

Radiation Report

DAC39RFx10-SP Total Ionizing Dose (TID) Radiation Report



ABSTRACT

This report covers the radiation characterization results of the DAC39RF10-SP Radiation 16-Bit Multi-Nyquist Digital-to-Analog Converter (DAC). The study was done to determine Total Ionizing Dose (TID) effects under high dose rate (HDR) up to 450 krad(Si) as a one time characterization. The results show that all samples passed within the specified limits up to 450 krad(Si).

To ensure the following results, the Radiation Lot Acceptance Testing (RLAT) was performed using 5 units at a dose level of 300 krad(Si).

Additionally, the DAC39RF10-SP is Single Event Latch-Up (SEL) immune up to 120MeV-cm²/mg.

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1 Device Information

The DAC39RF10-SP is a digital-to-analog converters (DAC) with 16-bit resolution. The device can be used as noninterpolating or interpolating DACs for either direct RF sampling or complex baseband signal generation. The maximum input data rate is 20.48GSPS for a single channel or 10.24GSPS for two channels. The device can generate signals of up to 10, 7.5, and 5GHz signal bandwidth (8, 12, and 16-bit input resolution) at carrier frequencies exceeding 8GHz enabling direct sampling through C-band and into X-band.

1.1 Device Details

[Table 1-1](#) lists the device information used for TID HDR characterization and qualification.

Table 1-1. Device and Exposure Details

TID HDR Details	
TI Device Number	DAC39RF10-SP
Package	256-pin FC-BGA
Technology	TSMC C014.P
Die Lot Number	4051260
A/T Lot Number / Lot Trace Code	5304650 / 53ZCCH9
Quantity Tested	35 irradiated devices + 2 control
Lot Accept/Reject	Devices passed 3 krad(Si), 10 krad(Si), 30 krad(Si), 50 krad(Si), 100 krad(Si), 300 krad(Si), 450 krad(Si)
HDR Radiation Facility	Texas Instruments CLAB, Dallas, TX
HDR Dose Level	300 krad(Si)
HDR Dose Rate	120 rad(Si)/s
HDR Radiation Source	Gammacell (GR420) Co-60
Irradiation Temperature	Ambient, room temperature

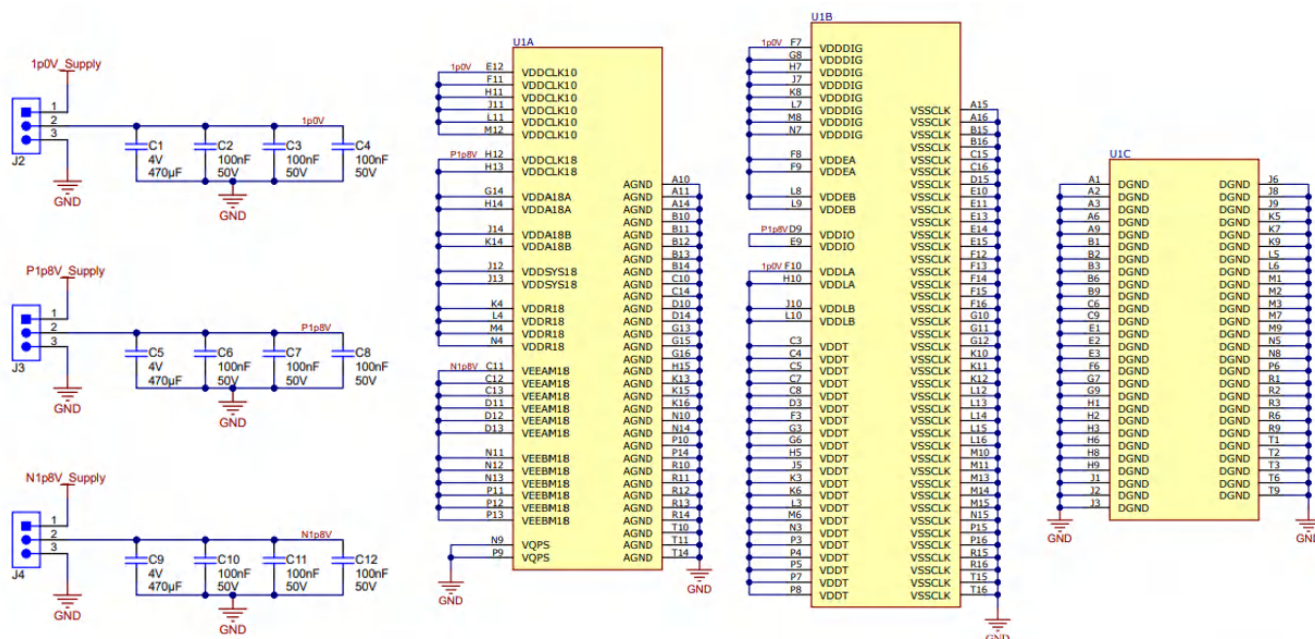


Figure 2-2. DAC39RF10-SP Biasing Diagram Continued

2.4 Exposure Details

Thirty-five (35) units were characterized at the 120 rad(Si)/s dose level with biased voltage conditions.

Table 2-1. Irradiation Information

Dose Rate	120 rad(Si)/s
Total Samples	37 (5 samples per dose level; 2 control)
Exposure Levels	3 krad(Si), 10 krad(Si), 30 krad(Si), 50 krad(Si), 100 krad(Si), 300 krad(Si), 450 krad(Si)
Supply Voltages	1.05V, +1.89V, -1.89V

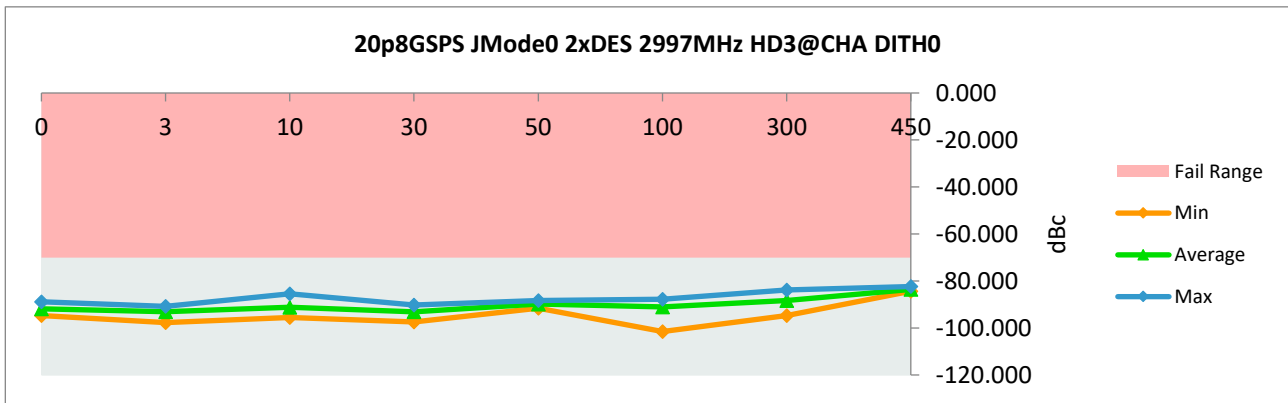
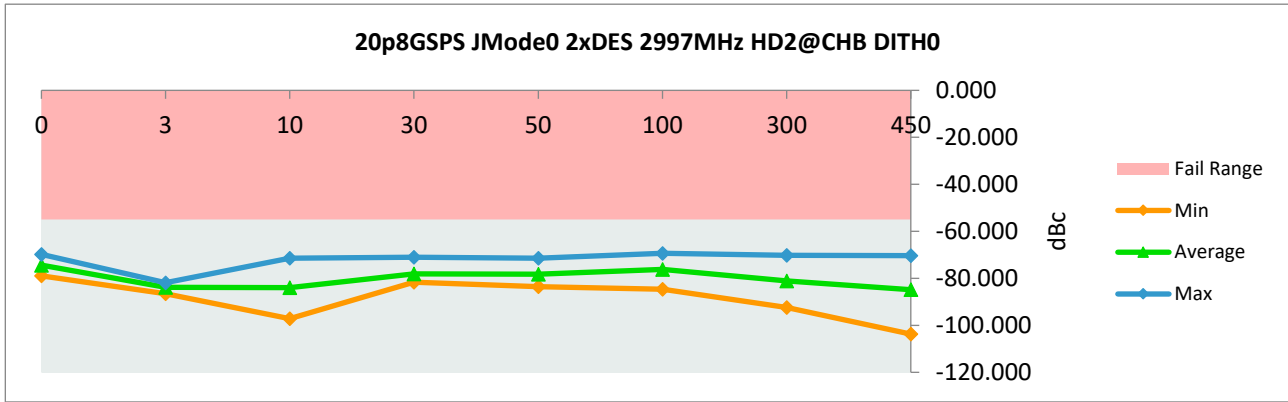
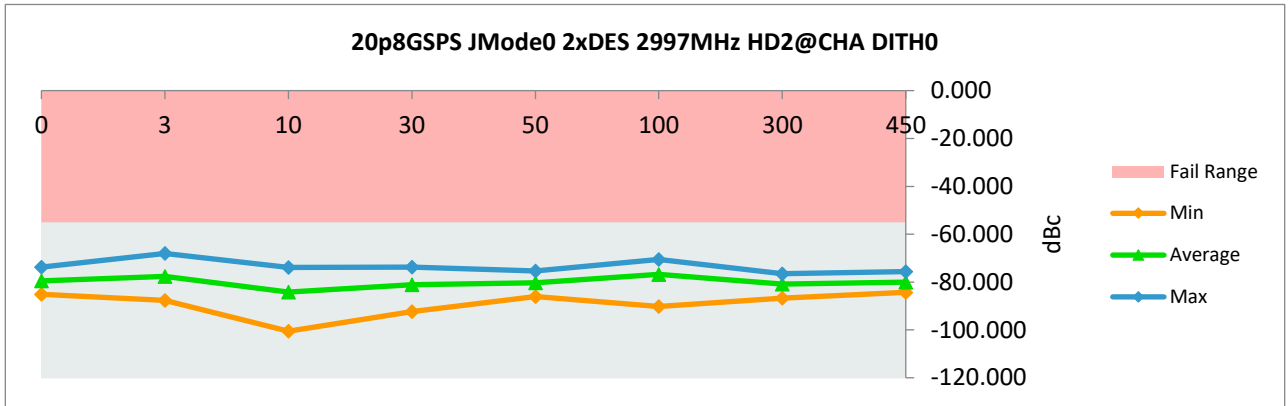
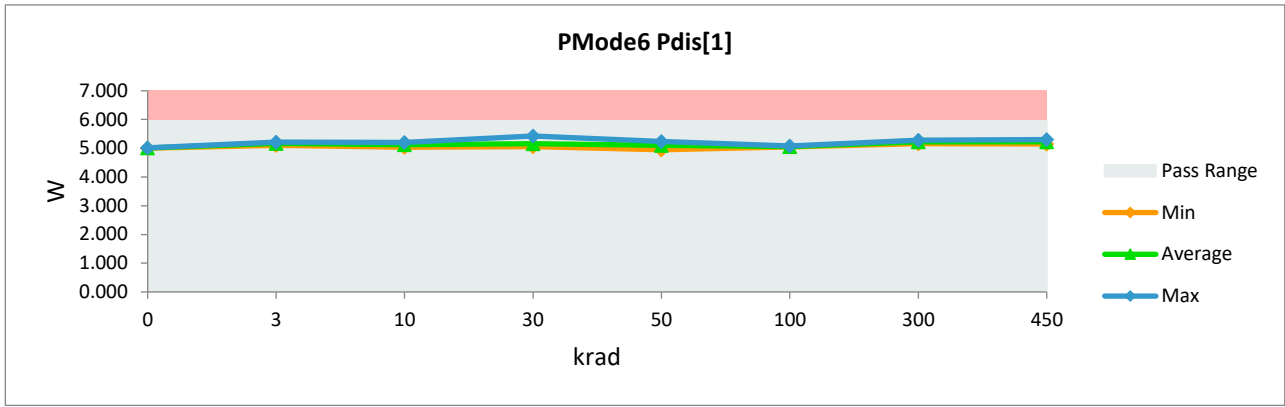
3 TID Characterization Test Results

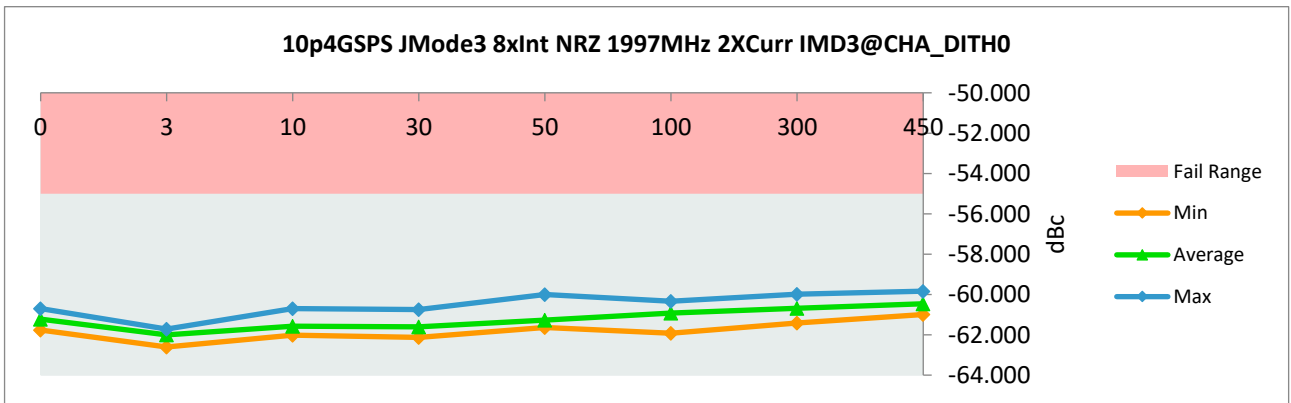
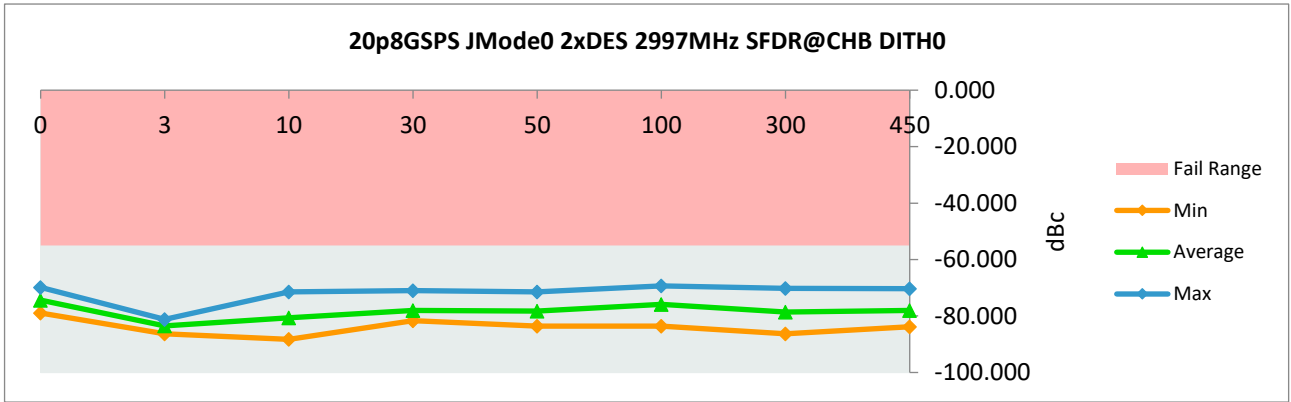
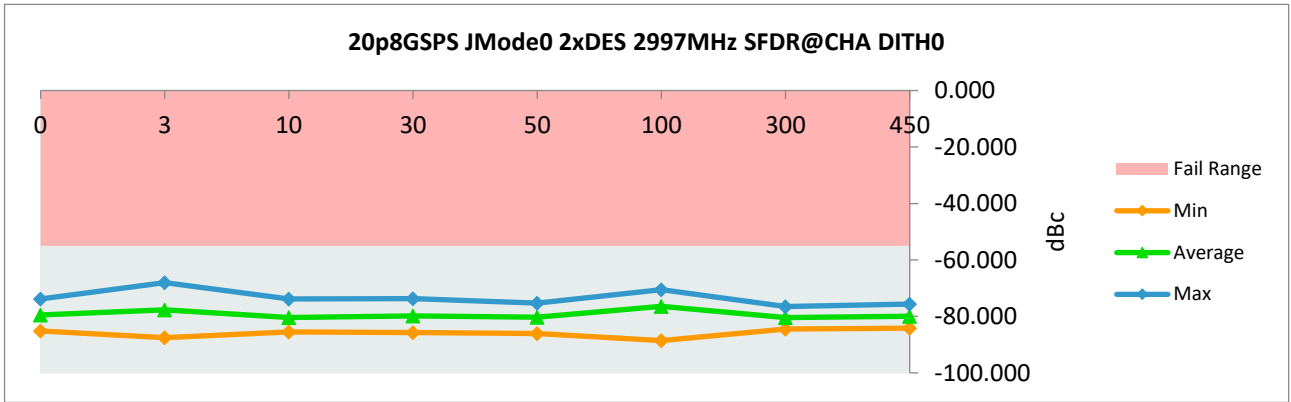
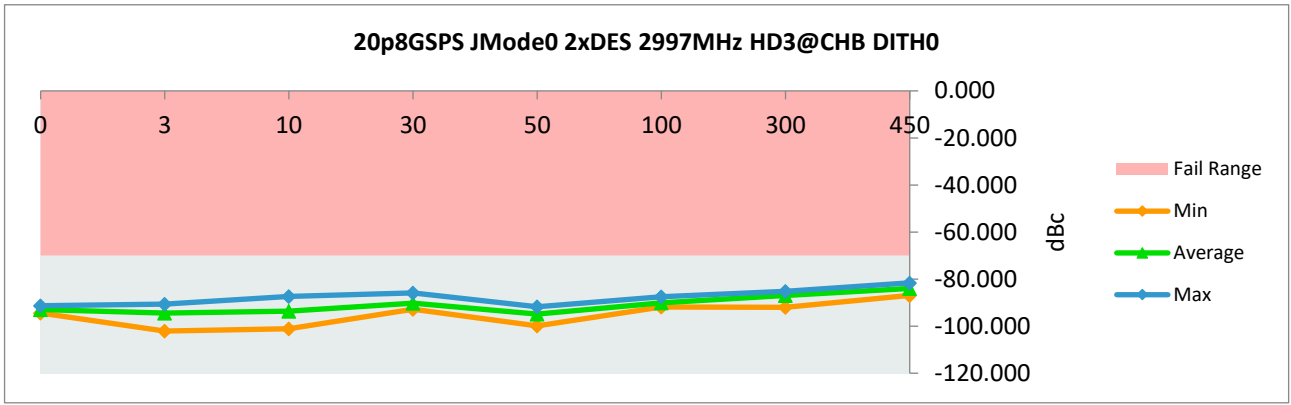
Electrical and parametric test results for all units at every dose level were within data sheet limits.

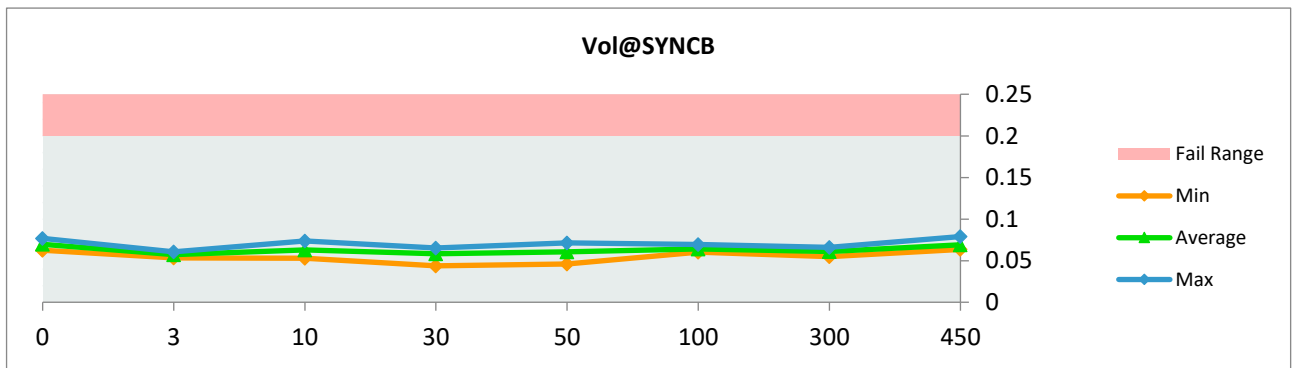
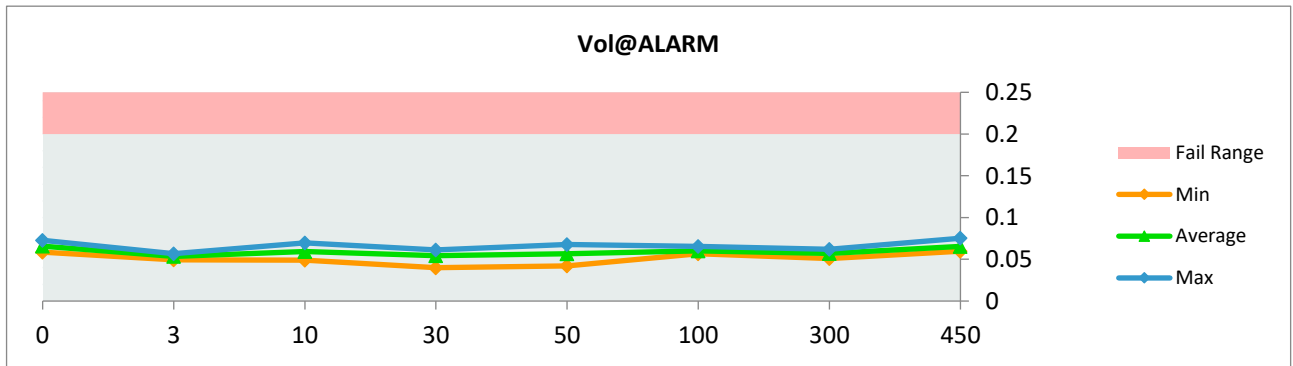
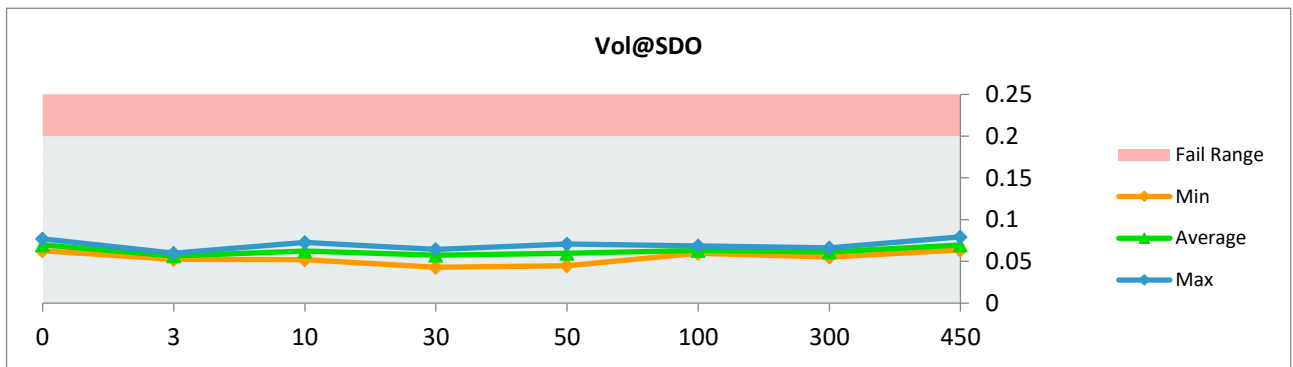
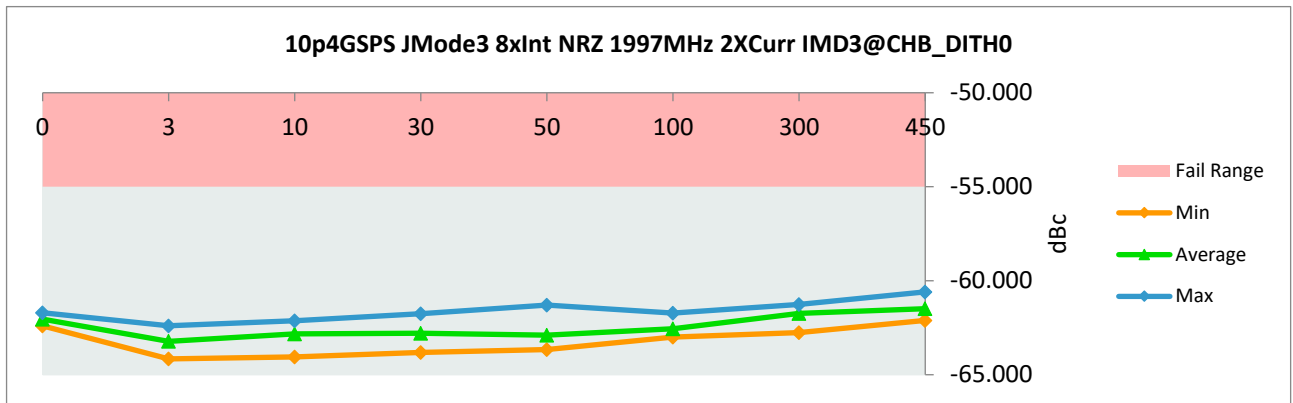
Unit Number	Dose Level, krad(Si)	Result
C1, C2	N/A (control)	PASS
1-5	3	PASS
6-10	10	PASS
11-15	30	PASS
16-20	50	PASS
21-25	100	PASS
26-30	300	PASS
31-35	450	PASS

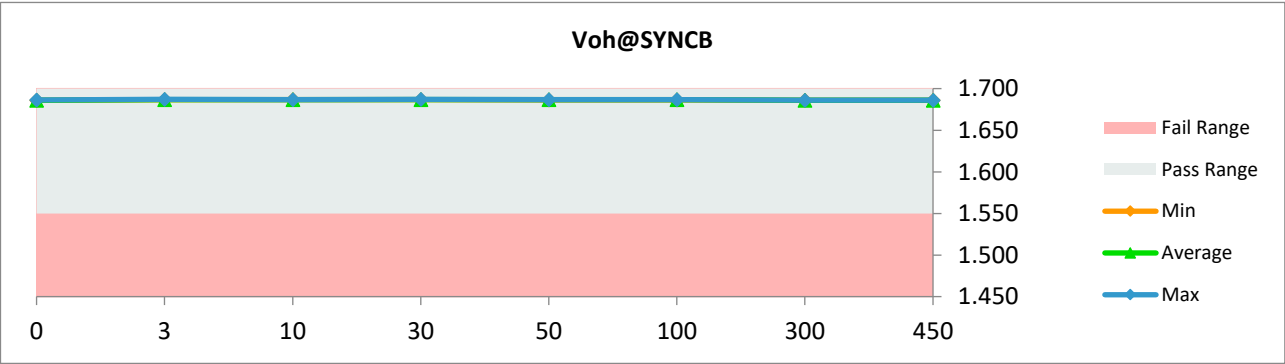
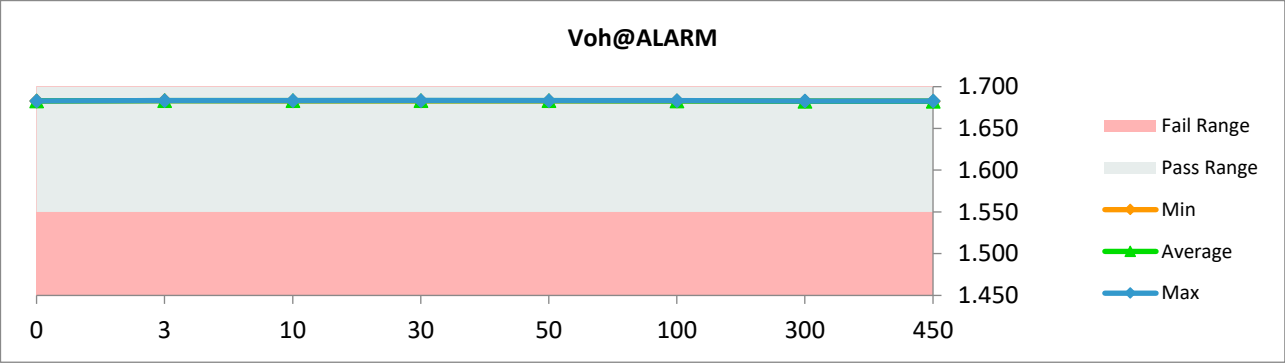
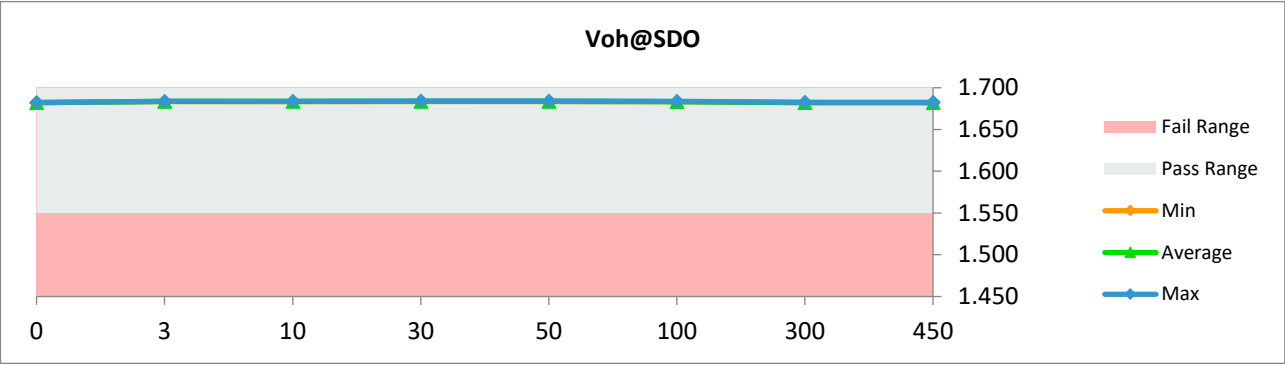
A TID Data Plots

This appendix provides the DAC39RF10-SP TID HDR report data plots. The plots show the variation for each critical parameter up to 450krad(Si).









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