

UNISYS

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SUBJECT: Radiation Report on HST/STIS
Part No. HCPL-5401
Control No. 12690

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A radiation evaluation was performed on HCPL-5401 (Optocoupler) 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 Co⁶⁰ gamma ray source. During the radiation testing, five parts were irradiated under bias (see Figure 1 for bias configuration), and one part was used as control sample. The total dose radiation levels were 1, 6, and 10 krads*. The dose rate was between 0.06 and 0.24 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.

All parts passed initial electrical measurements. All irradiated parts passed all parametric tests throughout all irradiation steps with no observable radiation-induced effects.

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

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

**These are manufacturer's pre-irradiation data specification limits. No post-irradiation limits were provided by the manufacturer at the time these tests were performed.

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TABLE I. Part Information

Generic Part Number:	HCPL-5401
HST/STIS Part Number:	HCPL-5401
HST/STIS Control Number:	12690
Charge Number:	EE56260
Manufacturer:	Hewlett Packard
Lot Date Code:	9149A
Quantity Tested:	6
Serial Number of Control Samples:	30
Serial Numbers of Radiation Samples:	31, 32, 33, 34, 35
Part Function:	Optocoupler
Part Technology:	Bipolar
Package Style:	8-pin DIP
Test Equipment:	S-50
Test Engineer:	C. Nguyen

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

TABLE II. Radiation Schedule for HCPL-5401

EVENTS	DATE
1) INITIAL ELECTRICAL MEASUREMENTS	04/19/95
2) 1 KRAD IRRADIATION (0.059 KRADS/HOUR) POST-1 KRAD ELECTRICAL MEASUREMENT	05/23/95 05/24/95
3) 6 KRAD IRRADIATION (0.057 KRADS/HOUR) POST-6 KRAD ELECTRICAL MEASUREMENT	05/26/95 05/30/95
4) 10 KRAD IRRADIATION (0.242 KRADS/HOUR) POST-10 KRAD ELECTRICAL MEASUREMENT	05/30/95 05/31/95

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

Table III. Electrical Characteristics of HCPL-5401

TESTS performed at 25°C

Vcc = 4.75V unless specified otherwise.

test#	Test name	Min	Max	Test conditions
1	Vf	1.00 v	1.85 v	if = 10ma
2	Iccl	0.00 ma	26.00 ma	Vcc=5.25v, ve=0v
3	Icch	0.00 ma	26.00 ma	Vcc=5.25v, ve=0v
4	Vol		0.500 v	note 1
5	Voh	2.40 v		note 1
6	Ioh	-100.00 ua	0.00 ua	Vo =5.25v, vi=0.7v
7	tphl		60.0 ns	note 2
8	tplh		60.0 ns	note 2

Note:

- 1 - VCC = 4.75V IF= 6ma Iol = 8ma Ioh = -4ma
- 2 - Vil =0.0v Vih =2.5v frequency =500KHZ 25% duty cycle;
measure from 50% of input voltage level to 1.5v Output voltage level.

TABLE IV: Summary of Electrical Measurements after Total Dose Exposures and Annealing for HCPL-5401 /1

Test #	Parameters	Unit	Spec. Lim./2		Total Dose Exposure (krads)									
			min	max	Initial		1		6		10			
					mean	sd	mean	sd	mean	sd	mean	sd		
1	Vf	V	1	1.85	1.34	0.0	1.32	0.0	1.33	0.01	1.33	0.0		
2	Icc1	mA	0	26	20.7	0.09	20.7	0.09	20.7	0.09	20.5	0.09		
3	Iccb	mA	0	26	18.7	0.11	18.7	0.11	18.7	0.11	18.7	0.11		
4	Vol	V	-	0.5	0.19	0.01	0.19	0.02	0.19	0.02	0.19	0.02		
5	Voh	V	2.4	-	3.25	0.01	3.25	0.01	3.26	0.01	3.25	0.01		
6	Ioh	uA	-100	0	30.41	0.22	-0.44	0.15	-0.40	0.02	-0.44	0.03		
7	tphl	nS	-	60	39.9	0.57	39.2	0.60	40.1	0.59	41.7	0.60		
8	tpth	nS	-	60	43.6	0.52	43.3	0.52	43.9	0.62	44.9	0.69		

Notes:

- 1/ The mean and standard deviation values were calculated over the five parts irradiated in this testing. The control sample remained constant throughout the testing and is not included in this table.
- 2/ These are manufacturer's pre-irradiation data sheet specification limits. No post-irradiation limits were provided by the manufacturer at the time the tests were performed.

Radiation-sensitive parameter: None.

Figure 1. Radiation Bias Circuit for HCPL-5401

