TL7700-SEP Total Ionizing Dose (TID)

ABSTRACT

This report covers the radiation characterization results of the TL7700-SEP supply-voltage supervisor. The study was done to determine total ionizing dose (TID) effects under low dose rate (LDR) up to 30 krad(Si) as a one time characterization. The results show that all samples passed within the specified limits up to 30 krad(Si) and Radiation Lot Acceptance Testing (RLAT) will be performed using 22 units at 20 krad(Si) for future wafer lots. Furthermore, the TL7700-SEP is packaged in a space enhanced plastic for low outgassing characteristics and is single event latch-up (SEL) immune up to 43 MeV-cm^2/mg making the device suitable for low Earth orbit space applications.

Contents

List of Figures

List of Tables

Trademarks

1 Device Information

1.1 Product Description

The TL7700-SEP is a bipolar integrated circuit designed for use as a reset controller in microcomputer and microprocessor systems. The SENSE voltage can be set to any value greater than 0.5 V using two external resistors. Circuit function is very stable, with supply voltage in the 1.8-V to 40-V range. Minimum supply current allows use with ac line operation, portable battery operation, and automotive applications. The TL7700-SEP is characterized for operation from –55°C to 125°C.

1.2 Device Details

Table 1 lists the device information used in the initial radiation hardened TID characterization and qualification of LDR tests.

Table 1. Device and Exposure Details

TID LDR Details: 30 krad(Si)	
TI Device Number	TL7700-SEP
Package	8-pin PW
Technology	JI1
Die Lot Number	8210562SHE
A/T Lot Number / Date Code	9067842MLA/91CEE6K
Quantity Tested	68 units, including 1 control unit
Lot Accept/Reject	Devices passed 3krad(Si), 10 krad(Si), 20 krad(Si), 25 krad(Si), and 30 krad(Si)
LDR Radiation Facility	VPT Rad, Chelmsford, MA
LDR Dose Level	5 krad(Si), 10 krad(Si), 20 krad(Si),25 krad(Si), 30 krad(Si)
LDR Dose Rate	0.01 rad(Si)/s
LDR Radiation Source	Gammacell JLSA 81-24 Co-60
Irradiation Temperature	Ambient, room temperature

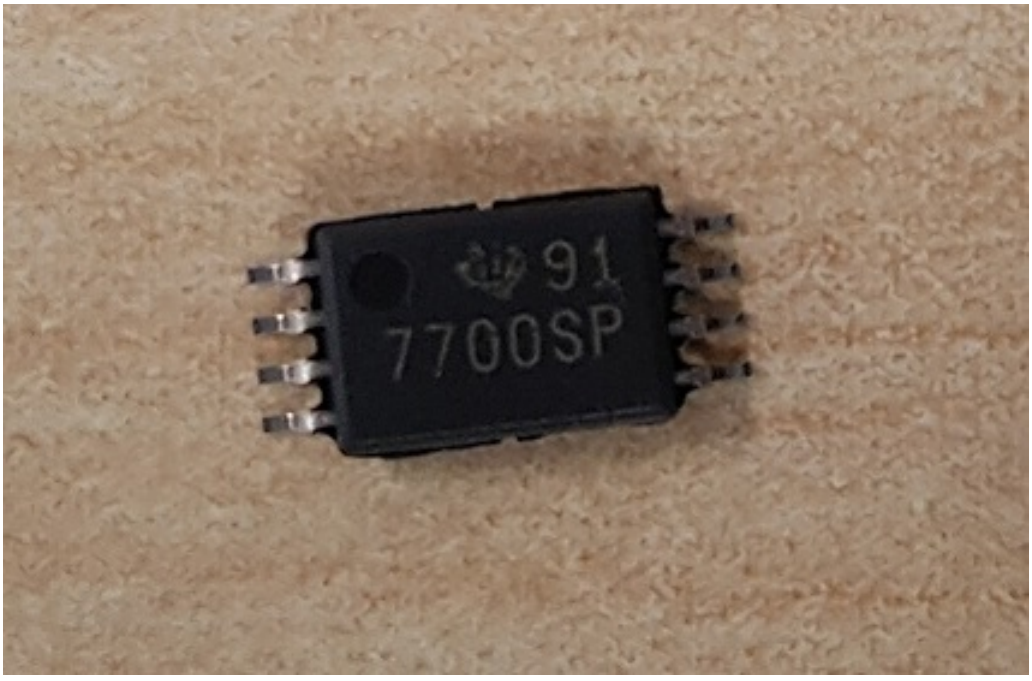


Figure 1. TL7700-SEP Device Used in Exposure

2 Total Dose Test Setup

2.1 Test Overview

The TL7700-SEP was irradiated at a LDR of less than 10 mrad(Si)/s. The product was irradiated up to 30 krad(Si) and then put through full electrical parametric testing on the production Automated Test Equipment (ATE). The device was functional and passed all electrical parametric tests with readings within data sheet electrical specification limits.

2.2 Test Description and Facilities

The TL7700-SEP LDR exposure was performed on biased and unbiased devices in a Co60 gamma cell under a 10-mrad(Si)/s exposure rate. The dose rate of the irradiator used in the exposure ranges from < 10 mrad(Si)/s to a maximum of approximately 65 rad(Si)/s, determined by the distance from the source. The exposure boards are housed in a lead-aluminum box (as specified in MIL-STD-883 TM 1019.9) to harden the gamma spectrum and minimize dose enhancement effects. The irradiator calibration is maintained by Logmire Laboratories using Thermoluminescence Dosimeters (TLDs) traceable to the National Institute of Standards and Technology (NIST) and the dosimetry was verified using TLDs prior to the radiation exposures. After exposure, the devices were packed in dry ice (per MIL-STD-883 Method 1019.9 section 3.10) and returned to TI Dallas for a full post radiation electrical evaluation using Texas Instruments production ATE. ATE guard band test limits are set within data sheet electrical limits to ensure a minimum Cpk and test error margin based on initial qualification and characterization data. Post radiation measurements were taken within 30 minutes of removal of the devices form the dry ice container. The devices were allowed to reach room temperature prior to electrical post radiation measurements.

2.3 Test Setup Details

The devices were tested under both biased and unbiased conditions as described below:

Unbiased - - *For the unbiased conditions, the exposure was performed with all pins grounded.*

Biased - - *Figure 2 shows the bias conditions for each pin during irradiation.*

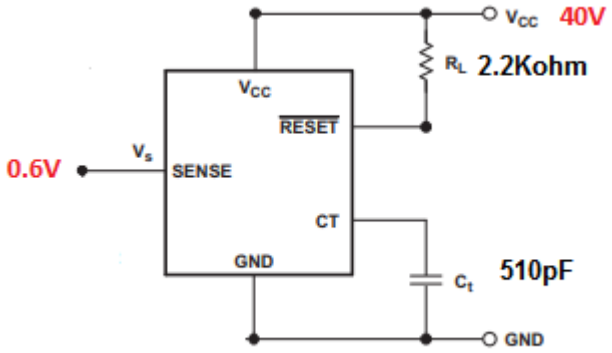


Figure 2. Bias Diagram Used in TID Exposure

2.4 Test Configuration and Condition

A step-stress (3k, 10k, 20k, 25k, 30k) 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 are within data sheet electrical test limits. From initial feasibility studies the difference between pre and post irradiation was greater for samples that were unbiased, hence for RLAT 22 units were used at the 20-krad(Si) dose level with unbiased setup conditions and this will be repeated for each wafer lot.

Table 2. LDR Biased Device and Exposure Information

LDR = 10 mrad(Si)/s				
Total Samples: 5 Biased/TID Level				
Exposure Levels:				
3k	10k	20k	25k	30k
54, 61, 63, 64, 69	6, 7, 8, 9, 10	38, 39, 49, 50, 51	17, 19, 33, 41, 42	102, 103, 104, 105, 106

Control Unit: 18

Table 3. LDR Unbiased Device and Exposure Information

LDR = 10 mrad(Si)/s				
Total Samples: 5 Biased/TID Level				
Exposure Levels:				
3k	10k	20k	25k	30k
5, 8, 43, 59, 101	11, 57, 71, 84, 89	2, 3, 9, 14, 21, 24, 26, 28, 31, 32, 34, 35, 36, 45, 47, 52, 58, 74, 75, 77, 97, 100	29, 66, 79, 81, 91	107, 108, 109, 110, 111

Control Unit: 18

3 Tested Parameters

Table 4 lists the test numbers for each test condition with the data sheet parameters.

Table 4. TL7700-SEP Data Sheet Parameters With Test Numbers

PARAMETER		TEST CONDITION	TL7700-SEP Data Sheet (SLVSF13 - MARCH 2019)			T#
			MIN	TYP	MAX	
VS	SENSE input voltage	Tj = –55°C to +125°C	490		520	055.VSENSE
IS	SENSE input current	Tj = –55°C to +125°C	1.5		3.5	015.IS_0.4V
ICC	Supply current	Tj = 25°C, VCC = 40 V, VS = 0.6 V, No load		0.6	1	005.ICC_40V
VOL	Low-level output voltage	Tj = 25°C, IOL =1.5 mA			0.4	011.VOL_1.5MA
		Tj = 25°C, IOL =3 mA			0.8	012.VOL_3MA
IOH	High-level output current	Tj = –55°C to +125°C, VOC = 40 V, VS = 0.6 V			1	008.IOH_VCC_40V_VS_0.6V
ICT	Timing-capacitor charge current	Tj = 25°C, VS = 0.6 V	11	15	19	014.ICT

4 Total Ionizing Dose (RHA) Characterization Test Results

4.1 Total Ionizing Dose RHA Characterization Summary Results

The parametric data for theTL7700-SEP passes up to 30-krad(Si) LDR for both biased and unbiased setup. Measurements taken post irradiation shows that the drift for unbiased samples was greater that biased samples.

1. **Vsense**

   The Vsense measured through post irradiation increases with each dose level but is within the data sheet limit. At 30 krad(Si), the drift for pre and post irradiation for the biased setup is 2%. The worst case is on the unbiased where the drift is at 4%.

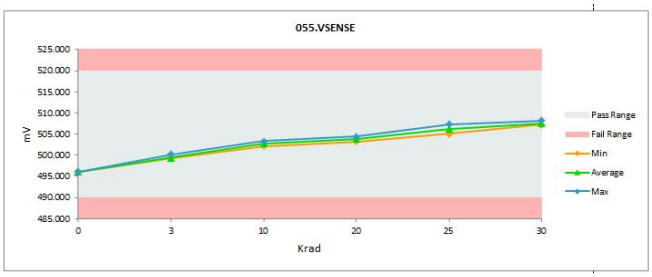


Figure 3. Radiation Exposure Effect on Vsense for Biased Samples

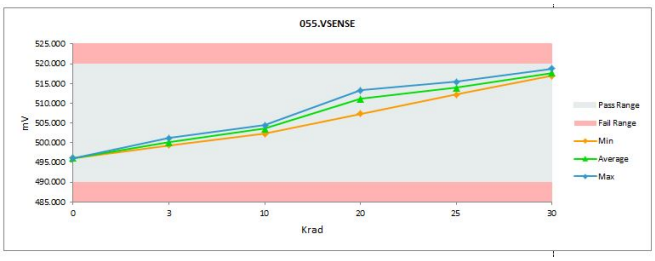


Figure 4. Radiation Exposure Effect on Vsense for Unbiased Samples

1. **I_{CC} Supply Current**

   The supply current exhibits a decrease of I_{CC} current through increased exposure but is still within the data sheet specifications. At 30 krad(Si), the drift for pre and post irradiation for the biased setup is 18%, while the drift for the unbiased setup is at 28%.

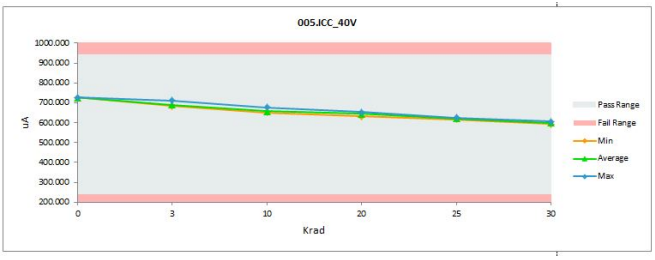


Figure 5. Radiation Exposure Effect on I_{CC} Supply Current for Biased Samples

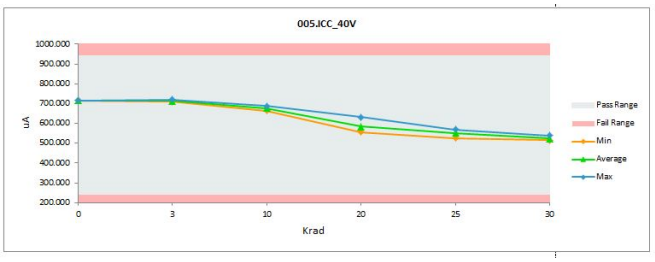


Figure 6. Radiation Exposure Effect on I_{CC} Supply Current for Unbiased Samples

5 Applicable and Reference Documents

5.1 Applicable Documents

- *TL7700-SEP radiation hardened supply-voltage supervisor in space enhanced plastic*, SLVSF13

Total Ionizing Dose LDR Biased Report

This appendix contains the full TID LDR biased report.

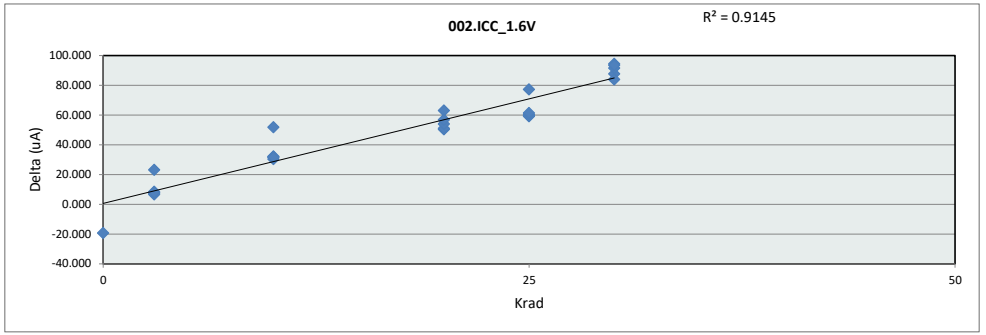
Delta Threshold 10.00%

TID Report
TL7700-SEP

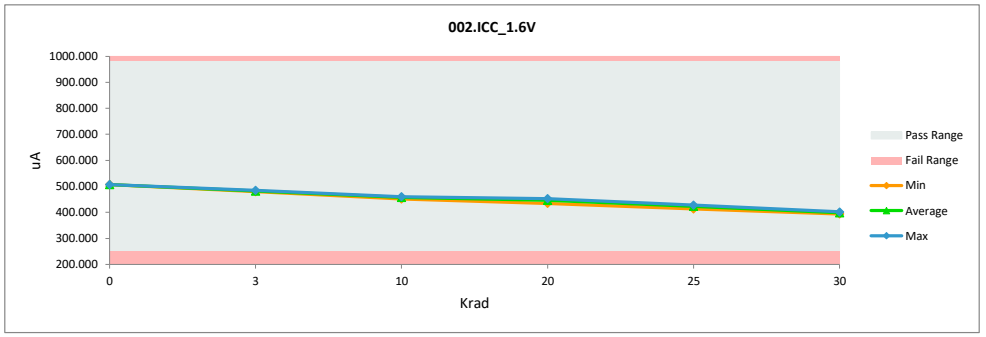
TID Report
TL7700-SEP

	002.ICC_1.6V	
Test Site		
Tester		
Test Number		
Unit	uA	uA
Max Limit	980	980
Min Limit	250	250

Krad	Serial #	Biased_Pre	TL7700_biased	Delta
0	18	487.313	506.699	-19.386
3	54	490.457	482.067	8.390
3	61	491.232	484.690	6.542
3	63	489.384	482.067	7.317
3	64	489.384	481.546	7.838
3	69	503.033	479.966	23.067
10	54_1	490.457	460.200	30.257
10	61_1	491.232	459.200	32.032
10	63_1	489.384	457.700	31.684
10	64_1	489.384	457.900	31.484
10	69_1	503.033	451.300	51.733
20	38	503.033	452.800	50.233
20	39	501.186	450.300	50.886
20	49	505.120	442.200	62.920
20	50	506.163	452.200	53.963
20	51	491.500	434.800	56.700
25	17	487.313	428.200	59.113
25	19	484.422	424.500	59.922
25	33	486.523	426.700	59.823
25	41	474.721	413.500	61.221
25	42	503.033	425.900	77.133
30	102	493.079	398.835	94.244
30	103	489.384	401.735	87.649
30	104	491.500	400.062	91.438
30	105	487.313	393.920	93.393
30	106	482.589	398.703	83.886
	Max	506.163	506.699	94.244
	Average	492.353	444.142	48.211
	Min	474.721	393.920	-19.386
	Std Dev	7.805	31.554	30.700



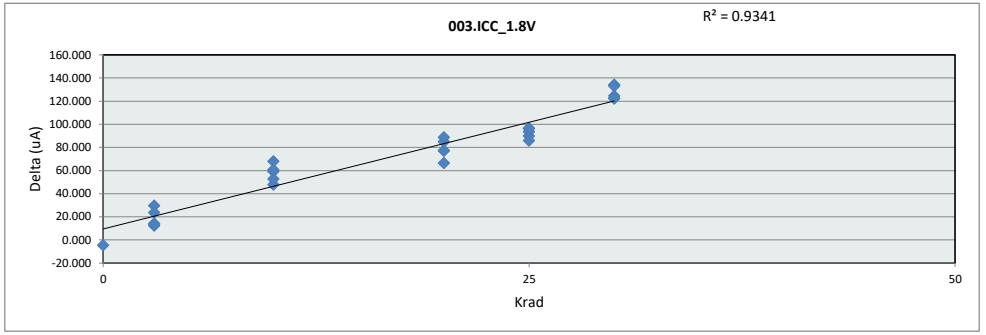
	002.ICC_1.6V					
Test Site						
Tester						
Test Number						
Max Limit	980	uA				
Min Limit	250	uA				
Krad	0	3	10	20	25	30
LL	250.000	250.000	250.000	250.000	250.000	250.000
Min	506.699	479.966	451.300	434.800	413.500	393.920
Average	506.699	482.067	457.260	446.460	423.760	398.651
Max	506.699	484.690	460.200	452.800	428.200	401.735
UL	980.000	980.000	980.000	980.000	980.000	980.000



TID Report
TL7700-SEP

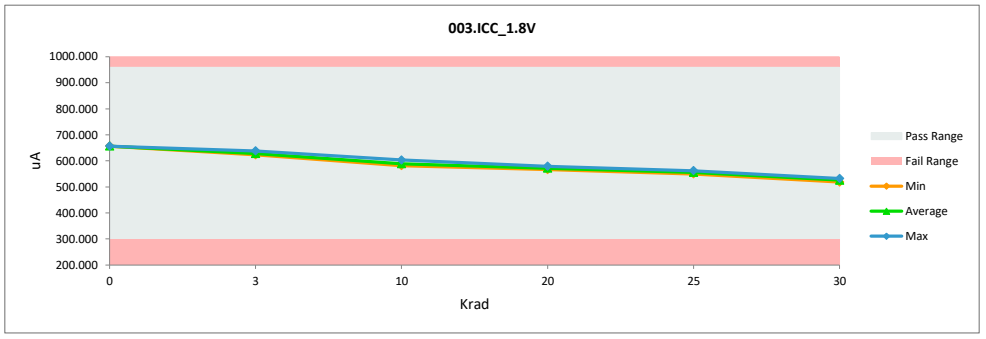
	003.ICC_1.8V	
Test Site		
Tester		
Test Number		
Unit	uA	uA
Max Limit	960	960
Min Limit	300	300

Krad	Serial #	Biased_Pre	TL7700_biased	Delta
0	18	651.926	656.635	-4.709
3	54	650.883	638.545	12.338
3	61	654.280	624.657	29.623
3	63	640.392	626.236	14.156
3	64	640.392	627.011	13.381
3	69	646.681	623.077	23.604
10	54_1	650.883	603.100	47.783
10	61_1	654.280	586.400	67.880
10	63_1	640.392	581.300	59.092
10	64_1	640.392	587.700	52.692
10	69_1	646.681	586.100	60.581
20	38	645.638	579.200	66.438
20	39	648.767	571.600	77.167
20	49	650.883	566.100	84.783
20	50	649.840	572.800	77.040
20	51	657.171	568.500	88.671
25	17	651.926	562.100	89.826
25	19	644.594	558.800	85.794
25	33	649.303	555.800	93.503
25	41	645.638	549.400	96.238
25	42	649.840	553.400	96.440
30	102	654.280	531.837	122.443
30	103	652.432	518.360	134.072
30	104	656.903	523.902	133.001
30	105	650.346	525.835	124.511
30	106	649.840	527.639	122.201
	Max	657.171	656.635	134.072
	Average	649.022	577.155	71.867
	Min	640.392	518.360	-4.709
	Std Dev	4.922	38.131	39.856



	003.ICC_1.8V	
Test Site		
Tester		
Test Number		
Max Limit	960	uA
Min Limit	300	uA

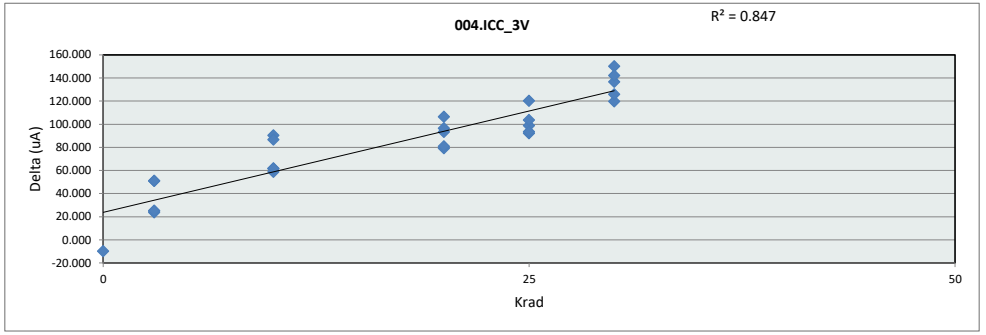
Krad	0	3	10	20	25	30
LL	300.000	300.000	300.000	300.000	300.000	300.000
Min	656.635	623.077	581.300	566.100	549.400	518.360
Average	656.635	627.905	588.920	571.640	555.900	525.515
Max	656.635	638.545	603.100	579.200	562.100	531.837
UL	960.000	960.000	960.000	960.000	960.000	960.000



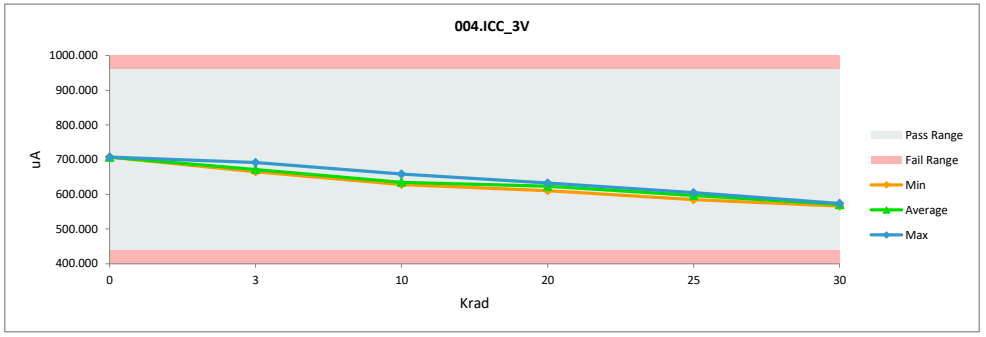
TID Report
TL7700-SEP

	004.ICC_3V	
Test Site		
Tester		
Test Number		
Unit	uA	uA
Max Limit	960	960
Min Limit	440	440

Krad	Serial #	Biased_Pre	TL7700_biased	Delta
0	18	697.017	706.971	-9.954
3	54	716.925	691.772	25.153
3	61	720.084	669.211	50.873
3	63	690.192	666.589	23.603
3	64	689.924	665.039	24.885
3	69	715.882	665.039	50.843
10	54_1	716.925	658.300	58.625
10	61_1	720.084	629.800	90.284
10	63_1	690.192	628.700	61.492
10	64_1	689.924	628.300	61.624
10	69_1	715.882	629.300	86.582
20	38	711.679	632.500	79.179
20	39	705.123	624.300	80.823
20	49	716.925	610.500	106.425
20	50	724.286	631.100	93.186
20	51	713.795	617.400	96.395
25	17	697.017	604.900	92.117
25	19	694.126	595.400	98.726
25	33	691.235	597.900	93.335
25	41	688.374	584.900	103.474
25	42	720.084	599.900	120.184
30	102	723.481	573.529	149.952
30	103	702.769	566.281	136.488
30	104	711.679	569.694	141.985
30	105	691.772	572.064	119.708
30	106	695.974	570.202	125.772
	Max	724.286	706.971	149.952
	Average	705.821	622.677	83.145
	Min	688.374	566.281	-9.954
	Std Dev	12.767	39.334	39.813



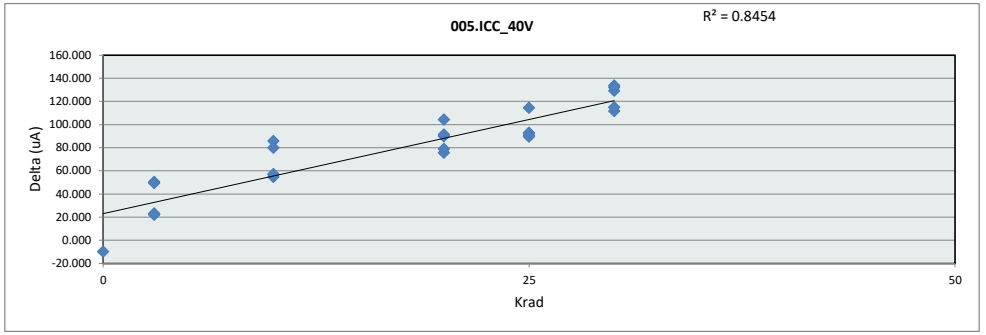
	004.ICC_3V					
Test Site						
Tester						
Test Number						
Max Limit	960	uA				
Min Limit	440	uA				
Krad	0	3	10	20	25	30
LL	440.000	440.000	440.000	440.000	440.000	440.000
Min	706.971	665.039	628.300	610.500	584.900	566.281
Average	706.971	671.530	634.880	623.160	596.600	570.354
Max	706.971	691.772	658.300	632.500	604.900	573.529
UL	960.000	960.000	960.000	960.000	960.000	960.000



TID Report
TL7700-SEP

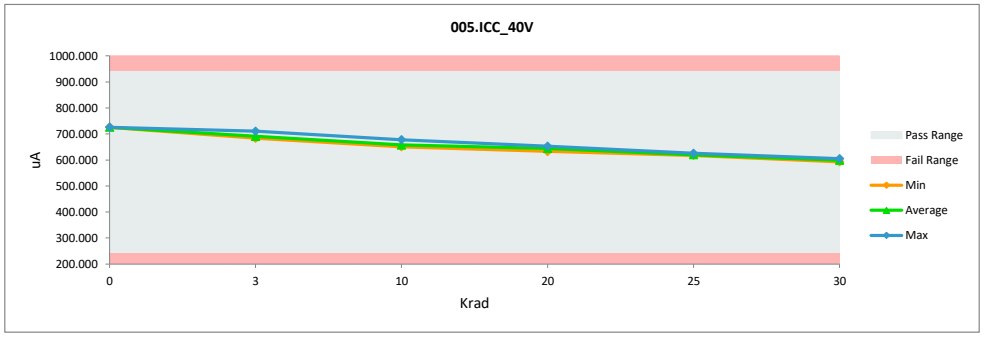
	005.ICC_40V	
Test Site		
Tester		
Test Number		
Unit	uA	uA
Max Limit	940	940
Min Limit	240	240

Krad	Serial #	Biased_Pre	TL7700_biased	Delta
0	18	715.882	725.836	-9.954
3	54	732.660	710.636	22.024
3	61	738.442	688.106	50.336
3	63	709.057	685.990	23.067
3	64	707.507	685.483	22.024
3	69	732.660	683.367	49.293
10	54_1	732.660	678.100	54.560
10	61_1	738.442	652.800	85.642
10	63_1	709.057	652.200	56.857
10	64_1	707.507	650.600	56.907
10	69_1	732.660	652.800	79.860
20	38	728.458	652.900	75.558
20	39	724.286	645.500	78.786
20	49	736.862	632.700	104.162
20	50	741.065	651.200	89.865
20	51	729.501	638.200	91.301
25	17	715.882	625.500	90.382
25	19	711.679	619.400	92.279
25	33	711.679	618.900	92.779
25	41	706.971	617.500	89.471
25	42	734.746	620.400	114.346
30	102	738.442	604.827	133.615
30	103	722.170	593.031	129.139
30	104	728.458	596.407	132.051
30	105	711.173	599.728	111.445
30	106	715.107	600.273	114.834
	Max	741.065	725.836	133.615
	Average	723.577	645.476	78.101
	Min	706.971	593.031	-9.954
	Std Dev	11.876	36.271	37.016



	005.ICC_40V	
Test Site		
Tester		
Test Number		
Max Limit	940	uA
Min Limit	240	uA

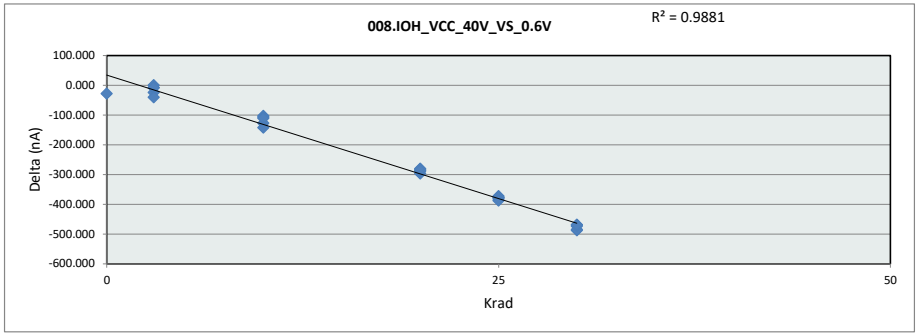
Krad	0	3	10	20	25	30
LL	240.000	240.000	240.000	240.000	240.000	240.000
Min	725.836	683.367	650.600	632.700	617.500	593.031
Average	725.836	690.716	657.300	644.100	620.340	598.853
Max	725.836	710.636	678.100	652.900	625.500	604.827
UL	940.000	940.000	940.000	940.000	940.000	940.000



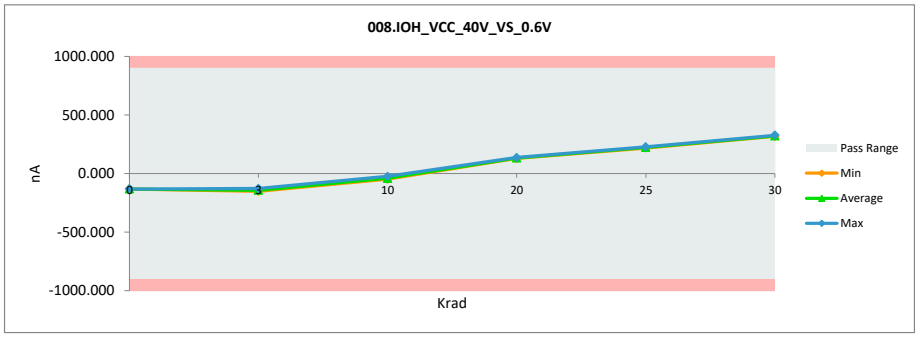
TID Report
TL7700-SEP

	008.IOH_VCC_40V_VS_0.6V	
Test Site		
Tester		
Test Number		
Unit	nA	nA
Max Limit	900	900
Min Limit	-900	-900

Krad	Serial #	Biased_Pre	TL7700_biased	Delta
0	18	-159.744	-131.069	-28.675
3	54	-151.551	-151.551	0.000
3	61	-151.551	-143.358	-8.193
3	63	-151.551	-126.980	-24.571
3	64	-151.551	-143.358	-8.193
3	69	-184.322	-143.358	-40.964
10	54_1	-151.551	-48.294	-103.257
10	61_1	-151.551	-44.268	-107.283
10	63_1	-151.551	-23.634	-127.917
10	64_1	-151.551	-40.720	-110.831
10	69_1	-184.322	-41.836	-142.486
20	38	-159.744	137.479	-297.223
20	39	-151.551	129.284	-280.835
20	49	-151.551	131.342	-282.893
20	50	-151.551	137.475	-289.026
20	51	-151.551	135.292	-286.843
25	17	-159.744	218.374	-378.118
25	19	-155.647	226.359	-382.006
25	33	-151.551	221.833	-373.384
25	41	-151.551	226.382	-377.933
25	42	-159.744	228.340	-388.084
30	102	-151.551	317.973	-469.524
30	103	-159.744	328.047	-487.791
30	104	-159.744	325.710	-485.454
30	105	-151.551	321.920	-473.471
30	106	-151.551	318.626	-470.177
	Max	-151.551	328.047	0.000
	Average	-156.120	91.000	-247.120
	Min	-184.322	-151.551	-487.791
	Std Dev	8.999	175.776	174.435



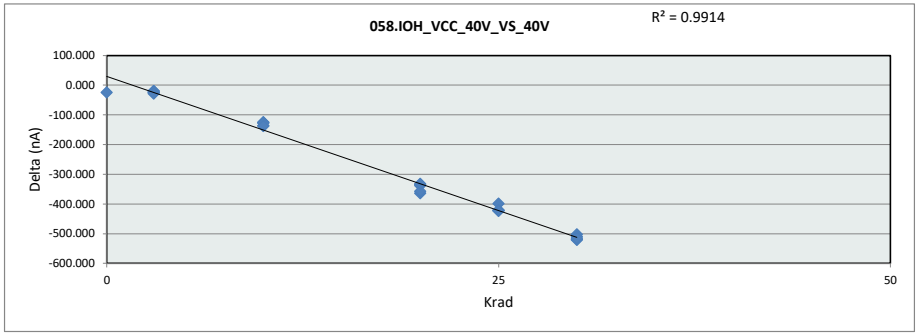
	008.IOH_VCC_40V_VS_0.6V					
Test Site						
Tester						
Test Number						
Max Limit	900	nA				
Min Limit	-900	nA				
Krad	0	3	10	20	25	30
LL	-900.000	-900.000	-900.000	-900.000	-900.000	-900.000
Min	-131.069	-151.551	-48.294	129.284	218.374	317.973
Average	-131.069	-141.721	-39.750	134.174	224.258	322.455
Max	-131.069	-126.980	-23.634	137.479	228.340	328.047
UL	900.000	900.000	900.000	900.000	900.000	900.000



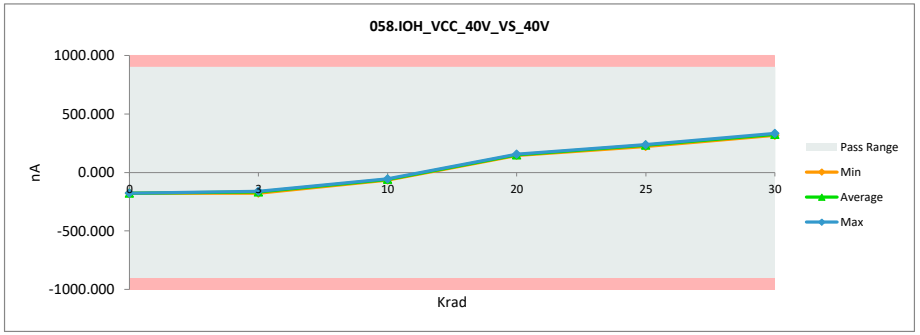
TID Report
TL7700-SEP

	058.IOH_VCC_40V_VS_40V	
Test Site		
Tester		
Test Number		
Unit	nA	nA
Max Limit	900	900
Min Limit	-900	-900

Krad	Serial #	Biased_Pre	TL7700_biased	Delta
0	18	-200.700	-176.129	-24.571
3	54	-184.322	-159.744	-24.578
3	61	-184.322	-163.840	-20.482
3	63	-200.700	-176.129	-24.571
3	64	-184.322	-163.840	-20.482
3	69	-192.515	-163.840	-28.675
10	54_1	-184.322	-57.842	-126.480
10	61_1	-184.322	-59.379	-124.943
10	63_1	-200.700	-64.271	-136.429
10	64_1	-184.322	-56.382	-127.940
10	69_1	-192.515	-54.284	-138.231
20	38	-217.085	146.834	-363.919
20	39	-184.322	153.725	-338.047
20	49	-184.322	150.820	-335.142
20	50	-200.700	157.279	-357.979
20	51	-184.322	148.236	-332.558
25	17	-200.700	222.831	-423.531
25	19	-184.322	236.391	-420.713
25	33	-163.840	235.419	-399.259
25	41	-184.322	238.249	-422.571
25	42	-184.322	237.294	-421.616
30	102	-184.322	317.892	-502.214
30	103	-184.322	335.075	-519.397
30	104	-192.515	328.537	-521.052
30	105	-184.322	325.761	-510.083
30	106	-192.515	322.703	-515.218
	Max	-163.840	335.075	-20.482
	Average	-189.204	86.976	-276.180
	Min	-217.085	-176.129	-521.052
	Std Dev	9.966	190.655	189.211



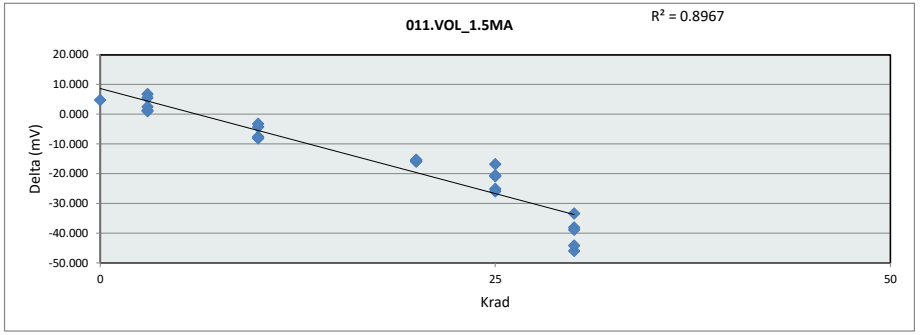
	058.IOH_VCC_40V_VS_40V					
Test Site						
Tester						
Test Number						
Max Limit	900	nA				
Min Limit	-900	nA				
Krad	0	3	10	20	25	30
LL	-900.000	-900.000	-900.000	-900.000	-900.000	-900.000
Min	-176.129	-176.129	-64.271	146.834	222.831	317.892
Average	-176.129	-165.479	-58.432	151.379	234.037	325.994
Max	-176.129	-159.744	-54.284	157.279	238.249	335.075
UL	900.000	900.000	900.000	900.000	900.000	900.000



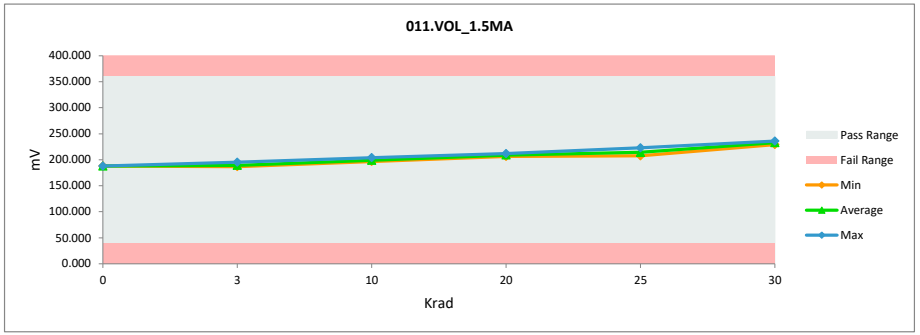
TID Report
TL7700-SEP

	011.VOL_1.5MA	
Test Site		
Tester		
Test Number		
Unit	mV	mV
Max Limit	360	360
Min Limit	40	40

Krad	Serial #	Biased_Pre	TL7700_biased	Delta
0	18	192.482	187.729	4.753
3	54	196.236	195.229	1.007
3	61	193.985	187.233	6.752
3	63	188.484	187.233	1.251
3	64	188.980	186.485	2.495
3	69	194.733	189.232	5.501
10	54_1	196.236	203.820	-7.584
10	61_1	193.985	198.250	-4.265
10	63_1	188.484	196.540	-8.056
10	64_1	188.980	197.050	-8.070
10	69_1	194.733	198.010	-3.277
20	38	192.482	208.360	-15.878
20	39	191.734	207.620	-15.886
20	49	190.735	206.130	-15.395
20	50	196.236	211.870	-15.634
20	51	196.236	211.630	-15.394
25	17	192.482	213.360	-20.878
25	19	193.985	210.820	-16.835
25	33	191.231	216.350	-25.119
25	41	186.729	207.290	-20.561
25	42	196.732	222.740	-26.008
30	102	195.480	228.917	-33.437
30	103	189.735	235.736	-46.001
30	104	195.732	233.874	-38.142
30	105	192.734	231.652	-38.918
30	106	189.735	233.904	-44.169
	Max	196.732	235.736	6.752
	Average	192.666	207.964	-15.298
	Min	186.729	186.485	-46.001
	Std Dev	2.966	15.720	15.577



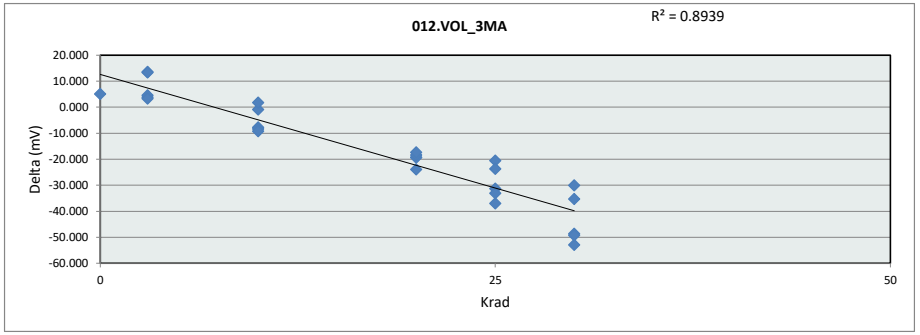
	011.VOL_1.5MA					
Test Site						
Tester						
Test Number						
Max Limit	360	mV				
Min Limit	40	mV				
Krad	0	3	10	20	25	30
LL	40.000	40.000	40.000	40.000	40.000	40.000
Min	187.729	186.485	196.540	206.130	207.290	228.917
Average	187.729	189.082	198.734	209.122	214.112	232.817
Max	187.729	195.229	203.820	211.870	222.740	235.736
UL	360.000	360.000	360.000	360.000	360.000	360.000



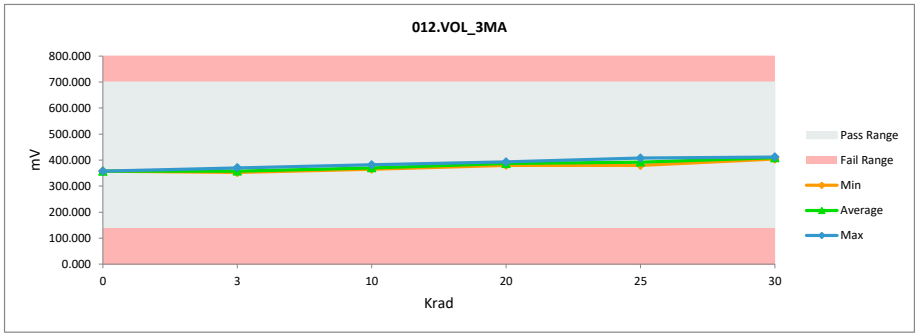
TID Report
TL7700-SEP

	012.VOL_3MA	
Test Site		
Tester		
Test Number		
Unit	mV	mV
Max Limit	700	700
Min Limit	140	140

Krad	Serial #	Biased_Pre	TL7700_biased	Delta
0	18	361.969	356.964	5.005
3	54	373.962	370.209	3.753
3	61	367.722	354.218	13.504
3	63	356.720	352.219	4.501
3	64	357.224	353.973	3.251
3	69	370.468	357.224	13.244
10	54_1	373.962	381.780	-7.818
10	61_1	367.722	368.690	-0.968
10	63_1	356.720	365.110	-8.390
10	64_1	357.224	366.540	-9.316
10	69_1	370.468	368.750	1.718
20	38	366.714	386.130	-19.416
20	39	360.718	384.690	-23.972
20	49	360.718	380.010	-19.292
20	50	374.222	392.660	-18.438
20	51	373.962	391.390	-17.428
25	17	361.969	393.320	-31.351
25	19	364.212	384.760	-20.548
25	33	360.718	397.730	-37.012
25	41	355.713	379.480	-23.767
25	42	374.222	407.330	-33.108
30	102	373.718	403.829	-30.111
30	103	358.963	411.926	-52.963
30	104	373.459	408.815	-35.356
30	105	361.710	410.374	-48.664
30	106	358.719	407.952	-49.233
	Max	374.222	411.926	13.504
	Average	365.150	382.157	-17.007
	Min	355.713	352.219	-52.963
	Std Dev	6.755	19.526	19.274



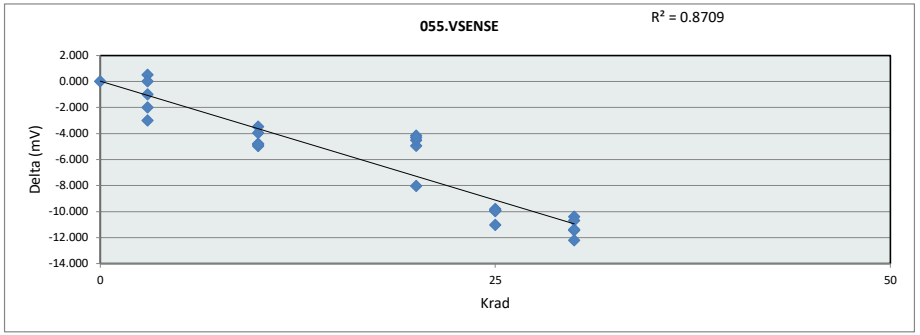
	012.VOL_3MA					
Test Site						
Tester						
Test Number						
Max Limit	700	mV				
Min Limit	140	mV				
Krad	0	3	10	20	25	30
LL	140.000	140.000	140.000	140.000	140.000	140.000
Min	356.964	352.219	365.110	380.010	379.480	403.829
Average	356.964	357.569	370.174	386.976	392.524	408.579
Max	356.964	370.209	381.780	392.660	407.330	411.926
UL	700.000	700.000	700.000	700.000	700.000	700.000



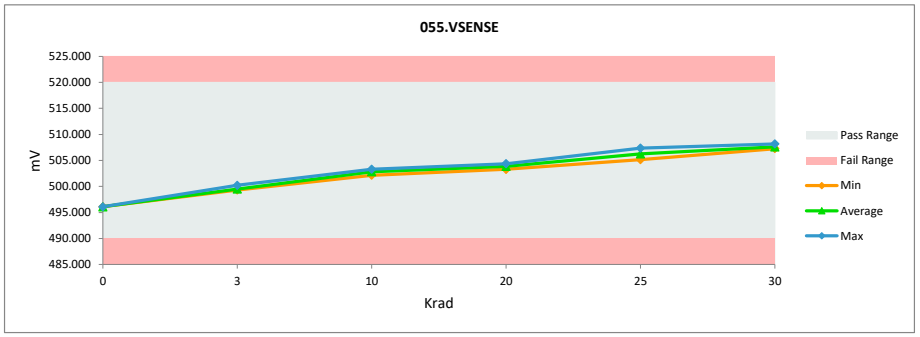
TID Report
TL7700-SEP

	055.VSENSE	
Test Site		
Tester		
Test Number		
Unit	mV	mV
Max Limit	520	520
Min Limit	490	490

Krad	Serial #	Biased_Pre	TL7700_biased	Delta
0	18	496.084	496.084	0.000
3	54	498.337	499.329	-0.992
3	61	499.832	499.329	0.503
3	63	497.208	500.214	-3.006
3	64	497.330	499.329	-1.999
3	69	499.329	499.329	0.000
10	54_1	498.337	503.120	-4.783
10	61_1	499.832	503.303	-3.471
10	63_1	497.208	502.165	-4.957
10	64_1	497.330	502.172	-4.842
10	69_1	499.329	503.297	-3.968
20	38	498.337	503.286	-4.949
20	39	499.832	503.995	-4.163
20	49	499.832	504.350	-4.518
20	50	498.962	503.279	-4.317
20	51	496.338	504.377	-8.039
25	17	495.331	505.127	-9.796
25	19	496.338	506.255	-9.917
25	33	496.338	506.247	-9.909
25	41	496.332	507.352	-11.020
25	42	496.329	506.289	-9.960
30	102	495.834	507.270	-11.436
30	103	496.964	507.358	-10.394
30	104	495.956	508.167	-12.211
30	105	496.339	507.724	-11.385
30	106	496.713	507.394	-10.681
	Max	499.832	508.167	0.503
	Average	497.536	503.698	-6.162
	Min	495.331	496.084	-12.211
	Std Dev	1.467	3.251	4.079



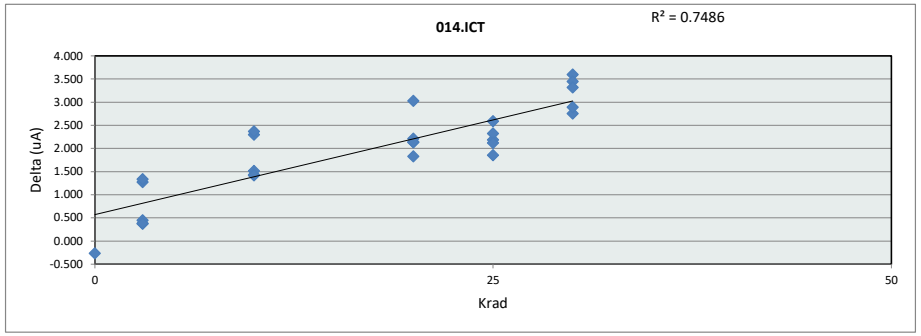
	055.VSENSE					
Test Site						
Tester						
Test Number						
Max Limit	520	mV				
Min Limit	495	mV				
Krad	0	3	10	20	25	30
LL	490.000	490.000	490.000	490.000	490.000	490.000
Min	496.084	499.329	502.165	503.279	505.127	507.270
Average	496.084	499.506	502.811	503.857	506.254	507.583
Max	496.084	500.214	503.303	504.377	507.352	508.167
UL	520.000	520.000	520.000	520.000	520.000	520.000



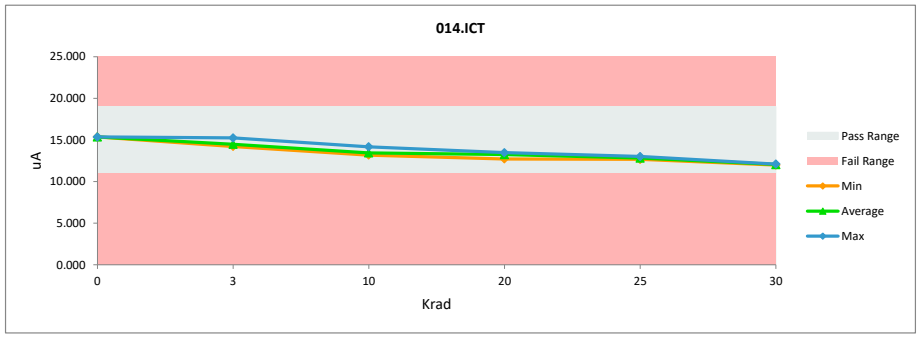
TID Report
TL7700-SEP

	014.ICT	
Test Site		
Tester		
Test Number		
Unit	uA	uA
Max Limit	19	19
Min Limit	11	11

Krad	Serial #	Biased_Pre	TL7700_biased	Delta
0	18	15.093	15.364	-0.271
3	54	15.683	15.237	0.446
3	61	15.553	14.283	1.270
3	63	14.676	14.307	0.369
3	64	14.602	14.225	0.377
3	69	15.716	14.385	1.331
10	54_1	15.683	14.172	1.511
10	61_1	15.553	13.257	2.296
10	63_1	14.676	13.249	1.427
10	64_1	14.602	13.187	1.415
10	69_1	15.716	13.352	2.364
20	38	15.454	13.324	2.130
20	39	15.159	13.332	1.827
20	49	15.750	12.725	3.025
20	50	15.683	13.475	2.208
20	51	15.425	13.290	2.135
25	17	15.093	12.912	2.181
25	19	14.971	12.652	2.319
25	33	14.963	12.845	2.118
25	41	14.553	12.701	1.852
25	42	15.586	13.003	2.583
30	102	15.683	12.091	3.592
30	103	15.425	11.983	3.442
30	104	15.422	12.106	3.316
30	105	14.815	12.063	2.752
30	106	14.881	11.994	2.887
	Max	15.750	15.364	3.592
	Average	15.247	13.289	1.958
	Min	14.553	11.983	-0.271
	Std Dev	0.419	0.943	0.986



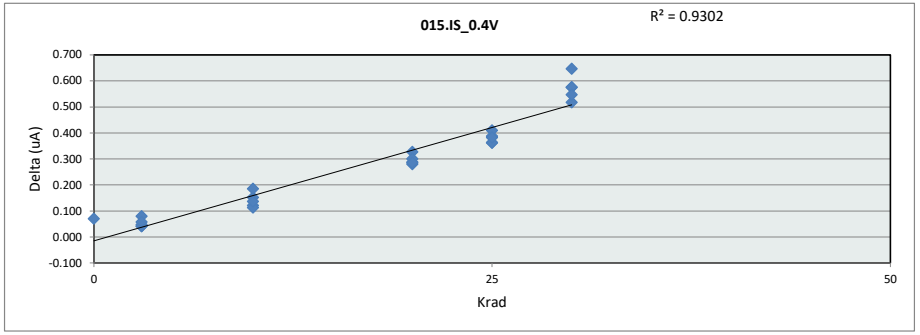
	014.ICT					
Test Site						
Tester						
Test Number						
Max Limit	19	uA				
Min Limit	11	uA				
Krad	0	3	10	20	25	30
LL	11.000	11.000	11.000	11.000	11.000	11.000
Min	15.364	14.225	13.187	12.725	12.652	11.983
Average	15.364	14.487	13.443	13.229	12.823	12.047
Max	15.364	15.237	14.172	13.475	13.003	12.106
UL	19.000	19.000	19.000	19.000	19.000	19.000



TID Report
TL7700-SEP

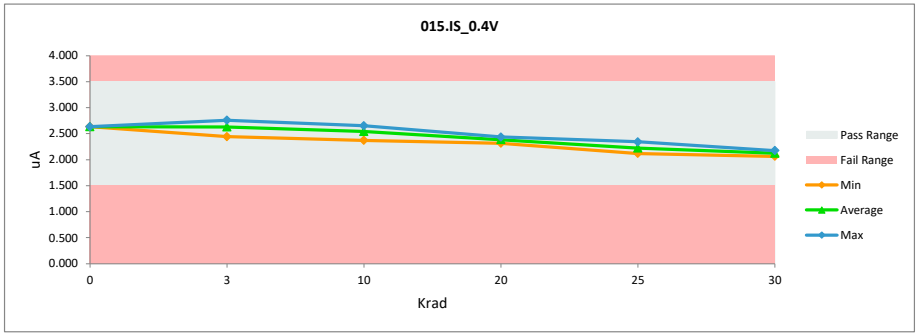
	015.IS_0.4V	
Test Site		
Tester		
Test Number		
Unit	uA	uA
Max Limit	3.5	3.5
Min Limit	1.5	1.5

Krad	Serial #	Biased_Pre	TL7700_biased	Delta
0	18	2.705	2.635	0.070
3	54	2.656	2.609	0.047
3	61	2.803	2.724	0.079
3	63	2.484	2.443	0.041
3	64	2.658	2.617	0.041
3	69	2.815	2.758	0.057
10	54_1	2.656	2.535	0.121
10	61_1	2.803	2.651	0.152
10	63_1	2.484	2.371	0.113
10	64_1	2.658	2.522	0.136
10	69_1	2.815	2.630	0.185
20	38	2.703	2.424	0.280
20	39	2.604	2.316	0.288
20	49	2.712	2.386	0.326
20	50	2.736	2.436	0.300
20	51	2.647	2.362	0.285
25	17	2.705	2.342	0.363
25	19	2.604	2.243	0.362
25	33	2.593	2.206	0.387
25	41	2.529	2.120	0.409
25	42	2.594	2.213	0.382
30	102	2.738	2.164	0.574
30	103	2.692	2.175	0.517
30	104	2.759	2.113	0.646
30	105	2.678	2.102	0.576
30	106	2.610	2.064	0.546
	Max	2.815	2.758	0.646
	Average	2.671	2.391	0.280
	Min	2.484	2.064	0.041
	Std Dev	0.093	0.211	0.189



	015.IS_0.4V	
Test Site		
Tester		
Test Number		
Max Limit	3.5	uA
Min Limit	1.5	uA

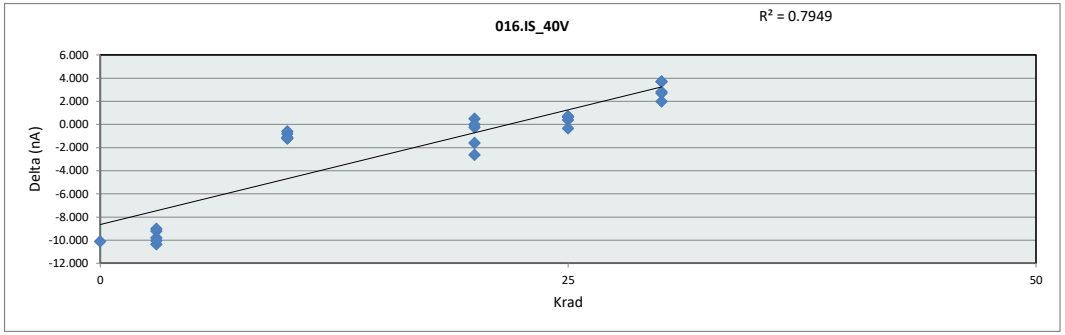
Krad	0	3	10	20	25	30
LL	1.500	1.500	1.500	1.500	1.500	1.500
Min	2.635	2.443	2.371	2.316	2.120	2.064
Average	2.635	2.630	2.542	2.385	2.225	2.124
Max	2.635	2.758	2.651	2.436	2.342	2.175
UL	3.500	3.500	3.500	3.500	3.500	3.500



TID Report
TL7700-SEP

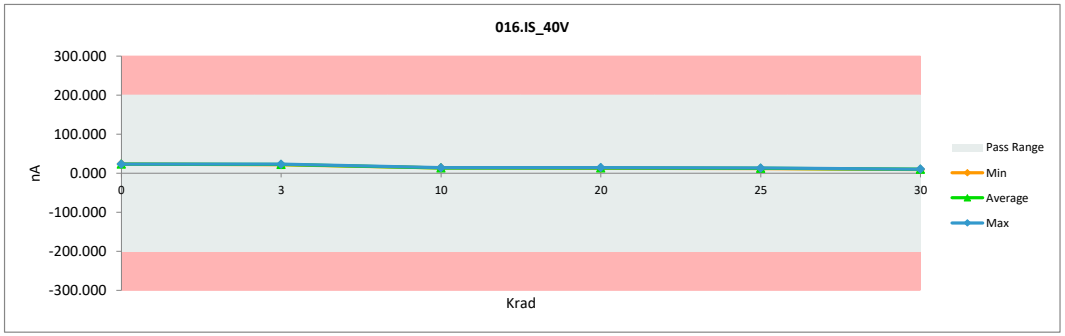
	016.IS_40V	
Test Site		
Tester		
Test Number		
Unit	nA	nA
Max Limit	200	200
Min Limit	-200	-200

Krad	Serial #	Biased_Pre	TL7700_biased	Delta
0	18	12.992	23.103	-10.111
3	54	12.799	22.015	-9.216
3	61	12.799	22.591	-9.792
3	63	12.992	22.015	-9.023
3	64	12.480	22.847	-10.367
3	69	12.480	22.527	-10.047
10	54_1	12.799	13.600	-0.801
10	61_1	12.799	13.400	-0.601
10	63_1	12.992	14.200	-1.208
10	64_1	12.480	13.600	-1.120
10	69_1	12.480	13.700	-1.220
20	38	13.440	13.700	-0.260
20	39	12.992	12.500	0.492
20	49	11.968	14.600	-2.632
20	50	11.903	13.500	-1.597
20	51	12.799	12.800	-0.001
25	17	12.992	12.300	0.692
25	19	12.351	11.700	0.651
25	33	13.184	12.800	0.384
25	41	12.992	12.300	0.692
25	42	12.863	13.200	-0.337
30	102	12.480	10.500	1.980
30	103	13.503	9.800	3.703
30	104	12.992	10.300	2.692
30	105	12.416	9.600	2.816
30	106	12.992	9.300	3.692
	Max	13.503	23.103	3.703
	Average	12.768	14.711	-1.944
	Min	11.903	9.300	-10.367
	Std Dev	0.384	4.588	4.638



	016.IS_40V	
Test Site		
Tester		
Test Number		
Max Limit	200	nA
Min Limit	-200	nA

Krad	0	3	10	20	25	30
LL	-200.000	-200.000	-200.000	-200.000	-200.000	-200.000
Min	23.103	22.015	13.400	12.500	11.700	9.300
Average	23.103	22.399	13.700	13.420	12.460	9.900
Max	23.103	22.847	14.200	14.600	13.200	10.500
UL	200.000	200.000	200.000	200.000	200.000	200.000



Total Ionizing Dose LDR Unbiased Report

This appendix contains the full TID LDR unbiased report.

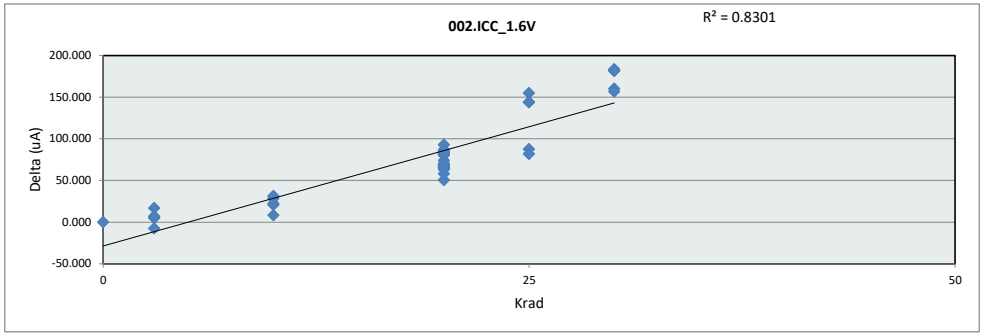
Delta Threshold 10.00%

TID Report
TL7700-SEP

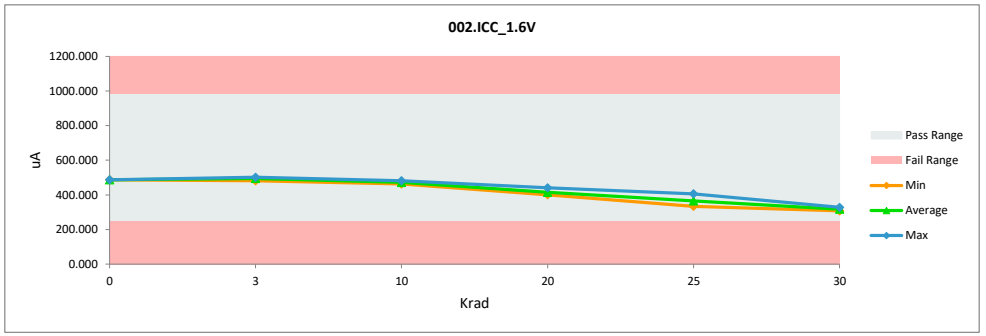
TID Report
TL7700-SEP

	002.ICC_1.6V	
Test Site		
Tester		
Test Number		
Unit	uA	uA
Max Limit	980	980
Min Limit	250	250

Krad	Serial #	UBiased_Pre	TL7700_unbiased.	Delta
0	18	487.313	487.313	0.000
3	5	506.163	501.454	4.709
3	8	501.454	495.166	6.288
3	43	503.033	496.209	6.824
3	59	491.232	498.831	-7.599
3	101	498.831	482.067	16.764
10	11	491.500	470.787	20.713
10	57	504.076	475.779	28.297
10	71	493.586	462.398	31.188
10	84	489.384	481.278	8.106
10	89	493.079	470.787	22.292
20	2	493.079	427.200	65.879
20	3	504.076	434.900	69.176
20	9	491.500	425.600	65.900
20	14	476.301	402.300	74.001
20	21	484.422	402.600	81.822
20	24	486.255	406.200	80.055
20	26	490.457	407.300	83.157
20	28	486.523	420.300	66.223
20	31	485.212	403.500	81.712
20	32	486.523	401.400	85.123
20	34	487.313	400.400	86.913
20	35	487.313	405.600	81.713
20	36	503.033	419.200	83.833
20	45	504.076	435.500	68.576
20	47	491.500	441.100	50.400
20	52	490.457	407.900	82.557
20	58	486.523	428.600	57.923
20	74	493.079	400.300	92.779
20	75	480.756	410.300	70.456
20	77	484.690	420.600	64.090
20	97	478.923	410.700	68.223
20	100	487.313	424.100	63.213
25	29	486.523	399.100	87.423
25	66	489.384	334.500	154.884
25	79	488.088	344.300	143.788
25	81	488.088	406.400	81.688
25	91	484.690	340.800	143.890
30	107	491.500	308.073	183.427
30	108	487.313	327.286	160.027
30	109	498.831	316.926	181.905
30	110	493.079	311.873	181.206
30	111	478.402	321.746	156.656
	Max	506.163	501.454	183.427
	Average	490.811	415.551	75.260
	Min	476.301	308.073	-7.599
	Std Dev	7.341	54.042	51.486



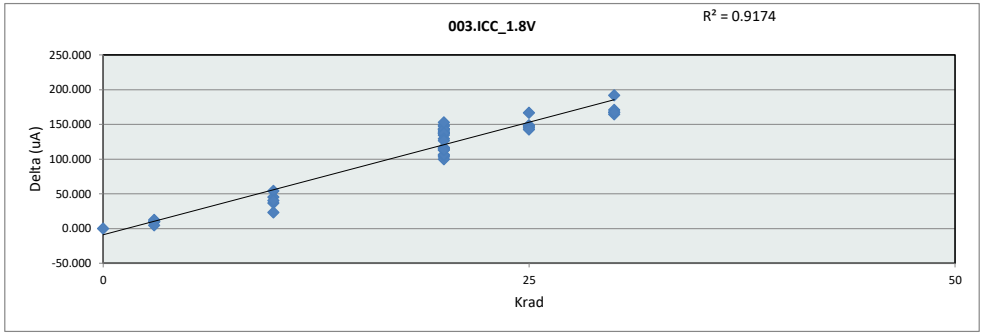
	002.ICC_1.6V					
Test Site						
Tester						
Test Number						
Max Limit	980	uA				
Min Limit	250	uA				
Krad	0	3	10	20	25	30
LL	250.000	250.000	250.000	250.000	250.000	250.000
Min	487.313	482.067	462.398	400.300	334.500	308.073
Average	487.313	494.745	472.206	415.255	365.020	317.181
Max	487.313	501.454	481.278	441.100	406.400	327.286
UL	980.000	980.000	980.000	980.000	980.000	980.000



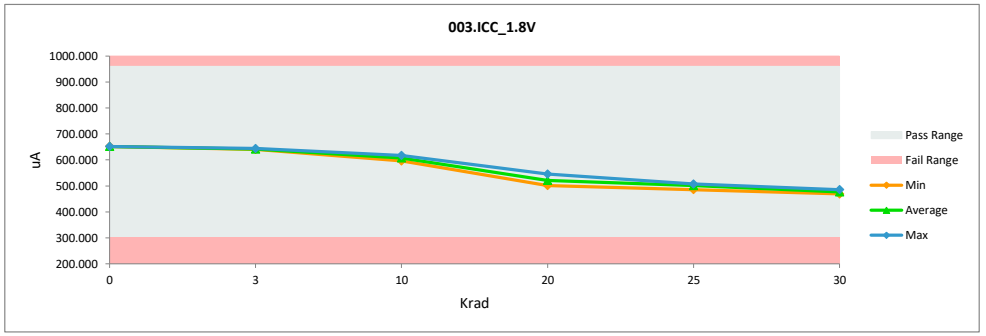
TID Report
TL7700-SEP

	003.ICC_1.8V	
Test Site		
Tester		
Test Number		
Unit	uA	uA
Max Limit	960	960
Min Limit	300	300

Krad	Serial #	UBiased_Pre	TL7700_unbiased.	Delta
0	18	651.926	651.926	0.000
3	5	650.615	640.899	9.716
3	8	650.883	640.899	9.984
3	43	649.840	639.856	9.984
3	59	654.280	641.972	12.308
3	101	648.767	644.058	4.709
10	11	641.435	596.076	45.359
10	57	648.767	612.080	36.687
10	71	659.257	604.987	54.270
10	84	648.767	608.414	40.353
10	89	640.392	617.325	23.067
20	2	657.171	541.900	115.271
20	3	648.767	545.400	103.367
20	9	640.124	540.400	99.724
20	14	642.478	507.800	134.678
20	21	644.594	506.600	137.994
20	24	648.767	511.300	137.467
20	26	656.366	512.700	143.666
20	28	648.767	532.100	116.667
20	31	648.767	506.200	142.567
20	32	649.303	501.700	147.603
20	34	651.926	502.900	149.026
20	35	648.767	508.400	140.367
20	36	645.638	532.500	113.138
20	45	648.767	543.500	105.267
20	47	656.903	513.600	143.303
20	52	650.883	513.700	137.183
20	58	648.767	542.300	106.467
20	74	654.280	501.400	152.880
20	75	642.747	513.400	129.347
20	77	648.767	532.600	116.167
20	97	641.435	514.800	126.635
20	100	652.969	539.500	113.469
25	29	648.767	501.100	147.667
25	66	652.432	503.800	148.632
25	79	652.432	485.700	166.732
25	81	652.432	507.400	145.032
25	91	648.767	506.100	142.667
30	107	660.837	468.937	191.900
30	108	652.969	485.824	167.145
30	109	648.767	477.839	170.928
30	110	640.392	475.833	164.559
30	111	641.435	473.917	167.518
	Max	660.837	651.926	191.900
	Average	649.328	540.689	108.639
	Min	640.124	468.937	0.000
	Std Dev	5.085	55.368	55.427



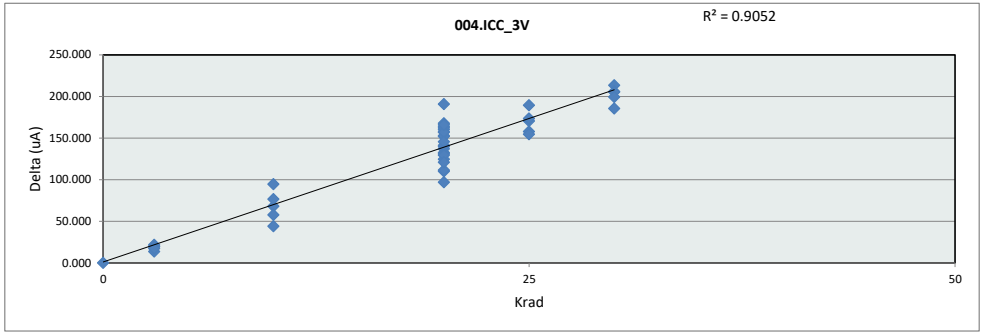
	003.ICC_1.8V					
Test Site						
Tester						
Test Number						
Max Limit	960	uA				
Min Limit	300	uA				
Krad	0	3	10	20	25	30
LL	300.000	300.000	300.000	300.000	300.000	300.000
Min	651.926	639.856	596.076	501.400	485.700	468.937
Average	651.926	641.537	607.776	521.123	500.820	476.470
Max	651.926	644.058	617.325	545.400	507.400	485.824
UL	960.000	960.000	960.000	960.000	960.000	960.000



TID Report
TL7700-SEP

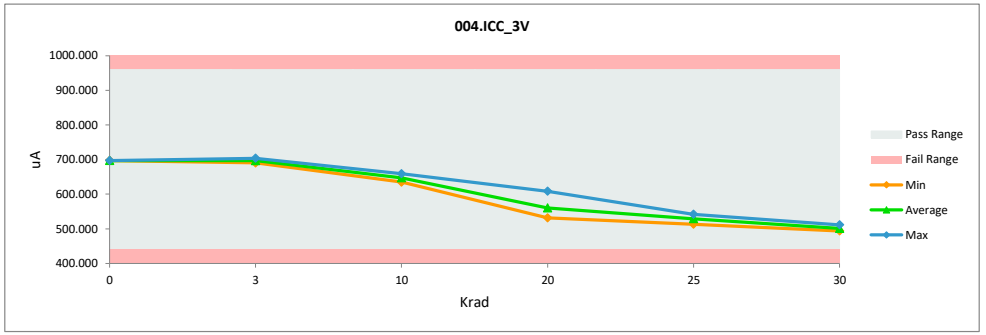
	004.ICC_3V	
Test Site		
Tester		
Test Number		
Unit	uA	uA
Max Limit	960	960
Min Limit	440	440

Krad	Serial #	UBiased_Pre	TL7700_unbiased.	Delta
0	18	697.017	697.017	0.000
3	5	723.213	703.812	19.401
3	8	705.391	691.772	13.619
3	43	720.084	698.328	21.756
3	59	720.084	700.146	19.938
3	101	707.507	690.192	17.315
10	11	729.501	634.879	94.622
10	57	717.968	649.840	68.128
10	71	722.170	645.638	76.532
10	84	704.348	646.681	57.667
10	89	703.305	659.257	44.048
20	2	712.752	602.805	109.947
20	3	719.815	608.461	111.354
20	9	699.103	602.342	96.761
20	14	696.748	564.297	132.451
20	21	694.126	542.100	152.026
20	24	699.103	546.500	152.603
20	26	713.795	550.300	163.495
20	28	703.305	566.300	137.005
20	31	694.394	537.100	157.294
20	32	691.235	531.300	159.935
20	34	697.017	534.900	162.117
20	35	706.702	539.100	167.602
20	36	711.679	571.900	139.779
20	45	715.107	584.200	130.907
20	47	711.679	554.700	156.979
20	52	716.925	551.200	165.725
20	58	703.305	578.700	124.605
20	74	723.481	532.700	190.781
20	75	685.751	544.700	141.051
20	77	696.748	567.400	129.348
20	97	691.772	546.200	145.572
20	100	697.017	576.300	120.717
25	29	703.305	532.900	170.405
25	66	702.769	513.500	189.269
25	79	694.394	521.100	173.294
25	81	694.394	536.700	157.694
25	91	696.748	542.200	154.548
30	107	706.971	493.726	213.245
30	108	697.017	511.723	185.294
30	109	707.507	501.739	205.768
30	110	703.305	498.026	205.279
30	111	700.146	500.835	199.311
	Max	729.501	703.812	213.245
	Average	705.551	579.152	126.400
	Min	685.751	493.726	0.000
	Std Dev	10.524	63.545	59.398



	004.ICC_3V	
Test Site		
Tester		
Test Number		
Max Limit	960	uA
Min Limit	440	uA

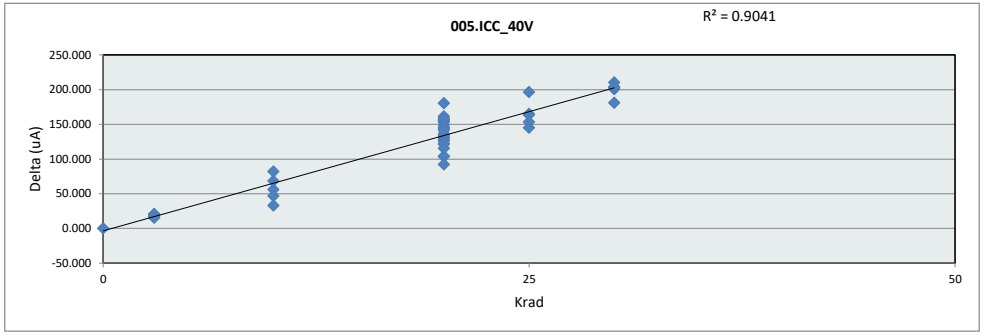
Krad	0	3	10	20	25	30
LL	440.000	440.000	440.000	440.000	440.000	440.000
Min	697.017	690.192	634.879	531.300	513.500	493.726
Average	697.017	696.850	647.259	560.614	529.280	501.210
Max	697.017	703.812	659.257	608.461	542.200	511.723
UL	960.000	960.000	960.000	960.000	960.000	960.000



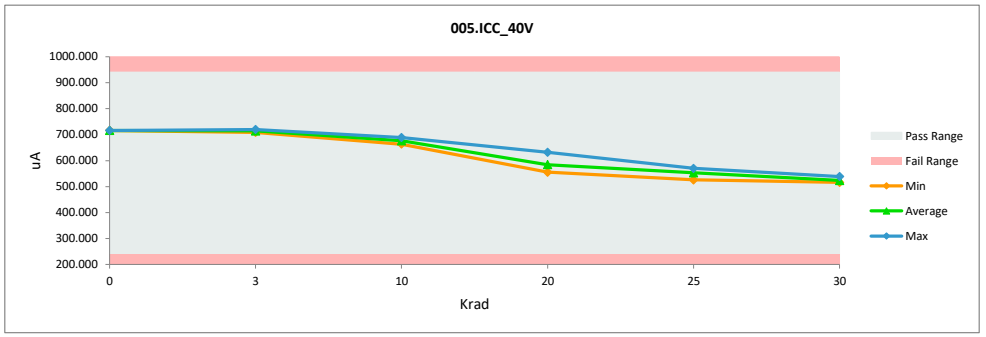
TID Report
TL7700-SEP

	005.ICC_40V	
Test Site		
Tester		
Test Number		
Unit	uA	uA
Max Limit	940	940
Min Limit	240	240

Krad	Serial #	UBiased_Pre	TL7700_unbiased.	Delta
0	18	715.882	715.882	0.000
3	5	738.442	719.547	18.895
3	8	725.329	708.550	16.779
3	43	734.746	714.302	20.444
3	59	738.442	717.968	20.474
3	101	726.372	711.173	15.199
10	11	745.237	663.459	81.778
10	57	734.746	678.927	55.819
10	71	742.614	674.218	68.396
10	84	724.286	677.615	46.671
10	89	721.663	688.881	32.782
20	2	728.458	624.914	103.544
20	3	735.819	632.222	103.597
20	9	717.193	625.185	92.008
20	14	715.375	589.619	125.756
20	21	711.679	566.500	145.179
20	24	717.461	573.400	144.061
20	26	728.458	573.200	155.258
20	28	721.663	588.300	133.363
20	31	713.795	564.700	149.095
20	32	711.679	555.200	156.479
20	34	715.882	562.300	153.582
20	35	724.286	563.100	161.186
20	36	728.458	597.600	130.858
20	45	730.306	602.100	128.206
20	47	728.458	573.400	155.058
20	52	732.660	574.300	158.360
20	58	721.663	600.200	121.463
20	74	738.442	558.200	180.242
20	75	703.305	567.300	136.005
20	77	715.107	593.100	122.007
20	97	709.593	568.300	141.293
20	100	719.815	604.600	115.215
25	29	721.663	558.200	163.463
25	66	722.170	525.800	196.370
25	79	713.795	548.900	164.895
25	81	713.795	560.600	153.195
25	91	715.107	570.200	144.907
30	107	727.952	517.736	210.216
30	108	719.815	539.052	180.763
30	109	726.372	526.034	200.338
30	110	721.663	518.572	203.091
30	111	719.279	515.836	203.443
	Max	745.237	719.547	210.216
	Average	723.696	602.539	121.157
	Min	703.305	515.836	0.000
	Std Dev	9.520	62.985	59.182



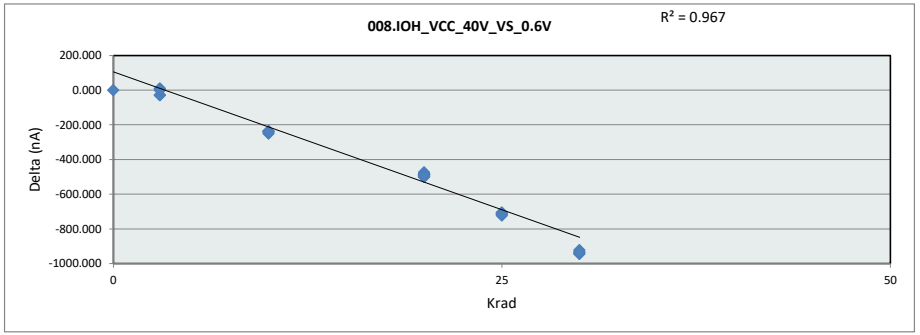
	005.ICC_40V					
Test Site						
Tester						
Test Number						
Max Limit	940	uA				
Min Limit	240	uA				
Krad	0	3	10	20	25	30
LL	240.000	240.000	240.000	240.000	240.000	240.000
Min	715.882	708.550	663.459	555.200	525.800	515.836
Average	715.882	714.308	676.620	584.443	552.740	523.446
Max	715.882	719.547	688.881	632.222	570.200	539.052
UL	940.000	940.000	940.000	940.000	940.000	940.000



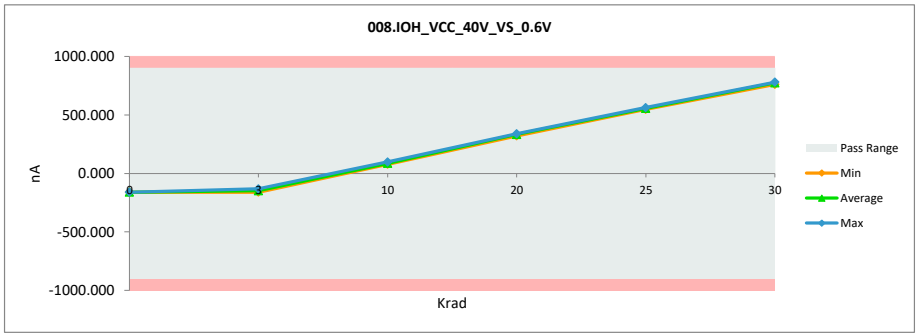
TID Report
TL7700-SEP

	008.IOH_VCC_40V_VS_0.6V	
Test Site		
Tester		
Test Number		
Unit	nA	nA
Max Limit	900	900
Min Limit	-900	-900

Krad	Serial #	UBiased_Pre	TL7700_unbiased.	Delta
0	18	-159.744	-159.744	0.000
3	5	-151.551	-159.744	8.193
3	8	-159.744	-131.069	-28.675
3	43	-159.744	-131.069	-28.675
3	59	-151.551	-159.744	8.193
3	101	-159.744	-159.744	0.000
10	11	-151.551	98.302	-249.853
10	57	-159.744	77.820	-237.564
10	71	-151.551	86.013	-237.564
10	84	-151.551	86.013	-237.564
10	89	-159.744	81.916	-241.660
20	2	-159.744	328.383	-488.127
20	3	-151.551	338.273	-489.824
20	9	-151.551	321.845	-473.396
20	14	-151.551	335.701	-487.252
20	21	-155.647	339.481	-495.128
20	24	-159.744	325.780	-485.524
20	26	-151.551	334.518	-486.069
20	28	-163.840	332.985	-496.825
20	31	-159.744	330.092	-489.836
20	32	-151.551	337.696	-489.247
20	34	-159.744	340.279	-500.023
20	35	-151.551	336.284	-487.835
20	36	-159.744	328.582	-488.326
20	45	-151.551	331.722	-483.273
20	47	-159.744	337.287	-497.031
20	52	-151.551	332.847	-484.398
20	58	-163.840	334.859	-498.699
20	74	-151.551	335.747	-487.298
20	75	-155.647	329.372	-485.019
20	77	-159.744	332.974	-492.718
20	97	-151.551	333.829	-485.380
20	100	-163.840	332.484	-496.324
25	29	-163.840	548.337	-712.177
25	66	-159.744	563.273	-723.017
25	79	-151.551	553.942	-705.493
25	81	-151.551	558.649	-710.200
25	91	-159.744	555.382	-715.126
30	107	-159.744	761.853	-921.597
30	108	-163.840	779.812	-943.652
30	109	-159.744	772.763	-932.507
30	110	-159.744	781.531	-941.275
30	111	-159.744	775.893	-935.637
	Max	-151.551	781.531	8.193
	Average	-156.791	314.219	-471.009
	Min	-163.840	-159.744	-943.652
	Std Dev	4.587	263.461	264.460



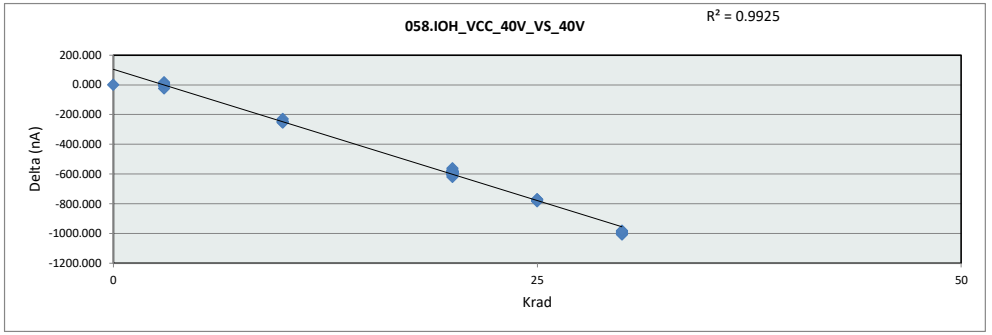
	008.IOH_VCC_40V_VS_0.6V					
Test Site						
Tester						
Test Number						
Max Limit	900	nA				
Min Limit	-900	nA				
Krad	0	3	10	20	25	30
LL	-900.000	-900.000	-900.000	-900.000	-900.000	-900.000
Min	-159.744	-159.744	77.820	321.845	548.337	761.853
Average	-159.744	-148.274	86.013	333.228	555.917	774.370
Max	-159.744	-131.069	98.302	340.279	563.273	781.531
UL	900.000	900.000	900.000	900.000	900.000	900.000



TID Report
TL7700-SEP

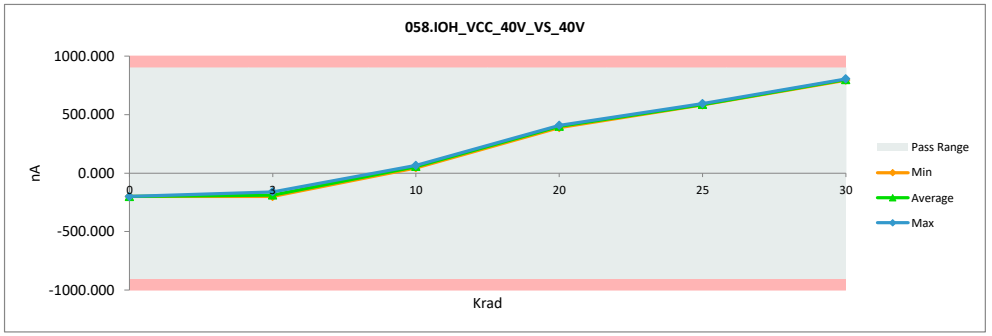
	058.IOH_VCC_40V_VS_40V	
Test Site		
Tester		
Test Number		
Unit	nA	nA
Max Limit	900	900
Min Limit	-900	-900

Krad	Serial #	UBiased_Pre	TL7700_unbiased.	Delta
0	18	-200.700	-200.700	0.000
3	5	-184.322	-176.129	-8.193
3	8	-200.700	-200.700	0.000
3	43	-184.322	-159.744	-24.578
3	59	-184.322	-200.700	16.378
3	101	-192.515	-200.700	8.185
10	11	-184.322	65.535	-249.857
10	57	-184.322	61.438	-245.760
10	71	-184.322	45.055	-229.377
10	84	-192.515	57.342	-249.857
10	89	-200.700	53.245	-253.945
20	2	-200.700	392.736	-593.436
20	3	-200.700	402.384	-603.084
20	9	-184.322	389.269	-573.591
20	14	-184.322	398.472	-582.794
20	21	-184.322	401.366	-585.688
20	24	-192.515	391.549	-584.064
20	26	-184.322	398.462	-582.784
20	28	-200.700	395.245	-595.945
20	31	-184.322	398.651	-582.973
20	32	-163.840	398.428	-562.268
20	34	-200.700	408.274	-608.974
20	35	-184.322	403.741	-588.063
20	36	-217.085	402.481	-619.566
20	45	-184.322	405.296	-589.618
20	47	-192.515	402.840	-595.355
20	52	-184.322	400.972	-585.294
20	58	-200.700	400.826	-601.526
20	74	-184.322	398.491	-582.813
20	75	-184.322	396.498	-580.820
20	77	-188.418	402.831	-591.249
20	97	-184.322	405.865	-590.187
20	100	-200.700	400.736	-601.436
25	29	-200.700	582.304	-783.004
25	66	-184.322	589.281	-773.603
25	79	-184.322	585.083	-769.405
25	81	-184.322	593.602	-777.924
25	91	-188.418	584.074	-772.492
30	107	-192.515	793.872	-986.387
30	108	-200.700	805.948	-1006.648
30	109	-192.515	800.905	-993.420
30	110	-200.700	801.037	-1001.737
30	111	-184.322	796.826	-981.148
	Max	-163.840	805.948	16.378
	Average	-190.512	345.867	-536.379
	Min	-217.085	-200.700	-1006.648
	Std Dev	9.129	289.779	290.323



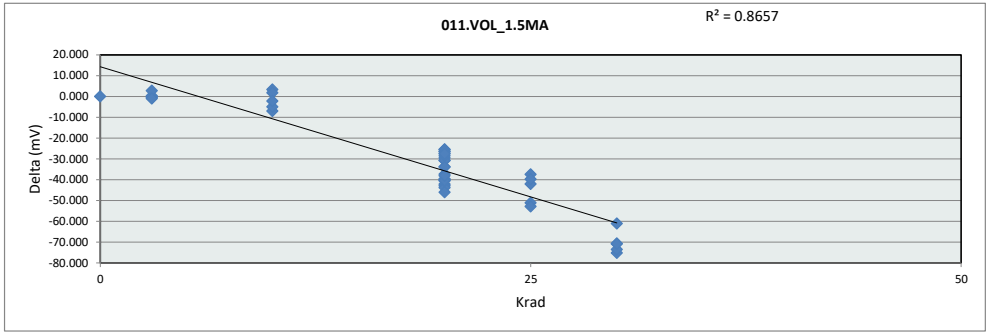
	058.IOH_VCC_40V_VS_40V	
Test Site		
Tester		
Test Number		
Max Limit	900	nA
Min Limit	-900	nA

Krad	0	3	10	20	25	30
LL	-900.000	-900.000	-900.000	-900.000	-900.000	-900.000
Min	-200.700	-200.700	45.055	389.269	582.304	793.872
Average	-200.700	-187.595	56.523	399.792	586.869	799.718
Max	-200.700	-159.744	65.535	408.274	593.602	805.948
UL	900.000	900.000	900.000	900.000	900.000	900.000

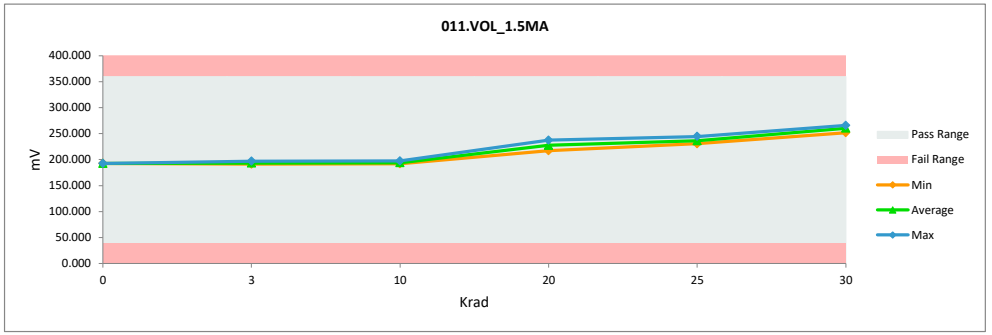


TID Report
TL7700-SEP

	011.VOL_1.5MA		
Test Site			
Tester			
Test Number			
Unit	mV	mV	
Max Limit	360	360	
Min Limit	40	40	
Krad	Serial #	UBiased_Pre	TL7700_unbiased.	Delta
0	18	192.482	192.482	0.000
3	5	194.733	194.481	0.252
3	8	191.986	192.482	-0.496
3	43	196.732	196.983	-0.251
3	59	193.985	191.231	2.754
3	101	190.231	191.231	-1.000
10	11	195.984	192.734	3.250
10	57	193.985	192.230	1.755
10	71	190.483	197.479	-6.996
10	84	190.735	195.732	-4.997
10	89	189.735	191.986	-2.251
20	2	195.229	221.700	-26.471
20	3	194.229	219.720	-25.491
20	9	188.736	219.490	-30.754
20	14	188.980	222.790	-33.810
20	21	193.985	236.180	-42.195
20	24	192.734	235.640	-42.906
20	26	195.732	235.420	-39.688
20	28	194.229	223.790	-29.561
20	31	192.230	236.120	-43.890
20	32	191.231	237.250	-46.019
20	34	192.482	232.260	-39.778
20	35	193.985	234.470	-40.485
20	36	192.482	223.290	-30.808
20	45	195.732	223.090	-27.358
20	47	195.732	224.290	-28.558
20	52	196.236	233.610	-37.374
20	58	194.229	219.820	-25.591
20	74	195.480	229.480	-34.000
20	75	190.231	230.660	-40.429
20	77	190.735	217.140	-26.405
20	97	189.735	227.830	-38.095
20	100	190.735	218.390	-27.655
25	29	194.229	231.750	-37.521
25	66	189.735	240.880	-51.145
25	79	191.734	244.610	-52.876
25	81	191.734	233.782	-42.048
25	91	190.735	230.480	-39.745
30	107	190.735	251.847	-61.112
30	108	190.735	265.951	-75.216
30	109	190.231	260.928	-70.697
30	110	189.735	263.257	-73.522
30	111	190.231	261.063	-70.832
	Max	196.732	265.951	3.250
	Average	192.465	223.629	-31.163
	Min	188.736	191.231	-75.216
	Std Dev	2.294	21.383	22.021



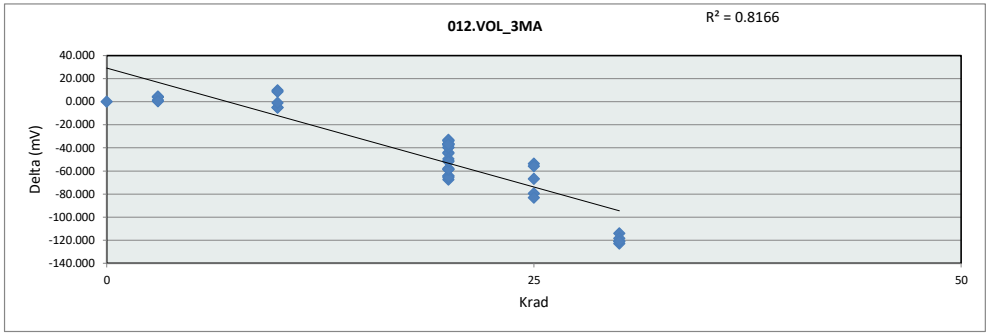
	011.VOL_1.5MA					
Test Site						
Tester						
Test Number						
Max Limit	360	mV				
Min Limit	40	mV				
Krad	0	3	10	20	25	30
LL	40.000	40.000	40.000	40.000	40.000	40.000
Min	192.482	191.231	191.986	217.140	230.480	251.847
Average	192.482	193.282	194.032	227.383	236.300	260.609
Max	192.482	196.983	197.479	237.250	244.610	265.951
UL	360.000	360.000	360.000	360.000	360.000	360.000



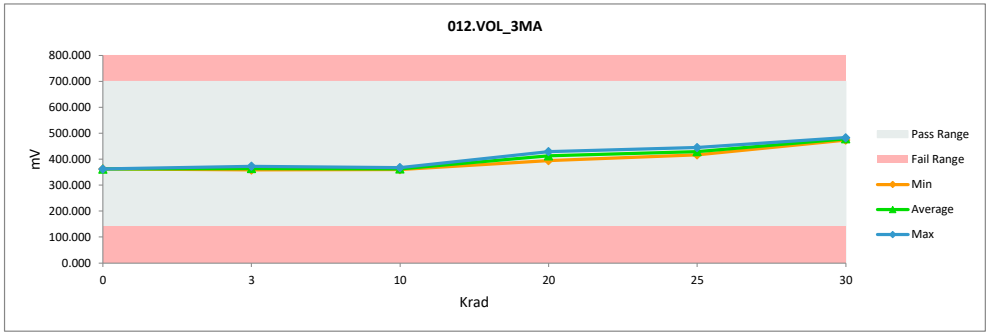
TID Report
TL7700-SEP

	012.VOL_3MA	
Test Site		
Tester		
Test Number		
Unit	mV	mV
Max Limit	700	700
Min Limit	140	140

Krad	Serial #	UBiased_Pre	TL7700_unbiased.	Delta
0	18	361.969	361.969	0.000
3	5	371.964	367.966	3.998
3	8	362.717	358.459	4.258
3	43	374.222	372.971	1.251
3	59	367.722	363.708	4.014
3	101	358.719	358.459	0.260
10	11	373.459	363.708	9.751
10	57	368.210	359.711	8.499
10	71	358.719	363.708	-4.989
10	84	362.717	367.966	-5.249
10	89	358.719	359.711	-0.992
20	2	372.223	405.360	-33.137
20	3	369.720	403.480	-33.760
20	9	358.215	402.380	-44.165
20	14	358.719	403.430	-44.711
20	21	364.212	428.370	-64.158
20	24	362.717	427.240	-64.523
20	26	374.222	425.490	-51.268
20	28	364.716	404.490	-39.774
20	31	361.710	429.340	-67.630
20	32	360.718	426.410	-65.692
20	34	361.969	419.830	-57.861
20	35	365.967	424.720	-58.753
20	36	366.714	403.590	-36.876
20	45	372.711	409.140	-36.429
20	47	373.459	410.240	-36.781
20	52	373.962	423.560	-49.598
20	58	364.716	402.420	-37.704
20	74	373.718	413.320	-39.602
20	75	358.719	417.520	-58.801
20	77	360.718	394.740	-34.022
20	97	358.719	410.580	-51.861
20	100	359.970	396.890	-36.920
25	29	364.716	418.440	-53.724
25	66	358.963	438.560	-79.597
25	79	361.969	445.090	-83.121
25	81	361.969	428.831	-66.862
25	91	360.718	416.570	-55.852
30	107	359.711	473.862	-114.151
30	108	359.970	482.875	-122.905
30	109	358.719	479.466	-120.747
30	110	358.719	477.083	-118.364
30	111	359.711	480.824	-121.113
	Max	374.222	482.875	9.751
	Average	364.252	409.825	-45.574
	Min	358.215	358.459	-122.905
	Std Dev	5.506	35.537	37.354



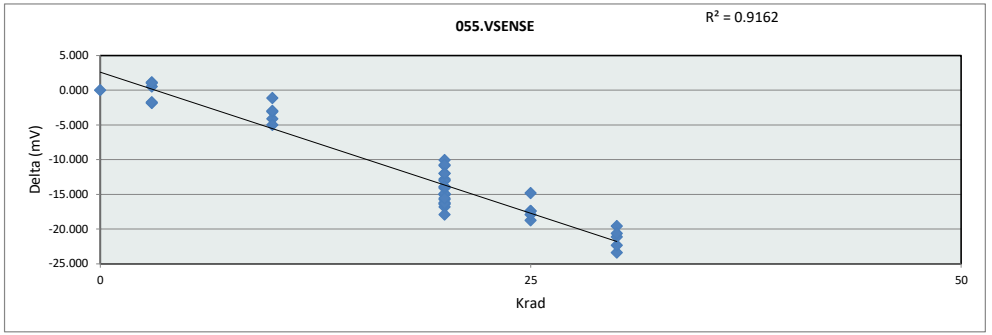
	012.VOL_3MA					
Test Site						
Tester						
Test Number						
Max Limit	700	mV				
Min Limit	140	mV				
Krad	0	3	10	20	25	30
LL	140.000	140.000	140.000	140.000	140.000	140.000
Min	361.969	358.459	359.711	394.740	416.570	473.862
Average	361.969	364.313	362.961	412.843	429.498	478.822
Max	361.969	372.971	367.966	429.340	445.090	482.875
UL	700.000	700.000	700.000	700.000	700.000	700.000



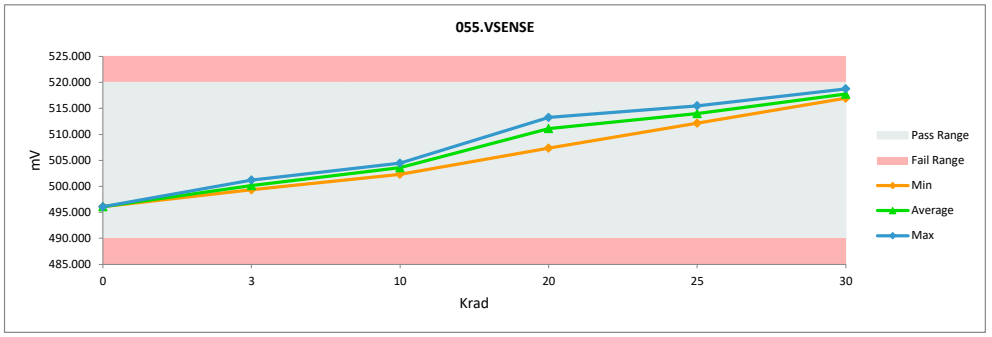
TID Report
TL7700-SEP

	055.VSENSE	
Test Site		
Tester		
Test Number		
Unit	mV	mV
Max Limit	520	520
Min Limit	490	490

Krad	Serial #	UBiased_Pre	TL7700_unbiased.	Delta
0	18	496.084	496.084	0.000
3	5	500.946	499.832	1.114
3	8	499.329	501.190	-1.861
3	43	499.329	501.068	-1.739
3	59	499.832	499.329	0.503
3	101	500.336	499.329	1.007
10	11	503.326	504.456	-1.130
10	57	498.199	502.319	-4.120
10	71	500.336	503.448	-3.112
10	84	499.329	504.333	-5.004
10	89	500.336	503.326	-2.990
20	2	495.331	510.388	-15.057
20	3	499.329	509.406	-10.077
20	9	499.329	512.130	-12.801
20	14	498.337	509.202	-10.865
20	21	496.338	511.370	-15.032
20	24	497.330	512.364	-15.034
20	26	495.331	512.155	-16.824
20	28	497.330	510.296	-12.966
20	31	496.201	511.953	-15.752
20	32	496.338	512.782	-16.444
20	34	495.331	513.258	-17.927
20	35	498.199	512.172	-13.973
20	36	498.337	511.405	-13.068
20	45	498.337	510.315	-11.978
20	47	495.956	512.172	-16.216
20	52	498.337	513.251	-14.914
20	58	497.330	508.097	-10.767
20	74	495.834	512.163	-16.329
20	75	495.834	511.422	-15.588
20	77	495.331	507.340	-12.009
20	97	497.330	511.434	-14.104
20	100	495.331	509.218	-13.887
25	29	497.330	512.154	-14.824
25	66	496.964	514.371	-17.407
25	79	496.710	515.483	-18.773
25	81	497.202	514.629	-17.427
25	91	495.331	513.258	-17.927
30	107	495.331	518.738	-23.407
30	108	495.331	517.695	-22.364
30	109	497.336	516.936	-19.600
30	110	496.336	517.479	-21.143
30	111	497.190	517.831	-20.641
	Max	503.326	518.738	1.114
	Average	497.561	509.711	-12.150
	Min	495.331	496.084	-23.407
	Std Dev	1.892	5.684	6.966



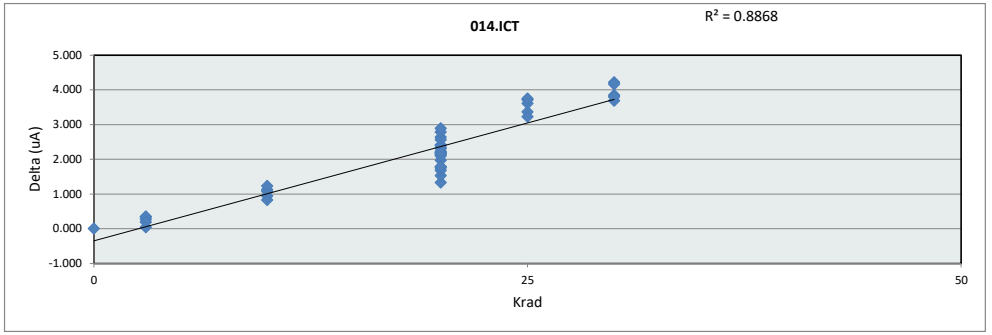
	055.VSENSE					
Test Site						
Tester						
Test Number						
Max Limit	520	mV				
Min Limit	495	mV				
Krad	0	3	10	20	25	30
LL	490.000	490.000	490.000	490.000	490.000	490.000
Min	496.084	499.329	502.319	507.340	512.154	516.936
Average	496.084	500.150	503.576	511.104	513.979	517.736
Max	496.084	501.190	504.456	513.258	515.483	518.738
UL	520.000	520.000	520.000	520.000	520.000	520.000



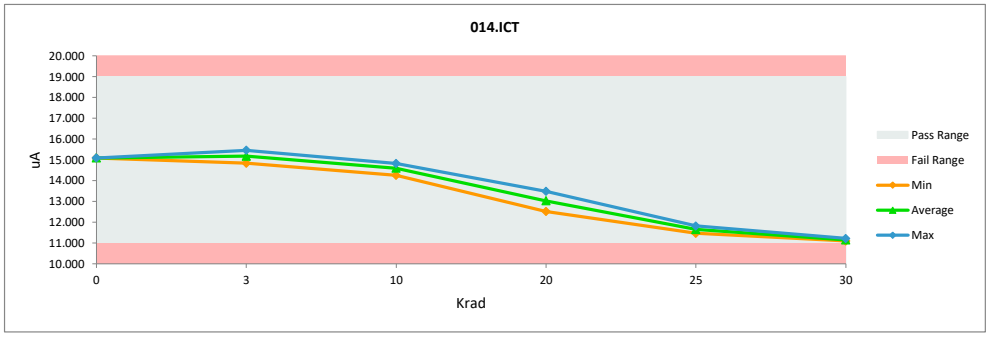
TID Report
TL7700-SEP

	014.ICT	
Test Site		
Tester		
Test Number		
Unit	uA	uA
Max Limit	19	19
Min Limit	11	11

Krad	Serial #	UBiased_Pre	TL7700_unbiased.	Delta
0	18	15.093	15.093	0.000
3	5	15.791	15.463	0.328
3	8	15.102	14.840	0.262
3	43	15.586	15.237	0.349
3	59	15.553	15.364	0.189
3	101	15.020	14.982	0.038
10	11	15.946	14.825	1.121
10	57	15.622	14.681	0.941
10	71	15.618	14.795	0.823
10	84	15.528	14.456	1.072
10	89	15.478	14.250	1.228
20	2	15.553	13.149	2.404
20	3	15.880	13.248	2.632
20	9	14.995	13.028	1.967
20	14	14.668	13.342	1.326
20	21	14.971	12.834	2.137
20	24	15.012	12.787	2.225
20	26	15.405	13.267	2.138
20	28	14.910	13.131	1.779
20	31	14.864	13.337	1.527
20	32	14.963	13.286	1.677
20	34	15.093	12.907	2.186
20	35	15.159	12.598	2.561
20	36	15.454	13.277	2.177
20	45	15.360	12.578	2.782
20	47	15.422	13.096	2.326
20	52	15.683	12.794	2.889
20	58	14.910	12.518	2.392
20	74	15.683	13.373	2.310
20	75	14.864	12.771	2.093
20	77	15.004	13.257	1.747
20	97	14.815	12.628	2.187
20	100	15.266	13.486	1.780
25	29	14.910	11.549	3.361
25	66	15.425	11.817	3.608
25	79	15.356	11.643	3.713
25	81	15.208	11.462	3.746
25	91	15.004	11.779	3.225
30	107	15.430	11.217	4.213
30	108	15.266	11.109	4.157
30	109	15.020	11.174	3.846
30	110	14.778	11.093	3.685
30	111	14.963	11.169	3.794
	Max	15.946	15.463	4.213
	Average	15.247	13.132	2.115
	Min	14.668	11.093	0.000
	Std Dev	0.327	1.280	1.181



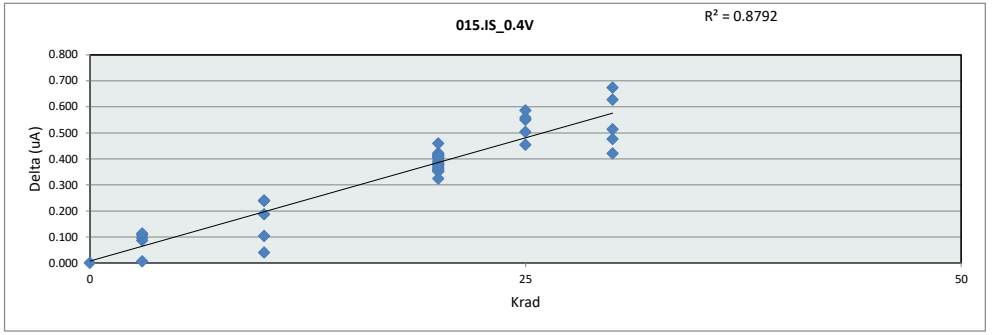
	014.ICT					
Test Site						
Tester						
Test Number						
Max Limit	19	uA				
Min Limit	11	uA				
Krad	0	3	10	20	25	30
LL	11.000	11.000	11.000	11.000	11.000	11.000
Min	15.093	14.840	14.250	12.518	11.462	11.093
Average	15.093	15.177	14.601	13.031	11.650	11.152
Max	15.093	15.463	14.825	13.486	11.817	11.217
UL	19.000	19.000	19.000	19.000	19.000	19.000



TID Report
TL7700-SEP

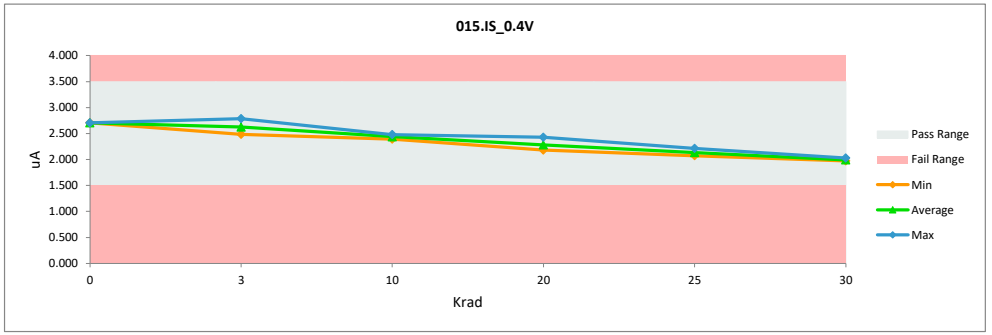
	015.IS_0.4V	
Test Site		
Tester		
Test Number		
Unit	uA	uA
Max Limit	3.5	3.5
Min Limit	1.5	1.5

Krad	Serial #	UBiased_Pre	TL7700_unbiased.	Delta
0	18	2.705	2.705	0.000
3	5	2.872	2.786	0.086
3	8	2.658	2.562	0.096
3	43	2.594	2.486	0.108
3	59	2.803	2.690	0.113
3	101	2.602	2.596	0.006
10	11	2.651	2.411	0.240
10	57	2.582	2.479	0.103
10	71	2.692	2.454	0.238
10	84	2.578	2.391	0.187
10	89	2.495	2.455	0.040
20	2	2.725	2.315	0.410
20	3	2.888	2.429	0.459
20	9	2.594	2.216	0.378
20	14	2.565	2.186	0.379
20	21	2.604	2.214	0.390
20	24	2.750	2.328	0.422
20	26	2.684	2.268	0.416
20	28	2.611	2.253	0.358
20	31	2.684	2.283	0.401
20	32	2.593	2.269	0.324
20	34	2.705	2.297	0.408
20	35	2.635	2.284	0.351
20	36	2.703	2.288	0.415
20	45	2.719	2.316	0.403
20	47	2.795	2.386	0.409
20	52	2.656	2.274	0.382
20	58	2.611	2.248	0.363
20	74	2.738	2.347	0.391
20	75	2.533	2.181	0.352
20	77	2.631	2.274	0.357
20	97	2.619	2.252	0.367
20	100	2.656	2.283	0.373
25	29	2.611	2.157	0.454
25	66	2.692	2.106	0.586
25	79	2.610	2.107	0.503
25	81	2.764	2.214	0.550
25	91	2.631	2.073	0.558
30	107	2.504	2.028	0.476
30	108	2.656	1.982	0.673
30	109	2.602	1.975	0.627
30	110	2.495	1.982	0.513
30	111	2.414	1.993	0.421
	Max	2.888	2.786	0.673
	Average	2.649	2.298	0.351
	Min	2.414	1.975	0.000
	Std Dev	0.096	0.192	0.165



	015.IS_0.4V	
Test Site		
Tester		
Test Number		
Max Limit	3.5	uA
Min Limit	1.5	uA

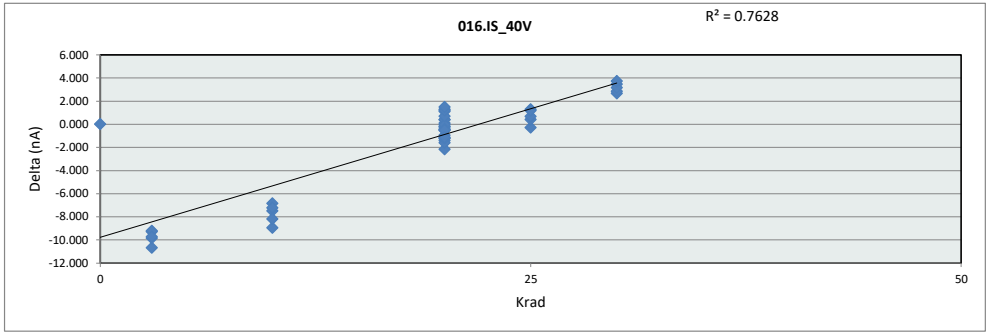
Krad	0	3	10	20	25	30
LL	1.500	1.500	1.500	1.500	1.500	1.500
Min	2.705	2.486	2.391	2.181	2.073	1.975
Average	2.705	2.624	2.438	2.281	2.131	1.992
Max	2.705	2.786	2.479	2.429	2.214	2.028
UL	3.500	3.500	3.500	3.500	3.500	3.500



TID Report
TL7700-SEP

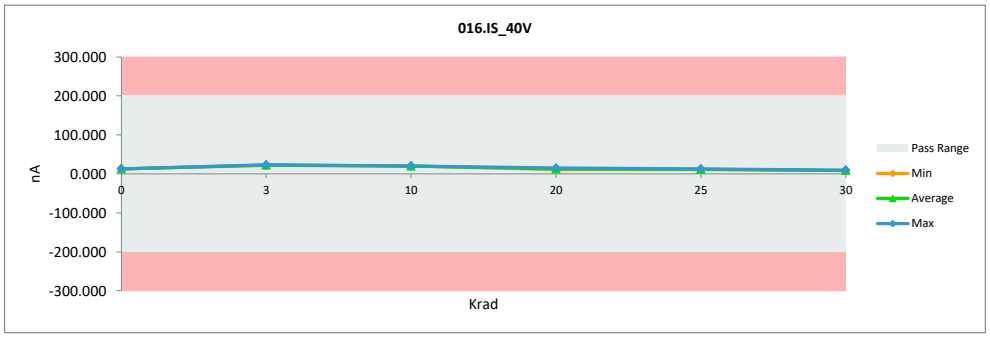
	016.IS_40V	
Test Site		
Tester		
Test Number		
Unit	nA	nA
Max Limit	200	200
Min Limit	-200	-200

Krad	Serial #	UBiased_Pre	TL7700_unbiased.	Delta
0	18	12.992	12.992	0.000
3	5	12.928	22.207	-9.279
3	8	12.416	23.103	-10.687
3	43	12.863	22.719	-9.856
3	59	12.799	22.015	-9.216
3	101	12.351	22.079	-9.728
10	11	12.992	19.839	-6.847
10	57	12.480	19.967	-7.487
10	71	12.992	20.224	-7.232
10	84	11.456	20.415	-8.959
10	89	11.968	20.159	-8.191
20	2	12.928	15.100	-2.172
20	3	12.992	11.700	1.292
20	9	12.799	14.200	-1.401
20	14	12.863	13.400	-0.537
20	21	12.351	12.800	-0.449
20	24	12.351	12.600	-0.249
20	26	12.351	13.300	-0.949
20	28	11.903	13.100	-1.197
20	31	12.288	11.900	0.388
20	32	13.184	13.400	-0.216
20	34	12.992	12.900	0.092
20	35	12.992	12.600	0.392
20	36	13.440	13.500	-0.060
20	45	12.799	11.700	1.099
20	47	12.992	12.300	0.692
20	52	12.799	11.600	1.199
20	58	11.903	13.500	-1.597
20	74	12.480	12.900	-0.420
20	75	12.480	13.700	-1.220
20	77	12.992	11.500	1.492
20	97	12.288	12.800	-0.512
20	100	11.968	13.100	-1.132
25	29	11.903	12.200	-0.297
25	66	13.503	13.100	0.403
25	79	11.968	11.300	0.668
25	81	12.480	11.200	1.280
25	91	12.992	11.800	1.192
30	107	12.351	8.900	3.451
30	108	11.968	9.300	2.668
30	109	12.351	9.500	2.851
30	110	11.968	8.800	3.168
30	111	12.224	8.500	3.724
Max		13.503	23.103	3.724
Average		12.560	14.277	-1.717
Min		11.456	8.500	-10.687
Std Dev		0.469	4.182	4.170



	016.IS_40V	
Test Site		
Tester		
Test Number		
Max Limit	200	nA
Min Limit	-200	nA

Krad	0	3	10	20	25	30
LL	-200.000	-200.000	-200.000	-200.000	-200.000	-200.000
Min	12.992	22.015	19.839	11.500	11.200	8.500
Average	12.992	22.425	20.121	12.891	11.920	9.000
Max	12.992	23.103	20.415	15.100	13.100	9.500
UL	200.000	200.000	200.000	200.000	200.000	200.000



IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265