

Total Dose Radiation Test Report

MSK 0002RH

Radiation Tolerant High Speed, Buffer Amp

March 29, 2007 (First Test)
April 7, 2009 (Second Test)

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I. Introduction:

The total dose radiation test plan for the MSK 0002RH was developed to qualify the device as radiation tolerant up to 100 Krad(Si). The testing was performed beyond 100 Krad(Si) to show trends in device performance as a function of total dose. The test does not classify maximum radiation tolerance of the hybrid, but simply offers designers insight to the critical parameter-shifts up to the specified total dose level.

MIL-STD-883 Method 1019.7 and ASTM F1892-06 were used as guidelines in the development and implementation of the total dose test plan for the MSK 0002RH.

II. Radiation Source:

Total dose was performed at the University of Massachusetts, Lowell, using a cobalt 60 radiation source. Dosimetry was performed prior to device irradiation and the dose rate was determined to be 180 rads(Si)/sec. The total dose schedule can be found in Table I.

III. Test Setup:

All test samples were subjected to Group A Electrical Test in accordance with the device data sheet. In addition, all devices received 320 hours of burn-in per MIL-STD-883 Method 1015 and were electrically tested prior to irradiation. For test platform verification, one control device was tested at 25°C.

The devices were vertically aligned with the radiation source and enclosed in a Pb/Al container during irradiation to minimize dose enhancement effects. Four devices were kept under bias during irradiation. Four devices had all leads grounded during irradiation for the unbiased condition.

After each irradiation, the device leads were shorted together and were transported to the MSK automatic electrical test platform and tested IAW MSK device data sheet. Testing was performed on irradiated devices, as well as the control device, at each total dose level. Electrical tests were completed within one hour of irradiation.

IV. Data:

All performance curves are averaged from the test results of the biased and unbiased devices respectively.

V. Summary:

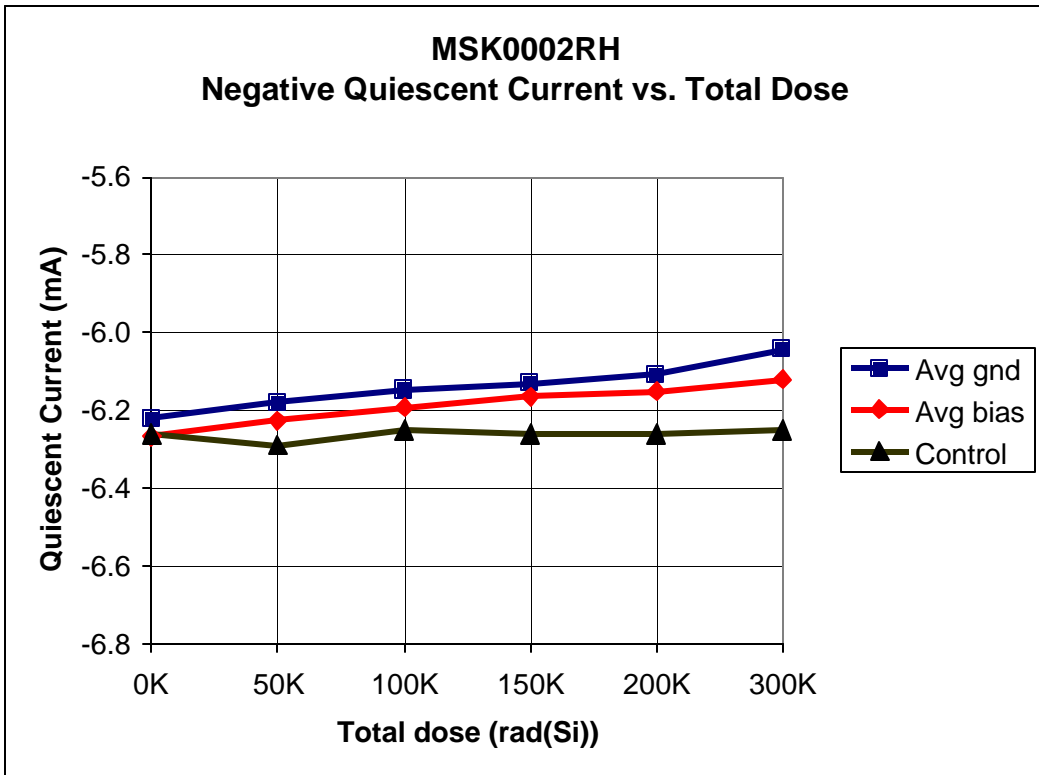
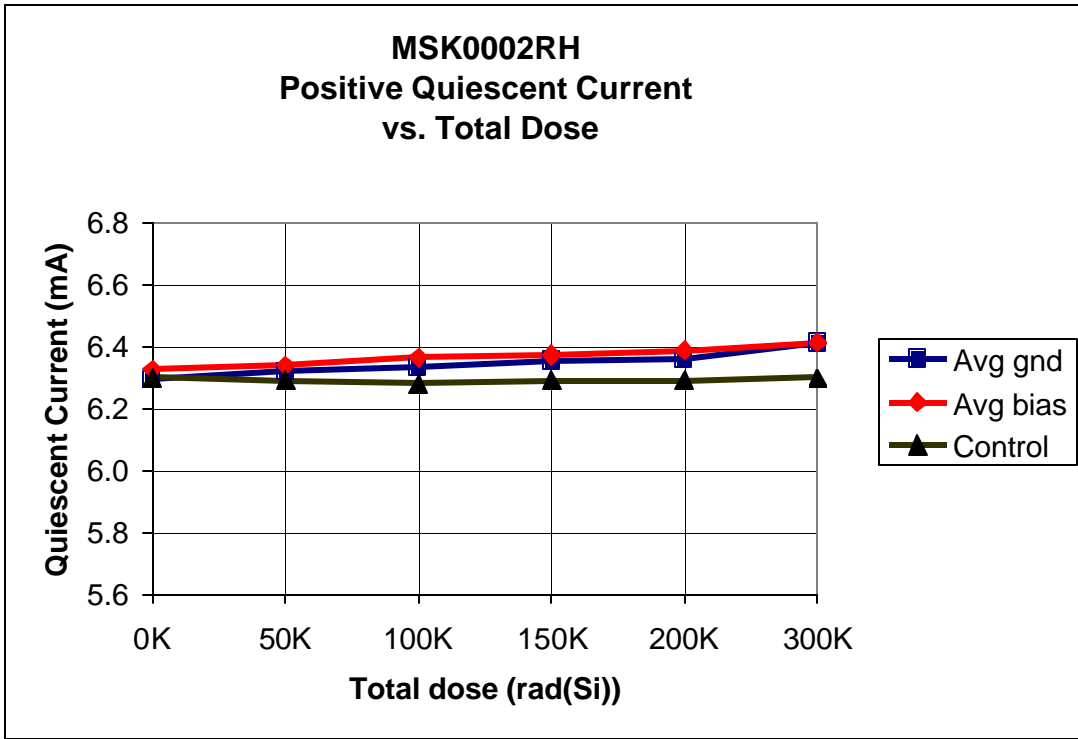
The devices performed very well with respect to TID tolerance. Some shift in the output offset current was seen from 0Krad(Si) to 300Krad(Si)..

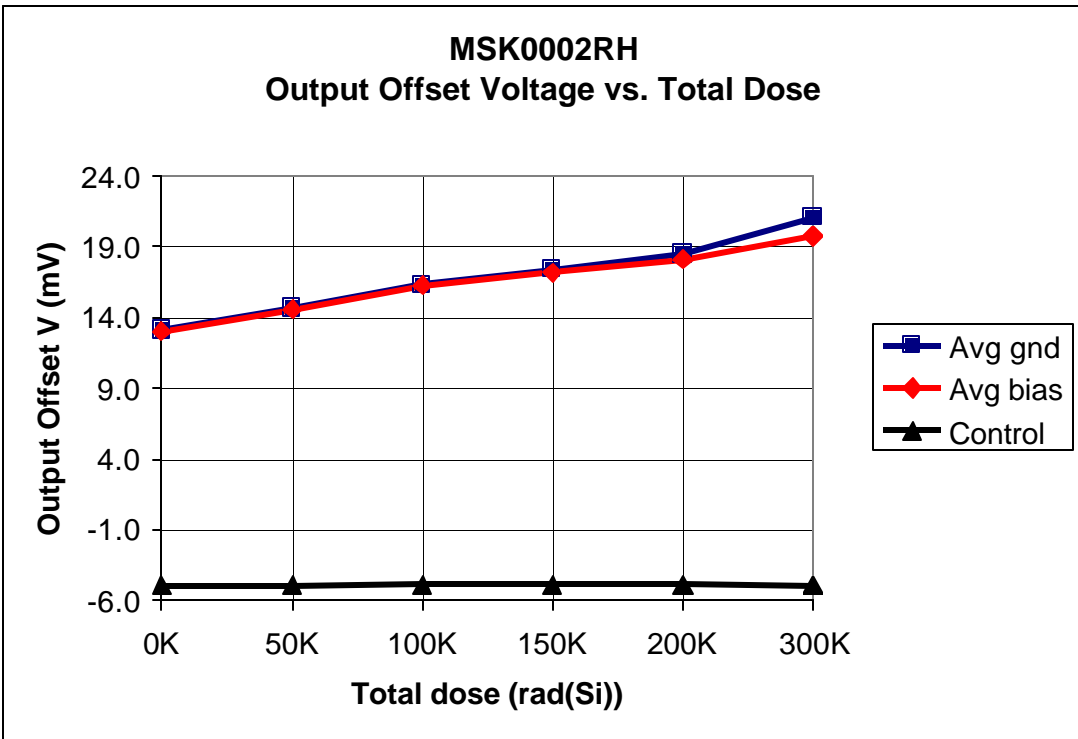
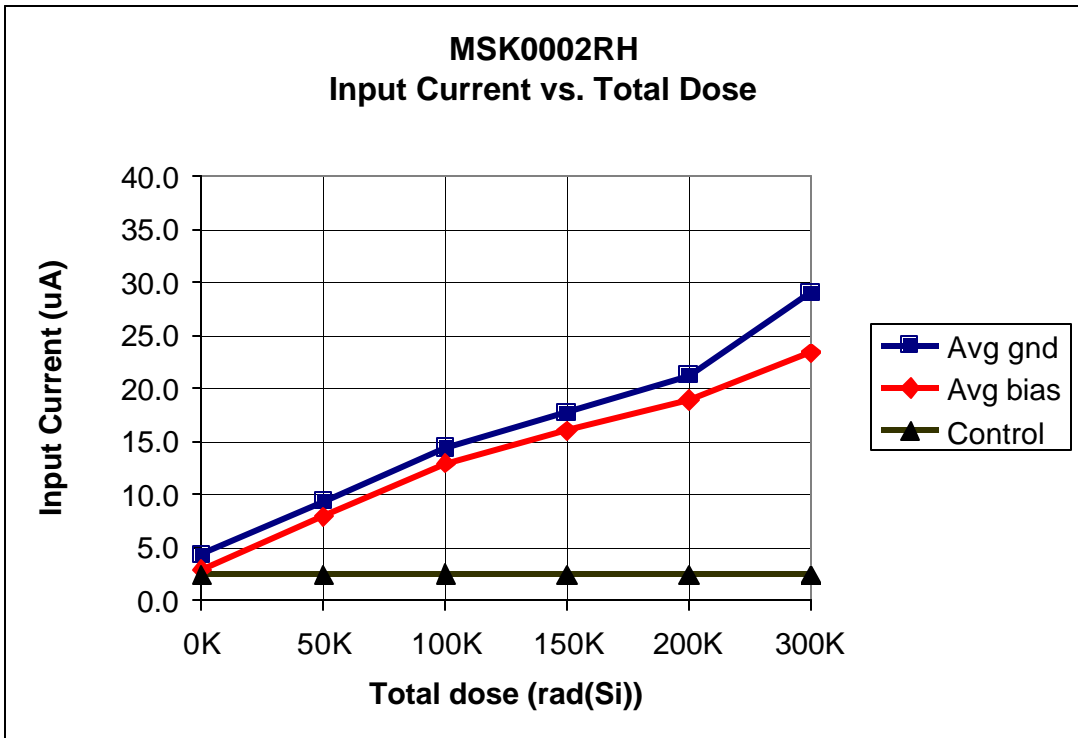
Negative Vout2, which is output voltage swing at maximum load, decreased with increased irradiation. However, the devices stayed within post irradiation limits throughout all testing.

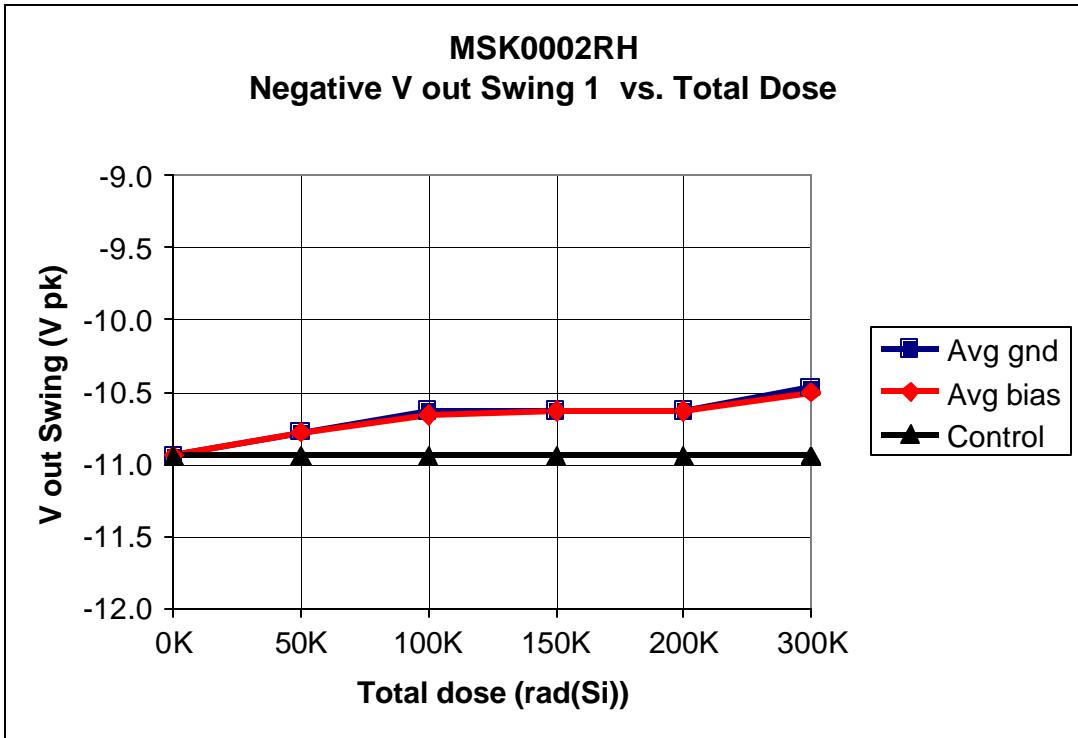
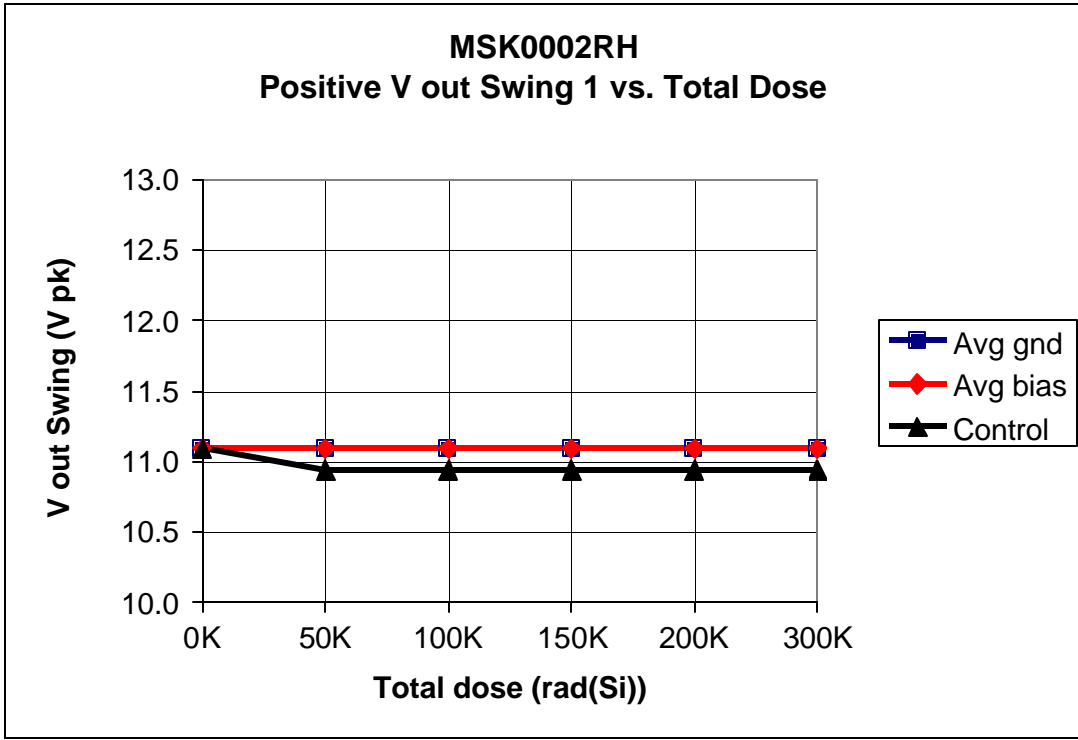
The devices also exhibited a slight voltage gain decrease. This was most pronounced from 0 Krad(Si) to 50Krad(Si). 0

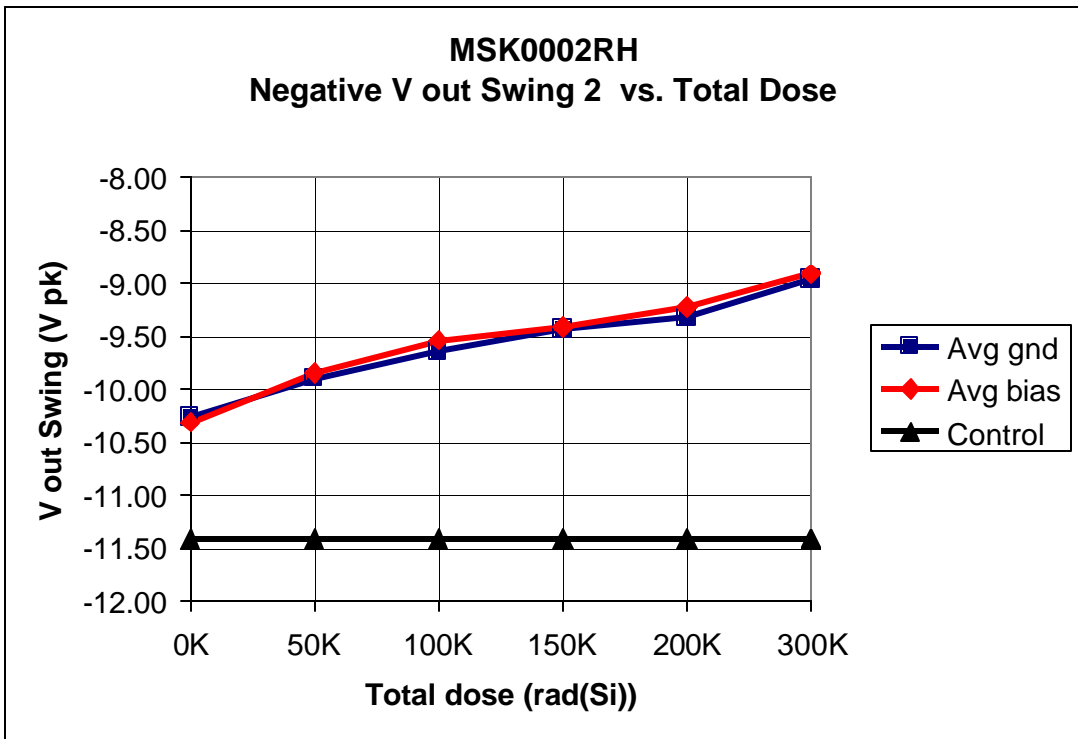
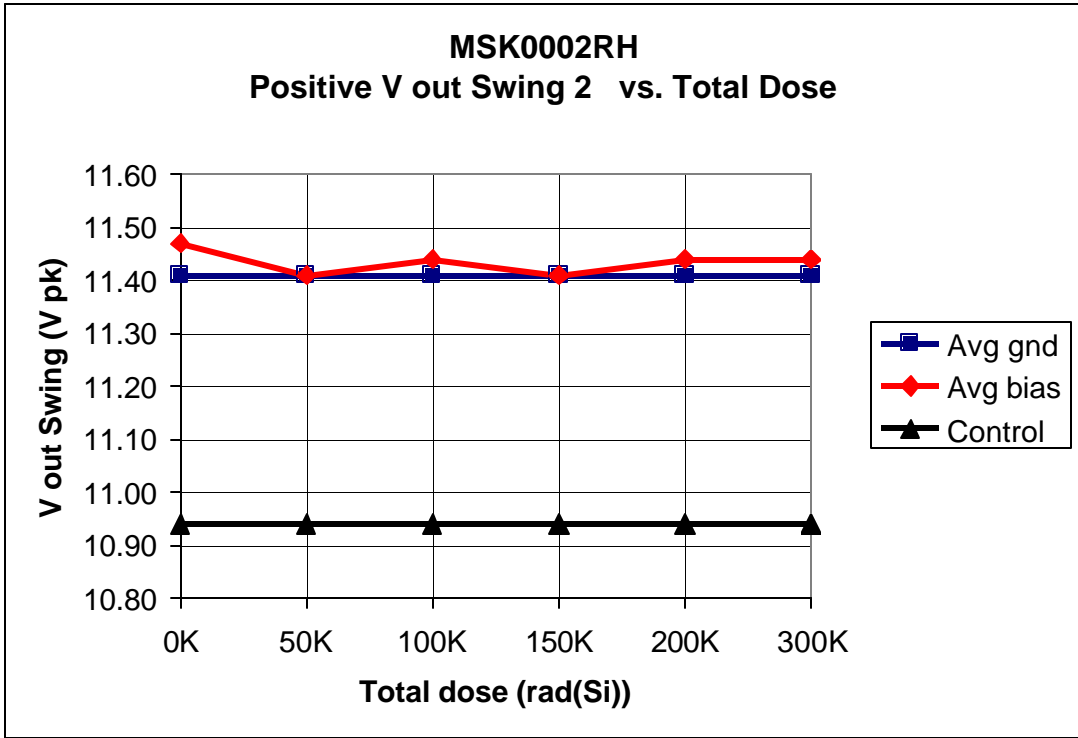
Dosimetry Equipment		Irradiation Date
Bruker Biospin #0141		4/07/2009
Exposure Length (min:sec)	Incremental Dose rads(Si)	Cumulative Dose rads(Si)
4:46	51,480	51,480
4:46	51,480	102,960
4:46	51,480	154,440
4:46	51,480	205,920
9:33	103,140	309,060
Biased Devices: 621, 622, 623, 624		
Unbiased Devices: 625, 641, 651, 652		

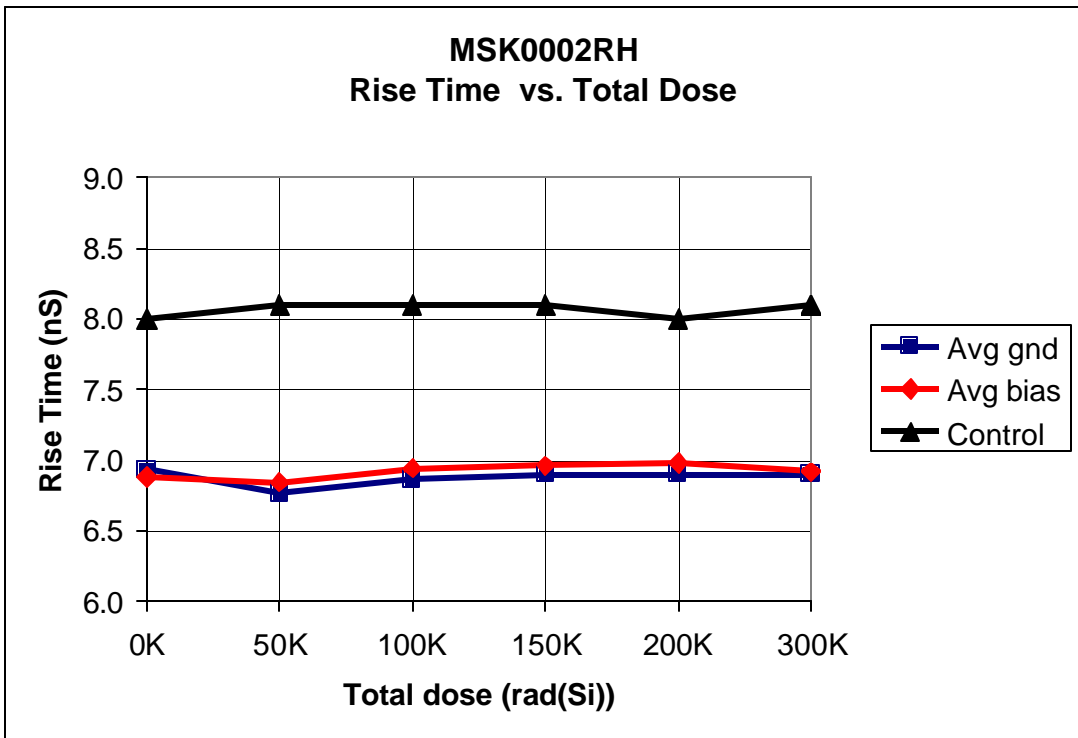
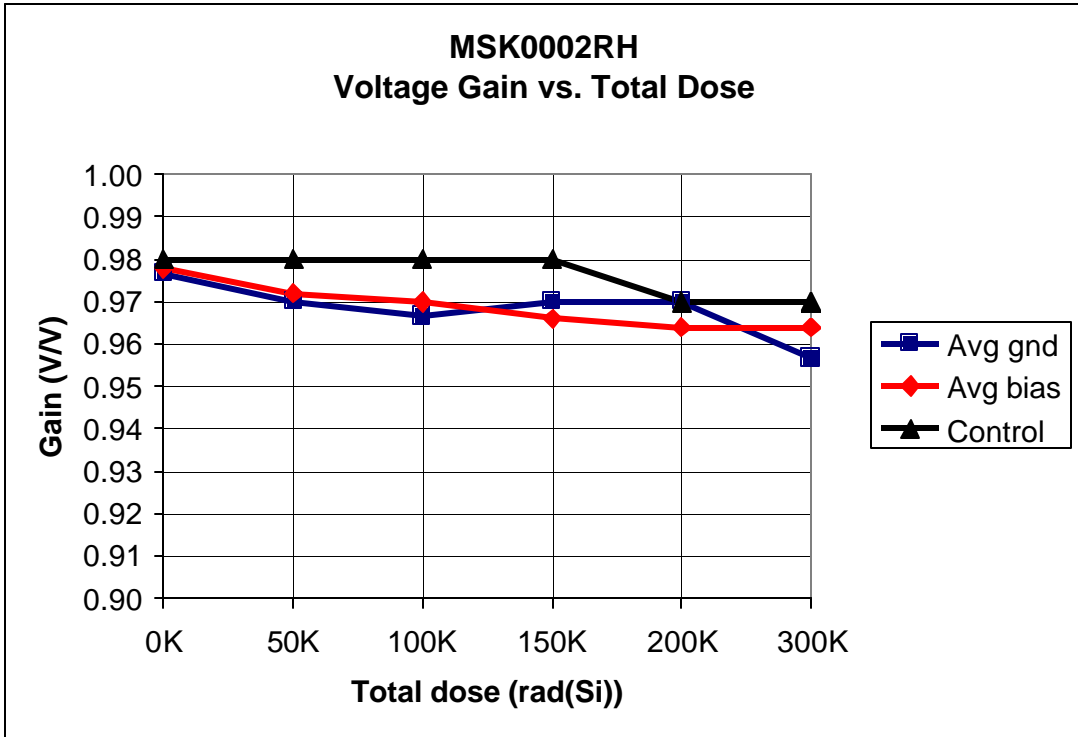
Table 1
Dose Time, Incremental Dose and Total Cumulative Dose











Total Dose Radiation Test Report
MSK 0002RH
Radiation Tolerant High Speed, Buffer Amp

March 29, 2007

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I. Introduction:

The total dose radiation test plan for the MSK 0002RH was developed to qualify the device as radiation tolerant up to 100 Krad(Si). The testing was performed beyond 100 Krad(Si) to show trends in device performance as a function of total dose. The test does not classify maximum radiation tolerance of the hybrid, but simply offers designers insight to the critical parameter-shifts up to the specified total dose level.

MIL-STD-883 Method 1019.7 and ASTM F1892-06 were used as guidelines in the development and implementation of the total dose test plan for the MSK 0002RH.

II. Radiation Source:

Total dose was performed at the University of Massachusetts, Lowell, using a cobalt 60 radiation source. Dosimetry was performed prior to device irradiation and the dose rate was determined to be 108 rads(Si)/sec. The total dose schedule can be found in Table I.

III. Test Setup:

All test samples were subjected to Group A Electrical Test in accordance with the device data sheet. In addition, all devices received 320 hours of burn-in per MIL-STD-883 Method 1015 and were electrically tested prior to irradiation. For test platform verification, one control device was tested at 25°C.

The devices were vertically aligned with the radiation source and enclosed in a Pb/Al container during irradiation to minimize dose enhancement effects. Four devices were kept under bias during irradiation. Four devices had all leads grounded during irradiation for the unbiased condition.

After each irradiation, the device leads were shorted together and were transported to the MSK automatic electrical test platform and tested IAW MSK device data sheet. Testing was performed on irradiated devices, as well as the control device, at each total dose level. Electrical tests were completed within one hour of irradiation.

IV. Data:

All performance curves are averaged from the test results of the biased and unbiased devices respectively.

V. Summary:

The devices performed very well with respect to TID tolerance. Some negative shift in the input offset current was seen from 0Krad(Si) to 100Krad(Si). The devices stabilized and input offset current stayed fairly constant with a slightly negative shift from 100Krad(Si) up to 300Krad(Si).

Vout2, which is output voltage swing at maximum load, decreased with increased irradiation. The decrease occurred between 0Krad(Si) and 100Krad(Si). This parameter also stabilized at higher radiation doses.

The devices also exhibited a slight voltage gain decrease. Again, this was most pronounced from 50Krad(Si) to 100Krad(Si) with less change from occurring from 100Krad(Si) to 300Krad(Si).

Dosimetry Equipment				Irradiation Date
Bruker Biospin #0141				3/29/2007
	Exposure Length (min:sec)	Incremental Dose rads(Si)	Cumulative Dose rads(Si)	
	7:57	51,516	51,516	
	7:57	51,516	103,032	
	7:57	51,516	154,548	
	7:57	51,516	206,064	
	7:57	51,516	257,580	
	7:57	51,516	309,096	

Table 1
Dose Time, Incremental Dose and Total Cumulative Dose

