Radiation Report

ISOS510-SP Total Ionizing Dose (TID) Report

Abstract

This report covers the radiation characterization results of the ISOS510-SP, current-driven analog isolator with transistor output. The study was done to determine Total Ionizing Dose (TID) effects under high dose rate (HDR) up to 150krad(Si) as a one time characterization. The results show that all samples passed within the specified limits up to 100krad(Si) (with 48hour room temperature anneal).

Radiation Lot Acceptance Testing (RLAT) will be performed using five units at a dose level of 100krad(Si) with the enabled bias only for future wafer lots per MIL-STD-883 TM 1019. All future wafer lots will be tested under the same conditions. HDR TID response is the worst case. TID HDR characterization was performed per TM 1019.

The ISOS510-SP device utilizes pure CMOS components from the LBC9 process technology and utilizes ISOSAX technology for high voltage isolation. In addition to an HDR TID, an ELDRS characterization was performed on technology process node (LBC9). Results showed that worst case values post-irradiation were still within pre-radiation specification limits for both HDR and LDR, hence no ELDRS effects were exhibited. Thus, HDR is performed on each wafer lot for future RLAT testing.

Table of Contents

1 Device Information 2
1.1 Device Details 2
2 Total Dose Test Setup 3
2.1 Test Overview 3
2.2 Test Description and Facilities 3
2.3 Test Setup Details 3
2.4 Test Configuration and Condition 4
3 TID Characterization Test Results 5
3.1 TID Characterization Summary Results 5
3.2 Specification Compliance Matrix 5
4 Reference Documents 6
Appendix A: HDR TID Report Data 7

List of Figures

Figure 2-1. ISOS510-SP Enabled Bias Diagram 3
Figure 2-2. ISOS510-SP Disabled Bias Diagram 3

List of Tables

Table 1-1. Device and Exposure Details 2
Table 2-1. HDR Biased Device Information 4
Table 3-1. Electrical Parameters Table 5

Trademarks

All trademarks are the property of their respective owners.

Copyright © 2026 Texas Instruments Incorporated

1 Device Information

The ISOS510 radiation-tolerant device is a single-channel, current-driven, analog isolator with transistor output. The device offers high bandwidth, low turn-off delay, low power consumption, wider temperature ranges, flat current transfer ratio (CTR), and tight process controls resulting in small part-to-part skew. These characteristics stay stable across radiation, temperature, and lifetime.

ISOS510 is offered in a small 4-pin SOIC(DFG) package with 2.54mm pin pitch, supporting a 3.75kV$_{RMS}$ isolation rating . The high performance and reliability of ISOS510 enables these devices to be used in aerospace & defense applications such as feedback loops in isolated DC/DC modules, satellite propulsion power processing units, spacecraft battery management systems, and more.

1.1 Device Details

Table 1-1 lists the ISOS510-SP device information used for TID HDR characterization and qualification.

Table 1-1. Device and Exposure Details

TID HDR Details: Up To 150krad(Si)	
TI Device Number	ISOS510-SP
VID/SMD Number	5962R2620601PXE
Package	4-pin SOIC (DFG)
Technology	LBC9 / ISOSAX
Die Lot Number	6016371RFB / 6010058MH8
A/T Lot Number	6370086ML6
Lot Trace Code	65AT9RK
Quantity Tested	30 irradiated devices and 5 control devices
Lot Accept or Reject	Devices passed 100krad(Si)
HDR Radiation Facility	Texas Instruments CLAB in Dallas, Texas
HDR Dose Level	Up to 150krad(Si)
HDR Dose Rate	140.41rad(Si)/s ionizing radiation
Effective Dose Rate 100krad(Si) with 48hour Anneal	578.70mrad(Si)/s ionizing radiation
Effective Dose Rate 150krad(Si) with 48hour Anneal	868.06mrad(Si)/s ionizing radiation
HDR Radiation Source	Gammacell 220 Excel (GC-220E) Co-60
Irradiation Temperature	Ambient, room temperature

Copyright © 2026 Texas Instruments Incorporated

2 Total Dose Test Setup

2.1 Test Overview

The ISOS510-SP samples were irradiated at a high dose rate of 140.41rad(Si)/s (578.70/868.06mrad(Si)/s effective does rate for 100/150krad(Si) with 48 hour anneal) up to 150krad(Si) and then put through full electrical parametric testing on the production Automated Test Equipment (ATE). The samples were functional and passed all electrical parametric tests with readings within datasheet electrical specification limits.

2.2 Test Description and Facilities

The ISOS510-SP HDR exposure was performed on biased devices in a Co-60 gamma cell at TI facility in Dallas, Texas. The un-attenuated dose rate of this cell is 140.41rad(Si)/s (578.70/868.06mrad(Si)/s effective does rate for 100/150krad(Si) with 48 hour anneal). After exposure, the devices were packed in dry ice (per MIL-STD-883 Method 1019.9 section 3.10) and full post radiation electrical evaluation using Texas Instruments ATE was conducted. ATE test limits are set per data sheet electrical limits based on qualification and characterization data. Post radiation measurements were taken within 30 minutes of removing the devices from 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 in biased conditions as described in the following sections.

2.3.1 Bias Diagram

The ISOS510-SP device bias schemes were selected to put the device in an enabled state and a disabled state to evaluate the device performance under TID effects. Figure 2-1 and Figure 2-2 show the bias conditions for each pin during irradiation.

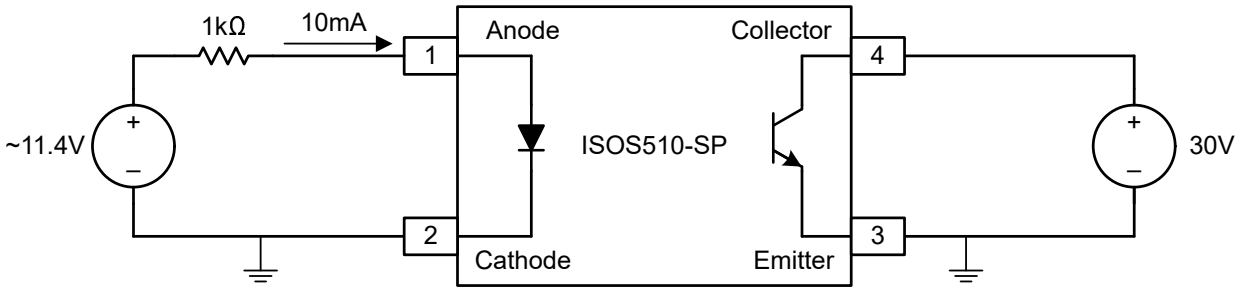


Figure 2-1. ISOS510-SP Enabled Bias Diagram

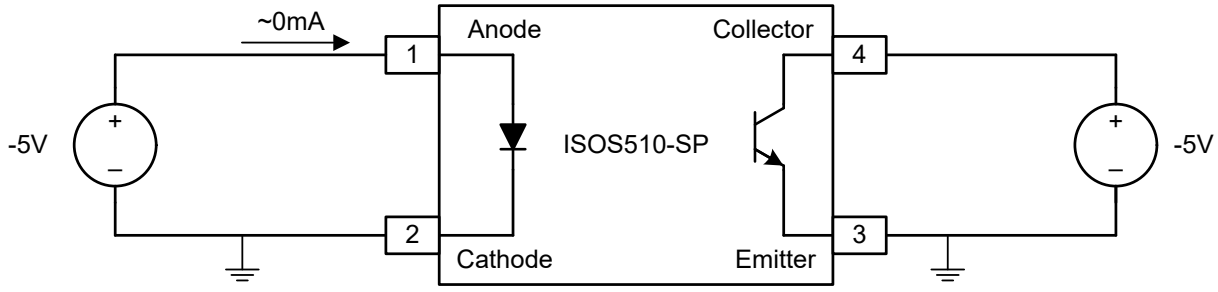


Figure 2-2. ISOS510-SP Disabled Bias Diagram

Copyright © 2026 Texas Instruments Incorporated

2.4 Test Configuration and Condition

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 specified data sheet electrical test limits. The HDR RLAT units will be irradiated to 100krad(Si) with the enabled bias (because those units saw the worst drift), and parametrically tested on ATE, and then were annealed at 25ºC for 48 hours.

Table 2-1 lists the serialized samples used for TID HDR biased characterization.

Table 2-1. HDR Biased Device Information

Control Group	**HDR Dose Rate = 140.41rad(Si)/s Effective Dose Rate (Anneal 48hours + 100/150krad) = 578.70/868.06mrad(Si)/s**					
Total Samples: 5	**Total Exposed Samples: 30**					
	Exposure Levels					
0krad (Si)	30krad(Si)	50krad(Si)	100krad(Si)	100krad(Si)	150krad(Si)	150krad(Si)
	Enabled Bias	Enabled Bias	Enabled Bias	Disabled Bias	Enabled Bias	Disabled Bias
1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31- 35

Copyright © 2026 Texas Instruments Incorporated

3 TID Characterization Test Results

3.1 TID Characterization Summary Results

The parametric data for the ISOS510-SP passes up to 100krad(Si) (with 48 hour room temperature anneal) HDR TID irradiation. The drifts of the electrical parameters through HDR were within the datasheet limits.

Overall, the ISOS510-SP showed a strong degree of hardness to HDR TID irradiation up to 100krad(Si). The measurements taken post-irradiation for each sample set showed a marginal shift for most parameters at the TID specification level of the device. The parameters that did show a degree of change between pre- and post-irradiation were still within the electrical performance characteristics specified in the datasheet electrical parameters. For the datasheet electrical parameters and associated tests, see *ISOS510-SEP Radiation Tolerant, Current-Driven Analog Isolator With Transistor Output*.

See Appendix A for HDR report up to 150krad(Si).

3.2 Specification Compliance Matrix

Table 3-1. Electrical Parameters Table

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT	TEST NAME
INPUT							
V_F	Input forward voltage	I_F = 5mA		1.2	1.6	V	VF_5mA
I_R	Input reverse current	V_R = 5V			10	µA	IR
OUTPUT							
$V_{CE(SAT)}$	Collector-emitter saturation voltage	I_F = 10mA, I_C = 1mA			0.3	V	VCE_SAT
I_{C_DARK}	Collector dark current	V_{CE} = 20V, I_F = 0mA			100	nA	IC_DARK
I_{EC}	Reverse current	V_{EC} = 5V, I_F = 0mA			50	µA	IEC
I_{C_OFF}	OFF_state collector current	V_F = 0.7V, V_{CE} = 30V			10	µA	IC_OFF
CTR (1)	Current Transfer Ratio	I_F = 2mA, V_{CE} = 5V	80	130	180	%	CTR_2mA
		I_F = 5mA, V_{CE} = 5V	95	127	164	%	CTR_5mA

(1) CTR (%) = (I_C / I_F) × 100%

Copyright © 2026 Texas Instruments Incorporated

4 Reference Documents

Texas Instruments total ionizing dose radiation (total dose) test procedure follows the standards put forth in MIL-STD-883 TM 1019. The document can be found at the DLA website.

Copyright © 2026 Texas Instruments Incorporated

Appendix A: HDR TID Report Data

This appendix provides the ISOS510-SP TID HDR report. The report shows the variation for each parameter up to 150krad(Si).

Copyright © 2026 Texas Instruments Incorporated

Radiation Level	Unit Serial	Recorded Value CTR_0.7mA % pre	post	Anneal 48hr
0	1	140.17355	139.13490	139.08409
	2	143.44683	141.86652	142.02832
	3	154.71079	135.15776	135.10153
	4	148.73552	138.81359	138.73682
	5	141.68854	136.21962	136.08342
30	6	142.74141	144.39617	·
	7	147.01966	148.26436	·
	8	139.89865	141.31352	·
	9	140.84768	142.02241	·
	10	145.26219	147.10055	·
50	11	139.37585	138.43497	·
	12	148.51669	147.93028	·
	13	145.86572	144.97359	·
	14	152.45193	152.22737	·
	15	146.92247	146.10484	·
100	16	140.19325	125.49345	132.15783
	17	146.73450	130.97110	138.81705
	18	143.41989	127.25105	135.30433
	19	143.34279	128.96179	134.89580
	20	141.97284	128.69118	134.46995
	21	151.40411	156.85664	·
	22	143.89416	148.39446	·
	23	145.02621	148.93341	·
	24	141.17215	145.66275	·
	25	145.24086	149.98918	·
150	26	147.13604	102.82426	132.42983
	27	141.17505	97.34901	126.10924
	28	148.88192	105.89369	134.39149
	29	143.39508	113.77141	136.93551
	30	150.72735	114.01336	136.86648
	31	140.17355	145.28263	·
	32	143.44683	148.42256	·
	33	154.71079	160.95100	·
	34	148.73552	154.28754	·
	35	141.68854	146.55731	·

Radiation Level	Unit Serial	Delta CTR_0.7mA % post	Anneal 48hr
0	1	-1.03865	-1.08946
	2	-1.58032	-1.41852
	3	-19.55303	-19.60926
	4	-9.92192	-9.99870
	5	-5.46892	-5.60511
30	6	1.65476	·
	7	1.24470	·
	8	1.41488	·
	9	1.17473	·
	10	1.83836	·
50	11	-0.94087	·
	12	-0.58641	·
	13	-0.89213	·
	14	-0.22456	·
	15	-0.81763	·
100	16	-14.69979	-8.03542
	17	-15.76340	-7.91744
	18	-16.16884	-8.11557
	19	-14.38100	-8.44699
	20	-13.28166	-7.50289
	21	5.45253	·
	22	4.50030	·
	23	3.90720	·
	24	4.49060	·
	25	4.74832	·
150	26	-44.31177	-14.70621
	27	-43.82604	-15.06581
	28	-42.98823	-14.49042
	29	-29.62367	-6.45957
	30	-36.71398	-13.86087
	31	5.10908	·
	32	4.97572	·
	33	6.24021	·
	34	5.55203	·
	35	4.86877	·

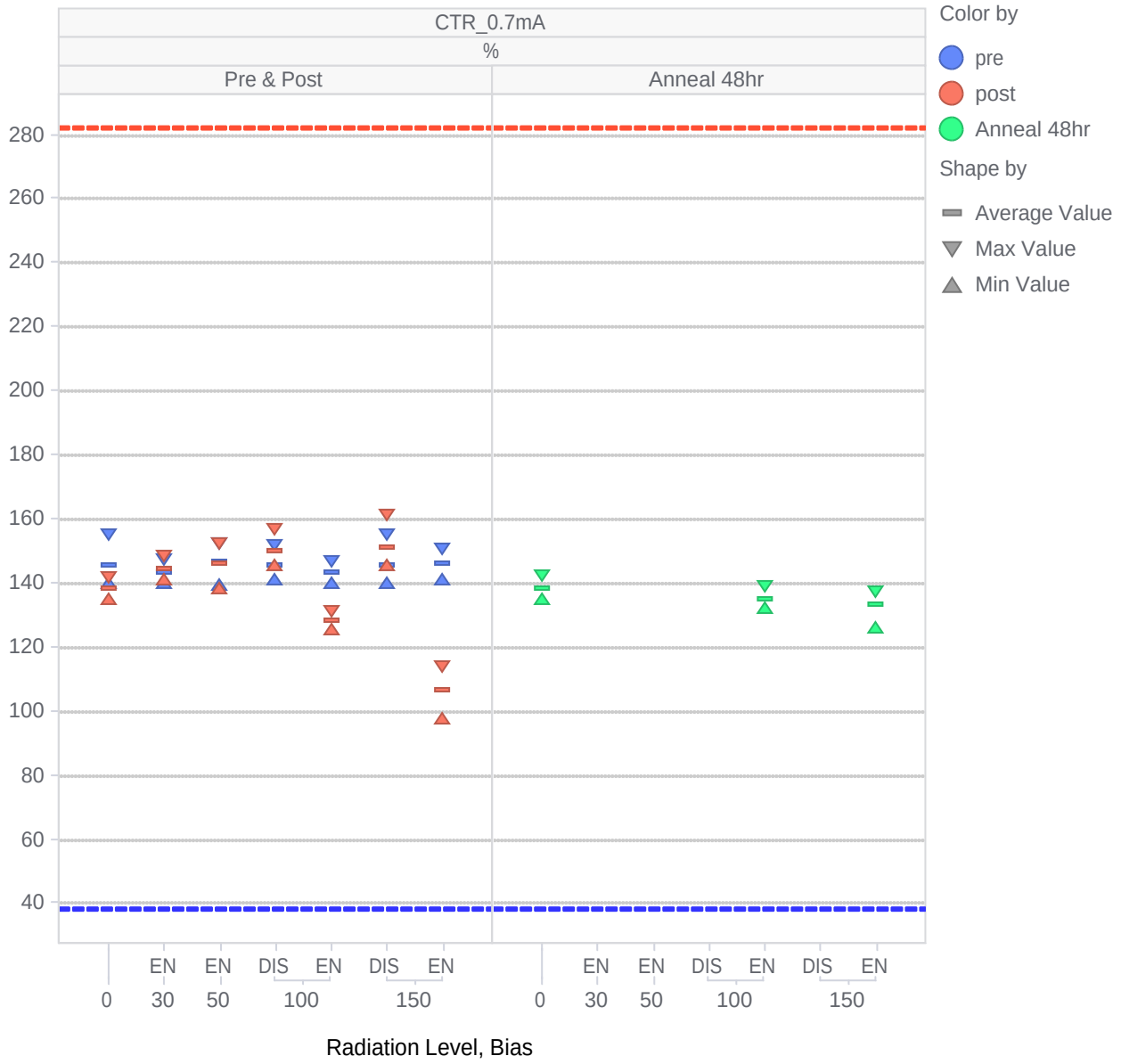
Colors

All values

Avg, Min and Max of Recorded Values

Radiation Level	Parameter	pre	post	Anneal 48hr
0	Max	154.7...	141....	142.02...
	Avg	145.7...	138....	138.20...
	Min	140.1...	135....	135.10...
30	Max	147.0...	148....	·
	Avg	143.1...	144....	·
	Min	139.8...	141....	·
50	Max	152.4...	152....	·
	Avg	146.6...	145....	·
	Min	139.3...	138....	·
100	Max	149.0...	143....	138.81...
	Avg	144.2...	139....	135.12...
	Min	140.6...	135....	132.15...
150	Max	152.7...	137....	136.93...
	Avg	146.0...	128....	133.34...
	Min	140.6...	121....	126.10...

Lower Test Limit	Upper Test Limit	Units
38.00	282.00	%



Radiation Level	Unit Serial	Recorded Value CTR_2mA % pre	post	Anneal 48hr
0	1	140.17355	139.13490	139.08409
	2	143.44683	141.86652	142.02832
	3	154.71079	135.15776	135.10153
	4	148.73552	138.81359	138.73682
	5	141.68854	136.21962	136.08342
30	6	142.74141	144.39617	·
	7	147.01966	148.26436	·
	8	139.89865	141.31352	·
	9	140.84768	142.02241	·
	10	145.26219	147.10055	·
50	11	139.37585	138.43497	·
	12	148.51669	147.93028	·
	13	145.86572	144.97359	·
	14	152.45193	152.22737	·
	15	146.92247	146.10484	·
100	16	140.19325	125.49345	132.15783
	17	146.73450	130.97110	138.81705
	18	143.41989	127.25105	135.30433
	19	143.34279	128.96179	134.89580
	20	141.97284	128.69118	134.46995
	21	151.40411	156.85664	·
	22	143.89416	148.39446	·
	23	145.02621	148.93341	·
	24	141.17215	145.66275	·
	25	145.24086	149.98918	·
150	26	147.13604	102.82426	132.42983
	27	141.17505	97.34901	126.10924
	28	148.88192	105.89369	134.39149
	29	143.39508	113.77141	136.93551
	30	150.72735	114.01336	136.86648
	31	140.17355	145.28263	·
	32	143.44683	148.42256	·
	33	154.71079	160.95100	·
	34	148.73552	154.28754	·
	35	141.68854	146.55731	·

Radiation Level	Unit Serial	Delta CTR_2mA % post	Anneal 48hr
0	1	-1.03865	-1.08946
	2	-1.58032	-1.41852
	3	-19.55303	-19.60926
	4	-9.92192	-9.99870
	5	-5.46892	-5.60511
30	6	1.65476	·
	7	1.24470	·
	8	1.41488	·
	9	1.17473	·
	10	1.83836	·
50	11	-0.94087	·
	12	-0.58641	·
	13	-0.89213	·
	14	-0.22456	·
	15	-0.81763	·
100	16	-14.69979	-8.03542
	17	-15.76340	-7.91744
	18	-16.16884	-8.11557
	19	-14.38100	-8.44699
	20	-13.28166	-7.50289
	21	5.45253	·
	22	4.50030	·
	23	3.90720	·
	24	4.49060	·
	25	4.74832	·
150	26	-44.31177	-14.70621
	27	-43.82604	-15.06581
	28	-42.98823	-14.49042
	29	-29.62367	-6.45957
	30	-36.71398	-13.86087
	31	5.10908	·
	32	4.97572	·
	33	6.24021	·
	34	5.55203	·
	35	4.86877	·

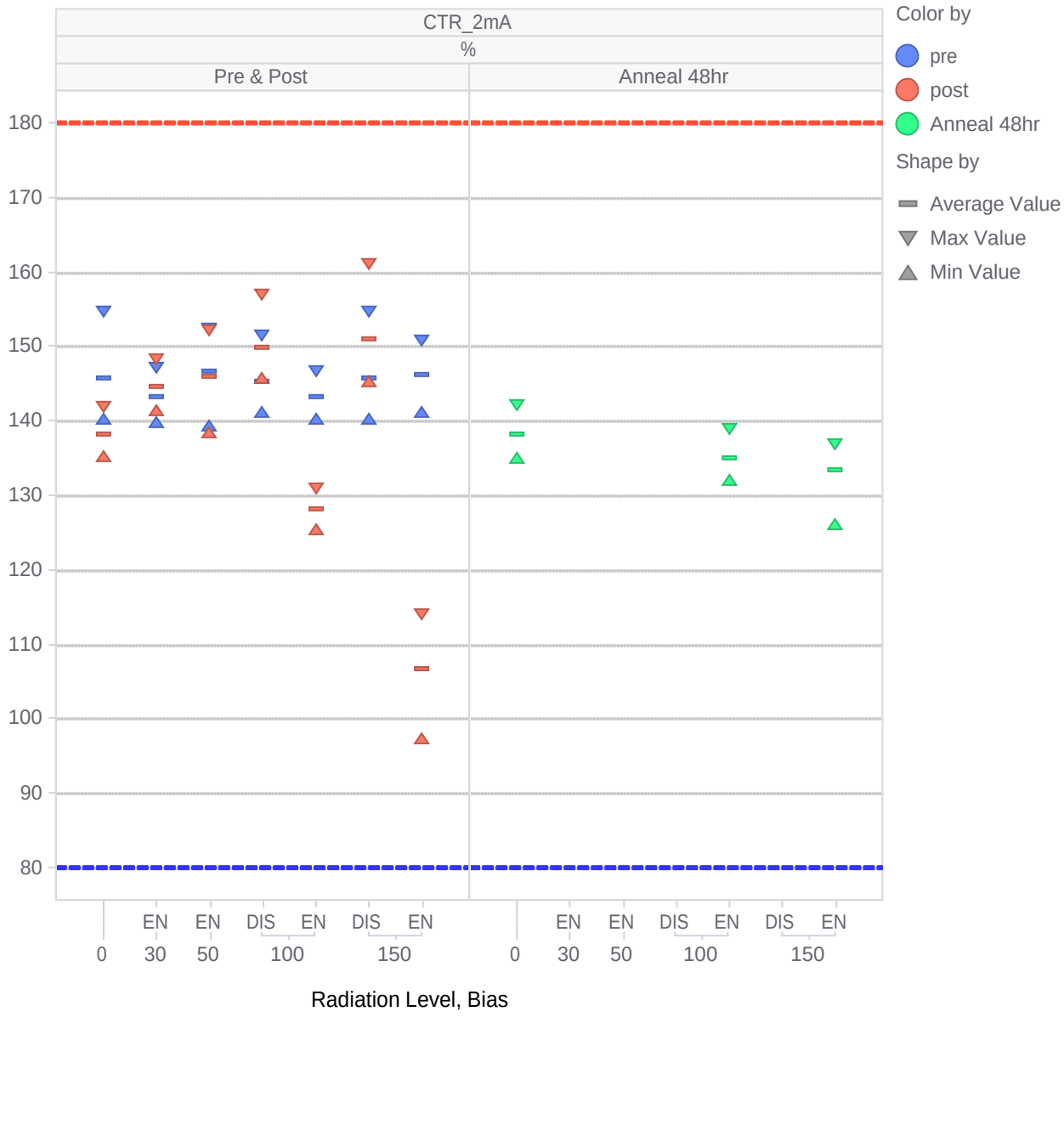
Colors

All values

Avg, Min and Max of Recorded Values

Radiation Level	Parameter	pre	post	Anneal 48hr
0	Max	154.7...	141....	142.02...
	Avg	145.7...	138....	138.20...
	Min	140.1...	135....	135.10...
30	Max	147.0...	148....	·
	Avg	143.1...	144....	·
	Min	139.8...	141....	·
50	Max	152.4...	152....	·
	Avg	146.6...	145....	·
	Min	139.3...	138....	·
100	Max	149.0...	143....	138.81...
	Avg	144.2...	139....	135.12...
	Min	140.6...	135....	132.15...
150	Max	152.7...	137....	136.93...
	Avg	146.0...	128....	133.34...
	Min	140.6...	121....	126.10...

Lower Test Limit	Upper Test Limit	Units
80.00	180.00	%



Radiation Level	Unit Serial	Recorded Value CTR_5mA % pre	post	Anneal 48hr	Radiation Level	Unit Serial	Delta CTR_5mA % post	Anneal 48hr
0	1	140.17355	139.13490	139.08409	0	1	-1.03865	-1.08946
	2	143.44683	141.86652	142.02832		2	-1.58032	-1.41852
	3	154.71079	135.15776	135.10153		3	-19.55303	-19.60926
	4	148.73552	138.81359	138.73682		4	-9.92192	-9.99870
	5	141.68854	136.21962	136.08342		5	-5.46892	-5.60511
30	6	142.74141	144.39617	·	30	6	1.65476	·
	7	147.01966	148.26436	·		7	1.24470	·
	8	139.89865	141.31352	·		8	1.41488	·
	9	140.84768	142.02241	·		9	1.17473	·
	10	145.26219	147.10055	·		10	1.83836	·
50	11	139.37585	138.43497	·	50	11	-0.94087	·
	12	148.51669	147.93028	·		12	-0.58641	·
	13	145.86572	144.97359	·		13	-0.89213	·
	14	152.45193	152.22737	·		14	-0.22456	·
	15	146.92247	146.10484	·		15	-0.81763	·
100	16	140.19325	125.49345	132.15783	100	16	-14.69979	-8.03542
	17	146.73450	130.97110	138.81705		17	-15.76340	-7.91744
	18	143.41989	127.25105	135.30433		18	-16.16884	-8.11557
	19	143.34279	128.96179	134.89580		19	-14.38100	-8.44699
	20	141.97284	128.69118	134.46995		20	-13.28166	-7.50289
	21	151.40411	156.85664	·		21	5.45253	·
	22	143.89416	148.39446	·		22	4.50030	·
	23	145.02621	148.93341	·		23	3.90720	·
	24	141.17215	145.66275	·		24	4.49060	·
	25	145.24086	149.98918	·		25	4.74832	·
150	26	147.13604	102.82426	132.42983	150	26	-44.31177	-14.70621
	27	141.17505	97.34901	126.10924		27	-43.82604	-15.06581
	28	148.88192	105.89369	134.39149		28	-42.98823	-14.49042
	29	143.39508	113.77141	136.93551		29	-29.62367	-6.45957
	30	150.72735	114.01336	136.86648		30	-36.71398	-13.86087
	31	140.17355	145.28263	·		31	5.10908	·
	32	143.44683	148.42256	·		32	4.97572	·
	33	154.71079	160.95100	·		33	6.24021	·
	34	148.73552	154.28754	·		34	5.55203	·
	35	141.68854	146.55731	·		35	4.86877	·

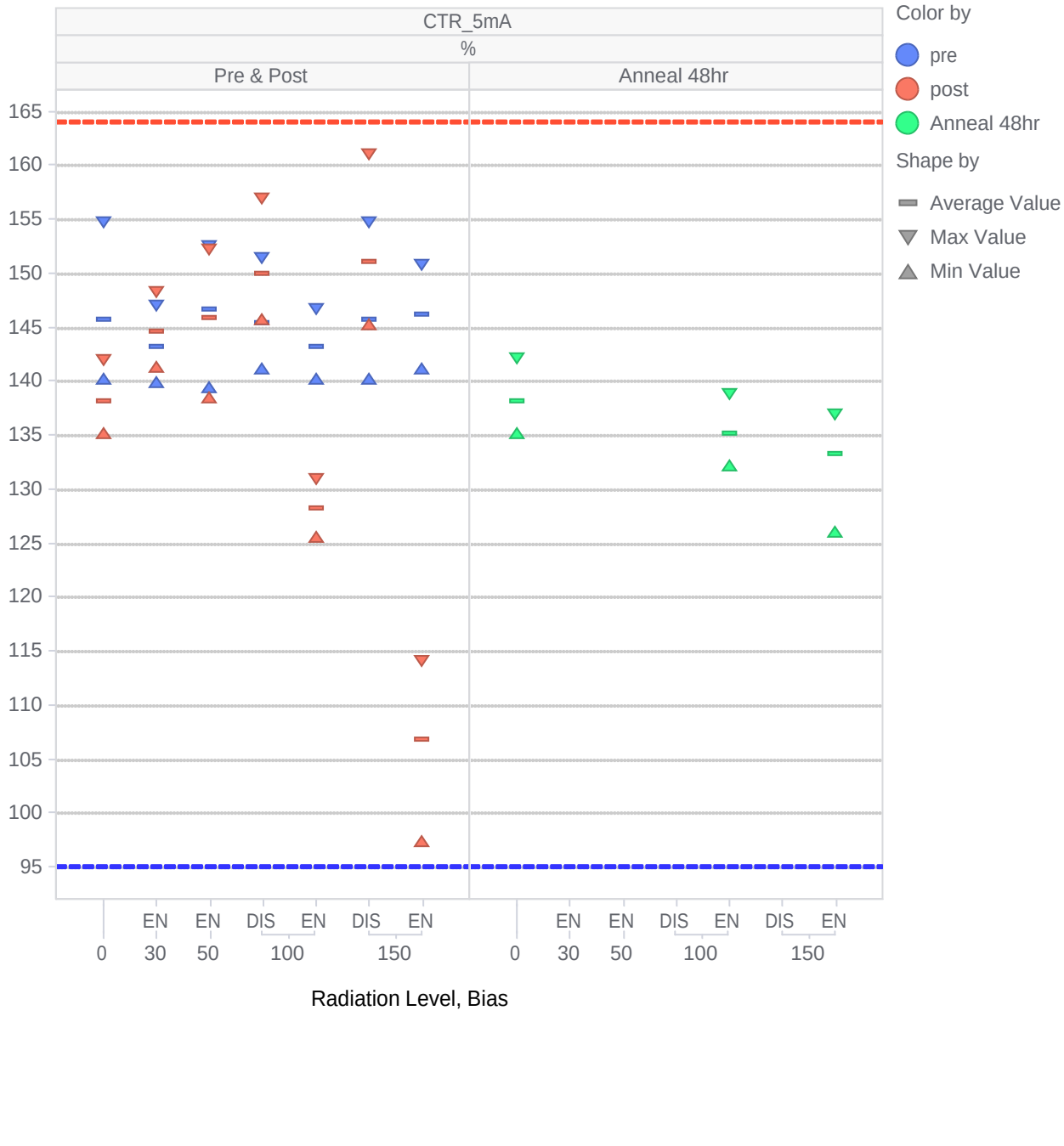
Colors

All values

Avg, Min and Max of Recorded Values

Radiation Level	Parameter	pre	post	Anneal 48hr
0	Max	154.7...	141....	142.02...
	Avg	145.7...	138....	138.20...
	Min	140.1...	135....	135.10...
30	Max	147.0...	148....	·
	Avg	143.1...	144....	·
	Min	139.8...	141....	·
50	Max	152.4...	152....	·
	Avg	146.6...	145....	·
	Min	139.3...	138....	·
100	Max	149.0...	143....	138.81...
	Avg	144.2...	139....	135.12...
	Min	140.6...	135....	132.15...
150	Max	152.7...	137....	136.93...
	Avg	146.0...	128....	133.34...
	Min	140.6...	121....	126.10...

Lower Test Limit	Upper Test Limit	Units
95.00	164.00	%



Radiation Level	Unit Serial	Recorded Value		
		IC_DARK		
		nA		
		pre	post	Anneal 48hr
0	1	20.98756	23.80023	27.47706
	2	20.46782	19.50926	23.41931
	3	18.52891	19.46802	22.77696
	4	17.89090	17.83488	23.45847
	5	17.52755	18.83313	22.80046
30	6	17.13775	20.24685	·
	7	17.86601	17.67538	·
	8	17.81777	17.83722	·
	9	16.70048	17.90335	·
	10	16.46940	18.89615	·
50	11	18.28071	17.44819	·
	12	18.62305	18.79578	·
	13	18.56859	23.70530	·
	14	18.04729	19.83137	·
	15	17.56957	17.59213	·
100	16	16.65224	6.69330k	19.76106
	17	24.14957	7.59969k	20.20757
	18	17.14242	6.12128k	22.98846
	19	16.25388	5.99521k	20.13707
	20	15.38868	4.46983k	21.93094
	21	17.42952	17.16031	·
	22	16.06170	16.79463	·
	23	16.80007	16.77751	·
	24	14.55305	16.04691	·
	25	16.30212	16.51297	·
150	26	17.26846	22.38831k	21.35909
	27	16.37370	22.64192k	20.73241
	28	15.64466	18.74530k	19.41638
	29	15.97689	15.49165k	22.09544
	30	15.74581	15.51664k	21.72727
	31	20.98756	20.45041	·
	32	20.46782	24.08516	·
	33	18.52891	21.61760	·
	34	17.89090	18.99338	·
	35	17.52755	20.94392	·

Radiation Level	Unit Serial	Delta	
		IC_DARK	
		nA	
		post	Anneal 48hr
0	1	2.81267	6.48950
	2	-0.95856	2.95149
	3	0.93911	4.24805
	4	-0.05602	5.56757
	5	1.30557	5.27291
30	6	3.10911	·
	7	-0.19062	·
	8	0.01945	·
	9	1.20287	·
	10	2.42675	·
50	11	-0.83252	·
	12	0.17273	·
	13	5.13672	·
	14	1.78408	·
	15	0.02256	·
100	16	6676.65033	3.10882
	17	7575.53813	-3.94200
	18	6104.13573	5.84605
	19	5978.95375	3.88319
	20	4454.43763	6.54226
	21	-0.26921	·
	22	0.73293	·
	23	-0.02257	·
	24	1.49386	·
	25	0.21085	·
150	26	22371.04411	4.09063
	27	22625.54784	4.35872
	28	18729.65414	3.77172
	29	15475.67738	6.11855
	30	15500.89774	5.98146
	31	-0.53715	·
	32	3.61734	·
	33	3.08869	·
	34	1.10247	·
	35	3.41637	·

Colors

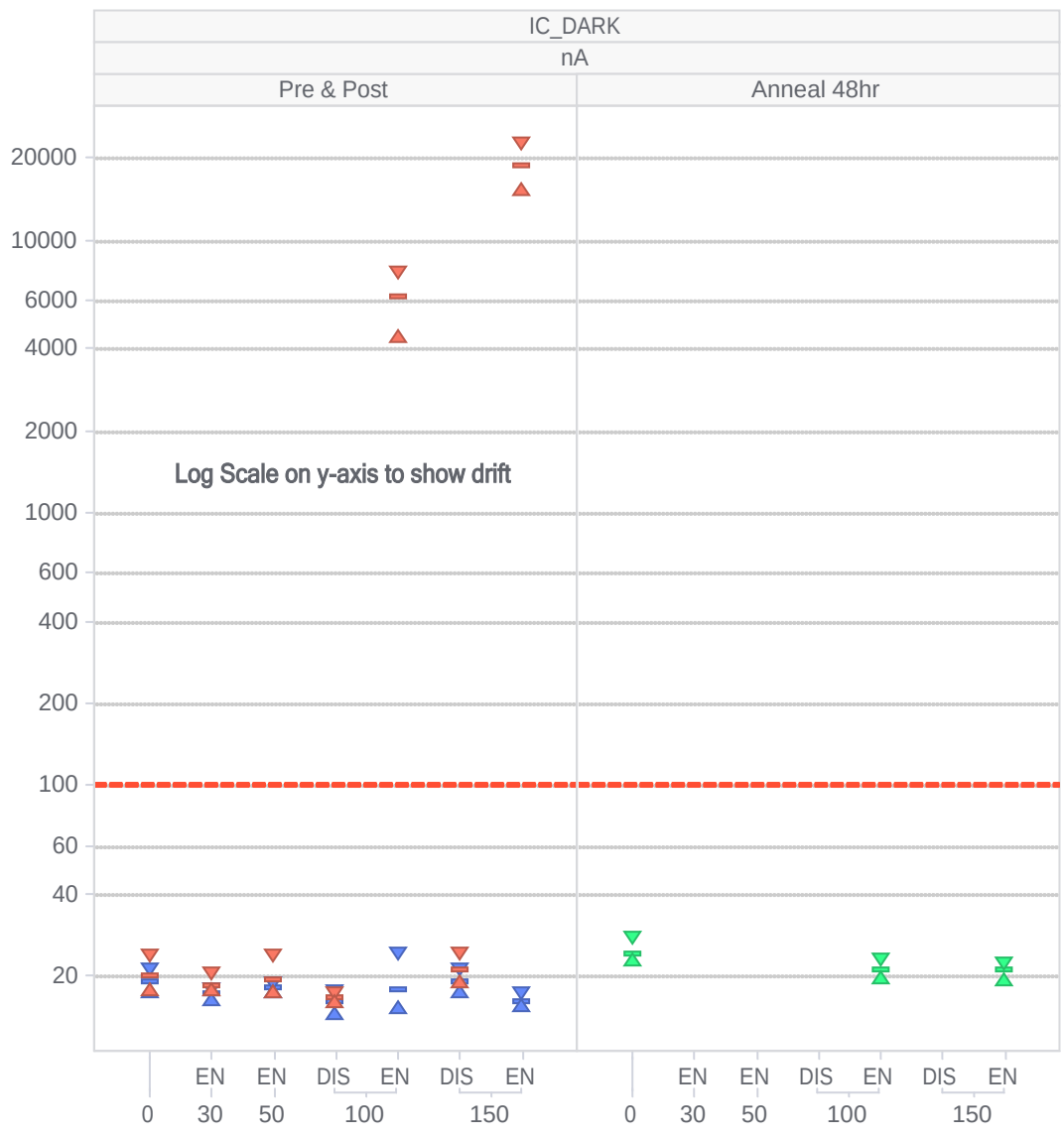
Delta > 50% of Pre

All other values

Avg, Min and Max of Recorded Values

Radiation Level	Parameter	pre	post	Anneal 48hr
0	Max	20.98...	23.8...	27.4771
	Avg	19.08...	19.8...	23.9865
	Min	17.52...	17.8...	22.7770
30	Max	17.86...	20.2...	·
	Avg	17.19...	18.5...	·
	Min	16.46...	17.6...	·
50	Max	18.62...	23.7...	·
	Avg	18.21...	19.4...	·
	Min	17.56...	17.4...	·
100	Max	20.78...	3808...	22.9885
	Avg	17.07...	3096...	21.0050
	Min	14.97...	2242...	19.7611
150	Max	19.12...	1133...	22.0954
	Avg	17.64...	9488...	21.0661
	Min	16.58...	7755...	19.4164

Lower Test Limit	Upper Test Limit	Units
-100.00	100.00	nA



Radiation Level	Unit Serial	Recorded Value IC_OFF uA pre	post	Anneal 48hr
0	1	0.47085	0.47764	0.47375
	2	0.45664	0.45689	0.45707
	3	0.45460	0.45530	0.45131
	4	0.45610	0.45455	0.45577
	5	0.45189	0.45198	0.45165
30	6	0.45180	0.46039	·
	7	0.45210	0.45842	·
	8	0.45465	0.45185	·
	9	0.45452	0.45614	·
	10	0.45212	0.45584	·
50	11	0.45884	0.45116	·
	12	0.45471	0.45208	·
	13	0.45962	0.46148	·
	14	0.45493	0.45002	·
	15	0.44981	0.44944	·
100	16	0.45516	7.16548	0.44526
	17	0.45404	8.05915	0.44923
	18	0.44852	6.58619	0.44985
	19	0.45219	6.42843	0.45252
	20	0.45068	4.91656	0.44894
	21	0.44972	0.45273	·
	22	0.44850	0.44951	·
	23	0.44867	0.44741	·
	24	0.44722	0.44604	·
	25	0.44824	0.45038	·
150	26	0.44893	22.91572	0.44937
	27	0.45331	23.19411	0.44710
	28	0.44974	19.24427	0.44720
	29	0.45086	16.01385	0.45285
	30	0.44824	16.00354	0.44293
	31	0.47085	0.45085	·
	32	0.45664	0.44917	·
	33	0.45460	0.44657	·
	34	0.45610	0.44343	·
	35	0.45189	0.44603	·

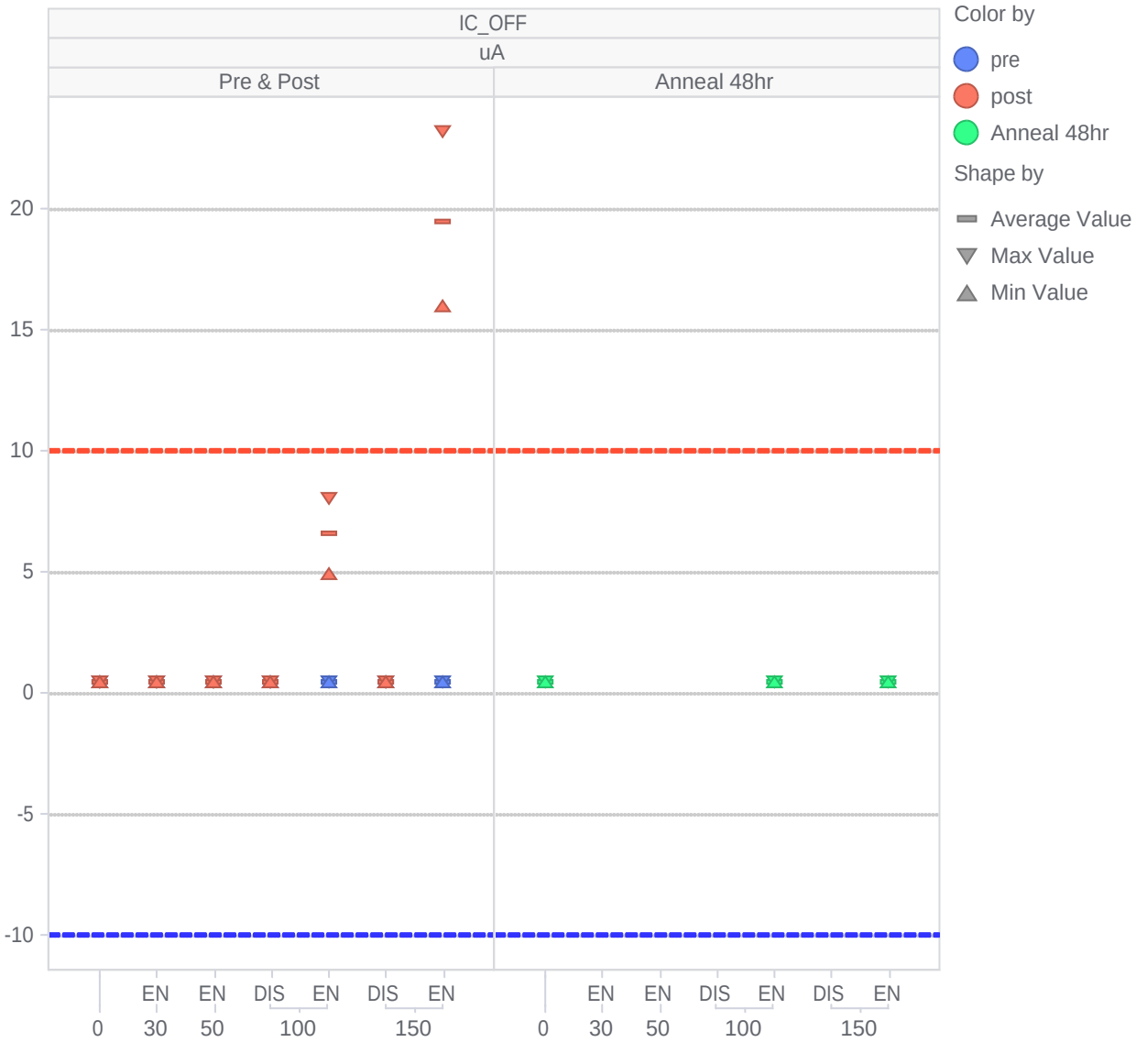
Radiation Level	Unit Serial	Delta IC_OFF uA post	Anneal 48hr
0	1	0.00679	0.00290
	2	0.00025	0.00043
	3	0.00070	-0.00329
	4	-0.00156	-0.00033
	5	0.00009	-0.00023
30	6	0.00859	·
	7	0.00632	·
	8	-0.00280	·
	9	0.00161	·
	10	0.00372	·
50	11	-0.00768	·
	12	-0.00264	·
	13	0.00186	·
	14	-0.00491	·
	15	-0.00037	·
100	16	6.71032	-0.00990
	17	7.60510	-0.00481
	18	6.13767	0.00133
	19	5.97624	0.00033
	20	4.46588	-0.00174
	21	0.00301	·
	22	0.00102	·
	23	-0.00126	·
	24	-0.00118	·
	25	0.00214	·
150	26	22.46679	0.00044
	27	22.74081	-0.00621
	28	18.79454	-0.00253
	29	15.56299	0.00198
	30	15.55530	-0.00531
	31	-0.02000	·
	32	-0.00747	·
	33	-0.00803	·
	34	-0.01267	·
	35	-0.00585	·

Colors
- Delta > 50% of Pre
- All other values

Avg, Min and Max of Recorded Values

Radiation Level	Parameter	pre	post	Anneal 48hr
0	Max	0.4708	0.4776	0.4737
	Avg	0.4580	0.4593	0.4579
	Min	0.4519	0.4520	0.4513
30	Max	0.4546	0.4604	·
	Avg	0.4530	0.4565	·
	Min	0.4518	0.4518	·
50	Max	0.4596	0.4615	·
	Avg	0.4556	0.4528	·
	Min	0.4498	0.4494	·
100	Max	0.4524	4.2559	0.4525
	Avg	0.4503	3.5402	0.4492
	Min	0.4479	2.6813	0.4453
150	Max	0.4621	11.8…	0.4528
	Avg	0.4541	9.9608	0.4479
	Min	0.4501	8.2235	0.4429

Lower Test Limit	Upper Test Limit	Units
-10.00	10.00	uA



Radiation Level	Unit Serial	Recorded Value		
		IEC		
		uA		
		pre	post	Anneal 48hr
0	1	-4.69853	-4.70342	-4.70367
	2	-4.64189	-4.68299	-4.67735
	3	-4.59828	-4.64333	-4.63574
	4	-4.60097	-4.67209	-4.67090
	5	-4.71858	-4.70479	-4.70223
30	6	-4.65843	-4.64314	·
	7	-4.63882	-4.62202	·
	8	-4.72177	-4.71626	·
	9	-4.67347	-4.66419	·
	10	-4.70956	-4.69847	·
50	11	-4.73456	-7.17899	·
	12	-4.62534	-7.41897	·
	13	-4.71457	-7.09685	·
	14	-4.66952	-6.54288	·
	15	-4.70429	-5.43220	·
100	16	-4.58950	-151.11323	-4.57058
	17	-4.74508	-180.84387	-4.71419
	18	-4.65824	-170.46860	-4.63775
	19	-4.71175	-148.62005	-4.69452
	20	-4.67697	-138.11652	-4.65661
	21	-4.62171	-4.61281	·
	22	-4.68719	-4.68124	·
	23	-4.58819	-4.58875	·
	24	-4.67998	-4.66820	·
	25	-4.72052	-4.71626	·
150	26	-4.65617	-468.13424	-4.64752
	27	-4.70417	-471.80479	-4.69001
	28	-4.58869	-452.52801	-4.57365
	29	-4.65768	-375.16863	-4.66914
	30	-4.68443	-374.61886	-4.66469
	31	-4.69853	-4.68725	·
	32	-4.64189	-4.63449	·
	33	-4.59828	-4.58643	·
	34	-4.60097	-4.59364	·
	35	-4.71858	-4.70968	·

Radiation Level	Unit Serial	Delta	
		IEC	
		uA	
		post	Anneal 48hr
0	1	-0.00489	-0.00514
	2	-0.04110	-0.03546
	3	-0.04505	-0.03747
	4	-0.07112	-0.06993
	5	0.01378	0.01635
30	6	0.01529	·
	7	0.01679	·
	8	0.00551	·
	9	0.00927	·
	10	0.01109	·
50	11	-2.44443	·
	12	-2.79363	·
	13	-2.38228	·
	14	-1.87336	·
	15	-0.72790	·
100	16	-146.52373	0.01892
	17	-176.09878	0.03089
	18	-165.81036	0.02049
	19	-143.90830	0.01723
	20	-133.43955	0.02036
	21	0.00890	·
	22	0.00595	·
	23	-0.00056	·
	24	0.01178	·
	25	0.00426	·
150	26	-463.47807	0.00865
	27	-467.10062	0.01416
	28	-447.93932	0.01504
	29	-370.51096	-0.01147
	30	-369.93443	0.01974
	31	0.01128	·
	32	0.00739	·
	33	0.01184	·
	34	0.00733	·
	35	0.00890	·

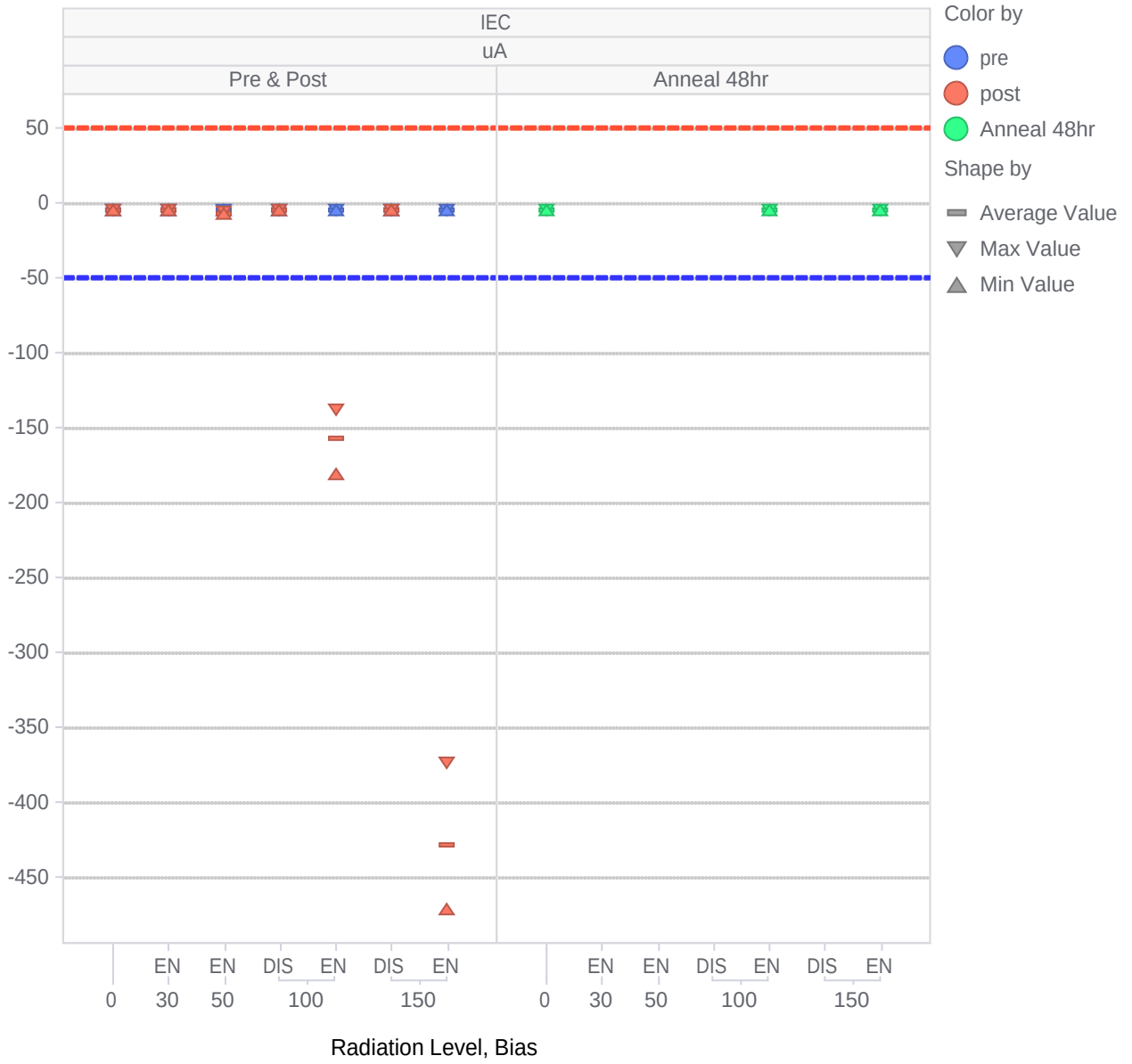
Colors

All values

Avg, Min and Max of Recorded Values

Radiation Level	Parameter	pre	post	Anneal 48hr
0	Max	-4.5983	-4.64…	-4.6357
	Avg	-4.6516	-4.68…	-4.6780
	Min	-4.7186	-4.70…	-4.7037
30	Max	-4.6388	-4.62…	·
	Avg	-4.6804	-4.66…	·
	Min	-4.7218	-4.71…	·
50	Max	-4.6253	-5.43…	·
	Avg	-4.6897	-6.73…	·
	Min	-4.7346	-7.41…	·
100	Max	-4.5888	-71.3…	-4.5706
	Avg	-4.6679	-81.2…	-4.6547
	Min	-4.7328	-92.7…	-4.7142
150	Max	-4.5935	-189.…	-4.5737
	Avg	-4.6549	-216.…	-4.6490
	Min	-4.7114	-238.…	-4.6900

Lower Test Limit	Upper Test Limit	Units
-50.00	50.00	uA



Radiation Level	Unit Serial	Recorded Value		
		IR		
		uA		
		pre	post	Anneal 48hr
0	1	-0.01302	-0.01168	-0.01451
	2	-0.01584	-0.01184	-0.01498
	3	-0.01662	-0.01592	-0.01247
	4	-0.01458	-0.01646	-0.01733
	5	-0.01372	-0.01380	-0.01278
30	6	-0.01560	-0.01498	·
	7	-0.01552	-0.01161	·
	8	-0.01545	-0.01302	·
	9	-0.01404	-0.01364	·
	10	-0.01466	-0.01364	·
50	11	-0.01498	-0.01505	·
	12	-0.01560	-0.01310	·
	13	-0.01693	-0.01662	·
	14	-0.01662	-0.01631	·
	15	-0.01349	-0.01513	·
100	16	-0.01576	-0.01513	-0.01388
	17	-0.01913	-0.01317	-0.01576
	18	-0.01498	-0.01474	-0.01639
	19	-0.01607	-0.01458	-0.01239
	20	-0.01521	-0.01427	-0.01686
	21	-0.01443	-0.01380	·
	22	-0.01349	-0.01270	·
	23	-0.01529	-0.01615	·
	24	-0.01317	-0.01200	·
	25	-0.01317	-0.01247	·
150	26	-0.01302	-0.01396	-0.01341
	27	-0.01780	-0.01380	-0.01419
	28	-0.01529	-0.01623	-0.01498
	29	-0.01654	-0.01458	-0.01451
	30	-0.01505	-0.01451	-0.01670
	31	-0.01302	-0.01498	·
	32	-0.01584	-0.01709	·
	33	-0.01662	-0.01748	·
	34	-0.01458	-0.01623	·
	35	-0.01372	-0.01772	·

Radiation Level	Unit Serial	Delta	
		IR	
		uA	
		post	Anneal 48hr
0	1	0.00133	-0.00149
	2	0.00400	0.00086
	3	0.00071	0.00415
	4	-0.00188	-0.00274
	5	-0.00008	0.00094
30	6	0.00063	·
	7	0.00392	·
	8	0.00243	·
	9	0.00039	·
	10	0.00102	·
50	11	-0.00008	·
	12	0.00251	·
	13	0.00031	·
	14	0.00031	·
	15	-0.00165	·
100	16	0.00063	0.00188
	17	0.00595	0.00337
	18	0.00024	-0.00141
	19	0.00149	0.00368
	20	0.00094	-0.00165
	21	0.00063	·
	22	0.00078	·
	23	-0.00086	·
	24	0.00118	·
	25	0.00071	·
150	26	-0.00094	-0.00039
	27	0.00400	0.00360
	28	-0.00094	0.00031
	29	0.00196	0.00204
	30	0.00055	-0.00165
	31	-0.00196	·
	32	-0.00125	·
	33	-0.00086	·
	34	-0.00165	·
	35	-0.00400	·

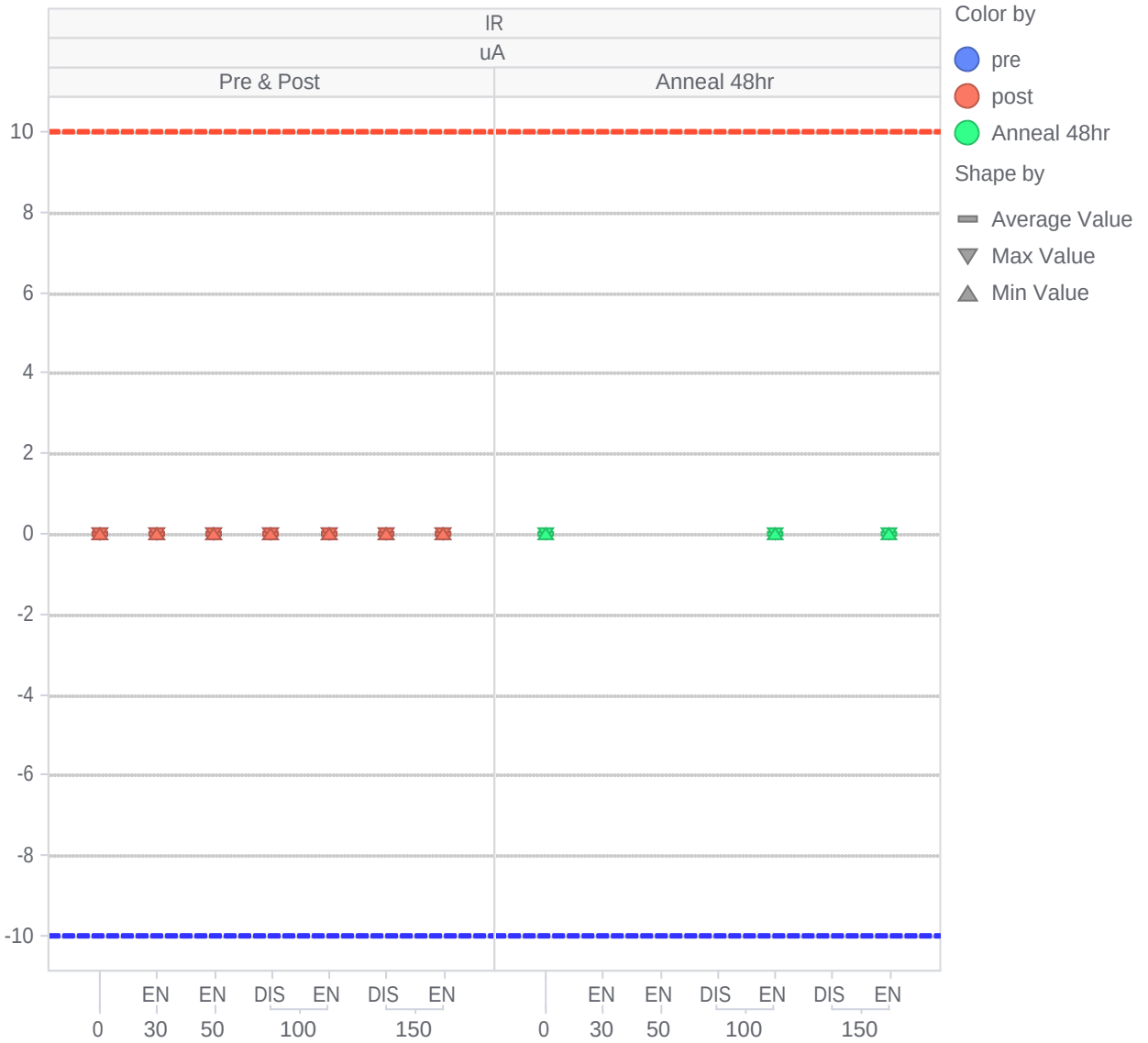
Colors

All values

Avg, Min and Max of Recorded Values

Radiation Level	Parameter	pre	post	Anneal 48hr
0	Max	-0.0130	-0.01…	-0.0125
	Avg	-0.0148	-0.01…	-0.0144
	Min	-0.0166	-0.01…	-0.0173
30	Max	-0.0140	-0.01…	·
	Avg	-0.0151	-0.01…	·
	Min	-0.0156	-0.01…	·
50	Max	-0.0135	-0.01…	·
	Avg	-0.0155	-0.01…	·
	Min	-0.0169	-0.01…	·
100	Max	-0.0141	-0.01…	-0.0124
	Avg	-0.0151	-0.01…	-0.0151
	Min	-0.0172	-0.01…	-0.0169
150	Max	-0.0130	-0.01…	-0.0134
	Avg	-0.0151	-0.01…	-0.0148
	Min	-0.0172	-0.01…	-0.0167

Lower Test Limit	Upper Test Limit	Units
-10.00	10.00	uA



Radiation Level	Unit Serial	Recorded Value VCE_SAT mV pre	post	Anneal 48hr
0	1	88.25798	87.93063	88.09806
	2	87.93063	88.08556	88.29047
	3	87.86067	89.08259	89.21503
	4	87.77321	88.13054	88.27048
	5	88.27048	88.39542	88.51786
30	6	88.27048	87.34591	·
	7	88.49037	87.62078	·
	8	88.55285	87.83818	·
	9	88.42290	87.81319	·
	10	88.73776	87.88066	·
50	11	88.47038	88.01060	·
	12	88.27297	87.78071	·
	13	88.40291	88.04309	·
	14	88.19801	87.84568	·
	15	88.28547	88.01810	·
100	16	89.00263	88.87769	89.57986
	17	88.06808	88.17802	88.77774
	18	88.62781	88.68028	89.17255
	19	88.88269	88.95516	89.54238
	20	88.80273	88.76774	89.21254
	21	88.44290	84.26487	·
	22	88.57533	84.47227	·
	23	88.56034	84.49475	·
	24	88.72526	84.68217	·
	25	88.46289	84.48726	·
150	26	88.35793	89.02262	89.94219
	27	88.38792	89.29750	90.03465
	28	87.99560	88.77024	89.46241
	29	88.31546	88.63031	89.42493
	30	87.93563	88.57533	89.34747
	31	88.25798	83.90503	·
	32	87.93063	83.35779	·
	33	87.86067	83.18787	·
	34	87.77321	83.38778	·
	35	88.27048	83.78009	·

Radiation Level	Unit Serial	Delta VCE_SAT mV post	Anneal 48hr
0	1	-0.32735	-0.15993
	2	0.15493	0.35983
	3	1.22192	1.35436
	4	0.35733	0.49727
	5	0.12494	0.24738
30	6	-0.92456	·
	7	-0.86959	·
	8	-0.71467	·
	9	-0.60971	·
	10	-0.85709	·
50	11	-0.45978	·
	12	-0.49227	·
	13	-0.35983	·
	14	-0.35234	·
	15	-0.26737	·
100	16	-0.12494	0.57723
	17	0.10995	0.70966
	18	0.05247	0.54474
	19	0.07246	0.65969
	20	-0.03498	0.40981
	21	-4.17803	·
	22	-4.10306	·
	23	-4.06559	·
	24	-4.04309	·
	25	-3.97563	·
150	26	0.66469	1.58425
	27	0.90957	1.64673
	28	0.77464	1.46681
	29	0.31485	1.10947
	30	0.63970	1.41183
	31	-4.35295	·
	32	-4.57285	·
	33	-4.67280	·
	34	-4.38543	·
	35	-4.49038	·

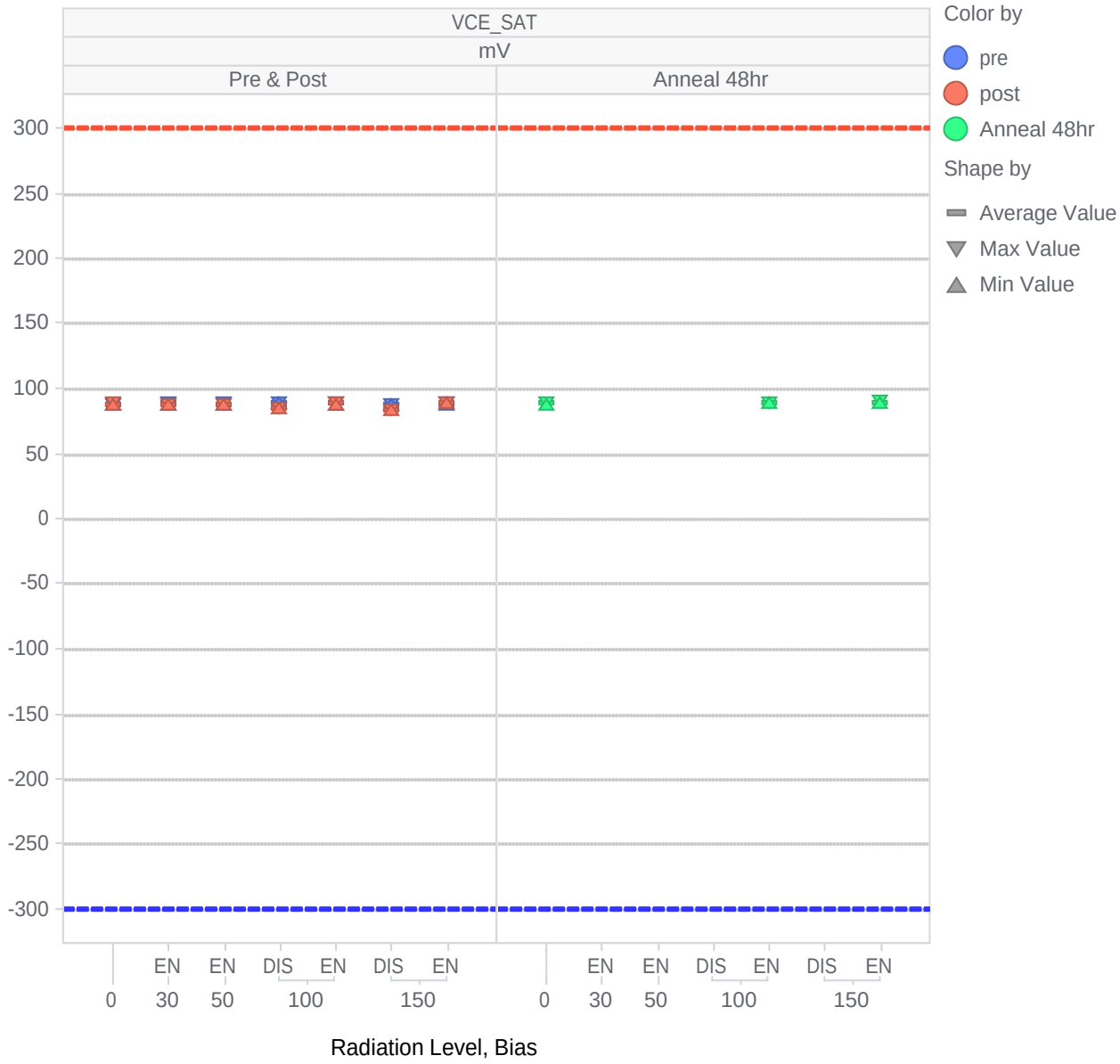
Colors

All values

Avg, Min and Max of Recorded Values

Radiation Level	Parameter	pre	post	Anneal 48hr
0	Max	88.27...	89.0...	89.2150
	Avg	88.01...	88.3...	88.4784
	Min	87.77...	87.9...	88.0981
30	Max	88.73...	87.8...	·
	Avg	88.49...	87.6...	·
	Min	88.27...	87.3...	·
50	Max	88.47...	88.0...	·
	Avg	88.32...	87.9...	·
	Min	88.19...	87.7...	·
100	Max	88.86...	86.8...	89.5799
	Avg	88.61...	86.5...	89.2570
	Min	88.25...	86.2...	88.7777
150	Max	88.32...	86.6...	90.0346
	Avg	88.10...	86.1...	89.6423
	Min	87.85...	85.8...	89.3475

Lower Test Limit	Upper Test Limit	Units
-300.00	300.00	mV



Radiation Level	Unit Serial	Recorded Value		
		VF_5mA		
		V		
		pre	post	Anneal 48hr
0	1	1.21753	1.21295	1.21333
	2	1.21335	1.21651	1.21712
	3	1.22537	1.21022	1.21074
	4	1.21675	1.21227	1.21274
	5	1.21930	1.21640	1.21672
30	6	1.20985	1.21317	·
	7	1.22240	1.22576	·
	8	1.21693	1.22106	·
	9	1.21743	1.22126	·
	10	1.21998	1.22406	·
50	11	1.21425	1.21667	·
	12	1.22606	1.22846	·
	13	1.22149	1.22401	·
	14	1.22394	1.22708	·
	15	1.21921	1.22272	·
100	16	1.21614	1.21310	1.21210
	17	1.22038	1.21749	1.21762
	18	1.21557	1.21274	1.21088
	19	1.21673	1.21470	1.21174
	20	1.21883	1.21646	1.21482
	21	1.22495	1.23031	·
	22	1.21862	1.22348	·
	23	1.21097	1.21555	·
	24	1.21566	1.22040	·
	25	1.21725	1.22287	·
150	26	1.21583	1.20490	1.20638
	27	1.21768	1.20552	1.20834
	28	1.21544	1.20462	1.20457
	29	1.22140	1.21366	1.21125
	30	1.22146	1.21359	1.21099
	31	1.21753	1.22390	·
	32	1.21335	1.21926	·
	33	1.22537	1.23206	·
	34	1.21675	1.22297	·
	35	1.21930	1.22471	·

Radiation Level	Unit Serial	Delta	
		VF_5mA	
		V	
		post	Anneal 48hr
0	1	-0.00459	-0.00420
	2	0.00316	0.00377
	3	-0.01514	-0.01463
	4	-0.00448	-0.00400
	5	-0.00290	-0.00258
30	6	0.00332	
	7	0.00336	
	8	0.00414	
	9	0.00383	
	10	0.00408	
50	11	0.00242	
	12	0.00240	
	13	0.00252	
	14	0.00314	
	15	0.00351	
100	16	-0.00305	-0.00405
	17	-0.00289	-0.00276
	18	-0.00283	-0.00469
	19	-0.00204	-0.00500
	20	-0.00237	-0.00401
	21	0.00536	
	22	0.00487	
	23	0.00458	
	24	0.00473	
	25	0.00562	
150	26	-0.01092	-0.00944
	27	-0.01216	-0.00934
	28	-0.01082	-0.01087
	29	-0.00774	-0.01015
	30	-0.00787	-0.01048
	31	0.00637	
	32	0.00591	
	33	0.00669	
	34	0.00623	
	35	0.00541	

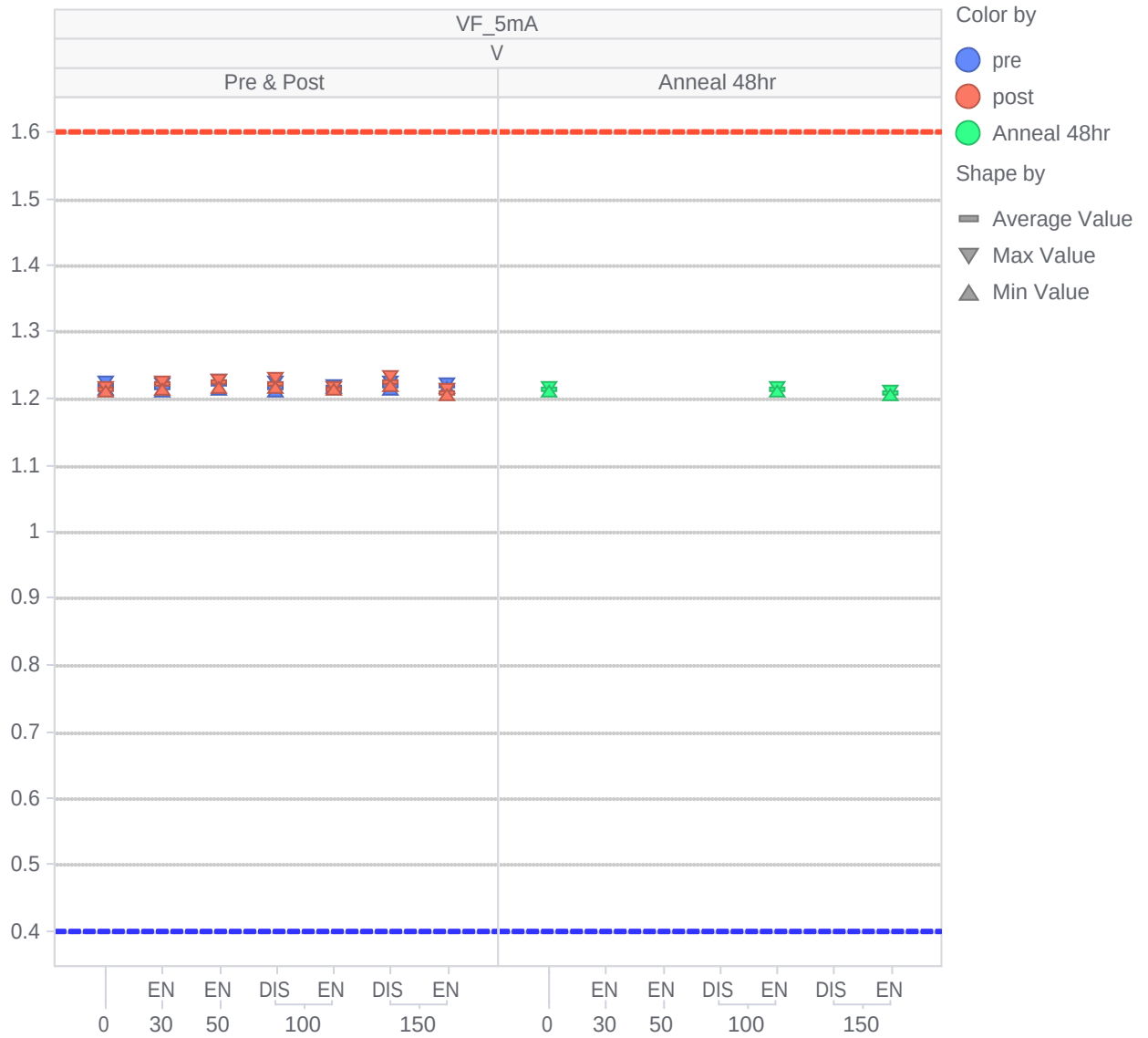
Colors

All values

Avg, Min and Max of Recorded Values

Radiation Level	Parameter	pre	post	Anneal 48hr
0	Max	1.2254	1.2165	1.2171
	Avg	1.2185	1.2137	1.2141
	Min	1.2134	1.2102	1.2107
30	Max	1.2224	1.2258	·
	Avg	1.2173	1.2211	·
	Min	1.2099	1.2132	·
50	Max	1.2261	1.2285	·
	Avg	1.2210	1.2238	·
	Min	1.2143	1.2167	·
100	Max	1.2227	1.2239	1.2176
	Avg	1.2175	1.2187	1.2134
	Min	1.2133	1.2141	1.2109
150	Max	1.2234	1.2229	1.2113
	Avg	1.2184	1.2165	1.2083
	Min	1.2144	1.2119	1.2046

Lower Test Limit	Upper Test Limit	Units
0.40	1.60	V



Radiation Level	Unit Serial	Recorded Value VF_10mA V pre	post	Anneal 48hr
0	1	1.32898	1.32565	1.32629
	2	1.32588	1.32724	1.32835
	3	1.33801	1.32351	1.32450
	4	1.33089	1.32431	1.32510
	5	1.33030	1.32871	1.32934
30	6	1.32156	1.31553	·
	7	1.33248	1.32745	·
	8	1.32813	1.32369	·
	9	1.32968	1.32484	·
	10	1.33018	1.32652	·
50	11	1.32616	1.31766	·
	12	1.33840	1.33014	·
	13	1.33467	1.32632	·
	14	1.33648	1.32914	·
	15	1.33118	1.32431	·
100	16	1.32669	1.31016	1.31406
	17	1.33273	1.31570	1.32084
	18	1.32628	1.31009	1.31307
	19	1.32898	1.31318	1.31559
	20	1.32972	1.31433	1.31717
	21	1.33514	1.33599	·
	22	1.33032	1.33004	·
	23	1.32297	1.32240	·
	24	1.33011	1.32959	·
	25	1.32903	1.32978	·
150	26	1.32870	1.30299	1.31001
	27	1.32990	1.30291	1.31084
	28	1.33001	1.30406	1.30983
	29	1.33415	1.31182	1.31566
	30	1.33413	1.31187	1.31520
	31	1.32898	1.33128	·
	32	1.32588	1.32794	·
	33	1.33801	1.34125	·
	34	1.33089	1.33298	·
	35	1.33030	1.33163	·

Radiation Level	Unit Serial	Delta VF_10mA V post	Anneal 48hr
0	1	-0.00333	-0.00268
	2	0.00137	0.00248
	3	-0.01450	-0.01351
	4	-0.00658	-0.00579
	5	-0.00158	-0.00095
30	6	-0.00603	·
	7	-0.00502	·
	8	-0.00444	·
	9	-0.00485	·
	10	-0.00366	·
50	11	-0.00851	·
	12	-0.00825	·
	13	-0.00835	·
	14	-0.00734	·
	15	-0.00687	·
100	16	-0.01653	-0.01263
	17	-0.01702	-0.01188
	18	-0.01619	-0.01322
	19	-0.01580	-0.01339
	20	-0.01539	-0.01255
	21	0.00085	·
	22	-0.00028	·
	23	-0.00056	·
	24	-0.00052	·
	25	0.00076	·
150	26	-0.02571	-0.01869
	27	-0.02699	-0.01906
	28	-0.02595	-0.02018
	29	-0.02233	-0.01849
	30	-0.02226	-0.01893
	31	0.00230	·
	32	0.00206	·
	33	0.00324	·
	34	0.00209	·
	35	0.00134	·

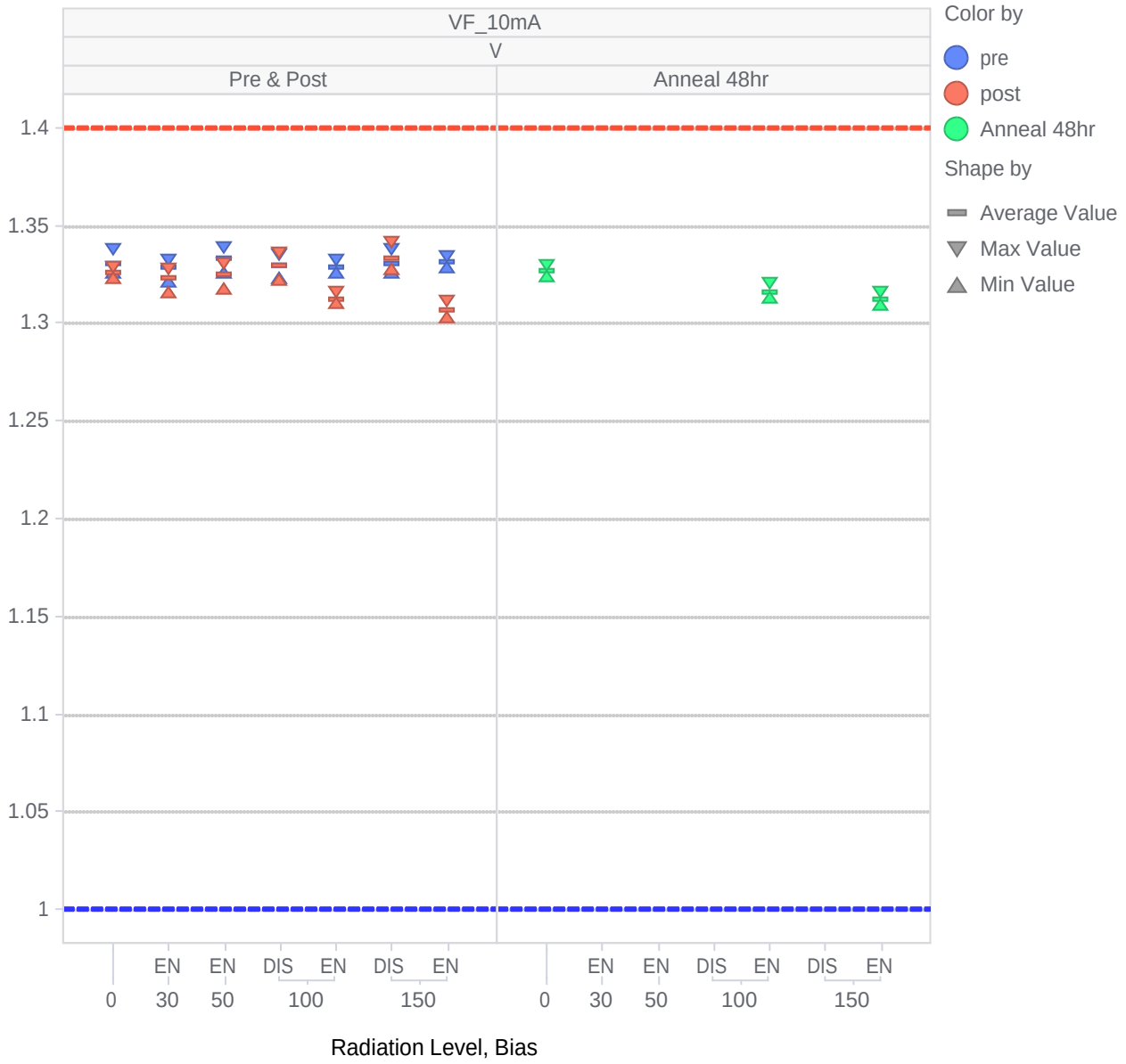
Colors

All values

Avg, Min and Max of Recorded Values

Radiation Level	Parameter	pre	post	Anneal 48hr
0	Max	1.3380	1.3287	1.3293
	Avg	1.3308	1.3259	1.3267
	Min	1.3259	1.3235	1.3245
30	Max	1.3325	1.3275	·
	Avg	1.3284	1.3236	·
	Min	1.3216	1.3155	·
50	Max	1.3384	1.3301	·
	Avg	1.3334	1.3255	·
	Min	1.3262	1.3177	·
100	Max	1.3339	1.3258	1.3208
	Avg	1.3292	1.3211	1.3161
	Min	1.3246	1.3162	1.3131
150	Max	1.3361	1.3266	1.3157
	Avg	1.3311	1.3199	1.3123
	Min	1.3273	1.3154	1.3098

Lower Test Limit	Upper Test Limit	Units
1.00	1.40	V



IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), 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 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, TI’s General Quality Guidelines, 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. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

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

Copyright © 2026, Texas Instruments Incorporated

Last updated 10/2025