

Unisys

DATE: October 20, 1999
TO: R. Reed/562
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SUBJECT: Radiation Report on **A250 (Amptek) (LDC 9902)**
PROJECT: GLAS

PPM-99-031

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A radiation evaluation was performed on **A250 Charge Sensitive Pre Amp (Amptek)** to determine the total dose tolerance of these parts. The total dose testing was performed using a Co⁶⁰ gamma ray source. During the radiation testing, one part was irradiated under bias to determine the initial degradation level. Seven parts were then irradiated under bias (see Figure 1 for bias configuration) and two parts were used as control samples. The total dose radiation levels were 10.0, 17.5, 20.0, 25.0, 50.0 and 100.0kRads.¹ The average dose rate was 0.246kRads/hour (0.07 Rads/s). See Table II for the radiation schedule and average dose rate calculation. After the 100.0kRad irradiation, the parts were annealed under bias at 25°C for 168 hours.² After each radiation exposure and annealing step, parts were electrically tested according to the test conditions and the specification limits³ listed in Table III. An executive summary of the test results is provided below in bold, followed by a detailed summary of the test results after each radiation level and annealing step.

All parts passed all tests through 100kRads. After annealing the parts at 25°C for 168 hours, the parts showed no significant change in any parameter.

Initial electrical measurements were made on 10 samples. One part was used to determine the initial degradation level (SN 1727). Seven samples (SN's 1697, 1705, 1712, 1713, 1719, 1720, and 1726) were used as radiation samples while SN's 1682 and 1689 were used as control samples. All parts passed all tests during initial electrical measurements.

All parts passed all tests through 100kRads.

After annealing the parts for 168 hours at 25°C, no significant change was noted in any parameter.

Table IV provides a summary of the test results with the mean and standard deviation values for each parameter after each irradiation exposure and annealing step.

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

¹ The term Rads, as used in this document, means Rads (silicon). All radiation levels cited are cumulative.

² The temperature 25°C as used in this document implies room temperature.

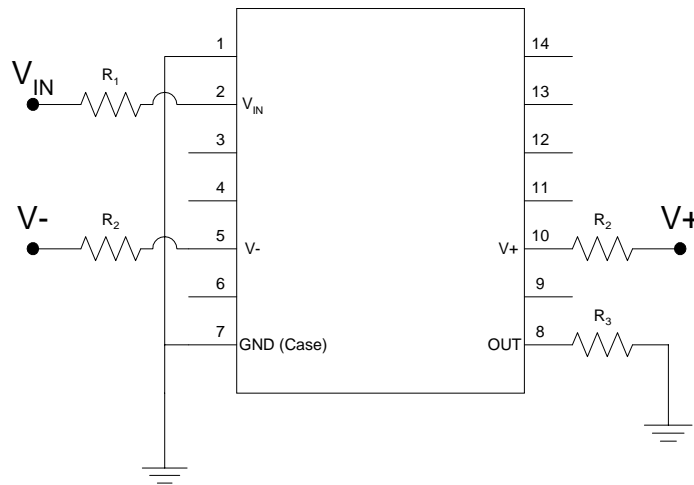
³ These are manufacturer's pre-irradiation data specification limits. The manufacturer provided no post-irradiation limits at the time these tests were performed.

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Figure 1. Radiation Bias Circuit for A250



Notes:

1. $V_{IN} = +7.5V \pm 0.25V$
2. $+V = +6.5V \pm 0.25V$
3. $-V = -6.5V \pm 0.25V$
4. $R_1 = 1k\Omega \pm 5\%, \frac{1}{2}W$
5. $R_2 = 390\Omega \pm 5\%, \frac{1}{2}W$
6. $R_3 = 2k\Omega \pm 5\%, \frac{1}{2}W$

Figure 2: A250 Internal Connection Diagram

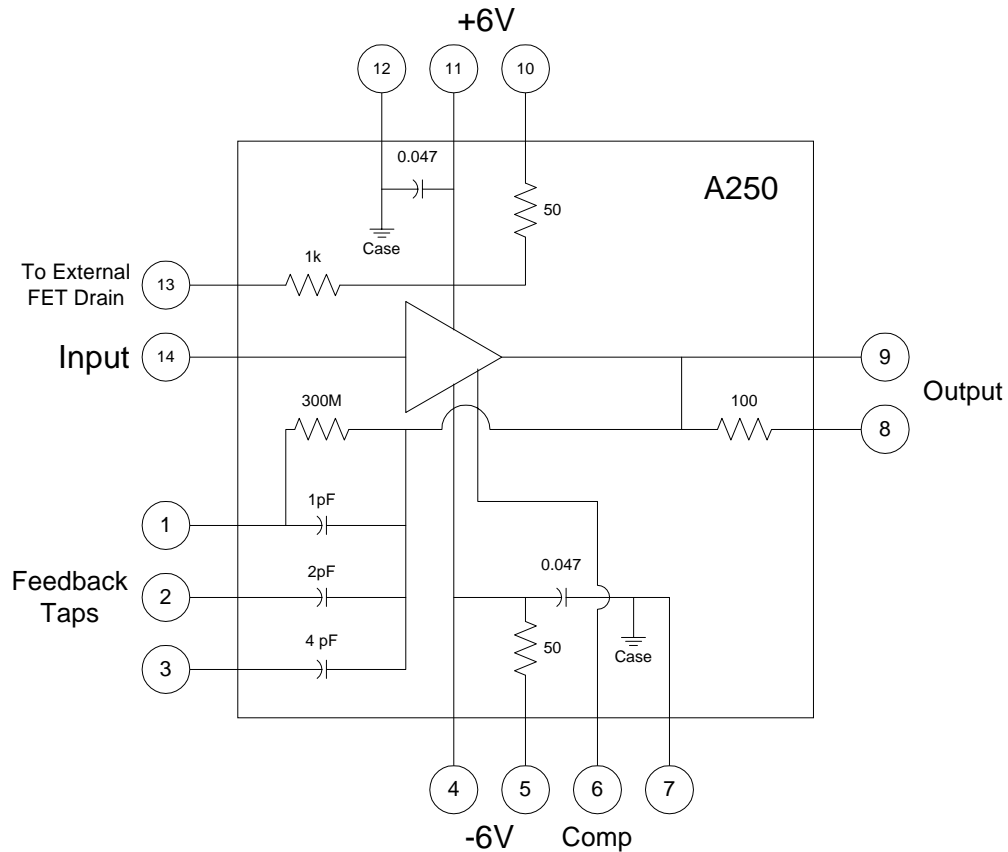


TABLE I. Part Information

Generic Part Number:	A250
GLAS Part Number	A250
GLAS TID Requirement	25kRads (RDM = 5)
Charge Number:	M90432
Manufacturer:	Amptek
Lot Date Code (LDC):	9902
Quantity Tested:	10
Serial Numbers of Control Samples:	1682, 1689
Serial Number of Initial Degradation Sample:	1727
Serial Numbers of Radiation Samples:	1697, 1705, 1712, 1713, 1719, 1720, 1726
Part Function:	Charge Sensitive Pre Amp
Part Technology:	Hybrid
Package Style:	14 Pin Hybrid DIP
Test Equipment:	Bench Setup
Test Engineer:	S. Norris

- The manufacturer for this part guaranteed no radiation tolerance/hardness.

TABLE II. Radiation Schedule for A250

EVENT	DATE
1) INITIAL ELECTRICAL MEASUREMENTS	09/03/99
One Part Test Runs	
2) 8 KRAD IRRADIATION (0.190 KRADS/HOUR).....	09/13/99
POST-8 KRAD ELECTRICAL MEASUREMENT	09/15/99
3) 16.0 KRAD IRRADIATION (0.174 KRADS/HOUR).....	09/15/99
POST-16.0 KRAD ELECTRICAL MEASUREMENT	09/17/99
4) 24.0 KRAD IRRADIATION (0.119 KRADS/HOUR).....	09/17/99
POST-24.0 KRAD ELECTRICAL MEASUREMENT	09/20/99
All Remaining Part	
5) 10.0 KRAD IRRADIATION (0.143 KRADS/HOUR).....	09/24/99
POST 10.0 KRAD ELECTRICAL MEASUREMENT	09/27/99
6) 17.5 KRAD IRRADIATION (0.177 KRADS/HOUR).....	09/27/99
POST-17.5 KRAD ELECTRICAL MEASUREMENT	09/29/99
7) 25.0 KRAD IRRADIATION (0.179 KRADS/HOUR).....	09/29/99
POST-25.0 KRAD ELECTRICAL MEASUREMENT	10/01/99
8) 50.0 KRAD IRRADIATION (0.225 KRADS/HOUR).....	10/01/99
POST-50.0 KRAD ELECTRICAL MEASUREMENT	10/06/99
9) 100.0 KRAD IRRADIATION (0.357 KRADS/HOUR).....	10/06/99
POST-100.0 KRAD ELECTRICAL MEASUREMENT	10/12/99
10) 168 HOUR ANNEALING @25°C.....	10/12/99
POST-168 HOUR ANNEAL ELECTRICAL MEASUREMENT	10/19/99

Average Dose Rate = 100,000 RADS/407 HOURS=245.7 RADS/HOUR=0.07RADS/SEC

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

Table III. Electrical Characteristics A250 (1)

Test #	Parameter	Units	Spec. Limit		Test Conditions (2)
			min	max	
1	Is+	mA	3.35	3.95	
2	Is-	mA	-1.05	-1.35	
3	ODC	V	-1.3	-1.9	C = 1pf, f = 100kHz
4	ACL1	dB	35	39	Input = 200mV p-p @ 100kHz, C = 1pf
5	PCL	V	2.7		f = 1MHz
6	NCL	V		-4.2	f = 1MHz
7	PSR	ns		9	0V to -1.5V, 100ns pulse
8	NSR	ns		55	0V to +400mV, 100ns pulse

Notes:

(1) These are the manufacturer's non-irradiated data sheet specification limits. The manufacturer provided no post-irradiation limits at the time the tests were performed.

(2) $V_S = \pm 6V$ unless otherwise specified.

TABLE IV: Summary of Electrical Measurements after Total Dose Exposures and Annealing for AMP250 (1)

Test #	Parameters	Units	Spec. Lim. (2)		Total Dose Exposure (kRads Si)												Annealing	
					Initial		10.0		17.5		25.0		50.0		100.0		168 hours @25°C	
					mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
1	Is+	mA	3.35	3.95	3.67	0.01	3.66	0.01	3.67	0.01	3.67	0.01	3.62	0.04	3.66	0.01	3.66	0.01
2	Is-	mA	-1.05	-1.35	-1.20	0.01	-1.19	0.01	-1.19	0.01	-1.19	0.01	-1.19	0.01	-1.19	0.01	-1.19	0.01
3	ODC	V	-1.30	-1.90	-1.40	0.01	-1.39	0.01	-1.39	0.01	-1.39	0.01	-1.40	0.01	-1.40	0.01	-1.39	0.01
4	ACL1	dB	35	39	38.8	0.1	38.5	0.2	38.5	0.3	38.5	0.1	38.7	0.4	38.5	0.1	38.7	0.1
5	PCL	V	2.7		3.3	0.1	3.1	0.03	3.3	0.05	3.3	0.04	3.4	0.04	3.3	0.05	3.3	0.05
6	NCL	V		-4.2	-4.6	0.1	-4.8	0.1	-4.9	0.1	-4.8	0	-4.8	0.1	-4.7	0	-4.7	0.05
7	PSR	ns		9	7.4	0.3	7.4	0.3	7.6	0.2	7.7	0.2	8.2	0.4	7.4	0.3	7.5	0.2
8	NSR	ns		55	35.9	1.3	33.4	0.3	31.5	0.4	32.4	0.3	31.5	0.5	31.7	0.5	31.0	0.5

Notes:

- (1) The mean and standard deviation values were calculated over the seven parts irradiated in this testing. The control samples remained constant throughout testing and are not included in the data.
- (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.