Radiation Report

LM117QML-SP Neutron Displacement Damage (NDD) Characterization

ABSTRACT

This report presents the effect of neutron displacement damage (NDD) on the LM117QML-SP device. The results show that all devices were fully functional and within production test limits after having been irradiated up to 1×10^{12} n/cm^2. A sample size of three units were exposed to radiation testing per (MIL-STD-883, Method 1017 for Neutron Irradiation). Electrical testing was performed at Texas Instruments before and after neutron irradiation using the production test program for LM117GWRLQMLV.

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Trademarks

1 Overview

The LM117QML-SP 3-terminal positive voltage linear regulator is capable of supplying either 0.5 A or 1.5 A over a 1.2-V to 37-V output range. It is simple to use and requires only two external resistors to set the output voltage.

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

Table 1-1. Overview Information

TI Part Number	LM117QML-SP
Device Function	3-Terminal Adjustable Regulator
Die Name	YALM117HVHZVF0 GLLM117HRRE RLM117HRRE
Technology	SLM
A/T Lot Number / Date Code	6040018 / 1602B
Biased Quantity Tested	0
Unbiased Quantity Tested	9
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 LM117QML-SP was electrically pre-tested using the production automated test equipment program.

General test procedures were IAW MIL-STD-883, Method 1017 for Neutron Irradiation of LM117QML-SP as modified in Table 2-1.

Table 2-1. Neutron Irradiation Conditions

Group	Sample Qty	Neutron Fluence (n/cm^2)	Bias
A	3	1.0×10^{12} n/cm^2	Unbiased
B	3	5.0×10^{12} n/cm^2	Unbiased
C	3	1.0×10^{13} n/cm^2	Unbiased

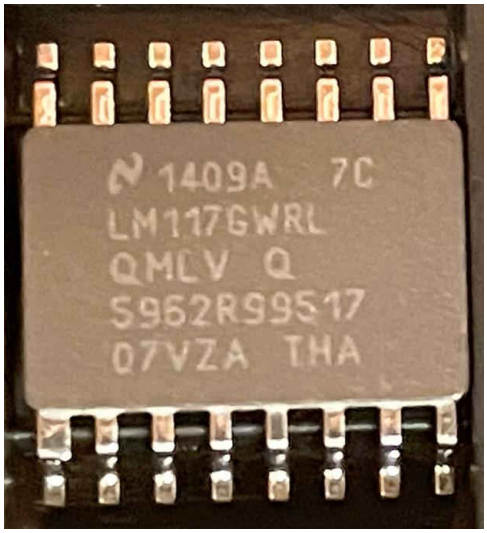

Figure 2-1. LM117QML-SP Device

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 having a maximum thermal energy output of up to 1 MW. The Fast Neutron Irradiator (FNI) faces one side of the reactor core. The 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 also 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

The device passed all parametric measurements well within all data sheet limits for 1.0 × 10^{12} n/cm^2 fluence level. All parametric measurements remained well within the production test limits which are guard banded from the data sheet limits for 1.0 × 10^{12} n/cm^2 fluence level. The data sheet parameters that were tested pre- and post-neutron radiation and their corresponding test names are included in Appendix A. Appendix B has the graphs showing the drift between pre- and post-neutron radiation for these parameters.

A Appendix: Test Results

Table A-1 provides the list of tested parameters.

Table A-1. LM117QML-SP Specific Compliance Matrix

Parameters		Test Conditions	TL7700-SEP Data Sheet SLVSF13 –MARCH 2019			Test# or Name
Symbol	Description		MIN	MAX	UNIT	
I_{adj}	Adjust Pin Current	C=4.25 V, I_L= -5 mA	-100	-15	µA	1
		V_I=41.25 V, I_L= -5 mA	-100	-15		2
ΔI_{Adj}/ Line	Adjust pin current change	4.25 V ≤ V_I ≤ 41.25 V , I_L= -5 mA	-5	5	µA	3
ΔI_{Adj}/ Load	Adjust pin current change	V_I= 6.25 V , -500 mA ≤ I_L ≤ -5 mA	-5	5	µA	4
I_Q	Minimum Load Current	V_I= 4.25 V , Forced V_O= 1.4 V	-3	-0.5	mA	5
		V_I= 14.25 V , Forced V_O= 1.4 V	-3	-0.5		6
		V_I= 41.25 V , Forced V_O= 1.4 V	-5	-1		7
V_O	Output Voltage	V_I= 4.25 V , I_L= -5 mA	1.2	1.3	V	8
		V_I= 4.25 V , I_L= -500 mA	1.2	1.3		9
		V_I= 41.25 V , I_L= -5 mA	1.2	1.3		10
		V_I= 41.25 V , I_L= -500 mA	1.2	1.3		11
V_{RLine}	Line Regulation	4.25 V ≤ V_I ≤ 41.25 V , I_L= -5 mA	-25	25	mV	12
V_{RLoad}	Load Regulation	V_I= 6.25 V , -500 mA ≤ I_L ≤ -5 mA	-100	-15	µA	13
		V_I= 41.25 V , -50 mA ≤ I_L ≤ -5 mA	-100	-15		14
V_{RTh}	Thermal Regulation	V_I= 14.6 V , I_L= -500 mA	-12	12	mV	15
V_{NO}	Output Noise Voltage	V_I= 6.25 V , I_L= -50 mA	7	120	μV_{RMS}	22
ΔV_O / ΔV_I	Line Transient Response	V_I= 6.25 V , ΔV_I= 3 V , I_L= -10 mA		6	mV/V	23
ΔV_O / ΔI_L	Load Transient Response	V_I= 6.25 V , ΔI_L= -200 mA, I_L= -50 mA		0.6	mV/mA	24
ΔV_I / ΔV_O	Ripple Rejection	V_I= 6.25 V , ΔI_L= -125 mA, E_I= 1 V_{RMS} At f = 2400 Hz	60		dB	25
I_{OS}	Output Short Circuit Current	V_I= 4.25 V	-1.8	-0.5	A	16
		V_I= 40 V	-0.5	-0.05		18
V_O (Recov)	Output Voltage Recovery	V_I= 4.25 V , R_L= 2.5 Ω, C_L= 20 µF	1.2	1.35	V	17
		V_I= 40 V , R_L= 250 Ω	1.2	1.35		19
V_{Start}	Voltage Startup	V_I= 4.25 V , R_L= 2.5 Ω, C_L= 20 µF, I_L = -500 mA	1.2	1.3	V	20

B Appendix: Test Data

Appendix B shows the detailed test results.

NDD Report - Parametric Drift Graphs

LM117QML-SP

NDD Report
LM117QML-SP

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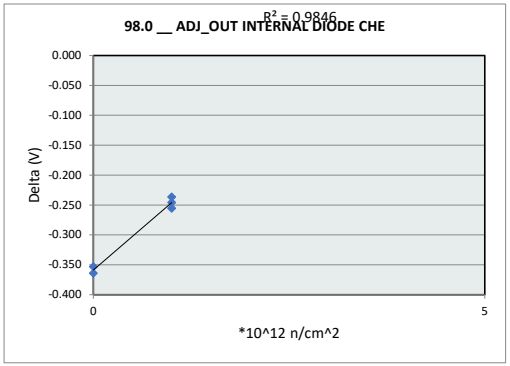
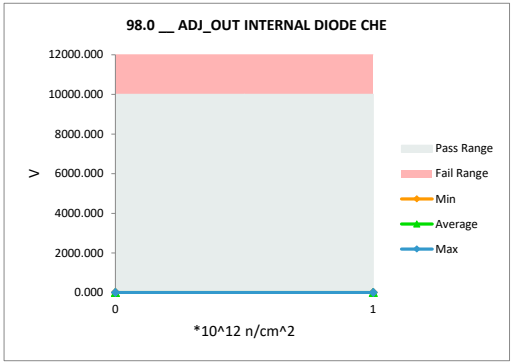
		98.0 __ ADJ_OUT INTERNAL DIO		
Test Site		TIEM	TIEM	
Tester		LTX77	LTX77	
Test Number		RH00117HYD	RH00117HYD	
Unit		V	V	
Max Limit		9999	9999	
Min Limit		0	0	
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	3.293	3.047	-0.246
1	2	3.293	3.056	-0.237
1	3	3.292	3.037	-0.256
0	10	3.297	2.944	-0.353
0	11	3.304	2.940	-0.364
	Max	3.304	3.056	-0.237
	Average	3.296	3.005	-0.291
	Min	3.292	2.940	-0.364
	Std Dev	0.005	0.058	0.062



	98.0 __ ADJ_OUT INTERNAL DI	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	9999	V
Min Limit	0	V
*10^12 n/cm^2	0	1
LL	0.000	0.000
Min	2.940	3.037
Average	2.942	3.047
Max	2.944	3.056
UL	9999.000	9999.000



NDD Report
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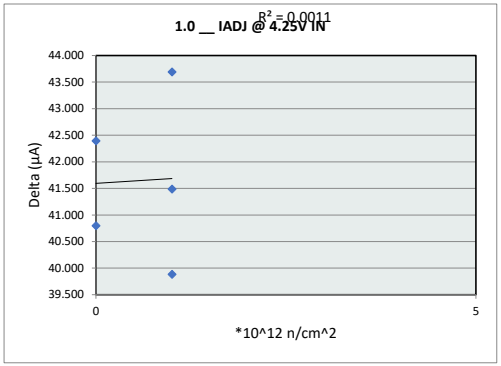
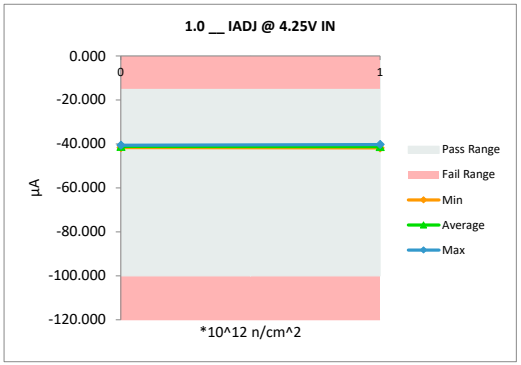
	1.0 __ IADJ @ 4.25V IN		
Test Site	TIEM	TIEM	
Tester	LTX77	LTX77	
Test Number	RH00117HYD	RH00117HYD	
Unit	µA	µA	
Max Limit	-15	-15	
Min Limit	-100	-100	
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	-83.306	-41.821	41.484
1	2	-81.473	-41.592	39.881
1	3	-83.993	-40.302	43.690
0	10	-82.466	-41.669	40.797
0	11	-83.000	-40.608	42.392
	Max	-81.473	-40.302	43.690
	Average	-82.848	-41.198	41.649
	Min	-83.993	-41.821	39.881
	Std Dev	0.946	0.692	1.466



	1.0 __ IADJ @ 4.25V IN	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	-15	µA
Min Limit	-100	µA
*10^12 n/cm^2	0	1
LL	-100.000	-100.000
Min	-41.669	-41.821
Average	-41.138	-41.239
Max	-40.608	-40.302
UL	-15.000	-15.000



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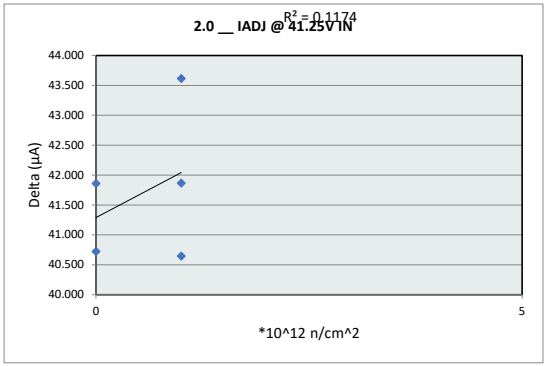
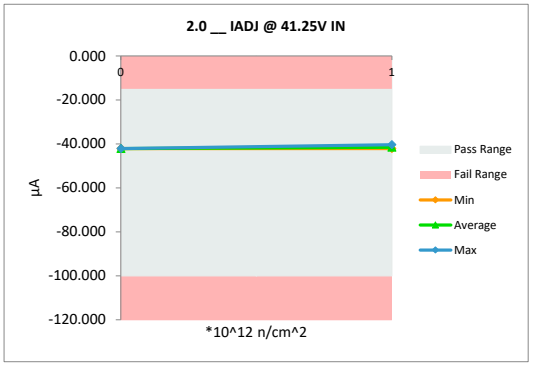
	2.0 __ IADJ @ 41.25V IN	
Test Site	TIEM	TIEM
Tester	LTX77	LTX77
Test Number	RH00117HYD	RH00117HYD
Unit	µA	µA
Max Limit	-15	-15
Min Limit	-100	-100

*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	-83.993	-42.127	41.866
1	2	-82.771	-42.127	40.645
1	3	-83.993	-40.379	43.614
0	10	-82.848	-42.127	40.721
0	11	-83.993	-42.135	41.858
	Max	-82.771	-40.379	43.614
	Average	-83.519	-41.779	41.741
	Min	-83.993	-42.135	40.645
	Std Dev	0.649	0.783	1.202



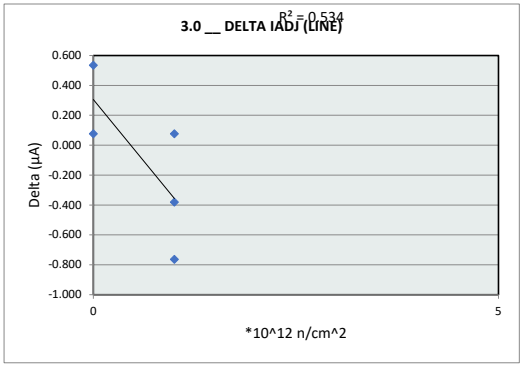
	2.0 __ IADJ @ 41.25V IN	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	-15	µA
Min Limit	-100	µA
*10^12 n/cm^2	0	1
LL	-100.000	-100.000
Min	-42.135	-42.127
Average	-42.131	-41.544
Max	-42.127	-40.379
UL	-15.000	-15.000



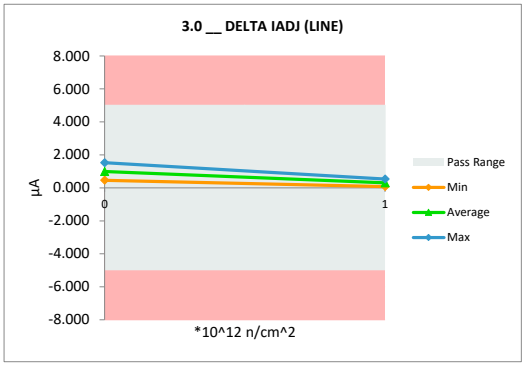
NDD Report
LM117QML-SP

	3.0 __ DELTA IADJ (LINE)	
Test Site	TIEM	TIEM
Tester	LTX77	LTX77
Test Number	RH00117HYD	RH00117HYD
Unit	µA	µA
Max Limit	5	5
Min Limit	-5	-5

*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	0.687	0.305	-0.382
1	2	1.298	0.534	-0.763
1	3	0.000	0.076	0.076
0	10	0.382	0.458	0.076
0	11	0.993	1.527	0.535
	Max	1.298	1.527	0.535
	Average	0.672	0.580	-0.092
	Min	0.000	0.076	-0.763
	Std Dev	0.508	0.557	0.496



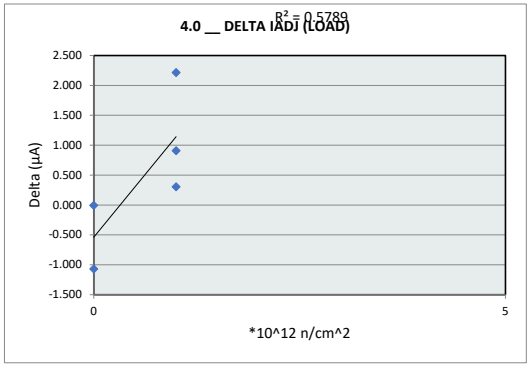
	3.0 __ DELTA IADJ (LINE)	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	5	µA
Min Limit	-5	µA
*10^12 n/cm^2	0	1
LL	-5.000	-5.000
Min	0.458	0.076
Average	0.993	0.305
Max	1.527	0.534
UL	5.000	5.000



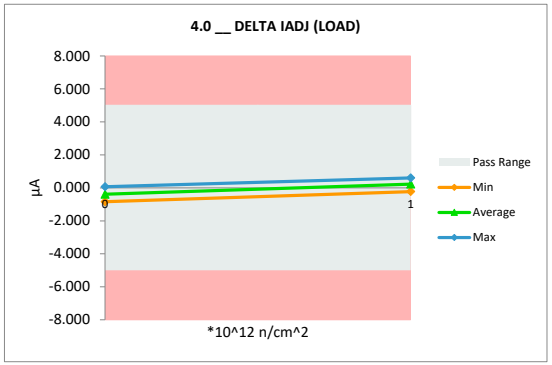
NDD Report
LM117QML-SP

	4.0 __ DELTA IADJ (LOAD)	
Test Site	TIEM	TIEM
Tester	LTX77	LTX77
Test Number	RH00117HYD	RH00117HYD
Unit	µA	µA
Max Limit	5	5
Min Limit	-5	-5

*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	-2.443	-0.229	2.214
1	2	0.000	0.305	0.305
1	3	-0.305	0.603	0.908
0	10	0.076	0.068	-0.008
0	11	0.229	-0.840	-1.069
	Max	0.229	0.603	2.214
	Average	-0.489	-0.019	0.470
	Min	-2.443	-0.840	-1.069
	Std Dev	1.110	0.552	1.210



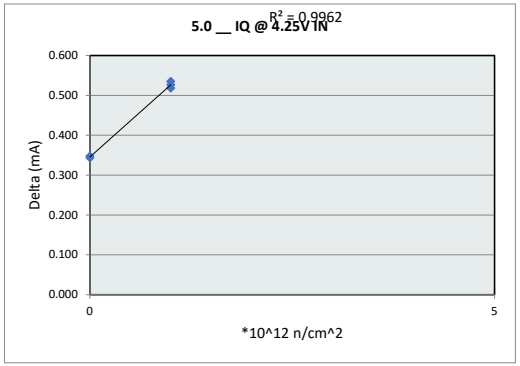
	4.0 __ DELTA IADJ (LOAD)	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	5	µA
Min Limit	-5	µA
*10^12 n/cm^2	0	1
LL	-5.000	-5.000
Min	-0.840	-0.229
Average	-0.386	0.226
Max	0.068	0.603
UL	5.000	5.000



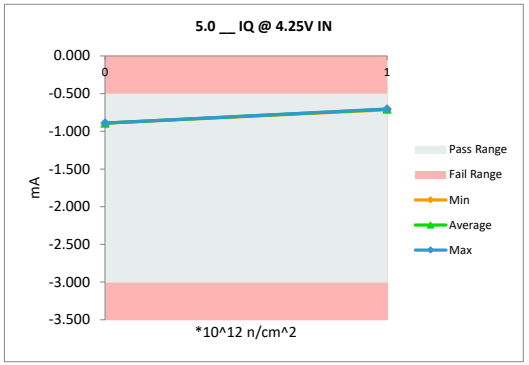
NDD Report
LM117QML-SP

	5.0 __ IQ @ 4.25V IN	
Test Site	TIEM	TIEM
Tester	LTX77	LTX77
Test Number	RH00117HYD	RH00117HYD
Unit	mA	mA
Max Limit	-0.5	-0.5
Min Limit	-3	-3

*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	-1.232	-0.714	0.518
1	2	-1.230	-0.704	0.526
1	3	-1.239	-0.704	0.535
0	10	-1.239	-0.891	0.347
0	11	-1.234	-0.891	0.343
	Max	-1.230	-0.704	0.535
	Average	-1.235	-0.781	0.454
	Min	-1.239	-0.891	0.343
	Std Dev	0.004	0.101	0.099



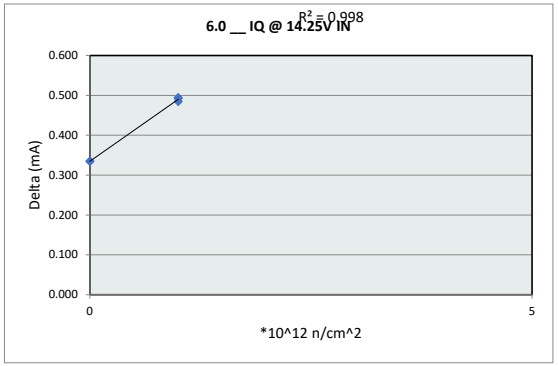
	5.0 __ IQ @ 4.25V IN	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	-0.5	mA
Min Limit	-3	mA
*10^12 n/cm^2	0	1
LL	-3.000	-3.000
Min	-0.891	-0.714
Average	-0.891	-0.707
Max	-0.891	-0.704
UL	-0.500	-0.500



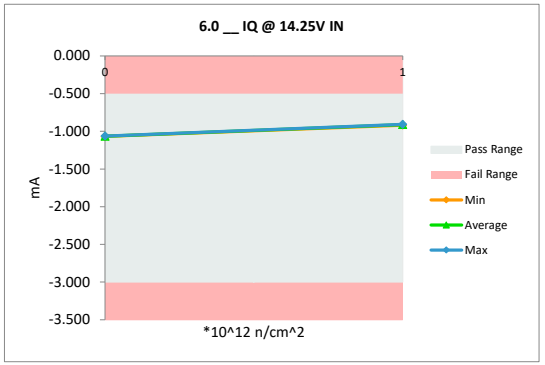
NDD Report
LM117QML-SP

	6.0 __ IQ @ 14.25V IN	
Test Site	TIEM	TIEM
Tester	LTX77	LTX77
Test Number	RH00117HYD	RH00117HYD
Unit	mA	mA
Max Limit	-0.5	-0.5
Min Limit	-3	-3

*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	-1.411	-0.919	0.492
1	2	-1.392	-0.907	0.484
1	3	-1.402	-0.907	0.494
0	10	-1.402	-1.067	0.335
0	11	-1.398	-1.063	0.334
	Max	-1.392	-0.907	0.494
	Average	-1.401	-0.973	0.428
	Min	-1.411	-1.067	0.334
	Std Dev	0.007	0.084	0.085



	6.0 __ IQ @ 14.25V IN	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	-0.5	mA
Min Limit	-3	mA
*10^12 n/cm^2	0	1
LL	-3.000	-3.000
Min	-1.067	-0.919
Average	-1.065	-0.911
Max	-1.063	-0.907
UL	-0.500	-0.500



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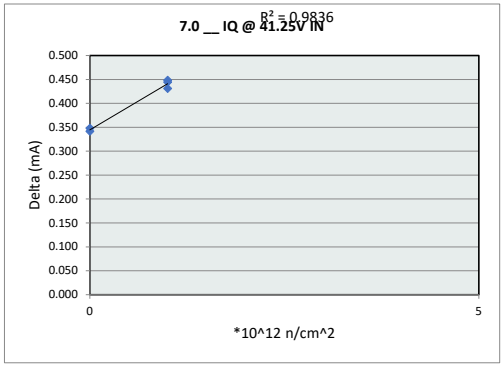
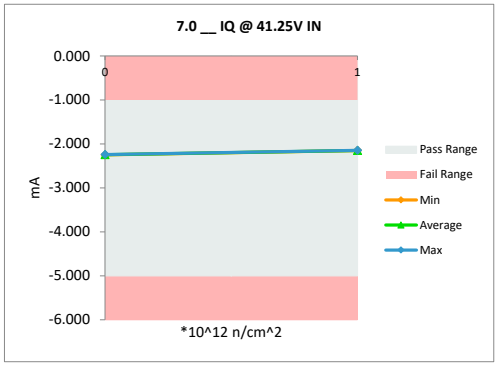
	7.0 __ IQ @ 41.25V IN	
Test Site	TIEM	TIEM
Tester	LTX77	LTX77
Test Number	RH00117HYD	RH00117HYD
Unit	mA	mA
Max Limit	-1	-1
Min Limit	-5	-5

*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	-2.595	-2.151	0.444
1	2	-2.582	-2.151	0.431
1	3	-2.595	-2.147	0.448
0	10	-2.590	-2.249	0.341
0	11	-2.590	-2.243	0.348
	Max	-2.582	-2.147	0.448
	Average	-2.591	-2.188	0.402
	Min	-2.595	-2.249	0.341
	Std Dev	0.005	0.053	0.053



	7.0 __ IQ @ 41.25V IN	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	-1	mA
Min Limit	-5	mA
*10^12 n/cm^2	0	1
LL	-5.000	-5.000
Min	-2.249	-2.151
Average	-2.246	-2.150
Max	-2.243	-2.147
UL	-1.000	-1.000



NDD Report
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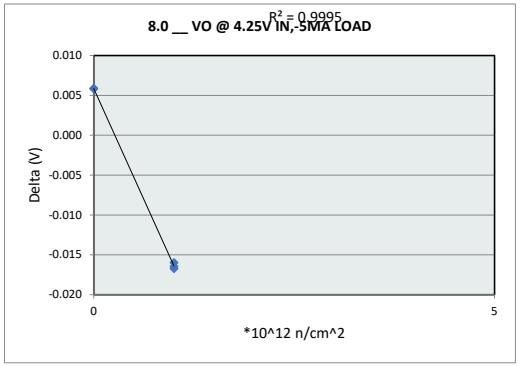
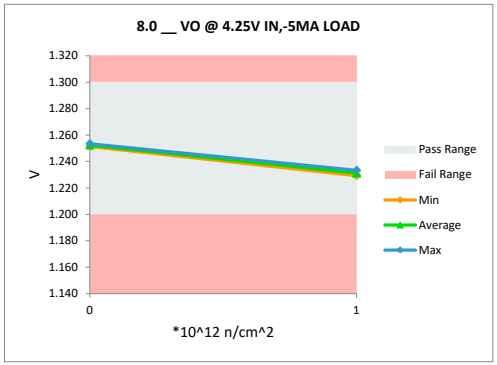
	8.0 __ VO @ 4.25V IN,-5MA LOAD	
Test Site	TIEM	TIEM
Tester	LTX77	LTX77
Test Number	RH00117HYD	RH00117HYD
Unit	V	V
Max Limit	1.3	1.3
Min Limit	1.2	1.2

*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	1.247	1.231	-0.016
1	2	1.250	1.233	-0.017
1	3	1.245	1.229	-0.016
0	10	1.246	1.251	0.006
0	11	1.248	1.253	0.006
	Max	1.250	1.253	0.006
	Average	1.247	1.240	-0.007
	Min	1.245	1.229	-0.017
	Std Dev	0.002	0.012	0.012



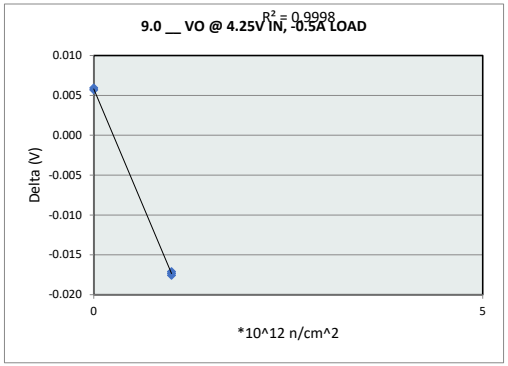
	8.0 __ VO @ 4.25V IN,-5MA LOA	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	1.3	V
Min Limit	1.2	V
*10^12 n/cm^2	0	1
LL	1.200	1.200
Min	1.251	1.229
Average	1.252	1.231
Max	1.253	1.233
UL	1.300	1.300



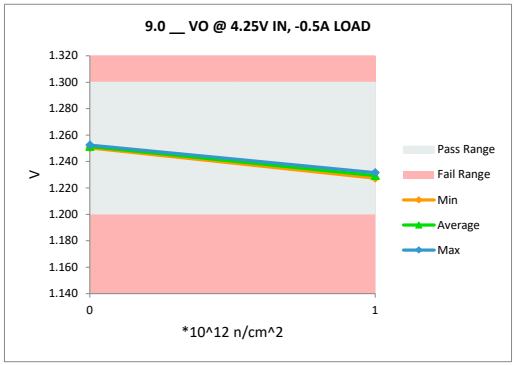
NDD Report
LM117QML-SP

	9.0 __ VO @ 4.25V IN, -0.5A LOA	
Test Site	TIEM	TIEM
Tester	LTX77	LTX77
Test Number	RH00117HYD	RH00117HYD
Unit	V	V
Max Limit	1.3	1.3
Min Limit	1.2	1.2

*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	1.246	1.229	-0.017
1	2	1.249	1.232	-0.018
1	3	1.244	1.227	-0.017
0	10	1.245	1.250	0.006
0	11	1.246	1.252	0.006
	Max	1.249	1.252	0.006
	Average	1.246	1.238	-0.008
	Min	1.244	1.227	-0.018
	Std Dev	0.002	0.012	0.013

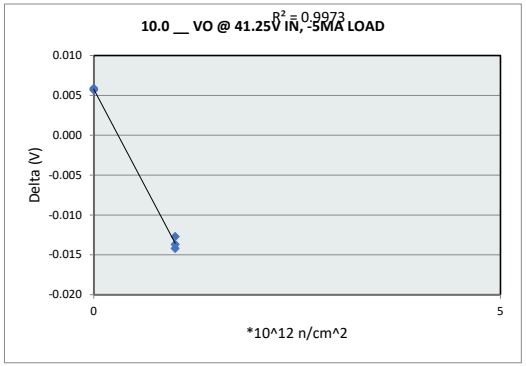


	9.0 __ VO @ 4.25V IN, -0.5A LO	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	1.3	V
Min Limit	1.2	V
*10^12 n/cm^2	0	1
LL	1.200	1.200
Min	1.250	1.227
Average	1.251	1.229
Max	1.252	1.232
UL	1.300	1.300

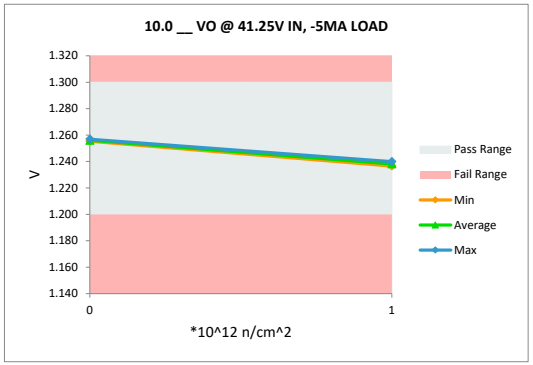


NDD Report
LM117QML-SP

		10.0 __ VO @ 41.25V IN, -5MA LO		
	Test Site	TIEM	TIEM	
	Tester	LTX77	LTX77	
	Test Number	RH00117HYD	RH00117HYD	
	Unit	V	V	
	Max Limit	1.3	1.3	
	Min Limit	1.2	1.2	
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	1.252	1.238	-0.014
1	2	1.254	1.240	-0.014
1	3	1.249	1.237	-0.013
0	10	1.249	1.255	0.006
0	11	1.251	1.257	0.006
	Max	1.254	1.257	0.006
	Average	1.251	1.245	-0.006
	Min	1.249	1.237	-0.014
	Std Dev	0.002	0.010	0.011



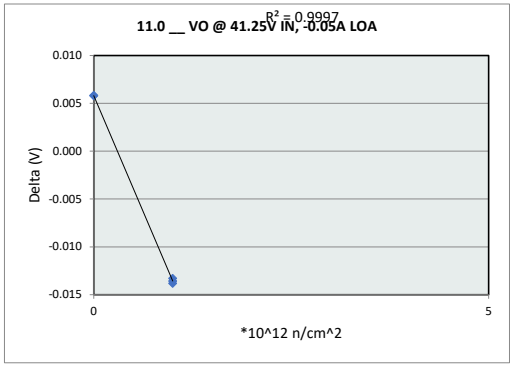
	10.0 __ VO @ 41.25V IN, -5MA	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	1.3	V
Min Limit	1.2	V
*10^12 n/cm^2	0	1
LL	1.200	1.200
Min	1.255	1.237
Average	1.256	1.238
Max	1.257	1.240
UL	1.300	1.300



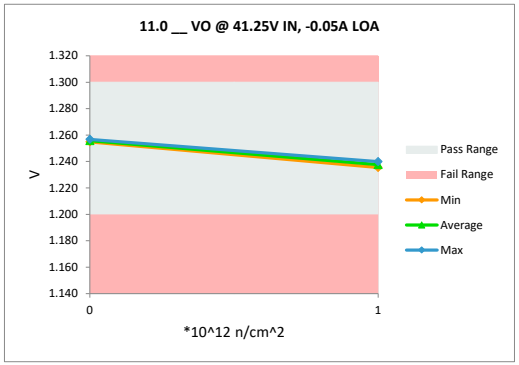
NDD Report
LM117QML-SP

	11.0 __ VO @ 41.25V IN, -0.05A L	
Test Site	TIEM	TIEM
Tester	LTX77	LTX77
Test Number	RH00117HYD	RH00117HYD
Unit	V	V
Max Limit	1.3	1.3
Min Limit	1.2	1.2

*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	1.251	1.238	-0.014
1	2	1.254	1.240	-0.014
1	3	1.249	1.235	-0.013
0	10	1.249	1.255	0.006
0	11	1.251	1.257	0.006
	Max	1.254	1.257	0.006
	Average	1.251	1.245	-0.006
	Min	1.249	1.235	-0.014
	Std Dev	0.002	0.010	0.011

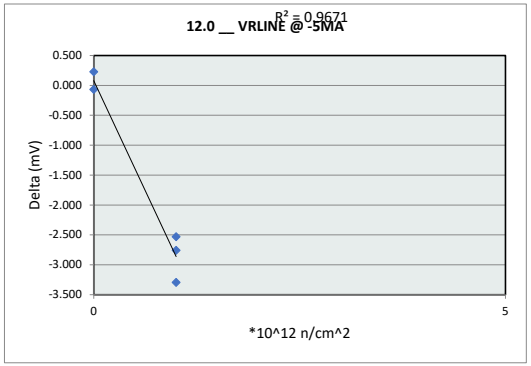


	11.0 __ VO @ 41.25V IN, -0.05A	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	1.3	V
Min Limit	1.2	V
*10^12 n/cm^2	0	1
LL	1.200	1.200
Min	1.255	1.235
Average	1.256	1.238
Max	1.257	1.240
UL	1.300	1.300

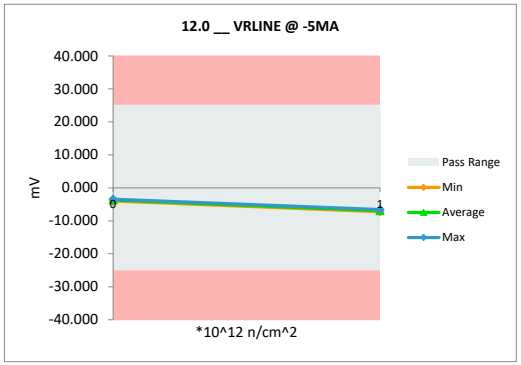


NDD Report
LM117QML-SP

	12.0 __ VRLINE @ -5MA		
Test Site	TIEM	TIEM	
Tester	LTX77	LTX77	
Test Number	RH00117HYD	RH00117HYD	
Unit	mV	mV	
Max Limit	25	25	
Min Limit	-25	-25	
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	-4.271	-7.030	-2.759
1	2	-4.043	-6.573	-2.530
1	3	-3.954	-7.250	-3.296
0	10	-3.905	-3.975	-0.070
0	11	-3.658	-3.430	0.228
	Max	-3.658	-3.430	0.228
	Average	-3.966	-5.651	-1.685
	Min	-4.271	-7.250	-3.296
	Std Dev	0.222	1.806	1.638

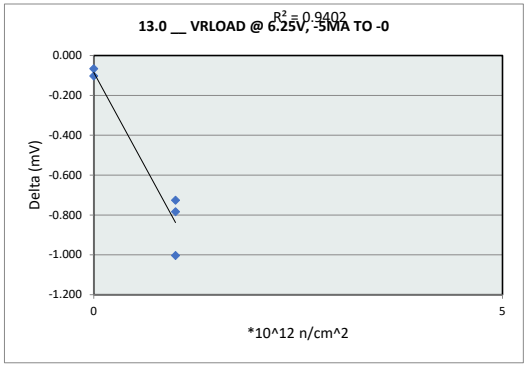


	12.0 __ VRLINE @ -5MA	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	25	mV
Min Limit	-25	mV
*10^12 n/cm^2	0	1
LL	-25.000	-25.000
Min	-3.975	-7.250
Average	-3.703	-6.951
Max	-3.430	-6.573
UL	25.000	25.000

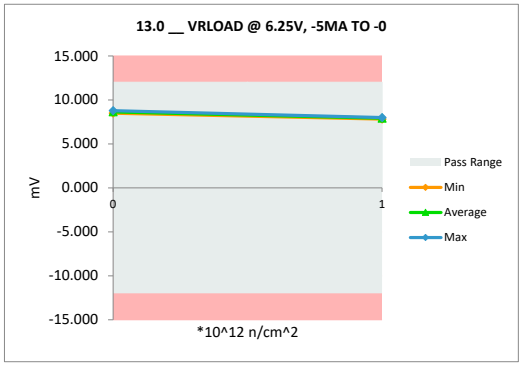


NDD Report
LM117QML-SP

		13.0 __ VRLOAD @ 6.25V, -5MA T	
Test Site		TIEM	TIEM
Tester		LTX77	LTX77
Test Number		RH00117HYD	RH00117HYD
Unit		mV	mV
Max Limit		12	12
Min Limit		-12	-12
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	8.672	7.946	-0.727
1	2	8.825	7.822	-1.003
1	3	8.778	7.994	-0.784
0	10	8.844	8.777	-0.067
0	11	8.595	8.492	-0.103
	Max	8.844	8.777	-0.067
	Average	8.743	8.206	-0.537
	Min	8.595	7.822	-1.003
	Std Dev	0.106	0.409	0.425

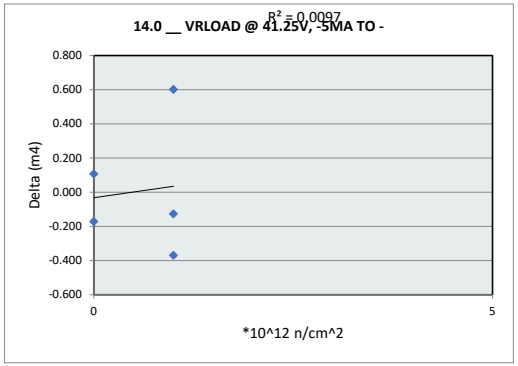


	13.0 __ VRLOAD @ 6.25V, -5MA	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	12	mV
Min Limit	-12	mV
*10^12 n/cm^2	0	1
LL	-12.000	-12.000
Min	8.492	7.822
Average	8.635	7.921
Max	8.777	7.994
UL	12.000	12.000

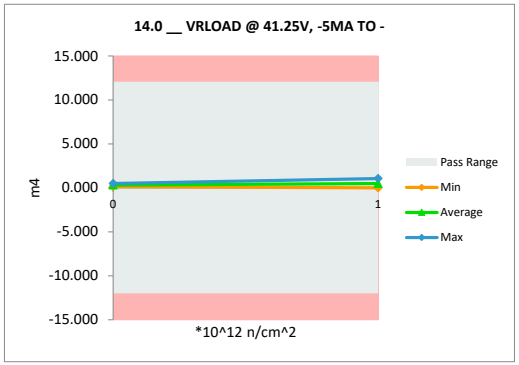


NDD Report
LM117QML-SP

		14.0 __ VRLOAD @ 41.25V, -5MA		
	Test Site	TIEM	TIEM	
	Tester	LTX77	LTX77	
	Test Number	RH00117HYD	RH00117HYD	
	Unit	m4	m4	
	Max Limit	12	12	
	Min Limit	-12	-12	
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	0.536	0.409	-0.127
1	2	0.372	0.002	-0.370
1	3	0.460	1.060	0.601
0	10	0.391	0.498	0.107
0	11	0.316	0.144	-0.172
	Max	0.536	1.060	0.601
	Average	0.415	0.423	0.008
	Min	0.316	0.002	-0.370
	Std Dev	0.085	0.408	0.372

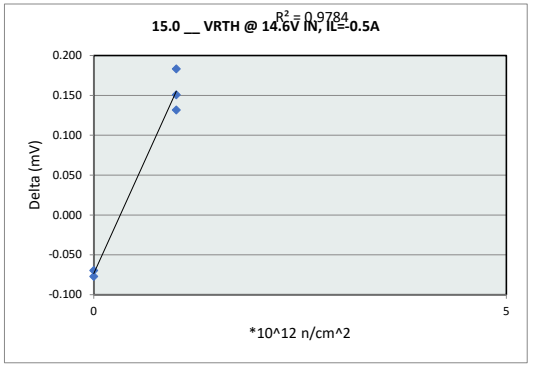


	14.0 __ VRLOAD @ 41.25V, -5M	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	12	m4
Min Limit	-12	m4
*10^12 n/cm^2	0	1
LL	-12.000	-12.000
Min	0.144	0.002
Average	0.321	0.491
Max	0.498	1.060
UL	12.000	12.000

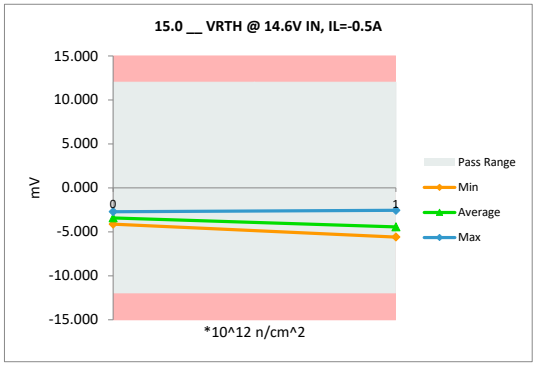


NDD Report
LM117QML-SP

		15.0 __ VRTH @ 14.6V IN, IL=-0.		
	Test Site	TIEM	TIEM	
	Tester	LTX77	LTX77	
	Test Number	RH00117HYD	RH00117HYD	
	Unit	mV	mV	
	Max Limit	12	12	
	Min Limit	-12	-12	
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	-5.318	-5.167	0.151
1	2	-5.780	-5.597	0.183
1	3	-2.683	-2.551	0.132
0	10	-4.048	-4.126	-0.077
0	11	-2.645	-2.714	-0.070
	Max	-2.645	-2.551	0.183
	Average	-4.095	-4.031	0.064
	Min	-5.780	-5.597	-0.077
	Std Dev	1.452	1.385	0.127

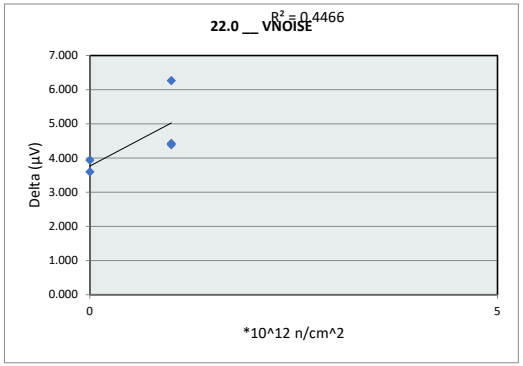


	15.0 __ VRTH @ 14.6V IN, IL=-	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	12	mV
Min Limit	-12	mV
*10^12 n/cm^2	0	1
LL	-12.000	-12.000
Min	-4.126	-5.597
Average	-3.420	-4.438
Max	-2.714	-2.551
UL	12.000	12.000

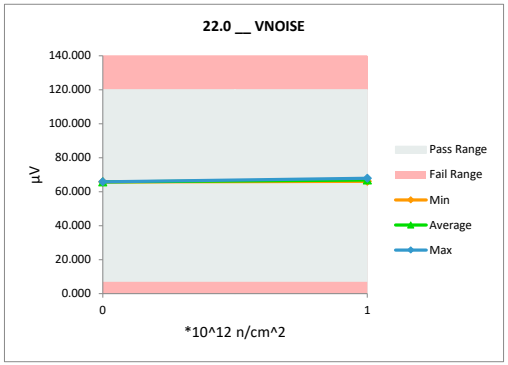


NDD Report
LM117QML-SP

	22.0 __ VNOISE		
Test Site	TIEM	TIEM	
Tester	LTX77	LTX77	
Test Number	RH00117HYD	RH00117HYD	
Unit	µV	µV	
Max Limit	120	120	
Min Limit	7	7	
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	61.640	67.906	6.266
1	2	62.195	66.581	4.386
1	3	61.675	66.102	4.427
0	10	61.866	65.801	3.935
0	11	62.127	65.723	3.596
	Max	62.195	67.906	6.266
	Average	61.900	66.422	4.522
	Min	61.640	65.723	3.596
	Std Dev	0.254	0.895	1.033

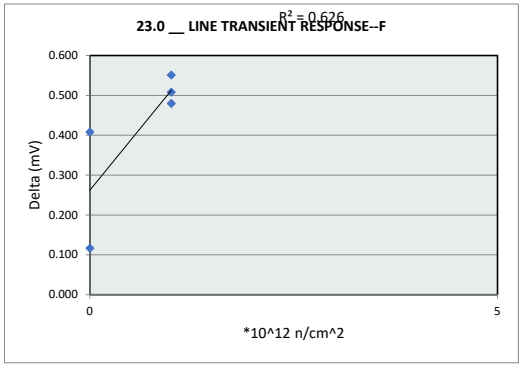


	22.0 __ VNOISE	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	120	µV
Min Limit	7	µV
*10^12 n/cm^2	0	1
LL	7.000	7.000
Min	65.723	66.102
Average	65.762	66.863
Max	65.801	67.906
UL	120.000	120.000

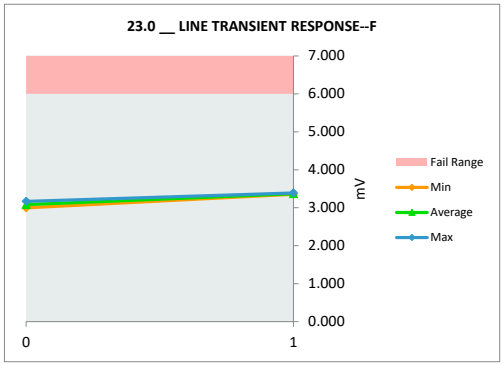


NDD Report
LM117QML-SP

	23.0 __ LINE TRANSIENT RESPON		
Test Site	TIEM	TIEM	
Tester	LTX77	LTX77	
Test Number	RH00117HYD	RH00117HYD	
Unit	mV	mV	
Max Limit	6	6	
Min Limit			
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	2.812	3.363	0.551
1	2	2.848	3.357	0.508
1	3	2.910	3.390	0.479
0	10	2.882	2.998	0.116
0	11	2.760	3.168	0.408
	Max	2.910	3.390	0.551
	Average	2.843	3.255	0.413
	Min	2.760	2.998	0.116
	Std Dev	0.059	0.169	0.174

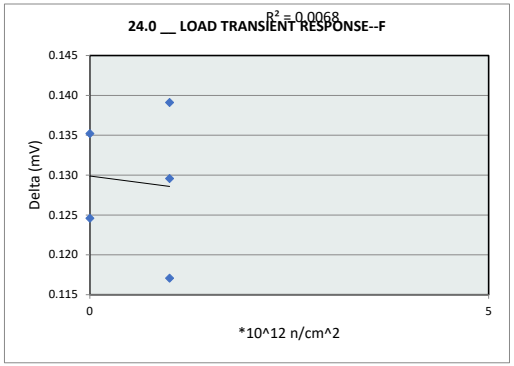


	23.0 __ LINE TRANSIENT RESP	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	6	mV
Min Limit		mV
*10^12 n/cm^2	0	1
LL		
Min	2.998	3.357
Average	3.083	3.370
Max	3.168	3.390
UL	6.000	6.000

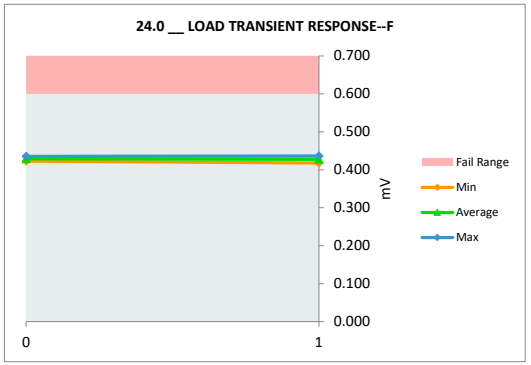


NDD Report
LM117QML-SP

		24.0 __ LOAD TRANSIENT RESPO		
	Test Site	TIEM	TIEM	
	Tester	LTX77	LTX77	
	Test Number	RH00117HYD	RH00117HYD	
	Unit	mV	mV	
	Max Limit	0.6	0.6	
	Min Limit			
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	0.299	0.428	0.130
1	2	0.301	0.418	0.117
1	3	0.297	0.436	0.139
0	10	0.300	0.435	0.135
0	11	0.298	0.423	0.125
	Max	0.301	0.436	0.139
	Average	0.299	0.428	0.129
	Min	0.297	0.418	0.117
	Std Dev	0.001	0.008	0.009

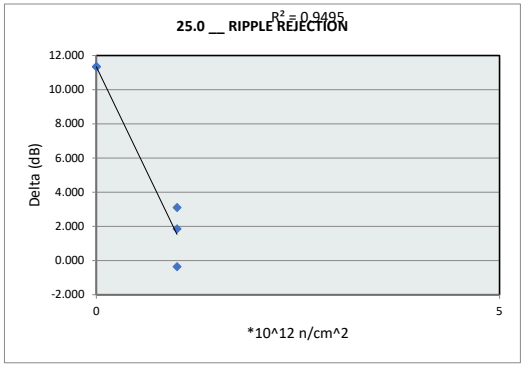


	24.0 __ LOAD TRANSIENT RESP		
Test Site	TIEM		
Tester	LTX77		
Test Number	RH00117HYD		
Max Limit	0.6	mV	
Min Limit		mV	
*10^12 n/cm^2	0	1	
LL			
Min	0.423	0.418	
Average	0.429	0.428	
Max	0.435	0.436	
UL	0.600	0.600	

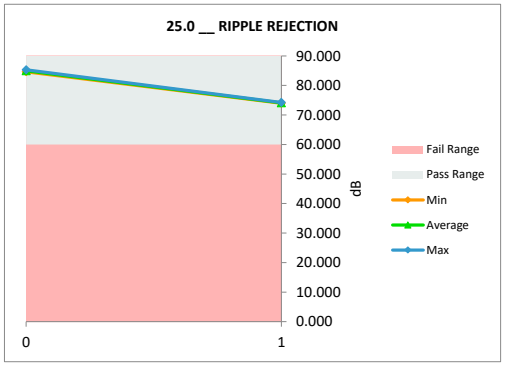


NDD Report
LM117QML-SP

	25.0 __ RIPPLE REJECTION		
Test Site	TIEM	TIEM	
Tester	LTX77	LTX77	
Test Number	RH00117HYD	RH00117HYD	
Unit	dB	dB	
Max Limit			
Min Limit	60	60	
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	74.334	73.975	-0.359
1	2	70.971	74.073	3.102
1	3	72.387	74.238	1.851
0	10	73.970	85.309	11.339
0	11	73.283	84.628	11.345
	Max	74.334	85.309	11.345
	Average	72.989	78.444	5.456
	Min	70.971	73.975	-0.359
	Std Dev	1.350	5.961	5.515

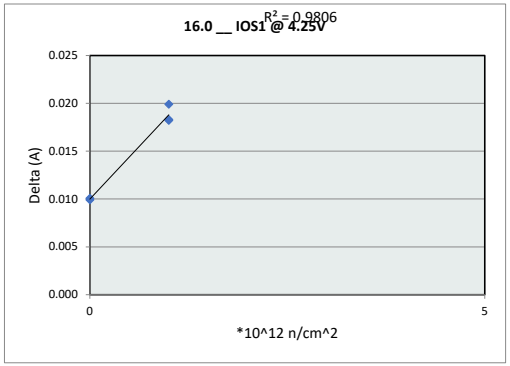


	25.0 __ RIPPLE REJECTION	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit		dB
Min Limit	60	dB
*10^12 n/cm^2	0	1
LL	60.000	60.000
Min	84.628	73.975
Average	84.968	74.095
Max	85.309	74.238
UL		

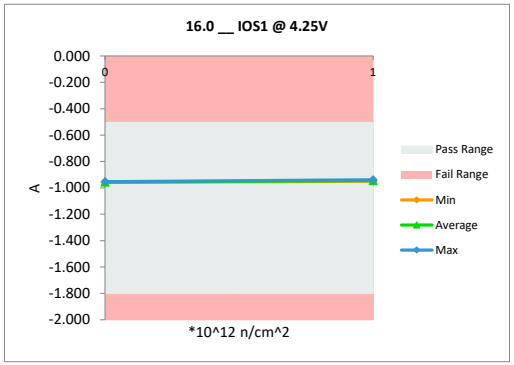


NDD Report
LM117QML-SP

	16.0 __ IOS1 @ 4.25V		
Test Site	TIEM	TIEM	
Tester	LTX77	LTX77	
Test Number	RH00117HYD	RH00117HYD	
Unit	A	A	
Max Limit	-0.5	-0.5	
Min Limit	-1.8	-1.8	
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	-0.958	-0.939	0.020
1	2	-0.964	-0.946	0.018
1	3	-0.968	-0.949	0.018
0	10	-0.963	-0.953	0.010
0	11	-0.969	-0.959	0.010
	Max	-0.958	-0.939	0.020
	Average	-0.964	-0.949	0.015
	Min	-0.969	-0.959	0.010
	Std Dev	0.004	0.008	0.005

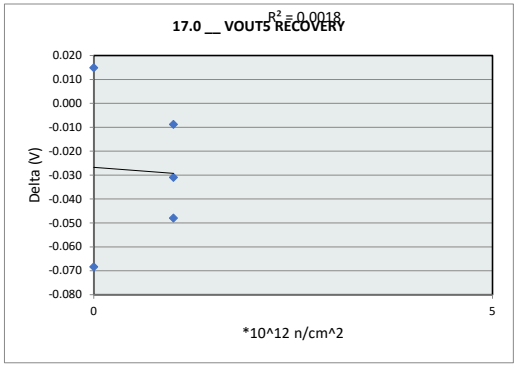


	16.0 __ IOS1 @ 4.25V	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	-0.5	A
Min Limit	-1.8	A
*10^12 n/cm^2	0	1
LL	-1.800	-1.800
Min	-0.959	-0.949
Average	-0.956	-0.945
Max	-0.953	-0.939
UL	-0.500	-0.500

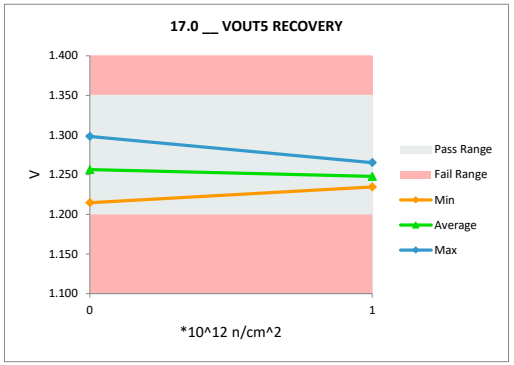


NDD Report
LM117QML-SP

	17.0 __ VOUT5 RECOVERY		
Test Site	TIEM	TIEM	
Tester	LTX77	LTX77	
Test Number	RH00117HYD	RH00117HYD	
Unit	V	V	
Max Limit	1.35	1.35	
Min Limit	1.2	1.2	
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	1.275	1.244	-0.031
1	2	1.283	1.235	-0.048
1	3	1.274	1.265	-0.009
0	10	1.283	1.298	0.015
0	11	1.283	1.215	-0.068
	Max	1.283	1.298	0.015
	Average	1.280	1.251	-0.028
	Min	1.274	1.215	-0.068
	Std Dev	0.005	0.032	0.033

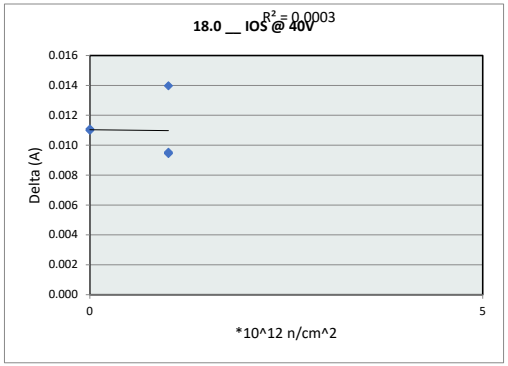


	17.0 __ VOUT5 RECOVERY	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	1.35	V
Min Limit	1.2	V
*10^12 n/cm^2	0	1
LL	1.200	1.200
Min	1.215	1.235
Average	1.256	1.248
Max	1.298	1.265
UL	1.350	1.350

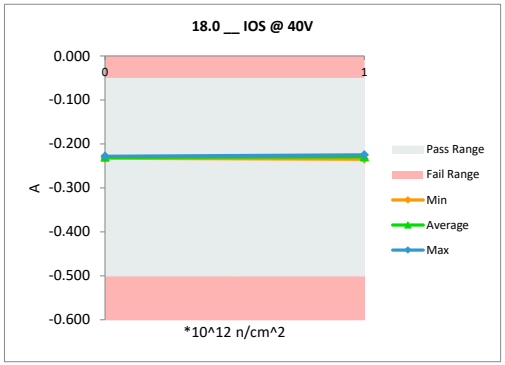


NDD Report
LM117QML-SP

	18.0 __ IOS @ 40V		
Test Site	TIEM	TIEM	
Tester	LTX77	LTX77	
Test Number	RH00117HYD	RH00117HYD	
Unit	A	A	
Max Limit	-0.05	-0.05	
Min Limit	-0.5	-0.5	
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	-0.238	-0.228	0.009
1	2	-0.239	-0.225	0.014
1	3	-0.244	-0.235	0.010
0	10	-0.239	-0.228	0.011
0	11	-0.244	-0.233	0.011
	Max	-0.238	-0.225	0.014
	Average	-0.241	-0.230	0.011
	Min	-0.244	-0.235	0.009
	Std Dev	0.003	0.004	0.002



	18.0 __ IOS @ 40V	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	-0.05	A
Min Limit	-0.5	A
*10^12 n/cm^2	0	1
LL	-0.500	-0.500
Min	-0.233	-0.235
Average	-0.230	-0.229
Max	-0.228	-0.225
UL	-0.050	-0.050



NDD Report
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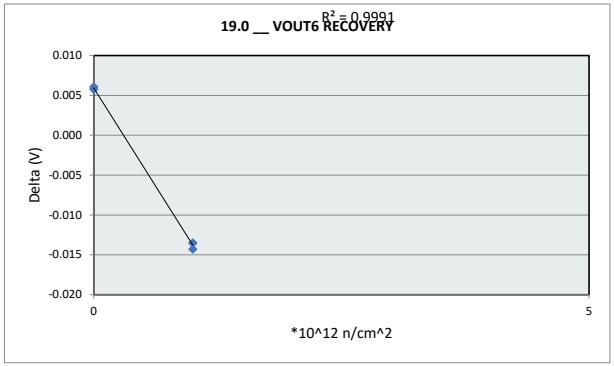
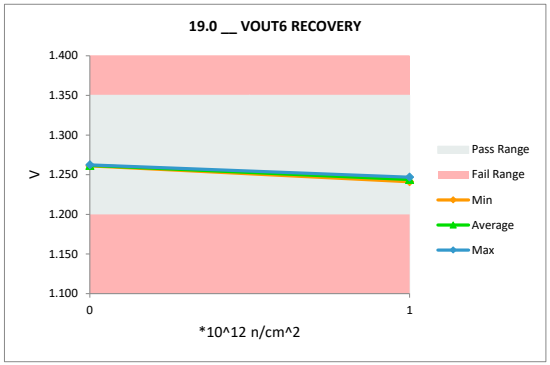
	19.0 __ VOUT6 RECOVERY	
Test Site	TIEM	TIEM
Tester	LTX77	LTX77
Test Number	RH00117HYD	RH00117HYD
Unit	V	V
Max Limit	1.35	1.35
Min Limit	1.2	1.2

*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	1.257	1.244	-0.014
1	2	1.261	1.247	-0.014
1	3	1.255	1.241	-0.014
0	10	1.255	1.261	0.006
0	11	1.256	1.262	0.006
	Max	1.261	1.262	0.006
	Average	1.257	1.251	-0.006
	Min	1.255	1.241	-0.014
	Std Dev	0.003	0.010	0.011

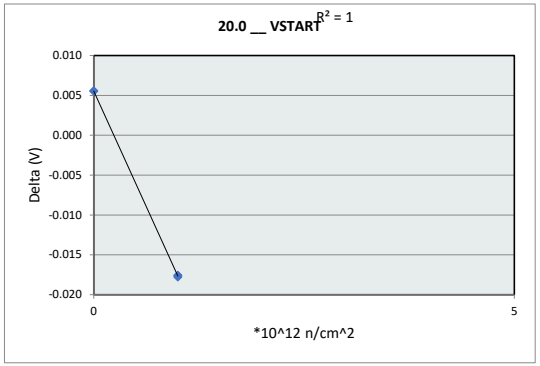


	19.0 __ VOUT6 RECOVERY	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	1.35	V
Min Limit	1.2	V
*10^12 n/cm^2	0	1
LL	1.200	1.200
Min	1.261	1.241
Average	1.262	1.244
Max	1.262	1.247
UL	1.350	1.350

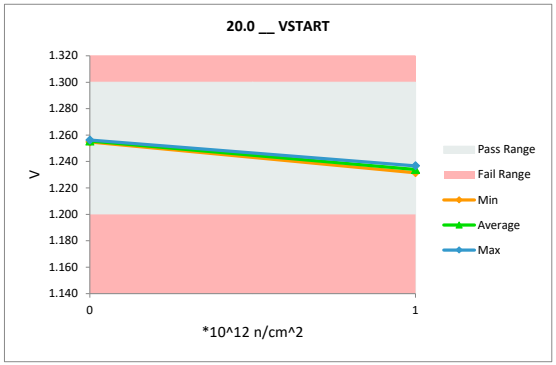


NDD Report
LM117QML-SP

	20.0 __ VSTART		
Test Site	TIEM	TIEM	
Tester	LTX77	LTX77	
Test Number	RH00117HYD	RH00117HYD	
Unit	V	V	
Max Limit	1.3	1.3	
Min Limit	1.2	1.2	
*10^12 n/cm^2	Serial #	PRE DATA	POST DATA	Delta
1	1	1.251	1.234	-0.018
1	2	1.254	1.237	-0.018
1	3	1.249	1.231	-0.018
0	10	1.249	1.255	0.006
0	11	1.251	1.256	0.006
	Max	1.254	1.256	0.006
	Average	1.251	1.243	-0.008
	Min	1.249	1.231	-0.018
	Std Dev	0.002	0.012	0.013



	20.0 __ VSTART	
Test Site	TIEM	
Tester	LTX77	
Test Number	RH00117HYD	
Max Limit	1.3	V
Min Limit	1.2	V
*10^12 n/cm^2	0	1
LL	1.200	1.200
Min	1.255	1.231
Average	1.256	1.234
Max	1.256	1.237
UL	1.300	1.300



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