Radiation Report

LM2941-SP Neutron Displacement Damage (NDD) Characterization

ABSTRACT

This report presents the effect of neutron displacement damage (NDD) on the LM2941QML-SP device. The devices were radiated up to 1 × 10^{13} n/cm^2 (1-MeV equivalent). A sample size of nine units was exposed to radiation testing per MIL-STD-883(Method 1017 for Neutron Irradiation) and an additional unirradiated sample device was used for correlation. Electrical testing was performed at Texas Instruments before and after neutron irradiation using the production test program for LM2941QML-SP.

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Trademarks

1 Overview

The LM2941-SP is a radiation-hardened QMLV, 6-V to 26-V input, 1-A adjustable output linear regulator. The LM2941 positive voltage regulator features the ability to source 1A of output current with a typical dropout voltage of 0.5V and a maximum of 1V over the entire temperature range. Furthermore, a which reduces the ground pin current when the differential between the input voltage and the output voltage exceeds approximately 3V.

General device information and testing conditions are listed in Table 1-1.

Table 1-1. Overview Information

TI Part Number	LM2941QML-SP
Orderable Number	LM2941GWRLQMLV
Device Function	Linear Regulator
Die Name	RLM1940FAQSRY
Package	16-pin CFP (NAC)
Technology	SLM
A/T Lot Number / Date Code	9161157/1918A
Unbiased Quantity Tested	9 + control
Exposure Facility	VPT Rad
Neutron Fluence (1-MeV equivalent)	1.0×10^{12}, 5.0×10^{12}, 1.0×10^{13} n/cm^2
Irradiation Temperature	25°C
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2 Test Procedures

The LM2941QML-SP was electrically pre-tested using the production automated test equipment (ATE) program.

General test procedures were IAW MIL-STD-883, Method 1017 for Neutron Irradiation of LM2941QML-SP.

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

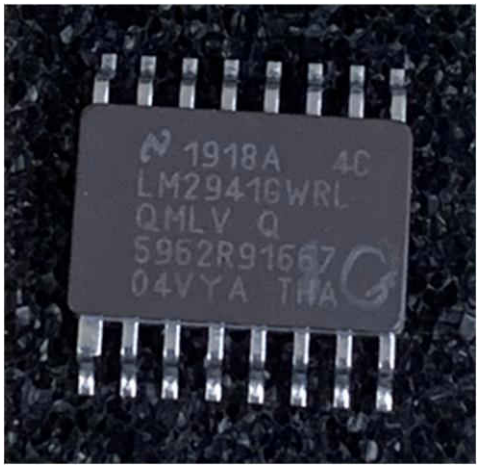


Figure 2-1. LM2941QML-SP Device

The LM2941QML-SP is packaged in a 16-pin ceramic flat pack package (NAC) as shown inFigure 2-1 .

3 Facility

VPT Rad performs all neutron displacement damage irradiations in a low-enriched, open-pool, water moderated, thermal neutron reactor. It utilizes flat-plate type fuel and has a maximum thermal energy output of up to 1 MW. The Fast Neutron Irradiator (FNI) faces one side of the reactor core. The FNI design produces a geometrical planar *beam* of fast neutrons that is approximately uniform over an area of 12 in × 20 in. Lead and thermal neutron absorbing compounds are combined to filter out both fission gammas and thermal neutrons. The ratio of fast-to-thermal neutrons is approximately 400:1, with a gamma exposure of up to 1401 rad(Si) for a 1E13 n/cm^2 (1-MeV(Si) equivalent) exposure. The FNI can accommodate a sample or samples with size up to 30 cm in diameter and 15-cm thick including packaging materials. The minimum neutron fluence rate is 1E6 n/cm^2-s. The maximum neutron fluence rate is approximately 1.0E11 n/cm^2-s (both values are 1-MeV(Si) equivalent).

The neutron fluence rate is determined using the previously-measured neutron radiation field for the FNI, performed in accordance with ASTM standards (ASTM F1190), and correlated to the measured reactor power level. The neutron dose is timed to meet the customer-specified fluence for the irradiation. Neutron dosimetry meeting ASTM standards (ASTM E265) is utilized to track and ensure irradiations meet the required minimum. The facility retains *source-suitability* with the Defense Logistics Agency (DLA) Laboratory Suitability Program for ASTM Test Method 1017. The DUTS are typically irradiation in an unbiased condition as per TM1017. If bias conditions are required, they can be maintained via dry thimbles connected to the irradiation volume.

4 Results

There were failures at all tested neutron fluence levels. At the 1 × 10^{12} n/cm^2 level, there was a marginal failure for one test for all three devices. At the 5 × 10^{12} n/cm^2 fluence levels, failures were present in all three devices. At the 1 × 10^{13} n/cm^2 fluence levels, failures were present in all three devices. The full parameter list and graphs are found in Appendix A.

Table 4-1 lists the LM2941QML-SP specification compliance matrix.

Table 4-1. LM2941QML-SP Specification Compliance Matrix

PARAMETER	TEST CONDITION	LM2941QML-SP DATA SHEET (SNVS390B)			ATE TEST #
		MIN	MAX	UNIT	
Reference Voltage	5mA ≤ I_O ≤ 1A	1.237	1.313	V	1.0, 7.0, 101.0, 106.0
Line Regulation	V_O + 2V ≤ V_{IN} ≤ 26V, I_O= 5mA		10	mV	2.0
Quiescent Current	V_O + 2V ≤ V_{IN} ≤ 26V, I_O= 5mA		15	mA	3.0, 4.0, 102.0, 103.0
	V_{IN}= V_O + 5V, I_O= 1A		45		5.0, 104.0
Load Regulation	5mA ≤ I_O ≤ 1A, V_{IN}= 10V, V_{OUT}= 5V		10	mV/V	6.0
	5mA ≤ I_O ≤ 1A, V_{IN}= 25V, V_{OUT}= 20V		10		105.0
ON/OFF Threshold Current	$V_{ON/OFF}$= 2.0V, I_O ≤ 1A		100	µA	10.0
Dropout Voltage	I_O= 100mA		200	mV	11.0
	I_O= 1A		0.8	V	12.0, 110.0
Short Circuit Current	$V_{IN\ MAX}$= 26V	1.6	3.5	A	35.0

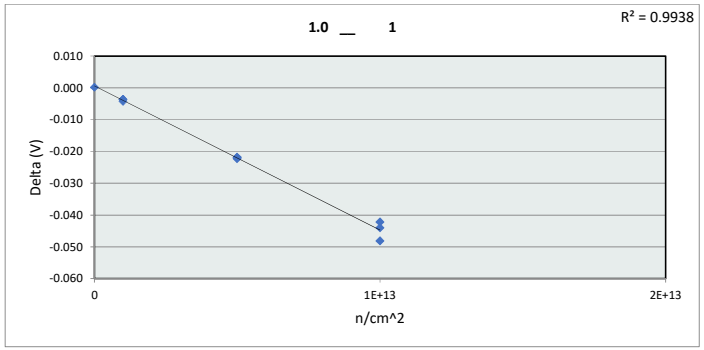
A Appendix: NDD Test Results

This appendix contains the detailed NDD test results.

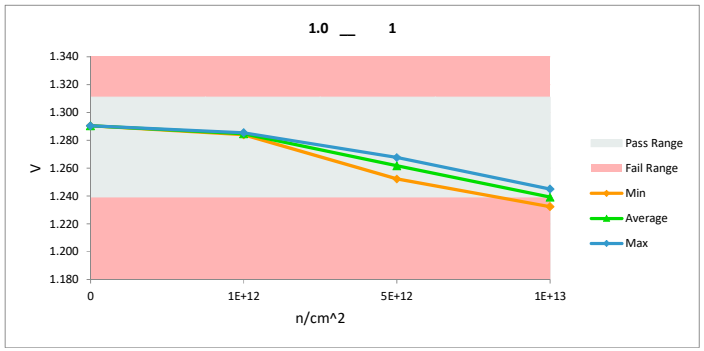
NDD Report
LM2941GWRLQMLV

	1.0 __ 1	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	1.311	1.311
Min Limit	1.239	1.239

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	1.288	1.284	-0.004
1E+12	2.1	1.288	1.285	-0.004
1E+12	3.1	1.290	1.286	-0.004
5E+12	4.1	1.288	1.265	-0.022
5E+12	5.1	1.289	1.268	-0.022
5E+12	6.1	1.274	1.252	-0.022
1E+13	7.1	1.288	1.240	-0.048
1E+13	8.1	1.289	1.245	-0.044
1E+13	9.1	1.275	1.232	-0.042
0	10.1	1.290	1.290	0.000
	Max	1.290	1.290	0.000
	Average	1.286	1.265	-0.021
	Min	1.274	1.232	-0.048
	Std Dev	0.006	0.021	0.018



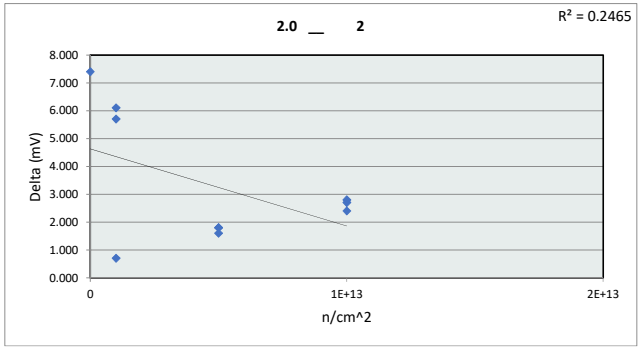
	1.0 __ 1			
Test Site				
Tester				
Test Number				
Max Limit	1.311	V		
Min Limit	1.239	V		
n/cm^2	0	1E+12	5E+12	1E+13
LL	1.239	1.239	1.239	1.239
Min	1.290	1.284	1.252	1.232
Average	1.290	1.285	1.262	1.239
Max	1.290	1.286	1.268	1.245
UL	1.311	1.311	1.311	1.311



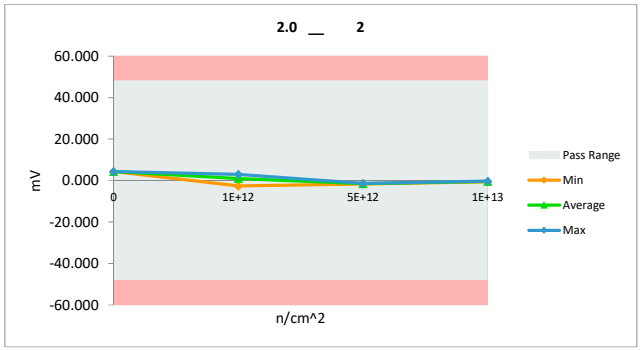
NDD Report
LM2941GWRLQMLV

	2.0 __ 2	
Test Site		
Tester		
Test Number		
Unit	mV	mV
Max Limit	48	48
Min Limit	-48	-48

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	-3.100	2.600	5.700
1E+12	2.1	-3.100	3.000	6.100
1E+12	3.1	-3.300	-2.600	0.700
5E+12	4.1	-3.200	-1.400	1.800
5E+12	5.1	-3.400	-1.600	1.800
5E+12	6.1	-3.000	-1.400	1.600
1E+13	7.1	-3.300	-0.500	2.800
1E+13	8.1	-3.000	-0.300	2.700
1E+13	9.1	-3.000	-0.600	2.400
0	10.1	-3.100	4.300	7.400
	Max	-3.000	4.300	7.400
	Average	-3.150	0.150	3.300
	Min	-3.400	-2.600	0.700
	Std Dev	0.143	2.309	2.260



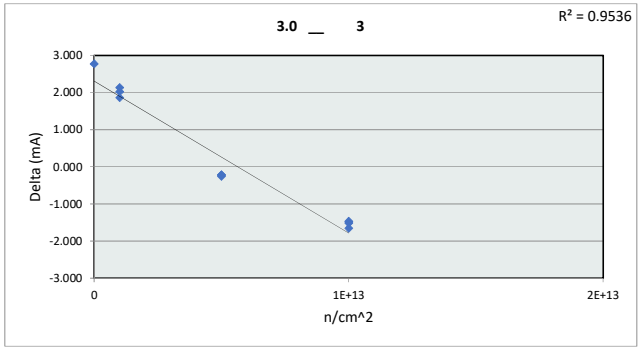
	2.0 __ 2			
Test Site				
Tester				
Test Number				
Max Limit	48	mV		
Min Limit	-48	mV		
n/cm^2	0	1E+12	5E+12	1E+13
LL	-48.000	-48.000	-48.000	-48.000
Min	4.300	-2.600	-1.600	-0.600
Average	4.300	1.000	-1.467	-0.467
Max	4.300	3.000	-1.400	-0.300
UL	48.000	48.000	48.000	48.000



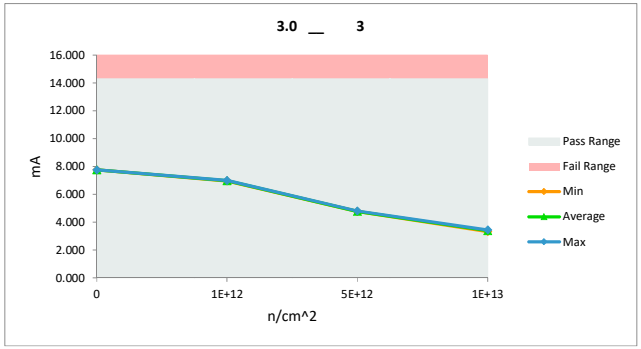
NDD Report
LM2941GWRLQMLV

	3.0 __ 3	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	14.3	14.3
Min Limit	0	0

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	5.140	7.000	1.860
1E+12	2.1	4.820	6.950	2.130
1E+12	3.1	4.930	6.950	2.020
5E+12	4.1	5.060	4.800	-0.260
5E+12	5.1	4.980	4.760	-0.220
5E+12	6.1	4.980	4.760	-0.220
1E+13	7.1	4.980	3.320	-1.660
1E+13	8.1	4.900	3.430	-1.470
1E+13	9.1	4.900	3.380	-1.520
0	10.1	4.980	7.750	2.770
	Max	5.140	7.750	2.770
	Average	4.967	5.310	0.343
	Min	4.820	3.320	-1.660
	Std Dev	0.089	1.709	1.699



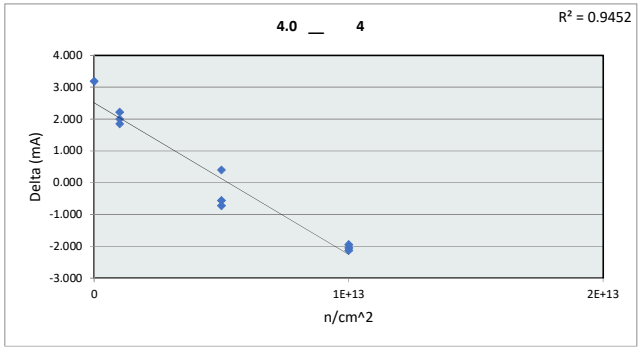
	3.0 __ 3			
Test Site				
Tester				
Test Number				
Max Limit	14.3	mA		
Min Limit	0	mA		
n/cm^2	0	1E+12	5E+12	1E+13
LL	0.000	0.000	0.000	0.000
Min	7.750	6.950	4.760	3.320
Average	7.750	6.967	4.773	3.377
Max	7.750	7.000	4.800	3.430
UL	14.300	14.300	14.300	14.300



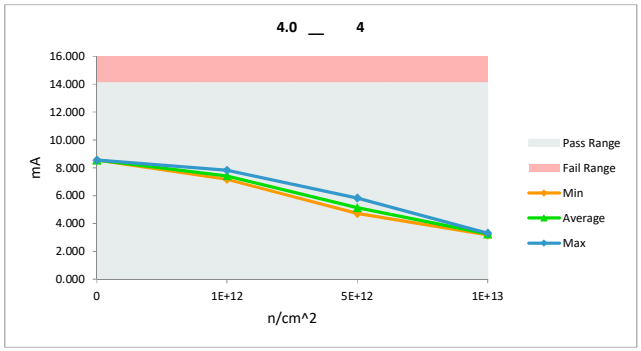
NDD Report
LM2941GWRLQMLV

	4.0 __ 4	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	14.1	14.1
Min Limit	0	0

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	5.590	7.810	2.220
1E+12	2.1	5.160	7.160	2.000
1E+12	3.1	5.430	7.280	1.850
5E+12	4.1	5.430	5.830	0.400
5E+12	5.1	5.380	4.820	-0.560
5E+12	6.1	5.430	4.710	-0.720
1E+13	7.1	5.300	3.170	-2.130
1E+13	8.1	5.300	3.250	-2.050
1E+13	9.1	5.250	3.300	-1.950
0	10.1	5.360	8.550	3.190
	Max	5.590	8.550	3.190
	Average	5.363	5.588	0.225
	Min	5.160	3.170	-2.130
	Std Dev	0.119	2.028	1.988



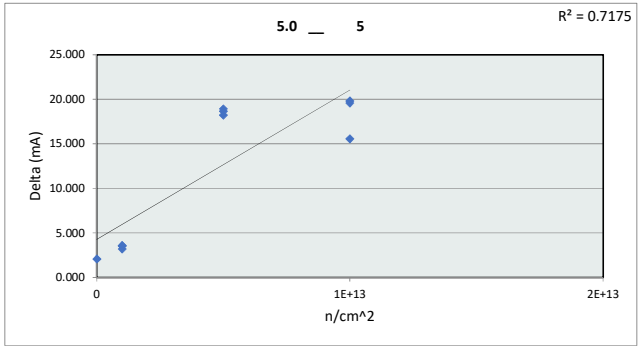
	4.0 __ 4			
Test Site				
Tester				
Test Number				
Max Limit	14.1	mA		
Min Limit	0	mA		
n/cm^2	0	1E+12	5E+12	1E+13
LL	0.000	0.000	0.000	0.000
Min	8.550	7.160	4.710	3.170
Average	8.550	7.417	5.120	3.240
Max	8.550	7.810	5.830	3.300
UL	14.100	14.100	14.100	14.100



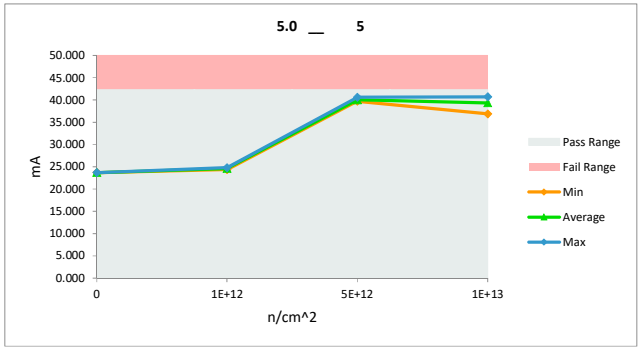
NDD Report
LM2941GWRLQMLV

	5.0 __ 5	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	42.3	42.3
Min Limit	0	0

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	21.480	24.670	3.190
1E+12	2.1	20.770	24.360	3.590
1E+12	3.1	21.230	24.770	3.540
5E+12	4.1	21.480	39.700	18.220
5E+12	5.1	21.660	40.590	18.930
5E+12	6.1	21.160	39.820	18.660
1E+13	7.1	21.290	36.860	15.570
1E+13	8.1	20.890	40.710	19.820
1E+13	9.1	20.970	40.540	19.570
0	10.1	21.610	23.690	2.080
	Max	21.660	40.710	19.820
	Average	21.254	33.571	12.317
	Min	20.770	23.690	2.080
	Std Dev	0.308	7.996	8.025

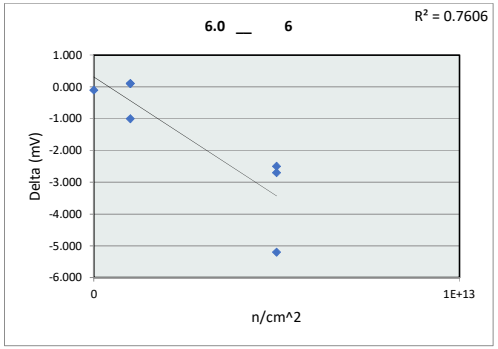


	5.0 __ 5			
Test Site				
Tester				
Test Number				
Max Limit	42.3	mA		
Min Limit	0	mA		
n/cm^2	0	1E+12	5E+12	1E+13
LL	0.000	0.000	0.000	0.000
Min	23.690	24.360	39.700	36.860
Average	23.690	24.600	40.037	39.370
Max	23.690	24.770	40.590	40.710
UL	42.300	42.300	42.300	42.300

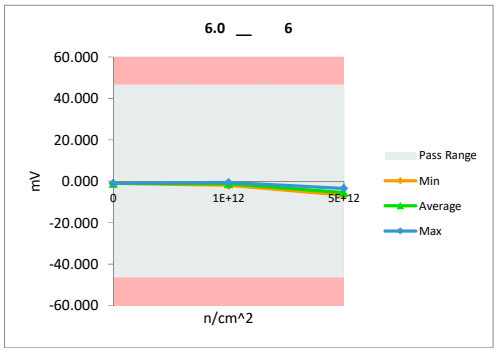


NDD Report
LM2941GWRLQMLV

	6.0 __ 6		
Test Site			
Tester			
Test Number			
Unit	mV	mV	
Max Limit	46.4	46.4	
Min Limit	-46.4	-46.4	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	-0.900	-1.900	-1.000
1E+12	2.1	-1.100	-1.000	0.100
1E+12	3.1	-0.700	-0.600	0.100
5E+12	4.1	-1.300	-6.500	-5.200
5E+12	5.1	-0.900	-3.400	-2.500
5E+12	6.1	-4.000	-6.700	-2.700
0	10.1	-0.900	-1.000	-0.100
	Max	-0.700	-0.600	0.100
	Average	-1.400	-3.014	-1.614
	Min	-4.000	-6.700	-5.200
	Std Dev	1.162	2.616	1.974



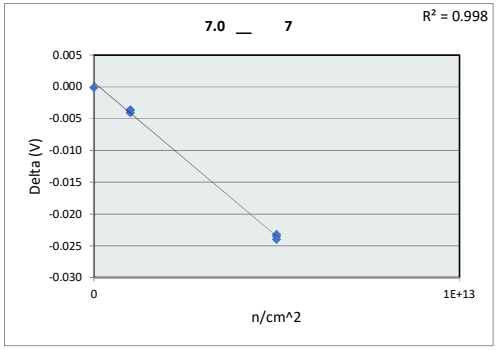
	6.0 __ 6		
Test Site			
Tester			
Test Number			
Max Limit	46.4	mV	
Min Limit	-46.4	mV	
n/cm^2	0	1E+12	5E+12
LL	-46.400	-46.400	-46.400
Min	-1.000	-1.900	-6.700
Average	-1.000	-1.167	-5.533
Max	-1.000	-0.600	-3.400
UL	46.400	46.400	46.400



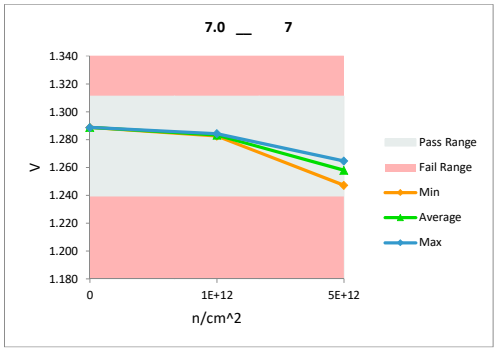
NDD Report
LM2941GWRLQMLV

	7.0 __ 7	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	1.311	1.311
Min Limit	1.239	1.239

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	1.286	1.282	-0.004
1E+12	2.1	1.287	1.283	-0.004
1E+12	3.1	1.288	1.284	-0.004
5E+12	4.1	1.286	1.262	-0.024
5E+12	5.1	1.288	1.265	-0.023
5E+12	6.1	1.271	1.247	-0.023
0	10.1	1.289	1.289	0.000
	Max	1.289	1.289	0.000
	Average	1.285	1.273	-0.012
	Min	1.271	1.247	-0.024
	Std Dev	0.006	0.015	0.011



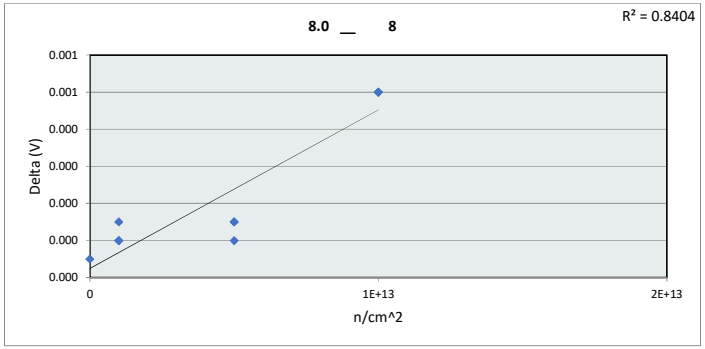
	7.0 __ 7		
Test Site			
Tester			
Test Number			
Max Limit	1.311	V	
Min Limit	1.239	V	
n/cm^2	0	1E+12	5E+12
LL	1.239	1.239	1.239
Min	1.289	1.282	1.247
Average	1.289	1.283	1.258
Max	1.289	1.284	1.265
UL	1.311	1.311	1.311



NDD Report
LM2941GWRLQMLV

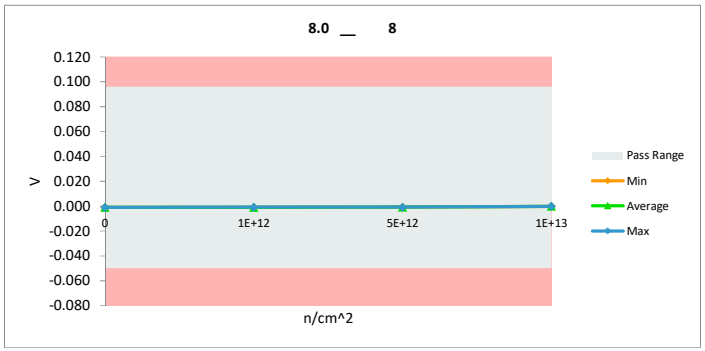
	8.0 __ 8	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	0.0956	0.0956
Min Limit	-0.05	-0.05

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	-0.001	-0.001	0.000
1E+12	2.1	-0.001	-0.001	0.000
1E+12	3.1	-0.001	-0.001	0.000
5E+12	4.1	-0.001	-0.001	0.000
5E+12	5.1	-0.001	-0.001	0.000
5E+12	6.1	-0.001	-0.001	0.000
1E+13	7.1	-0.001	0.000	0.001
1E+13	8.1	-0.001	0.000	0.001
1E+13	9.1	-0.001	0.000	0.001
0	10.1	-0.001	-0.001	0.000
	Max	-0.001	0.000	0.001
	Average	-0.001	-0.001	0.000
	Min	-0.001	-0.001	0.000
	Std Dev	0.000	0.000	0.000



	8.0 __ 8	
Test Site		
Tester		
Test Number		
Max Limit	0.0956	V
Min Limit	-0.05	V

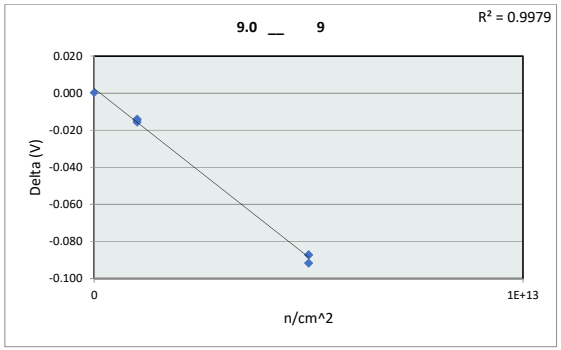
n/cm^2	0	1E+12	5E+12	1E+13
LL	-0.050	-0.050	-0.050	-0.050
Min	-0.001	-0.001	-0.001	0.000
Average	-0.001	-0.001	-0.001	0.000
Max	-0.001	-0.001	-0.001	0.000
UL	0.096	0.096	0.096	0.096



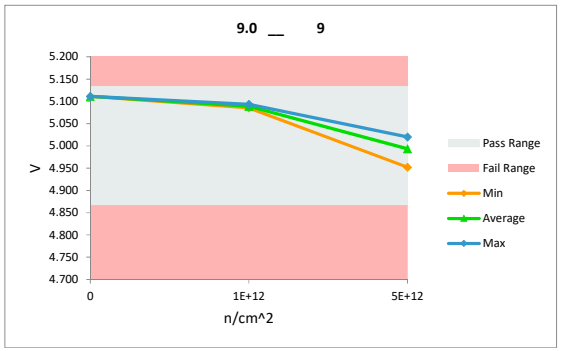
NDD Report
LM2941GWRLQMLV

	9.0 __ 9	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	5.133	5.133
Min Limit	4.867	4.867

n/cm^2	Serial #	pre	post	Delta	Delta %	% of Limit Range
1E+12	1.1	5.100	5.085	-0.015	-0.28%	5.45%
1E+12	2.1	5.102	5.088	-0.014	-0.27%	5.26%
1E+12	3.1	5.109	5.094	-0.016	-0.31%	5.90%
5E+12	4.1	5.099	5.008	-0.092	-1.80%	34.44%
5E+12	5.1	5.107	5.020	-0.087	-1.71%	32.78%
5E+12	6.1	5.039	4.952	-0.087	-1.73%	32.78%
0	10.1	5.111	5.111	0.000	0.01%	0.11%
	Max	5.111	5.111	0.000	0.01%	34.44%
	Average	5.095	5.051	-0.044	-0.87%	16.68%
	Min	5.039	4.952	-0.092	-1.80%	0.11%
	Std Dev	0.025	0.059	0.042	0.82%	15.71%

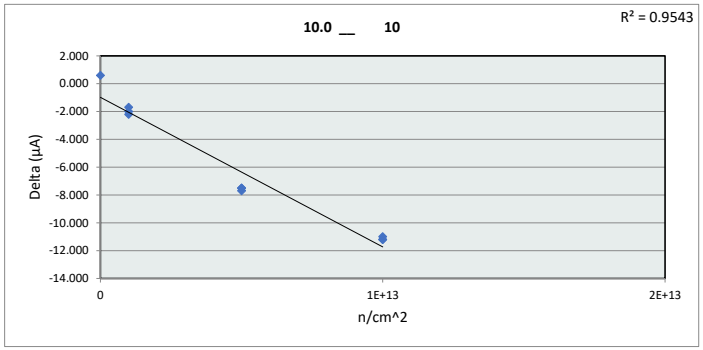


	9.0 __ 9		
Test Site			
Tester			
Test Number			
Max Limit	5.133	V	
Min Limit	4.867	V	
n/cm^2	0	1E+12	5E+12
LL	4.867	4.867	4.867
Min	5.111	5.085	4.952
Average	5.111	5.089	4.993
Max	5.111	5.094	5.020
UL	5.133	5.133	5.133

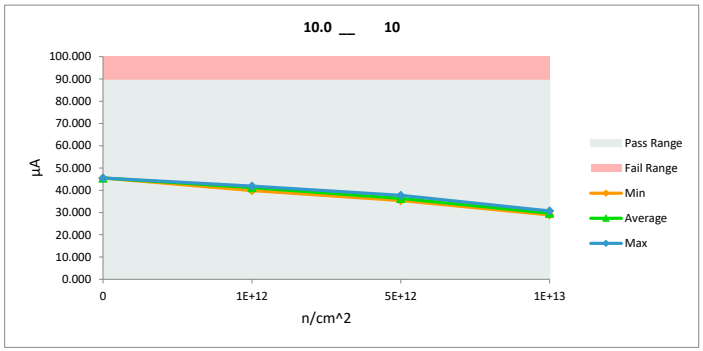


NDD Report
LM2941GWRLQMLV

	10.0 __ 10		
Test Site			
Tester			
Test Number			
Unit	µA	µA	
Max Limit	89.4	89.4	
Min Limit	0	0	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	43.400	41.700	-1.700
1E+12	2.1	41.900	39.900	-2.000
1E+12	3.1	44.100	41.900	-2.200
5E+12	4.1	43.400	35.900	-7.500
5E+12	5.1	45.400	37.700	-7.700
5E+12	6.1	42.900	35.400	-7.500
1E+13	7.1	41.900	30.700	-11.200
1E+13	8.1	40.100	28.900	-11.200
1E+13	9.1	40.400	29.400	-11.000
0	10.1	44.900	45.500	0.600
	Max	45.400	45.500	0.600
	Average	42.840	36.700	-6.140
	Min	40.100	28.900	-11.200
	Std Dev	1.772	5.708	4.457



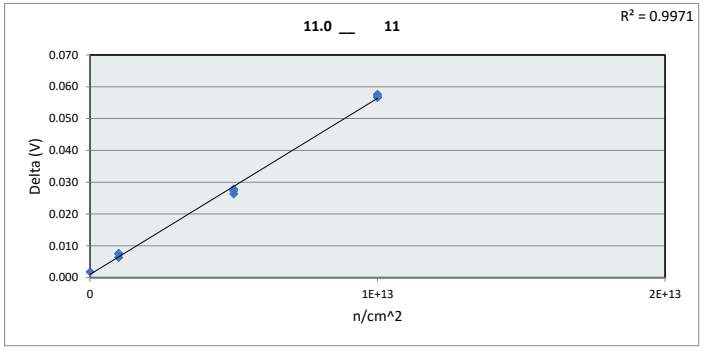
	10.0 __ 10			
Test Site				
Tester				
Test Number				
Max Limit	89.4	µA		
Min Limit	0	µA		
n/cm^2	0	1E+12	5E+12	1E+13
LL	0.000	0.000	0.000	0.000
Min	45.500	39.900	35.400	28.900
Average	45.500	41.167	36.333	29.667
Max	45.500	41.900	37.700	30.700
UL	89.400	89.400	89.400	89.400



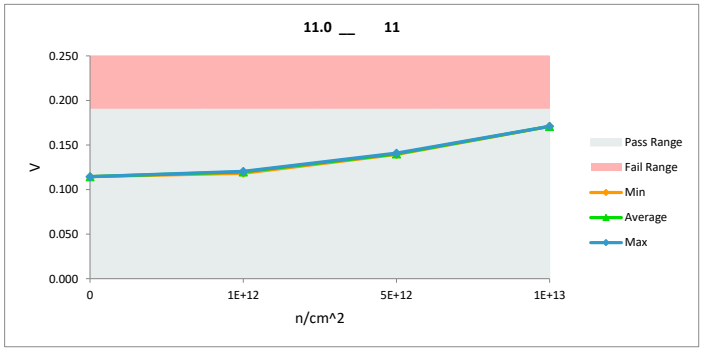
NDD Report
LM2941GWRLQMLV

	11.0 __ 11	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	0.19	0.19
Min Limit	0	0

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	0.112	0.118	0.006
1E+12	2.1	0.113	0.120	0.008
1E+12	3.1	0.113	0.120	0.008
5E+12	4.1	0.112	0.140	0.027
5E+12	5.1	0.113	0.140	0.026
5E+12	6.1	0.113	0.141	0.028
1E+13	7.1	0.113	0.171	0.058
1E+13	8.1	0.114	0.171	0.057
1E+13	9.1	0.114	0.171	0.057
0	10.1	0.113	0.115	0.002
	Max	0.114	0.171	0.058
	Average	0.113	0.141	0.028
	Min	0.112	0.115	0.002
	Std Dev	0.001	0.023	0.022

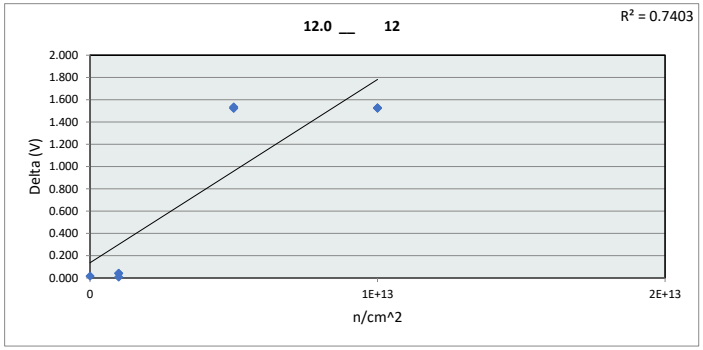


	11.0 __ 11			
Test Site				
Tester				
Test Number				
Max Limit	0.19	V		
Min Limit	0	V		
n/cm^2	0	1E+12	5E+12	1E+13
LL	0.000	0.000	0.000	0.000
Min	0.115	0.118	0.140	0.171
Average	0.115	0.120	0.140	0.171
Max	0.115	0.121	0.141	0.171
UL	0.190	0.190	0.190	0.190

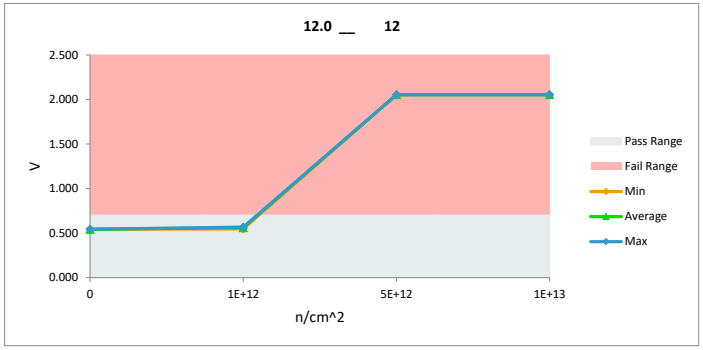


NDD Report
LM2941GWRLQMLV

	12.0 __ 12		
Test Site			
Tester			
Test Number			
Unit	V	V	
Max Limit	0.7	0.7	
Min Limit	0	0	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	0.539	0.547	0.008
1E+12	2.1	0.525	0.566	0.041
1E+12	3.1	0.526	0.568	0.042
5E+12	4.1	0.518	2.054	1.535
5E+12	5.1	0.531	2.054	1.522
5E+12	6.1	0.527	2.054	1.526
1E+13	7.1	0.527	2.054	1.526
1E+13	8.1	0.530	2.054	1.524
1E+13	9.1	0.527	2.054	1.526
0	10.1	0.527	0.543	0.016
	Max	0.539	2.054	1.535
	Average	0.528	1.455	0.927
	Min	0.518	0.543	0.008
	Std Dev	0.005	0.773	0.775

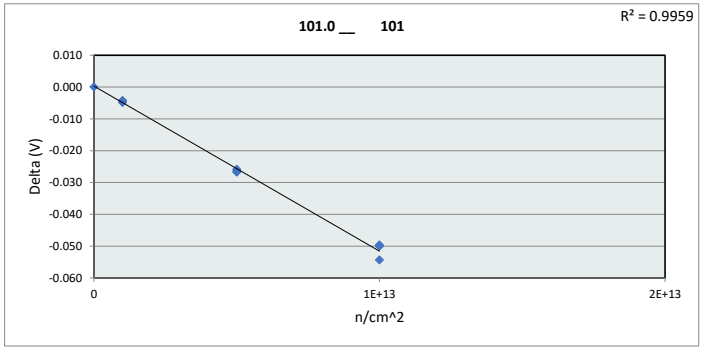


	12.0 __ 12			
Test Site				
Tester				
Test Number				
Max Limit	0.7	V		
Min Limit	0	V		
n/cm^2	0	1E+12	5E+12	1E+13
LL	0.000	0.000	0.000	0.000
Min	0.543	0.547	2.054	2.054
Average	0.543	0.560	2.054	2.054
Max	0.543	0.568	2.054	2.054
UL	0.700	0.700	0.700	0.700

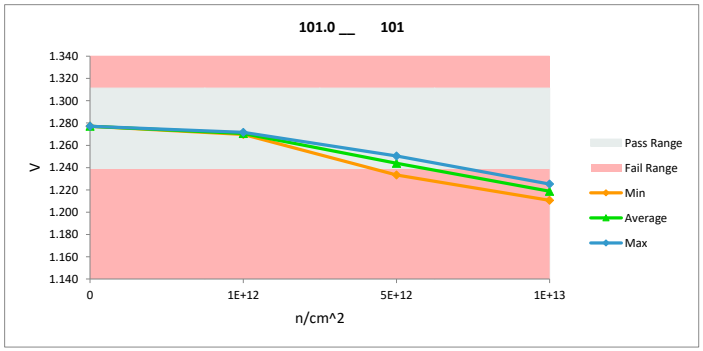


NDD Report
LM2941GWRLQMLV

	101.0 __ 101		
Test Site			
Tester			
Test Number			
Unit	V	V	
Max Limit	1.3112	1.3112	
Min Limit	1.2388	1.2388	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	1.274	1.270	-0.004
1E+12	2.1	1.275	1.270	-0.004
1E+12	3.1	1.276	1.272	-0.005
5E+12	4.1	1.274	1.248	-0.026
5E+12	5.1	1.276	1.250	-0.026
5E+12	6.1	1.260	1.233	-0.027
1E+13	7.1	1.275	1.220	-0.054
1E+13	8.1	1.275	1.225	-0.050
1E+13	9.1	1.260	1.211	-0.050
0	10.1	1.277	1.277	0.000
	Max	1.277	1.277	0.000
	Average	1.272	1.248	-0.025
	Min	1.260	1.211	-0.054
	Std Dev	0.006	0.024	0.021

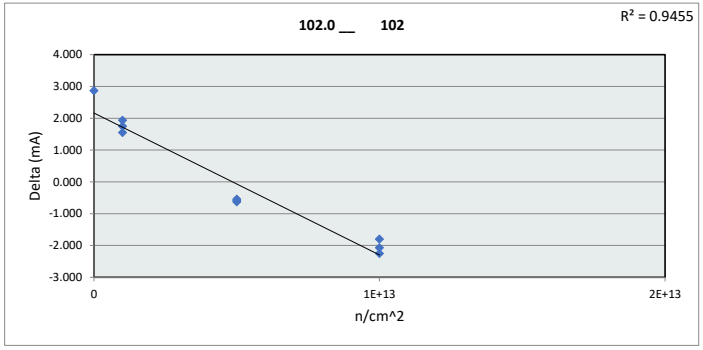


	101.0 __ 101			
Test Site				
Tester				
Test Number				
Max Limit	1.3112	V		
Min Limit	1.2388	V		
n/cm^2	0	1E+12	5E+12	1E+13
LL	1.239	1.239	1.239	1.239
Min	1.277	1.270	1.233	1.211
Average	1.277	1.271	1.244	1.219
Max	1.277	1.272	1.250	1.225
UL	1.311	1.311	1.311	1.311

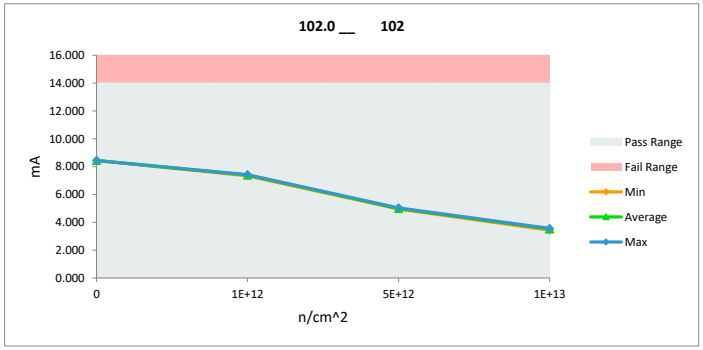


NDD Report
LM2941GWRLQMLV

	102.0 __ 102		
Test Site			
Tester			
Test Number			
Unit	mA	mA	
Max Limit	14	14	
Min Limit	0	0	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	5.870	7.420	1.550
1E+12	2.1	5.400	7.340	1.940
1E+12	3.1	5.660	7.410	1.750
5E+12	4.1	5.660	5.030	-0.630
5E+12	5.1	5.540	5.000	-0.540
5E+12	6.1	5.540	4.950	-0.590
1E+13	7.1	5.680	3.430	-2.250
1E+13	8.1	5.630	3.560	-2.070
1E+13	9.1	5.360	3.560	-1.800
0	10.1	5.570	8.440	2.870
	Max	5.870	8.440	2.870
	Average	5.591	5.614	0.023
	Min	5.360	3.430	-2.250
	Std Dev	0.146	1.880	1.858



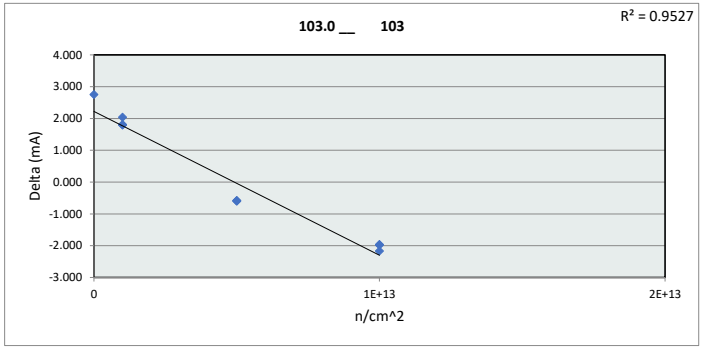
	102.0 __ 102			
Test Site				
Tester				
Test Number				
Max Limit	14	mA		
Min Limit	0	mA		
n/cm^2	0	1E+12	5E+12	1E+13
LL	0.000	0.000	0.000	0.000
Min	8.440	7.340	4.950	3.430
Average	8.440	7.390	4.993	3.517
Max	8.440	7.420	5.030	3.560
UL	14.000	14.000	14.000	14.000



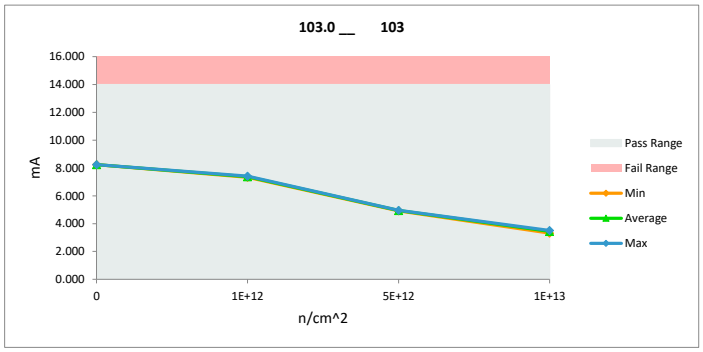
NDD Report
LM2941GWRLQMLV

	103.0 __ 103	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	14	14
Min Limit	0	0

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	5.630	7.420	1.790
1E+12	2.1	5.350	7.390	2.040
1E+12	3.1	5.520	7.330	1.810
5E+12	4.1	5.540	4.960	-0.580
5E+12	5.1	5.540	4.950	-0.590
5E+12	6.1	5.520	4.920	-0.600
1E+13	7.1	5.490	3.320	-2.170
1E+13	8.1	5.490	3.510	-1.980
1E+13	9.1	5.470	3.510	-1.960
0	10.1	5.490	8.240	2.750
	Max	5.630	8.240	2.750
	Average	5.504	5.555	0.051
	Min	5.350	3.320	-2.170
	Std Dev	0.070	1.876	1.877



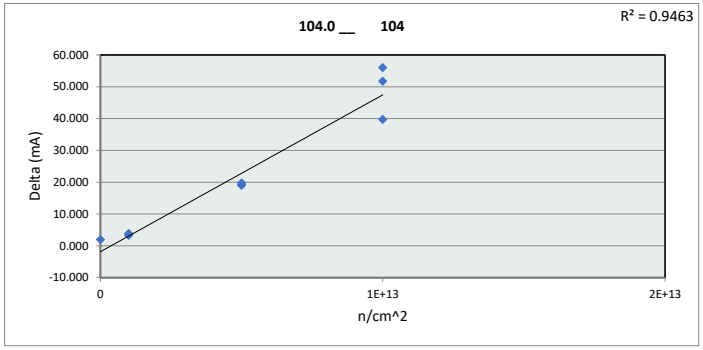
	103.0 __ 103			
Test Site				
Tester				
Test Number				
Max Limit	14	mA		
Min Limit	0	mA		
n/cm^2	0	1E+12	5E+12	1E+13
LL	0.000	0.000	0.000	0.000
Min	8.240	7.330	4.920	3.320
Average	8.240	7.380	4.943	3.447
Max	8.240	7.420	4.960	3.510
UL	14.000	14.000	14.000	14.000



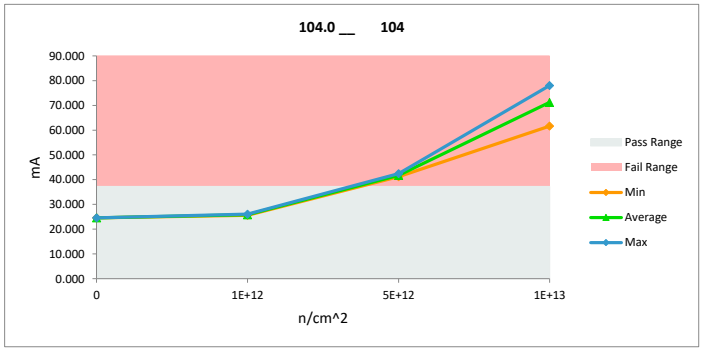
NDD Report
LM2941GWRLQMLV

	104.0 __ 104	
Test Site		
Tester		
Test Number		
Unit	mA	mA
Max Limit	37.2	37.2
Min Limit	0	0

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	22.460	25.750	3.290
1E+12	2.1	21.830	25.600	3.770
1E+12	3.1	22.250	26.060	3.810
5E+12	4.1	22.500	41.670	19.170
5E+12	5.1	22.730	42.460	19.730
5E+12	6.1	22.140	41.160	19.020
1E+13	7.1	22.300	74.020	51.720
1E+13	8.1	22.010	78.030	56.020
1E+13	9.1	21.910	61.630	39.720
0	10.1	22.660	24.570	1.910
	Max	22.730	78.030	56.020
	Average	22.279	44.095	21.816
	Min	21.830	24.570	1.910
	Std Dev	0.309	20.431	20.530

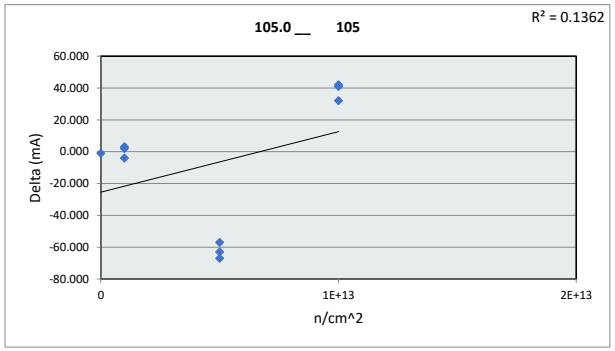


	104.0 __ 104			
Test Site				
Tester				
Test Number				
Max Limit	37.2	mA		
Min Limit	0	mA		
n/cm^2	0	1E+12	5E+12	1E+13
LL	0.000	0.000	0.000	0.000
Min	24.570	25.600	41.160	61.630
Average	24.570	25.803	41.763	71.227
Max	24.570	26.060	42.460	78.030
UL	37.200	37.200	37.200	37.200

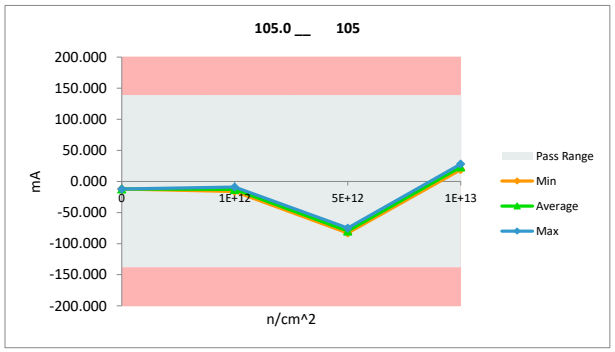


NDD Report
LM2941GWRLQMLV

	105.0 __ 105		
Test Site			
Tester			
Test Number			
Unit	mV	mA	
Max Limit	138	138	
Min Limit	-138	-138	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	-12.000	-16.000	-4.000
1E+12	2.1	-16.000	-13.000	3.000
1E+12	3.1	-11.000	-9.000	2.000
5E+12	4.1	-14.000	-81.000	-67.000
5E+12	5.1	-12.000	-75.000	-63.000
5E+12	6.1	-26.000	-83.000	-57.000
1E+13	7.1	-13.000	19.000	32.000
1E+13	8.1	-14.000	28.000	42.000
1E+13	9.1	-18.000	23.000	41.000
0	10.1	-11.000	-12.000	-1.000
	Max	-11.000	28.000	42.000
	Average	-14.700	-21.900	-7.200
	Min	-26.000	-83.000	-67.000
	Std Dev	4.547	42.951	41.750



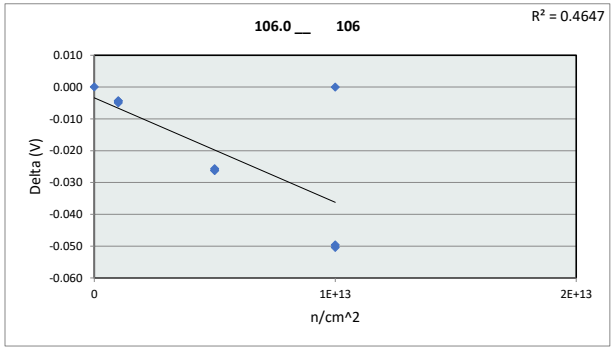
	105.0 __ 105			
Test Site				
Tester				
Test Number				
Max Limit	138	mA		
Min Limit	-138	mA		
n/cm^2	0	1E+12	5E+12	1E+13
LL	-138.000	-138.000	-138.000	-138.000
Min	-12.000	-16.000	-83.000	19.000
Average	-12.000	-12.667	-79.667	23.333
Max	-12.000	-9.000	-75.000	28.000
UL	138.000	138.000	138.000	138.000



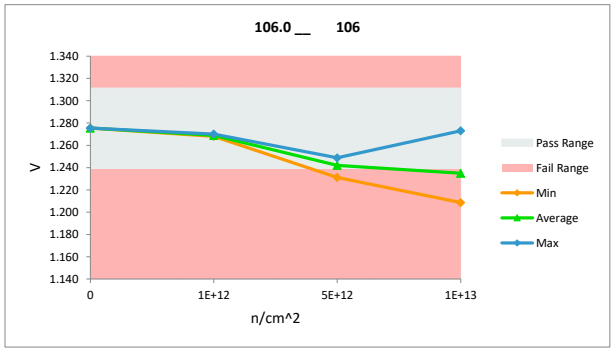
NDD Report
LM2941GWRLQMLV

	106.0 __ 106	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	1.3112	1.3112
Min Limit	1.2388	1.2388

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	1.272	1.268	-0.004
1E+12	2.1	1.273	1.269	-0.004
1E+12	3.1	1.275	1.270	-0.005
5E+12	4.1	1.272	1.246	-0.026
5E+12	5.1	1.274	1.249	-0.026
5E+12	6.1	1.257	1.231	-0.026
1E+13	7.1	1.273	1.273	0.000
1E+13	8.1	1.274	1.223	-0.050
1E+13	9.1	1.258	1.209	-0.050
0	10.1	1.275	1.276	0.000
	Max	1.275	1.276	0.000
	Average	1.270	1.251	-0.019
	Min	1.257	1.209	-0.050
	Std Dev	0.007	0.024	0.020

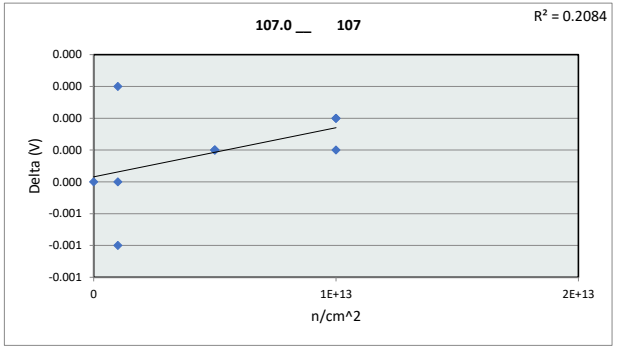


	106.0 __ 106			
Test Site				
Tester				
Test Number				
Max Limit	1.3112	V		
Min Limit	1.2388	V		
n/cm^2	0	1E+12	5E+12	1E+13
LL	1.239	1.239	1.239	1.239
Min	1.276	1.268	1.231	1.209
Average	1.276	1.269	1.242	1.235
Max	1.276	1.270	1.249	1.273
UL	1.311	1.311	1.311	1.311

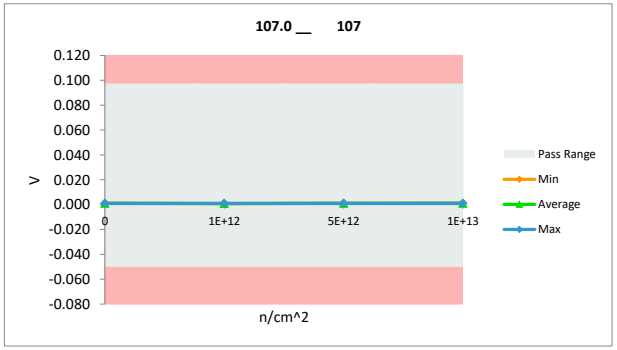


NDD Report
LM2941GWRLQMLV

	107.0 __ 107		
Test Site			
Tester			
Test Number			
Unit	V	V	
Max Limit	0.097	0.097	
Min Limit	-0.05	-0.05	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	0.001	0.001	0.000
1E+12	2.1	0.001	0.001	-0.001
1E+12	3.1	0.001	0.001	0.000
5E+12	4.1	0.001	0.001	0.000
5E+12	5.1	0.001	0.001	0.000
5E+12	6.1	0.001	0.001	0.000
1E+13	7.1	0.001	0.001	0.000
1E+13	8.1	0.001	0.001	0.000
1E+13	9.1	0.001	0.001	0.000
0	10.1	0.001	0.001	0.000
	Max	0.001	0.001	0.000
	Average	0.001	0.001	0.000
	Min	0.001	0.001	-0.001
	Std Dev	0.000	0.000	0.000

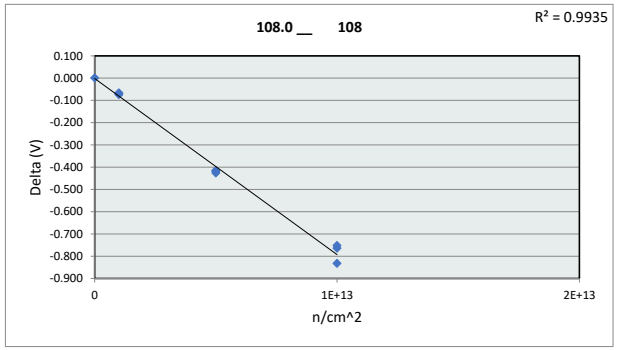


	107.0 __ 107			
Test Site				
Tester				
Test Number				
Max Limit	0.097	V		
Min Limit	-0.05	V		
n/cm^2	0	1E+12	5E+12	1E+13
LL	-0.050	-0.050	-0.050	-0.050
Min	0.001	0.001	0.001	0.001
Average	0.001	0.001	0.001	0.001
Max	0.001	0.001	0.001	0.001
UL	0.097	0.097	0.097	0.097

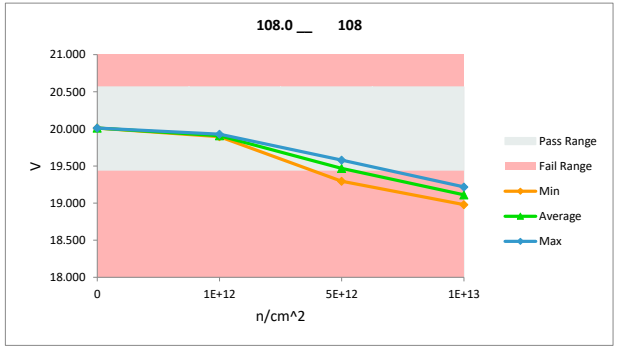


NDD Report
LM2941GWRLQMLV

	108.0 __ 108		
Test Site			
Tester			
Test Number			
Unit	V	V	
Max Limit	20.564	20.564	
Min Limit	19.436	19.436	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	19.961	19.894	-0.067
1E+12	2.1	19.970	19.903	-0.067
1E+12	3.1	20.003	19.929	-0.074
5E+12	4.1	19.959	19.533	-0.426
5E+12	5.1	19.993	19.578	-0.415
5E+12	6.1	19.713	19.295	-0.418
1E+13	7.1	19.969	19.137	-0.832
1E+13	8.1	19.982	19.218	-0.764
1E+13	9.1	19.731	18.979	-0.752
0	10.1	20.010	20.011	0.001
	Max	20.010	20.011	0.001
	Average	19.929	19.548	-0.381
	Min	19.713	18.979	-0.832
	Std Dev	0.111	0.376	0.321



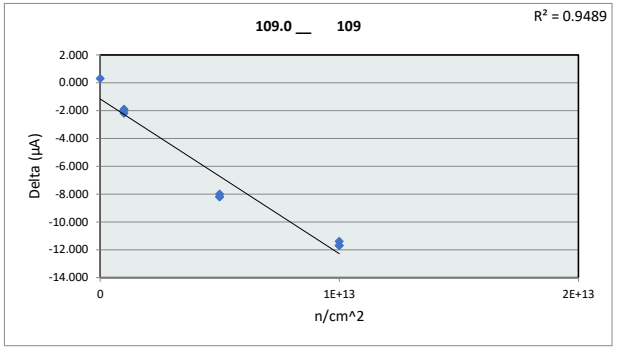
	108.0 __ 108			
Test Site				
Tester				
Test Number				
Max Limit	20.564	V		
Min Limit	19.436	V		
n/cm^2	0	1E+12	5E+12	1E+13
LL	19.436	19.436	19.436	19.436
Min	20.011	19.894	19.295	18.979
Average	20.011	19.909	19.469	19.111
Max	20.011	19.929	19.578	19.218
UL	20.564	20.564	20.564	20.564



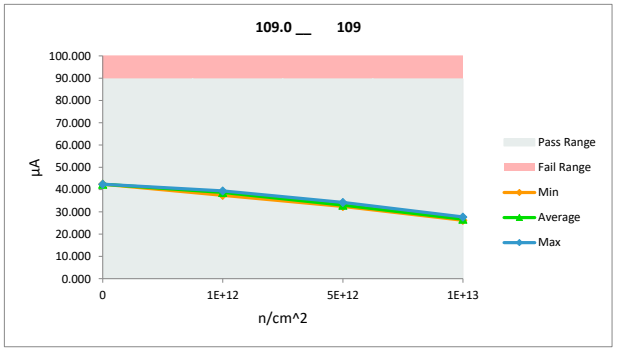
NDD Report
LM2941GWRLQMLV

	109.0 __ 109	
Test Site		
Tester		
Test Number		
Unit	µA	µA
Max Limit	89.6	89.6
Min Limit	0	0

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	41.100	39.200	-1.900
1E+12	2.1	39.600	37.400	-2.200
1E+12	3.1	41.400	39.400	-2.000
5E+12	4.1	40.600	32.400	-8.200
5E+12	5.1	42.400	34.200	-8.200
5E+12	6.1	40.400	32.400	-8.000
1E+13	7.1	39.400	27.700	-11.700
1E+13	8.1	37.900	26.200	-11.700
1E+13	9.1	37.600	26.200	-11.400
0	10.1	42.100	42.400	0.300
	Max	42.400	42.400	0.300
	Average	40.250	33.750	-6.500
	Min	37.600	26.200	-11.700
	Std Dev	1.630	5.814	4.622



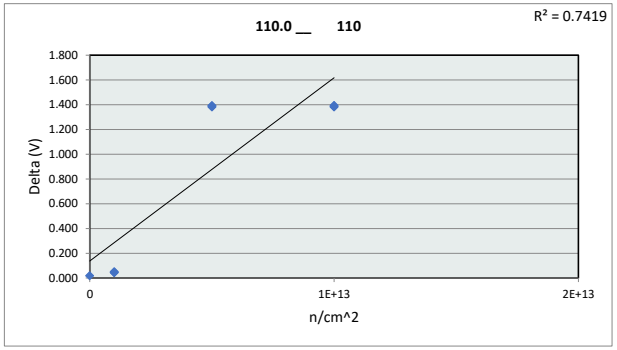
	109.0 __ 109			
Test Site				
Tester				
Test Number				
Max Limit	89.6	µA		
Min Limit	0	µA		
n/cm^2	0	1E+12	5E+12	1E+13
LL	0.000	0.000	0.000	0.000
Min	42.400	37.400	32.400	26.200
Average	42.400	38.667	33.000	26.700
Max	42.400	39.400	34.200	27.700
UL	89.600	89.600	89.600	89.600



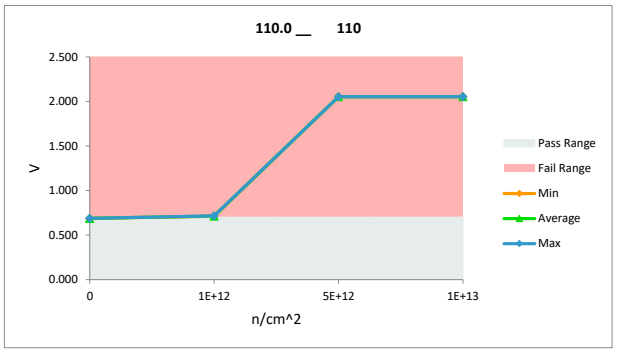
NDD Report
LM2941GWRLQMLV

	110.0 __ 110	
Test Site		
Tester		
Test Number		
Unit	V	V
Max Limit	0.7	0.7
Min Limit	0	0

n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	0.665	0.711	0.046
1E+12	2.1	0.672	0.715	0.043
1E+12	3.1	0.666	0.716	0.050
5E+12	4.1	0.662	2.054	1.392
5E+12	5.1	0.673	2.054	1.381
5E+12	6.1	0.665	2.054	1.389
1E+13	7.1	0.672	2.054	1.382
1E+13	8.1	0.668	2.054	1.385
1E+13	9.1	0.660	2.054	1.393
0	10.1	0.670	0.688	0.018
	Max	0.673	2.054	1.393
	Average	0.667	1.515	0.848
	Min	0.660	0.688	0.018
	Std Dev	0.004	0.695	0.696

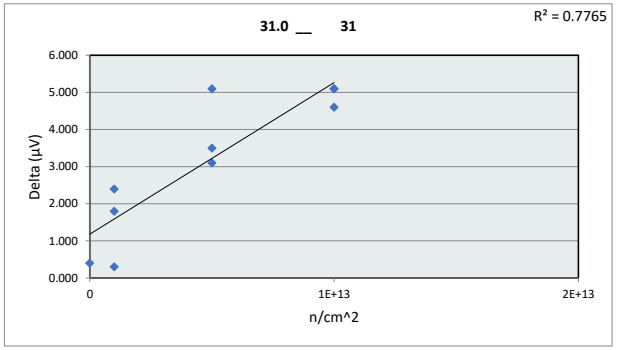


	110.0 __ 110			
Test Site				
Tester				
Test Number				
Max Limit	0.7	V		
Min Limit	0	V		
n/cm^2	0	1E+12	5E+12	1E+13
LL	0.000	0.000	0.000	0.000
Min	0.688	0.712	2.054	2.054
Average	0.688	0.714	2.054	2.054
Max	0.688	0.716	2.054	2.054
UL	0.700	0.700	0.700	0.700

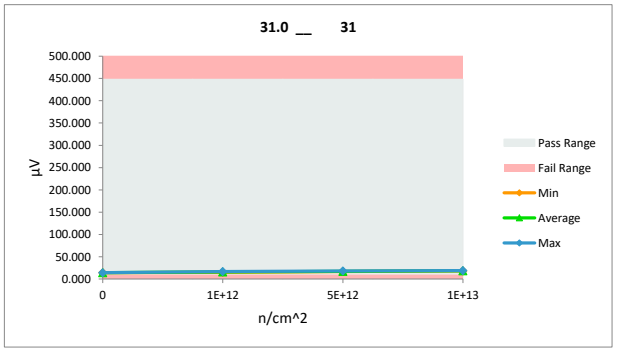


NDD Report
LM2941GWRLQMLV

	31.0 __ 31		
Test Site			
Tester			
Test Number			
Unit	µV	µV	
Max Limit	448	448	
Min Limit	10	10	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	14.700	16.500	1.800
1E+12	2.1	14.600	14.900	0.300
1E+12	3.1	13.500	15.900	2.400
5E+12	4.1	13.400	16.500	3.100
5E+12	5.1	13.200	16.700	3.500
5E+12	6.1	13.000	18.100	5.100
1E+13	7.1	13.900	18.500	4.600
1E+13	8.1	13.800	18.900	5.100
1E+13	9.1	13.000	18.100	5.100
0	10.1	13.800	14.200	0.400
	Max	14.700	18.900	5.100
	Average	13.690	16.830	3.140
	Min	13.000	14.200	0.300
	Std Dev	0.599	1.565	1.877

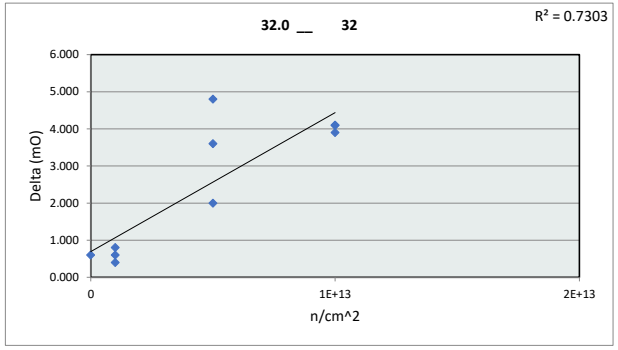


	31.0 __ 31			
Test Site				
Tester				
Test Number				
Max Limit	448	µV		
Min Limit	10	µV		
n/cm^2	0	1E+12	5E+12	1E+13
LL	10.000	10.000	10.000	10.000
Min	14.200	14.900	16.500	18.100
Average	14.200	15.767	17.100	18.500
Max	14.200	16.500	18.100	18.900
UL	448.000	448.000	448.000	448.000

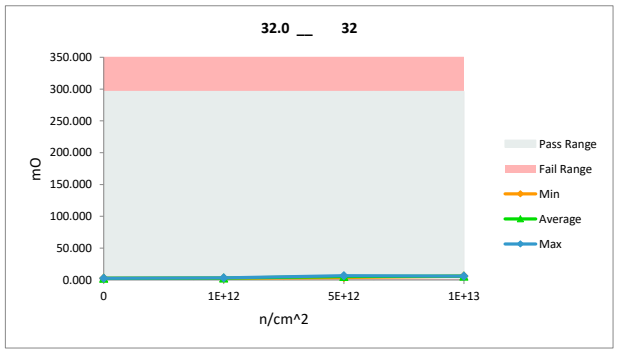


NDD Report
LM2941GWRLQMLV

	32.0 __ 32		
Test Site			
Tester			
Test Number			
Unit	mO	mO	
Max Limit	296.4	296.4	
Min Limit	1.2	1.2	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	2.500	2.900	0.400
1E+12	2.1	2.500	3.300	0.800
1E+12	3.1	2.000	2.600	0.600
5E+12	4.1	1.900	5.500	3.600
5E+12	5.1	2.000	4.000	2.000
5E+12	6.1	1.900	6.700	4.800
1E+13	7.1	2.000	5.900	3.900
1E+13	8.1	1.900	6.000	4.100
1E+13	9.1	2.000	6.100	4.100
0	10.1	2.000	2.600	0.600
	Max	2.500	6.700	4.800
	Average	2.070	4.560	2.490
	Min	1.900	2.600	0.400
	Std Dev	0.231	1.634	1.775

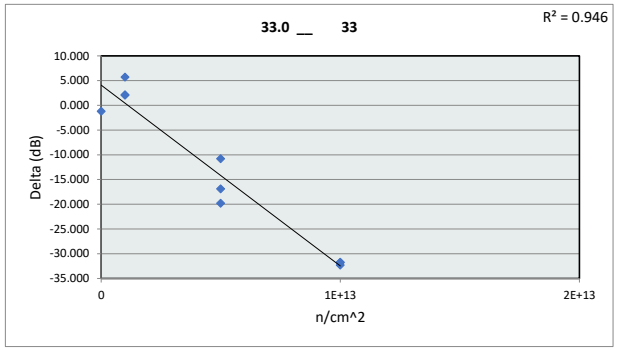


	32.0 __ 32			
Test Site				
Tester				
Test Number				
Max Limit	296.4	mO		
Min Limit	1.2	mO		
n/cm^2	0	1E+12	5E+12	1E+13
LL	1.200	1.200	1.200	1.200
Min	2.600	2.600	4.000	5.900
Average	2.600	2.933	5.400	6.000
Max	2.600	3.300	6.700	6.100
UL	296.400	296.400	296.400	296.400

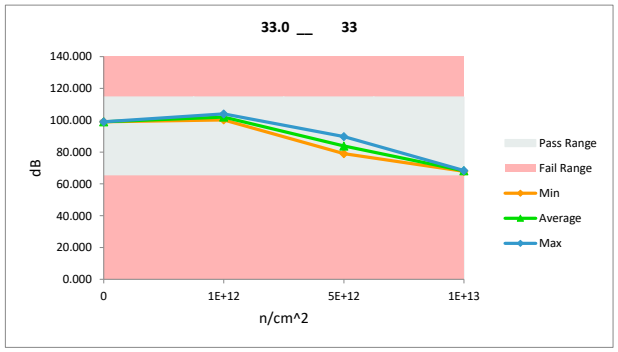


NDD Report
LM2941GWRLQMLV

	33.0 __ 33		
Test Site			
Tester			
Test Number			
Unit	dB	dB	
Max Limit	114.6	114.6	
Min Limit	65.4	65.4	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	98.100	100.200	2.100
1E+12	2.1	98.300	104.000	5.700
1E+12	3.1	99.700	101.800	2.100
5E+12	4.1	100.500	89.700	-10.800
5E+12	5.1	98.800	79.000	-19.800
5E+12	6.1	99.700	82.800	-16.900
1E+13	7.1	100.200	68.400	-31.800
1E+13	8.1	100.000	68.300	-31.700
1E+13	9.1	100.200	67.900	-32.300
0	10.1	100.200	99.000	-1.200
	Max	100.500	104.000	5.700
	Average	99.570	86.110	-13.460
	Min	98.100	67.900	-32.300
	Std Dev	0.859	14.786	15.220

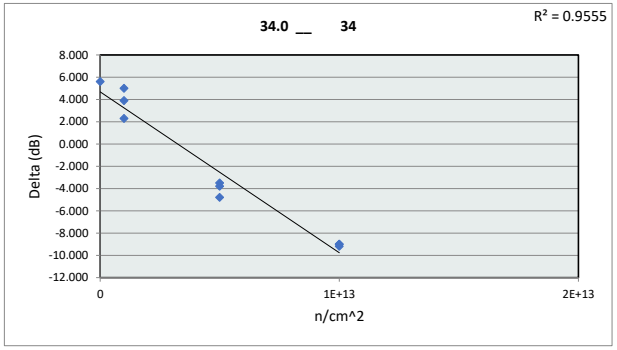


	33.0 __ 33			
Test Site				
Tester				
Test Number				
Max Limit	114.6	dB		
Min Limit	65.4	dB		
n/cm^2	0	1E+12	5E+12	1E+13
LL	65.400	65.400	65.400	65.400
Min	99.000	100.200	79.000	67.900
Average	99.000	102.000	83.833	68.200
Max	99.000	104.000	89.700	68.400
UL	114.600	114.600	114.600	114.600

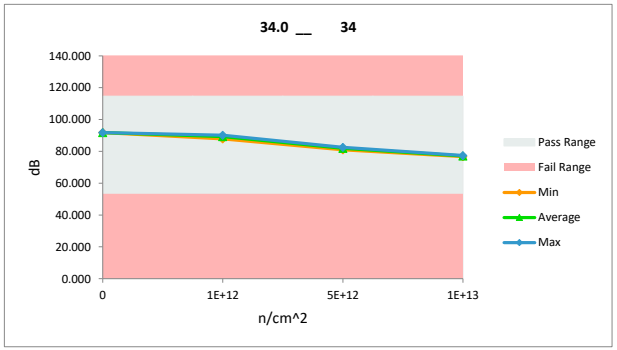


NDD Report
LM2941GWRLQMLV

	34.0 __ 34		
Test Site			
Tester			
Test Number			
Unit	dB	dB	
Max Limit	114.6	114.6	
Min Limit	53.4	53.4	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	85.600	87.900	2.300
1E+12	2.1	85.100	90.100	5.000
1E+12	3.1	86.000	89.900	3.900
5E+12	4.1	86.000	82.200	-3.800
5E+12	5.1	86.000	82.500	-3.500
5E+12	6.1	85.800	81.000	-4.800
1E+13	7.1	86.200	77.200	-9.000
1E+13	8.1	86.400	77.400	-9.000
1E+13	9.1	85.900	76.700	-9.200
0	10.1	86.200	91.800	5.600
	Max	86.400	91.800	5.600
	Average	85.920	83.670	-2.250
	Min	85.100	76.700	-9.200
	Std Dev	0.365	5.817	5.987

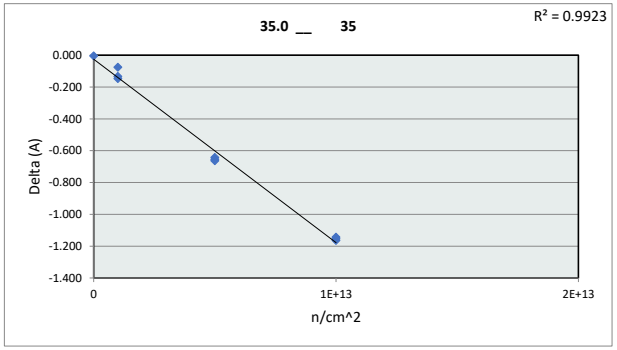


	34.0 __ 34			
Test Site				
Tester				
Test Number				
Max Limit	114.6	dB		
Min Limit	53.4	dB		
n/cm^2	0	1E+12	5E+12	1E+13
LL	53.400	53.400	53.400	53.400
Min	91.800	87.900	81.000	76.700
Average	91.800	89.300	81.900	77.100
Max	91.800	90.100	82.500	77.400
UL	114.600	114.600	114.600	114.600

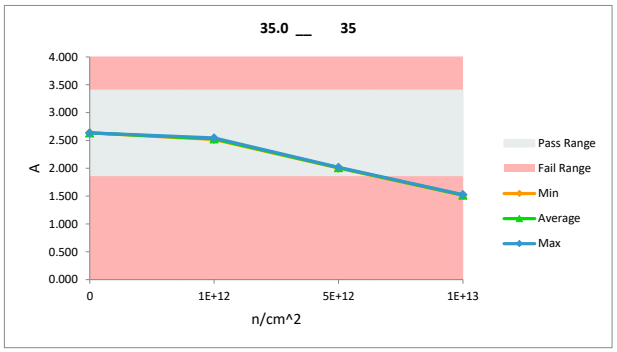


NDD Report
LM2941GWRLQMLV

	35.0 __ 35		
Test Site			
Tester			
Test Number			
Unit	A	A	
Max Limit	3.4	3.4	
Min Limit	1.86	1.86	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	2.653	2.519	-0.134
1E+12	2.1	2.624	2.547	-0.076
1E+12	3.1	2.670	2.523	-0.147
5E+12	4.1	2.674	2.018	-0.656
5E+12	5.1	2.649	2.005	-0.644
5E+12	6.1	2.670	2.006	-0.664
1E+13	7.1	2.681	1.517	-1.164
1E+13	8.1	2.680	1.527	-1.153
1E+13	9.1	2.658	1.514	-1.144
0	10.1	2.641	2.636	-0.005
	Max	2.681	2.636	-0.005
	Average	2.660	2.081	-0.578
	Min	2.624	1.514	-1.164
	Std Dev	0.018	0.457	0.469

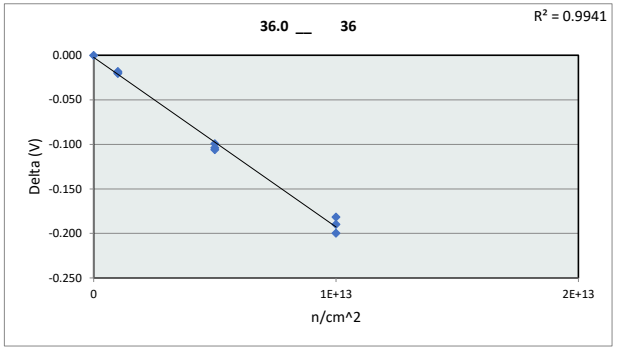


	35.0 __ 35			
Test Site				
Tester				
Test Number				
Max Limit	3.4	A		
Min Limit	1.86	A		
n/cm^2	0	1E+12	5E+12	1E+13
LL	1.860	1.860	1.860	1.860
Min	2.636	2.519	2.005	1.514
Average	2.636	2.530	2.010	1.519
Max	2.636	2.547	2.018	1.527
UL	3.400	3.400	3.400	3.400

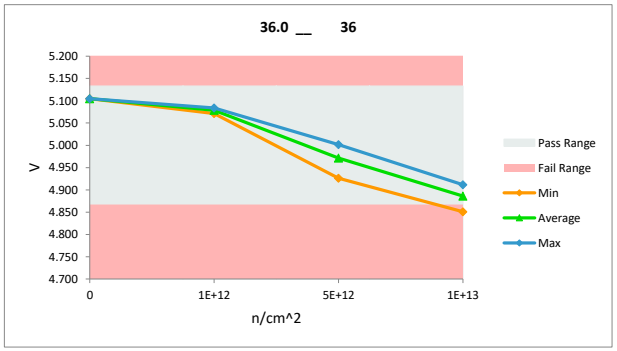


NDD Report
LM2941GWRLQMLV

	36.0 __ 36		
Test Site			
Tester			
Test Number			
Unit	V	V	
Max Limit	5.133	5.133	
Min Limit	4.867	4.867	
n/cm^2	Serial #	pre	post	Delta
1E+12	1.1	5.090	5.071	-0.018
1E+12	2.1	5.101	5.080	-0.020
1E+12	3.1	5.103	5.084	-0.019
5E+12	4.1	5.092	4.986	-0.106
5E+12	5.1	5.101	5.002	-0.099
5E+12	6.1	5.030	4.926	-0.104
1E+13	7.1	5.096	4.896	-0.200
1E+13	8.1	5.101	4.911	-0.190
1E+13	9.1	5.032	4.851	-0.181
0	10.1	5.105	5.105	0.000
	Max	5.105	5.105	0.000
	Average	5.085	4.991	-0.094
	Min	5.030	4.851	-0.200
	Std Dev	0.029	0.091	0.077



	36.0 __ 36			
Test Site				
Tester				
Test Number				
Max Limit	5.133	V		
Min Limit	4.867	V		
n/cm^2	0	1E+12	5E+12	1E+13
LL	4.867	4.867	4.867	4.867
Min	5.105	5.071	4.926	4.851
Average	5.105	5.079	4.971	4.886
Max	5.105	5.084	5.002	4.912
UL	5.133	5.133	5.133	5.133



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