



## LX7710\_V1R4 Diode Arrays with Redundancy

### Total Ionizing Dose Radiation Report

**Date:** 5/22/15

**Summary:** Total Ionizing Dose (TID) testing was performed on four LX7710 parts. These parts were irradiated to a total dose of 100krad(Si) at a dose rate of 52.4rad(SiO<sub>2</sub>)/s.

**TID Report:** DMEA-2015-NRC-008

**Test completion Date:** 5/21/15

**Test Lab:** Defense Microelectronics Activity (DMEA) Science and Engineering Gamma Irradiation Test Facility, McClellan, CA 95652. Lab accredited by A2LA (certificate number: 1691.01.)

**Customer:** Microsemi Corporation

**Part Type Tested:** LX7710\_V1R4, Part Package: SOIC20.

**Traceability Information:** All parts serialized at assembly house from lot# E23240 serial # 4, 5, 7, 9..

**Radiation Test Standard:** MIL-STD-883H TM1019

**Test Hardware and Software:** Credence ASL-1000 Automated Tester, Entity ID: TMT4 (pre-irradiation and post-irradiation), tester calibration performed monthly, test board: LX7710 Final Test Board & test program: LX7710\_R\_06.

**Facility and Radiation Source:** J.L. Shepherd & Associates Model 81-22/484 self-contained irradiation facility, S/Ns 7125/50016. Gamma rays were created from two large Co-60 sources. The DUTs semiconductor chip plane was placed perpendicular to the incident beam of gamma rays. Dosimeters were calibrated by an ISO17025:2005 accredited lab.

**Irradiation:** 100krad(Si) at a dose rate of 52.4rad(SiO<sub>2</sub>)/s with a dose rate uniformity across target area of  $\pm 5.3\%$ , exposed time 31.80minutes Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of  $k = 2$

#### Radiation Test Conditions

The four LX7710 parts were loaded onto the LX7710 RADIATION BOARD. The board requires to have 6 parts loaded for the chips to be biased. Serial # 4, 5, 6, 7, 8, 9 were loaded on the board. Dosimeter was focused on serial # 4, 5, 7, 9 with a 5% certainty.

**Pass/Fail Criteria:** Pass if irradiated part pass production program.

**Test Result:** All parts pass post TID electrical testing at 100krad(Si) See Tables: 1 to 4 for details.

## TID Test Results

Tables 1-4 summarize all tested electrical parameters before and after irradiation.

**Table 1.** SN 4 TID Results

Test#	Test Name	PRE TID Value	POST TID Value	Unit	Min Limit	Max Limit	PASS/FAIL
001.02.01	VF_100MA_CH1	1.5406	1.5703	V	1.52	1.58	Pass
001.02.02	VF_350MA_CH1	1.7446	1.7701	V	1.69	1.82	Pass
001.02.03	VF_700MA_CH1	1.9343	1.9565	V	1.84	2.04	Pass
001.02.04	VF_100MA_CH2	1.5346	1.5632	V	1.52	1.58	Pass
001.02.05	VF_350MA_CH2	1.7298	1.7531	V	1.69	1.82	Pass
001.02.06	VF_700MA_CH2	1.9059	1.9242	V	1.84	2.04	Pass
001.02.07	VF_100MA_CH3	1.5335	1.5618	V	1.52	1.58	Pass
001.02.08	VF_350MA_CH3	1.7264	1.75	V	1.69	1.82	Pass
001.02.09	VF_700MA_CH3	1.9008	1.9192	V	1.84	2.04	Pass
001.02.10	VF_100MA_CH4	1.5314	1.5602	V	1.52	1.58	Pass
001.02.11	VF_350MA_CH4	1.7214	1.7443	V	1.69	1.82	Pass
001.02.12	VF_700MA_CH4	1.889	1.9077	V	1.84	2.04	Pass
001.02.13	VF_100MA_CH5	1.5314	1.5596	V	1.52	1.58	Pass
001.02.14	VF_350MA_CH5	1.7225	1.7458	V	1.69	1.82	Pass
001.02.15	VF_700MA_CH5	1.8901	1.9107	V	1.84	2.04	Pass
001.02.16	VF_100MA_CH6	1.5315	1.5599	V	1.52	1.58	Pass
001.02.17	VF_350MA_CH6	1.7235	1.7467	V	1.69	1.82	Pass
001.02.18	VF_700MA_CH6	1.8944	1.9134	V	1.84	2.04	Pass
001.02.19	VF_100MA_CH7	1.534	1.5616	V	1.52	1.58	Pass
001.02.20	VF_350MA_CH7	1.7322	1.7542	V	1.69	1.82	Pass
001.02.21	VF_700MA_CH7	1.9103	1.9285	V	1.84	2.04	Pass
001.02.22	VF_100MA_CH8	1.5371	1.5648	V	1.52	1.58	Pass
001.02.23	VF_350MA_CH8	1.7454	1.7663	V	1.69	1.82	Pass
001.02.24	VF_700MA_CH8	1.9398	1.9557	V	1.84	2.04	Pass
001.03.01	RVKA_D1	299.9813	300.0035	V	295	305	Pass
001.03.02	RVKA_D2	299.9806	300.0034	V	295	305	Pass
001.03.03	RVKA_D3	299.9823	300.0018	V	295	305	Pass
001.03.04	RVKA_D4	299.9838	300.0034	V	295	305	Pass
001.03.05	RVKA_D5	299.9821	300.004	V	295	305	Pass
001.03.06	RVKA_D6	299.981	300.0037	V	295	305	Pass

001.03.07	RVKA_D7	299.9828	300.0028	V	295	305	Pass
001.03.08	RVKA_D8	299.983	300.003	V	295	305	Pass
001.03.09	RVAG_D1	299.9814	300.0044	V	295	305	Pass
001.03.10	RVAG_D2	299.9815	300.0032	V	295	305	Pass
001.03.11	RVAG_D3	299.9822	300.0031	V	295	305	Pass
001.03.12	RVAG_D4	299.9813	300.0029	V	295	305	Pass
001.03.13	RVAG_D5	299.982	300.002	V	295	305	Pass
001.03.14	RVAG_D6	299.9826	300.0038	V	295	305	Pass
001.03.15	RVAG_D7	299.9821	300.0021	V	295	305	Pass
001.03.16	RVAG_D8	299.9831	300.0031	V	295	305	Pass
001.04.01	RV_GND_A1	-261.084	-252.761	V	-295	-230	Pass
001.04.02	RV_GND_A2	-259.175	-253.146	V	-295	-230	Pass
001.04.03	RV_GND_A3	-260.118	-252.421	V	-295	-230	Pass
001.04.04	RV_GND_A4	-260.205	-253.763	V	-295	-230	Pass
001.04.05	RV_GND_A5	-261.132	-252.655	V	-295	-230	Pass
001.04.06	RV_GND_A6	-260.052	-253.816	V	-295	-230	Pass
001.04.07	RV_GND_A7	-264.642	-256.101	V	-295	-230	Pass
001.04.08	RV_GND_A8	-262.928	-255.901	V	-295	-230	Pass
001.05.01	I_GA1	0.0166	0.015	uA	-0.1	0.1	Pass
001.05.02	I_GA2	0.0161	0.0145	uA	-0.1	0.1	Pass
001.05.03	I_GA3	0.0381	0.035	uA	-0.1	0.1	Pass
001.05.04	I_GA4	0.0173	0.0266	uA	-0.1	0.1	Pass
001.05.05	I_GA5	0.0281	0.0253	uA	-0.1	0.1	Pass
001.05.06	I_GA6	0.0112	0.0103	uA	-0.1	0.1	Pass
001.05.07	I_GA7	0.0244	0.0227	uA	-0.1	0.1	Pass
001.05.08	I_GA8	0.0249	0.0222	uA	-0.1	0.1	Pass

**Table 2.** SN 5 TID Results

Test#	Test Name	PRE TID Value	POST TID Value	Unit	Min Limit	Max Limit	PASS/FAIL
001.02.01	VF_100MA_CH1	1.5426	1.5684	V	1.52	1.58	Pass
001.02.02	VF_350MA_CH1	1.7489	1.7695	V	1.69	1.82	Pass
001.02.03	VF_700MA_CH1	1.937	1.9521	V	1.84	2.04	Pass

001.02.04	VF_100MA_CH2	1.5371	1.5625	V	1.52	1.58	Pass
001.02.05	VF_350MA_CH2	1.7366	1.7576	V	1.69	1.82	Pass
001.02.06	VF_700MA_CH2	1.914	1.9303	V	1.84	2.04	Pass
001.02.07	VF_100MA_CH3	1.5358	1.5616	V	1.52	1.58	Pass
001.02.08	VF_350MA_CH3	1.7334	1.7552	V	1.69	1.82	Pass
001.02.09	VF_700MA_CH3	1.9094	1.9264	V	1.84	2.04	Pass
001.02.10	VF_100MA_CH4	1.534	1.5599	V	1.52	1.58	Pass
001.02.11	VF_350MA_CH4	1.7271	1.7492	V	1.69	1.82	Pass
001.02.12	VF_700MA_CH4	1.8964	1.9143	V	1.84	2.04	Pass
001.02.13	VF_100MA_CH5	1.534	1.5595	V	1.52	1.58	Pass
001.02.14	VF_350MA_CH5	1.7286	1.7506	V	1.69	1.82	Pass
001.02.15	VF_700MA_CH5	1.8974	1.9168	V	1.84	2.04	Pass
001.02.16	VF_100MA_CH6	1.5334	1.5596	V	1.52	1.58	Pass
001.02.17	VF_350MA_CH6	1.7308	1.7517	V	1.69	1.82	Pass
001.02.18	VF_700MA_CH6	1.903	1.9205	V	1.84	2.04	Pass
001.02.19	VF_100MA_CH7	1.5358	1.5612	V	1.52	1.58	Pass
001.02.20	VF_350MA_CH7	1.7352	1.7559	V	1.69	1.82	Pass
001.02.21	VF_700MA_CH7	1.9125	1.9289	V	1.84	2.04	Pass
001.02.22	VF_100MA_CH8	1.5393	1.5643	V	1.52	1.58	Pass
001.02.23	VF_350MA_CH8	1.7507	1.7684	V	1.69	1.82	Pass
001.02.24	VF_700MA_CH8	1.9443	1.9566	V	1.84	2.04	Pass
001.03.01	RVKA_D1	299.9825	300.0025	V	295	305	Pass
001.03.02	RVKA_D2	299.9829	300.0034	V	295	305	Pass
001.03.03	RVKA_D3	299.9837	300.0026	V	295	305	Pass
001.03.04	RVKA_D4	299.9847	300.0031	V	295	305	Pass
001.03.05	RVKA_D5	299.984	300.002	V	295	305	Pass
001.03.06	RVKA_D6	299.9841	300.004	V	295	305	Pass
001.03.07	RVKA_D7	299.9841	300.0034	V	295	305	Pass
001.03.08	RVKA_D8	299.9835	300.0026	V	295	305	Pass
001.03.09	RVAG_D1	299.9835	300.0032	V	295	305	Pass
001.03.10	RVAG_D2	299.9827	300.0021	V	295	305	Pass
001.03.11	RVAG_D3	299.9845	300.0038	V	295	305	Pass
001.03.12	RVAG_D4	299.9829	300.0032	V	295	305	Pass
001.03.13	RVAG_D5	299.9848	300.0046	V	295	305	Pass

001.03.14	RVAG_D6	299.9842	300.0041	V	295	305	Pass
001.03.15	RVAG_D7	299.9837	300.0032	V	295	305	Pass
001.03.16	RVAG_D8	299.9833	300.0042	V	295	305	Pass
001.04.01	RV_GND_A1	-258.15	-246.387	V	-295	-230	Pass
001.04.02	RV_GND_A2	-255.65	-246.564	V	-295	-230	Pass
001.04.03	RV_GND_A3	-257.095	-246.189	V	-295	-230	Pass
001.04.04	RV_GND_A4	-256.914	-248.235	V	-295	-230	Pass
001.04.05	RV_GND_A5	-259.944	-249.46	V	-295	-230	Pass
001.04.06	RV_GND_A6	-256.573	-248.494	V	-295	-230	Pass
001.04.07	RV_GND_A7	-257.717	-247.491	V	-295	-230	Pass
001.04.08	RV_GND_A8	-258.165	-249.159	V	-295	-230	Pass
001.05.01	I_GA1	0.0155	0.0143	uA	-0.1	0.1	Pass
001.05.02	I_GA2	0.0151	0.0139	uA	-0.1	0.1	Pass
001.05.03	I_GA3	0.0243	0.0344	uA	-0.1	0.1	Pass
001.05.04	I_GA4	0.0155	0.026	uA	-0.1	0.1	Pass
001.05.05	I_GA5	0.0272	0.024	uA	-0.1	0.1	Pass
001.05.06	I_GA6	0.0098	0.0225	uA	-0.1	0.1	Pass
001.05.07	I_GA7	0.0121	0.0221	uA	-0.1	0.1	Pass
001.05.08	I_GA8	0.0239	0.0219	uA	-0.1	0.1	Pass

**Table 3. SN 7 TID Results**

Test#	Test Name	PRE TID Value	POST TID Value	Unit	Min Limit	Max Limit	PASS/FAIL
001.02.01	VF_100MA_CH1	1.545	1.5681	V	1.52	1.58	Pass
001.02.02	VF_350MA_CH1	1.7506	1.7698	V	1.69	1.82	Pass
001.02.03	VF_700MA_CH1	1.9401	1.955	V	1.84	2.04	Pass
001.02.04	VF_100MA_CH2	1.5395	1.5619	V	1.52	1.58	Pass
001.02.05	VF_350MA_CH2	1.7403	1.7592	V	1.69	1.82	Pass
001.02.06	VF_700MA_CH2	1.9214	1.9354	V	1.84	2.04	Pass
001.02.07	VF_100MA_CH3	1.538	1.5606	V	1.52	1.58	Pass
001.02.08	VF_350MA_CH3	1.7342	1.752	V	1.69	1.82	Pass
001.02.09	VF_700MA_CH3	1.9079	1.9224	V	1.84	2.04	Pass
001.02.10	VF_100MA_CH4	1.536	1.5592	V	1.52	1.58	Pass
001.02.11	VF_350MA_CH4	1.7297	1.7482	V	1.69	1.82	Pass

001.02.12	VF_700MA_CH4	1.8996	1.9146	V	1.84	2.04	Pass
001.02.13	VF_100MA_CH5	1.5358	1.5578	V	1.52	1.58	Pass
001.02.14	VF_350MA_CH5	1.7302	1.7478	V	1.69	1.82	Pass
001.02.15	VF_700MA_CH5	1.899	1.9133	V	1.84	2.04	Pass
001.02.16	VF_100MA_CH6	1.5365	1.5589	V	1.52	1.58	Pass
001.02.17	VF_350MA_CH6	1.731	1.7492	V	1.69	1.82	Pass
001.02.18	VF_700MA_CH6	1.9026	1.9178	V	1.84	2.04	Pass
001.02.19	VF_100MA_CH7	1.5381	1.5605	V	1.52	1.58	Pass
001.02.20	VF_350MA_CH7	1.7368	1.7568	V	1.69	1.82	Pass
001.02.21	VF_700MA_CH7	1.9129	1.9317	V	1.84	2.04	Pass
001.02.22	VF_100MA_CH8	1.542	1.5634	V	1.52	1.58	Pass
001.02.23	VF_350MA_CH8	1.75	1.7667	V	1.69	1.82	Pass
001.02.24	VF_700MA_CH8	1.9411	1.9549	V	1.84	2.04	Pass
001.03.01	RVKA_D1	299.9908	300.0047	V	295	305	Pass
001.03.02	RVKA_D2	299.9896	300.0025	V	295	305	Pass
001.03.03	RVKA_D3	299.99	300.0046	V	295	305	Pass
001.03.04	RVKA_D4	299.9908	300.0051	V	295	305	Pass
001.03.05	RVKA_D5	299.9908	300.0034	V	295	305	Pass
001.03.06	RVKA_D6	299.9909	300.0036	V	295	305	Pass
001.03.07	RVKA_D7	299.991	300.0044	V	295	305	Pass
001.03.08	RVKA_D8	299.9906	300.0043	V	295	305	Pass
001.03.09	RVAG_D1	299.9907	300.0037	V	295	305	Pass
001.03.10	RVAG_D2	299.991	300.0039	V	295	305	Pass
001.03.11	RVAG_D3	299.9912	300.0034	V	295	305	Pass
001.03.12	RVAG_D4	299.9919	300.0029	V	295	305	Pass
001.03.13	RVAG_D5	299.9918	300.0036	V	295	305	Pass
001.03.14	RVAG_D6	299.9906	300.0041	V	295	305	Pass
001.03.15	RVAG_D7	299.9923	300.0036	V	295	305	Pass
001.03.16	RVAG_D8	299.99	300.0036	V	295	305	Pass
001.04.01	RV_GND_A1	-256.865	-247.702	V	-295	-230	Pass
001.04.02	RV_GND_A2	-253.785	-247.826	V	-295	-230	Pass
001.04.03	RV_GND_A3	-258.322	-249.263	V	-295	-230	Pass
001.04.04	RV_GND_A4	-254.688	-248.517	V	-295	-230	Pass
001.04.05	RV_GND_A5	-258.608	-249.945	V	-295	-230	Pass

001.04.06	RV_GND_A6	-257.3	-251.373	V	-295	-230	Pass
001.04.07	RV_GND_A7	-258.696	-249.624	V	-295	-230	Pass
001.04.08	RV_GND_A8	-258.398	-251.315	V	-295	-230	Pass
001.05.01	I_GA1	0.0159	0.0145	uA	-0.1	0.1	Pass
001.05.02	I_GA2	0.0156	0.0141	uA	-0.1	0.1	Pass
001.05.03	I_GA3	0.025	0.0341	uA	-0.1	0.1	Pass
001.05.04	I_GA4	0.0164	0.0256	uA	-0.1	0.1	Pass
001.05.05	I_GA5	0.0267	0.0363	uA	-0.1	0.1	Pass
001.05.06	I_GA6	0.0092	0.0086	uA	-0.1	0.1	Pass
001.05.07	I_GA7	0.0111	0.009	uA	-0.1	0.1	Pass
001.05.08	I_GA8	0.023	0.021	uA	-0.1	0.1	Pass

**Table 4. SN 9 TID Results**

Test#	Test Name	PRE TID Value	POST TID Value	Unit	Min Limit	Max Limit	PASS/FAIL
001.02.01	VF_100MA_CH1	1.5488	1.5647	V	1.52	1.58	Pass
001.02.02	VF_350MA_CH1	1.751	1.7635	V	1.69	1.82	Pass
001.02.03	VF_700MA_CH1	1.9387	1.9485	V	1.84	2.04	Pass
001.02.04	VF_100MA_CH2	1.543	1.5591	V	1.52	1.58	Pass
001.02.05	VF_350MA_CH2	1.7381	1.751	V	1.69	1.82	Pass
001.02.06	VF_700MA_CH2	1.9137	1.9236	V	1.84	2.04	Pass
001.02.07	VF_100MA_CH3	1.5425	1.5578	V	1.52	1.58	Pass
001.02.08	VF_350MA_CH3	1.7381	1.7482	V	1.69	1.82	Pass
001.02.09	VF_700MA_CH3	1.9138	1.9196	V	1.84	2.04	Pass
001.02.10	VF_100MA_CH4	1.54	1.5561	V	1.52	1.58	Pass
001.02.11	VF_350MA_CH4	1.7295	1.7421	V	1.69	1.82	Pass
001.02.12	VF_700MA_CH4	1.897	1.9073	V	1.84	2.04	Pass
001.02.13	VF_100MA_CH5	1.5396	1.5552	V	1.52	1.58	Pass
001.02.14	VF_350MA_CH5	1.732	1.7443	V	1.69	1.82	Pass
001.02.15	VF_700MA_CH5	1.8998	1.9101	V	1.84	2.04	Pass
001.02.16	VF_100MA_CH6	1.5392	1.5546	V	1.52	1.58	Pass
001.02.17	VF_350MA_CH6	1.7359	1.7483	V	1.69	1.82	Pass
001.02.18	VF_700MA_CH6	1.9088	1.9189	V	1.84	2.04	Pass
001.02.19	VF_100MA_CH7	1.5412	1.5565	V	1.52	1.58	Pass

001.02.20	VF_350MA_CH7	1.7406	1.7527	V	1.69	1.82	Pass
001.02.21	VF_700MA_CH7	1.9176	1.9269	V	1.84	2.04	Pass
001.02.22	VF_100MA_CH8	1.5438	1.5602	V	1.52	1.58	Pass
001.02.23	VF_350MA_CH8	1.7526	1.7667	V	1.69	1.82	Pass
001.02.24	VF_700MA_CH8	1.9425	1.9571	V	1.84	2.04	Pass
001.03.01	RVKA_D1	299.9928	300.0056	V	295	305	Pass
001.03.02	RVKA_D2	299.992	300.0038	V	295	305	Pass
001.03.03	RVKA_D3	299.9922	300.0048	V	295	305	Pass
001.03.04	RVKA_D4	299.9922	300.0049	V	295	305	Pass
001.03.05	RVKA_D5	299.9921	300.0046	V	295	305	Pass
001.03.06	RVKA_D6	299.9924	300.0044	V	295	305	Pass
001.03.07	RVKA_D7	299.9916	300.0047	V	295	305	Pass
001.03.08	RVKA_D8	299.9926	300.0033	V	295	305	Pass
001.03.09	RVAG_D1	299.9928	300.0045	V	295	305	Pass
001.03.10	RVAG_D2	299.9919	300.0041	V	295	305	Pass
001.03.11	RVAG_D3	299.9926	300.0052	V	295	305	Pass
001.03.12	RVAG_D4	299.9916	300.0049	V	295	305	Pass
001.03.13	RVAG_D5	299.9921	300.0052	V	295	305	Pass
001.03.14	RVAG_D6	299.9928	300.0043	V	295	305	Pass
001.03.15	RVAG_D7	299.9935	300.0053	V	295	305	Pass
001.03.16	RVAG_D8	299.9934	300.004	V	295	305	Pass
001.04.01	RV_GND_A1	-265.366	-256.05	V	-295	-230	Pass
001.04.02	RV_GND_A2	-261.389	-255.418	V	-295	-230	Pass
001.04.03	RV_GND_A3	-263.774	-255.567	V	-295	-230	Pass
001.04.04	RV_GND_A4	-261.419	-255.614	V	-295	-230	Pass
001.04.05	RV_GND_A5	-263.104	-254.535	V	-295	-230	Pass
001.04.06	RV_GND_A6	-260.594	-254.867	V	-295	-230	Pass
001.04.07	RV_GND_A7	-261.933	-253.953	V	-295	-230	Pass
001.04.08	RV_GND_A8	-261.035	-254.291	V	-295	-230	Pass
001.05.01	I_GA1	0.0158	0.0154	uA	-0.1	0.1	Pass
001.05.02	I_GA2	0.0154	0.0149	uA	-0.1	0.1	Pass
001.05.03	I_GA3	0.0248	0.0361	uA	-0.1	0.1	Pass
001.05.04	I_GA4	0.028	0.0274	uA	-0.1	0.1	Pass
001.05.05	I_GA5	0.039	0.038	uA	-0.1	0.1	Pass



001.05.06	I_GA6	0.0231	0.0231	uA	-0.1	0.1	Pass
001.05.07	I_GA7	0.0122	0.0101	uA	-0.1	0.1	Pass
001.05.08	I_GA8	0.0252	0.0222	uA	-0.1	0.1	Pass

**Figure A.1.** Irradiation Board Schematic.

