

Total Dose Radiation Test Report
MSK 5940 RH Series
RAD Hard Negative Voltage Regulator

September 25, 2008

B. Erwin
F. Freytag

M.S. Kennedy Corporation
Liverpool, NY

I. Introduction:

The total dose radiation test plan for the MSK 5940RH series was developed to qualify the devices as RAD Hard to 100 KRADS(Si). The testing was performed beyond 100 KRADS(Si) to show trends in device performance as a function of total dose. The test does not classify maximum radiation tolerance of the device, but simply offers designers insight to the critical parameter-shifts up to the specified total dose level.

The internal active components are the same for the entire MSK 5940RH series and therefore, the MSK 5940-5.0RH was chosen to be representative of the entire product series.

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 5940RH series.

II. Radiation Source:

Total dose was performed at the University of Massachusetts, Lowell, using a cobalt 60 radiation source. The dose rate was determined to be 191 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 fully screened IAW MIL-PRF-38534 Class K. For test platform verification, one control device was tested at 25°C. Nine devices were then tested at 25°C, prior to irradiation, and were found to be within acceptable test limits.

The devices were vertically aligned with the radiation source and enclosed in a lead/aluminum container during irradiation. Five devices were kept under bias during irradiation. Maximum recommended operating voltage of - 35 Volts were used for the bias condition. Four devices had all leads grounded during irradiation for the unbiased condition.

After each irradiation, the device leads were shorted together and the devices were transported to the MSK automatic electrical test platform. Testing was performed in accordance with the 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. Devices were subjected to subsequent radiation doses within two hours of removal from the radiation field.

IV. Data:

All performance curves are averaged from the test results of the biased and unbiased devices, respectively. If required, full test data can be obtained by contacting M.S. Kennedy Corporation.

V. Summary:

All devices showed a slight decrease in quiescent current.

Output voltage tolerance exhibited the most significant shifts due to irradiation. The most notable changes were seen at low input voltage and low output current. In addition, the ground devices changed more than the biased devices. It is important to note however, that all devices maintained pre-irradiation output tolerance levels throughout irradiation.

Line and load regulation displayed some shift, once again with ground devices being more significant. However, as with output voltage tolerance, all devices stayed within pre-irradiation limits throughout testing.

MSK 5940-5.0RH Biased/Unbiased Dose
Rate Schedule

Dosimetry Equipment
Bruker Biospin # 0141

Irradiation Date
9/25/08

Exposure Length (min:sec)	Incremental Dose rads(Si)	Cumulative Dose rads(Si)
4:30	51,570	51,570
4:30	51,570	103,140
4:30	51,570	154,710
4:30	51,570	206,280
9:00	103,140	309,420
13:30	154,710	464,130

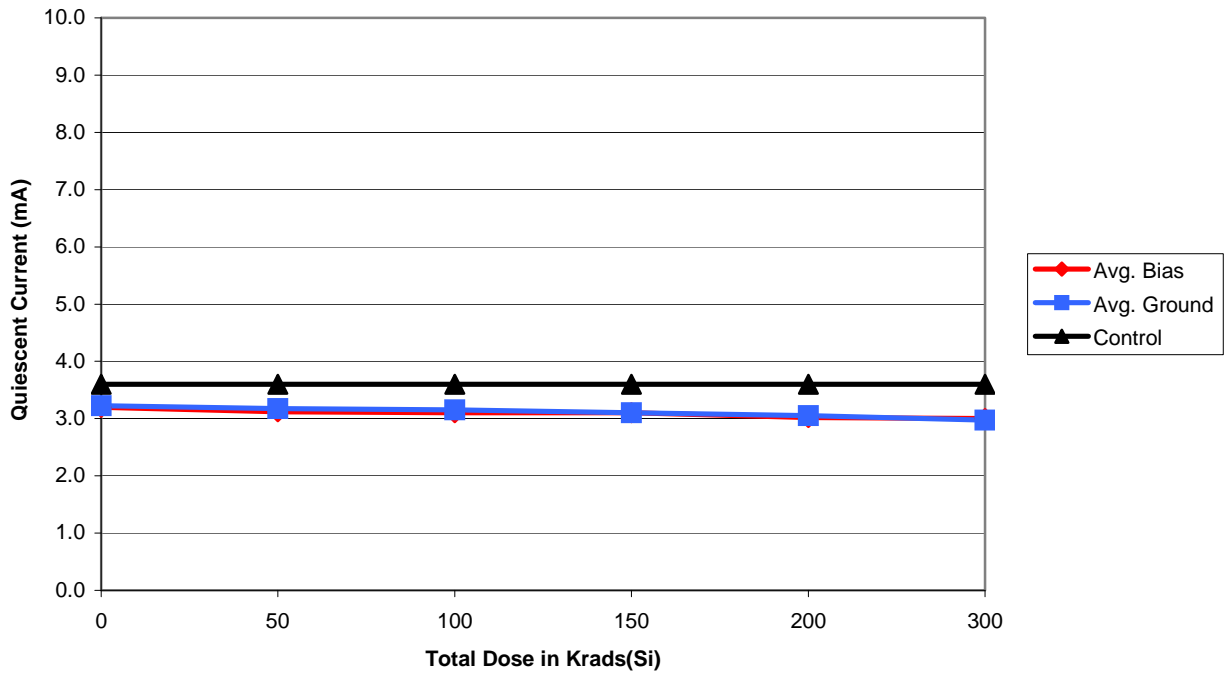
Biased S/N – 001, 002, 003, 004, 005

Unbiased S/N – 006, 007, 008, 009

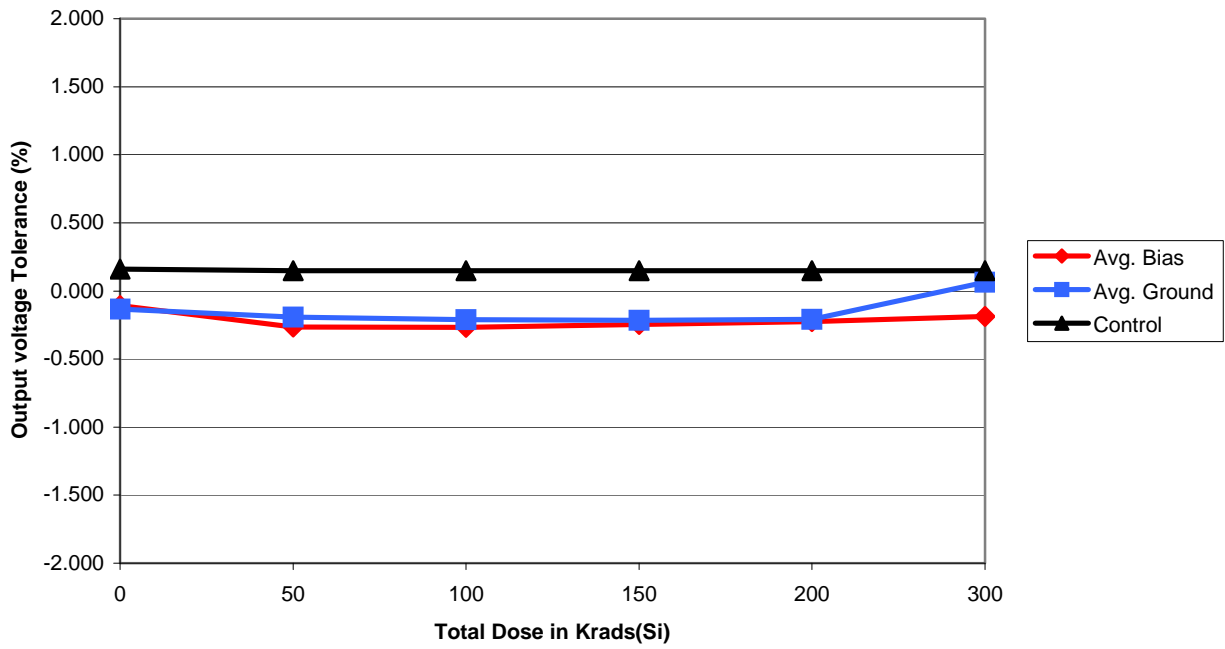
Table 1

Dose Time, Incremental Dose and Total Cumulative Dose

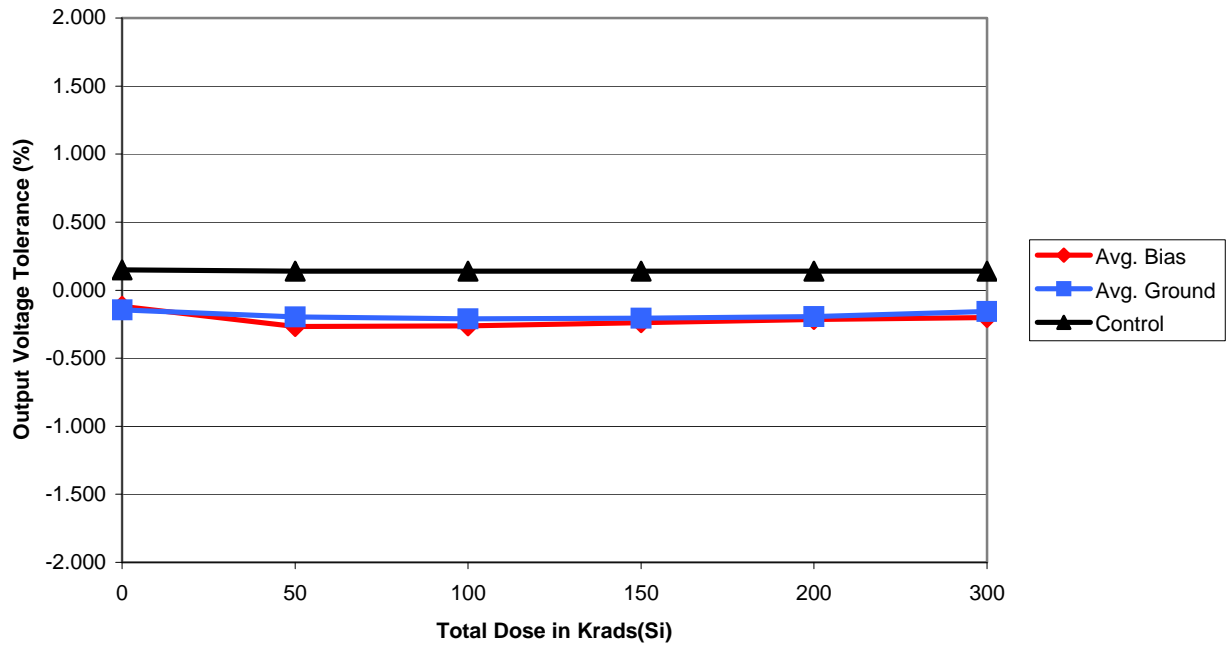
MSK5940RH
Negative Quiescent Current vs. Total Dose



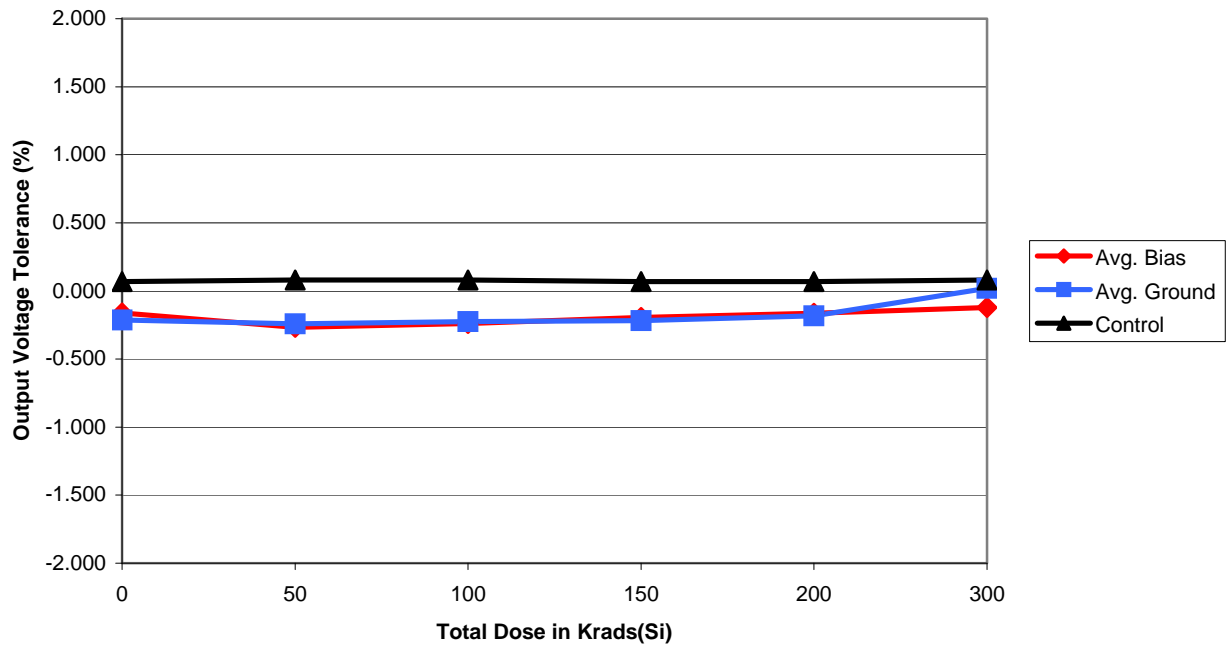
MSK5940RH
Negative Vout Tolerance vs. Total Dose
Vin = -8V Iout = 10 mA



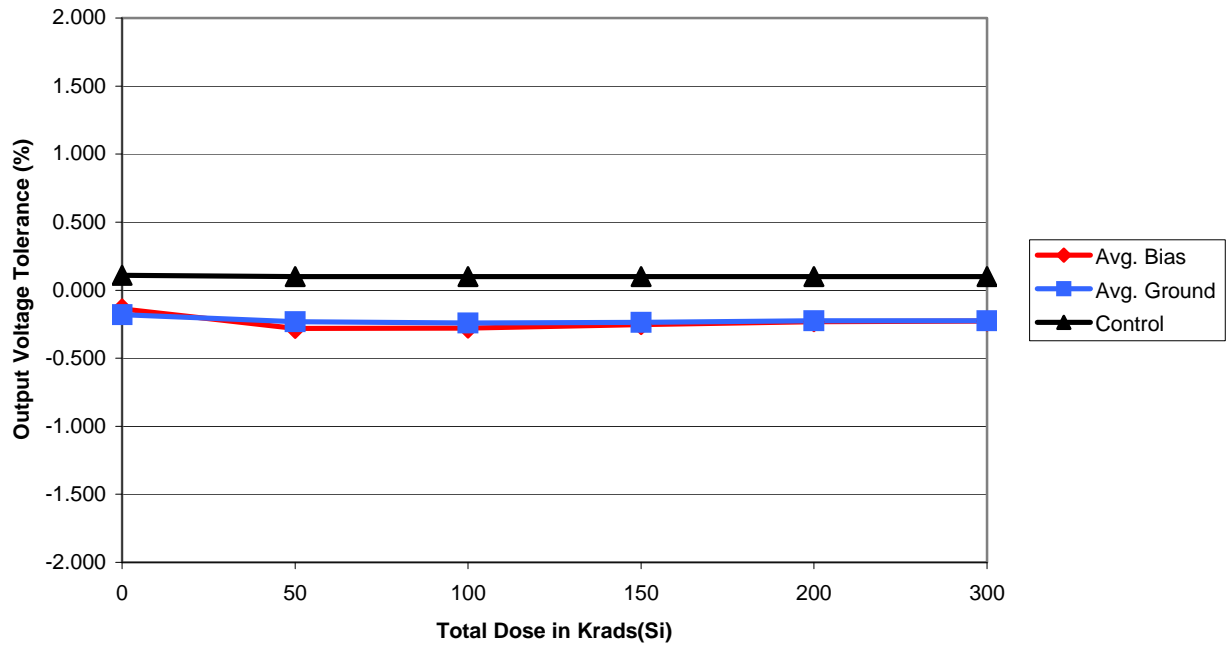
MSK5940RH
Negative Vout Tolerance vs. Total Dose
Vin = -20V Iout = 10 mA



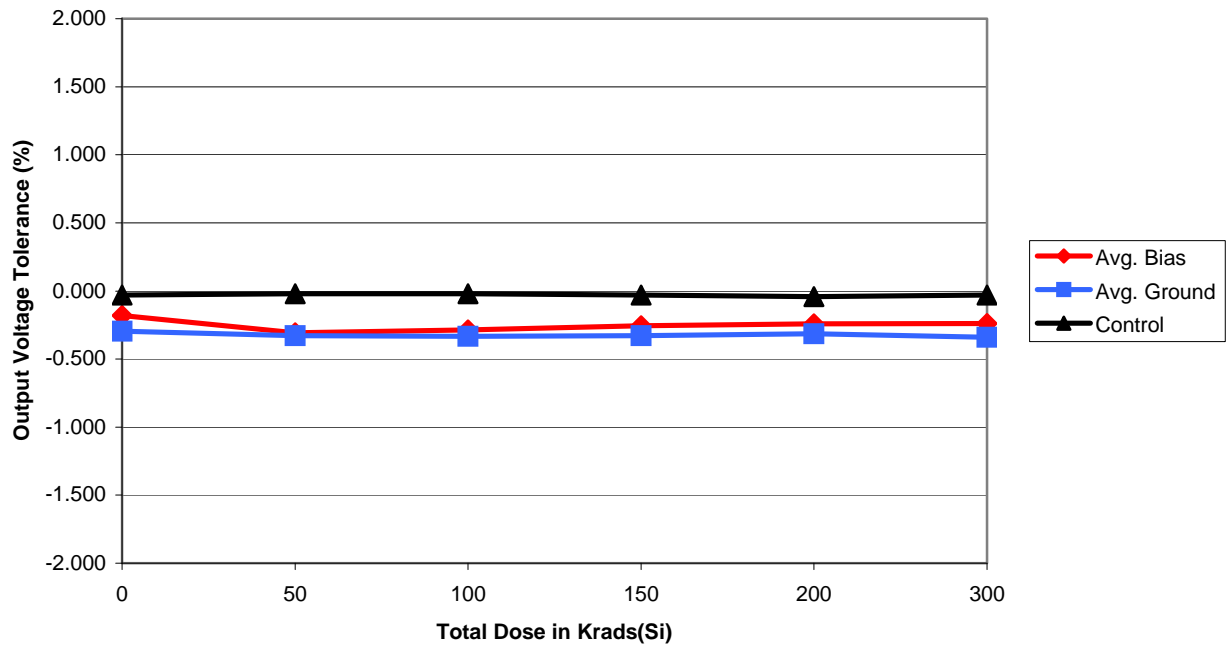
MSK5940RH
Negative Vout Tolerance vs. Total Dose
Vin = -8V Iout = 3 Amps



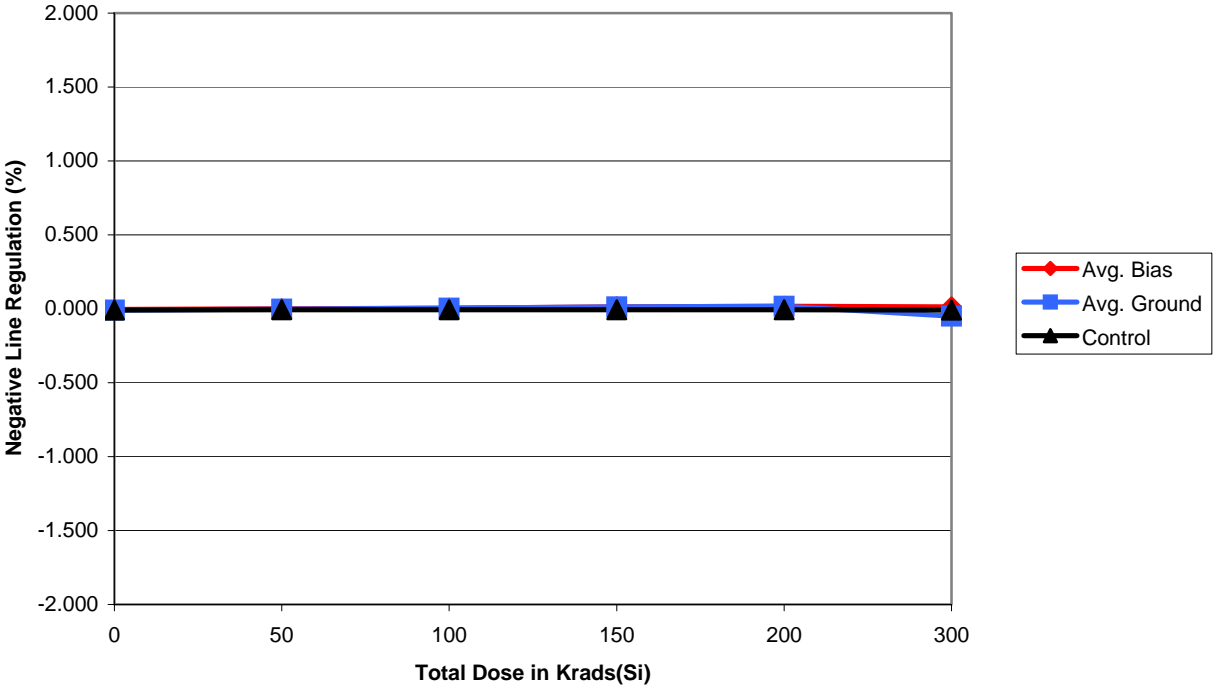
MSK5940RH
Negative Vout Tolerance vs. Total Dose
Vin = -35V Iout = 100 mA



MSK5940RH
Negative Vout Tolerance vs. Total Dose
Vin = -15V Iout = 1.5 Amps



MSK5940RH
Negative Line Regulation vs. Total Dose



MSK5940RH
Negative Load Regulation vs. Total Dose

