Post Office Box 84
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(903) 868-7111
www.ti.com

Total Ionizing Dose (TID)

TL1431-RHA
(5962R9962001PA)
Precision Programmable Voltage Reference

Wafer Lot: 2269933 – Wafers 1, 3, 4

Date: March 21, 2013
Approved by:
Nancy Shindler
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Sherman, TX 75090
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1.0 Summary

Texas Instruments plans to release a radiation hardened assurance (RHA) version of the TL1431-SP, Precision Programmable Voltage Reference. The TL1431-SP passes 100 kRAD (Si) total ionizing dose (TID) radiation for application environments. The results are based on testing performed to 1.5X the assurance level or 150 kRAD(Si) with one interim read point to demonstrate that device performance as a function of total dose exhibits a 1.5X margin over the stated assured radiation level.

2.0 Radiation Source

Total Ionizing Dose Low Dose Rate (TID LDR) radiation testing was performed at the Aeroflex Radiation Assured Devices (RAD) in its Colorado Springs, CO facility using Co-60 gamma ray source with dose rate maintained at 0.1 RAD(Si)/sec and accuracy of +/-10%. Total Ionizing Dose High Dose Rate (TID HDR) radiation testing was performed by the Texas Instruments SVA Group in its Santa Clara, CA facility using Co-60 gamma ray source with dose rate maintained at 100 RAD (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 TL1431-SP J1 Bipolar technology contains only bipolar components therefore an Enhanced Low Dose Rate Sensitive (ELDRS) study was 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, 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.

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

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4.0 Results

The parametric data for the TL1431-SP passes up to 150 kRAD(Si) Low Dose Rate and High Dose Rate TID. Refer to data and plots in the TID Report bookmark.

Sample units passed all specification limits over all radiation dose levels. In the case of VREF (critical parameter), the drift through low dose rate (LDR) was comparable to the drift at high dose rate (HDR). “If this ratio exceeds 1.5 for any of the most sensitive parameters then the part is to be considered LDR 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). VREF delta drift is within experimental error and therefore is not considered as an ELDRS device.

Quadrant-level testing across 3 wafers at 100 kRAD yielded passing results for all test SMD parametrics (see Device-Level Test/Quadrant Testing and TL1431 RHA Test Plan bookmark).

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Radiation Summary Report

Device Information:
Device: TL1431-RHA
Wafer Lot Number: 2269933
Wafer Number: 1, 3, 4

Manufacturer: Texas Instruments, Inc

Controlling Specification: 5962R9962001VPA

Bias Circuit: Un-Biased (worse-case)

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

Low Dose Rate: 0.1 RAD (Si)/sec

High Dose Rate Radiation Source: Texas Instruments SVA Group in its Santa Clara, CA facility using Gammacell 220 Excel (GC-220E) Co-60 gamma ray source

High Dose Rate: 100 RAD (Si)/sec (+/-10%)

Package Type: 8-pin JG

Disposition: Passes Up To 150 kRAD

Summary:
Passes Room Temp @:
- TID: Pre-Rad, Post 30 kRAD, 50 kRAD, 100 kRAD, Post 150 kRAD
- HDR (100 RAD/sec) and LDR (0.1 RAD/sec) unbiased at 100 kRAD(Si)

Prepared By: Keith Stephens Date: 03-21-2013
Reviewed By: James Salzman Date: 03-22-2013
Approved By QA: Nancy Shindler Date: 03/22-2013

Stephens, Keith

From: Shindler, Nancy
Sent: Wednesday, March 13, 2013 11:43 AM
To: Stephens, Keith
Subject: FW: TL1431-SP Radiation Characterization and Qualification

FYI...

Best Regards,
Nancy Shindler
Quality Engineering
Medical, HiRel, Defense & Aerospace
mailto: nshindler@ti.com
903-868-6323 (Office)
903-422-1025 (Mobile)
903-868-6410 (Fax)

-----Original Message-----
From: Akbar, Muhammad A DLA CIV LAND AND MARITIME [mailto:Muhammad.Akbar@dla.mil]
Sent: Tuesday, November 13, 2012 9:11 AM
To: Shindler, Nancy
Subject: RE: TL1431-SP Radiation Characterization and Qualification

Hi Nancy,

We have reviewed your submitted draft RHA test plan for TL1431-SP Unitrode bipolar process technology devices which has more electrical parametric drift (worse case) at unbiased conditions than biased condition. Therefore, TI may go ahead for ELDRS characterization/testing at unbiased condition for this technology devices.

With regards.

Muhammad Akbar
Electronics Engineer
MIL-PRF-38535, FSC-5962
Active Device Branch
DLA Land and Maritime
Voice (com):(614) 692-8108
Voice (DSN):850-8108
Fax: (614) 692-6939
VA Web: http://www.dscc.dla.mil/programs/milspec/default.asp

-----Original Message-----
From: Shindler, Nancy [mailto:nshindler@ti.com]
Sent: Friday, October 19, 2012 2:56 PM
To: Akbar, Muhammad A DLA CIV LAND AND MARITIME
Cc: Stephens, Keith; Dahl, Bret
Subject: TL1431-SP Radiation Characterization and Qualification

Hi Akbar,

Attached is the test plan for the TL1431-SP device we plan to release as RHA to 100krad(Si).

Please review the plan and provide your approval email to me as soon as possible.

If you have any questions, please do not hesitate to call. Thank you!

Best Regards,
Nancy Shindler
Quality Engineering
Medical, HiRel, Defense & Aerospace
mailto: nshindler@ti.com <mailto:nshindler@ti.com>
903-868-6323 (Office)
903-422-1025 (Mobile)
903-868-6410 (Fax)

Device: TL1431-SP (5962-9962001VPA)
Technology: JI Bipolar
Wafer FAB: Sherman, TX (SFAB)

Test Plan:

The test plan details the characterization plan for the RHA release of the TL1431-SP device to 100 kRAD (Si) (level R). This plan also includes details on the Group E plan for production material once DLA accepts the product for release as 5962R9962001VPA.

ELDRS Characterization:
Based on previous studies ran on different product within the same technology and based on 3.9.3 of TM1019, it was determined that Unbias is worst case for the device.

Samples were taken across three (3) wafer lot splits for LDR evaluation on TL1431-SP. LDR data is shown in Table I where data was taken at 30K, 50K, 75K and 100K with no failures observed. The values observed are below the pre-irradiation electrical specification limits at low dose rate at the tested dose (reference 3.13.1.1, TM1019).

In order to complete ELDRS characterization, we plan to irradiate additional samples to the same dose levels, including 0.5 and 1.0 times the specification dose and complete electrical characterization at HDR (see Table II.). With this data, we will calculate the radiation induced change in each electrical parameter for each sample set at each radiation level and calculate the ratio to determine if it exceeds 1.5 for any of the most sensitive parameters to determine if the device is ELDRS (reference 3.13.1.1, TM 1019).

Once confirmed that the device is not ELDRS, TI will add a supplementary step to examine wafer to wafer variability by sampling die at 100 kRAD (Si) (R level with does rate between 50 and 300 RAD(Si)/s) across three (3) wafers and sampling die in 5 quadrants on each wafer (top, bottom, left, right and center). Reference Table III. The total number of samples to be taken will meet the requirements as specified in MIL-PRF-38535 to classify the wafer lot as RHA to level R. Subsequent wafer lots will be covered by Group E by sampling 22 die per wafer lot.

Table I. TL1431 LDR Study

TL1431 Material	Current Baseline	Wafer lot 2	Wafer lot split 3
Die Lot	3065705SHE	1286502SHE	1286502SHE
Assy Lot	0003437MMT	1025631MMT	1025632MMT
Test Result: Sample Size / Bias Condition / Pass or Fail (Test Program XPM16107)			
30 kRAD	3 / Unbias / Pass	3 / Unbias / Pass	3 / Unbias / Pass
50 kRAD	3 / Unbias / Pass	3 / Unbias / Pass	3 / Unbias / Pass
75 kRAD	3 / Unbias / Pass	3 / Unbias / Pass	3 / Unbias / Pass
100 kRAD	3 / Unbias / Pass	3 / Unbias / Pass	3 / Unbias / Pass

Table II. TL1431 HDR Study Proposal

TL1431 Material	Current Baseline
Die Lot	2269933SHE
Assy Lot	TBD
HDR Test: Sample Size / Bias Condition	
3 kRAD	5 / Unbias
10 kRAD	5 / Unbias
30 kRAD	5 / Unbias
50 kRAD	5 / Unbias
100 kRAD	5 / Unbias
150 kRAD	5 / Unbias

Table III. Quadrant Test Sampling Plan (Group E Coverage)

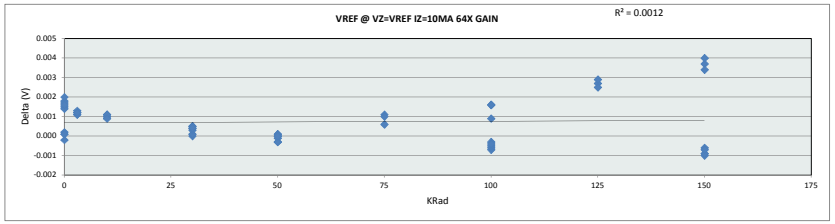
	Each Wafer (Across 3 Wafers)	Test Condition	Total Die Tested
Quadrant Sampling and RLAT (Group E)	5 quadrants, min 2 samples per quad; 1 correlation unit	Test at RHA level: 100 kRAD (Si) Dose rate: Between 50 and 300 RAD(Si)/s Worst Case: Unbias	31 die to complete testing at 100 kRAD (Si) to exceed wafer lot sample size requirement per MIL-PRF-38535, TABLE B-I. Group E (RHA) TCI, Class V, Subgroup 2. Wafer lot will be qualified as RHA.

TID Report
Device Name TL1431-SP

	VREF @ VZ=VREF IZ=10MA 64X G	
Test Site	TI Dallas - CLAB	TI Dallas - CLAB
Tester	LTX TS88	LTX TS88
Test Number	XPM16107	XPM16107
Unit	V	V
Max Limit	2.523	2.523
Min Limit	2.476	2.476

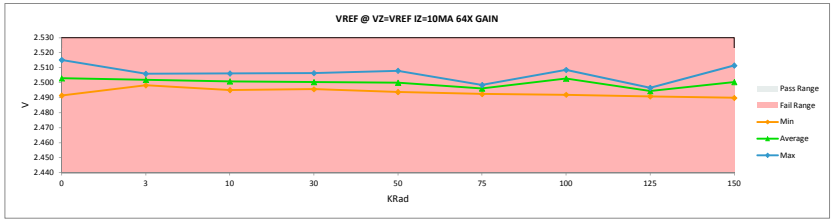
kRAD	Serial #	PRE LDR HDR	POST LDR HDR	Delta
0	LDR_B-372	2.498	2.498	0.000
0	LDR_B-384	2.493	2.493	0.000
0	LDR_B-452	2.492	2.491	0.000
0	LDR_B-334	2.495	2.495	0.000
0	HDR_W3T015C	2.507	2.505	0.002
0	HDR_W3T016C	2.505	2.504	0.002
0	HDR_W1Q015C	2.510	2.508	0.002
0	HDR_W4Q010C	2.508	2.506	0.002
0	HDR_W3Q011C	2.515	2.514	0.001
0	HDR_W1Q016C	2.517	2.515	0.002
3	HDR_W1T001	2.500	2.498	0.001
3	HDR_W3T001	2.505	2.504	0.001
3	HDR_W3T002	2.507	2.506	0.001
3	HDR_W4T002	2.502	2.501	0.001
3	HDR_W4T003	2.502	2.501	0.001
10	HDR_W1T003	2.504	2.503	0.001
10	HDR_W1T005	2.496	2.495	0.001
10	HDR_W3T003	2.505	2.504	0.001
10	HDR_W4T004	2.498	2.497	0.001
10	HDR_W4T005	2.507	2.506	0.001
30	LDR_B-336	2.500	2.500	0.000
30	LDR_B-349	2.497	2.497	0.000
30	LDR_B-352	2.499	2.499	0.000
30	HDR_W1T006	2.496	2.496	0.001
30	HDR_W1T007	2.501	2.501	0.000
30	HDR_W3T006	2.507	2.506	0.000
30	HDR_W3T010	2.503	2.503	0.001
30	HDR_W4T006	2.501	2.501	0.000
50	LDR_B-373	2.494	2.494	0.000
50	LDR_B-377	2.495	2.495	0.000
50	LDR_B-379	2.497	2.498	0.000
50	HDR_W1T008	2.508	2.508	0.000
50	HDR_W1T009	2.500	2.500	0.000
50	HDR_W3T011	2.502	2.502	0.000
50	HDR_W4T007	2.507	2.507	0.000
50	HDR_W4T009	2.496	2.496	0.000
75	LDR_B-385	2.494	2.493	0.001
75	LDR_B-386	2.499	2.498	0.001
75	LDR_B-448	2.499	2.499	0.001
100	LDR_B1-385	2.494	2.492	0.002
100	LDR_B1-386	2.499	2.497	0.002
100	LDR_B1-448	2.499	2.498	0.001
100	HDR_W1T010	2.507	2.507	0.000
100	HDR_W3T012	2.506	2.506	-0.001
100	HDR_W3T013	2.506	2.507	-0.001
100	HDR_W4T011	2.508	2.509	0.000
100	HDR_W4T013	2.506	2.506	0.000
125	LDR_B2-385	2.494	2.491	0.003
125	LDR_B2-386	2.499	2.496	0.003
125	LDR_B2-448	2.499	2.497	0.003
150	LDR_B3-385	2.494	2.490	0.004
150	LDR_B3-386	2.499	2.495	0.004
150	LDR_B3-448	2.499	2.496	0.003
150	HDR_W1T011	2.504	2.505	-0.001
150	HDR_W1T015	2.502	2.503	-0.001
150	HDR_W3T014	2.506	2.506	-0.001
150	HDR_W4T014	2.511	2.511	-0.001
150	HDR_W4T015	2.498	2.499	-0.001
	Max	2.517	2.515	0.004
	Average	2.502	2.501	0.001
	Min	2.492	2.490	-0.001
	Std Dev	0.006	0.006	0.001

LDR and HDR Delta Median and Delta Ratio	
0 kRAD LDR Delta Median	0.0001
0 kRAD HDR Delta Median	0.0017
0 kRAD LDR to HDR Delta Median Ratio	0.0606
30 kRAD LDR Delta Median	0.0001
30 kRAD HDR Delta Median	0.0004
30 kRAD LDR to HDR Delta Median Ratio	0.2499
50 kRAD LDR Delta Median	0.0000
50 kRAD HDR Delta Median	0.0000
50 kRAD LDR to HDR Delta Median Ratio	0.0001
100 kRAD LDR Delta Median	0.0016
100 kRAD HDR Delta Median	-0.0005
100 kRAD LDR to HDR Delta Median Ratio	-3.1998
150 kRAD LDR Delta Median	0.0037
150 kRAD HDR Delta Median	-0.0009
150 kRAD LDR to HDR Delta Median Ratio	-4.1118



	VREF @ VZ=VREF IZ=10MA 64X	
Test Site	TI Dallas - CLAB	TI Dallas - CLAB
Tester	LTX TS88	LTX TS88
Test Number	XPM16107	XPM16107
Max Limit	2.523	V
Min Limit	2.476	V

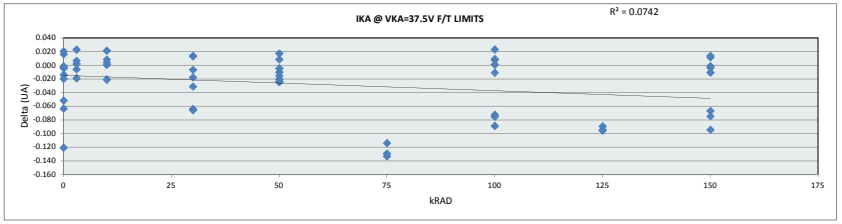
kRAD	0	3	10	30	50	75	100	125	150
LL	2.476	2.476	2.476	2.476	2.476	2.476	2.476	2.476	2.476
Min	2.492	2.498	2.495	2.496	2.494	2.493	2.492	2.491	2.490
Average	2.503	2.502	2.501	2.500	2.500	2.496	2.503	2.494	2.501
Max	2.515	2.506	2.506	2.506	2.508	2.499	2.509	2.497	2.512
UL	2.523	2.523	2.523	2.523	2.523	2.523	2.523	2.523	2.523



TID Report
Device Name TL1431-SP

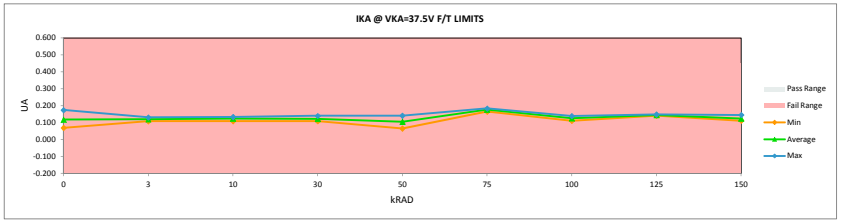
	IKA @ VKA=37.5V F/T LIMITS	
Test Site	TI Dallas - CLAB	TI Dallas - CLAB
Tester	LTX TS88	LTX TS88
Test Number	XPM16107	XPM16107
Unit	UA	UA
Max Limit	0.45	0.45
Min Limit	-0.1	-0.1

kRAD	Serial #	PRE LDR HDR	POST LDR HDR	Delta
0	LDR_B-372	0.054	0.117	-0.063
0	LDR_B-384	0.055	0.069	-0.014
0	LDR_B-452	0.054	0.174	-0.121
0	LDR_B-334	0.054	0.106	-0.052
0	HDR_W3T015C	0.132	0.116	0.016
0	HDR_W3T016C	0.119	0.122	-0.003
0	HDR_W1Q015C	0.104	0.123	-0.020
0	HDR_W4Q010C	0.132	0.111	0.021
0	HDR_W3Q011C	0.116	0.120	-0.004
0	HDR_W1Q016C	0.114	0.116	-0.001
3	HDR_W1T001	0.137	0.114	0.023
3	HDR_W3T001	0.117	0.123	-0.006
3	HDR_W3T002	0.110	0.108	0.002
3	HDR_W4T002	0.128	0.122	0.007
3	HDR_W4T003	0.112	0.131	-0.019
10	HDR_W1T003	0.134	0.134	0.001
10	HDR_W1T005	0.130	0.109	0.021
10	HDR_W3T003	0.108	0.128	-0.021
10	HDR_W4T004	0.128	0.124	0.004
10	HDR_W4T005	0.133	0.124	0.008
30	LDR_B-336	0.044	0.108	-0.065
30	LDR_B-349	0.053	0.119	-0.066
30	LDR_B-352	0.048	0.112	-0.064
30	HDR_W1T006	0.136	0.122	0.014
30	HDR_W1T007	0.119	0.137	-0.017
30	HDR_W3T006	0.109	0.140	-0.031
30	HDR_W3T010	0.131	0.118	0.013
30	HDR_W4T006	0.119	0.125	-0.006
50	LDR_B-373	0.049	0.065	-0.015
50	LDR_B-377	0.047	0.067	-0.020
50	LDR_B-379	0.044	0.068	-0.024
50	HDR_W1T008	0.131	0.141	-0.010
50	HDR_W1T009	0.117	0.141	-0.024
50	HDR_W3T011	0.130	0.134	-0.005
50	HDR_W4T007	0.120	0.112	0.009
50	HDR_W4T009	0.132	0.114	0.017
75	LDR_B-385	0.054	0.183	-0.129
75	LDR_B-386	0.050	0.184	-0.133
75	LDR_B-448	0.051	0.165	-0.114
100	LDR_B1-385	0.054	0.126	-0.072
100	LDR_B1-386	0.050	0.139	-0.089
100	LDR_B1-448	0.051	0.126	-0.075
100	HDR_W1T010	0.133	0.125	0.008
100	HDR_W3T012	0.117	0.127	-0.011
100	HDR_W3T013	0.120	0.111	0.009
100	HDR_W4T011	0.136	0.112	0.023
100	HDR_W4T013	0.136	0.134	0.001
125	LDR_B2-385	0.054	0.149	-0.095
125	LDR_B2-386	0.050	0.146	-0.096
125	LDR_B2-448	0.051	0.140	-0.089
150	LDR_B3-385	0.054	0.121	-0.067
150	LDR_B3-386	0.050	0.125	-0.075
150	LDR_B3-448	0.051	0.146	-0.094
150	HDR_W1T011	0.124	0.112	0.012
150	HDR_W1T015	0.113	0.114	-0.001
150	HDR_W3T014	0.131	0.142	-0.011
150	HDR_W4T014	0.142	0.128	0.014
150	HDR_W4T015	0.108	0.111	-0.004
	Max	0.142	0.184	0.023
	Average	0.096	0.124	-0.028
	Min	0.044	0.065	-0.133
	Std Dev	0.037	0.023	0.044



	IKA @ VKA=37.5V F/T LIMITS	
Test Site	TI Dallas - CLAB	TI Dallas - CLAB
Tester	LTX TS88	LTX TS88
Test Number	XPM16107	XPM16107
Max Limit	0.45	UA
Min Limit	-0.1	UA

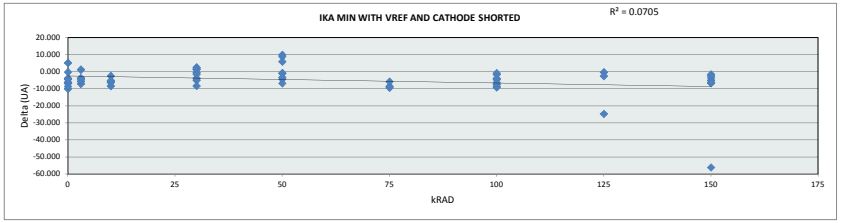
kRAD	0	3	10	30	50	75	100	125	150
LL	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100
Min	0.069	0.108	0.109	0.108	0.065	0.165	0.111	0.140	0.111
Average	0.117	0.120	0.124	0.123	0.105	0.177	0.125	0.145	0.125
Max	0.174	0.131	0.134	0.140	0.141	0.184	0.139	0.149	0.146
UL	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450



TID Report
Device Name TL1431-SP

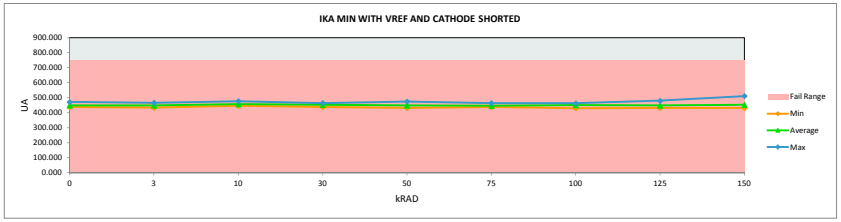
	IKA MIN WITH VREF AND CATHOD	
Test Site	TI Dallas - CLAB	TI Dallas - CLAB
Tester	LTX TS88	LTX TS88
Test Number	XPM16107	XPM16107
Unit	UA	UA
Max Limit	750	750
Min Limit		

kRAD	Serial #	PRE LDR HDR	POST LDR HDR	Delta
0	LDR_B-372	438.126	438.352	-0.226
0	LDR_B-384	450.884	445.703	5.181
0	LDR_B-452	464.361	471.249	-6.888
0	LDR_B-334	436.518	440.335	-3.817
0	HDR_W3T015C	448.085	458.116	-10.031
0	HDR_W3T016C	433.772	440.208	-6.436
0	HDR_W1Q015C	441.596	447.994	-6.398
0	HDR_W4Q010C	447.322	455.975	-8.653
0	HDR_W3Q011C	442.435	448.642	-6.207
0	HDR_W1Q016C	447.317	451.818	-4.501
3	HDR_W1T001	443.999	451.055	-7.056
3	HDR_W3T001	443.999	442.802	1.197
3	HDR_W3T002	429.299	433.033	-3.733
3	HDR_W4T002	460.419	466.016	-5.597
3	HDR_W4T003	447.665	452.009	-4.344
10	HDR_W1T003	439.689	445.820	-6.131
10	HDR_W1T005	468.391	476.787	-8.396
10	HDR_W3T003	452.557	455.022	-2.464
10	HDR_W4T004	446.140	452.314	-6.174
10	HDR_W4T005	452.700	457.849	-5.149
30	LDR_B-336	456.421	454.999	1.423
30	LDR_B-349	439.652	437.126	2.526
30	LDR_B-352	447.293	445.686	1.606
30	HDR_W1T006	459.504	464.491	-4.987
30	HDR_W1T007	463.089	463.532	-0.443
30	HDR_W3T006	437.891	439.331	-1.440
30	HDR_W3T010	454.350	462.660	-8.310
30	HDR_W4T006	451.490	455.365	-3.875
50	LDR_B-373	449.429	439.596	9.833
50	LDR_B-377	447.020	438.221	8.798
50	LDR_B-379	443.320	437.424	5.896
50	HDR_W1T008	430.830	431.774	-0.944
50	HDR_W1T009	446.864	447.689	-0.824
50	HDR_W3T011	469.197	473.540	-4.343
50	HDR_W4T007	442.587	445.934	-3.347
50	HDR_W4T009	467.786	474.570	-6.784
75	LDR_B-385	455.277	463.839	-8.562
75	LDR_B-386	432.361	438.181	-5.821
75	LDR_B-448	429.576	438.944	-9.368
100	LDR_B1-385	455.277	462.825	-7.548
100	LDR_B1-386	432.361	433.961	-1.600
100	LDR_B1-448	429.576	430.370	-0.794
100	HDR_W1T010	448.924	458.154	-9.230
100	HDR_W3T012	456.371	460.977	-4.605
100	HDR_W3T013	454.617	458.535	-3.918
100	HDR_W4T011	447.622	456.438	-8.816
100	HDR_W4T013	438.316	444.823	-6.507
125	LDR_B2-385	455.277	479.962	-24.685
125	LDR_B2-386	432.361	432.661	-0.300
125	LDR_B2-448	429.576	432.127	-2.550
150	LDR_B3-385	455.277	511.355	-56.078
150	LDR_B3-386	432.361	437.286	-4.925
150	LDR_B3-448	429.576	431.091	-1.515
150	HDR_W1T011	437.439	444.213	-6.774
150	HDR_W1T015	460.457	464.033	-3.575
150	HDR_W3T014	435.145	441.543	-6.398
150	HDR_W4T014	441.977	448.299	-6.322
150	HDR_W4T015	452.095	454.488	-2.393
	Max	469.197	511.355	9.833
	Average	446.273	451.158	-4.885
	Min	429.299	430.370	-56.078
	Std Dev	10.893	14.982	8.537



	IKA MIN WITH VREF AND CATH	
Test Site	TI Dallas - CLAB	TI Dallas - CLAB
Tester	LTX TS88	LTX TS88
Test Number	XPM16107	XPM16107
Max Limit	750	UA
Min Limit		UA

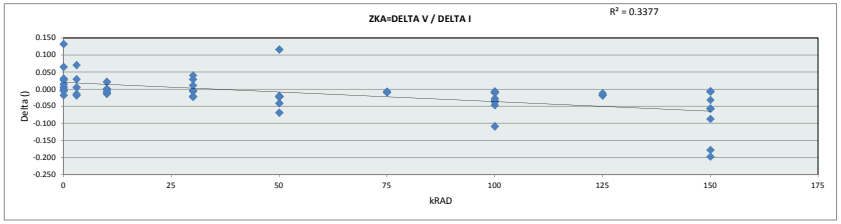
kRAD	0	3	10	30	50	75	100	125	150
LL									
Min	438.352	433.033	445.820	437.126	431.774	438.182	430.370	432.127	431.092
Average	449.839	448.983	457.558	452.899	448.593	446.988	450.760	448.250	454.039
Max	471.249	466.016	476.787	464.491	474.570	463.839	462.825	479.962	511.355
UL	750.000	750.000	750.000	750.000	750.000	750.000	750.000	750.000	750.000



TID Report
Device Name TL1431-SP

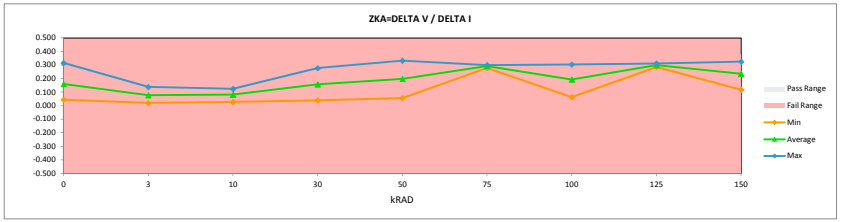
	ZKA=DELTA V / DELTA I	
Test Site	TI Dallas - CLAB	TI Dallas - CLAB
Tester	LTX TS88	LTX TS88
Test Number	XPM16107	XPM16107
Unit		
Max Limit	0.38	0.38
Min Limit	-0.38	-0.38

kRAD	Serial #	PRE LDR HDR	POST LDR HDR	Delta
0	LDR_B-372	0.272	0.272	0.000
0	LDR_B-384	0.298	0.316	-0.017
0	LDR_B-452	0.230	0.235	-0.005
0	LDR_B-334	0.287	0.290	-0.003
0	HDR_W3T015C	0.089	0.058	0.031
0	HDR_W3T016C	0.052	0.045	0.007
0	HDR_W1Q015C	0.283	0.151	0.132
0	HDR_W4Q010C	0.164	0.099	0.065
0	HDR_W3Q011C	0.099	0.072	0.027
0	HDR_W1Q016C	0.073	0.059	0.015
3	HDR_W1T001	0.177	0.106	0.071
3	HDR_W3T001	0.025	0.020	0.006
3	HDR_W3T002	0.076	0.046	0.030
3	HDR_W4T002	0.120	0.138	-0.018
3	HDR_W4T003	0.062	0.076	-0.014
10	HDR_W1T003	0.115	0.117	-0.002
10	HDR_W1T005	0.099	0.077	0.022
10	HDR_W3T003	0.053	0.066	-0.013
10	HDR_W4T004	0.019	0.028	-0.008
10	HDR_W4T005	0.126	0.124	0.001
30	LDR_B-336	0.273	0.278	-0.005
30	LDR_B-349	0.228	0.234	-0.006
30	LDR_B-352	0.227	0.232	-0.004
30	HDR_W1T006	0.157	0.117	0.041
30	HDR_W1T007	0.113	0.136	-0.022
30	HDR_W3T006	0.019	0.040	-0.021
30	HDR_W3T010	0.102	0.091	0.012
30	HDR_W4T006	0.165	0.136	0.029
50	LDR_B-373	0.271	0.292	-0.021
50	LDR_B-377	0.233	0.255	-0.022
50	LDR_B-379	0.269	0.291	-0.022
50	HDR_W1T008	0.292	0.333	-0.041
50	HDR_W1T009	0.086	0.106	-0.020
50	HDR_W3T011	0.046	0.115	-0.068
50	HDR_W4T007	0.036	0.057	-0.021
50	HDR_W4T009	0.246	0.130	0.116
75	LDR_B-385	0.294	0.301	-0.007
75	LDR_B-386	0.270	0.278	-0.008
75	LDR_B-448	0.289	0.298	-0.009
100	LDR_B1-385	0.294	0.304	-0.010
100	LDR_B1-386	0.270	0.276	-0.007
100	LDR_B1-448	0.289	0.298	-0.009
100	HDR_W1T010	0.069	0.096	-0.027
100	HDR_W3T012	0.046	0.093	-0.047
100	HDR_W3T013	0.092	0.130	-0.038
100	HDR_W4T011	0.179	0.287	-0.109
100	HDR_W4T013	0.030	0.063	-0.033
125	LDR_B2-385	0.294	0.312	-0.018
125	LDR_B2-386	0.270	0.287	-0.017
125	LDR_B2-448	0.289	0.300	-0.012
150	LDR_B3-385	0.294	0.326	-0.031
150	LDR_B3-386	0.270	0.275	-0.005
150	LDR_B3-448	0.289	0.296	-0.007
150	HDR_W1T011	0.108	0.305	-0.198
150	HDR_W1T015	0.091	0.147	-0.056
150	HDR_W3T014	0.061	0.118	-0.058
150	HDR_W4T014	0.107	0.285	-0.178
150	HDR_W4T015	0.055	0.142	-0.087
	Max	0.298	0.333	0.132
	Average	0.168	0.180	-0.012
	Min	0.019	0.020	-0.198
	Std Dev	0.099	0.102	0.052



	ZKA=DELTA V / DELTA I	
Test Site	TI Dallas - CLAB	TI Dallas - CLAB
Tester	LTX TS88	LTX TS88
Test Number	XPM16107	XPM16107
Max Limit	0.38	
Min Limit	-0.38	

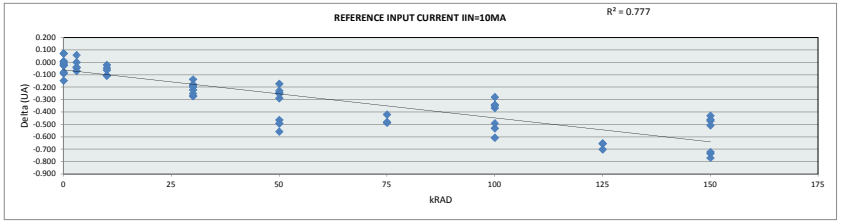
kRAD	0	3	10	30	50	75	100	125	150
LL	-0.380	-0.380	-0.380	-0.380	-0.380	-0.380	-0.380	-0.380	-0.380
Min	0.045	0.020	0.028	0.040	0.057	0.278	0.063	0.287	0.118
Average	0.160	0.077	0.082	0.158	0.197	0.292	0.193	0.300	0.237
Max	0.316	0.138	0.124	0.278	0.333	0.301	0.304	0.312	0.326
UL	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380



TID Report
Device Name TL1431-SP

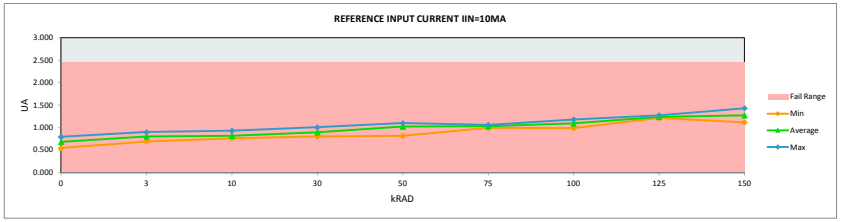
	REFERENCE INPUT CURRENT IIN=	
Test Site	TI Dallas - CLAB	TI Dallas - CLAB
Tester	LTX TS88	LTX TS88
Test Number	XPM16107	XPM16107
Unit	UA	UA
Max Limit	2.45	2.45
Min Limit		

kRAD	Serial #	PRE LDR HDR	POST LDR HDR	Delta
0	LDR_B-372	0.564	0.575	-0.012
0	LDR_B-384	0.587	0.734	-0.147
0	LDR_B-452	0.539	0.628	-0.089
0	LDR_B-334	0.522	0.548	-0.026
0	HDR_W3T015C	0.765	0.693	0.072
0	HDR_W3T016C	0.780	0.769	0.011
0	HDR_W1Q015C	0.673	0.752	-0.079
0	HDR_W4Q010C	0.725	0.653	0.072
0	HDR_W3Q011C	0.776	0.798	-0.022
0	HDR_W1Q016C	0.705	0.702	0.003
3	HDR_W1T001	0.843	0.785	0.059
3	HDR_W3T001	0.770	0.813	-0.043
3	HDR_W3T002	0.833	0.903	-0.070
3	HDR_W4T002	0.696	0.695	0.001
3	HDR_W4T003	0.794	0.832	-0.039
10	HDR_W1T003	0.828	0.933	-0.106
10	HDR_W1T005	0.753	0.773	-0.021
10	HDR_W3T003	0.750	0.855	-0.105
10	HDR_W4T004	0.738	0.782	-0.044
10	HDR_W4T005	0.704	0.766	-0.062
30	LDR_B-336	0.554	0.824	-0.270
30	LDR_B-349	0.544	0.817	-0.272
30	LDR_B-352	0.552	0.803	-0.251
30	HDR_W1T006	0.743	0.880	-0.137
30	HDR_W1T007	0.710	0.931	-0.222
30	HDR_W3T006	0.812	1.010	-0.197
30	HDR_W3T010	0.813	0.989	-0.176
30	HDR_W4T006	0.753	0.939	-0.186
50	LDR_B-373	0.580	1.043	-0.464
50	LDR_B-377	0.545	1.102	-0.557
50	LDR_B-379	0.579	1.072	-0.492
50	HDR_W1T008	0.854	1.098	-0.244
50	HDR_W1T009	0.767	1.056	-0.289
50	HDR_W3T011	0.780	1.008	-0.228
50	HDR_W4T007	0.778	1.031	-0.253
50	HDR_W4T009	0.648	0.821	-0.172
75	LDR_B-385	0.575	1.061	-0.486
75	LDR_B-386	0.566	1.046	-0.481
75	LDR_B-448	0.575	0.995	-0.420
100	LDR_B1-385	0.575	1.182	-0.607
100	LDR_B1-386	0.566	1.096	-0.530
100	LDR_B1-448	0.575	1.066	-0.490
100	HDR_W1T010	0.745	1.094	-0.348
100	HDR_W3T012	0.741	1.109	-0.368
100	HDR_W3T013	0.780	1.122	-0.343
100	HDR_W4T011	0.711	0.991	-0.280
100	HDR_W4T013	0.759	1.102	-0.343
125	LDR_B2-385	0.575	1.276	-0.701
125	LDR_B2-386	0.566	1.219	-0.654
125	LDR_B2-448	0.575	1.229	-0.653
150	LDR_B3-385	0.575	1.345	-0.769
150	LDR_B3-386	0.566	1.299	-0.734
150	LDR_B3-448	0.575	1.297	-0.722
150	HDR_W1T011	0.774	1.233	-0.459
150	HDR_W1T015	0.649	1.121	-0.472
150	HDR_W3T014	0.927	1.435	-0.508
150	HDR_W4T014	0.818	1.247	-0.429
150	HDR_W4T015	0.774	1.239	-0.464
	Max	0.927	1.435	0.072
	Average	0.688	0.969	-0.281
	Min	0.522	0.548	-0.769
	Std Dev	0.107	0.211	0.234



	REFERENCE INPUT CURRENT II	
Test Site	TI Dallas - CLAB	TI Dallas - CLAB
Tester	LTX TS88	LTX TS88
Test Number	XPM16107	XPM16107
Max Limit	2.45	UA
Min Limit		UA

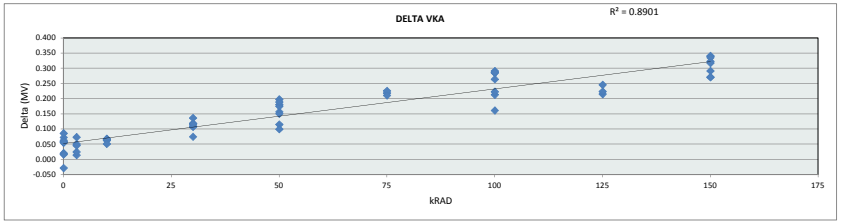
kRAD	0	3	10	30	50	75	100	125	150
LL									
Min	0.548	0.695	0.766	0.803	0.821	0.995	0.991	1.219	1.121
Average	0.685	0.805	0.822	0.899	1.029	1.034	1.095	1.241	1.277
Max	0.798	0.903	0.933	1.010	1.102	1.061	1.182	1.276	1.435
UL	2.450	2.450	2.450	2.450	2.450	2.450	2.450	2.450	2.450



TID Report
Device Name TL1431-SP

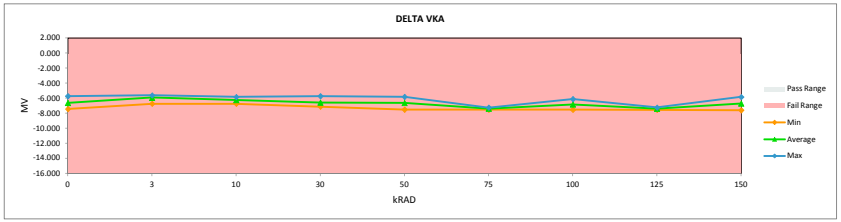
DELTA VKA		
Test Site	TI Dallas - CLAB	TI Dallas - CLAB
Tester	LTX TS88	LTX TS88
Test Number	XPM16107	XPM16107
Unit	MV	MV
Max Limit	-0.1	-0.1
Min Limit	-14	-14

kRAD	Serial #	PRE LDR HDR	POST LDR HDR	Delta
0	LDR_B-372	-7.112	-7.130	0.019
0	LDR_B-384	-7.015	-6.987	-0.028
0	LDR_B-452	-6.944	-6.965	0.021
0	LDR_B-334	-7.418	-7.435	0.016
0	HDR_W3T015C	-6.328	-6.400	0.073
0	HDR_W3T016C	-5.674	-5.729	0.055
0	HDR_W1Q015C	-6.515	-6.573	0.058
0	HDR_W4Q010C	-6.554	-6.640	0.086
0	HDR_W3Q011C	-6.035	-6.098	0.063
0	HDR_W1Q016C	-6.216	-6.275	0.059
3	HDR_W1T001	-5.809	-5.860	0.051
3	HDR_W3T001	-5.605	-5.619	0.015
3	HDR_W3T002	-5.599	-5.624	0.025
3	HDR_W4T002	-6.690	-6.736	0.046
3	HDR_W4T003	-5.707	-5.780	0.073
10	HDR_W1T003	-5.767	-5.834	0.066
10	HDR_W1T005	-6.374	-6.439	0.065
10	HDR_W3T003	-6.238	-6.301	0.063
10	HDR_W4T004	-5.885	-5.953	0.068
10	HDR_W4T005	-6.683	-6.735	0.051
30	LDR_B-336	-6.880	-6.955	0.075
30	LDR_B-349	-6.996	-7.115	0.119
30	LDR_B-352	-7.012	-7.122	0.110
30	HDR_W1T006	-6.542	-6.660	0.118
30	HDR_W1T007	-6.410	-6.517	0.107
30	HDR_W3T006	-5.611	-5.728	0.117
30	HDR_W3T010	-6.043	-6.180	0.137
30	HDR_W4T006	-6.222	-6.340	0.118
50	LDR_B-373	-7.401	-7.516	0.115
50	LDR_B-377	-7.166	-7.323	0.157
50	LDR_B-379	-7.070	-7.169	0.100
50	HDR_W1T008	-5.833	-5.983	0.151
50	HDR_W1T009	-5.724	-5.905	0.181
50	HDR_W3T011	-6.162	-6.360	0.198
50	HDR_W4T007	-5.640	-5.815	0.175
50	HDR_W4T009	-6.872	-7.061	0.189
75	LDR_B-385	-7.028	-7.247	0.219
75	LDR_B-386	-7.307	-7.533	0.226
75	LDR_B-448	-7.128	-7.339	0.211
100	LDR_B1-385	-7.028	-7.241	0.213
100	LDR_B1-386	-7.307	-7.530	0.223
100	LDR_B1-448	-7.128	-7.289	0.161
100	HDR_W1T010	-6.364	-6.656	0.291
100	HDR_W3T012	-6.201	-6.486	0.285
100	HDR_W3T013	-6.043	-6.330	0.287
100	HDR_W4T011	-6.645	-6.932	0.287
100	HDR_W4T013	-5.852	-6.116	0.264
125	LDR_B2-385	-7.028	-7.243	0.215
125	LDR_B2-386	-7.307	-7.553	0.246
125	LDR_B2-448	-7.128	-7.351	0.224
150	LDR_B3-385	-7.028	-7.298	0.271
150	LDR_B3-386	-7.307	-7.599	0.292
150	LDR_B3-448	-7.128	-7.399	0.272
150	HDR_W1T011	-5.807	-6.147	0.340
150	HDR_W1T015	-6.466	-6.789	0.323
150	HDR_W3T014	-5.493	-5.834	0.341
150	HDR_W4T014	-6.135	-6.470	0.335
150	HDR_W4T015	-5.679	-5.996	0.318
	Max	-5.493	-5.619	0.341
	Average	-6.488	-6.642	0.154
	Min	-7.418	-7.599	-0.028
	Std Dev	0.595	0.606	0.102



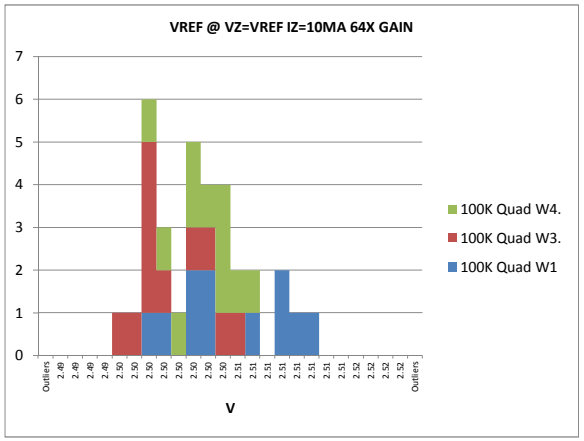
DELTA VKA		
Test Site	TI Dallas - CLAB	TI Dallas - CLAB
Tester	LTX TS88	LTX TS88
Test Number	XPM16107	XPM16107
Max Limit	-0.1	MV
Min Limit	-14	MV

kRAD	0	3	10	30	50	75	100	125	150
LL	-14.000	-14.000	-14.000	-14.000	-14.000	-14.000	-14.000	-14.000	-14.000
Min	-7.435	-6.736	-6.735	-7.122	-7.516	-7.533	-7.530	-7.553	-7.599
Average	-6.623	-5.924	-6.252	-6.577	-6.642	-7.373	-6.823	-7.383	-6.692
Max	-5.729	-5.619	-5.834	-5.728	-5.815	-7.247	-6.116	-7.243	-5.834
UL	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100



VREF @ VZ=VREF IZ=10MA 64X GAIN

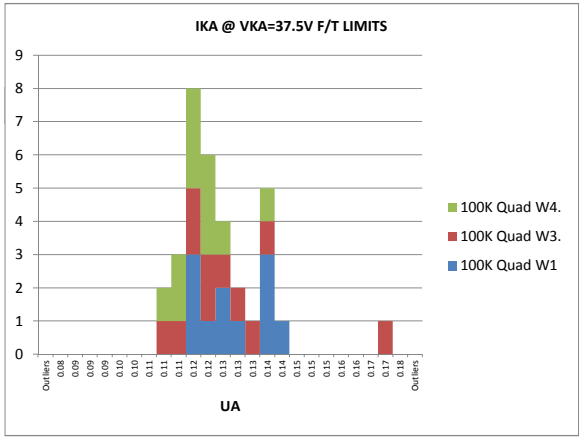
Bin	100K Quad W1	100K Quad W3.	100K Quad W4.
Outliers	0	0	0
2.49	0	0	0
2.49	0	0	0
2.49	0	0	0
2.49	0	0	0
2.50	0	1	0
2.50	0	1	0
2.50	1	4	1
2.50	1	1	1
2.50	0	0	1
2.50	2	1	2
2.50	2	1	1
2.50	0	1	3
2.51	0	1	1
2.51	1	0	1
2.51	0	0	0
2.51	2	0	0
2.51	1	0	0
2.51	1	0	0
2.51	0	0	0
2.51	0	0	0
2.52	0	0	0
2.52	0	0	0
2.52	0	0	0
2.52	0	0	0
Outliers	0	0	0



	Cpk(LL)	LL	Min	Avg	Max	Sigma	UL	Cpk(UL)
100K Quad W1	1.835	2.476	2.497	2.505	2.513	5.25E-03	2.523	2.347
100K Quad W3.	2.472	2.476	2.496	2.500	2.505	3.18E-03	2.523	2.453
100K Quad W4.	3.270	2.476	2.498	2.502	2.507	2.68E-03	2.523	2.574

IKA @ VKA=37.5V F/T LIMITS

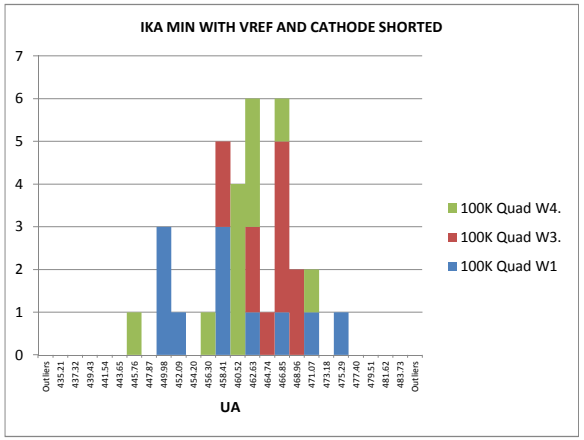
Bin	100K Quad W1	100K Quad W3.	100K Quad W4.
Outliers	0	0	0
0.08	0	0	0
0.09	0	0	0
0.09	0	0	0
0.09	0	0	0
0.10	0	0	0
0.10	0	0	0
0.11	0	0	0
0.11	0	1	1
0.11	0	1	2
0.12	3	2	3
0.12	1	2	3
0.13	2	1	1
0.13	1	1	0
0.13	0	1	0
0.14	3	1	1
0.14	1	0	0
0.15	0	0	0
0.15	0	0	0
0.15	0	0	0
0.16	0	0	0
0.16	0	0	0
0.17	0	0	0
0.17	0	1	0
0.18	0	0	0
Outliers	0	0	0



	Cpk(LL)	LL	Min	Avg	Max	Sigma	UL	Cpk(UL)
100K Quad W1	8.658	-0.1	0.116	0.128	0.141	8.78E-03	0.45	12.213
100K Quad W3.	4.669	-0.1	0.112	0.128	0.171	0.016	0.45	6.576
100K Quad W4.	10.610	-0.1	0.112	0.121	0.137	6.93E-03	0.45	15.829

IKA MIN WITH VREF AND CATHODE SHORTED

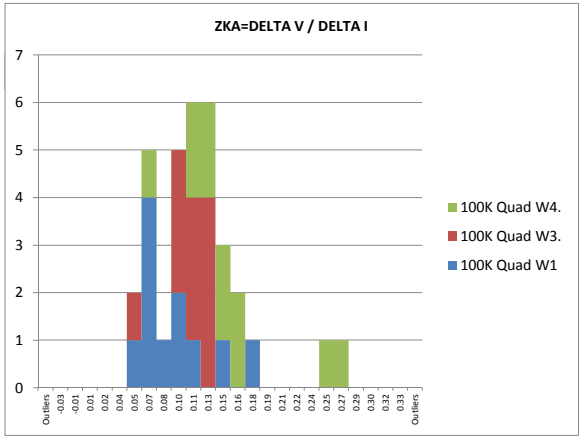
Bin	100K Quad W1	100K Quad W3.	100K Quad W4.
Outliers	0	0	0
435.21	0	0	0
437.32	0	0	0
439.43	0	0	0
441.54	0	0	0
443.65	0	0	0
445.76	0	0	1
447.87	0	0	0
449.98	3	0	0
452.09	1	0	0
454.20	0	0	0
456.30	0	0	1
458.41	3	2	0
460.52	0	0	4
462.63	1	2	3
464.74	0	1	0
466.85	1	4	1
468.96	0	2	0
471.07	1	0	1
473.18	0	0	0
475.29	1	0	0
477.40	0	0	0
479.51	0	0	0
481.62	0	0	0
483.73	0	0	0
Outliers	0	0	0



	Cpk(LL)	LL	Min	Avg	Max	Sigma	UL	Cpk(UL)
100K Quad W1	-	-	450.521	459.469	474.913	8.438	750	11.478
100K Quad W3.	-	-	458.378	464.721	468.724	3.596	750	26.446
100K Quad W4.	-	-	445.090	460.696	471.213	6.404	750	15.058

ZKA=DELTA V / DELTA I

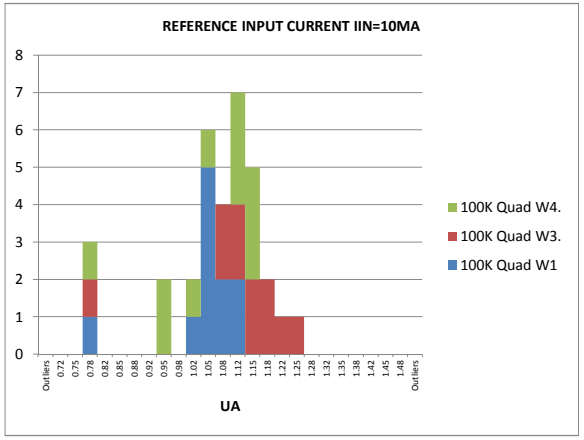
Bin	100K Quad W1	100K Quad W3.	100K Quad W4.
Outliers	0	0	0
-0.03	0	0	0
-0.01	0	0	0
0.01	0	0	0
0.02	0	0	0
0.04	0	0	0
0.05	1	1	0
0.07	4	0	1
0.08	1	0	0
0.10	2	3	0
0.11	1	3	2
0.13	0	4	2
0.15	1	0	2
0.16	0	0	2
0.18	1	0	0
0.19	0	0	0
0.21	0	0	0
0.22	0	0	0
0.24	0	0	0
0.25	0	0	1
0.27	0	0	1
0.29	0	0	0
0.30	0	0	0
0.32	0	0	0
0.33	0	0	0
Outliers	0	0	0



	Cpk(LL)	LL	Min	Avg	Max	Sigma	UL	Cpk(UL)
100K Quad W1	4.080	-0.38	0.057	0.094	0.179	0.039	0.38	2.459
100K Quad W3.	7.262	-0.38	0.055	0.111	0.135	0.023	0.38	3.968
100K Quad W4.	2.854	-0.38	0.064	0.154	0.277	0.062	0.38	1.834

REFERENCE INPUT CURRENT IIN=10MA

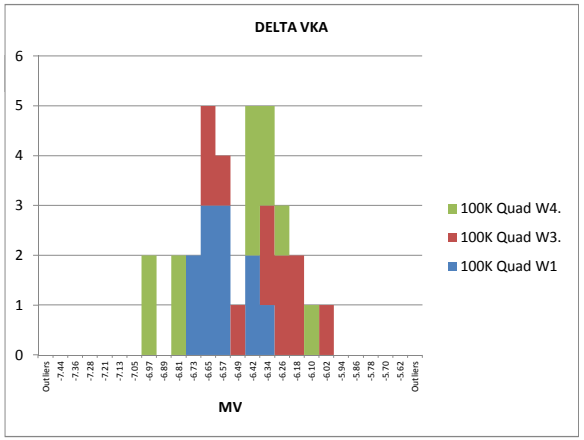
Bin	100K Quad W1	100K Quad W3.	100K Quad W4.
Outliers	0	0	0
0.72	0	0	0
0.75	0	0	0
0.78	1	1	1
0.82	0	0	0
0.85	0	0	0
0.88	0	0	0
0.92	0	0	0
0.95	0	0	2
0.98	0	0	0
1.02	1	0	1
1.05	5	0	1
1.08	2	2	0
1.12	2	2	3
1.15	0	2	3
1.18	0	2	0
1.22	0	1	0
1.25	0	1	0
1.28	0	0	0
1.32	0	0	0
1.35	0	0	0
1.38	0	0	0
1.42	0	0	0
1.45	0	0	0
1.48	0	0	0
Outliers	0	0	0



	Cpk(LL)	LL	Min	Avg	Max	Sigma	UL	Cpk(UL)
100K Quad W1	-	-	0.769	1.038	1.130	0.096	2.45	4.887
100K Quad W3.	-	-	0.779	1.121	1.258	0.126	2.45	3.515
100K Quad W4.	-	-	0.779	1.053	1.155	0.118	2.45	3.954

DELTA VKA

Bin	100K Quad W1	100K Quad W3.	100K Quad W4.
Outliers	0	0	0
-7.44	0	0	0
-7.36	0	0	0
-7.28	0	0	0
-7.21	0	0	0
-7.13	0	0	0
-7.05	0	0	0
-6.97	0	0	2
-6.89	0	0	0
-6.81	0	0	2
-6.73	2	0	0
-6.65	3	2	0
-6.57	3	1	0
-6.49	0	1	0
-6.42	2	0	3
-6.34	1	2	2
-6.26	0	2	1
-6.18	0	2	0
-6.10	0	0	1
-6.02	0	1	0
-5.94	0	0	0
-5.86	0	0	0
-5.78	0	0	0
-5.70	0	0	0
-5.62	0	0	0
Outliers	0	0	0



	Cpk(LL)	LL	Min	Avg	Max	Sigma	UL	Cpk(UL)
100K Quad W1	18.081	-14	-6.714	-6.562	-6.298	0.137	-0.1	15.708
100K Quad W3.	13.355	-14	-6.625	-6.345	-6.057	0.191	-0.1	10.896
100K Quad W4.	7.871	-14	-7.008	-6.534	-6.077	0.316	-0.1	6.782

Exposure Record

Customer:	TI		**Device Type:**	TL1431MJG/Baseline
Dose Rate:	0.01	rad/sec (Si)	**Total Dose (krad):**	30krad
Quantity Irradiated:	3		**RAD Job Number:**	12-190

Serial Number	Total Dose (krad)	Date Shipped	Comments
336	30k	4/4/2012	un-biased
349	30k	4/4/2012	un-biased
352	30k	4/4/2012	un-biased
372	0	4/4/2012	control

Notes: Parts were irradiated at 24℃ ± 6℃ and were shipped FED EX.

Exposure Record

Customer:	TI		**Device Type:**	TL1431MJG/Baseline
Dose Rate:	0.01	rad/sec (Si)	**Total Dose (krad):**	50krad
Quantity Irradiated:	3		**RAD Job Number:**	12-190

Serial Number	Total Dose (krad)	Date Shipped	Comments
373	50k	4/30/2012	un-biased
377	50k	4/30/2012	un-biased
379	50k	4/30/2012	un-biased
384	0	4/30/2012	control

Notes: Parts were irradiated at 24℃ ± 6℃ and were shipped FED EX.

AEROFLEX
RAD

Exposure Record

Customer:	TI		
Dose Rate:	0.01	rad/sec (Si)	
Quantity Irradiated:	3		

Device Type:	TL1431MJG/Baseline
Total Dose (krad):	75k
RAD Job Number:	12-190

Serial Number	Total Dose (krad)	Date Shipped	Comments
385	75k	5/29/2012	un-biased
386	75k	5/29/2012	un-biased
448	75k	5/29/2012	un-biased
452	0	5/29/2012	control

Notes: Parts were irradiated at 24℃ ± 6℃ and were shipped FED EX.

AEROFLEX
RAD

Exposure Record

Customer:	TI		
Dose Rate:	0.01	rad/sec (Si)	
Quantity Irradiated:	3		

Device Type:	TL1431MJG/NSG PSG
Total Dose (krad):	75krad
RAD Job Number:	12-191

Serial Number	Total Dose (krad)	Date Shipped	Comments
20	75k	5/29/2012	un-biased
22	75k	5/29/2012	un-biased
25	75k	5/29/2012	un-biased
26	0	5/29/2012	control

Notes: Parts were irradiated at 24℃ ± 6℃ and were shipped FED EX.

Exposure Record

Customer:	TI		**Device Type:**	TL1431
Dose Rate:	0.01	rad/sec (Si)	**Total Dose (krad):**	25krad
Quantity Irradiated:	9		**RAD Job Number:**	12-588

Serial Number	Total Dose (krad)	Date Shipped	Comments
20	25k	9/4/2012	un-biased
22	25k	9/4/2012	un-biased
25	25k	9/4/2012	un-biased
26	0	9/4/2012	control
28	25k	9/4/2012	un-biased
29	25k	9/4/2012	un-biased
32	25k	9/4/2012	un-biased
33	0	9/4/2012	control
385	25k	9/4/2012	un-biased
386	25k	9/4/2012	un-biased
448	25k	9/4/2012	un-biased
452	0	9/4/2012	control

Notes: Parts were irradiated at 24℃ ± 6℃ and were shipped FED EX.

Exposure Record

Customer:	TI		**Device Type:**	TL1431
Dose Rate:	0.01	rad/sec (Si)	**Total Dose (krad):**	50krad
Quantity Irradiated:	9		**RAD Job Number:**	12-588

Serial Number	Total Dose (krad)	Date Shipped	Comments
20	50k	10/10/2012	un-biased
22	50k	10/10/2012	un-biased
25	50k	10/10/2012	un-biased
26	0	10/10/2012	control
28	50k	10/10/2012	un-biased
29	50k	10/10/2012	un-biased
32	50k	10/10/2012	un-biased
33	0	10/10/2012	control
385	50k	10/10/2012	un-biased
386	50k	10/10/2012	un-biased
448	50k	10/10/2012	un-biased
452	0	10/10/2012	control

Notes: Parts were irradiated at 24℃ ± 6℃ and were shipped FED EX.

Exposure Record

Customer:	TI		**Device Type:**	TL1431
Dose Rate:	0.01	rad/sec (Si)	**Total Dose (krad):**	75krad
Quantity Irradiated:	9		**RAD Job Number:**	12-588

Serial Number	Total Dose (krad)	Date Shipped	Comments
20	75k	11/14/2012	un-biased
22	75k	11/14/2012	un-biased
25	75k	11/14/2012	un-biased
26	0	11/14/2012	control
28	75k	11/14/2012	un-biased
29	75k	11/14/2012	un-biased
32	75k	11/14/2012	un-biased
33	0	11/14/2012	control
385	75k	11/14/2012	un-biased
386	75k	11/14/2012	un-biased
448	75k	11/14/2012	un-biased
452	0	11/14/2012	control

Notes: Parts were irradiated at 24℃ ± 6℃ and were shipped FED EX.

NSPN: TEXAS TL1431 **Test Date:** 1/21/2013
IPI:

A. SAMPLE LIST

Serial Numbers Start	End	Qty.	Wafer Run #	Lot #	Date Code	BS #
TL1431		5				

Correlation unit serial number: _____

B. DOSE RATE

Test Date: 1/21/2013

Enclosure Type: 2

Enclosures:
1 - No Enclosure
2 - Field Flattener w/Al Liner
3 - Field Flattener w/JLS 25% Attenuator & Liner
4 - 53% Attenuator
5 - 66% Attenuator
6 - 90% Attenuator

Calculations (based upon last dosimetery data):
26-Aug-05

Days since last dosimetery: 2705

Reference decay: 0.06276 min/kRad(Si)

Reference dose rate: 265.54 Rads(Si)/sec

Decay: 0.16665 min/kRad(Si)

Dose Rate: (Expected) 100.01 Rads(Si)/sec

(Range) 90.01 to 110.01 Rads(Si)/sec

C. EXPOSURE TIMES

Start nA	Total-Dose kRads(Si)[1]	Total Acc. Dose kRads(Si)	Time mins	Time Seconds	Exposure Time (HHMM) Start	Exposure Time (HHMM) Stop	Serial Number	ATE Time (HHMM) Stop
	0	0						
	3	3	0.51	30	1136	1137	See attachments	

In Dry Ice Box @ 1139

[1] Minumum dose is 450 Rads(Si) per cycle.

Bias Circuit: EVM

Start Voltage: 0V End Voltage: 0V

D. ELECTRICAL TESTS

Tester Type: _____ Station No: 1

Location: TI Dallas Harness No: _____

Socket No.: _____ Test Box No: _____

Program Name: _____

Lot Names: 1- _____ 5- _____

2- _____ 6- _____

3- _____ 7- _____

4- _____ 8- _____

Test conducted by: Thang

NSPN: TEXAS TL1431 **Test Date:** 1/21/2013
IPI:

A. SAMPLE LIST

Serial Numbers Start	End	Qty.	Wafer Run #	Lot #	Date Code	BS #
TL1431		5				

Correlation unit serial number: _____

B. DOSE RATE

Test Date: 1/21/2013

Enclosure Type: 2

Enclosures:
1 - No Enclosure
2 - Field Flattener w/Al Liner
3 - Field Flattener w/JLS 25% Attenuator & Liner
4 - 53% Attenuator
5 - 66% Attenuator
6 - 90% Attenuator

Calculations (based upon last dosimetery data): 26-Aug-05

Days since last dosimetery: 2705

Reference decay: 0.06276 min/kRad(Si)

Reference dose rate: 265.54 Rads(Si)/sec

Decay: 0.16665 min/kRad(Si)

Dose Rate: (Expected) 100.01 Rads(Si)/sec

(Range) 90.01 to 110.01 Rads(Si)/sec

C. EXPOSURE TIMES

Start nA	Total-Dose kRads(Si)[1]	Total Acc. Dose kRads(Si)	Time mins	Time Seconds	Exposure Time (HHMM) Start	Exposure Time (HHMM) Stop	Serial Number	ATE Time (HHMM) Stop
	0	0						
	10	10	1.68	100	11:40	11:42	See attachments	

In Dry Ice Box @ 11:43

[1] Minumum dose is 450 Rads(Si) per cycle.

Bias Circuit: EVM

Start Voltage: 0V End Voltage: 0V

D. ELECTRICAL TESTS

Tester Type: _____ Station No: 1

Location: TI Dallas Harness No: _____

Socket No.: _____ Test Box No: _____

Program Name: _____

Lot Names: 1- _____ 5- _____

2- _____ 6- _____

3- _____ 7- _____

4- _____ 8- _____

Test conducted by: Thang

NSPN: TEXAS TL1431 **Test Date:** 1/21/2013
IPI:

A. SAMPLE LIST

Serial Numbers Start	End	Qty.	Wafer Run #	Lot #	Date Code	BS #
TL1431		3				

Correlation unit serial number: _____

B. DOSE RATE

Test Date: 1/21/2013

Enclosure Type: 2

Enclosures:
1 - No Enclosure
2 - Field Flattener w/Al Liner
3 - Field Flattener w/JLS 25% Attenuator & Liner
4 - 53% Attenuator
5 - 66% Attenuator
6 - 90% Attenuator

Calculations (based upon last dosimetery data):
26-Aug-05

Days since last dosimetery: 2705

Reference decay: 0.06276 min/kRad(Si)

Reference dose rate: 265.54 Rads(Si)/sec

Decay: 0.16665 min/kRad(Si)

Dose Rate: (Expected) 100.01 Rads(Si)/sec

(Range) 90.01 to 110.01 Rads(Si)/sec

C. EXPOSURE TIMES

Start nA	Total-Dose kRads(Si)[1]	Total Acc. Dose kRads(Si)	Time mins	Time Seconds	Exposure Time (HHMM) Start	Exposure Time (HHMM) Stop	Serial Number	ATE Time (HHMM) Stop
	0	0						
	30	30	5.01	300	11:45	11:50	See attachments	

In Dry Ice Box @ 11:51

[1] Minumum dose is 450 Rads(Si) per cycle.

Bias Circuit: EVM

Start Voltage: 0V End Voltage: 0V

D. ELECTRICAL TESTS

Tester Type: _____ Station No: 1

Location: TI Dallas Harness No: _____

Socket No.: _____ Test Box No: _____

Program Name: _____

Lot Names: 1- _____ 5- _____

2- _____ 6- _____

3- _____ 7- _____

4- _____ 8- _____

Test conducted by: Thang

Texas Instruments

Total Dose Radiation Test
Test Flow For Gamma Cell 220 Excel

Hi-Rel Operations

NSPN: TEXAS TL1431 **Test Date:** 1/21/2013
IPI:

A. SAMPLE LIST

Serial Numbers Start	End	Qty.	Wafer Run #	Lot #	Date Code	BS #
TL1431		5				

Correlation unit serial number: _____

B. DOSE RATE

Test Date: 1/21/2013

Enclosure Type: 2

Enclosures:
1 - No Enclosure
2 - Field Flattener w/Al Liner
3 - Field Flattener w/JLS 25% Attenuator & Liner
4 - 53% Attenuator
5 - 66% Attenuator
6 - 90% Attenuator

Calculations (based upon last dosimetery data):
26-Aug-05

Days since last dosimetery: 2705

Reference decay: 0.06276 min/kRad(Si)

Reference dose rate: 265.54 Rads(Si)/sec

Decay: 0.16665 min/kRad(Si)

Dose Rate: (Expected) 100.01 Rads(Si)/sec

(Range) 90.01 to 110.01 Rads(Si)/sec

C. EXPOSURE TIMES

Start nA	Total-Dose kRads(Si)[1]	Total Acc. Dose kRads(Si)	Time mins	Time Seconds	Exposure Time (HHMM) Start	Exposure Time (HHMM) Stop	Serial Number	ATE Time (HHMM) Stop
	0	0						
	50	50	8.34	500	11:53	12:02	See attachments	

In Dry Ice Box @ 12:04

[1] Minumum dose is 450 Rads(Si) per cycle.

Bias Circuit: EVM

Start Voltage: 0V End Voltage: 0V

D. ELECTRICAL TESTS

Tester Type: _____ Station No: 1

Location: TI Dallas Harness No: _____

Socket No.: _____ Test Box No: _____

Program Name: _____

Lot Names: 1- _____ 5- _____

2- _____ 6- _____

3- _____ 7- _____

4- _____ 8- _____

Test conducted by: Thang

Texas Instruments

Total Dose Radiation Test
Test Flow For Gamma Cell 220 Excel

Hi-Rel Operations

NSPN: TEXAS TL1431 **Test Date:** 1/21/2013
IPI:

A. SAMPLE LIST

Serial Numbers Start	End	Qty.	Wafer Run #	Lot #	Date Code	BS #
TL1431		35				

Correlation unit serial number: _____

B. DOSE RATE

Test Date: 1/21/2013

Enclosure Type: 2

Enclosures:
1 - No Enclosure
2 - Field Flattener w/Al Liner
3 - Field Flattener w/JLS 25% Attenuator & Liner
4 - 53% Attenuator
5 - 66% Attenuator
6 - 90% Attenuator

Calculations (based upon last dosimetery data):
26-Aug-05

Days since last dosimetery: 2705

Reference decay: 0.06276 min/kRad(Si)

Reference dose rate: 265.54 Rads(Si)/sec

Decay: 0.16665 min/kRad(Si)

Dose Rate: (Expected) 100.01 Rads(Si)/sec

(Range) 90.01 to 110.01 Rads(Si)/sec

C. EXPOSURE TIMES

Start nA	Total-Dose kRads(Si)[1]	Total Acc. Dose kRads(Si)	Time mins	Time Seconds	Exposure Time (HHMM) Start	Exposure Time (HHMM) Stop	Serial Number	ATE Time (HHMM) Stop
	0	0						
	100	100	16.67	1000	12:13	12:30	See attachments	

In Dry Ice Box @ 12:34

[1] Minumum dose is 450 Rads(Si) per cycle.

Bias Circuit: EVM

Start Voltage: 0V End Voltage: 0V

D. ELECTRICAL TESTS

Tester Type: _____ Station No: 1

Location: TI Dallas Harness No: _____

Socket No.: _____ Test Box No: _____

Program Name: _____

Lot Names: 1- _____ 5- _____

2- _____ 6- _____

3- _____ 7- _____

4- _____ 8- _____

Test conducted by: Thang

Total Dose Radiation Test
Test Flow For Gamma Cell 220 Excel

NSPN: TEXAS TL1431 **Test Date:** 1/21/2013
IPI:

A. SAMPLE LIST

Serial Numbers Start	End	Qty.	Wafer Run #	Lot #	Date Code	BS #
TL1431		11				

Correlation unit serial number: _____

B. DOSE RATE

Test Date: 1/21/2013

Enclosure Type: 2

Enclosures:
1 - No Enclosure
2 - Field Flattener w/Al Liner
3 - Field Flattener w/JLS 25% Attenuator & Liner
4 - 53% Attenuator
5 - 66% Attenuator
6 - 90% Attenuator

Calculations (based upon last dosimetery data):
26-Aug-05

Days since last dosimetery: 2705

Reference decay: 0.06276 min/kRad(Si)

Reference dose rate: 265.54 Rads(Si)/sec

Decay: 0.16665 min/kRad(Si)

Dose Rate: (Expected) 100.01 Rads(Si)/sec

(Range) 90.01 to 110.01 Rads(Si)/sec

C. EXPOSURE TIMES

Start nA	Total-Dose kRads(Si)[1]	Total Acc. Dose kRads(Si)	Time mins	Time Seconds	Exposure Time (HHMM) Start	Exposure Time (HHMM) Stop	Serial Number	ATE Time (HHMM) Stop
	0	0						
	150	150	25.01	1500	12:39	13:04	See attachments	

In Dry Ice Box @ 13:10

[1] Minumum dose is 450 Rads(Si) per cycle.

Bias Circuit: EVM

Start Voltage: 0V End Voltage: 0V

D. ELECTRICAL TESTS

Tester Type: _____ Station No: 1

Location: TI Dallas Harness No: _____

Socket No.: _____ Test Box No: _____

Program Name: _____

Lot Names: 1- _____ 5- _____

2- _____ 6- _____

3- _____ 7- _____

4- _____ 8- _____

Test conducted by: Thang

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