

**Neutron Displacement Damage Test Report**

**MSK5970KRH**

**RAD Hard Positive Voltage Regulator**

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## **I. Introduction:**

The Neutron Irradiation test for the MSK5970RH was performed to determine the change in device performance as a function of neutron fluence. The testing was performed to  $3.28 \times 10^{11}$  n/cm<sup>2</sup> total integral fluence. The test does not classify maximum radiation tolerance of the device, but simply offers designers insight to the critical parameter-shifts up to the indicated fluence levels

MIL-STD-883 Method 1017.9 was used as the basis in the development and implementation of the Neutron Irradiation test plan for the MSK5055RH series.

## **II. Radiation Source:**

Neutron Irradiation was performed at the University of Massachusetts, Lowell, using the Reactor Facility-FNI. The neutron flux was determined by dosimetry system S/P-32, method ASTM E-265, to be  $1.71 \times 10^8$  n/cm<sup>2</sup>-s and  $3.42 \times 10^8$  n/cm<sup>2</sup>-s (1 MeV equivalent) for the first and second irradiation steps respectively.

## **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 I.A.W. MIL-PRF-38534 Class K. Two control devices were tested at 25°C for test platform verification. One control device was a MSK5970RH and the other was a functionally similar MSK5971RH. Fourteen devices were then tested at 25°C, prior to irradiation, and were found to be within acceptable test limits.

During irradiation, devices leads were shorted together using antistatic foam and then devices were placed into an anti-static bag. Devices were then vertically aligned with the radiation source.

After each irradiation step, the devices were transported to the MSK electrical test platform. Testing was performed in accordance with the MSK5970RH data sheet. Electrical testing was performed on the irradiated devices, as well as the control devices, at each fluence level. Electrical tests were completed within one hour after irradiation.

## **IV. Data:**

All performance curves are averaged from the test results of both the irradiated devices, and the control devices. Both controls were used for all tests except current limit. If required, full test data can be obtained by contacting M.S. Kennedy Corporation.

## **V. Summary:**

Based on data recorded during neutron irradiation testing and statistical analysis, the MSK5970RH exhibits low susceptibility to neutron displacement damage. The Reference Voltage shows some degradation with irradiation but remained well within post irradiation specifications up to the maximum tested fluence. All other devices performed well within data sheet specifications throughout all test intervals.

Table 1.

MSK5970RH Neutron Irradiation						
Reactor Facility – Fast Neutron Irradiation (FNI) Dosimetry System: S/P-32 (ASTM E-265)						
Exposure Date: 11/19/14						
Irradiation	Reactor Power (kW)	Gamma Dose Rad (Si)	Flux (n/cm <sup>2</sup> -S)	Time(s)	Fluence (n/cm <sup>2</sup> )	Total Fluence (n/cm <sup>2</sup> )
Step 1	2	13	1.71E8	585	1.04E11	1.04E11
Step 2	4	27	3.42E8	585	2.24E11	3.28E11

**Gamma Dose, Neutron Flux and Total Fluence**





