2	299	1.1	299	1.2	299	1.1	299	1.1	299	1.1
T PHL20 ns	57	63	62.0	.38	61.7	.43	61.9	.38	61.8	.37	61.9	.37	61.8	.39
T PHL40 ns	114	126	122	.37	121	.42	122	.36	122	.35	122	.37	122	.34
T PHL60 ns	171	189	183	.98	183	1.0	183	.96	183	1.0	183	1.0	183	.96
T PHL80 ns	228	252	243	1.5	243	1.5	243	1.5	243	1.5	243	1.5	243	1.5
T PHL100 ns	285	315	304	1.1	303	1.2	304	1.1	304	1.1	304	1.1	304	1.1

Notes:

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

2/ These are manufacturers' non-irradiated data sheet specification limits. No post-irradiation limits were provided by the manufacturer at the time the tests were performed.

Figure 1. Radiation Bias Circuit for 8002300 1/, 2/, 3/, 4/, 5/



- 1/ $V_{CC} = 3.3 \text{ V to } 5.5 \text{ V}$
- 2/ $R = 50 \Omega$
- 3/ $C1 = 0.01 \mu\text{F} \pm 10\% \text{ max, } 50\text{V min, } C2 = 0.1 \mu\text{F} \pm 10\% \text{ max, } 50\text{V min}$
- 4/ $R_L = 2\text{K}\Omega \pm 10\% \text{ max, } \frac{1}{2}\text{W min}$
- 5/ $V_{IN} = 1.25\text{MHz square wave, } V_{IL} = 0\text{V, } V_{IH} = 3.3\text{V, pulse width} = 320 \text{ ns}$