

**UNISYS**

DATE: August 11, 1995 PPM-95-171

TO: S. Hull/311 *KS*

FROM: K. Sahu/300.1

SUBJECT: Radiation Report on HST  
Part No. HA7-5127/883B  
Control No. 12546

cc: A. Sharma/311.0  
R. Williams/300.1  
OFA Library/300.1

A radiation evaluation was performed on HA7-5127/883B (Operational Amplifier) 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 Co<sup>60</sup> gamma ray source. During the radiation testing, six parts were irradiated under bias (see Figure 1 for bias configuration), and two parts were used as control samples. The total dose radiation levels were 1, 2, 3, 5 and 10 krads\*. The dose rate was between 0.05 and 0.25 krads/hour, depending on the total dose level (see Table II for radiation schedule). After each radiation exposure 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:	HA-5127
HST Part Number:	5962-8962701PA
HST Control Number:	12546
Charge Number:	EE56209
Manufacturer:	Harris Corp
Lot Date Code:	9327
Quantity Tested:	8
Serial Number of Control Samples:	26, 27
Serial Numbers of Radiation Samples:	20, 21, 22, 23, 24, 25
Part Function:	Op-Amp
Part Technology:	CMOS
Package Style:	Mini-DIP
Test Equipment:	A540
Test Engineer:	T. Mondy

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

TABLE II. Radiation Schedule for HA7-5127/883

EVENTS	DATE
1) INITIAL ELECTRICAL MEASUREMENTS	06/15/95
2) 1 KRAD IRRADIATION (0.05 KRADS/HOUR) POST-1 KRAD ELECTRICAL MEASUREMENT	06/19/95 06/20/95
3) 2 KRAD IRRADIATION (0.05 KRADS/HOUR) POST-2 KRAD ELECTRICAL MEASUREMENT	06/20/95 06/21/95
4) 3 KRAD IRRADIATION (0.05 KRADS/HOUR) POST-3 KRAD ELECTRICAL MEASUREMENT	06/21/95 06/22/95
5) 5 KRAD IRRADIATION (0.1 KRADS/HOUR) POST-5 KRAD ELECTRICAL MEASUREMENT	06/22/95 06/23/95
6) 10 KRAD IRRADIATION (0.25 KRADS/HOUR) POST-10 KRAD ELECTRICAL MEASUREMENT	06/23/95 06/26/95

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

Table III. Electrical Characteristics of HA7-5127/883B

Unless Otherwise Specified:  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = \pm 15\text{Vdc}$ ,  $V_{OUT} = 0\text{v}$ 

TEST NAME	SYMBOL	CONDITIONS	LIMITS	
			MIN	MAX
SUPPLY CURRENT				
Plus $I_{cc}$	$I_{cc}$	$V_{OUT} = 0\text{V}$		4.0mA
Minus $I_{cc}$	$I_{cc}$	$V_{OUT} = 0\text{V}$	-4.0mA	
INPUT OFFSET TESTS				
VOS 0V	$V_{IO}$	$V_{OUT} = 0\text{V}$	-100.0uV	100.0uV
P IIB 0V	$+I_{IB}$	$V_{OUT} = 0\text{V}$	-80.0nA	80.0nA
N IIB 0V	$-I_{IB}$	$V_{OUT} = 0\text{V}$	-80.0nA	80.0nA
IIS 0V	$I_{IO}$	$V_{OUT} = 0\text{V}$	-75.0nA	75.0nA
CMRR	+CMRR	$V_{CM} = +11\text{V}$	100dB	
CMRR	-CMRR	$V_{CM} = -11\text{V}$	100dB	
Plus PSRR	+PSRR	$+V_{cc} = 22\text{V}, 8\text{V}$	86dB	
Minus PSRR	-PSRR	$-V_{cc} = -22\text{V}, -8\text{V}$	86dB	
AMPLIFIER OUTPUT TESTS				
P VOUT 2K	$V_{OP}$	$R_L = 2\text{K}\Omega$	11.5V	
P VOUT 600	$V_{OP}$	$R_L = 600\Omega$	10.0V	
N VOUT 2K	$V_{OP}$	$R_L = 2\text{K}\Omega$		-11.5V
N VOUT 600	$V_{OP}$	$R_L = 600\Omega$		-10.0V
P AOL KV/V	$A_{VS}$	$V_{OUT} = (0\text{V to } 10\text{V}), R_L = 2\text{K}\Omega$	700 KV/V	
N AOL KV/V	$A_{VS}$	$V_{OUT} = (0\text{V to } -10\text{V}), R_L = 2\text{K}\Omega$	700 KV/V	
OUTPUT CURRENT				
Plus $I_{out}$	$+I_{OIT}$	$V_{OUT} = -10\text{V}$	16.5mA	
MINUS $I_{out}$	$-I_{OIT}$	$V_{OUT} = 10\text{V}$		-16.5mA
PLUS SLEW	$+I_{OIT}$	$V_{OUT} = (-3\text{V to } 3\text{V}), R_L = 2\text{K}\Omega$	7.0V/uS	
MINUS SLEW	$-I_{OIT}$	$V_{OUT} = (-3\text{V to } 3\text{V}), R_L = 2\text{K}\Omega$	7.0V/uS	

**TABLE IV: Summary of Electrical Measurements after Total Dose Exposures and Annealing for HA7-5127/883 /1**

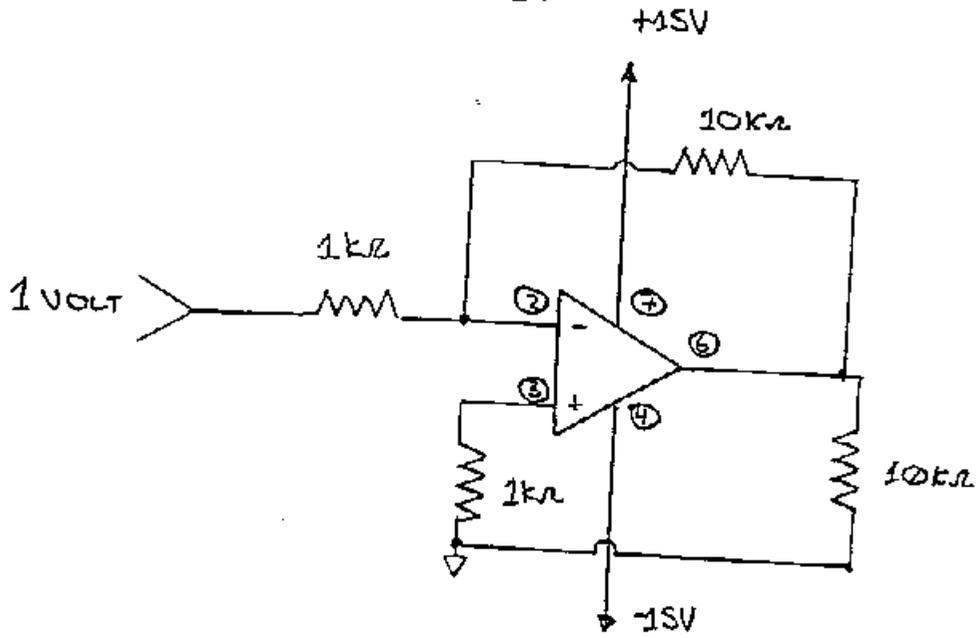
Test #	Parameters	Units	Spec. Lim./2		Total Dose Exposure (krads)											
					Initial		1		2		3		5		10	
					mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
1	Plus_Icc	mA	-	4	3.05	0.07	3.05	0.07	3.05	0.07	3.05	0.07	3.05	0.07	3.05	0.07
2	Minus_Icc	mA	-4	-	-3.05	0.07	-3.05	0.07	-3.05	0.07	-3.05	0.07	-3.05	0.07	-3.05	0.07
3	VOS_0V	uV	-100	100	-17	16	-18	17	-19	17	-18	17	-19	17	-19	17
4	P_IIB_0V	nA	-80	80	8.03	4.01	7.53	4.12	7.43	4.25	7.57	4.31	8.22	4.67	9.30	5.75
5	N_IIB_0V	nA	-80	80	6.91	3.15	6.53	3.21	6.38	3.30	6.73	3.33	7.29	3.67	8.48	4.70
6	IIOS_0V	nA	-75	75	1.12	1.66	1.04	1.76	1.05	1.83	83.4	1.89	92.9	1.91	81.9	2.25
7	+CMRR	dB	100	-	135	2.63	136	2.34	135	2.33	135	1.84	135	1.63	136	2.39
8	-CMRR	dB	100	-	132	1.42	135	2.34	135	2.10	137	2.42	137	2.32	137	2.67
9	Plus_PSRR	dB	86	-	134	4.07	134	5.69	135	5.12	135	5.48	135	5.01	135	4.82
10	Minus_PSRR	dB	86	-	142	7.57	142	7.29	142	7.83	142	9.29	141	9.25	142	16.1
11	P_VOUT_2K	V	11.5	-	13.3	0.03	13.3	0.02	13.3	0.02	13.3	0.03	13.3	0.01	13.3	0.03
12	P_VOUT_600	V	10	-	12.9	0.13	12.9	0.05	12.9	0.07	12.9	0.07	12.9	0.03	12.9	0.07
13	N_VOUT_2K	V	-	11.5	-13.8	0.0	-13.8	0.01	-13.8	0.0	-13.8	0.01	-13.8	0.01	-13.8	0.01
14	N_VOUT_600	V	-	10	-12.1	0.07	-12.0	0.07	-11.9	0.07	-11.9	0.06	-11.9	0.06	-11.9	0.06
15	P_AOL_KV/V	KV/V	700	-	2141	89.3	2128	80.4	2105	64.6	2047	69.7	1967	57.9	1832	70.0
16	N_AOL_KV/V	KV/V	700	-	2245	69.7	2325	46.7	2242	64.9	2162	61.5	2073	67.3	1928	54.6
17	Plus_Iout	mA	16.5	-	26.5	0.38	26.5	0.35	26.3	0.35	26.4	0.32	26.4	0.36	25.9	0.39
18	Minus_Iout	mA	-	-16.5	-28.4	0.15	-28.4	0.13	-28.2	0.13	-28.4	0.13	-28.5	0.15	-2.3	0.19
19	PLUS_SLEW	V/uS	7	-	10.8	0.29	10.9	0.57	10.8	0.47	10.6	0.39	10.8	0.53	10.7	0.52
20	MINUS_SLEW	V/uS	7	-	-9.34	0.30	-9.24	0.31	-9.20	0.32	-9.11	0.23	-9.03	0.24	-9.09	0.28
21	In1_10Hz	PA/Hz	-	-	2.08	1.85	2.12	1.96	2.52	2.10	2.65	1.99	3.28	2.43	3.58	2.16
22	In2_100Hz	PA/Hz	-	-	1.17	0.91	1.49	1.61	1.45	1.28	1.66	1.67	1.79	1.64	1.91	1.48
23	In3_1KHz	PA/Hz	-	-	0.69	0.11	0.71	0.13	0.68	0.11	0.71	0.09	0.77	0.09	0.79	0.10
24	En1_10Hz	nV/Hz	-	-	3.09	0.65	3.12	0.19	3.17	0.16	3.09	0.20	3.18	0.21	3.16	0.14
25	En2_100Hz	nV/Hz	-	-	3.25	0.12	3.29	0.14	3.27	0.16	3.20	0.15	3.23	0.14	3.27	0.05
26	En3_1KHz	nV/Hz	-	-	3.23	0.07	3.16	0.05	3.15	0.05	3.18	0.07	3.12	0.11	3.13	0.09

Notes:

- 1/ The mean and standard deviation values were calculated over the six parts irradiated in this testing. The control samples remained constant throughout the testing and are 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 parameters: None**

Figure 1. Radiation Bias Circuit for HA7-5127/883B



PINS 1, 8 and 5 are not connected.

TOP VIEW

