Radiation Report

TPS7H2211-SP Neutron Displacement Damage (NDD) Characterization

ABSTRACT

This report presents the effect of neutron displacement damage (NDD) on the TPS7H2211-SP eFuse. The TPS7H2211-SP showed a strong degree of hardness to neutron irradiation up to fluence level 1×10^{13} n/cm^2.

The neutron irradiation test is a destructive test. Test procedure follows MIL-STD-883 method 1017 as guidance. The purpose of this test is to determine the device susceptibility to non-ionizing energy loss (NIEL) degradation. Objectives of the test are to detect and measure the degradation of critical device parameters as a function of neutron fluence and to determine if these parameters are within specified limits after exposure to a specified level of neutron fluence.

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Trademarks

1 Device Information

1.1 Product Description

The TPS7H2211-SP is a single channel eFuse that provides reverse current protection, overvoltage protection, and a configurable rise time to minimize inrush current (soft start). The device contains P-channel MOSFETs that operate over an input voltage range of 4.5 V to 14 V and supports a maximum continuous current of 3.5 A.

The eFuse is controlled by an on and off input (EN), which is capable of interfacing directly with low-voltage control signals. Overvoltage protection and soft start are programmable with few external components through the OVP and SS pins. The TPS7H2211-SP is available in a ceramic package with an exposed thermal pad allowing for improved thermal performance.

1.2 Device Details

Table 1-1 lists the device information and test conditions used in the NDD characterization.

Table 1-1. Device and Exposure Details

TI Device	TPS7H2211-SP
TI Part Name	PTPS7H2211HKR/EM
Device Function	eFuse
Package	16-pin CFP (HKR)
Technology	LBC7
Lot Number / Date Code	1005070 / 2119A
Sample quantity	9 + 1 control unit
Exposure Facility	Fast Neutron Irradiation (FNI) Facility of University of Massachusetts Lowell Research Reactor (UMLRR)
Neutron Fluence (1-MeV equivalent) Level	1×10^{12}, 5×10^{12}, 1×10^{13} n/cm^2
Irradiation Temperature	25°C

Figure 1-1. TPS7H2211-SP Device Photo (Front and Back)

2 Neutron Irradiation Test Setup

2.1 Test Overview

General test procedures adhere to MIL-STD-883, Method 1017 as a guide for neutron irradiation. The TPS7H2211-SP was electrically tested using the production automated test equipment (ATE) program at an ambient room temperature of 25°C before and after neutron irradiation.

2.2 Test Facility

The utilized test facility is the Fast Neutron Irradiation (FNI) Facility of University of Massachusetts Lowell Research Reactor. The neutron fluence for this irradiation was measured utilizing ASTM E-265 “Measuring Reaction Rates and Fast Neutron Fluence by Radioactivation of Sulfur-32” and correlated to the measured reactor power level. All irradiation conditions required under ASTM 722 were met, this includes neutron fluence, distribution, and uncertainty. The Average Integrated Neutron fluence (1-MeV(Si) equivalent) reflects these factors.

Detailed information of the radiation facility is available at the following link: https://www.uml.edu/docs/FNI%20Brochure_tcm18-90375.pdf

2.3 Test Setup Details

Devices were irradiated at three fluence levels in unbiased conditions: 1.0×10^{12} n/cm^2, 5.0×10^{12} n/cm^2 and 1.0×10^{13} n/cm^2.

Table 2-1. Neutron Irradiation Conditions

GROUP	SAMPLE QTY	NEUTRON FLUENCE (n/cm^2)	BIAS
A	3	1.0×10^{12}	Unbiased
B	3	5.0×10^{12}	Unbiased
C	3	1.0×10^{13}	Unbiased
Control Unit	1	N/A	N/A

3 Test Results

3.1 NDD Characterization Summary

The results show that all devices were fully functional and within specification limits. A sample size of nine units was exposed for neutron irradiation and an additional unirradiated control unit was used as correlation.

Overall, the TPS7H2211-SP showed a strong degree of hardness to neutron irradiation up to fluence level 1×10^{13} n/cm^2. The measurements taken post-irradiation for each sample set showed a marginal shift for most parameters at each fluence level. The parameters that showed a greater degree of change between pre- and post-irradiation were still within the electrical performance characteristics specified in data sheet electrical parameters table. See Table 3-1 for the data sheet electrical parameters and associated tests.

Electrical testing is done for pre- and post-neutron irradiation by ATE. ATE electrical test is done at an ambient room temperature of 25°C. Parameters not listed in the Table 3-1 are omitted either because there is no parametric data or because verification was done through bench testing.

See Appendix A for NDD report up to 1.0×10^{13} n/cm^2.

3.2 Data Sheet Electrical Parameters and Associated Tests

Table 3-1. TPS7H2211-SP Electrical Parameters Table

PARAMETER	TEST CONDITION		TPS7H2211-SP DATA SHEET (SLVSEW6)				ATE TEST NAME
			MIN	TYP	MAX	UNIT	
VIN_{UVLOR} Internal VIN UVLO rising			3.2	3.4	3.8	V	5.0 __VIN_UVLO_RISING
VIN_{UVLOF} Internal VIN UVLO falling			2.6	2.9	3.2	V	5.1 __VIN_UVLO_FALLING
$HYST_{VIN-UVLO}$ Internal VIN UVLO hysteresis				0.55	0.75	V	5.2 __VIN_UVLO_HYSTERESIS
I_Q Quiescent current	I_{OUT} = 0 mA, EN = 7 V			5	10	mA	3.0 __IQ_Vin_4p5V 3.2 __IQ_Vin_14p0V
I_F VIN to VOUT forward leakage current	EN = 0 V, VOUT = 0 V, measured VOUT current	VIN = 14 V		1	1.3	mA	4.9 __Forward_Leakage_14p0V
		VIN = 12 V		0.65	0.94	mA	4.7 __Forward_Leakage_12p0V
		VIN = 9 V		0.15	0.49	mA	4.5 __Forward_Leakage_9p0V
		VIN = 4.5 V		0.04	0.23	mA	4.1 __Forward_Leakage_4p5V
I_{SD} VIN off-state supply current	EN = 0 V, VOUT = 0 V, measured VIN current	VIN = 14 V		6.9	10	mA	4.8 __ISD_Vin_14p0V
		VIN = 12 V		5.9	9.5	mA	4.6 __ISD_Vin_12p0V
		VIN = 9V		4.4	8	mA	4.4 __ISD_Vin_9p0V
		VIN = 4.5V		3.7	7	mA	4.0 __ISD_Vin_4p5V
I_{RCP} Reverse current protection leakage current	EN = 0 V, VOUT = 0 to 14 V and VOUT > VIN			44	250	µA	3.1 __IRCP_EN0p0V_4p5V 3.3 __IRCP_EN0p0V_14p0V
	EN = 7 V, VIN = 0 V, VOUT = 0 to 14 V			37	240	µA	3.4 __IRCP_EN7p0V_4p5V 3.5 __IRCP_EN7p0V_14p0V
I_{SS} Soft start charge current				65	83	µA	6.3 __SS_Icharge_4p5V 6.7 __SS_Icharge_14V
V_{IHEN} EN threshold voltage, rising			0.60	0.63	0.68	V	6.0 __EN_UVLO_RISING_4p5V 6.4 __EN_UVLO_RISING_14V
V_{ILEN} EN threshold voltage, falling			0.50	0.52	0.57	V	6.1 __EN_UVLO_FALLING_4p5V 6.5 __EN_UVLO_FALLING_14V
$HYST_{EN}$ EN hysteresis voltage			94	109	139	mV	6.2 __EN_UVLO_HYSTERESIS_4p5V 6.6 __EN_UVLO_HYSTERESIS_14V

Table 3-1. TPS7H2211-SP Electrical Parameters Table (continued)

PARAMETER	TEST CONDITION	TPS7H2211-SP DATA SHEET (SLVSEW6)				ATE TEST NAME
		MIN	TYP	MAX	UNIT	
I_{EN} EN pin input leakage current	EN = 7 V, VIN = 14 V		2	12	nA	6.8 __EN7p0V_I_Vin14V
V_{OVPR} OVP threshold voltage, rising		1.11	1.15	1.18	V	7.0 __OVP_UVLO_RISING_4p5V 7.3 __OVP_UVLO_RISING_14p0V
V_{OVPF} OVP threshold voltage, falling		1.09	1.14	1.17	V	7.1 __OVP_UVLO_FALLING_4p5V 7.4 __OVP_UVLO_FALLING_14p0V
$HYST_{OVP}$ OVP hysteresis voltage	4.6 V < VIN < 14 V	5	14	40	mV	7.2 __OVP_UVLO_HYSTERESIS_4p5V 7.5 __OVP_UVLO_HYSTERESIS_14p0V
I_{OVP} OVP pin input leakage current	OVP = 7 V		1.5	12	nA	7.6 __OVP_I_Vin7V 7.7 __OVP_I_Vin5V 7.8 __OVP_I_Vin3p3V 7.9 __OVP_I_Vin1p8V 7.10__OVP_I_Vin1p5V
R_{ON} On-state resistance, lead length ≈ 2.5 mm	VIN = 14 V, IOUT = 3.5 A, 25°C		54	60	mΩ	8.4 __RdsOn_3p50A_14p0V
	VIN = 12 V, IOUT = 3.5 A, 25°C		54	60	mΩ	8.3 __RdsOn_3p50A_12p0V
	VIN = 9 V, IOUT = 3.5 A, 25°C		54	61	mΩ	8.2 __RdsOn_3p50A_9p0V
	VIN = 6 V, IOUT = 3.5 A, 25°C		54	61	mΩ	8.1 __RdsOn_3p50A_6p0V
	VIN = 4.5 V, IOUT = 3.5 A, 25°C		59	65	mΩ	8.0 __RdsOn_3p50A_4p5V

4 Applicable and Reference Documents

Texas Instruments Neutron Irradiation test follow the guideline from MIL-STD-883 TM 1017. The document is available in Defense Logistic Agency's website.

4.1 Applicable Documents

- Texas Instruments, *TPS7H2211-SP Radiation-Hardness-Assured (RHA) 14-V, 3.5-A eFuse* data sheet
- Texas Instruments, *TPS7H2211EVM-CVAL Evaluation Module* user's guide
- Texas Instruments, *Single-Event-Effects Test Report of the TPS7H2211-SP eFuse* radiation report
- Texas Instruments, *TPS7H2211-SP Total Ionizing Dose (TID)* radiation report

A Appendix: NDD Report Data

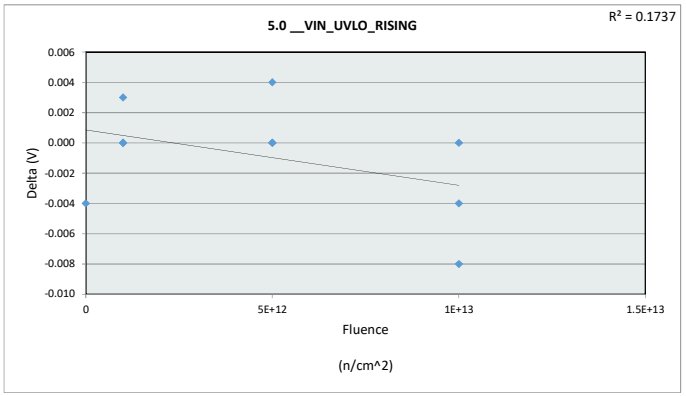
This appendix contains the NDD report data.

Neutron Displacement Damage (NDD) Report **for** TPS7H2211-SP

Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

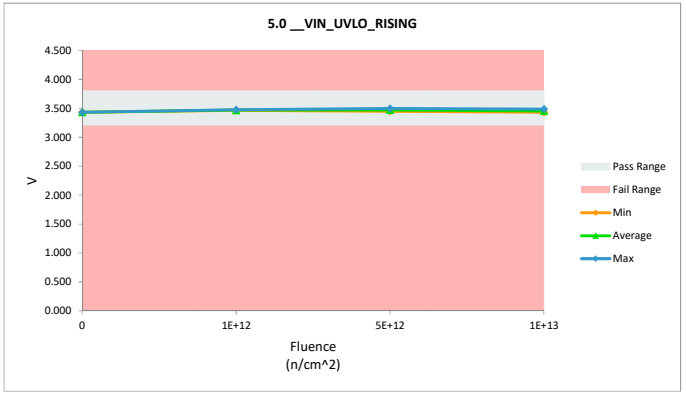
	5.0 __VIN_UVLO_RISING	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	3.8	3.8
Min Limit	3.2	3.2

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	3.435	3.431	-0.004
1E+12	1	3.476	3.476	0.000
1E+12	2	3.465	3.465	0.000
1E+12	3	3.465	3.468	0.003
5E+12	4	3.442	3.446	0.004
5E+12	5	3.472	3.472	0.000
5E+12	6	3.498	3.498	0.000
1E+13	7	3.450	3.446	-0.004
1E+13	8	3.439	3.431	-0.008
1E+13	9	3.487	3.487	0.000
	Max	3.498	3.498	0.004
	Average	3.463	3.462	-0.001
	Min	3.435	3.431	-0.008
	Std Dev	0.021	0.023	0.004



	5.0 __VIN_UVLO_RISING			
Test Site				
Tester				
Test Number				
Max Limit	3.8	V		
Min Limit	3.2	V		

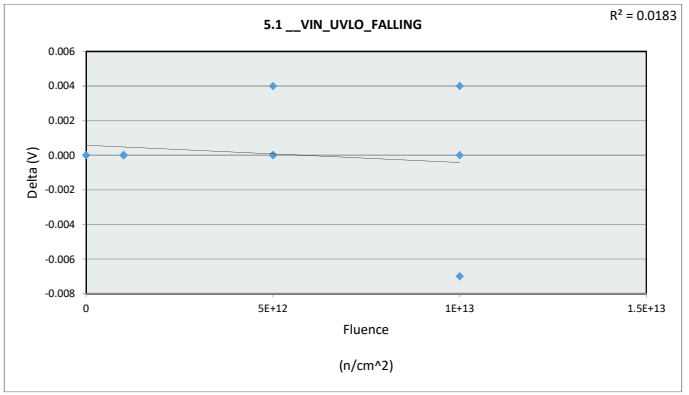
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	3.200	3.200	3.200	3.200
Min	3.431	3.465	3.446	3.431
Average	3.431	3.470	3.472	3.455
Max	3.431	3.476	3.498	3.487
UL	3.800	3.800	3.800	3.800



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

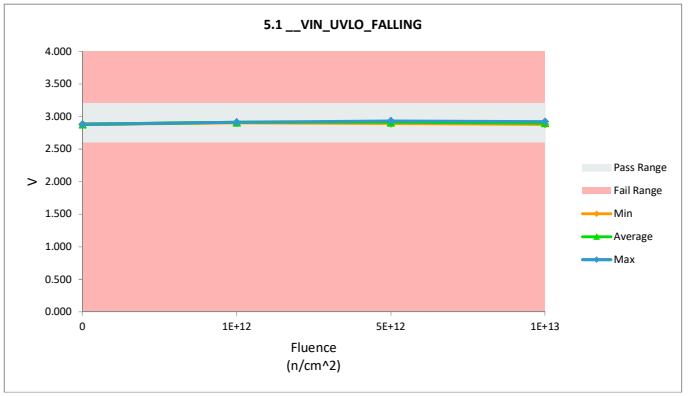
5.1 __VIN_UVLO_FALLING		
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	3.2	3.2
Min Limit	2.6	2.6

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	2.880	2.880	0.000
1E+12	1	2.913	2.913	0.000
1E+12	2	2.909	2.909	0.000
1E+12	3	2.905	2.905	0.000
5E+12	4	2.887	2.891	0.004
5E+12	5	2.909	2.909	0.000
5E+12	6	2.931	2.931	0.000
1E+13	7	2.891	2.891	0.000
1E+13	8	2.887	2.880	-0.007
1E+13	9	2.920	2.924	0.004
	Max	2.931	2.931	0.004
	Average	2.903	2.903	0.000
	Min	2.880	2.880	-0.007
	Std Dev	0.016	0.017	0.003



5.1 __VIN_UVLO_FALLING				
Test Site				
Tester				
Test Number				
Max Limit	3.2	V		
Min Limit	2.6	V		

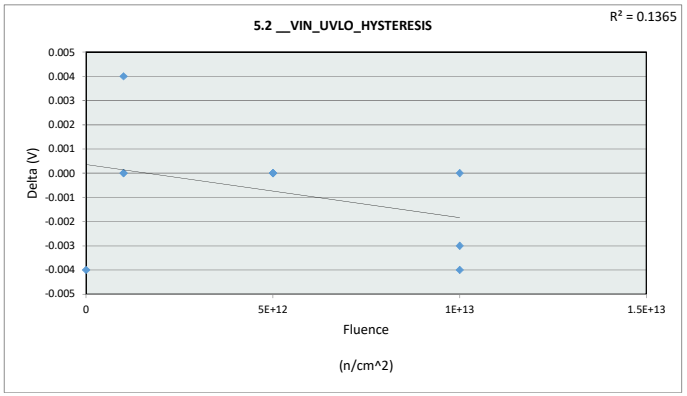
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	2.600	2.600	2.600	2.600
Min	2.880	2.905	2.891	2.880
Average	2.880	2.909	2.910	2.898
Max	2.880	2.913	2.931	2.924
UL	3.200	3.200	3.200	3.200



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

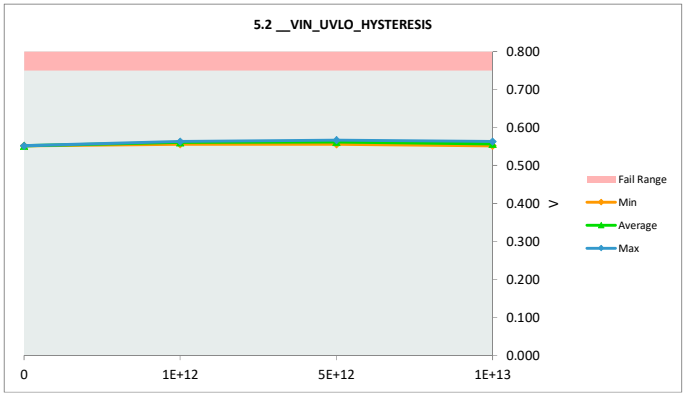
	5.2 __VIN_UVLO_HYSTERESIS	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	0.75	0.75
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	0.556	0.552	-0.004
1E+12	1	0.563	0.563	0.000
1E+12	2	0.556	0.556	0.000
1E+12	3	0.559	0.563	0.004
5E+12	4	0.556	0.556	0.000
5E+12	5	0.563	0.563	0.000
5E+12	6	0.567	0.567	0.000
1E+13	7	0.559	0.556	-0.003
1E+13	8	0.552	0.552	0.000
1E+13	9	0.567	0.563	-0.004
	Max	0.567	0.567	0.004
	Average	0.560	0.559	-0.001
	Min	0.552	0.552	-0.004
	Std Dev	0.005	0.005	0.002



	5.2 __VIN_UVLO_HYSTERESIS			
Test Site				
Tester				
Test Number				
Max Limit	0.75	V		
Min Limit		V		

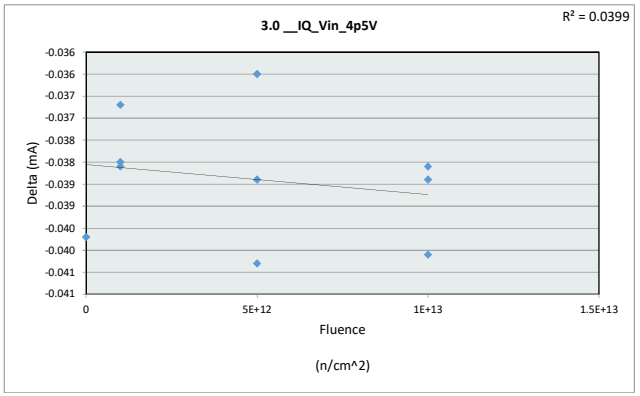
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	0.552	0.556	0.556	0.552
Average	0.552	0.561	0.562	0.557
Max	0.552	0.563	0.567	0.563
UL	0.750	0.750	0.750	0.750



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

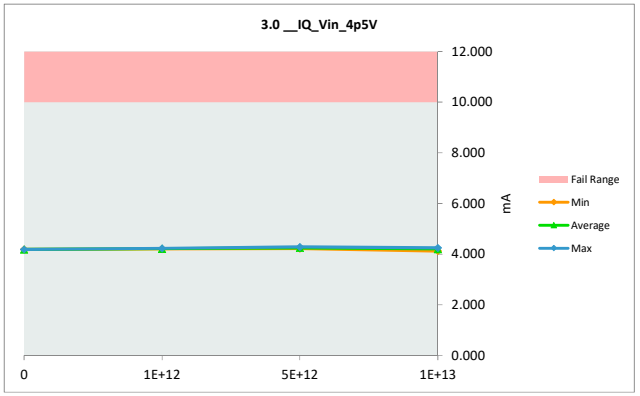
	3.0 __IQ_Vin_4p5V	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	10	10
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	4.225	4.185	-0.040
1E+12	1	4.236	4.198	-0.038
1E+12	2	4.261	4.223	-0.038
1E+12	3	4.266	4.230	-0.037
5E+12	4	4.261	4.222	-0.038
5E+12	5	4.274	4.238	-0.036
5E+12	6	4.326	4.286	-0.040
1E+13	7	4.262	4.224	-0.038
1E+13	8	4.289	4.249	-0.040
1E+13	9	4.159	4.121	-0.038
	Max	4.326	4.286	-0.036
	Average	4.256	4.218	-0.038
	Min	4.159	4.121	-0.040
	Std Dev	0.044	0.044	0.001



	3.0 __IQ_Vin_4p5V	
Test Site		
Tester		
Test Number		
Max Limit	10	mA
Min Limit		mA

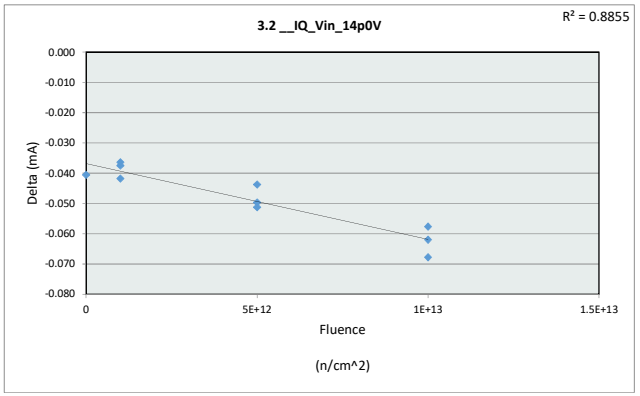
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	4.185	4.198	4.222	4.121
Average	4.185	4.217	4.249	4.198
Max	4.185	4.230	4.286	4.249
UL	10.000	10.000	10.000	10.000



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

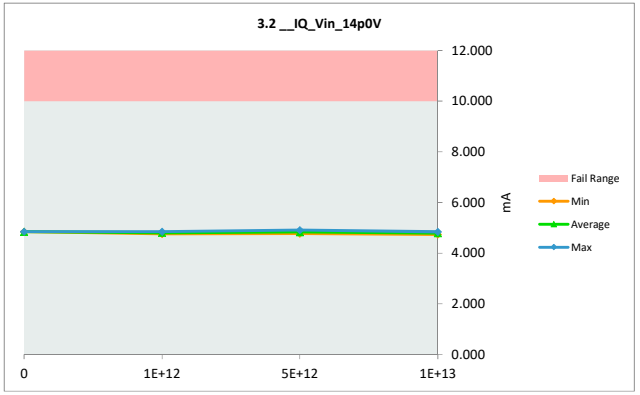
	3.2 __IQ_Vin_14p0V	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	10	10
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	4.890	4.849	-0.041
1E+12	1	4.861	4.820	-0.042
1E+12	2	4.793	4.757	-0.036
1E+12	3	4.884	4.846	-0.037
5E+12	4	4.823	4.772	-0.051
5E+12	5	4.852	4.808	-0.044
5E+12	6	4.960	4.911	-0.050
1E+13	7	4.905	4.843	-0.062
1E+13	8	4.853	4.785	-0.068
1E+13	9	4.796	4.738	-0.058
	Max	4.960	4.911	-0.036
	Average	4.862	4.813	-0.049
	Min	4.793	4.738	-0.068
	Std Dev	0.051	0.052	0.011



	3.2 __IQ_Vin_14p0V	
Test Site		
Tester		
Test Number		
Max Limit	10	mA
Min Limit		mA

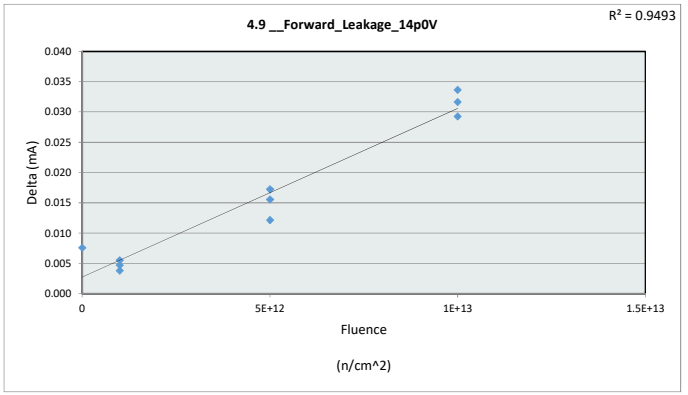
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	4.849	4.757	4.772	4.738
Average	4.849	4.808	4.830	4.789
Max	4.849	4.846	4.911	4.843
UL	10.000	10.000	10.000	10.000



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

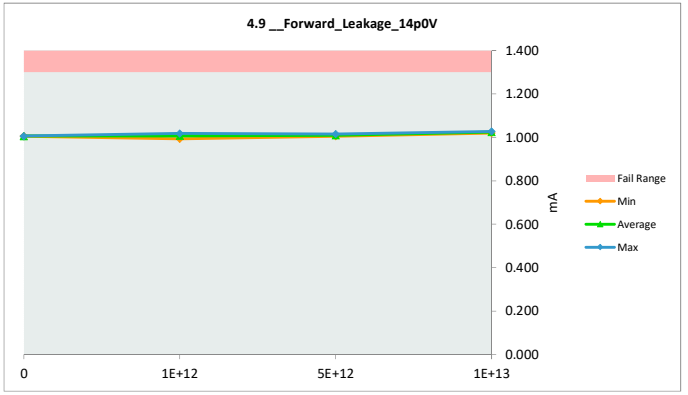
	4.9 __Forward_Leakage_14p0V	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	1.3	1.3
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	0.998	1.006	0.008
1E+12	1	1.014	1.018	0.004
1E+12	2	0.988	0.994	0.006
1E+12	3	1.005	1.010	0.005
5E+12	4	0.998	1.016	0.017
5E+12	5	0.996	1.008	0.012
5E+12	6	0.990	1.006	0.016
1E+13	7	0.989	1.020	0.032
1E+13	8	0.996	1.025	0.029
1E+13	9	0.994	1.027	0.034
	Max	1.014	1.027	0.034
	Average	0.997	1.013	0.016
	Min	0.988	0.994	0.004
	Std Dev	0.008	0.010	0.012



	4.9 __Forward_Leakage_14p0			
Test Site				
Tester				
Test Number				
Max Limit	1.3	mA		
Min Limit		mA		

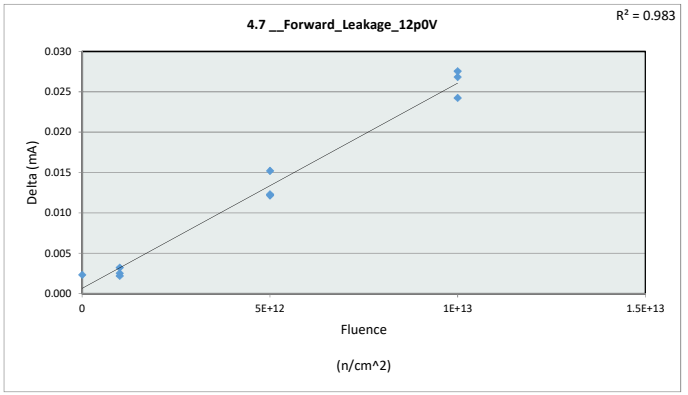
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	1.006	0.994	1.006	1.020
Average	1.006	1.007	1.010	1.024
Max	1.006	1.018	1.016	1.027
UL	1.300	1.300	1.300	1.300



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

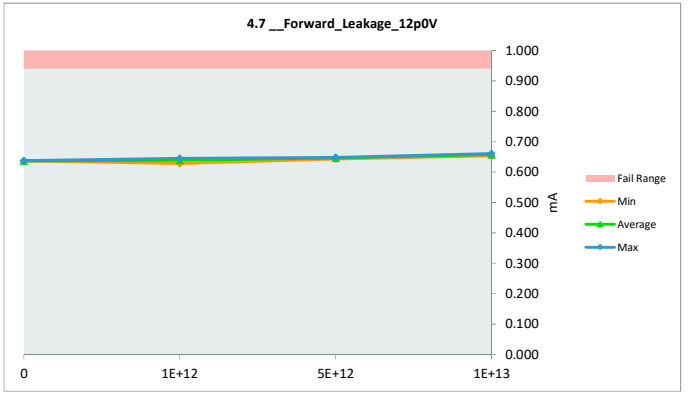
	4.7 __Forward_Leakage_12p0V	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	0.94	0.94
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	0.635	0.637	0.002
1E+12	1	0.643	0.645	0.002
1E+12	2	0.625	0.628	0.003
1E+12	3	0.641	0.643	0.003
5E+12	4	0.633	0.648	0.015
5E+12	5	0.636	0.648	0.012
5E+12	6	0.631	0.644	0.012
1E+13	7	0.626	0.653	0.028
1E+13	8	0.636	0.661	0.024
1E+13	9	0.634	0.661	0.027
	Max	0.643	0.661	0.028
	Average	0.634	0.647	0.013
	Min	0.625	0.628	0.002
	Std Dev	0.006	0.010	0.010



	4.7 __Forward_Leakage_12p0	
Test Site		
Tester		
Test Number		
Max Limit	0.94	mA
Min Limit		mA

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	0.637	0.628	0.644	0.653
Average	0.637	0.639	0.647	0.658
Max	0.637	0.645	0.648	0.661
UL	0.940	0.940	0.940	0.940



Neutron Displacement Damage (NDD) Report
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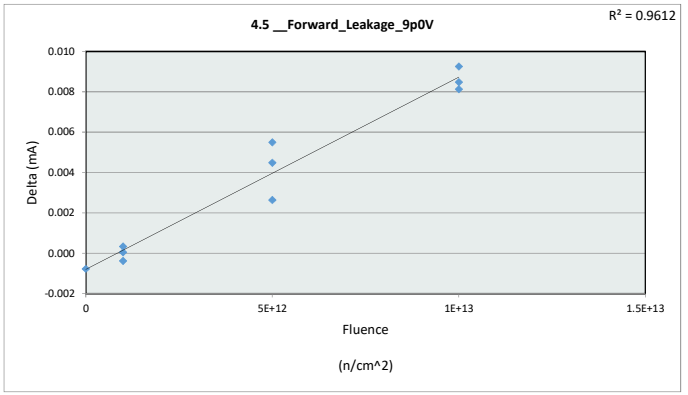
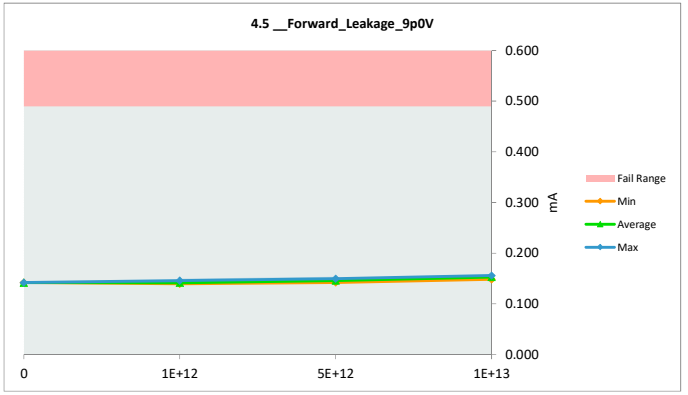
	4.5 __Forward_Leakage_9p0V	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	0.49	0.49
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	0.143	0.142	-0.001
1E+12	1	0.140	0.140	0.000
1E+12	2	0.139	0.139	0.000
1E+12	3	0.146	0.146	0.000
5E+12	4	0.137	0.142	0.005
5E+12	5	0.145	0.150	0.004
5E+12	6	0.144	0.147	0.003
1E+13	7	0.139	0.148	0.009
1E+13	8	0.147	0.155	0.008
1E+13	9	0.147	0.156	0.008
	Max	0.147	0.156	0.009
	Average	0.143	0.147	0.004
	Min	0.137	0.139	-0.001
	Std Dev	0.004	0.006	0.004



	4.5 __Forward_Leakage_9p0V	
Test Site		
Tester		
Test Number		
Max Limit	0.49	mA
Min Limit		mA

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	0.142	0.139	0.142	0.148
Average	0.142	0.142	0.146	0.153
Max	0.142	0.146	0.150	0.156
UL	0.490	0.490	0.490	0.490



Neutron Displacement Damage (NDD) Report
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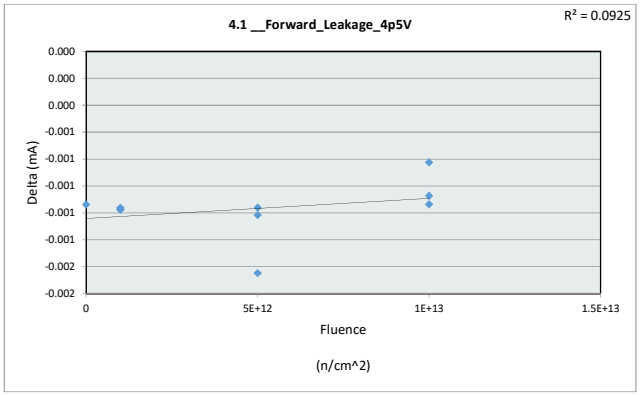
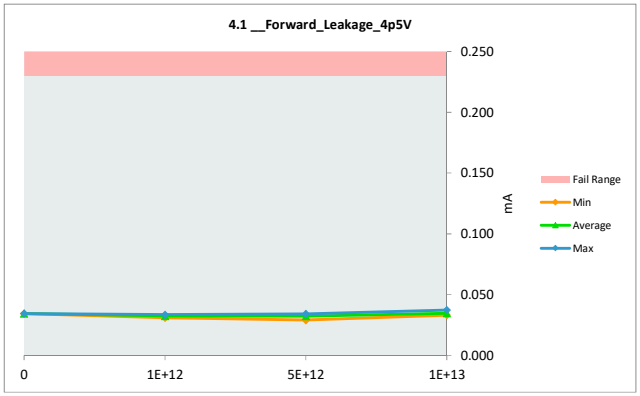
	4.1 __Forward_Leakage_4p5V	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	0.23	0.23
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	0.036	0.034	-0.001
1E+12	1	0.032	0.031	-0.001
1E+12	2	0.034	0.033	-0.001
1E+12	3	0.035	0.034	-0.001
5E+12	4	0.031	0.029	-0.002
5E+12	5	0.035	0.034	-0.001
5E+12	6	0.035	0.034	-0.001
1E+13	7	0.034	0.033	-0.001
1E+13	8	0.038	0.037	-0.001
1E+13	9	0.034	0.033	-0.001
	Max	0.038	0.037	-0.001
	Average	0.034	0.033	-0.001
	Min	0.031	0.029	-0.002
	Std Dev	0.002	0.002	0.000



	4.1 __Forward_Leakage_4p5V	
Test Site		
Tester		
Test Number		
Max Limit	0.23	mA
Min Limit		mA

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	0.034	0.031	0.029	0.033
Average	0.034	0.033	0.032	0.035
Max	0.034	0.034	0.034	0.037
UL	0.230	0.230	0.230	0.230



Neutron Displacement Damage (NDD) Report
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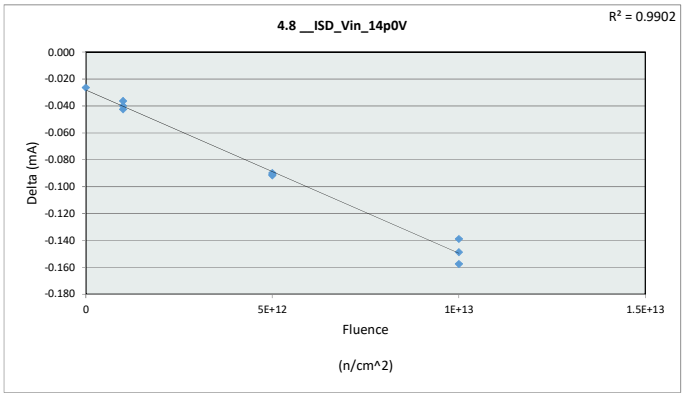
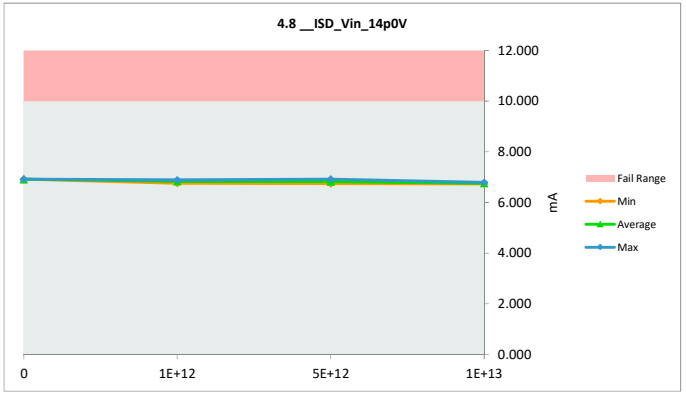
	4.8 __ISD_Vin_14p0V	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	10	10
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	6.944	6.918	-0.026
1E+12	1	6.885	6.842	-0.043
1E+12	2	6.795	6.758	-0.036
1E+12	3	6.932	6.892	-0.040
5E+12	4	6.840	6.749	-0.091
5E+12	5	6.910	6.820	-0.090
5E+12	6	7.010	6.918	-0.092
1E+13	7	6.941	6.792	-0.149
1E+13	8	6.895	6.738	-0.157
1E+13	9	6.877	6.738	-0.139
	Max	7.010	6.918	-0.026
	Average	6.903	6.816	-0.086
	Min	6.795	6.738	-0.157
	Std Dev	0.060	0.073	0.049



	4.8 __ISD_Vin_14p0V	
Test Site		
Tester		
Test Number		
Max Limit	10	mA
Min Limit		mA

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	6.918	6.758	6.749	6.738
Average	6.918	6.831	6.829	6.756
Max	6.918	6.892	6.918	6.792
UL	10.000	10.000	10.000	10.000



Neutron Displacement Damage (NDD) Report
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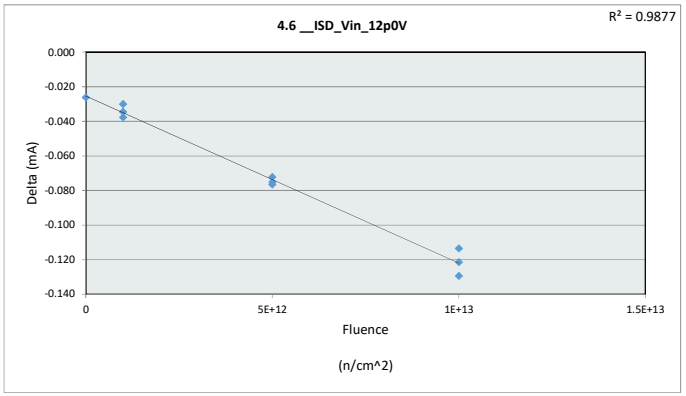
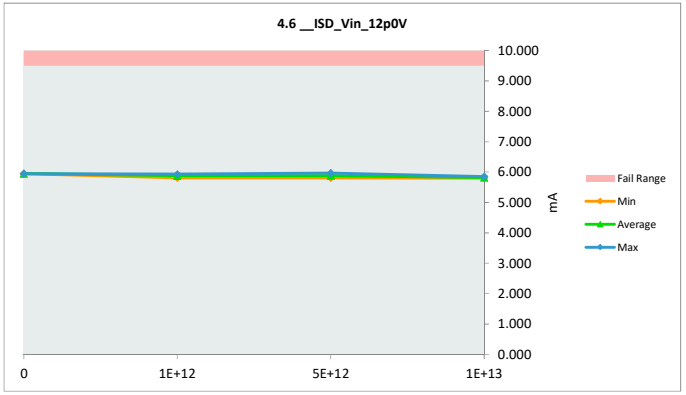
	4.6 __ISD_Vin_12p0V	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	9.5	9.5
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	5.979	5.953	-0.026
1E+12	1	5.929	5.891	-0.038
1E+12	2	5.839	5.809	-0.030
1E+12	3	5.969	5.934	-0.035
5E+12	4	5.888	5.813	-0.075
5E+12	5	5.949	5.877	-0.072
5E+12	6	6.046	5.969	-0.077
1E+13	7	5.978	5.856	-0.122
1E+13	8	5.933	5.804	-0.129
1E+13	9	5.921	5.807	-0.114
	Max	6.046	5.969	-0.026
	Average	5.943	5.871	-0.072
	Min	5.839	5.804	-0.129
	Std Dev	0.056	0.064	0.039



	4.6 __ISD_Vin_12p0V			
Test Site				
Tester				
Test Number				
Max Limit	9.5	mA		
Min Limit		mA		

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	5.953	5.809	5.813	5.804
Average	5.953	5.878	5.886	5.822
Max	5.953	5.934	5.969	5.856
UL	9.500	9.500	9.500	9.500



Neutron Displacement Damage (NDD) Report
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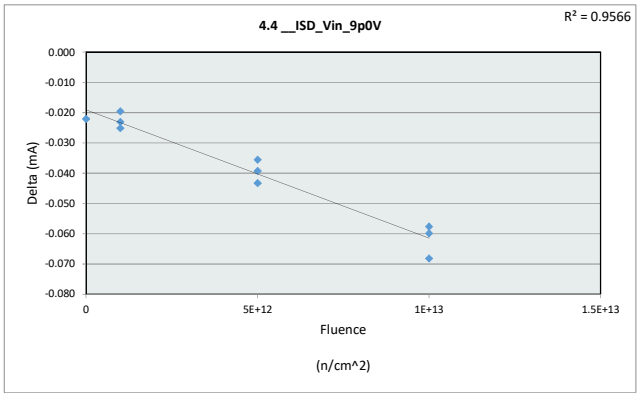
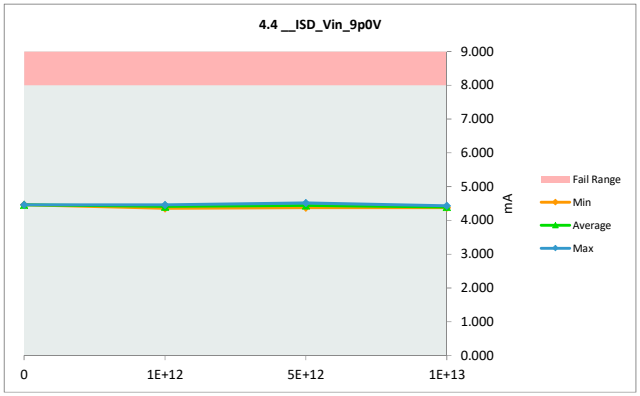
	4.4 __ISD_Vin_9p0V	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	8	8
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	4.485	4.463	-0.022
1E+12	1	4.447	4.421	-0.025
1E+12	2	4.376	4.357	-0.020
1E+12	3	4.482	4.458	-0.023
5E+12	4	4.417	4.378	-0.039
5E+12	5	4.464	4.429	-0.036
5E+12	6	4.557	4.514	-0.043
1E+13	7	4.494	4.434	-0.060
1E+13	8	4.441	4.373	-0.068
1E+13	9	4.451	4.393	-0.058
	Max	4.557	4.514	-0.020
	Average	4.461	4.422	-0.039
	Min	4.376	4.357	-0.068
	Std Dev	0.048	0.048	0.018



	4.4 __ISD_Vin_9p0V			
Test Site				
Tester				
Test Number				
Max Limit	8	mA		
Min Limit		mA		

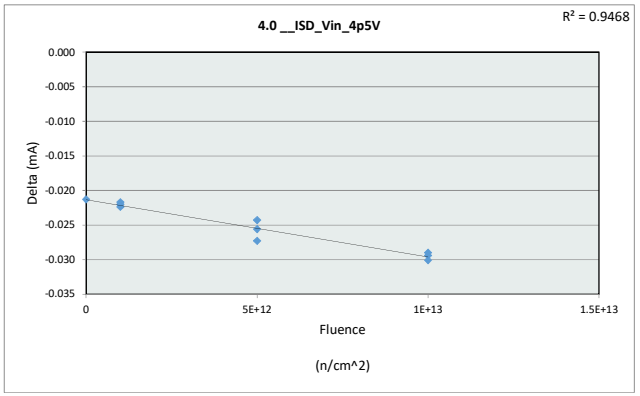
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	4.463	4.357	4.378	4.373
Average	4.463	4.412	4.440	4.400
Max	4.463	4.459	4.514	4.434
UL	8.000	8.000	8.000	8.000



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

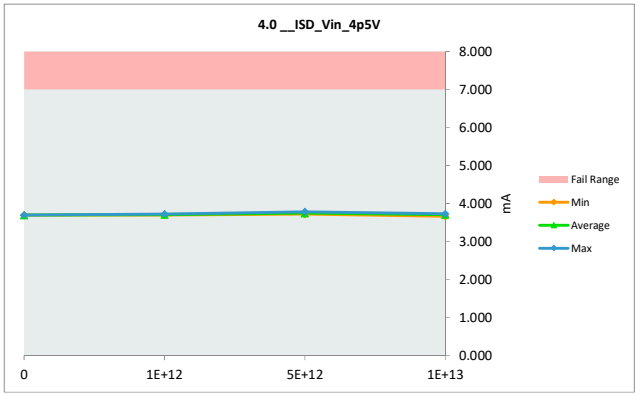
	4.0 __ISD_Vin_4p5V	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	7	7
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	3.717	3.696	-0.021
1E+12	1	3.716	3.694	-0.022
1E+12	2	3.733	3.711	-0.022
1E+12	3	3.744	3.723	-0.022
5E+12	4	3.744	3.718	-0.026
5E+12	5	3.768	3.743	-0.024
5E+12	6	3.808	3.780	-0.027
1E+13	7	3.750	3.720	-0.029
1E+13	8	3.756	3.725	-0.030
1E+13	9	3.689	3.660	-0.029
	Max	3.808	3.780	-0.021
	Average	3.742	3.717	-0.025
	Min	3.689	3.660	-0.030
	Std Dev	0.032	0.032	0.003



	4.0 __ISD_Vin_4p5V	
Test Site		
Tester		
Test Number		
Max Limit	7	mA
Min Limit		mA

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	3.696	3.694	3.718	3.660
Average	3.696	3.709	3.747	3.702
Max	3.696	3.723	3.780	3.725
UL	7.000	7.000	7.000	7.000



Neutron Displacement Damage (NDD) Report
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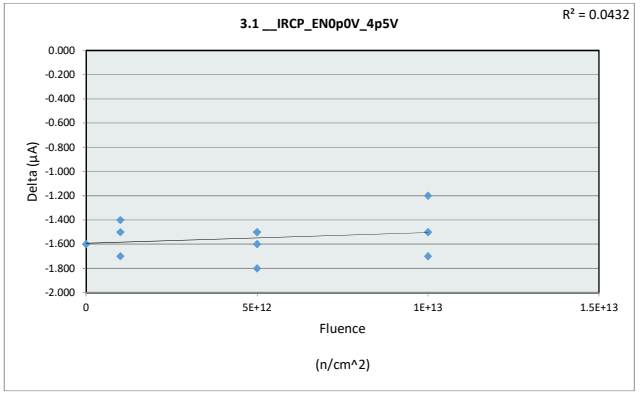
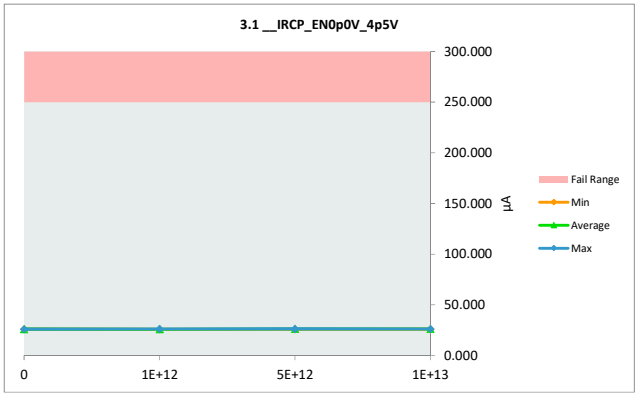
	3.1 __IRCP_EN0p0V_4p5V	
Test Site		
Tester		
Test Number		
Unit	µA	µA
Max Limit	250	250
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	27.600	26.000	-1.600
1E+12	1	27.600	25.900	-1.700
1E+12	2	27.500	26.100	-1.400
1E+12	3	27.600	26.100	-1.500
5E+12	4	27.400	25.800	-1.600
5E+12	5	27.700	26.200	-1.500
5E+12	6	28.100	26.300	-1.800
1E+13	7	27.800	26.100	-1.700
1E+13	8	27.400	26.200	-1.200
1E+13	9	27.500	26.000	-1.500
	Max	28.100	26.300	-1.200
	Average	27.620	26.070	-1.550
	Min	27.400	25.800	-1.800
	Std Dev	0.210	0.149	0.172



	3.1 __IRCP_EN0p0V_4p5V			
Test Site				
Tester				
Test Number				
Max Limit	250	µA		
Min Limit		µA		

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	26.000	25.900	25.800	26.000
Average	26.000	26.033	26.100	26.100
Max	26.000	26.100	26.300	26.200
UL	250.000	250.000	250.000	250.000



Neutron Displacement Damage (NDD) Report
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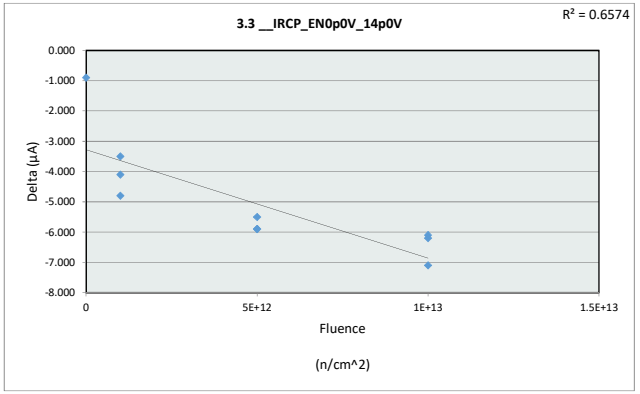
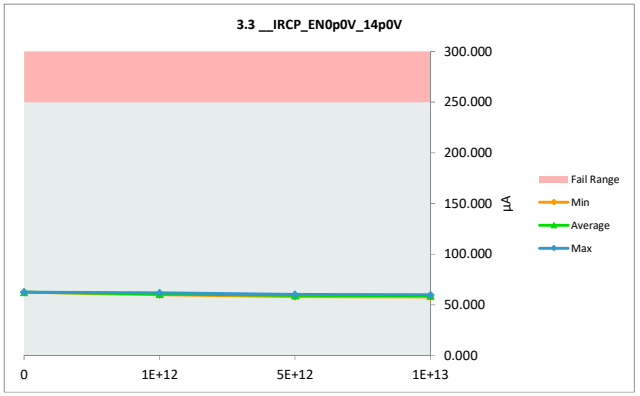
	3.3 __IRCP_EN0p0V_14p0V	
Test Site		
Tester		
Test Number		
Unit	µA	µA
Max Limit	250	250
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	63.300	62.400	-0.900
1E+12	1	65.200	60.400	-4.800
1E+12	2	63.300	59.800	-3.500
1E+12	3	65.800	61.700	-4.100
5E+12	4	63.600	58.100	-5.500
5E+12	5	66.000	60.100	-5.900
5E+12	6	66.100	60.200	-5.900
1E+13	7	66.100	59.900	-6.200
1E+13	8	65.400	59.300	-6.100
1E+13	9	64.900	57.800	-7.100
	Max	66.100	62.400	-0.900
	Average	64.970	59.970	-5.000
	Min	63.300	57.800	-7.100
	Std Dev	1.155	1.408	1.790



	3.3 __IRCP_EN0p0V_14p0V	
Test Site		
Tester		
Test Number		
Max Limit	250	µA
Min Limit		µA

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	62.400	59.800	58.100	57.800
Average	62.400	60.633	59.467	59.000
Max	62.400	61.700	60.200	59.900
UL	250.000	250.000	250.000	250.000



Neutron Displacement Damage (NDD) Report
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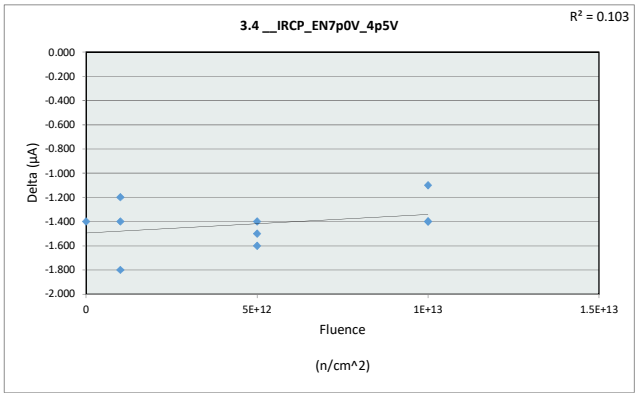
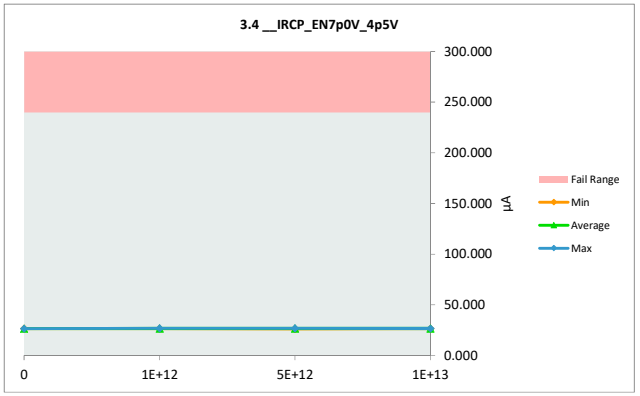
	3.4 __IRCP_EN7p0V_4p5V	
Test Site		
Tester		
Test Number		
Unit	µA	µA
Max Limit	240	240
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	27.900	26.500	-1.400
1E+12	1	28.200	26.400	-1.800
1E+12	2	27.900	26.500	-1.400
1E+12	3	28.000	26.800	-1.200
5E+12	4	27.800	26.300	-1.500
5E+12	5	28.200	26.800	-1.400
5E+12	6	28.300	26.700	-1.600
1E+13	7	28.100	26.700	-1.400
1E+13	8	27.800	26.700	-1.100
1E+13	9	27.900	26.500	-1.400
	Max	28.300	26.800	-1.100
	Average	28.010	26.590	-1.420
	Min	27.800	26.300	-1.800
	Std Dev	0.179	0.173	0.193



	3.4 __IRCP_EN7p0V_4p5V			
Test Site				
Tester				
Test Number				
Max Limit	240	µA		
Min Limit		µA		

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	26.500	26.400	26.300	26.500
Average	26.500	26.567	26.600	26.633
Max	26.500	26.800	26.800	26.700
UL	240.000	240.000	240.000	240.000



Neutron Displacement Damage (NDD) Report
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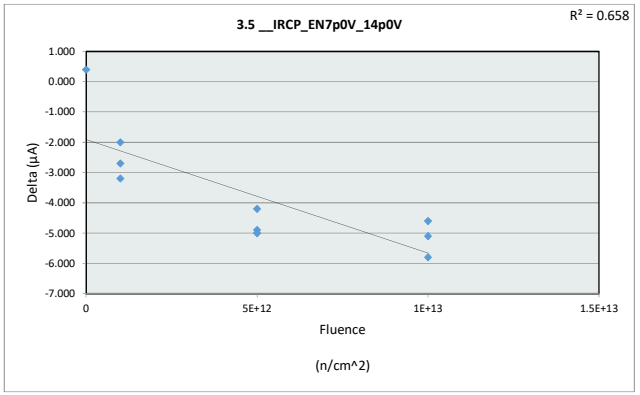
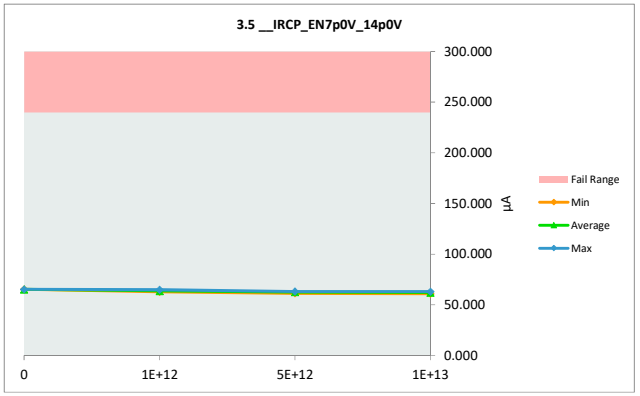
	3.5 __IRCP_EN7p0V_14p0V	
Test Site		
Tester		
Test Number		
Unit	µA	µA
Max Limit	240	240
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	64.900	65.300	0.400
1E+12	1	66.600	63.400	-3.200
1E+12	2	64.800	62.800	-2.000
1E+12	3	67.600	64.900	-2.700
5E+12	4	65.600	61.400	-4.200
5E+12	5	67.900	62.900	-5.000
5E+12	6	68.000	63.100	-4.900
1E+13	7	68.100	63.000	-5.100
1E+13	8	67.100	62.500	-4.600
1E+13	9	66.700	60.900	-5.800
	Max	68.100	65.300	0.400
	Average	66.730	63.020	-3.710
	Min	64.800	60.900	-5.800
	Std Dev	1.253	1.347	1.871



	3.5 __IRCP_EN7p0V_14p0V	
Test Site		
Tester		
Test Number		
Max Limit	240	µA
Min Limit		µA

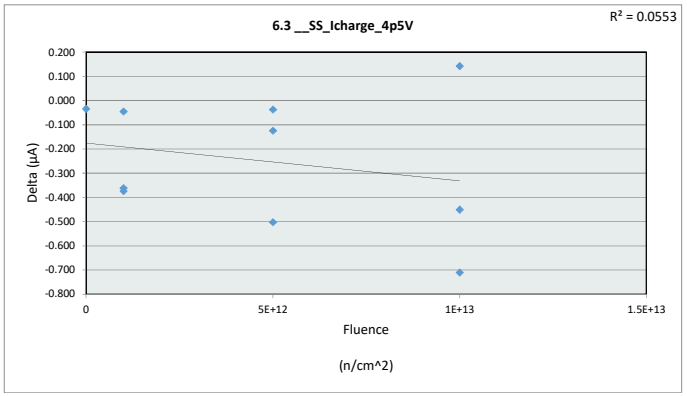
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	65.300	62.800	61.400	60.900
Average	65.300	63.700	62.467	62.133
Max	65.300	64.900	63.100	63.000
UL	240.000	240.000	240.000	240.000



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

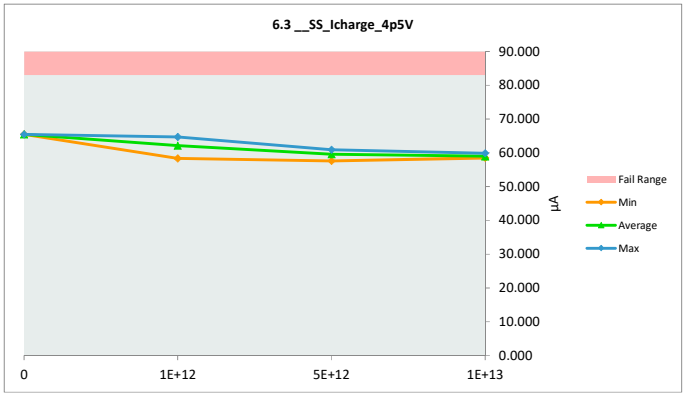
	6.3 __SS_Icharge_4p5V	
Test Site		
Tester		
Test Number		
Unit	µA	µA
Max Limit	83	83
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	65.494	65.459	-0.035
1E+12	1	58.725	58.363	-0.362
1E+12	2	65.052	64.678	-0.374
1E+12	3	63.452	63.406	-0.046
5E+12	4	61.435	60.932	-0.503
5E+12	5	57.626	57.588	-0.038
5E+12	6	60.450	60.325	-0.125
1E+13	7	59.743	59.885	0.142
1E+13	8	58.937	58.486	-0.451
1E+13	9	59.292	58.581	-0.711
	Max	65.494	65.459	0.142
	Average	61.021	60.770	-0.250
	Min	57.626	57.588	-0.711
	Std Dev	2.757	2.812	0.268



	6.3 __SS_Icharge_4p5V	
Test Site		
Tester		
Test Number		
Max Limit	83	µA
Min Limit		µA

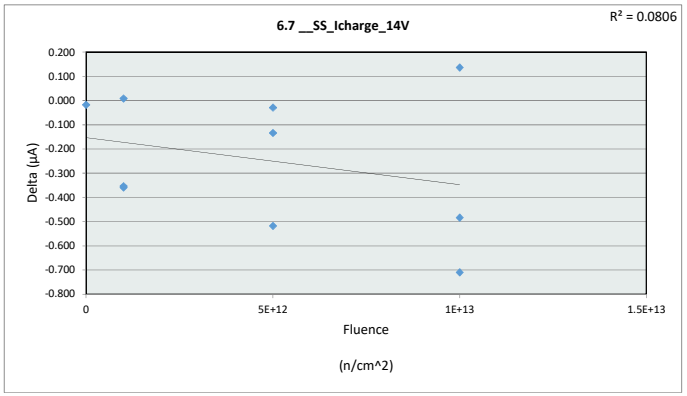
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	65.459	58.363	57.588	58.486
Average	65.459	62.149	59.615	58.984
Max	65.459	64.678	60.932	59.885
UL	83.000	83.000	83.000	83.000



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

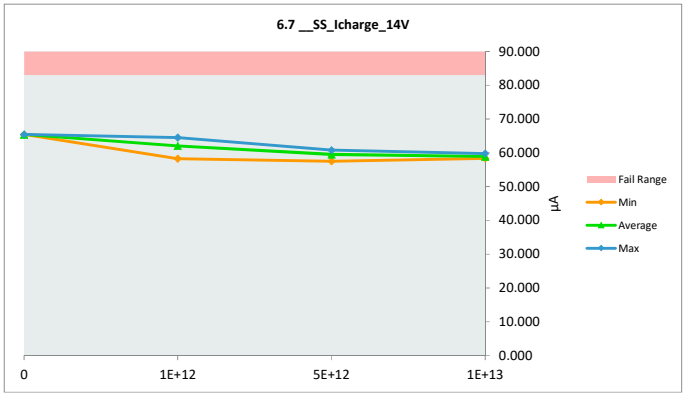
	6.7 __SS_Icharge_14V	
Test Site		
Tester		
Test Number		
Unit	µA	µA
Max Limit	83	83
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	65.440	65.422	-0.018
1E+12	1	58.660	58.306	-0.354
1E+12	2	64.897	64.537	-0.360
1E+12	3	63.333	63.341	0.008
5E+12	4	61.322	60.804	-0.518
5E+12	5	57.527	57.497	-0.030
5E+12	6	60.383	60.249	-0.134
1E+13	7	59.668	59.804	0.136
1E+13	8	58.831	58.347	-0.484
1E+13	9	59.225	58.515	-0.710
	Max	65.440	65.422	0.136
	Average	60.929	60.682	-0.246
	Min	57.527	57.497	-0.710
	Std Dev	2.748	2.815	0.277



	6.7 __SS_Icharge_14V			
Test Site				
Tester				
Test Number				
Max Limit	83	µA		
Min Limit		µA		

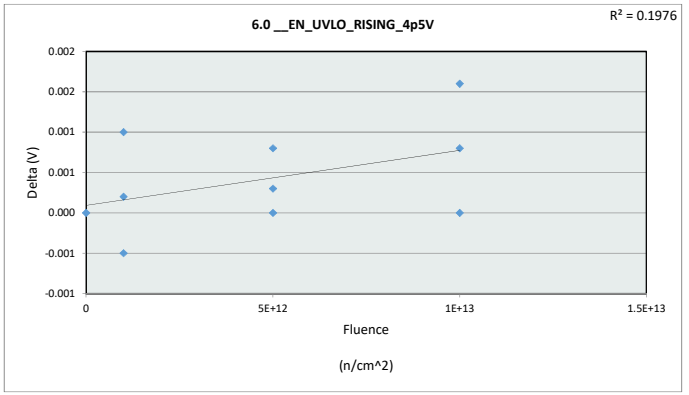
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	65.422	58.306	57.497	58.347
Average	65.422	62.061	59.517	58.889
Max	65.422	64.537	60.804	59.804
UL	83.000	83.000	83.000	83.000



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

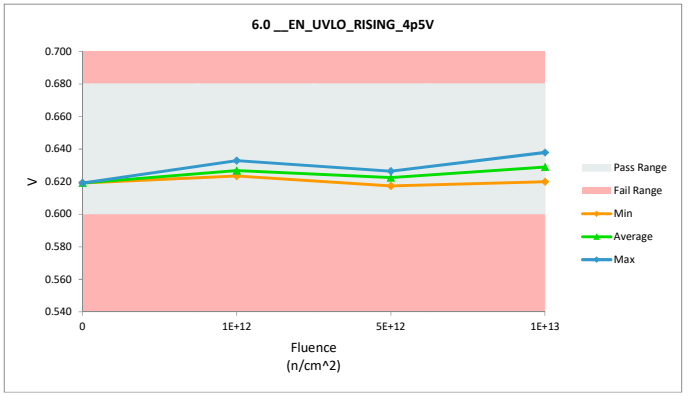
	6.0 __EN_UVLO_RISING_4p5V	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	0.68	0.68
Min Limit	0.6	0.6

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	0.619	0.619	0.000
1E+12	1	0.624	0.623	-0.001
1E+12	2	0.623	0.624	0.001
1E+12	3	0.633	0.633	0.000
5E+12	4	0.626	0.627	0.001
5E+12	5	0.623	0.623	0.000
5E+12	6	0.617	0.617	0.000
1E+13	7	0.618	0.620	0.002
1E+13	8	0.637	0.638	0.001
1E+13	9	0.629	0.629	0.000
	Max	0.637	0.638	0.002
	Average	0.625	0.625	0.000
	Min	0.617	0.617	-0.001
	Std Dev	0.006	0.006	0.001



	6.0 __EN_UVLO_RISING_4p5V	
Test Site		
Tester		
Test Number		
Max Limit	0.68	V
Min Limit	0.6	V

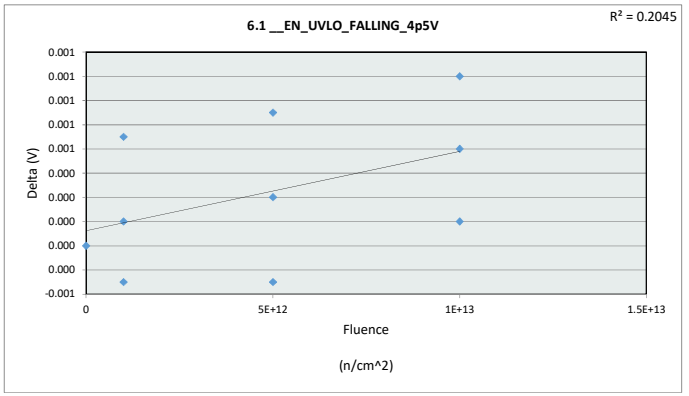
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	0.600	0.600	0.600	0.600
Min	0.619	0.623	0.617	0.620
Average	0.619	0.627	0.622	0.629
Max	0.619	0.633	0.627	0.638
UL	0.680	0.680	0.680	0.680



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

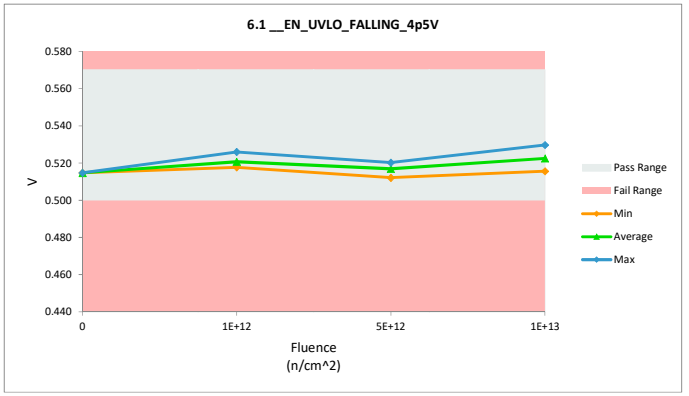
	6.1 __EN_UVLO_FALLING_4p5V	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	0.57	0.57
Min Limit	0.5	0.5

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	0.515	0.515	0.000
1E+12	1	0.518	0.518	0.000
1E+12	2	0.517	0.518	0.001
1E+12	3	0.526	0.526	0.000
5E+12	4	0.519	0.520	0.001
5E+12	5	0.518	0.518	0.000
5E+12	6	0.513	0.512	-0.001
1E+13	7	0.514	0.516	0.001
1E+13	8	0.529	0.530	0.001
1E+13	9	0.522	0.522	0.000
	Max	0.529	0.530	0.001
	Average	0.519	0.519	0.000
	Min	0.513	0.512	-0.001
	Std Dev	0.005	0.005	0.001



	6.1 __EN_UVLO_FALLING_4p5			
Test Site				
Tester				
Test Number				
Max Limit	0.57	V		
Min Limit	0.5	V		

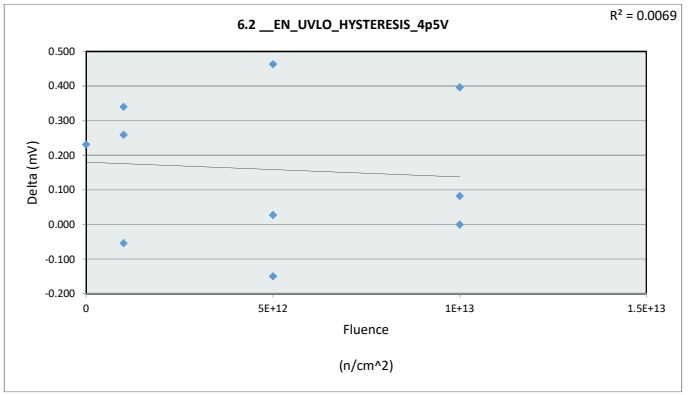
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	0.500	0.500	0.500	0.500
Min	0.515	0.518	0.512	0.516
Average	0.515	0.521	0.517	0.522
Max	0.515	0.526	0.520	0.530
UL	0.570	0.570	0.570	0.570



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

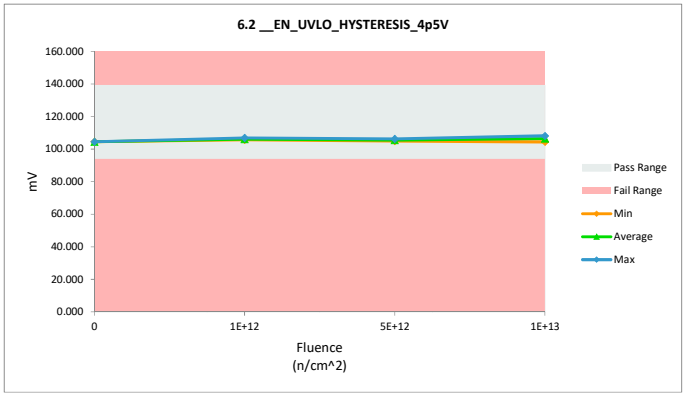
	6.2 __EN_UVLO_HYSTERESIS_4p5V	
Test Site		
Tester		
Test Number		
Unit	mV	mV
Max Limit	139	139
Min Limit	94	94

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	104.301	104.532	0.231
1E+12	1	105.719	105.665	-0.054
1E+12	2	105.638	105.978	0.340
1E+12	3	106.648	106.907	0.259
5E+12	4	106.374	106.224	-0.150
5E+12	5	104.942	104.969	0.027
5E+12	6	104.805	105.268	0.463
1E+13	7	103.986	104.382	0.396
1E+13	8	108.039	108.121	0.082
1E+13	9	106.961	106.961	0.000
	Max	108.039	108.121	0.463
	Average	105.741	105.901	0.159
	Min	103.986	104.382	-0.150
	Std Dev	1.277	1.187	0.207



	6.2 __EN_UVLO_HYSTERESIS_	
Test Site		
Tester		
Test Number		
Max Limit	139	mV
Min Limit	94	mV

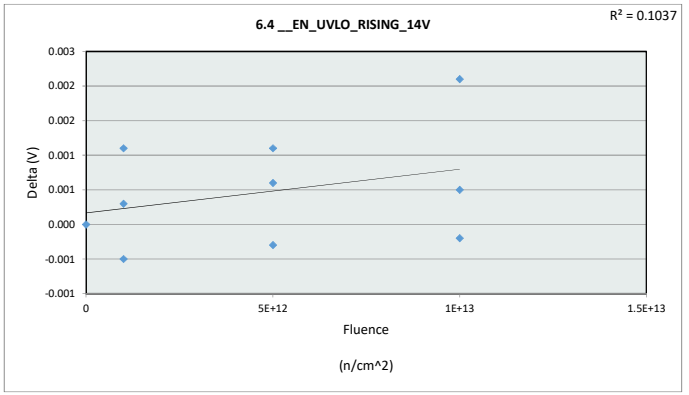
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	94.000	94.000	94.000	94.000
Min	104.532	105.665	104.969	104.382
Average	104.532	106.183	105.487	106.488
Max	104.532	106.907	106.224	108.121
UL	139.000	139.000	139.000	139.000



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

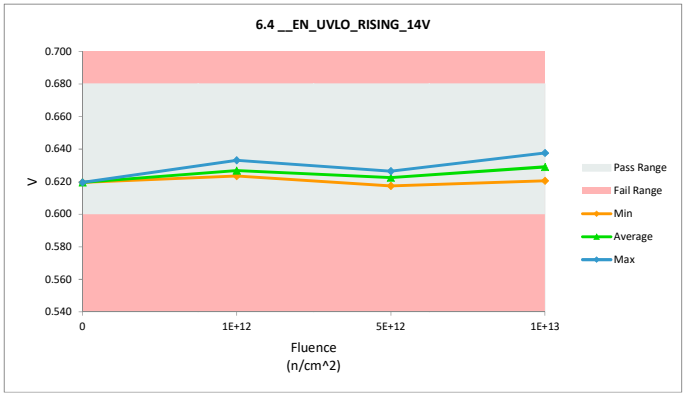
	6.4 __EN_UVLO_RISING_14V	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	0.68	0.68
Min Limit	0.6	0.6

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	0.619	0.619	0.000
1E+12	1	0.624	0.623	-0.001
1E+12	2	0.623	0.624	0.001
1E+12	3	0.633	0.633	0.000
5E+12	4	0.625	0.627	0.001
5E+12	5	0.623	0.623	0.001
5E+12	6	0.618	0.617	0.000
1E+13	7	0.618	0.621	0.002
1E+13	8	0.637	0.638	0.001
1E+13	9	0.629	0.629	0.000
	Max	0.637	0.638	0.002
	Average	0.625	0.625	0.000
	Min	0.618	0.617	-0.001
	Std Dev	0.006	0.006	0.001



	6.4 __EN_UVLO_RISING_14V			
Test Site				
Tester				
Test Number				
Max Limit	0.68	V		
Min Limit	0.6	V		

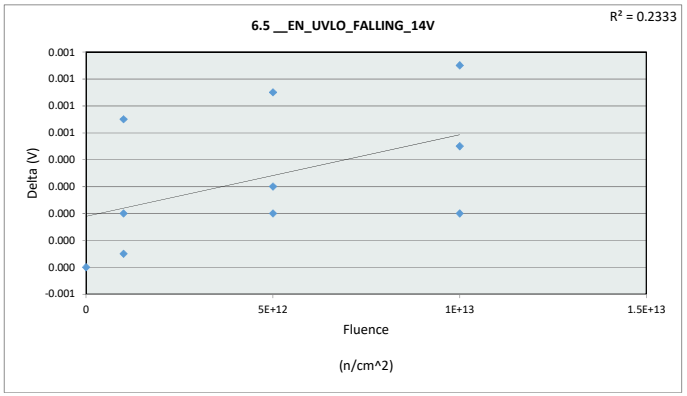
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	0.600	0.600	0.600	0.600
Min	0.620	0.623	0.617	0.621
Average	0.620	0.627	0.622	0.629
Max	0.620	0.633	0.627	0.638
UL	0.680	0.680	0.680	0.680



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

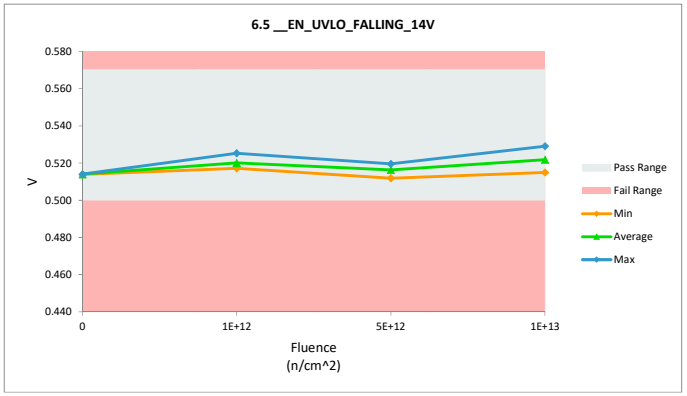
	6.5 __EN_UVLO_FALLING_14V	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	0.57	0.57
Min Limit	0.5	0.5

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	0.514	0.514	0.000
1E+12	1	0.517	0.517	0.000
1E+12	2	0.517	0.517	0.001
1E+12	3	0.525	0.525	0.000
5E+12	4	0.519	0.520	0.001
5E+12	5	0.517	0.518	0.000
5E+12	6	0.512	0.512	0.000
1E+13	7	0.514	0.515	0.001
1E+13	8	0.529	0.529	0.001
1E+13	9	0.521	0.521	0.000
	Max	0.529	0.529	0.001
	Average	0.519	0.519	0.000
	Min	0.512	0.512	0.000
	Std Dev	0.005	0.005	0.001



	6.5 __EN_UVLO_FALLING_14V			
Test Site				
Tester				
Test Number				
Max Limit	0.57	V		
Min Limit	0.5	V		

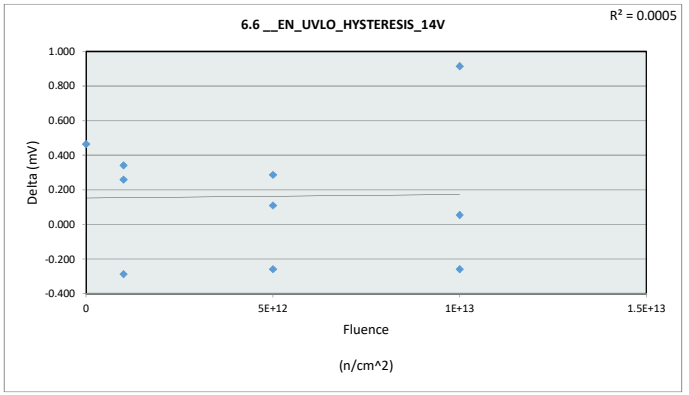
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	0.500	0.500	0.500	0.500
Min	0.514	0.517	0.512	0.515
Average	0.514	0.520	0.516	0.522
Max	0.514	0.525	0.520	0.529
UL	0.570	0.570	0.570	0.570



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

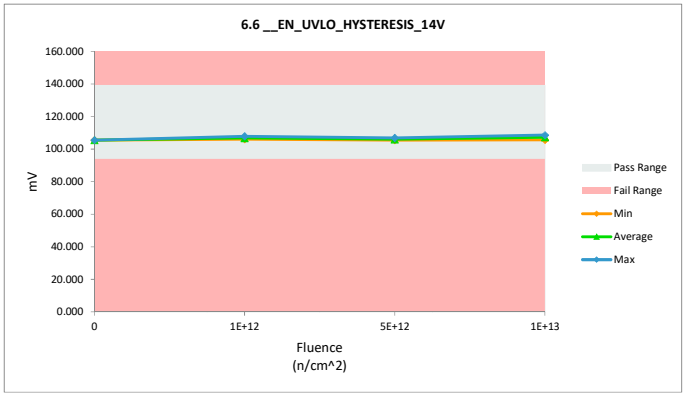
	6.6 __EN_UVLO_HYSTERESIS_14V	
Test Site		
Tester		
Test Number		
Unit	mV	mV
Max Limit	139	139
Min Limit	94	94

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	105.023	105.487	0.464
1E+12	1	106.415	106.128	-0.287
1E+12	2	106.074	106.415	0.341
1E+12	3	107.603	107.862	0.259
5E+12	4	106.810	106.919	0.109
5E+12	5	105.379	105.665	0.286
5E+12	6	105.759	105.500	-0.259
1E+13	7	104.682	105.596	0.914
1E+13	8	108.503	108.557	0.054
1E+13	9	107.916	107.657	-0.259
	Max	108.503	108.557	0.914
	Average	106.416	106.579	0.162
	Min	104.682	105.487	-0.287
	Std Dev	1.280	1.117	0.378



	6.6 __EN_UVLO_HYSTERESIS_	
Test Site		
Tester		
Test Number		
Max Limit	139	mV
Min Limit	94	mV

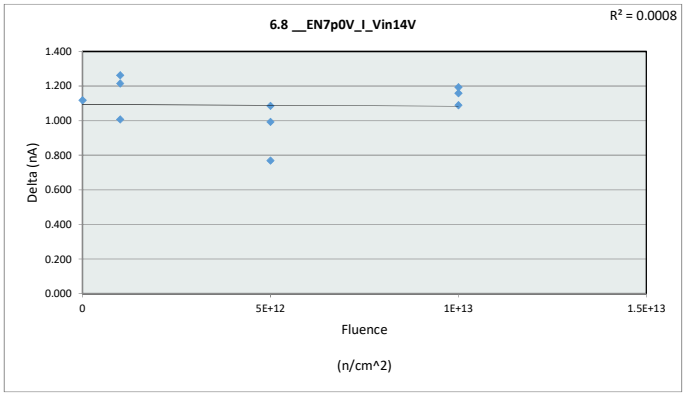
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	94.000	94.000	94.000	94.000
Min	105.487	106.128	105.500	105.596
Average	105.487	106.802	106.028	107.270
Max	105.487	107.862	106.919	108.557
UL	139.000	139.000	139.000	139.000



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

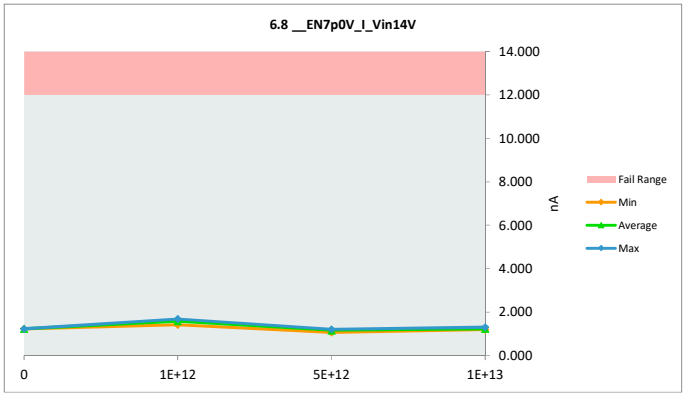
	6.8 __EN7p0V_I_Vin14V	
Test Site		
Tester		
Test Number		
Unit	nA	nA
Max Limit	12	12
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	0.110	1.228	1.118
1E+12	1	0.640	1.647	1.007
1E+12	2	0.416	1.678	1.262
1E+12	3	0.204	1.418	1.214
5E+12	4	0.114	1.199	1.085
5E+12	5	0.214	1.206	0.992
5E+12	6	0.297	1.066	0.769
1E+13	7	0.028	1.186	1.158
1E+13	8	0.011	1.204	1.193
1E+13	9	0.211	1.300	1.089
	Max	0.640	1.678	1.262
	Average	0.224	1.313	1.089
	Min	0.011	1.066	0.769
	Std Dev	0.190	0.205	0.142



	6.8 __EN7p0V_I_Vin14V			
Test Site				
Tester				
Test Number				
Max Limit	12	nA		
Min Limit		nA		

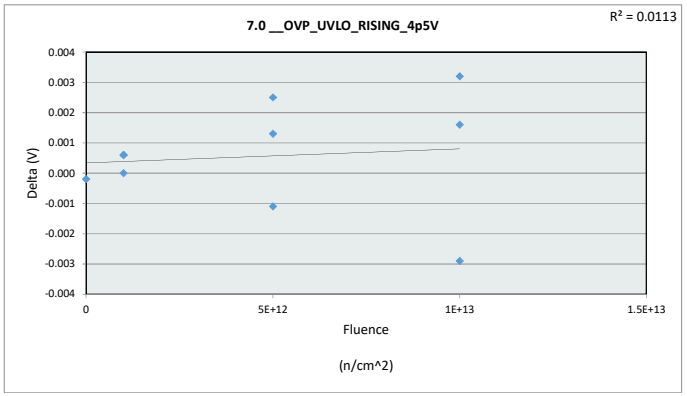
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	1.228	1.418	1.066	1.186
Average	1.228	1.581	1.157	1.230
Max	1.228	1.678	1.206	1.300
UL	12.000	12.000	12.000	12.000



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

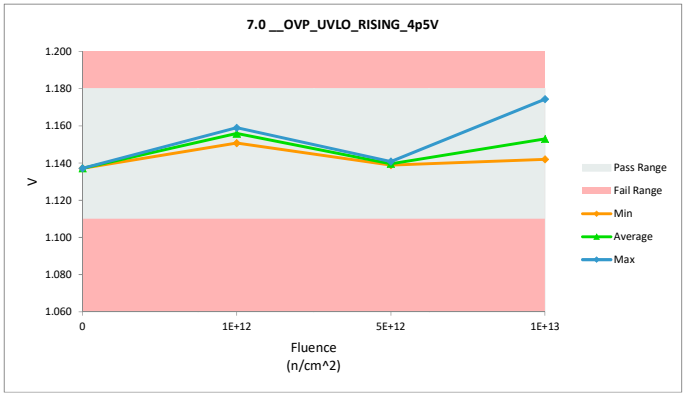
	7.0 __OVP_UVLO_RISING_4p5V	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	1.18	1.18
Min Limit	1.11	1.11

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	1.137	1.137	0.000
1E+12	1	1.158	1.158	0.000
1E+12	2	1.158	1.159	0.001
1E+12	3	1.150	1.151	0.001
5E+12	4	1.140	1.141	0.001
5E+12	5	1.136	1.139	0.003
5E+12	6	1.140	1.139	-0.001
1E+13	7	1.140	1.142	0.002
1E+13	8	1.145	1.143	-0.003
1E+13	9	1.171	1.174	0.003
	Max	1.171	1.174	0.003
	Average	1.148	1.148	0.001
	Min	1.136	1.137	-0.003
	Std Dev	0.011	0.012	0.002



	7.0 __OVP_UVLO_RISING_4p5	
Test Site		
Tester		
Test Number		
Max Limit	1.18	V
Min Limit	1.11	V

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	1.110	1.110	1.110	1.110
Min	1.137	1.151	1.139	1.142
Average	1.137	1.156	1.140	1.153
Max	1.137	1.159	1.141	1.174
UL	1.180	1.180	1.180	1.180



Neutron Displacement Damage (NDD) Report
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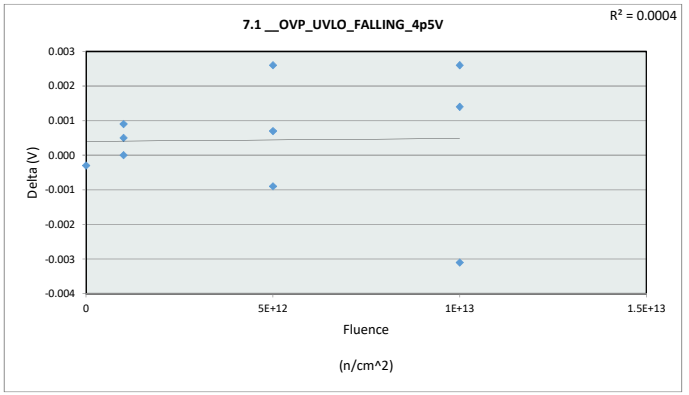
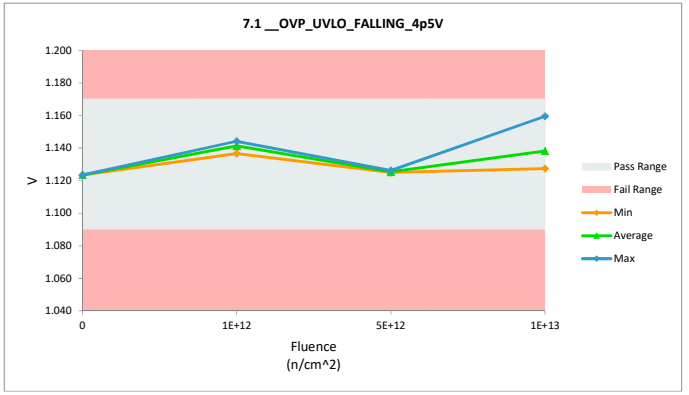
	7.1 __OVP_UVLO_FALLING_4p5V	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	1.17	1.17
Min Limit	1.09	1.09

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	1.124	1.123	0.000
1E+12	1	1.143	1.143	0.000
1E+12	2	1.144	1.144	0.000
1E+12	3	1.136	1.137	0.001
5E+12	4	1.126	1.126	0.001
5E+12	5	1.122	1.125	0.003
5E+12	6	1.126	1.125	-0.001
1E+13	7	1.126	1.127	0.001
1E+13	8	1.131	1.128	-0.003
1E+13	9	1.157	1.160	0.003
	Max	1.157	1.160	0.003
	Average	1.133	1.134	0.000
	Min	1.122	1.123	-0.003
	Std Dev	0.011	0.012	0.002



	7.1 __OVP_UVLO_FALLING_4p			
Test Site				
Tester				
Test Number				
Max Limit	1.17	V		
Min Limit	1.09	V		

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	1.090	1.090	1.090	1.090
Min	1.123	1.137	1.125	1.127
Average	1.123	1.141	1.125	1.138
Max	1.123	1.144	1.126	1.160
UL	1.170	1.170	1.170	1.170



Neutron Displacement Damage (NDD) Report
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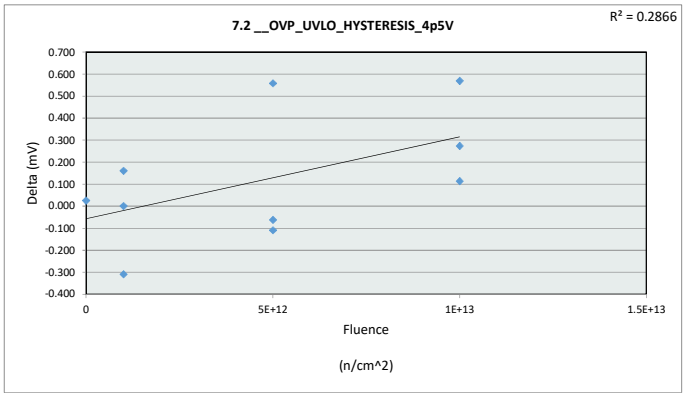
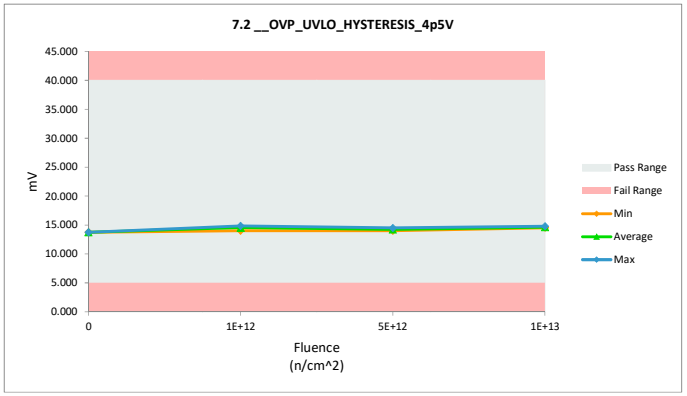
	7.2 __OVP_UVLO_HYSTERESIS_4p5V	
Test Site		
Tester		
Test Number		
Unit	mV	mV
Max Limit	40	40
Min Limit	5	5

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	13.733	13.758	0.025
1E+12	1	14.858	14.858	0.000
1E+12	2	14.574	14.734	0.160
1E+12	3	14.364	14.054	-0.310
5E+12	4	13.956	14.514	0.558
5E+12	5	14.093	14.030	-0.063
5E+12	6	14.327	14.217	-0.110
1E+13	7	14.327	14.600	0.273
1E+13	8	14.438	14.551	0.113
1E+13	9	14.238	14.807	0.569
	Max	14.858	14.858	0.569
	Average	14.291	14.412	0.122
	Min	13.733	13.758	-0.310
	Std Dev	0.316	0.375	0.282



	7.2 __OVP_UVLO_HYSTERESIS			
Test Site				
Tester				
Test Number				
Max Limit	40	mV		
Min Limit	5	mV		

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	5.000	5.000	5.000	5.000
Min	13.758	14.054	14.030	14.551
Average	13.758	14.549	14.254	14.653
Max	13.758	14.858	14.514	14.807
UL	40.000	40.000	40.000	40.000



Neutron Displacement Damage (NDD) Report
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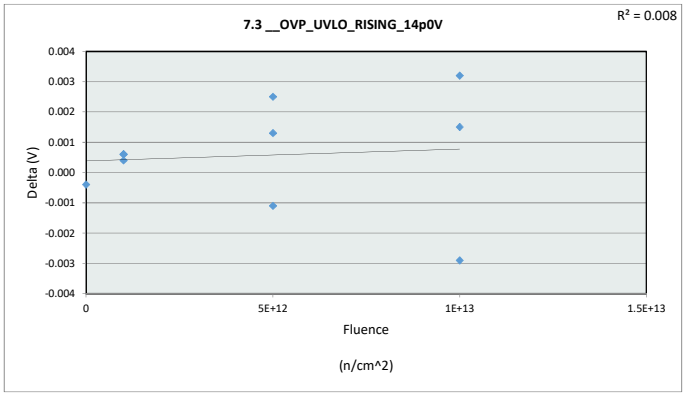
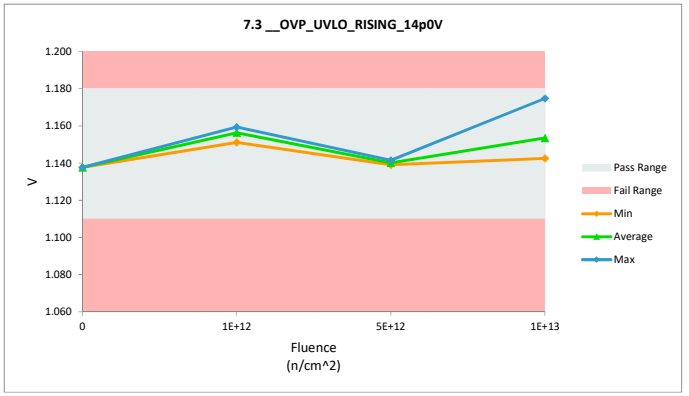
	7.3 __OVP_UVLO_RISING_14p0V	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	1.18	1.18
Min Limit	1.11	1.11

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	1.138	1.138	0.000
1E+12	1	1.158	1.158	0.000
1E+12	2	1.159	1.159	0.001
1E+12	3	1.151	1.151	0.001
5E+12	4	1.140	1.141	0.001
5E+12	5	1.137	1.139	0.002
5E+12	6	1.141	1.140	-0.001
1E+13	7	1.141	1.143	0.002
1E+13	8	1.146	1.143	-0.003
1E+13	9	1.171	1.175	0.003
	Max	1.171	1.175	0.003
	Average	1.148	1.149	0.001
	Min	1.137	1.138	-0.003
	Std Dev	0.011	0.012	0.002



	7.3 __OVP_UVLO_RISING_14p			
Test Site				
Tester				
Test Number				
Max Limit	1.18	V		
Min Limit	1.11	V		

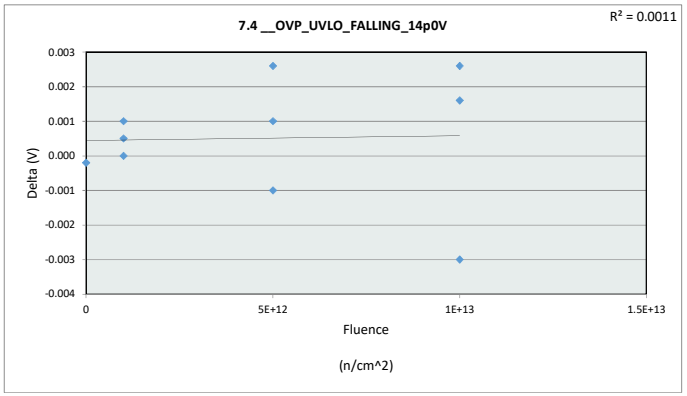
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	1.110	1.110	1.110	1.110
Min	1.138	1.151	1.139	1.143
Average	1.138	1.156	1.140	1.153
Max	1.138	1.159	1.141	1.175
UL	1.180	1.180	1.180	1.180



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

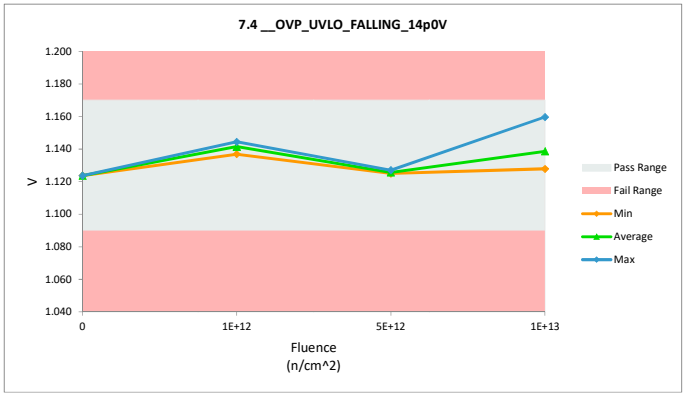
	7.4 __OVP_UVLO_FALLING_14p0V	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	1.17	1.17
Min Limit	1.09	1.09

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	1.124	1.124	0.000
1E+12	1	1.143	1.143	0.000
1E+12	2	1.144	1.144	0.000
1E+12	3	1.136	1.137	0.001
5E+12	4	1.126	1.127	0.001
5E+12	5	1.122	1.125	0.003
5E+12	6	1.126	1.125	-0.001
1E+13	7	1.126	1.128	0.002
1E+13	8	1.131	1.128	-0.003
1E+13	9	1.157	1.160	0.003
	Max	1.157	1.160	0.003
	Average	1.134	1.134	0.001
	Min	1.122	1.124	-0.003
	Std Dev	0.011	0.012	0.002



	7.4 __OVP_UVLO_FALLING_14	
Test Site		
Tester		
Test Number		
Max Limit	1.17	V
Min Limit	1.09	V

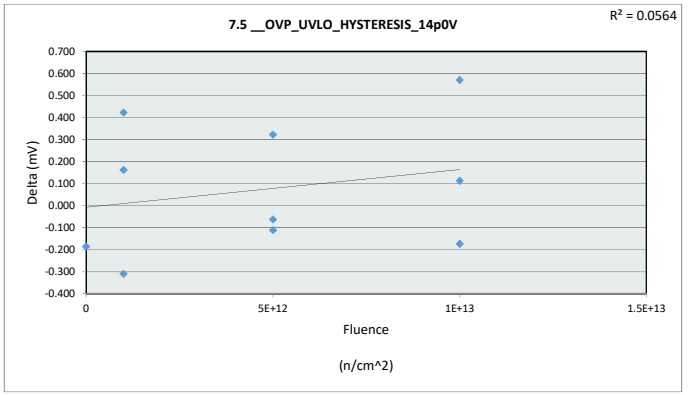
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	1.090	1.090	1.090	1.090
Min	1.124	1.137	1.125	1.128
Average	1.124	1.142	1.126	1.139
Max	1.124	1.144	1.127	1.160
UL	1.170	1.170	1.170	1.170



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

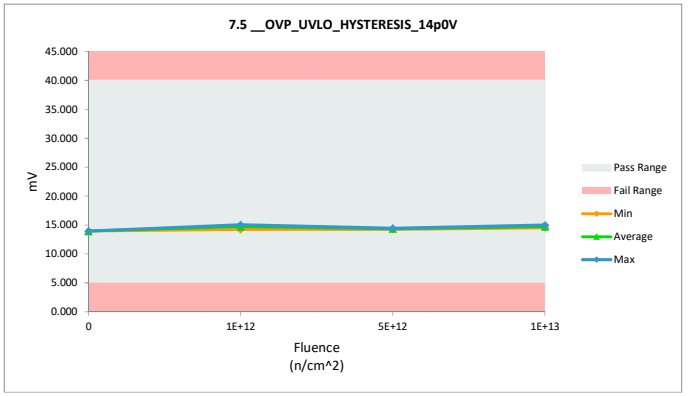
	7.5 __OVP_UVLO_HYSTERESIS_14p0V	
Test Site		
Tester		
Test Number		
Unit	mV	mV
Max Limit	40	40
Min Limit	5	5

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	14.130	13.944	-0.186
1E+12	1	14.623	15.045	0.422
1E+12	2	14.759	14.921	0.162
1E+12	3	14.549	14.239	-0.310
5E+12	4	14.117	14.439	0.322
5E+12	5	14.304	14.241	-0.063
5E+12	6	14.514	14.402	-0.112
1E+13	7	14.725	14.551	-0.174
1E+13	8	14.599	14.712	0.113
1E+13	9	14.423	14.993	0.570
	Max	14.759	15.045	0.570
	Average	14.474	14.549	0.074
	Min	14.117	13.944	-0.310
	Std Dev	0.228	0.365	0.292



	7.5 __OVP_UVLO_HYSTERESIS			
Test Site				
Tester				
Test Number				
Max Limit	40	mV		
Min Limit	5	mV		

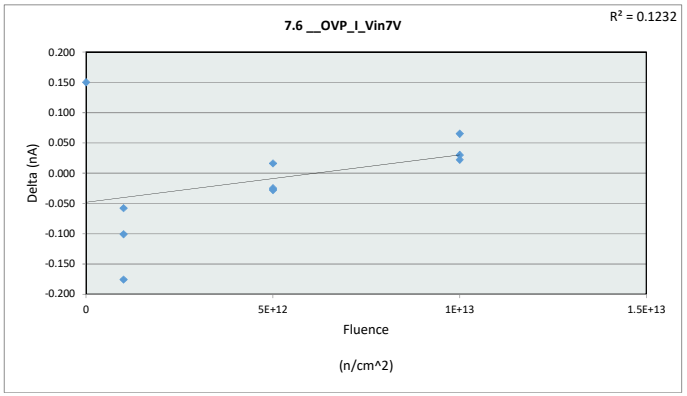
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL	5.000	5.000	5.000	5.000
Min	13.944	14.239	14.241	14.551
Average	13.944	14.735	14.361	14.752
Max	13.944	15.045	14.439	14.993
UL	40.000	40.000	40.000	40.000



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

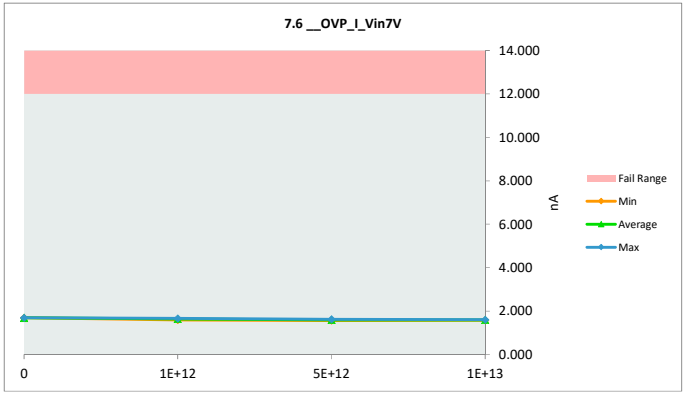
	7.6 __OVP_I_Vin7V	
Test Site		
Tester		
Test Number		
Unit	nA	nA
Max Limit	12	12
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	1.540	1.690	0.150
1E+12	1	1.831	1.655	-0.176
1E+12	2	1.650	1.592	-0.058
1E+12	3	1.756	1.655	-0.101
5E+12	4	1.623	1.595	-0.028
5E+12	5	1.604	1.620	0.016
5E+12	6	1.586	1.561	-0.025
1E+13	7	1.558	1.580	0.022
1E+13	8	1.556	1.586	0.030
1E+13	9	1.535	1.600	0.065
	Max	1.831	1.690	0.150
	Average	1.624	1.613	-0.010
	Min	1.535	1.561	-0.176
	Std Dev	0.098	0.041	0.090



	7.6 __OVP_I_Vin7V			
Test Site				
Tester				
Test Number				
Max Limit	12	nA		
Min Limit		nA		

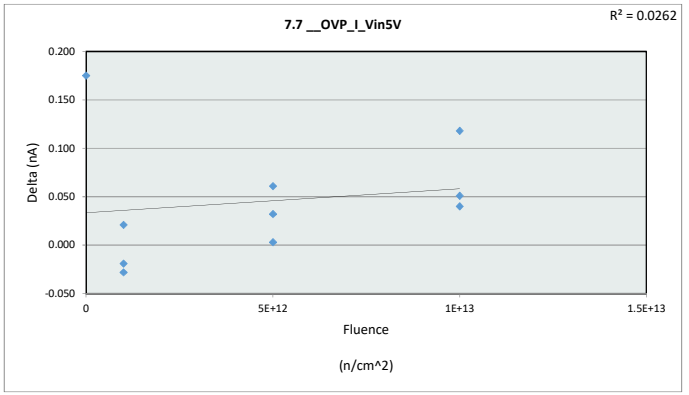
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	1.690	1.592	1.561	1.580
Average	1.690	1.634	1.592	1.589
Max	1.690	1.655	1.620	1.600
UL	12.000	12.000	12.000	12.000



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

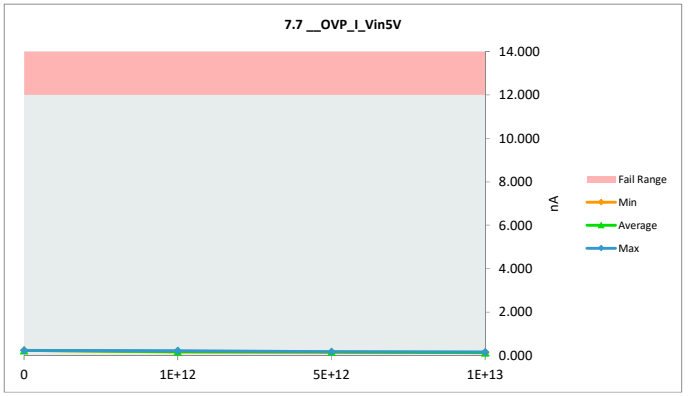
	7.7 __OVP_I_Vin5V	
Test Site		
Tester		
Test Number		
Unit	nA	nA
Max Limit	12	12
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	0.064	0.239	0.175
1E+12	1	0.205	0.177	-0.028
1E+12	2	0.134	0.155	0.021
1E+12	3	0.239	0.220	-0.019
5E+12	4	0.141	0.144	0.003
5E+12	5	0.140	0.172	0.032
5E+12	6	0.094	0.155	0.061
1E+13	7	0.089	0.129	0.040
1E+13	8	0.074	0.125	0.051
1E+13	9	0.040	0.158	0.118
	Max	0.239	0.239	0.175
	Average	0.122	0.167	0.045
	Min	0.040	0.125	-0.028
	Std Dev	0.063	0.037	0.062



	7.7 __OVP_I_Vin5V	
Test Site		
Tester		
Test Number		
Max Limit	12	nA
Min Limit		nA

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	0.239	0.155	0.144	0.125
Average	0.239	0.184	0.157	0.137
Max	0.239	0.220	0.172	0.158
UL	12.000	12.000	12.000	12.000



Neutron Displacement Damage (NDD) Report
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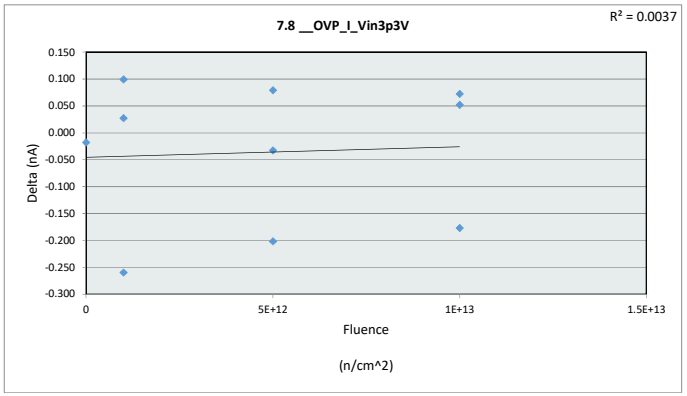
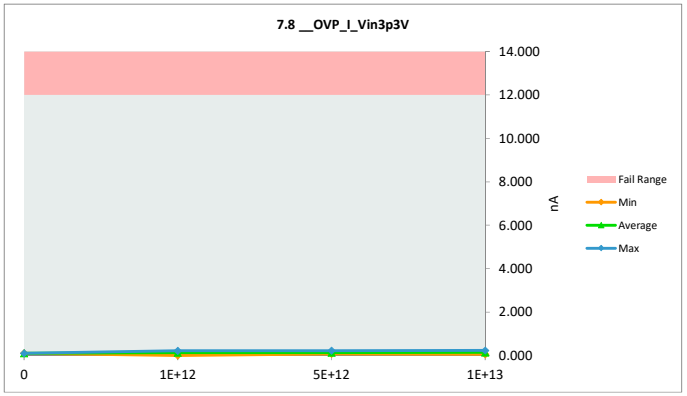
	7.8 __OVP_I_Vin3p3V	
Test Site		
Tester		
Test Number		
Unit	nA	nA
Max Limit	12	12
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	0.122	0.104	-0.018
1E+12	1	0.261	0.001	-0.260
1E+12	2	0.074	0.173	0.099
1E+12	3	0.189	0.216	0.027
5E+12	4	0.140	0.219	0.079
5E+12	5	0.277	0.075	-0.202
5E+12	6	0.145	0.112	-0.033
1E+13	7	0.312	0.135	-0.177
1E+13	8	0.157	0.229	0.072
1E+13	9	0.004	0.056	0.052
	Max	0.312	0.229	0.099
	Average	0.168	0.132	-0.036
	Min	0.004	0.001	-0.260
	Std Dev	0.095	0.077	0.130



	7.8 __OVP_I_Vin3p3V	
Test Site		
Tester		
Test Number		
Max Limit	12	nA
Min Limit		nA

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	0.104	0.001	0.075	0.056
Average	0.104	0.130	0.135	0.140
Max	0.104	0.216	0.219	0.229
UL	12.000	12.000	12.000	12.000



Neutron Displacement Damage (NDD) Report
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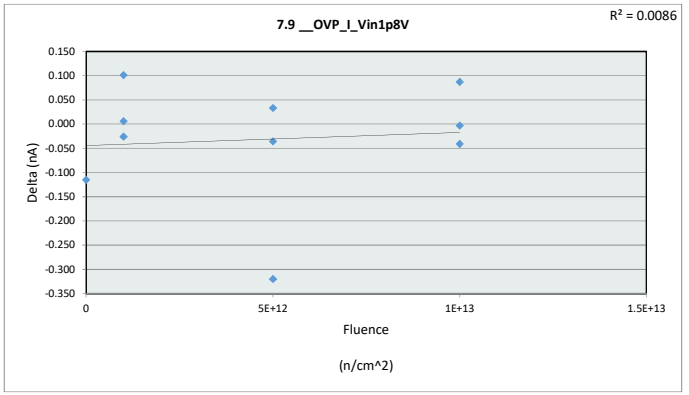
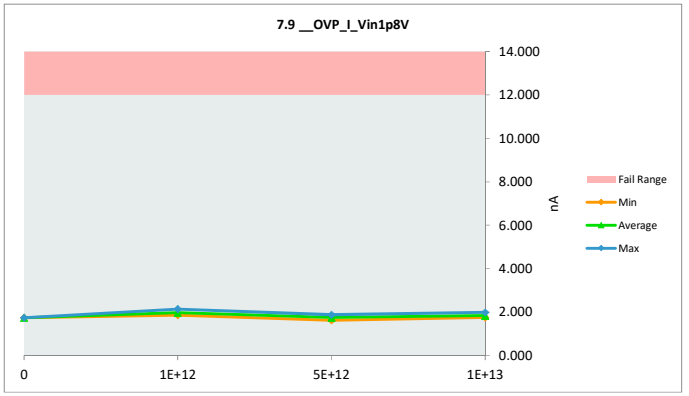
	7.9 __OVP_I_Vin1p8V	
Test Site		
Tester		
Test Number		
Unit	nA	nA
Max Limit	12	12
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	1.854	1.739	-0.115
1E+12	1	1.850	1.856	0.006
1E+12	2	2.035	2.136	0.101
1E+12	3	1.939	1.913	-0.026
5E+12	4	1.939	1.619	-0.320
5E+12	5	1.844	1.877	0.033
5E+12	6	1.786	1.750	-0.036
1E+13	7	1.821	1.780	-0.041
1E+13	8	1.747	1.744	-0.003
1E+13	9	1.898	1.985	0.087
	Max	2.035	2.136	0.101
	Average	1.871	1.840	-0.031
	Min	1.747	1.619	-0.320
	Std Dev	0.084	0.147	0.119



	7.9 __OVP_I_Vin1p8V	
Test Site		
Tester		
Test Number		
Max Limit	12	nA
Min Limit		nA

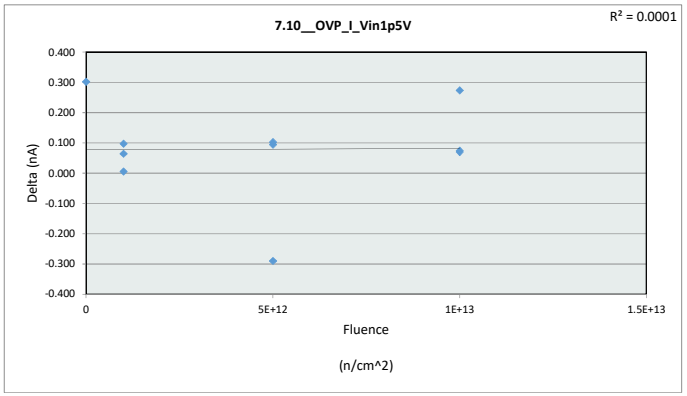
Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	1.739	1.856	1.619	1.744
Average	1.739	1.968	1.749	1.836
Max	1.739	2.136	1.877	1.985
UL	12.000	12.000	12.000	12.000



Neutron Displacement Damage (NDD) Report
TPS7H2211-SP

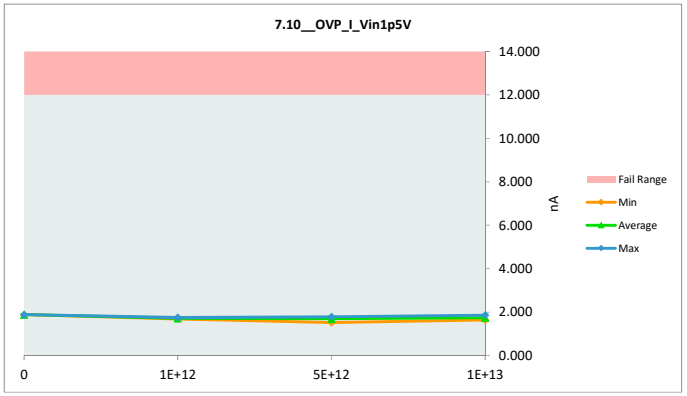
	7.10__OVP_I_Vin1p5V	
Test Site		
Tester		
Test Number		
Unit	nA	nA
Max Limit	12	12
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	1.577	1.879	0.302
1E+12	1	1.714	1.719	0.005
1E+12	2	1.618	1.682	0.064
1E+12	3	1.646	1.743	0.097
5E+12	4	1.808	1.518	-0.290
5E+12	5	1.681	1.775	0.094
5E+12	6	1.678	1.780	0.102
1E+13	7	1.566	1.636	0.070
1E+13	8	1.584	1.857	0.273
1E+13	9	1.647	1.721	0.074
	Max	1.808	1.879	0.302
	Average	1.652	1.731	0.079
	Min	1.566	1.518	-0.290
	Std Dev	0.073	0.105	0.160



	7.10__OVP_I_Vin1p5V	
Test Site		
Tester		
Test Number		
Max Limit	12	nA
Min Limit		nA

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	1.879	1.682	1.518	1.636
Average	1.879	1.715	1.691	1.738
Max	1.879	1.743	1.780	1.857
UL	12.000	12.000	12.000	12.000



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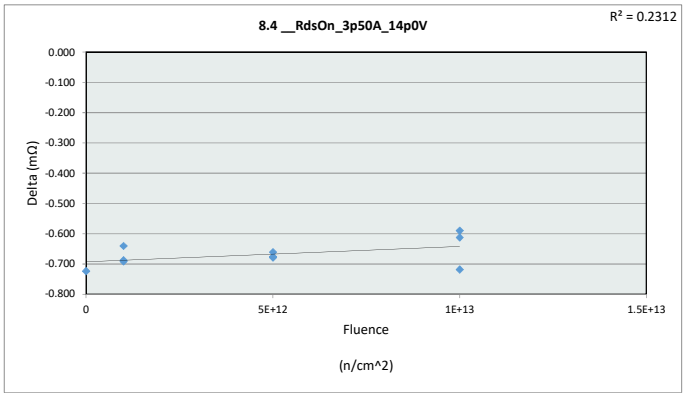
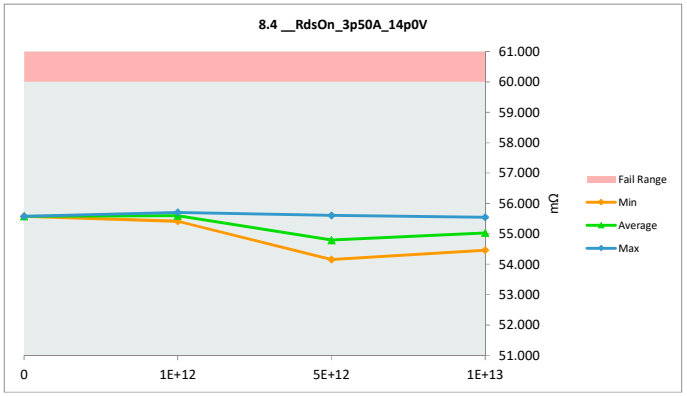
	8.4 __RdsOn_3p50A_14p0V	
Test Site		
Tester		
Test Number		
Unit	mΩ	mΩ
Max Limit	60	60
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	56.303	55.579	-0.724
1E+12	1	56.378	55.690	-0.688
1E+12	2	56.056	55.415	-0.641
1E+12	3	56.394	55.702	-0.692
5E+12	4	54.822	54.161	-0.661
5E+12	5	55.303	54.624	-0.679
5E+12	6	56.285	55.608	-0.677
1E+13	7	55.058	54.468	-0.590
1E+13	8	56.159	55.546	-0.613
1E+13	9	55.797	55.078	-0.719
	Max	56.394	55.702	-0.590
	Average	55.856	55.187	-0.668
	Min	54.822	54.161	-0.724
	Std Dev	0.586	0.570	0.043



	8.4 __RdsOn_3p50A_14p0V			
Test Site				
Tester				
Test Number				
Max Limit	60	mΩ		
Min Limit		mΩ		

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	55.579	55.415	54.161	54.468
Average	55.579	55.602	54.798	55.031
Max	55.579	55.702	55.608	55.546
UL	60.000	60.000	60.000	60.000



Neutron Displacement Damage (NDD) Report
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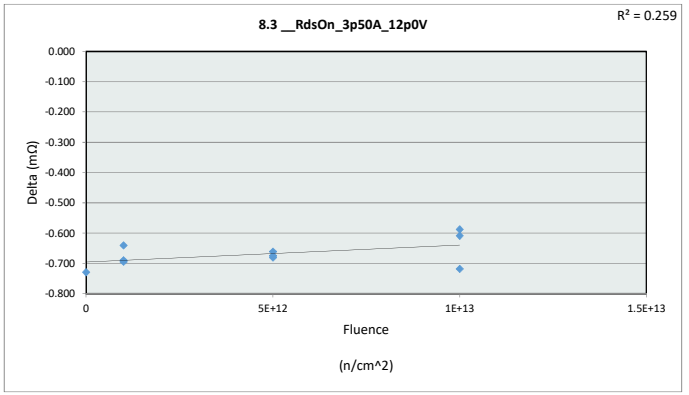
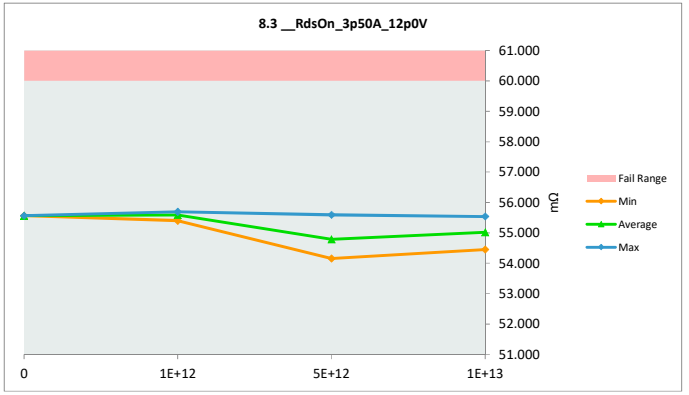
	8.3 __RdsOn_3p50A_12p0V	
Test Site		
Tester		
Test Number		
Unit	mΩ	mΩ
Max Limit	60	60
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	56.296	55.567	-0.729
1E+12	1	56.371	55.681	-0.690
1E+12	2	56.042	55.401	-0.641
1E+12	3	56.387	55.692	-0.695
5E+12	4	54.817	54.156	-0.661
5E+12	5	55.294	54.613	-0.681
5E+12	6	56.272	55.597	-0.675
1E+13	7	55.043	54.455	-0.588
1E+13	8	56.149	55.540	-0.609
1E+13	9	55.795	55.077	-0.718
	Max	56.387	55.692	-0.588
	Average	55.847	55.178	-0.669
	Min	54.817	54.156	-0.729
	Std Dev	0.586	0.570	0.045



	8.3 __RdsOn_3p50A_12p0V	
Test Site		
Tester		
Test Number		
Max Limit	60	mΩ
Min Limit		mΩ

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	55.567	55.401	54.156	54.455
Average	55.567	55.591	54.789	55.024
Max	55.567	55.692	55.597	55.540
UL	60.000	60.000	60.000	60.000



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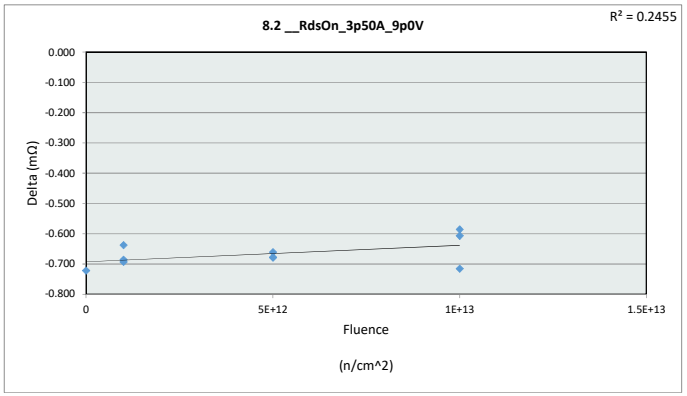
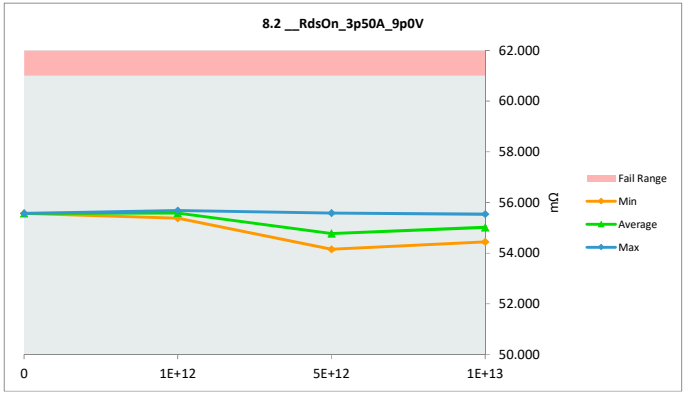
	8.2 __RdsOn_3p50A_9p0V	
Test Site		
Tester		
Test Number		
Unit	mΩ	mΩ
Max Limit	61	61
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	56.289	55.567	-0.722
1E+12	1	56.361	55.675	-0.686
1E+12	2	56.023	55.385	-0.638
1E+12	3	56.377	55.683	-0.694
5E+12	4	54.812	54.151	-0.661
5E+12	5	55.279	54.601	-0.678
5E+12	6	56.259	55.580	-0.679
1E+13	7	55.032	54.446	-0.586
1E+13	8	56.145	55.538	-0.607
1E+13	9	55.793	55.077	-0.716
	Max	56.377	55.683	-0.586
	Average	55.837	55.170	-0.667
	Min	54.812	54.151	-0.722
	Std Dev	0.586	0.570	0.044



	8.2 __RdsOn_3p50A_9p0V	
Test Site		
Tester		
Test Number		
Max Limit	61	mΩ
Min Limit		mΩ

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	55.567	55.385	54.151	54.446
Average	55.567	55.581	54.777	55.020
Max	55.567	55.683	55.580	55.538
UL	61.000	61.000	61.000	61.000



Neutron Displacement Damage (NDD) Report
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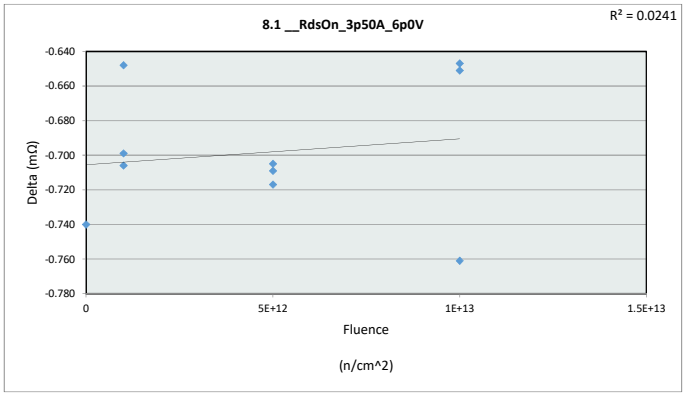
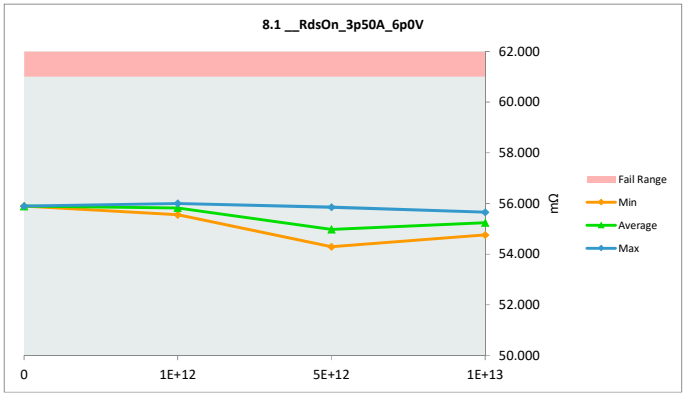
	8.1 __RdsOn_3p50A_6p0V	
Test Site		
Tester		
Test Number		
Unit	mΩ	mΩ
Max Limit	61	61
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	56.638	55.898	-0.740
1E+12	1	56.699	56.000	-0.699
1E+12	2	56.200	55.552	-0.648
1E+12	3	56.643	55.937	-0.706
5E+12	4	54.997	54.292	-0.705
5E+12	5	55.489	54.780	-0.709
5E+12	6	56.572	55.855	-0.717
1E+13	7	55.401	54.754	-0.647
1E+13	8	56.307	55.656	-0.651
1E+13	9	56.089	55.328	-0.761
	Max	56.699	56.000	-0.647
	Average	56.104	55.405	-0.698
	Min	54.997	54.292	-0.761
	Std Dev	0.605	0.599	0.039



	8.1 __RdsOn_3p50A_6p0V			
Test Site				
Tester				
Test Number				
Max Limit	61	mΩ		
Min Limit		mΩ		

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	55.898	55.552	54.292	54.754
Average	55.898	55.830	54.976	55.246
Max	55.898	56.000	55.855	55.656
UL	61.000	61.000	61.000	61.000



Neutron Displacement Damage (NDD) Report
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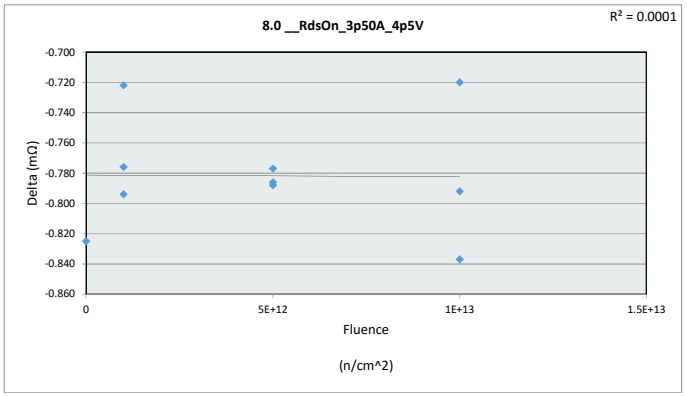
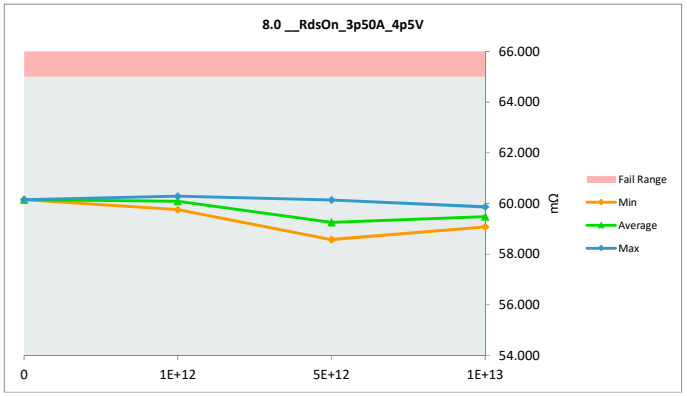
	8.0 __RdsOn_3p50A_4p5V	
Test Site		
Tester		
Test Number		
Unit	mΩ	mΩ
Max Limit	65	65
Min Limit		

Fluence (n/cm^2)	Serial #	PRE_NDD	POST_NDD	Delta
0	10	60.976	60.151	-0.825
1E+12	1	61.062	60.286	-0.776
1E+12	2	60.482	59.760	-0.722
1E+12	3	61.017	60.223	-0.794
5E+12	4	59.354	58.577	-0.777
5E+12	5	59.837	59.051	-0.786
5E+12	6	60.925	60.137	-0.788
1E+13	7	59.793	59.073	-0.720
1E+13	8	60.658	59.866	-0.792
1E+13	9	60.364	59.527	-0.837
	Max	61.062	60.286	-0.720
	Average	60.447	59.665	-0.782
	Min	59.354	58.577	-0.837
	Std Dev	0.602	0.590	0.038



	8.0 __RdsOn_3p50A_4p5V	
Test Site		
Tester		
Test Number		
Max Limit	65	mΩ
Min Limit		mΩ

Fluence (n/cm^2)	0	1E+12	5E+12	1E+13
LL				
Min	60.151	59.760	58.577	59.073
Average	60.151	60.090	59.255	59.489
Max	60.151	60.286	60.137	59.866
UL	65.000	65.000	65.000	65.000



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