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**Total Ionizing Dose (TID)
ADS5463-SP
(5962R0720802VXC)
12-BIT, 500-MSPS Analog-To-Digital Converter**

Wafer Lot: 1065118– 4, 5, 6

Date: December 1, 2011
Approved by:
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1.0 Summary

Texas Instruments plans to release a radiation hardened assurance (RHA) version of the ADS5463-SP, 12 BIT, 500-MSPS Analog-To-Digital Converter. The ADS5463-SP passes 100 krad(Si) total ionizing dose (TID) radiation for application environments. The results are based on testing performed to 2X the assurance level or 200krad(Si) with one interim read point to demonstrate that device performance as a function of total dose exhibits a 2X margin over the stated assured radiation level.¹

2.0 Radiation Source

Total ionizing dose (TID) radiation testing was performed at the Radiation Assured Devices (RAD) in its Colorado Springs, CO facility using Co-60 gamma ray source with dose rate maintained at 50Rads(Si)/sec and accuracy of +/-10%.

3.0 Test Details

MIL-STD-883H, Test Method 1019.8 was used as a guideline for testing.

A step-stress test method was used to determine the TID hardness level. That is, after a predetermined TID level was reached, an electrical test was performed on a given sample of parts to verify that the units pass predefined SMD electrical specification limits. This demonstrated that the wafer lot can be certified RHA

The ADS5463-SP BiCOM3X technology contains both Bipolar and CMOS components therefore an ELDRS and dry ice tests (used in TID step-stress testing) were performed. This approach is technology based, and per MIL-STD-883H, Test Method 1019.8, once the device technology is shown to be ELDRS free for the stated RHA level, and the dry ice method validation is completed, the technology will be classified as only needing Radiation Lot Acceptance Testing (RLAT) per MIL-STD-883H, Test Method 5005, Table V (Subgroup 2) for future devices manufactured in this technology.

Rebound testing was also performed on 6 sample units from dry ice testing. The units were placed under bias @ 125°C for 96 hours to determine if these parts suffer from any rebound issues.

Radiation Summary report contains the detailed TID testing information for lot traceability and radiation details.

¹ TI products are not designed to be radiation hardened or radiation tolerant except when noted.



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Separate from device level testing for ELDRS and Dry Ice, Texas Instruments conducted additional evaluation at the component level using single transistors. A correlation study was performed on single NPN and NMOS transistors measured pre and post TID, and after cycling on dry-ice for parametric correlation.

4.0 Results

The parametric data for the ADS5463-SP passes up to 200 krad(Si) TID.

Device Level Testing

Device level testing for dry ice revealed no significant variation in any parameter at any test. Parametric data readings were inside both the pre and post irradiation limits.

Rebound test showed all readings inside both the pre and post irradiation limits.

In most cases, the drift through low dose rate (LDR) was less than the drift at high dose rate (HDR). In the few cases where the LDR drift was greater than HDR drift, the drift was insignificant, and all readings were well within the pre-irradiation limits. “If this ratio exceeds 1.5 for any of the most sensitive parameters then the part is to be considered ELDRS sensitive. This test does not apply to parameters which exhibit changes that is within experimental error or whose values are below the pre-irradiation electrical specification limits at low dose rate at the specification dose.” (MIL-STD-883H, TM 1019.8, 3.13.1.1).

Component Level Testing for Correlation

We have correlated the dry ice TID time extension test methodology for our technology. TID correlation testing was performed on NMOS transistors. Transistor characteristics including threshold voltages V_t and leakage currents correlated to dry ice and non dry ice units. It should be pointed out that that there are no active NMOS transistors used in the design of this part. NMOS transistors are used as load resistors with gates connected to drain and are not sensitive to V_t shifts or leakage.

Dry ice correlation testing was performed at 100 krad(Si) TID.

Component level testing on unbiased NPN/PNP units completed LDR at 100 krad(Si) showing no significant drift.

Parameters in the SMD have been modified to represent the device performance up to 200 krad(Si). Reference SMD 5962R07208.



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Radiation Summary Report

Device Information:

Device: ADS5463-SP
Wafer Lot Number: 1065118
Wafer Number: 4,5,6

Manufacturer: Texas Instruments, Inc

Controlling Specification: 5962R0720802VXC

Bias Circuit: 6488453

Radiation Source: Radiation Assured Devices (RAD) in its Colorado Springs, CO facility using Co-60 gamma ray source

Dose Rate: 50Rads(Si)/sec (+/-10%)

Package Type: 84pin HFG

Disposition: Passes Up To 200Krad

Summary:

Passes Room Temp @:

- TID: Pre-Rad, Post 100Krad, Post 150Krad, Post 200Krad
- Dry Ice Test (device and component level) at 100Krad
- Rebound test post bias 125C/96hrs
- HDR (50rad/sec) and LDR (10mrads/sec) both biased and unbiased at 100 Krad(Si)

Prepared By: Mohammad Karim

Date: 12-01-2011

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Date: 12-01-2011

Approved By QA: Nancy Shindler

Date: 12-01-2011