

Total Ionization Dose (TID) Test Results of the RH137K Negative Adjustable Regulator @ High Dose Rate (HDR)

HDR = 50 rads(Si)/s

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The authors would like to thank the S-Power Product Engineering group from Linear Technology for their help with the board design and assembly as well as the data collection pre- and post-irradiations. Special thanks are also for Thomas Shepherd from Defense Microelectronics Activity (DMEA) for the extensive work for board setup and continuous dosimetry monitoring throughout the tests.

TID HDR Test Results of the RH137K Negative Adjustable Regulator

Part Type Tested: RH137K Negative Adjustable Regulator

Traceability Information: Fab Lot # W1328052.2; Assembly Lot # 732141.1; Wafer #3; Date Code: 1345A. See photograph of unit under test in Appendix A.

Quantity of Units: 42 units received, 2 units for control, 20 units for biased irradiation, and 20 units for unbiased irradiation. Serial numbers 198-202, 208-212, 219-220, 222-224, and 230-234 had all pins tied to ground during irradiation. Serial numbers 191-192, 194, 196-197, 203-207, 213, 215-218, and 225-229 were biased during irradiation. Serial numbers 235 and 236 were used as control. See Appendix B for the radiation bias connection tables.

Radiation and Electrical Test Increments: 40 samples were divided into four groups of 10 each. Serial numbers 191-192, 194, 196-202 of group 1 were irradiated to 10 Krads(Si). Serial numbers 203-212 of group 2 were irradiated to 20 Krads(Si). Serial numbers 213, 215-220 and 222-224 of group 3 were irradiated to 50 Krads(Si). Serial numbers 225-234 of group 4 were irradiated to 100 Krads(Si).

Radiation dose rate: 50 rads(Si)/sec.

Radiation Test Standard: MIL-STD-883 TM1019.9 Condition A.

Test Hardware and Software: LTX pre-irradiation test program: EFLR137K.01 and post-irradiation test program EQ2LR137K.01.

Facility and Radiation Source: Defense Micro Electronic Activity (DMEA) and Cobalt-60.

Irradiation and Test Temperature: Room temperature controlled to 24°C±6°C per MIL-STD-883 and MIL-STD-750.

SUMMARY

ALL 42 PARTS PASSED THE ELECTRICAL TEST LIMITS AS SPECIFIED IN THE DATASHEET AFTER EACH IRRADIATION INCREMENT. ADDITIONAL INFORMATION CAN BE PROVIDED PER REQUEST.

1.0 Overview and Background

Among other radiation effects, Total Ionizing Dose (TID) may affect electrical characteristics, causing parametric and/or functional failures in integrated circuits. During gamma-irradiations, TID-induced and transported electron-hole pairs may result in charge trapping in a transistor's dielectrics and interface regions, affecting the device's basic features. Such effects warrant testing and monitoring of circuits to TID, after which annealing and/or Time Dependent Effects (TDE) may take place, depending on the circuit's design and process technology. Hence the requirement per Condition A (for high-dose rates ranging from 50 and 300 rads(Si)/sec) in TM1019, MIL-STD-883 is to not exceed the allowed time of one hour from the end of an incremented irradiation and an electrical test. Additionally, the total time from the end of one incremental irradiation to the start of the next incremental step should be less than two hours.

2.0 Radiation Facility and Test Equipment

The samples were irradiated at Defense Micro-Electronics Activity (DMEA) facility in Sacramento, California. DMEA utilizes J.L. Shepherd model 81-22/484 to provide the dose-rate of 50 rads(Si)/s. A special design screw-driven automatic cart inside the exposure tunnel positions the Device-Under-Test (DUT) precisely and repeatedly from the source to attain optimal rate verified by ion chamber detectors. See Appendix C for the certificate of dosimetry.

3.0 Test Conditions

The 40 test samples and two control units were electrically tested at 25°C prior to irradiation. The parts were then placed in a lead/aluminum container and aligned with the radiation source, Cobalt-60, at DMEA facility in Sacramento, California. During irradiation, five units of six separate groups were biased at +/- 15V and other five of similar groups had all pads grounded. Ten units of group 1 were irradiated to 10 Krads(Si); group 2 to 20 Krads(Si); group 3 to 50 Krads(Si); and group 4 to 100 Krads(Si). After irradiation, the samples were transported in dry ice to Linear Technology testing facility. Testing was performed on the two control units to confirm the operation of the test system prior to the electrical testing of the 42 units (40 irradiated and 2 control).

The criteria to pass the high dose-rate test is that five samples in each corresponding dose group irradiated under electrical bias must pass the datasheet limits. If any of the tested parameters of these five units of each group do not meet the required limits then a failure-analysis of the part should be conducted and if valid the lot will be scrapped.

4.0 Tested Parameters

The following parameters were measured pre- and post-irradiations:

- V_{REF} (V) @ $|V_{IN} - V_{OUT}| \leq 5V$, $I_{OUT} = 10mA$
- V_{REF} (V) @ $|V_{IN} - V_{OUT}| \leq 5V$, $I_{OUT} \leq 1.5A$
- V_{REF} (V) @ $|V_{IN} - V_{OUT}| \leq 3V$, $I_{OUT} = 10mA$
- V_{REF} (V) @ $|V_{IN} - V_{OUT}| \leq 30V$, $I_{OUT} = 10mA$
- V_{REF} (V) @ $|V_{IN} - V_{OUT}| \leq 30V$, $I_{OUT} = 150mA$
- V_{REF} (V) @ $|V_{IN} - V_{OUT}| \leq 10V$, $I_{OUT} = 10mA$
- V_{REF} (V) @ $|V_{IN} - V_{OUT}| \leq 18V$, $I_{OUT} = 1A$
- Line Regulation (%/V) @ $3V \leq |V_{IN} - V_{OUT}| \leq 30V$
- Load Regulation (mV) @ $V_{OUT} \leq 5V$, $10mA \leq I_{OUT} \leq 1.5A$
- Load Regulation (%) @ $V_{OUT} \geq 5V$, $10mA \leq I_{OUT} \leq 1.5A$
- Adjust Pin Current (μA)
- Adjust Pin Current Change (μA) @ $10mA \leq I_{OUT} \leq 1.5A$
- Adjust Pin Current Change (μA) @ $3V \leq |V_{IN} - V_{OUT}| \leq 30V$
- Minimum Load Current (mA) @ $|V_{IN} - V_{OUT}| = 30V$
- Minimum Load Current (mA) @ $|V_{IN} - V_{OUT}| \leq 10V$
- Current Limit (A) @ $|V_{IN} - V_{OUT}| \leq 15V$
- Current Limit (A) @ $|V_{IN} - V_{OUT}| = 30V$

Appendix D details the test conditions, minimum and maximum values at different accumulated doses.

5.0 Test Results

All 40 samples passed the post-irradiation electrical tests. All measurements of the seventeen listed parameters in section 4.0 are within the specification limits.

The used statistics in this report are based on the tolerance limits, which are bounds to gage the quality of the manufactured products. It assumes that if the quality of the items is normally distributed with known mean and known standard deviation, the two-sided tolerance limits can be calculated as follows:

$$+K_{TL} = \text{mean} + (K_{TL}) (\text{standard deviation})$$

$$-K_{TL} = \text{mean} - (K_{TL}) (\text{standard deviation})$$

Where $+K_{TL}$ is the upper tolerance limit and $-K_{TL}$ is the lower tolerance limit. These tolerance limits are defined in a table of inverse normal probability distribution.

However, in most cases, mean and standard deviations are unknown and therefore it is practical to estimate both of them from a sample. Hence the tolerance limit depends greatly on the sample size. The $P_{s90\%/90\%}$ K_{TL} factor for a lot quality P of 0.9, confidence C of 0.9 with a sample size of 5, can be found from the tabulated table (MIL-HDBK-814, page 94, table IX-B). The K_{TL} factor in this report is 2.742.

In the plots, the dotted lines with diamond markers are the average of the measured data points of five samples irradiated under electrical bias while the dashed lines with X-markers are the average of measured data points of five units irradiated with all pins tied to ground. The solid lines with triangle markers are the 90%/90% minimum and maximum determined from the calculation of the K_{TL} on the samples irradiated in the biased setup. The solid lines with square symbols are the 90%/90% minimum and maximum determined from the calculation of the K_{TL} on the five samples irradiated with all pins grounded. The orange solid lines with circle markers are the specification limits.

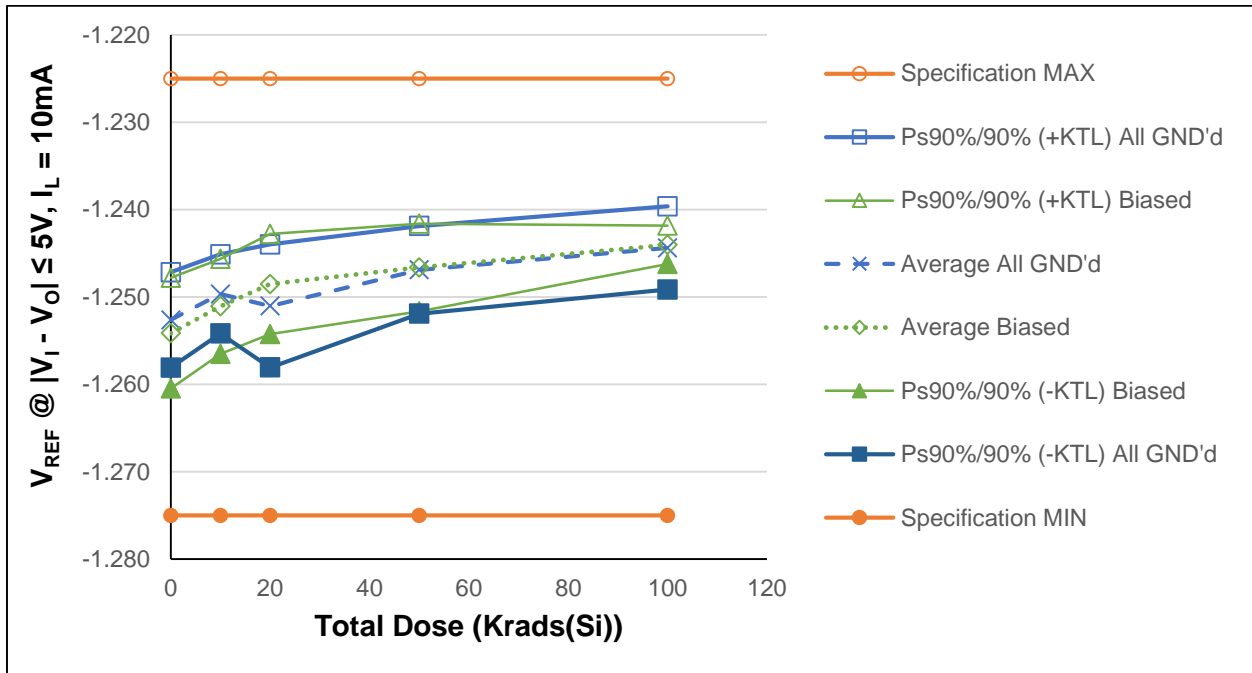


Figure 5.1 Plot of V_{REF} @ $|V_I - V_O| \leq 5V$ versus Total Dose

Table 5.1: Raw data for reference voltage @ $|V_I - V_O| \leq 5V$ versus total dose including the statistical calculations, minimum specification, maximum specification, and the status of the test (PASS/FAIL) under the orange headers

Parameter Units	V_{REF} @ $V_I - V_O \leq 5V, I_L = 10mA$ (V)	Total Dose (Krad(Si)) @ 50rads/second				
		0	10	20	50	100
198	All GND'd Irradiation	-1.25304	-1.25046			
199	All GND'd Irradiation	-1.25041	-1.24795			
200	All GND'd Irradiation	-1.25317	-1.25026			
201	All GND'd Irradiation	-1.25103	-1.24791			
202	All GND'd Irradiation	-1.25543	-1.25165			
191	Biased Irradiation	-1.25526	-1.25210			
192	Biased Irradiation	-1.25636	-1.25270			
194	Biased Irradiation	-1.25575	-1.25268			
196	Biased Irradiation	-1.25194	-1.24936			
197	Biased Irradiation	-1.25134	-1.24852			
208	All GND'd Irradiation	-1.25872		-1.25390		
209	All GND'd Irradiation	-1.25406		-1.25039		
210	All GND'd Irradiation	-1.25461		-1.25069		
211	All GND'd Irradiation	-1.25667		-1.25286		
212	All GND'd Irradiation	-1.25073		-1.24725		
203	Biased Irradiation	-1.25343		-1.24927		
204	Biased Irradiation	-1.25561		-1.25149		
205	Biased Irradiation	-1.25018		-1.24642		
206	Biased Irradiation	-1.25239		-1.24875		
207	Biased Irradiation	-1.25048		-1.24661		
219	All GND'd Irradiation	-1.25206			-1.24673	
220	All GND'd Irradiation	-1.25240			-1.24645	
222	All GND'd Irradiation	-1.25102			-1.24555	
223	All GND'd Irradiation	-1.25136			-1.24569	
224	All GND'd Irradiation	-1.25636			-1.25005	
213	Biased Irradiation	-1.25055			-1.24428	
215	Biased Irradiation	-1.25201			-1.24590	
216	Biased Irradiation	-1.25498			-1.24828	
217	Biased Irradiation	-1.25445			-1.24866	
218	Biased Irradiation	-1.25126			-1.24596	
230	All GND'd Irradiation	-1.25255				-1.24211
231	All GND'd Irradiation	-1.25614				-1.24530
232	All GND'd Irradiation	-1.25343				-1.24378
233	All GND'd Irradiation	-1.25375				-1.24394
234	All GND'd Irradiation	-1.25537				-1.24673
225	Biased Irradiation	-1.25267				-1.24302
226	Biased Irradiation	-1.25313				-1.24459
227	Biased Irradiation	-1.25248				-1.24372
228	Biased Irradiation	-1.25484				-1.24507
229	Biased Irradiation	-1.25209				-1.24374
235	Control Unit	-1.25406	-1.25119	-1.25119	-1.25119	-1.25119
236	Control Unit	-1.25415	-1.25163	-1.25163	-1.25163	-1.25163
	All GND'd Irradiation Statistics					
	Average All GND'd	-1.25262	-1.24964	-1.25102	-1.24689	-1.24437
	Std Dev All GND'd	0.00199	0.00165	0.00257	0.00183	0.00174
	Ps90%/90% (+KTL) All GND'd	-1.24716	-1.24511	-1.24397	-1.24187	-1.23961
	Ps90%/90% (-KTL) All GND'd	-1.25807	-1.25418	-1.25806	-1.25191	-1.24913
	Biased Irradiation Statistics					
	Average Biased	-1.25413	-1.25107	-1.24851	-1.24662	-1.24403
	Std Dev Biased	0.00231	0.00198	0.00209	0.00183	0.00080
	Ps90%/90% (+KTL) Biased	-1.24779	-1.24563	-1.24277	-1.24161	-1.24183
	Ps90%/90% (-KTL) Biased	-1.26048	-1.25651	-1.25425	-1.25162	-1.24623
	Specification MIN	-1.275	-1.275	-1.275	-1.275	-1.275
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Specification MAX	-1.225	-1.225	-1.225	-1.225	-1.225
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (+KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) Biased	PASS	PASS	PASS	PASS	PASS
	Status (+KTL) Biased	PASS	PASS	PASS	PASS	PASS

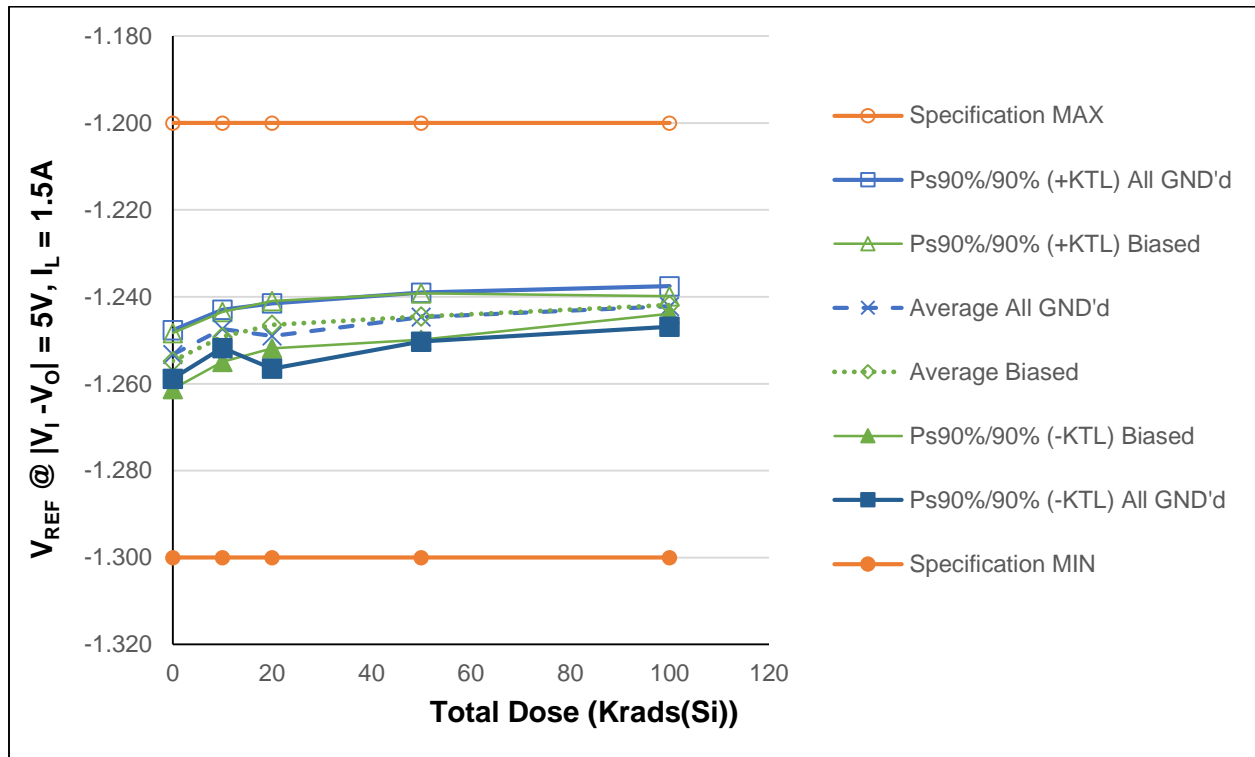


Figure 5.2 Plot of V_{REF} @ $|V_I - V_O| = 5V, I_L = 1.5A$ versus Total Dose

Table 5.2: Raw data for reference voltage @ $|V_I - V_O| = 5V$, $I_L = 1.5A$ versus total dose including the statistical calculations, minimum specification, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

Parameter Units	V_{REF} @ $ V_I - V_O \leq 5V$, $I_L = 1.5A$ (V)	Total Dose (Krad(Si)) @ 50rads/second				
		0	10	20	50	100
198	All GND'd Irradiation	-1.25365	-1.24782			
199	All GND'd Irradiation	-1.25110	-1.24561			
200	All GND'd Irradiation	-1.25370	-1.24797			
201	All GND'd Irradiation	-1.25163	-1.24591			
202	All GND'd Irradiation	-1.25624	-1.24951			
191	Biased Irradiation	-1.25606	-1.25026			
192	Biased Irradiation	-1.25706	-1.25127			
194	Biased Irradiation	-1.25633	-1.25058			
196	Biased Irradiation	-1.25255	-1.24730			
197	Biased Irradiation	-1.25197	-1.24660			
208	All GND'd Irradiation	-1.25950		-1.25195		
209	All GND'd Irradiation	-1.25485		-1.24866		
210	All GND'd Irradiation	-1.25514		-1.24859		
211	All GND'd Irradiation	-1.25742		-1.25096		
212	All GND'd Irradiation	-1.25121		-1.24486		
203	Biased Irradiation	-1.25400		-1.24720		
204	Biased Irradiation	-1.25618		-1.24923		
205	Biased Irradiation	-1.25086		-1.24450		
206	Biased Irradiation	-1.25309		-1.24669		
207	Biased Irradiation	-1.25110		-1.24455		
219	All GND'd Irradiation	-1.25254			-1.24428	
220	All GND'd Irradiation	-1.25309			-1.24431	
222	All GND'd Irradiation	-1.25160			-1.24322	
223	All GND'd Irradiation	-1.25195			-1.24325	
224	All GND'd Irradiation	-1.25697			-1.24821	
213	Biased Irradiation	-1.25121			-1.24203	
215	Biased Irradiation	-1.25254			-1.24355	
216	Biased Irradiation	-1.25567			-1.24642	
217	Biased Irradiation	-1.25511			-1.24657	
218	Biased Irradiation	-1.25209			-1.24404	
230	All GND'd Irradiation	-1.25309				-1.24008
231	All GND'd Irradiation	-1.25679				-1.24295
232	All GND'd Irradiation	-1.25407				-1.24153
233	All GND'd Irradiation	-1.25450				-1.24180
234	All GND'd Irradiation	-1.25592				-1.24463
225	Biased Irradiation	-1.25348				-1.24142
226	Biased Irradiation	-1.25363				-1.24221
227	Biased Irradiation	-1.25316				-1.24127
228	Biased Irradiation	-1.25557				-1.24306
229	Biased Irradiation	-1.25267				-1.24153
235	Control Unit	-1.25469	-1.24936	-1.24936	-1.24936	-1.24936
236	Control Unit	-1.25470	-1.24943	-1.24943	-1.24943	-1.24943
	All GND'd Irradiation Statistics					
	Average All GND'd	-1.25326	-1.24737	-1.24900	-1.24465	-1.24220
	Std Dev All GND'd	0.00204	0.00161	0.00274	0.00206	0.00170
	Ps90%/90% (+KTL) All GND'd	-1.24768	-1.24295	-1.24149	-1.23901	-1.23754
	Ps90%/90% (-KTL) All GND'd	-1.25885	-1.25178	-1.25652	-1.25030	-1.24686
	Biased Irradiation Statistics					
	Average Biased	-1.25479	-1.24920	-1.24643	-1.24452	-1.24190
	Std Dev Biased	0.00235	0.00210	0.00199	0.00195	0.00074
	Ps90%/90% (+KTL) Biased	-1.24835	-1.24344	-1.24099	-1.23918	-1.23986
	Ps90%/90% (-KTL) Biased	-1.26123	-1.25496	-1.25188	-1.24987	-1.24394
	Specification MIN	-1.3	-1.3	-1.3	-1.3	-1.3
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Specification MAX	-1.2	-1.2	-1.2	-1.2	-1.2
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (+KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) Biased	PASS	PASS	PASS	PASS	PASS
	Status (+KTL) Biased	PASS	PASS	PASS	PASS	PASS

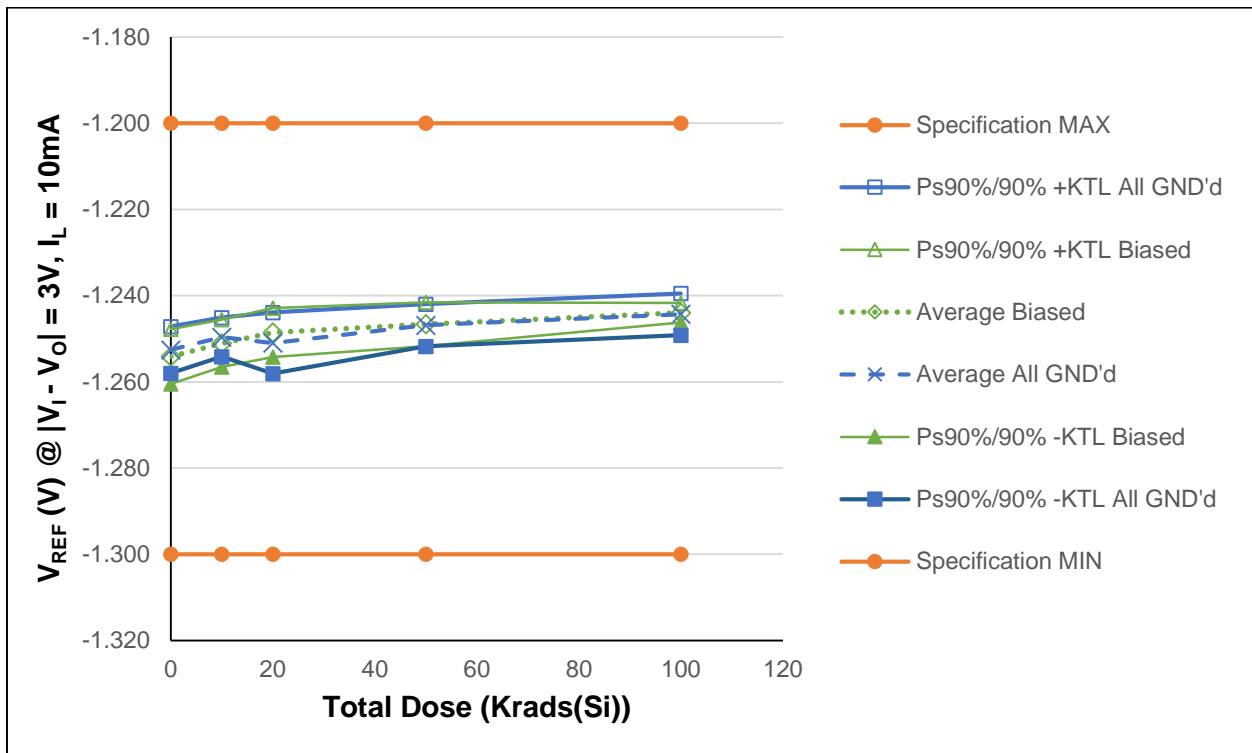


Figure 5.3 Plot of V_{REF} @ $|V_I - V_O| = 3V, I_L = 10mA$ versus Total Dose

Table 5.3: Raw data for reference voltage @ $|V_i - V_o| = 3V$, $I_L = 10\text{ mA}$ versus total dose including the statistical calculations, minimum specification, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

Parameter Units	V_{REF} @ $ V_i - V_o = 3V$, $I_L = 10\text{mA}$ (V)	Total Dose (Krad(Si)) @ 10mr/s				
		0	10	20	50	100
198	All GND'd Irradiation	-1.25301	-1.25042			
199	All GND'd Irradiation	-1.25041	-1.24786			
200	All GND'd Irradiation	-1.25323	-1.25019			
201	All GND'd Irradiation	-1.25099	-1.24797			
202	All GND'd Irradiation	-1.25537	-1.25166			
191	Biased Irradiation	-1.25522	-1.25210			
192	Biased Irradiation	-1.25644	-1.25283			
194	Biased Irradiation	-1.25567	-1.25259			
196	Biased Irradiation	-1.25195	-1.24923			
197	Biased Irradiation	-1.25132	-1.24856			
208	All GND'd Irradiation	-1.25872		-1.25392		
209	All GND'd Irradiation	-1.25406		-1.25028		
210	All GND'd Irradiation	-1.25445		-1.25079		
211	All GND'd Irradiation	-1.25667		-1.25279		
212	All GND'd Irradiation	-1.25069		-1.24720		
203	Biased Irradiation	-1.25331		-1.24939		
204	Biased Irradiation	-1.25559		-1.25141		
205	Biased Irradiation	-1.25018		-1.24645		
206	Biased Irradiation	-1.25232		-1.24882		
207	Biased Irradiation	-1.25041		-1.24659		
219	All GND'd Irradiation	-1.25206			-1.24675	
220	All GND'd Irradiation	-1.25238			-1.24631	
222	All GND'd Irradiation	-1.25095			-1.24566	
223	All GND'd Irradiation	-1.25133			-1.24569	
224	All GND'd Irradiation	-1.25635			-1.24997	
213	Biased Irradiation	-1.25048			-1.24428	
215	Biased Irradiation	-1.25194			-1.24577	
216	Biased Irradiation	-1.25492			-1.24829	
217	Biased Irradiation	-1.25441			-1.24873	
218	Biased Irradiation	-1.25127			-1.24599	
230	All GND'd Irradiation	-1.25243				-1.24204
231	All GND'd Irradiation	-1.25606				-1.24523
232	All GND'd Irradiation	-1.25345				-1.24371
233	All GND'd Irradiation	-1.25374				-1.24386
234	All GND'd Irradiation	-1.25529				-1.24674
225	Biased Irradiation	-1.25262				-1.24294
226	Biased Irradiation	-1.25301				-1.24447
227	Biased Irradiation	-1.25243				-1.24367
228	Biased Irradiation	-1.25476				-1.24509
229	Biased Irradiation	-1.25209				-1.24363
235	Control Unit	-1.25400	-1.25127	-1.25127	-1.25127	-1.25127
236	Control Unit	-1.25407	-1.25165	-1.25165	-1.25165	-1.25165
All GND'd Irradiation Statistics						
Average All GND'd		-1.25260	-1.24962	-1.25100	-1.24688	-1.24432
Std Dev All GND'd		0.00198	0.00165	0.00258	0.00179	0.00177
Ps90%/90% +KTL All GND'd		-1.24718	-1.24508	-1.24391	-1.24197	-1.23947
Ps90%/90% -KTL All GND'd		-1.25802	-1.25415	-1.25808	-1.25178	-1.24916
Biased Irradiation Statistics						
Average Biased		-1.25412	-1.25106	-1.24853	-1.24661	-1.24396
Std Dev Biased		0.00232	0.00201	0.00207	0.00186	0.00083
Ps90%/90% +KTL Biased		-1.24775	-1.24555	-1.24285	-1.24152	-1.24167
Ps90%/90% -KTL Biased		-1.26049	-1.25657	-1.25422	-1.25171	-1.24625
Specification MIN		-1.3	-1.3	-1.3	-1.3	-1.3
Status (Measurements) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (Measurements) Biased		PASS	PASS	PASS	PASS	PASS
Specification MAX		-1.2	-1.2	-1.2	-1.2	-1.2
Status (Measurements) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (Measurements) Biased		PASS	PASS	PASS	PASS	PASS
Status (-KTL) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (+KTL) All GND'd		PASS	PASS	PASS	PASS	PASS
Stauts (-KTL) Biased		PASS	PASS	PASS	PASS	PASS
Stauts (+KTL) Biased		PASS	PASS	PASS	PASS	PASS

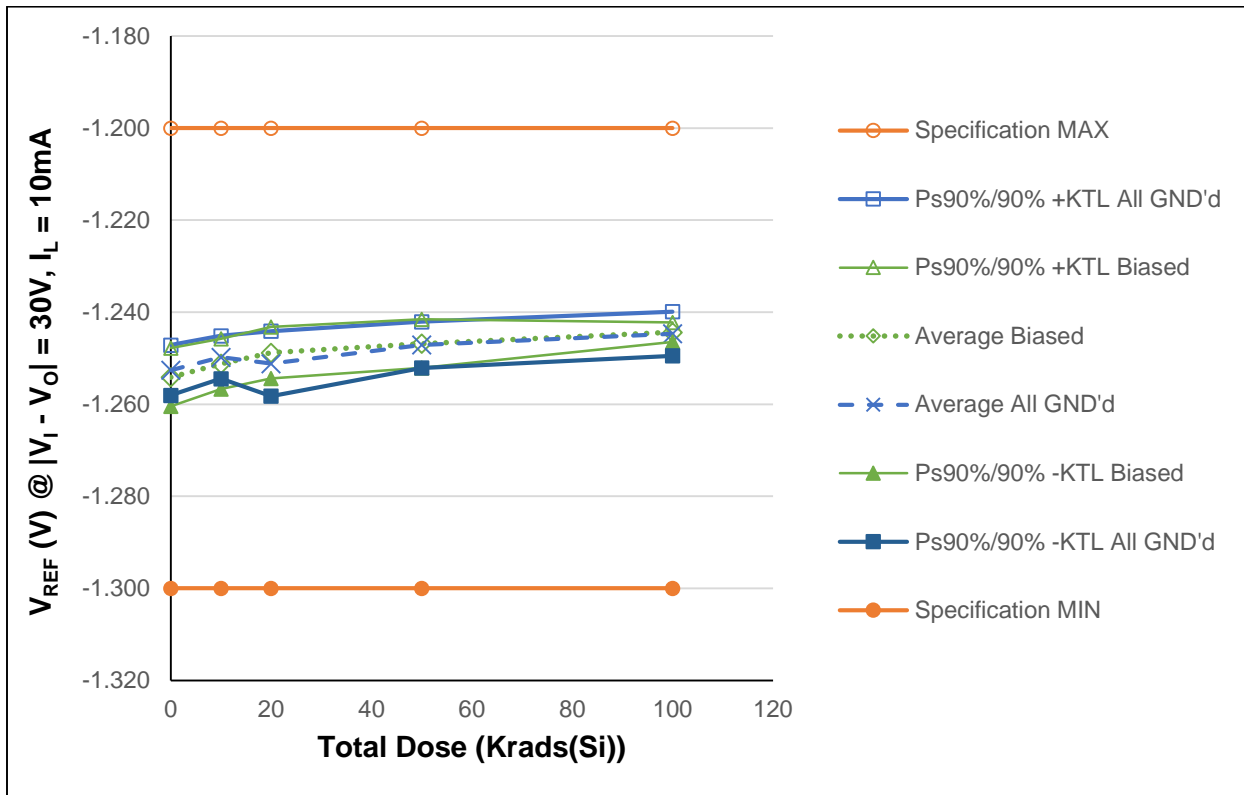


Figure 5.4 Plot of V_{REF} @ $|V_I - V_O| = 30V, I_L = 10mA$ versus Total Dose

Table 5.4: Raw data for reference voltage @ $|V_I - V_O| = 30V$, $I_L = 10\text{ mA}$ versus total dose including the statistical calculations, minimum specification, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

Parameter Units	V_{REF} @ 30V, $I_L = 10\text{mA}$ (V)	Total Dose (Krad(Si)) @ 10mr/s				
		0	10	20	50	100
198	All GND'd Irradiation	-1.25301	-1.25054			
199	All GND'd Irradiation	-1.25041	-1.24798			
200	All GND'd Irradiation	-1.25316	-1.25035			
201	All GND'd Irradiation	-1.25104	-1.24814			
202	All GND'd Irradiation	-1.25545	-1.25195			
191	Biased Irradiation	-1.25522	-1.25237			
192	Biased Irradiation	-1.25640	-1.25287			
194	Biased Irradiation	-1.25574	-1.25271			
196	Biased Irradiation	-1.25201	-1.24936			
197	Biased Irradiation	-1.25133	-1.24875			
208	All GND'd Irradiation	-1.25872		-1.25401		
209	All GND'd Irradiation	-1.25415		-1.25046		
210	All GND'd Irradiation	-1.25457		-1.25102		
211	All GND'd Irradiation	-1.25668		-1.25305		
212	All GND'd Irradiation	-1.25071		-1.24737		
203	Biased Irradiation	-1.25339		-1.24958		
204	Biased Irradiation	-1.25561		-1.25171		
205	Biased Irradiation	-1.25018		-1.24675		
206	Biased Irradiation	-1.25252		-1.24902		
207	Biased Irradiation	-1.25055		-1.24694		
219	All GND'd Irradiation	-1.25201			-1.24692	
220	All GND'd Irradiation	-1.25243			-1.24674	
222	All GND'd Irradiation	-1.25099			-1.24572	
223	All GND'd Irradiation	-1.25131			-1.24585	
224	All GND'd Irradiation	-1.25635			-1.25024	
213	Biased Irradiation	-1.25057			-1.24439	
215	Biased Irradiation	-1.25197			-1.24601	
216	Biased Irradiation	-1.25499			-1.24862	
217	Biased Irradiation	-1.25452			-1.24897	
218	Biased Irradiation	-1.25121			-1.24615	
230	All GND'd Irradiation	-1.25248				-1.24249
231	All GND'd Irradiation	-1.25621				-1.24546
232	All GND'd Irradiation	-1.25339				-1.24409
233	All GND'd Irradiation	-1.25377				-1.24416
234	All GND'd Irradiation	-1.25526				-1.24718
225	Biased Irradiation	-1.25262				-1.24340
226	Biased Irradiation	-1.25304				-1.24481
227	Biased Irradiation	-1.25254				-1.24416
228	Biased Irradiation	-1.25485				-1.24542
229	Biased Irradiation	-1.25209				-1.24404
235	Control Unit	-1.25407	-1.25141	-1.25141	-1.25141	-1.25141
236	Control Unit	-1.25411	-1.25180	-1.25180	-1.25180	-1.25180
All GND'd Irradiation Statistics						
Average All GND'd		-1.25261	-1.24979	-1.25118	-1.24709	-1.24468
Std Dev All GND'd		0.00199	0.00170	0.00258	0.00183	0.00175
Ps90%/90% +KTL All GND'd		-1.24715	-1.24513	-1.24412	-1.24206	-1.23987
Ps90%/90% -KTL All GND'd		-1.25808	-1.25445	-1.25825	-1.25212	-1.24948
Biased Irradiation Statistics						
Average Biased		-1.25414	-1.25121	-1.24880	-1.24683	-1.24436
Std Dev Biased		0.00230	0.00199	0.00205	0.00193	0.00077
Ps90%/90% +KTL Biased		-1.24782	-1.24575	-1.24319	-1.24154	-1.24225
Ps90%/90% -KTL Biased		-1.26046	-1.25667	-1.25442	-1.25212	-1.24648
Specification MIN		-1.3	-1.3	-1.3	-1.3	-1.3
Status (Measurements) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (Measurements) Biased		PASS	PASS	PASS	PASS	PASS
Specification MAX		-1.2	-1.2	-1.2	-1.2	-1.2
Status (Measurements) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (Measurements) Biased		PASS	PASS	PASS	PASS	PASS
Status (-KTL) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (+KTL) All GND'd		PASS	PASS	PASS	PASS	PASS
Stauts (-KTL) Biasedd		PASS	PASS	PASS	PASS	PASS
Stauts (+KTL) Biasedd		PASS	PASS	PASS	PASS	PASS

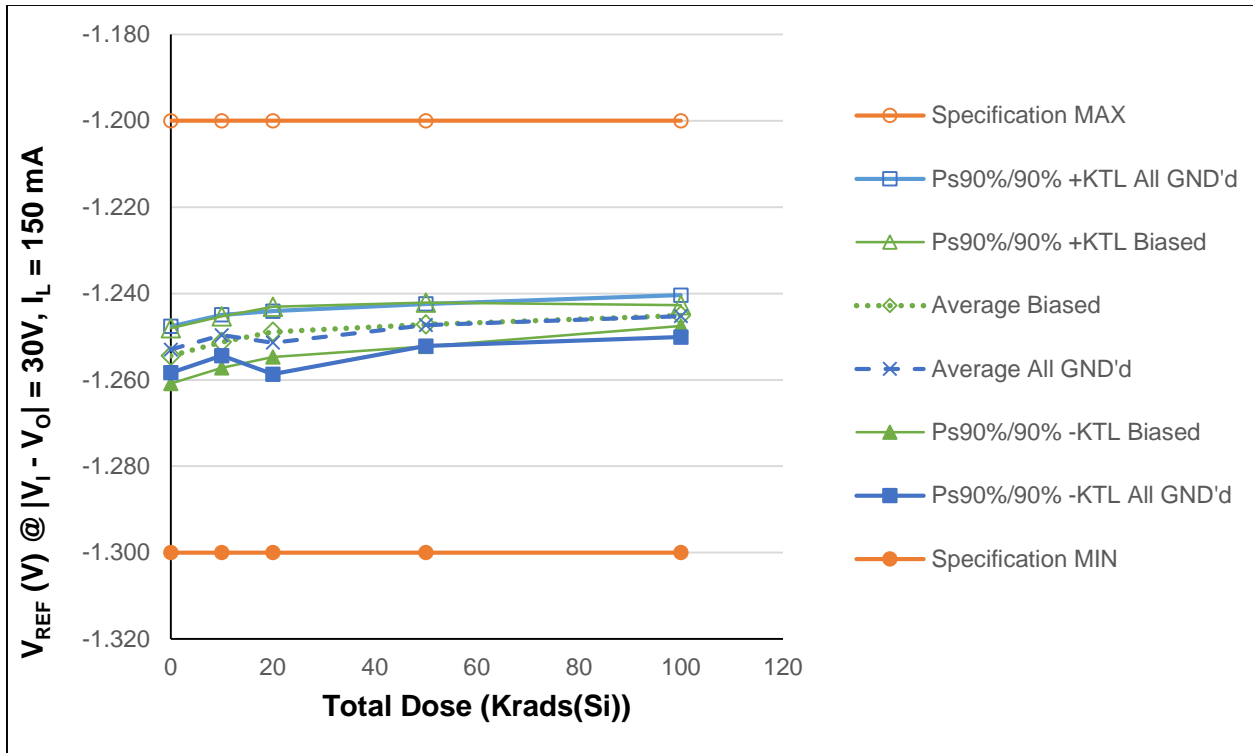


Figure 5.5 Plot of V_{REF} @ $|V_I - V_O| = 30V$, $I_L = 150mA$ versus Total Dose

Table 5.5: Raw data for reference voltage @ $|V_i - V_o| = 30V$, $I_L = 150$ mA versus total dose including the statistical calculations, minimum specification, maximum specification, and the status of the test (PASS/FAIL) under the orange headers

Parameter	V_{REF} @ $ V_i - V_o = 30V$, $I_L = 150$ mA	Total Dose (Krad(Si)) @ 10mr/s				
		0	10	20	50	100
Units	(V)					
198	All GND'd Irradiation	-1.25343	-1.25049			
199	All GND'd Irradiation	-1.25084	-1.24768			
200	All GND'd Irradiation	-1.25354	-1.25019			
201	All GND'd Irradiation	-1.25136	-1.24814			
202	All GND'd Irradiation	-1.25575	-1.25180			
191	Biased Irradiation	-1.25560	-1.25249			
192	Biased Irradiation	-1.25670	-1.25334			
194	Biased Irradiation	-1.25605	-1.25263			
196	Biased Irradiation	-1.25221	-1.24920			
197	Biased Irradiation	-1.25162	-1.24859			
208	All GND'd Irradiation	-1.25911		-1.25432		
209	All GND'd Irradiation	-1.25439		-1.25073		
210	All GND'd Irradiation	-1.25484		-1.25120		
211	All GND'd Irradiation	-1.25706		-1.25324		
212	All GND'd Irradiation	-1.25095		-1.24740		
203	Biased Irradiation	-1.25370		-1.24965		
204	Biased Irradiation	-1.25591		-1.25183		
205	Biased Irradiation	-1.25055		-1.24657		
206	Biased Irradiation	-1.25272		-1.24927		
207	Biased Irradiation	-1.25079		-1.24710		
219	All GND'd Irradiation	-1.25228			-1.24710	
220	All GND'd Irradiation	-1.25273			-1.24692	
222	All GND'd Irradiation	-1.25121			-1.24603	
223	All GND'd Irradiation	-1.25156			-1.24608	
224	All GND'd Irradiation	-1.25675			-1.25035	
213	Biased Irradiation	-1.25087			-1.24489	
215	Biased Irradiation	-1.25228			-1.24631	
216	Biased Irradiation	-1.25529			-1.24902	
217	Biased Irradiation	-1.25483			-1.24913	
218	Biased Irradiation	-1.25156			-1.24642	
230	All GND'd Irradiation	-1.25278				-1.24302
231	All GND'd Irradiation	-1.25648				-1.24622
232	All GND'd Irradiation	-1.25375				-1.24463
233	All GND'd Irradiation	-1.25407				-1.24469
234	All GND'd Irradiation	-1.25560				-1.24768
225	Biased Irradiation	-1.25304				-1.24401
226	Biased Irradiation	-1.25331				-1.24560
227	Biased Irradiation	-1.25278				-1.24465
228	Biased Irradiation	-1.25522				-1.24629
229	Biased Irradiation	-1.25232				-1.24493
235	Control Unit	-1.25435	-1.25127	-1.25127	-1.25127	-1.25127
236	Control Unit	-1.25439	-1.25152	-1.25152	-1.25152	-1.25152
	All GND'd Irradiation Statistics					
	Average All GND'd	-1.25298	-1.24966	-1.25138	-1.24729	-1.24525
	Std Dev All GND'd	0.00196	0.00172	0.00266	0.00178	0.00177
	Ps90%/90% +KTL All GND'd	-1.24760	-1.24495	-1.24407	-1.24243	-1.24040
	Ps90%/90% -KTL All GND'd	-1.25836	-1.25437	-1.25868	-1.25216	-1.25009
	Biased Irradiation Statistics					
	Average Biased	-1.25444	-1.25125	-1.24888	-1.24715	-1.24509
	Std Dev Biased	0.00234	0.00218	0.00212	0.00185	0.00088
	Ps90%/90% +KTL Biased	-1.24801	-1.24526	-1.24307	-1.24207	-1.24269
	Ps90%/90% -KTL Biased	-1.26086	-1.25723	-1.25469	-1.25223	-1.24750
	Specification MIN	-1.3	-1.3	-1.3	-1.3	-1.3
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Specification MAX	-1.2	-1.2	-1.2	-1.2	-1.2
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (+KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Stauts (-KTL) Biased	PASS	PASS	PASS	PASS	PASS
	Stauts (+KTL) Biased	PASS	PASS	PASS	PASS	PASS

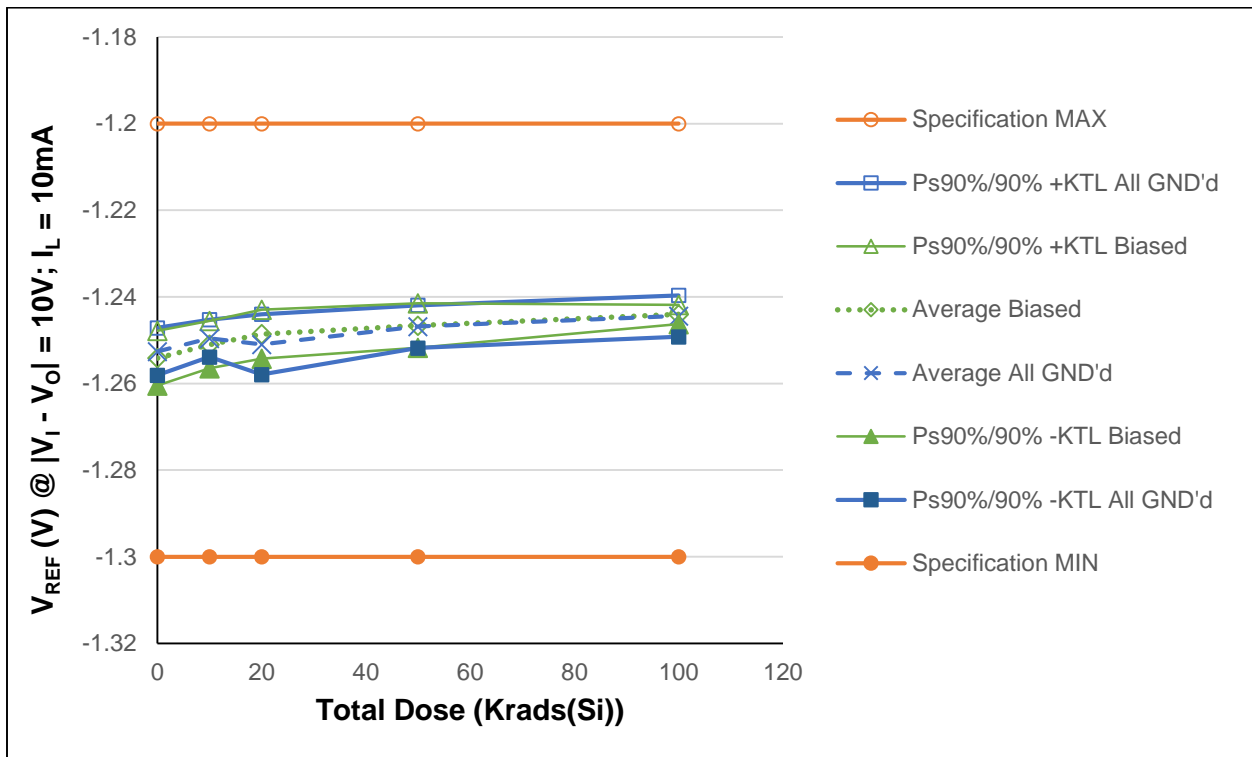


Figure 5.6 Plot of V_{REF} @ $|V_I - V_O| = 10V$, $I_L = 10mA$ versus Total Dose

Table 5.6: Raw data for reference voltage @ $|V_I - V_O| = 30V$, $I_L = 150 \text{ mA}$ versus total dose including the statistical calculations, minimum specification, maximum specification, and the status of the test (PASS/FAIL) under the orange headers

Parameter Units	V_{REF} @ $ V_I - V_O = 10V$; $I_L = 10mA$ (V)	Total Dose (Krad(Si)) @ 50r/s				
		0	10	20	50	100
198	All GND'd Irradiation	-1.25301	-1.25030			
199	All GND'd Irradiation	-1.25041	-1.24783			
200	All GND'd Irradiation	-1.25316	-1.25015			
201	All GND'd Irradiation	-1.25104	-1.24805			
202	All GND'd Irradiation	-1.25545	-1.25149			
191	Biased Irradiation	-1.25522	-1.25213			
192	Biased Irradiation	-1.25640	-1.25268			
194	Biased Irradiation	-1.25574	-1.25253			
196	Biased Irradiation	-1.25201	-1.24920			
197	Biased Irradiation	-1.25133	-1.24852			
208	All GND'd Irradiation	-1.25872		-1.25378		
209	All GND'd Irradiation	-1.25415		-1.25030		
210	All GND'd Irradiation	-1.25457		-1.25073		
211	All GND'd Irradiation	-1.25668		-1.25279		
212	All GND'd Irradiation	-1.25071		-1.24722		
203	Biased Irradiation	-1.25339		-1.24939		
204	Biased Irradiation	-1.25561		-1.25149		
205	Biased Irradiation	-1.25018		-1.24649		
206	Biased Irradiation	-1.25252		-1.24886		
207	Biased Irradiation	-1.25055		-1.24675		
219	All GND'd Irradiation	-1.25201			-1.24673	
220	All GND'd Irradiation	-1.25243			-1.24631	
222	All GND'd Irradiation	-1.25099			-1.24561	
223	All GND'd Irradiation	-1.25131			-1.24569	
224	All GND'd Irradiation	-1.25635			-1.24998	
213	Biased Irradiation	-1.25057			-1.24431	
215	Biased Irradiation	-1.25197			-1.24577	
216	Biased Irradiation	-1.25499			-1.24836	
217	Biased Irradiation	-1.25452			-1.24875	
218	Biased Irradiation	-1.25121			-1.24591	
230	All GND'd Irradiation	-1.25248				-1.24218
231	All GND'd Irradiation	-1.25621				-1.24530
232	All GND'd Irradiation	-1.25339				-1.24386
233	All GND'd Irradiation	-1.25377				-1.24389
234	All GND'd Irradiation	-1.25526				-1.24683
225	Biased Irradiation	-1.25262				-1.24309
226	Biased Irradiation	-1.25304				-1.24463
227	Biased Irradiation	-1.25254				-1.24371
228	Biased Irradiation	-1.25485				-1.24511
229	Biased Irradiation	-1.25209				-1.24369
235	Control Unit	-1.25407	-1.25127	-1.25127	-1.25127	-1.25127
236	Control Unit	-1.25411	-1.25158	-1.25158	-1.25158	-1.25158
All GND'd Irradiation Statistics						
Average All GND'd		-1.25261	-1.24957	-1.25097	-1.24686	-1.24441
Std Dev All GND'd		0.00199	0.00157	0.00254	0.00180	0.00174
Ps90%/90% +KTL All GND'd		-1.24715	-1.24525	-1.24400	-1.24192	-1.23963
Ps90%/90% -KTL All GND'd		-1.25808	-1.25388	-1.25793	-1.25180	-1.24920
Biased Irradiation Statistics						
Average Biased		-1.25414	-1.25101	-1.24860	-1.24662	-1.24405
Std Dev Biased		0.00230	0.00199	0.00206	0.00188	0.00081
Ps90%/90% +KTL Biased		-1.24782	-1.24555	-1.24295	-1.24147	-1.24183
Ps90%/90% -KTL Biased		-1.26046	-1.25647	-1.25424	-1.25177	-1.24627
Specification MIN		-1.3	-1.3	-1.3	-1.3	-1.3
Status (Measurements) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (Measurements) Biased		PASS	PASS	PASS	PASS	PASS
Specification MAX		-1.2	-1.2	-1.2	-1.2	-1.2
Status (Measurements) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (Measurements) Biased		PASS	PASS	PASS	PASS	PASS
Status (-KTL) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (+KTL) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (-KTL) Biased		PASS	PASS	PASS	PASS	PASS
Status (+KTL) Biased		PASS	PASS	PASS	PASS	PASS

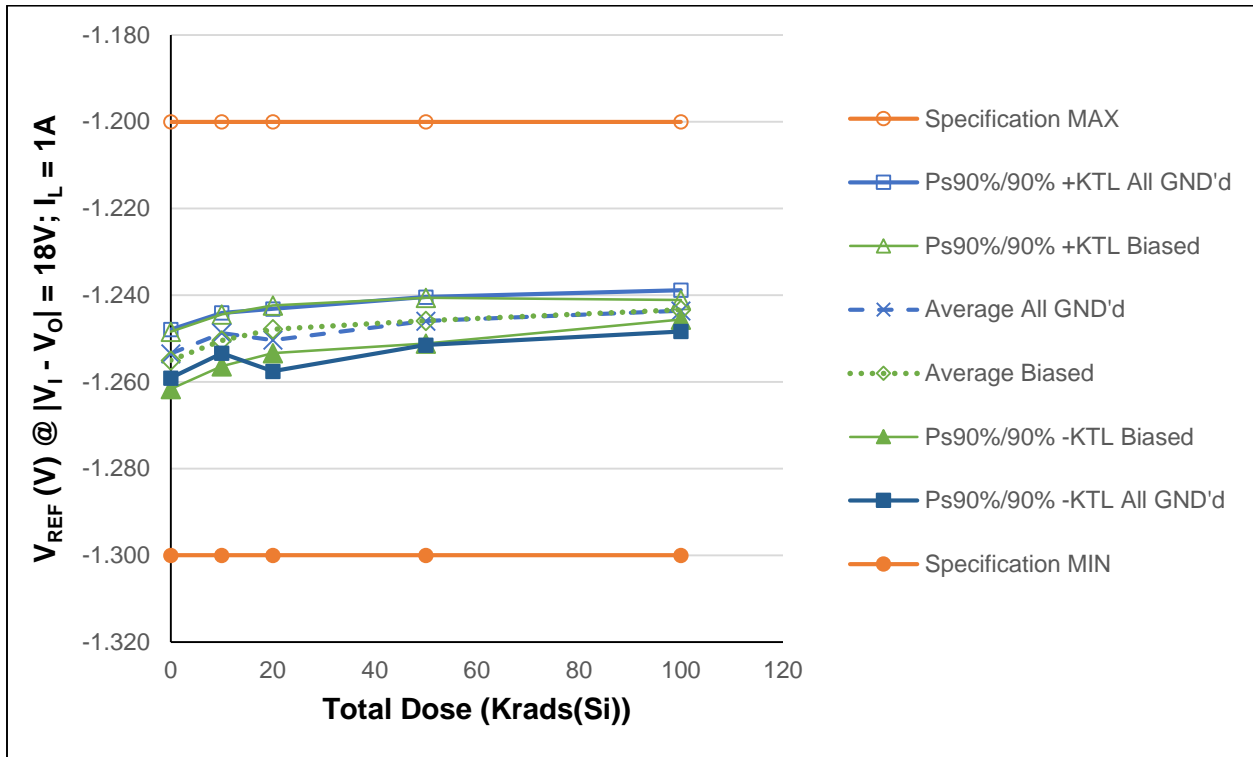


Figure 5.7 Plot of V_{REF} @ $|V_I - V_O| = 18V, I_L = 1A$ versus Total Dose

Table 5.7: Raw data for reference voltage @ $|V_I - V_O| = 18V$, $I_L = 1A$ versus total dose including the statistical calculations, minimum specification, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

Parameter Units	V_{REF} @ $ V_I - V_O = 18V$; $I_L = 1A$ V	Total Dose (Krad(Si)) @ 50r/s				
		0	10	20	50	100
198	All GND'd Irradiation	-1.25391	-1.24951			
199	All GND'd Irradiation	-1.25133	-1.24692			
200	All GND'd Irradiation	-1.25392	-1.24927			
201	All GND'd Irradiation	-1.25191	-1.24713			
202	All GND'd Irradiation	-1.25651	-1.25091			
191	Biased Irradiation	-1.25636	-1.25161			
192	Biased Irradiation	-1.25731	-1.25249			
194	Biased Irradiation	-1.25667	-1.25196			
196	Biased Irradiation	-1.25270	-1.24840			
197	Biased Irradiation	-1.25217	-1.24779			
208	All GND'd Irradiation	-1.25975		-1.25324		
209	All GND'd Irradiation	-1.25498		-1.24978		
210	All GND'd Irradiation	-1.25537		-1.25015		
211	All GND'd Irradiation	-1.25777		-1.25226		
212	All GND'd Irradiation	-1.25145		-1.24645		
203	Biased Irradiation	-1.25423		-1.24852		
204	Biased Irradiation	-1.25650		-1.25059		
205	Biased Irradiation	-1.25099		-1.24561		
206	Biased Irradiation	-1.25328		-1.24842		
207	Biased Irradiation	-1.25136		-1.24615		
219	All GND'd Irradiation	-1.25270			-1.24557	
220	All GND'd Irradiation	-1.25330			-1.24539	
222	All GND'd Irradiation	-1.25163			-1.24477	
223	All GND'd Irradiation	-1.25209			-1.24463	
224	All GND'd Irradiation	-1.25729			-1.24951	
213	Biased Irradiation	-1.25147			-1.24352	
215	Biased Irradiation	-1.25278			-1.24486	
216	Biased Irradiation	-1.25598			-1.24779	
217	Biased Irradiation	-1.25529			-1.24795	
218	Biased Irradiation	-1.25225			-1.24535	
230	All GND'd Irradiation	-1.25331				-1.24142
231	All GND'd Irradiation	-1.25706				-1.24455
232	All GND'd Irradiation	-1.25435				-1.24294
233	All GND'd Irradiation	-1.25468				-1.24309
234	All GND'd Irradiation	-1.25618				-1.24599
225	Biased Irradiation	-1.25365				-1.24278
226	Biased Irradiation	-1.25389				-1.24386
227	Biased Irradiation	-1.25331				-1.24276
228	Biased Irradiation	-1.25575				-1.24463
229	Biased Irradiation	-1.25293				-1.24294
235	Control Unit	-1.25498	-1.25066	-1.25066	-1.25066	-1.25066
236	Control Unit	-1.25498	-1.25073	-1.25073	-1.25073	-1.25073
All GND'd Irradiation Statistics						
Average All GND'd		-1.25351	-1.24875	-1.25038	-1.24597	-1.24360
Std Dev All GND'd		0.00204	0.00170	0.00263	0.00202	0.00174
Ps90%/90% +KTL All GND'd		-1.24792	-1.24410	-1.24317	-1.24044	-1.23884
Ps90%/90% -KTL All GND'd		-1.25911	-1.25340	-1.25758	-1.25151	-1.24836
Biased Irradiation Statistics						
Average Biased		-1.25504	-1.25045	-1.24786	-1.24589	-1.24339
Std Dev Biased		0.00241	0.00218	0.00201	0.00193	0.00083
Ps90%/90% +KTL Biased		-1.24843	-1.24447	-1.24234	-1.24061	-1.24112
Ps90%/90% -KTL Biased		-1.26166	-1.25643	-1.25337	-1.25117	-1.24566
Specification MIN		-1.3	-1.3	-1.3	-1.3	-1.3
Status (Measurements) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (Measurements) Biased		PASS	PASS	PASS	PASS	PASS
Specification MAX		-1.2	-1.2	-1.2	-1.2	-1.2
Status (Measurements) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (Measurements) Biased		PASS	PASS	PASS	PASS	PASS
Status (-KTL) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (+KTL) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (-KTL) Biased		PASS	PASS	PASS	PASS	PASS
Status (+KTL) Biased		PASS	PASS	PASS	PASS	PASS

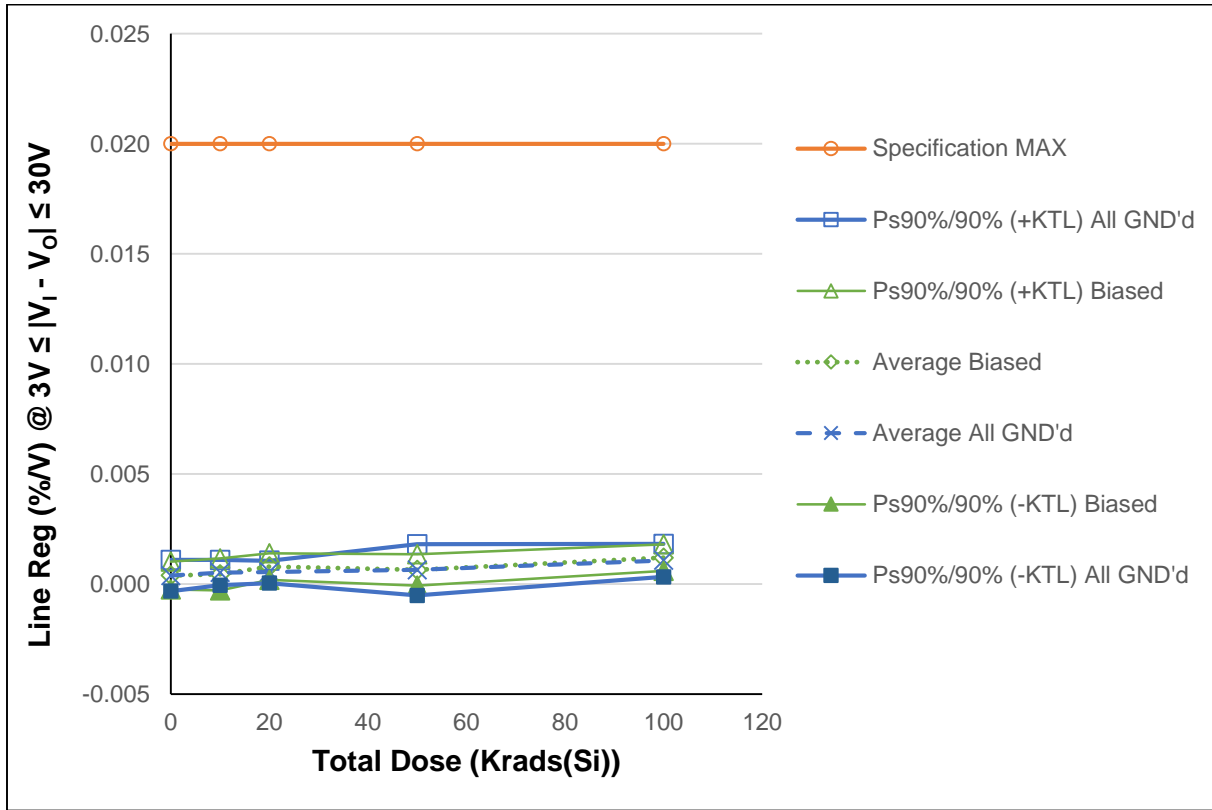


Figure 5.8: Plot of Line Regulation versus Total Dose

Table 5.8: Raw data for line regulation versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL under the second orange header)

Parameter Units	Line Reg @ 3V ≤ V _I - V _O ≤ 30V (%/V)	Total Dose (Krad(Si)) @ 50rads/second				
		0	10	20	50	100
198	All GND'd Irradiation	0.00043	0.00037			
199	All GND'd Irradiation	0.00048	0.00037			
200	All GND'd Irradiation	0.00000	0.00048			
201	All GND'd Irradiation	0.00031	0.00051			
202	All GND'd Irradiation	0.00070	0.00088			
191	Biased Irradiation	0.00068	0.00082			
192	Biased Irradiation	0.00026	0.00011			
194	Biased Irradiation	0.00059	0.00034			
196	Biased Irradiation	0.00017	0.00037			
197	Biased Irradiation	0.00025	0.00057			
208	All GND'd Irradiation	0.00028		0.00028		
209	All GND'd Irradiation	0.00025		0.00051		
210	All GND'd Irradiation	0.00065		0.00068		
211	All GND'd Irradiation	0.00034		0.00076		
212	All GND'd Irradiation	0.00031		0.00051		
203	Biased Irradiation	0.00068		0.00057		
204	Biased Irradiation	0.00040		0.00090		
205	Biased Irradiation	0.00048		0.00091		
206	Biased Irradiation	0.00059		0.00057		
207	Biased Irradiation	0.00057		0.00105		
219	All GND'd Irradiation	0.00008			0.00048	
220	All GND'd Irradiation	0.00047			0.00131	
222	All GND'd Irradiation	0.00023			0.00020	
223	All GND'd Irradiation	0.00020			0.00045	
224	All GND'd Irradiation	0.00048			0.00079	
213	Biased Irradiation	0.00060			0.00031	
215	Biased Irradiation	0.00042			0.00071	
216	Biased Irradiation	0.00041			0.00099	
217	Biased Irradiation	0.00070			0.00071	
218	Biased Irradiation	0.00017			0.00048	
230	All GND'd Irradiation	0.00056				0.00134
231	All GND'd Irradiation	0.00044				0.00071
232	All GND'd Irradiation	0.00045				0.00114
233	All GND'd Irradiation	0.00045				0.00088
234	All GND'd Irradiation	0.00000				0.00130
225	Biased Irradiation	0.00059				0.00136
226	Biased Irradiation	0.00065				0.00099
227	Biased Irradiation	0.00056				0.00145
228	Biased Irradiation	0.00068				0.00096
229	Biased Irradiation	0.00048				0.00122
235	Control Unit	0.00020	0.00042	0.00042	0.00042	0.00042
236	Control Unit	0.00048	0.00045	0.00045	0.00045	0.00045
All GND'd Irradiation Statistics						
Average All GND'd		0.00038	0.00052	0.00055	0.00065	0.00107
Std Dev All GND'd		0.00026	0.00021	0.00019	0.00042	0.00027
Ps90%/90% (+KTL) All GND'd		0.00109	0.00110	0.00106	0.00181	0.00182
Ps90%/90% (-KTL) All GND'd		-0.00032	-0.00005	0.00004	-0.00052	0.00033
Biased Irradiation Statistics						
Average Biased		0.00039	0.00044	0.00080	0.00064	0.00120
Std Dev Biased		0.00023	0.00027	0.00022	0.00026	0.00022
Ps90%/90% (+KTL) Biased		0.00102	0.00117	0.00140	0.00135	0.00180
Ps90%/90% (-KTL) Biased		-0.00024	-0.00029	0.00020	-0.00007	0.00060
Specification MIN						
Status (Measurements) All GND'd						
Status (Measurements) Biased						
Specification MAX						
Status (Measurements) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (Measurements) Biased		PASS	PASS	PASS	PASS	PASS
Status (-KTL) All GND'd						
Status (+KTL) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (-KTL) Biased						
Status (+KTL) Biased		PASS	PASS	PASS	PASS	PASS

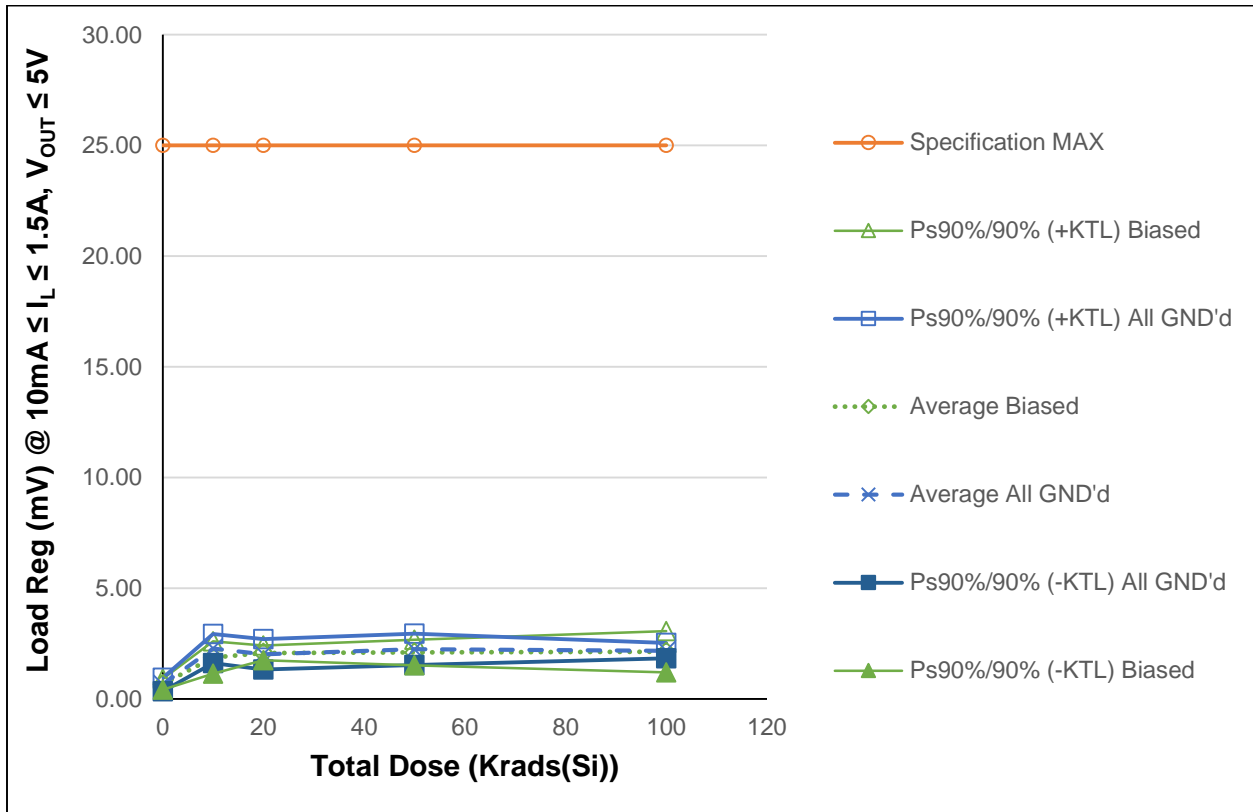


Figure 5.9: Plot of Load Regulation ($V_{OUT} \leq 5V$) versus Total Dose

Table 5.9: Raw data for load regulation ($V_{OUT} \leq 5V$) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL).

Parameter Units	Load Reg @ 10mA \leq I _L \leq 1.5A, V _O \leq 5V (mV)	Total Dose (Krad(Si)) @ 50rads/second				
		0	10	20	50	100
198	All GND'd Irradiation	0.61226	2.63310			
199	All GND'd Irradiation	0.68855	2.33841			
200	All GND'd Irradiation	0.52261	2.28977			
201	All GND'd Irradiation	0.59891	1.99413			
202	All GND'd Irradiation	0.80967	2.13623			
191	Biased Irradiation	0.80204	1.84155			
192	Biased Irradiation	0.69809	1.43147			
194	Biased Irradiation	0.57983	2.09904			
196	Biased Irradiation	0.60844	2.06184			
197	Biased Irradiation	0.63133	1.91784			
208	All GND'd Irradiation	0.77343		1.94550		
209	All GND'd Irradiation	0.79346		1.72710		
210	All GND'd Irradiation	0.52261		2.09904		
211	All GND'd Irradiation	0.74291		1.89877		
212	All GND'd Irradiation	0.47779		2.39372		
203	Biased Irradiation	0.57125		2.07138		
204	Biased Irradiation	0.57125		2.26021		
205	Biased Irradiation	0.67806		1.91784		
206	Biased Irradiation	0.69427		2.05994		
207	Biased Irradiation	0.61226		2.05994		
219	All GND'd Irradiation	0.47779			2.44236	
220	All GND'd Irradiation	0.68474			2.13623	
222	All GND'd Irradiation	0.57983			2.33555	
223	All GND'd Irradiation	0.59319			2.44141	
224	All GND'd Irradiation	0.61226			1.83392	
213	Biased Irradiation	0.65899			2.25163	
215	Biased Irradiation	0.53215			2.35653	
216	Biased Irradiation	0.68855			1.86062	
217	Biased Irradiation	0.65899			2.08950	
218	Biased Irradiation	0.83160			1.91689	
230	All GND'd Irradiation	0.54169				2.03133
231	All GND'd Irradiation	0.64945				2.35558
232	All GND'd Irradiation	0.63801				2.24304
233	All GND'd Irradiation	0.74577				2.13814
234	All GND'd Irradiation	0.55408				2.09999
225	Biased Irradiation	0.81158				1.60313
226	Biased Irradiation	0.50640				2.37465
227	Biased Irradiation	0.68855				2.45094
228	Biased Irradiation	0.72289				2.00272
229	Biased Irradiation	0.58079				2.20394
235	Control Unit	0.63038	1.83201	1.83201	1.83201	1.83201
236	Control Unit	0.55408	2.19345	2.19345	2.19345	2.19345
All GND'd Irradiation Statistics						
Average All GND'd		0.64640	2.27833	2.01283	2.23789	2.17361
Std Dev All GND'd		0.10860	0.24008	0.25085	0.25802	0.12733
Ps90%/90% (+KTL) All GND'd		0.94419	2.93663	2.70065	2.94538	2.52276
Ps90%/90% (-KTL) All GND'd		0.34861	1.62002	1.32501	1.53041	1.82447
Biased Irradiation Statistics						
Average Biased		0.66395	1.87035	2.07386	2.09503	2.12708
Std Dev Biased		0.08868	0.26677	0.12192	0.21191	0.33988
Ps90%/90% (+KTL) Biased		0.90710	2.60184	2.40818	2.67608	3.05903
Ps90%/90% (-KTL) Biased		0.42079	1.13885	1.73954	1.51398	1.19512
Specification MIN						
Status (Measurements) All GND'd						
Status (Measurements) Biased						
Specification MAX						
Status (Measurements) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (Measurements) Biased		PASS	PASS	PASS	PASS	PASS
Status (-KTL) All GND'd						
Status (+KTL) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (-KTL) Biased						
Status (+KTL) Biased		PASS	PASS	PASS	PASS	PASS

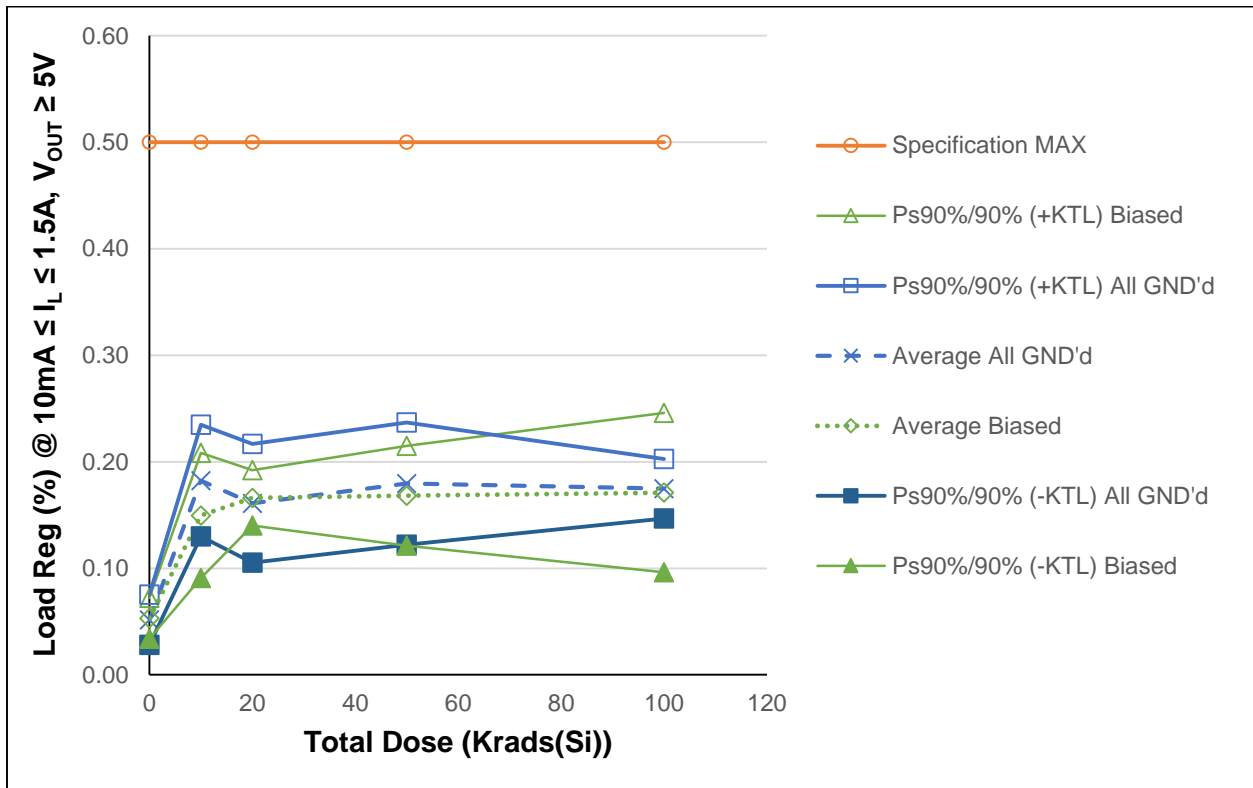


Figure 5.10: Plot of Load Regulation ($V_{OUT} \geq 5V$) versus Total Dose

Table 5.10: Raw data for load regulation ($V_{OUT} \geq 5V$) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL).

Parameter	Load Reg @ 10mA $\leq V_I - V_O \leq 1.5A, V_O \geq 5V$	Total Dose (Krad(Si)) @ 50rads/second				
		0	10	20	50	100
Units	(%)					
198	All GND'd Irradiation	0.04886	0.21057			
199	All GND'd Irradiation	0.05507	0.18738			
200	All GND'd Irradiation	0.04170	0.18314			
201	All GND'd Irradiation	0.04787	0.15980			
202	All GND'd Irradiation	0.06449	0.17067			
191	Biased Irradiation	0.06389	0.14708			
192	Biased Irradiation	0.05556	0.11427			
194	Biased Irradiation	0.04617	0.16756			
196	Biased Irradiation	0.04860	0.16503			
197	Biased Irradiation	0.05045	0.15361			
208	All GND'd Irradiation	0.06145		0.15516		
209	All GND'd Irradiation	0.06327		0.13813		
210	All GND'd Irradiation	0.04166		0.16783		
211	All GND'd Irradiation	0.05912		0.15155		
212	All GND'd Irradiation	0.03820		0.19192		
203	Biased Irradiation	0.04557		0.16581		
204	Biased Irradiation	0.04550		0.18060		
205	Biased Irradiation	0.05424		0.15387		
206	Biased Irradiation	0.05544		0.16496		
207	Biased Irradiation	0.04896		0.16524		
219	All GND'd Irradiation	0.03816			0.19590	
220	All GND'd Irradiation	0.05467			0.17139	
222	All GND'd Irradiation	0.04635			0.18751	
223	All GND'd Irradiation	0.04740			0.19599	
224	All GND'd Irradiation	0.04873			0.14671	
213	Biased Irradiation	0.05270			0.18096	
215	Biased Irradiation	0.04250			0.18914	
216	Biased Irradiation	0.05487			0.14905	
217	Biased Irradiation	0.05253			0.16734	
218	Biased Irradiation	0.06646			0.15385	
230	All GND'd Irradiation	0.04325				0.16354
231	All GND'd Irradiation	0.05170				0.18916
232	All GND'd Irradiation	0.05090				0.18034
233	All GND'd Irradiation	0.05948				0.17188
234	All GND'd Irradiation	0.04414				0.16844
225	Biased Irradiation	0.06479				0.12897
226	Biased Irradiation	0.04041				0.19080
227	Biased Irradiation	0.05498				0.19707
228	Biased Irradiation	0.05761				0.16085
229	Biased Irradiation	0.04639				0.17720
235	Control Unit	0.05027	0.14642	0.14642	0.14642	0.14642
236	Control Unit	0.04418	0.17525	0.17525	0.17525	0.17525
	All GND'd Irradiation Statistics					
	Average All GND'd	0.05160	0.18231	0.16092	0.17950	0.17467
	Std Dev All GND'd	0.00863	0.01915	0.02031	0.02089	0.01016
	Ps90%/90% (+KTL) All GND'd	0.07525	0.23483	0.21660	0.23679	0.20252
	Ps90%/90% (-KTL) All GND'd	0.02795	0.12980	0.10524	0.12221	0.14683
	Biased Irradiation Statistics					
	Average Biased	0.05294	0.14951	0.16610	0.16807	0.17098
	Std Dev Biased	0.00703	0.02140	0.00951	0.01714	0.02729
	Ps90%/90% (+KTL) Biased	0.07221	0.20818	0.19218	0.21505	0.24581
	Ps90%/90% (-KTL) Biased	0.03366	0.09084	0.14001	0.12108	0.09614
	Specification MIN					
	Status (Measurements) All GND'd					
	Status (Measurements) Biased					
	Specification MAX	0.5	0.5	0.5	0.5	0.5
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) All GND'd					
	Status (+KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) Biased					
	Status (+KTL) Biased	PASS	PASS	PASS	PASS	PASS

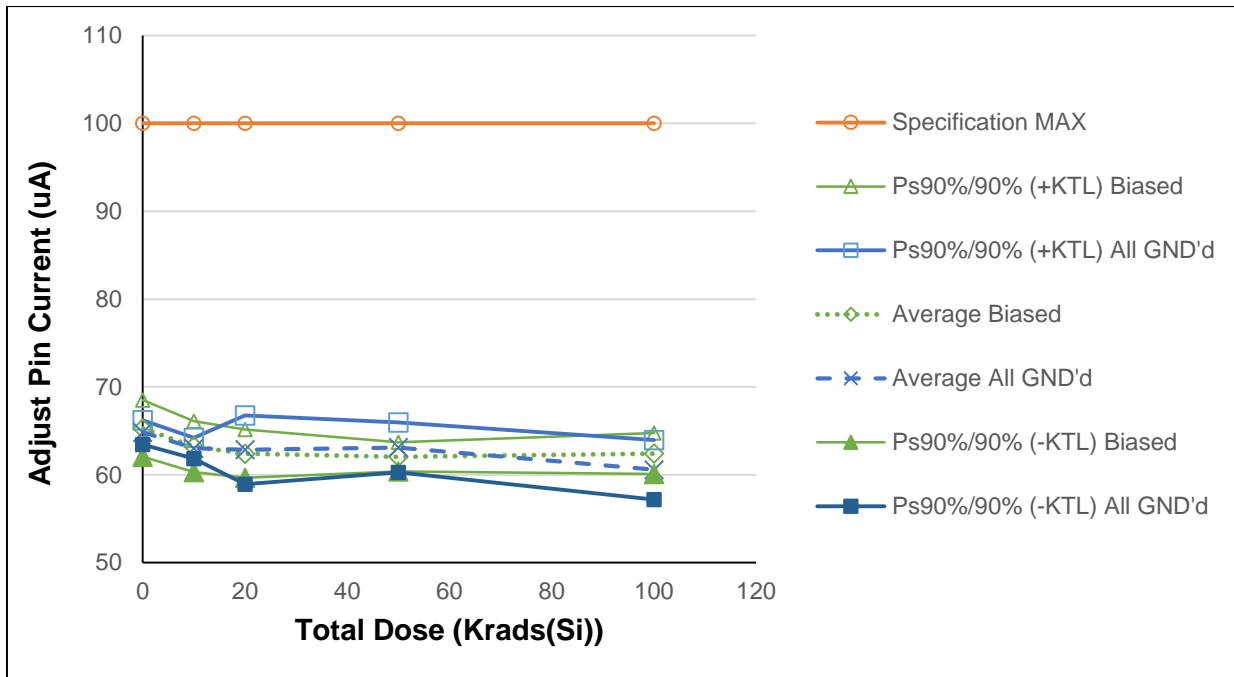


Figure 5.11: Plot of Adjust Pin Current versus Total Dose

Table 5.11: Raw data for adjust pin current versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL)

Parameter Units	Adjust Pin Current (uA)	Total Dose (Krad(Si)) @ 50rads/second				
		0	10	20	50	100
198	All GND'd Irradiation	65.007	63.196			
199	All GND'd Irradiation	64.692	63.013			
200	All GND'd Irradiation	65.620	63.622			
201	All GND'd Irradiation	64.274	62.490			
202	All GND'd Irradiation	64.637	62.752			
191	Biased Irradiation	66.339	64.077			
192	Biased Irradiation	65.876	63.415			
194	Biased Irradiation	63.951	62.096			
196	Biased Irradiation	64.050	62.138			
197	Biased Irradiation	66.180	64.328			
208	All GND'd Irradiation	64.859		62.257		
209	All GND'd Irradiation	63.794		61.664		
210	All GND'd Irradiation	67.680		65.200		
211	All GND'd Irradiation	65.329		63.205		
212	All GND'd Irradiation	64.311		61.982		
203	Biased Irradiation	64.348		62.109		
204	Biased Irradiation	63.921		61.525		
205	Biased Irradiation	64.159		62.081		
206	Biased Irradiation	64.665		62.130		
207	Biased Irradiation	66.670		64.136		
219	All GND'd Irradiation	66.318			64.079	
220	All GND'd Irradiation	66.841			64.148	
222	All GND'd Irradiation	65.035			62.472	
223	All GND'd Irradiation	64.198			61.724	
224	All GND'd Irradiation	65.667			63.166	
213	Biased Irradiation	64.484			61.606	
215	Biased Irradiation	64.158			61.569	
216	Biased Irradiation	64.512			61.740	
217	Biased Irradiation	65.624			62.957	
218	Biased Irradiation	64.940			62.368	
230	All GND'd Irradiation	63.523				59.610
231	All GND'd Irradiation	64.056				60.023
232	All GND'd Irradiation	63.789				60.005
233	All GND'd Irradiation	64.246				60.505
234	All GND'd Irradiation	66.101				62.701
225	Biased Irradiation	65.806				61.500
226	Biased Irradiation	66.713				62.557
227	Biased Irradiation	66.538				62.472
228	Biased Irradiation	66.204				61.857
229	Biased Irradiation	68.022				63.717
235	Control Unit	63.988	62.081	62.081	62.081	62.081
236	Control Unit	64.254	62.482	62.482	62.482	62.482
	All GND'd Irradiation Statistics					
	Average All GND'd	64.846	63.015	62.862	63.118	60.569
	Std Dev All GND'd	0.505	0.432	1.428	1.043	1.233
	Ps90%/90% (+KTL) All GND'd	66.230	64.198	66.778	65.976	63.951
	Ps90%/90% (-KTL) All GND'd	63.462	61.831	58.946	60.259	57.188
	Biased Irradiation Statistics					
	Average Biased	65.279	63.211	62.396	62.048	62.421
	Std Dev Biased	1.180	1.053	1.005	0.601	0.847
	Ps90%/90% (+KTL) Biased	68.514	66.097	65.152	63.697	64.742
	Ps90%/90% (-KTL) Biased	62.044	60.325	59.641	60.399	60.099
	Specification MIN					
	Status (Measurements) All GND'd					
	Status (Measurements) Biased					
	Specification MAX	100	100	100	100	100
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) All GND'd					
	Status (+KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) Biased					
	Status (+KTL) Biased	PASS	PASS	PASS	PASS	PASS

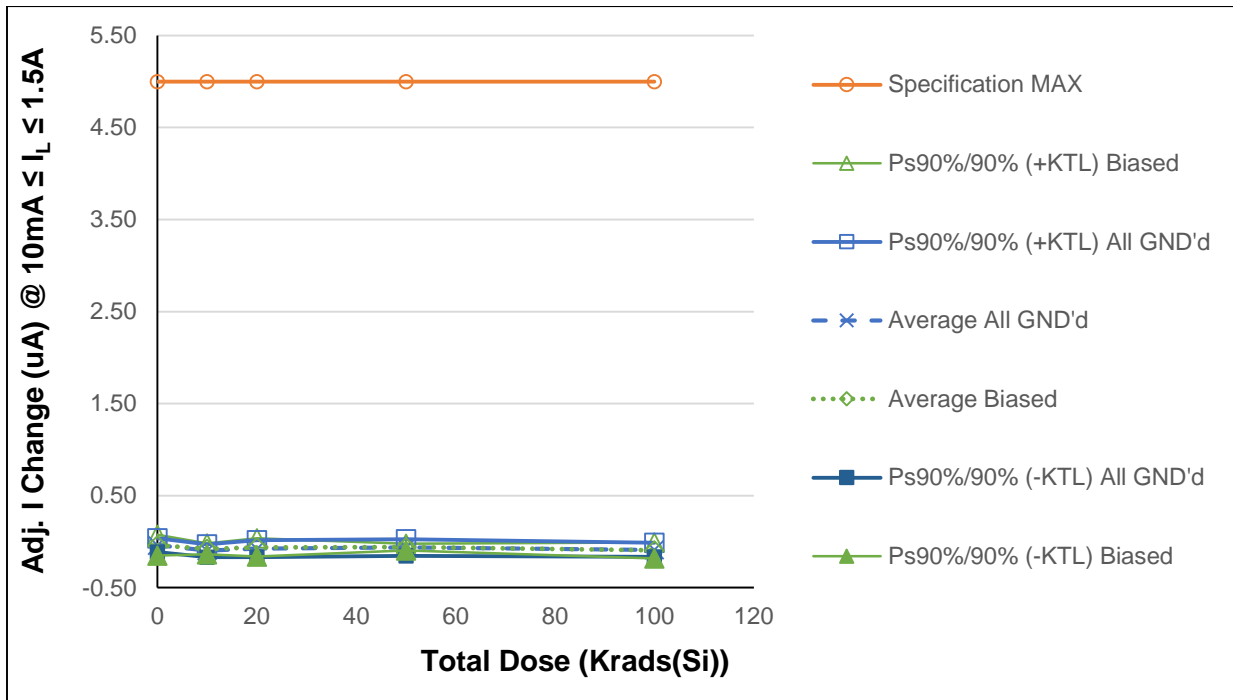


Figure 5.12: Plot of Adjust Pin Current Change @ $10mA \leq I_L \leq 1.5A$ versus Total Dose

Table 5.12: Raw data for adjust pin current change @ $10\text{mA} \leq I_L \leq 1.5\text{A}$ versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL)

Parameter	Adj. I Change @ $10\text{mA} \leq I_L \leq 1.5\text{A}$	Total Dose (Krad(Si)) @ 50rads/second				
		0	10	20	50	100
Units	(uA)					
198	All GND'd Irradiation	-0.07114	-0.10457			
199	All GND'd Irradiation	-0.05602	-0.11659			
200	All GND'd Irradiation	-0.03302	-0.05955			
201	All GND'd Irradiation	0.00000	-0.08575			
202	All GND'd Irradiation	-0.03098	-0.12256			
191	Biased Irradiation	-0.02861	-0.06313			
192	Biased Irradiation	-0.07628	-0.08683			
194	Biased Irradiation	0.02026	-0.07146			
196	Biased Irradiation	-0.02740	-0.11316			
197	Biased Irradiation	-0.07867	-0.06074			
208	All GND'd Irradiation	-0.07592		-0.04169		
209	All GND'd Irradiation	-0.07116		-0.04406		
210	All GND'd Irradiation	-0.03814		-0.07372		
211	All GND'd Irradiation	0.02859		-0.11422		
212	All GND'd Irradiation	-0.01906		-0.10588		
203	Biased Irradiation	-0.12990		-0.02619		
204	Biased Irradiation	-0.08664		-0.08683		
205	Biased Irradiation	-0.04767		-0.02621		
206	Biased Irradiation	-0.06674		-0.10600		
207	Biased Irradiation	-0.06519		-0.06430		
219	All GND'd Irradiation	-0.10844			-0.03216	
220	All GND'd Irradiation	-0.07472			-0.05837	
222	All GND'd Irradiation	-0.06639			-0.11422	
223	All GND'd Irradiation	-0.01906			-0.07609	
224	All GND'd Irradiation	-0.03337			-0.03692	
213	Biased Irradiation	-0.10607			-0.03811	
215	Biased Irradiation	-0.05125			-0.05943	
216	Biased Irradiation	-0.14265			-0.07372	
217	Biased Irradiation	-0.03660			-0.06540	
218	Biased Irradiation	-0.02979			-0.05943	
230	All GND'd Irradiation	-0.00597				-0.05955
231	All GND'd Irradiation	-0.06793				-0.11075
232	All GND'd Irradiation	-0.01072				-0.06671
233	All GND'd Irradiation	0.00000				-0.08217
234	All GND'd Irradiation	-0.09737				-0.12267
225	Biased Irradiation	-0.02027				-0.08098
226	Biased Irradiation	-0.10809				-0.06669
227	Biased Irradiation	-0.00955				-0.13923
228	Biased Irradiation	-0.00953				-0.07015
229	Biased Irradiation	-0.06794				-0.11422
235	Control Unit	-0.01788	-0.07622	-0.07622	-0.07622	-0.07622
236	Control Unit	-0.10453	-0.06777	-0.06777	-0.06777	-0.06777
	All GND'd Irradiation Statistics					
	Average All GND'd	-0.03823	-0.09780	-0.07591	-0.06355	-0.08837
	Std Dev All GND'd	0.02712	0.02559	0.03375	0.03334	0.02746
	Ps90%/90% (+KTL) All GND'd	0.03612	-0.02762	0.01662	0.02786	-0.01308
	Ps90%/90% (-KTL) All GND'd	-0.11259	-0.16798	-0.16845	-0.15497	-0.16367
	Biased Irradiation Statistics					
	Average Biased	-0.03814	-0.07906	-0.06191	-0.05922	-0.09426
	Std Dev Biased	0.04097	0.02162	0.03578	0.01317	0.03138
	Ps90%/90% (+KTL) Biased	0.07419	-0.01977	0.03620	-0.02310	-0.00822
	Ps90%/90% (-KTL) Biased	-0.15047	-0.13835	-0.16001	-0.09534	-0.18029
	Specification MIN					
	Status (Measurements) All GND'd					
	Status (Measurements) Biased					
	Specification MAX	5	5	5	5	5
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) All GND'd					
	Status (+KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) Biased					
	Status (+KTL) Biased	PASS	PASS	PASS	PASS	PASS

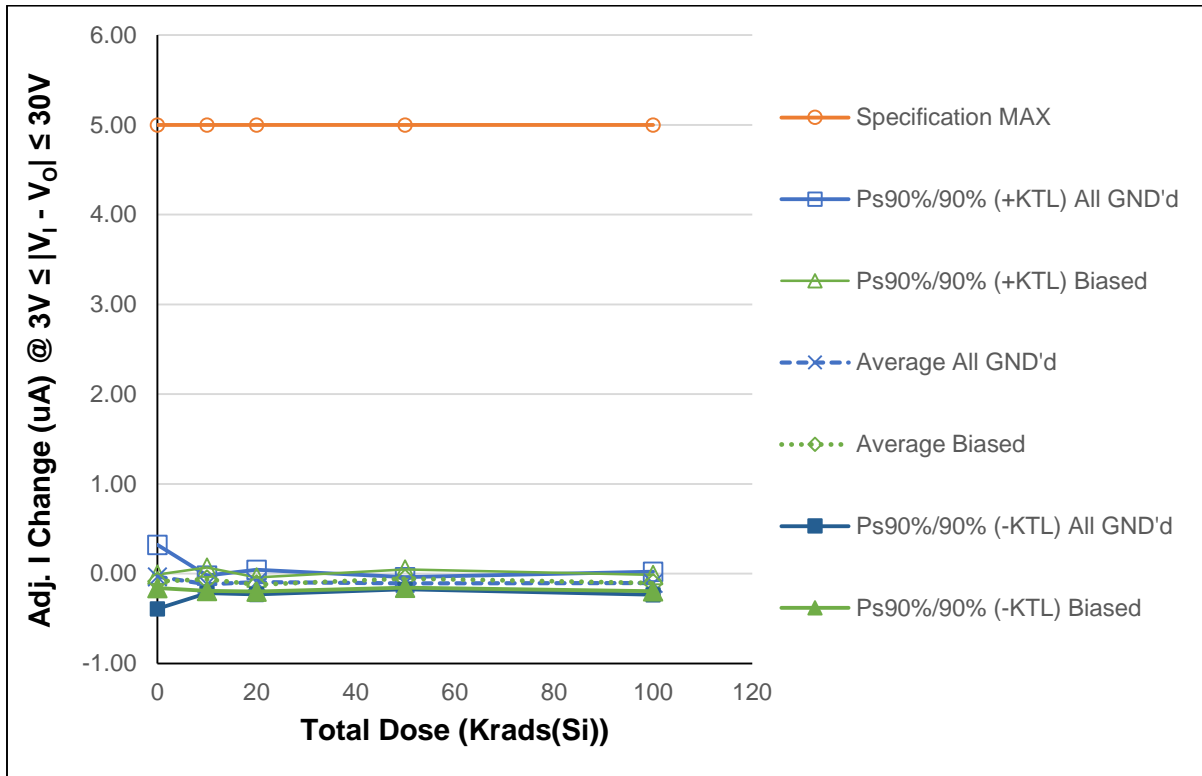


Figure 5.13: Plot of Adjust Pin Current Change @ $3V \leq |V_I - V_O| \leq 30V$ versus Total Dose

Table 5.13: Raw data table for adjust pin current change @ $3V \leq |V_i - V_o| \leq 30V$ versus total dose including the statistical calculations, maximum specification, and the status of the test.

Parameter	Adj. I Change @ $3V \leq V_i - V_o \leq 30V$	Total Dose (Krad(Si)) @ 50rads/second				
		0	10	20	50	100
Units	(uA)					
198	All GND'd Irradiation	-0.05566	-0.15697			
199	All GND'd Irradiation	-0.08664	-0.15233			
200	All GND'd Irradiation	-0.11167	-0.11778			
201	All GND'd Irradiation	0.19390	-0.08456			
202	All GND'd Irradiation	-0.11406	-0.08087			
191	Biased Irradiation	-0.11406	-0.08695			
192	Biased Irradiation	-0.06794	-0.13565			
194	Biased Irradiation	-0.10488	-0.03811			
196	Biased Irradiation	-0.09499	-0.02739			
197	Biased Irradiation	-0.04767	-0.02740			
208	All GND'd Irradiation	-0.09499		-0.03811		
209	All GND'd Irradiation	-0.05685		-0.11778		
210	All GND'd Irradiation	-0.16888		-0.16781		
211	All GND'd Irradiation	-0.10846		-0.07611		
212	All GND'd Irradiation	-0.13312		-0.07253		
203	Biased Irradiation	-0.01311		-0.12982		
204	Biased Irradiation	-0.02264		-0.16662		
205	Biased Irradiation	-0.12954		-0.11433		
206	Biased Irradiation	-0.13909		-0.09051		
207	Biased Irradiation	-0.14267		-0.10480		
219	All GND'd Irradiation	-0.02026			-0.12862	
220	All GND'd Irradiation	-0.07592			-0.08562	
222	All GND'd Irradiation	-0.11406			-0.08087	
223	All GND'd Irradiation	-0.08664			-0.10349	
224	All GND'd Irradiation	-0.15696			-0.13552	
213	Biased Irradiation	-0.08818			-0.10480	
215	Biased Irradiation	-0.06793			-0.07849	
216	Biased Irradiation	-0.09380			-0.04871	
217	Biased Irradiation	-0.11285			-0.00834	
218	Biased Irradiation	-0.10488			-0.03692	
230	All GND'd Irradiation	-0.09415				-0.06671
231	All GND'd Irradiation	-0.05482				-0.14291
232	All GND'd Irradiation	-0.13551				-0.07253
233	All GND'd Irradiation	-0.15220				-0.07969
234	All GND'd Irradiation	-0.05840				-0.16888
225	Biased Irradiation	-0.06794				-0.07145
226	Biased Irradiation	-0.03778				-0.12851
227	Biased Irradiation	-0.18199				-0.06669
228	Biased Irradiation	-0.13670				-0.13209
229	Biased Irradiation	-0.11167				-0.12970
235	Control Unit	-0.19747	-0.12506	-0.12506	-0.12506	-0.12506
236	Control Unit	-0.05805	-0.09754	-0.09754	-0.09754	-0.09754
	All GND'd Irradiation Statistics					
	Average All GND'd	-0.03483	-0.11850	-0.09447	-0.10683	-0.10614
	Std Dev All GND'd	0.13002	0.03603	0.04979	0.02466	0.04656
	Ps90%/90% (+KTL) All GND'd	0.32169	-0.01970	0.04207	-0.03920	0.02154
	Ps90%/90% (-KTL) All GND'd	-0.39134	-0.21730	-0.23100	-0.17445	-0.23382
	Biased Irradiation Statistics					
	Average Biased	-0.08591	-0.06310	-0.12122	-0.05545	-0.10569
	Std Dev Biased	0.02747	0.04745	0.02913	0.03733	0.03349
	Ps90%/90% (+KTL) Biased	-0.01057	0.06701	-0.04134	0.04692	-0.01385
	Ps90%/90% (-KTL) Biased	-0.16125	-0.19321	-0.20110	-0.15782	-0.19753
	Specification MIN					
	Status (Measurements) All GND'd					
	Status (Measurements) Biased					
	Specification MAX	5	5	5	5	5
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) All GND'd					
	Status (+KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) Biased					
	Status (+KTL) Biased	PASS	PASS	PASS	PASS	PASS

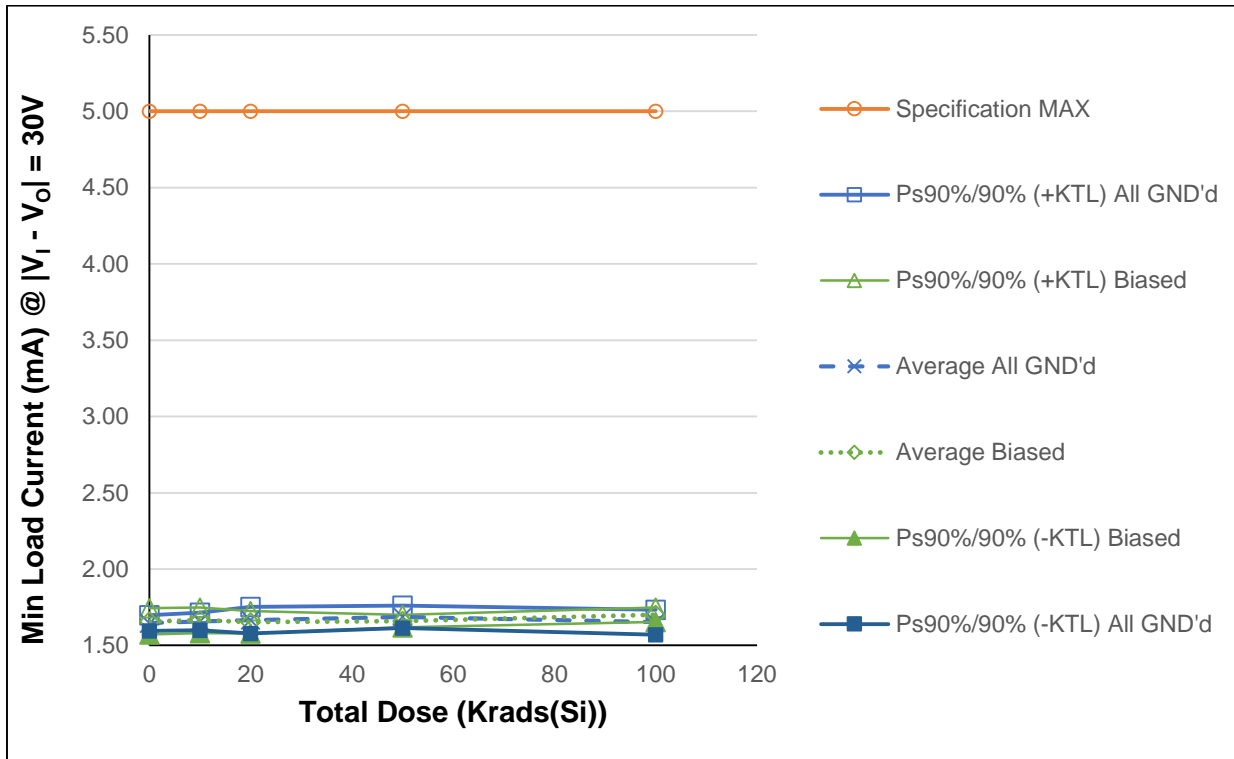


Figure 5.14: Plot of Minimum Load Current @ $|V_I - V_O| = 30V$ versus Total Dose

Table 5.14: Raw data table for minimum load current @ $|V_I - V_O| = 30V$ versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL)

Parameter Units	Min I_L @ $ V_I - V_O = 30V$ (mA)	Total Dose (Krad(Si)) @ 50rads/second				
		0	10	20	50	100
198	All GND'd Irradiation	1.65548	1.67153			
199	All GND'd Irradiation	1.63709	1.64957			
200	All GND'd Irradiation	1.67370	1.68557			
201	All GND'd Irradiation	1.62618	1.63203			
202	All GND'd Irradiation	1.63777	1.64767			
191	Biased Irradiation	1.68170	1.68686			
192	Biased Irradiation	1.67987	1.68076			
194	Biased Irradiation	1.62315	1.63004			
196	Biased Irradiation	1.62315	1.63218			
197	Biased Irradiation	1.68101	1.69175			
208	All GND'd Irradiation	1.63785		1.65766		
209	All GND'd Irradiation	1.62429		1.63622		
210	All GND'd Irradiation	1.70022		1.72004		
211	All GND'd Irradiation	1.65113		1.66269		
212	All GND'd Irradiation	1.62733		1.65202		
203	Biased Irradiation	1.63291		1.64522		
204	Biased Irradiation	1.62924		1.63981		
205	Biased Irradiation	1.61026		1.62578		
206	Biased Irradiation	1.63596		1.65148		
207	Biased Irradiation	1.68588		1.69685		
219	All GND'd Irradiation	1.67095			1.70760	
220	All GND'd Irradiation	1.69625			1.71966	
222	All GND'd Irradiation	1.65059			1.68045	
223	All GND'd Irradiation	1.62649			1.65202	
224	All GND'd Irradiation	1.65334			1.67580	
213	Biased Irradiation	1.65113			1.66360	
215	Biased Irradiation	1.63222			1.65202	
216	Biased Irradiation	1.63107			1.64873	
217	Biased Irradiation	1.66035			1.68373	
218	Biased Irradiation	1.62131			1.64896	
230	All GND'd Irradiation	1.61362				1.63218
231	All GND'd Irradiation	1.62618				1.64172
232	All GND'd Irradiation	1.60424				1.62921
233	All GND'd Irradiation	1.61431				1.65781
234	All GND'd Irradiation	1.66150				1.70219
225	Biased Irradiation	1.66522				1.67718
226	Biased Irradiation	1.68626				1.70608
227	Biased Irradiation	1.69383				1.70943
228	Biased Irradiation	1.66942				1.68922
229	Biased Irradiation	1.70670				1.72125
235	Control Unit	1.63038	1.63195	1.63195	1.63195	1.63195
236	Control Unit	1.61948	1.62188	1.62188	1.62188	1.62188
	All GND'd Irradiation Statistics					
	Average All GND'd	1.64604	1.65727	1.66572	1.68711	1.65262
	Std Dev All GND'd	0.01869	0.02117	0.03195	0.02685	0.02987
	Ps90%/90% (+KTL) All GND'd	1.69729	1.71532	1.75333	1.76072	1.73452
	Ps90%/90% (-KTL) All GND'd	1.59480	1.59922	1.57812	1.61349	1.57072
	Biased Irradiation Statistics					
	Average Biased	1.65777	1.66432	1.65183	1.65941	1.70063
	Std Dev Biased	0.03162	0.03057	0.02690	0.01489	0.01741
	Ps90%/90% (+KTL) Biased	1.74447	1.74815	1.72559	1.70024	1.74837
	Ps90%/90% (-KTL) Biased	1.57108	1.58049	1.57807	1.61858	1.65289
	Specification MIN					
	Status (Measurements) All GND'd					
	Status (Measurements) Biased					
	Specification MAX	5	5	5	5	5
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) All GND'd					
	Status (+KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (-KTL) Biased					
	Status (+KTL) Biased	PASS	PASS	PASS	PASS	PASS

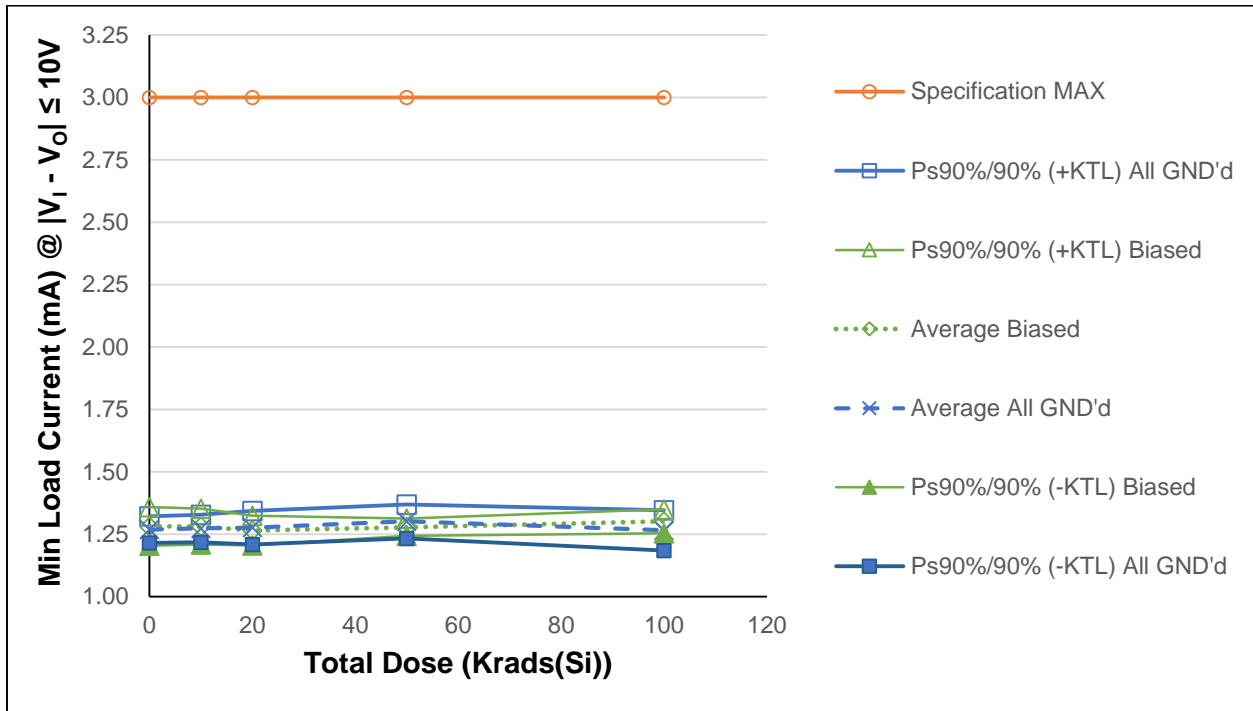


Figure 5.15: Plot of Minimum Load Current @ $|V_I - V_O| \leq 10V$ versus Total Dose

Table 5.15: Raw data table for minimum load current @ $|V_i - V_o| \leq 10V$ versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL)

Parameter Units	Min I_L @ $ V_i - V_o \leq 10V$ (mA)	Total Dose (Krad(Si)) @ 50rads/second				
		0	10	20	50	100
198	All GND'd Irradiation	1.27846	1.28413			
199	All GND'd Irradiation	1.26055	1.26399			
200	All GND'd Irradiation	1.29767	1.30250			
201	All GND'd Irradiation	1.24918	1.25179			
202	All GND'd Irradiation	1.25650	1.26231			
191	Biased Irradiation	1.30287	1.29572			
192	Biased Irradiation	1.29607	1.28840			
194	Biased Irradiation	1.24972	1.25149			
196	Biased Irradiation	1.25048	1.25637			
197	Biased Irradiation	1.30529	1.31280			
208	All GND'd Irradiation	1.26544		1.26887		
209	All GND'd Irradiation	1.24918		1.25148		
210	All GND'd Irradiation	1.30598		1.31707		
211	All GND'd Irradiation	1.27115		1.27688		
212	All GND'd Irradiation	1.25079		1.26819		
203	Biased Irradiation	1.25650		1.26041		
204	Biased Irradiation	1.25780		1.25880		
205	Biased Irradiation	1.23545		1.24020		
206	Biased Irradiation	1.25894		1.26369		
207	Biased Irradiation	1.29737		1.30006		
219	All GND'd Irradiation	1.28982			1.32256	
220	All GND'd Irradiation	1.30965			1.32958	
222	All GND'd Irradiation	1.27184			1.29876	
223	All GND'd Irradiation	1.24743			1.27078	
224	All GND'd Irradiation	1.27413			1.28535	
213	Biased Irradiation	1.27487			1.28237	
215	Biased Irradiation	1.25955			1.27017	
216	Biased Irradiation	1.25535			1.26491	
217	Biased Irradiation	1.27884			1.29702	
218	Biased Irradiation	1.24888			1.27375	
230	All GND'd Irradiation	1.24401				1.24760
231	All GND'd Irradiation	1.25163				1.25377
232	All GND'd Irradiation	1.23211				1.24088
233	All GND'd Irradiation	1.23828				1.27131
234	All GND'd Irradiation	1.27548				1.31410
225	Biased Irradiation	1.28335				1.27955
226	Biased Irradiation	1.30287				1.31280
227	Biased Irradiation	1.30713				1.31410
228	Biased Irradiation	1.28389				1.28535
229	Biased Irradiation	1.31688				1.31593
235	Control Unit	1.25537	1.24867	1.24867	1.24867	1.24867
236	Control Unit	1.24371	1.24149	1.24149	1.24149	1.24149
All GND'd Irradiation Statistics						
Average All GND'd		1.26847	1.27294	1.27650	1.30141	1.26553
Std Dev All GND'd		0.01956	0.02025	0.02449	0.02472	0.02941
Ps90%/90% (+KTL) All GND'd		1.32211	1.32846	1.34366	1.36919	1.34617
Ps90%/90% (-KTL) All GND'd		1.21483	1.21743	1.20934	1.23362	1.18489
Biased Irradiation Statistics						
Average Biased		1.28089	1.28096	1.26463	1.27764	1.30155
Std Dev Biased		0.02831	0.02627	0.02182	0.01256	0.01759
Ps90%/90% (+KTL) Biased		1.35850	1.35298	1.32447	1.31208	1.34977
Ps90%/90% (-KTL) Biased		1.20327	1.20893	1.20479	1.24321	1.25332
Specification MIN						
Status (Measurements) All GND'd						
Status (Measurements) Biased						
Specification MAX						
Status (Measurements) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (Measurements) Biased		PASS	PASS	PASS	PASS	PASS
Status (-KTL) All GND'd						
Status (+KTL) All GND'd		PASS	PASS	PASS	PASS	PASS
Status (-KTL) Biased						
Status (+KTL) Biased		PASS	PASS	PASS	PASS	PASS

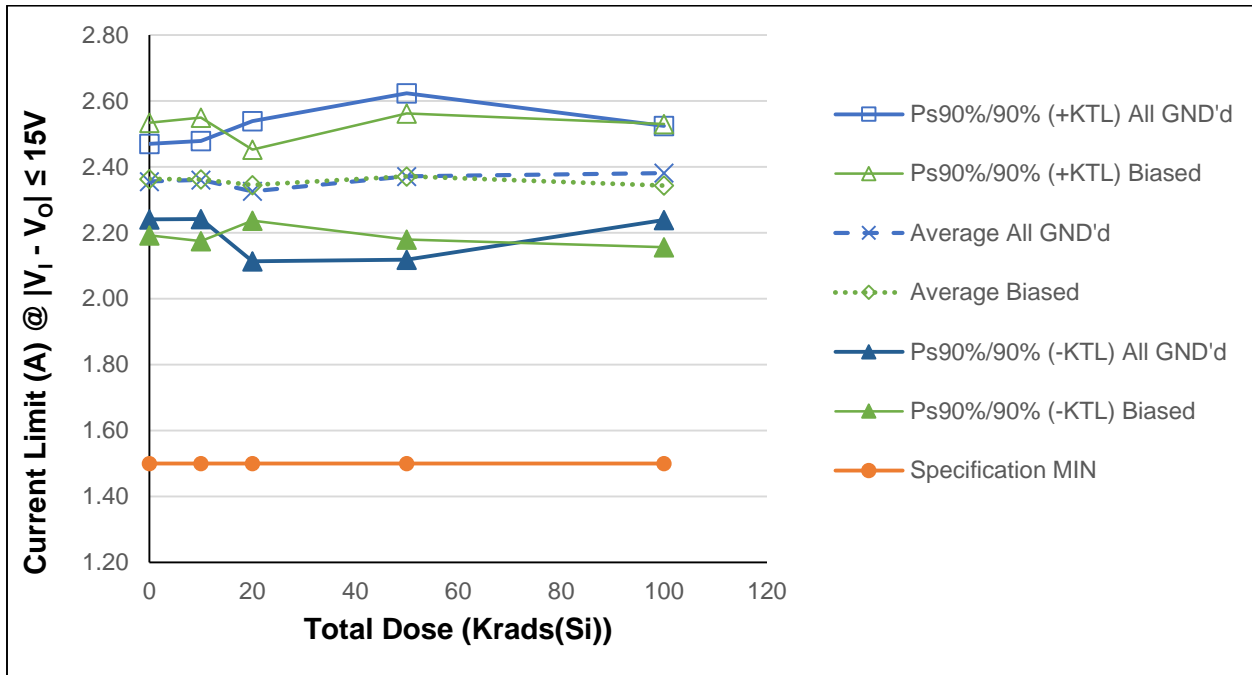


Figure 5.16: Plot of Current Limit @ $|V_I - V_O| \leq 15V$ versus Total Dose

Table 5.16: Raw data table for current limit @ $|V_i - V_o| \leq 15V$ versus total dose including the statistical calculations, minimum specification, and the status of the test (PASS/FAIL)

Parameter Units	I_{LIMIT} @ $ V_i - V_o \leq 15V$ (A)	Total Dose (Krad(Si)) @ 50rads/second				
		0	10	20	50	100
198	All GND'd Irradiation	2.38387	2.38689			
199	All GND'd Irradiation	2.32919	2.33663			
200	All GND'd Irradiation	2.41343	2.42254			
201	All GND'd Irradiation	2.33767	2.33776			
202	All GND'd Irradiation	2.31334	2.31769			
191	Biased Irradiation	2.29257	2.28591			
192	Biased Irradiation	2.30412	2.29365			
194	Biased Irradiation	2.38069	2.38406			
196	Biased Irradiation	2.43279	2.43125			
197	Biased Irradiation	2.40697	2.41566			
208	All GND'd Irradiation	2.20168		2.20871		
209	All GND'd Irradiation	2.30335		2.30557		
210	All GND'd Irradiation	2.33315		2.35354		
211	All GND'd Irradiation	2.33597		2.34165		
212	All GND'd Irradiation	2.39532		2.42059		
203	Biased Irradiation	2.29740		2.29830		
204	Biased Irradiation	2.32785		2.33224		
205	Biased Irradiation	2.31856		2.32695		
206	Biased Irradiation	2.39140		2.40116		
207	Biased Irradiation	2.35576		2.36496		
219	All GND'd Irradiation	2.38979			2.44390	
220	All GND'd Irradiation	2.31071			2.32925	
222	All GND'd Irradiation	2.40921			2.44087	
223	All GND'd Irradiation	2.38322			2.41205	
224	All GND'd Irradiation	2.20790			2.22840	
213	Biased Irradiation	2.35909			2.36605	
215	Biased Irradiation	2.36770			2.38394	
216	Biased Irradiation	2.25590			2.26970	
217	Biased Irradiation	2.35225			2.36983	
218	Biased Irradiation	2.41718			2.46611	
230	All GND'd Irradiation	2.34452				2.34879
231	All GND'd Irradiation	2.36213				2.35906
232	All GND'd Irradiation	2.32250				2.32589
233	All GND'd Irradiation	2.37904				2.44315
234	All GND'd Irradiation	2.38040				2.43087
225	Biased Irradiation	2.29171				2.29520
226	Biased Irradiation	2.40976				2.42251
227	Biased Irradiation	2.39599				2.41305
228	Biased Irradiation	2.28376				2.29312
229	Biased Irradiation	2.29777				2.29271
235	Control Unit	2.29468	2.27649	2.27649	2.27649	2.27649
236	Control Unit	2.40097	2.38645	2.38645	2.38645	2.38645
	All GND'd Irradiation Statistics					
	Average All GND'd	2.35550	2.36030	2.32601	2.37089	2.38155
	Std Dev All GND'd	0.04168	0.04320	0.07766	0.09214	0.05221
	Ps90%/90% (+KTL) All GND'd	2.46978	2.47875	2.53896	2.62354	2.52472
	Ps90%/90% (-KTL) All GND'd	2.24121	2.24186	2.11306	2.11824	2.23838
	Biased Irradiation Statistics					
	Average Biased	2.36343	2.36211	2.34472	2.37113	2.34332
	Std Dev Biased	0.06234	0.06823	0.03944	0.06982	0.06806
	Ps90%/90% (+KTL) Biased	2.53435	2.54920	2.45286	2.56258	2.52994
	Ps90%/90% (-KTL) Biased	2.19250	2.17501	2.23659	2.17967	2.15669
	Specification MIN	1.5	1.5	1.5	1.5	1.5
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Specification MAX					
	Status (Measurements) All GND'd					
	Status (Measurements) Biased					
	Status (-KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (+KTL) All GND'd					
	Status (-KTL) Biased	PASS	PASS	PASS	PASS	PASS
	Status (+KTL) Biased					

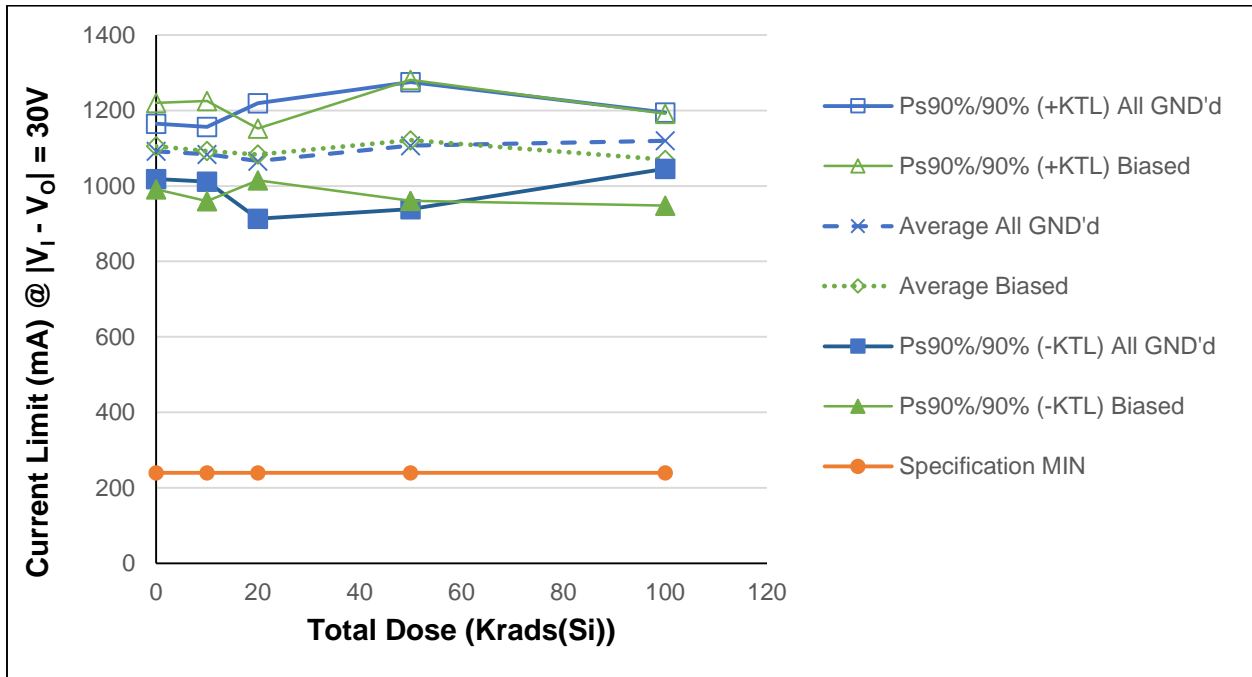


Figure 5.17: Plot of Current Limit @ $|V_I - V_O| = 30V$ versus Total Dose

Table 5.17: Raw data table for current limit @ $|V_i - V_o| = 30V$ versus total dose including the statistical calculations, minimum specification, and the status of the test (PASS/FAIL)

Parameter Units	I_{LIMIT} @ $ V_i - V_o = 30V$ (mA)	Total Dose (Krad(Si)) @ 50rads/second				
		0	10	20	50	100
198	All GND'd Irradiation	1104.068	1093.035			
199	All GND'd Irradiation	1075.201	1069.242			
200	All GND'd Irradiation	1127.001	1120.643			
201	All GND'd Irradiation	1096.150	1087.056			
202	All GND'd Irradiation	1057.531	1050.066			
191	Biased Irradiation	1064.081	1043.435			
192	Biased Irradiation	1066.938	1044.265			
194	Biased Irradiation	1128.834	1120.613			
196	Biased Irradiation	1162.403	1154.014			
197	Biased Irradiation	1105.514	1101.896			
208	All GND'd Irradiation	1007.819		998.378		
209	All GND'd Irradiation	1080.286		1068.659		
210	All GND'd Irradiation	1037.774		1033.202		
211	All GND'd Irradiation	1090.302		1083.818		
212	All GND'd Irradiation	1138.799		1146.830		
203	Biased Irradiation	1076.419		1067.275		
204	Biased Irradiation	1098.728		1092.079		
205	Biased Irradiation	1081.524		1078.032		
206	Biased Irradiation	1128.565		1122.321		
207	Biased Irradiation	1066.261		1058.229		
219	All GND'd Irradiation	1105.801			1143.156	
220	All GND'd Irradiation	1062.565			1073.744	
222	All GND'd Irradiation	1129.687			1150.627	
223	All GND'd Irradiation	1134.136			1152.401	
224	All GND'd Irradiation	1007.172			1013.694	
213	Biased Irradiation	1095.129			1101.359	
215	Biased Irradiation	1122.868			1135.210	
216	Biased Irradiation	1042.372			1047.513	
217	Biased Irradiation	1101.339			1114.002	
218	Biased Irradiation	1170.632			1208.296	
230	All GND'd Irradiation	1109.973				1112.623
231	All GND'd Irradiation	1115.301				1110.338
232	All GND'd Irradiation	1089.816				1091.125
233	All GND'd Irradiation	1121.181				1164.421
234	All GND'd Irradiation	1085.331				1121.139
225	Biased Irradiation	1061.211				1056.405
226	Biased Irradiation	1114.037				1123.533
227	Biased Irradiation	1099.898				1106.833
228	Biased Irradiation	1022.743				1017.358
229	Biased Irradiation	1051.148				1043.894
235	Control Unit	1066.573	1040.649	1040.649	1040.649	1040.649
236	Control Unit	1132.580	1109.090	1109.090	1109.090	1109.090
	All GND'd Irradiation Statistics					
	Average All GND'd	1091.990	1084.008	1066.177	1106.724	1119.929
	Std Dev All GND'd	26.731	26.472	55.916	61.407	27.185
	Ps90%/90% (+KTL) All GND'd	1165.287	1156.594	1219.499	1275.103	1194.470
	Ps90%/90% (-KTL) All GND'd	1018.693	1011.423	912.856	938.346	1045.389
	Biased Irradiation Statistics					
	Average Biased	1105.554	1092.845	1083.587	1121.276	1069.605
	Std Dev Biased	41.788	48.466	25.062	58.432	44.326
	Ps90%/90% (+KTL) Biased	1220.137	1225.740	1152.307	1281.497	1191.147
	Ps90%/90% (-KTL) Biased	990.971	959.950	1014.867	961.055	948.063
	Specification MIN	240	240	240	240	240
	Status (Measurements) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (Measurements) Biased	PASS	PASS	PASS	PASS	PASS
	Specification MAX					
	Status (Measurements) All GND'd					
	Status (Measurements) Biased					
	Status (-KTL) All GND'd	PASS	PASS	PASS	PASS	PASS
	Status (+KTL) All GND'd					
	Status (-KTL) Biased	PASS	PASS	PASS	PASS	PASS
	Status (+KTL) Biased					

Appendix A



Figure A1: Top View showing ID and Date Code

Appendix B

Radiation Bias Connection Tables

Table B1: Biased Conditions

PIN	FUNCTION	CONNECTION / BIAS
1	ADJUST	To +15V via 2K Ω
2	OUTPUT	To +15V via 243 Ω
3	INPUT	To -15V

Table B2: All GND'd

PIN	FUNCTION	CONNECTION / BIAS
1	ADJUST	Ground
2	OUTPUT	Ground
3	INPUT	Ground

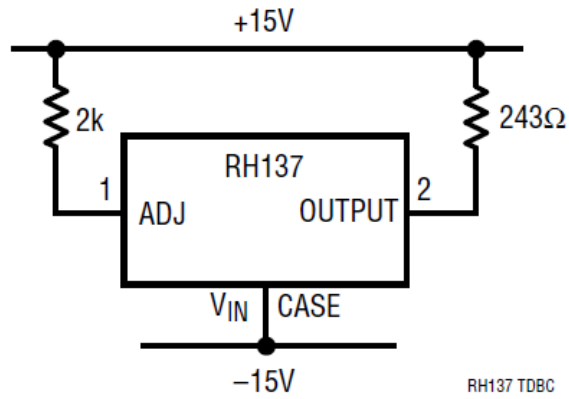


Figure B1: Total Dose Bias Circuit

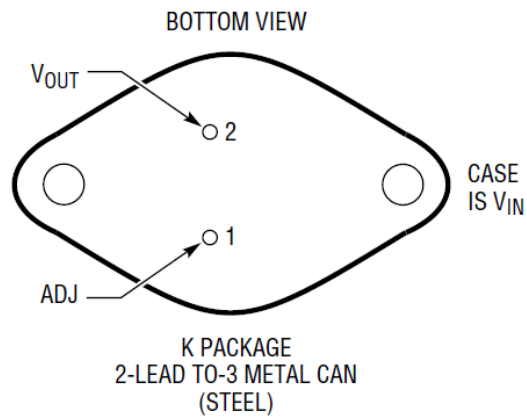


Figure B2: Pin-Out



Figure B3: Bias Board (top view)

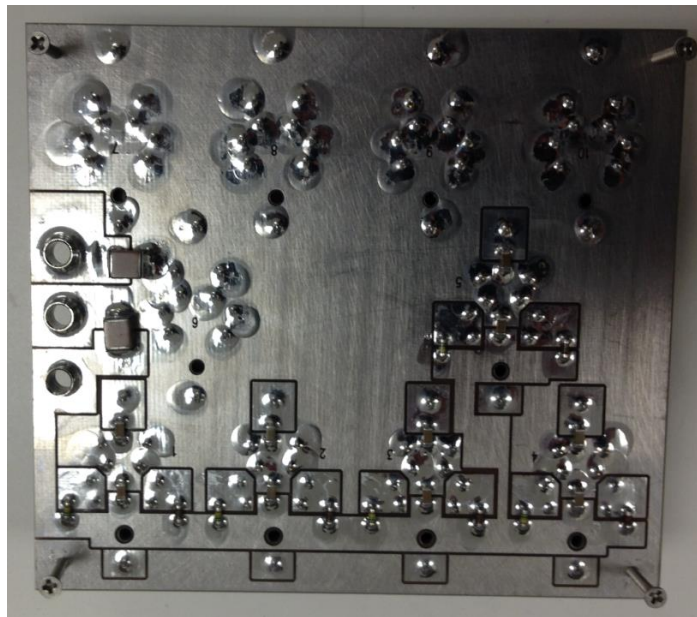


Figure B4: Bias Board (bottom view)

Appendix C

TEST CERTIFICATE

**Defense Microelectronics Activity
Science and Engineering Gamma Irradiation Test Facility
DMEA/MEBC
4234 54th Street
McClellan, CA 95652**









Testing Certificate Number: 1691.01

This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the dosimetry reported in this test certificate has been determined in accordance with the laboratory's terms of accreditation. The results contained herein relate only to the items tested. This certificate may not be reproduced, except in full, without the approval of this laboratory.

Date: 2014-04-01 Test Certificate #: 2014-NRC-047 Total Pages (except cover): 2

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REQUEST FOR AND RESULTS OF TESTS					PAGE NO. 1	NO. OF PAGES 2
SECTION A - REQUEST FOR TEST						
1. TO: (Include ZIP Code) Defense Microelectronics Activity Science and Engineering Gamma Irradiation Test Facility 4234 54th Street McClellan, CA 95652-2100			2. FROM: (Include ZIP Code) Dr. Sana Rezgui Linear Technology Corp. 1630 McCarthy Blvd. Milpitas, CA 95035 Phone: (408) 432-1900 Email: srezgui@linear.com			
3. PRIME CONTRACTOR AND ADDRESS (Include ZIP Code) Same as block 2 CONTRACT NUMBER CRADA CR-08-17			4. MANUFACTURING PLANT NAME AND ADDRESS (Include ZIP Code) Linear Technology Corp. 1630 McCarthy Blvd. Milpitas, CA 95035 P.O. NUMBER TBD			
5. END ITEM AND/OR PROJECT N/A		6. SAMPLE NUMBER N/A	7. LOT NO. See below	8. REASON FOR SUBMITTAL Total Ionizing Dose (TID) Testing		9. DATE SUBMITTED 2014-03-31
10. MATERIAL TO BE TESTED Various biased/unbiased devices - see below	10a. QUANTITY SUBMITTED See below	11. QUANTITY REPRESENTED N/A	12. SPEC. & AMEND AND/OR DRAWING NO. & REV. FOR SAMPLE & DATE N/A			
13. PURCHASED FROM OR SOURCE Linear Technology Corp.		14. SHIPMENT METHOD Hand carry	15. DATE SAMPLED AND SUBMITTED BY 2014-03-31 by Tom Shepherd			
16. REMARKS AND/OR SPECIAL INSTRUCTIONS AND/OR WAIVERS. Dose Rate: 3000 ±10% rad(SiO ₂)/min Irradiation Steps: 11 Type of Test: Customer-Performed Total Dose: see below ±10% krad(SiO ₂) Requested Test Start Date: 2014-04-01 Dimensions: various Security Requirements, Safety or Handling Precautions: Customer to perform pre- and post-irradiation electrical testing. Parts may be packed by customer in dry ice for transport. Irradiation portion of testing to be conducted per MIL-STD-883H, Test Method 1019.8, Condition A. Customer reserves right to modify parameters, devices, etc. to suit test requirements. Description of parts to be irradiated is as follows: RH117H, fab lot #10216255.1, ass'y lot #742778.1, WFR #1: 50 and 200 krad(SiO ₂), 5 devices per dose level, biased RH1963MK, fab lot #WD42342.1, ass'y lot #N/A, WFR #1: 10, 20, 50, 100 and 200 krad(SiO ₂), 10 devices per dose level, biased RH3083MK, fab lot #HP201682.1, ass'y lot #N/A, WFR #1: 10, 20, 50, 100 and 200 krad(SiO ₂), 10 devices per dose level, biased RH137K (6RH137BK*12), fab lot #W1328052.1, ass'y lot #732141.1, WFR #3: 10, 20, 50 and 100 krad(SiO ₂), 10 devices per dose level, biased						
Experiment #: 2014-NRC-047	DMEA Approval:	 SHEPHERD, THOMAS J. 125523594	 SHEPHERD, THOMAS J. 125523594	 ARSHAD, MOHAMMAD.1231956693	 MELINE, CARY W.1231854033	
17. SEND REPORT OF TEST TO Individual identified in Block 2						
SECTION B - RESULTS OF TEST (Continue on plain white paper if more space is required)						
1. DATE SAMPLE RECEIVED 2014-04-01		2. DATE RESULTS REPORTED 2014-04-01		3. LAB REPORT NUMBER N/A		
4. TEST PERFORMED	RESULTS OF TEST	SAMPLE RESULT	REQUIREMENTS			
Please see next page.						
DATE	TYPED NAME AND TITLE OF PERSON CONDUCTING TEST		SIGNATURE			
2014-04-01	Thomas J. Shepherd, SEGIT Technical Manager		 SHEPHERD, THOMAS J. 125523594			
2014-04-02	Mohammad Arshad, Alt. SEGIT Facility Supervisor		 ARSHAD, MOHAMMAD.1231956693			

DD FORM 1222, FEB 62 (EF)

REPLACES DD FORM 1222, 1 JUL 58, WHICH IS OBSOLETE.

Continuation of DD Form 1222		Experiment #:		Page 2 of 2		
4. Test Performed		Results of Test		Sample Result	Requirements	Step No.
20140401 10:00:00 to 20140401 10:15:39	5.000E+04 rad(SiO2) at 3.195E+03	rad(SiO2)/min	RH117H, WFR #1, S/Ns 101-103, 121-123, 161-163, 181:	50 krad SD, 50 krad TD		1
20140401 10:24:30 to 20140401 10:40:09	5.000E+04 rad(SiO2) at 3.195E+03	rad(SiO2)/min	RH117H, WFR #1, S/Ns 123, 161-163, 181:	50 krad SD, 100 krad TD		2
20140401 11:38:30 to 20140401 11:41:47	1.000E+04 rad(SiO2) at 3.047E+03	rad(SiO2)/min	RH1963MK, WFR #11, S/Ns 1-2, 4-7, 10-12:	10 krad TD		3
20140401 11:38:30 to 20140401 11:41:47	1.000E+04 rad(SiO2) at 3.047E+03	rad(SiO2)/min	RH3083MK, WFR #1, S/Ns 1-10:	10 krad TD		3
20140401 11:57:15 to 20140401 12:03:49	2.000E+04 rad(SiO2) at 3.047E+03	rad(SiO2)/min	RH1963MK, WFR #11, S/Ns 14-17, 20-21, 23-24, 26, 30:	20 krad TD		4
20140401 11:57:15 to 20140401 12:03:49	2.000E+04 rad(SiO2) at 3.047E+03	rad(SiO2)/min	RH3083MK, WFR #11, S/Ns 11-20:	20 krad TD		4
20140401 12:17:30 to 20140401 12:33:55	5.000E+04 rad(SiO2) at 3.047E+03	rad(SiO2)/min	RH1963MK, WFR #11, S/Ns 33-40, 42-43:	50 krad TD		5
20140401 12:17:30 to 20140401 12:33:55	5.000E+04 rad(SiO2) at 3.047E+03	rad(SiO2)/min	RH3083MK, WFR #1, S/Ns 21-30:	50 krad TD		5
20140401 12:47:00 to 20140401 13:19:49	1.000E+05 rad(SiO2) at 3.047E+03	rad(SiO2)/min	RH1963MK, WFR #11, S/Ns 44-47, 49-51, 53-55:	100 krad TD		6
20140401 12:47:00 to 20140401 13:19:49	1.000E+05 rad(SiO2) at 3.047E+03	rad(SiO2)/min	RH3083MK, WFR #1, S/Ns 31-40:	100 krad TD		6
20140401 13:31:00 to 20140401 14:36:39	2.000E+05 rad(SiO2) at 3.046E+03	rad(SiO2)/min	RH1963MK, WFR #11, S/Ns 56-57, 59, 61, 63-66, 68-69:	200 krad TD		7
20140401 13:31:00 to 20140401 14:36:39	2.000E+05 rad(SiO2) at 3.046E+03	rad(SiO2)/min	RH3083MK, WFR #1, S/Ns 41-50:	200 krad TD		7
20140401 14:57:00 to 20140401 15:00:08	1.000E+04 rad(SiO2) at 3.194E+03	rad(SiO2)/min	RH137K (6RH137BKK*12), WFR #3, S/Ns 191-192, 194, 196-202:	10 krad TD		8
20140401 15:06:30 to 20140401 15:12:46	2.000E+04 rad(SiO2) at 3.194E+03	rad(SiO2)/min	RH137K (6RH137BKK*12), WFR #3, S/Ns 203-212:	20 krad TD		9
20140401 15:20:05 to 20140401 15:35:44	5.000E+04 rad(SiO2) at 3.194E+03	rad(SiO2)/min	RH137K (6RH137BKK*12), WFR #3, S/Ns 213, 215-220, 222-224:	50 krad TD		10
20140401 15:43:00 to 20140401 16:14:18	1.000E+05 rad(SiO2) at 3.194E+03	rad(SiO2)/min	RH137K (6RH137BKK*12), WFR #3, S/Ns 225-234:	100 krad TD		11

Uncertainty: Total Doses reported are ± 10.94% (Step Nos. 1-2, 8-11)
 ± 16.02% (Step Nos. 3-7)

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

NOTES:

1. ASTM = American Society for Testing and Materials.
2. DUT = Device Under Test.
3. S/N = Serial Number.
4. SD = Step Dose.
5. TD = Total Dose.
6. Dose rate uniformity across target area: ± 4.67% (Step Nos. 1-2, 8-11)
 ± 9.76% (Step Nos. 3-7)
7. All irradiation steps met the requirements of MIL-STD-883H, Test Method 1019.8, Condition A.
8. After the original Test Request (DD Form 1222) was approved, the following changes were made:
 - a. TDs for the RH117H devices were changed to 50 and 100 krad(SiO2) per customer request.
 - Latitude to change test parameters to suit customer requirements was included in the original Test Request; no Customer Order Change Request (SEGIT Form QP03-4, Rev. 5) was required/issued.
9. Source information:
 - a. Irradiator = J.L. Shepherd & Associates Model 81-22/484 self-contained irradiation facility, S/Ns 7125/50016.
 - b. Source selection = two large Co-60 sources.
10. Dosimeter system:
 - a. Radcal Model No. 9010 Radiation Monitor Controller, S/N 90-1313.
 - b. Radcal Model No. 90X5-0.18 Electrometer/Ion Chamber, S/Ns 95-0478/9771.
 - c. This dosimeter system was calibrated per ISO/IEC 17025:2005 by University of Wisconsin Medical Radiation Research Center on 3 Feb 2014 (Report No. ION14426). This calibration is effective for two years.
11. Irradiation geometry: in accordance with section 7.3.2 of ASTM E1249-00 (2005), the DUT's semiconductor chip plane was perpendicular to the incident radiation beam.
12. Filter box: a DMEA Dose Enhancement Chamber (DEC) was used for all testing/dosimetry involved with this experiment.

The DEC's Pb and Al layers are compliant with section 7.2.2 of ASTM E1249-00 (2005) with respect to thickness and geometry.

Appendix D

Table D1: Pre-Irradiation Electrical Characteristics of Device-Under-Test

SYMBOL	PARAMETER	CONDITIONS	NOTES	$T_A = 25^\circ\text{C}$			SUB-GROUP	$-55^\circ\text{C} \leq T_A \leq 150^\circ\text{C}$			SUB-GROUP	UNITS
				MIN	TYP	MAX		MIN	TYP	MAX		
V_{REF}	Reference Voltage	$ V_{IN} - V_{OUT} = 5V, I_{OUT} = 10\text{mA}$		-1.225	-1.275		1					V
		$3V \leq V_{IN} - V_{OUT} \leq 30V,$ $10\text{mA} \leq I_{OUT} \leq I_{MAX}, P \leq P_{MAX}$		-1.200	-1.300		1	-1.200	-1.300		2, 3	V
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	$3V \leq V_{IN} - V_{OUT} \leq 30V$	2		0.02		1		0.05		2, 3	%/V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation	$10\text{mA} \leq I_{OUT} \leq I_{MAX}, V_{OUT} \leq 5V$ $10\text{mA} \leq I_{OUT} \leq I_{MAX}, V_{OUT} \geq 5V$	2 2		25 0.5		1 1		50 1		2, 3 2, 3	mV %
	Thermal Regulation	10ms Pulse			0.02		1					%/W
	Ripple Rejection	$V_{OUT} = -10V, f = 120\text{Hz}, C_{ADJ} = 0$			60							dB
		$V_{OUT} = -10V, f = 120\text{Hz},$ $C_{ADJ} = 10\mu\text{F}$	3	66				66				dB
I_{ADJ}	Adjust Pin Current						1		100		2, 3	μA
ΔI_{ADJ}	Adjust Pin Current Change	$10\text{mA} \leq I_{OUT} \leq I_{MAX}$ $3V \leq V_{IN} - V_{OUT} \leq 30V$			5 5		1 1		5 5		2, 3 2, 3	μA μA
I_{MIN}	Minimum Load Current	$ V_{IN} - V_{OUT} = 30V$ $ V_{IN} - V_{OUT} \leq 10V$			5 3		1 1		5 3		2, 3 2, 3	mA mA
	Current Limit	$ V_{IN} - V_{OUT} \leq 15V$	H Package K Package	5 5	0.5 1.5		1 1	0.5 1.5			2, 3 2, 3	A A
		$ V_{IN} - V_{OUT} = 30V$	H Package K Package	5 5	0.15 0.24		1 1					A A
$\frac{\Delta V_{OUT}}{\Delta \text{Temp}}$	Temperature Stability	$-55^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$	3					0.6				%
$\frac{\Delta V_{OUT}}{\Delta \text{Time}}$	Long Term Stability	$T_A = 125^\circ\text{C}$	3						1			%
e_n	RMS Output Noise	$10\text{Hz} \leq f \leq 10\text{kHz}$			0.003							%
θ_{JC}	Thermal Resistance (Junction to Case)	H Package K Package	3 3									$^\circ\text{C/W}$ $^\circ\text{C/W}$

Table D2: Post-Irradiation Electrical Characteristics of Device-Under-Test

SYMBOL	PARAMETER	CONDITIONS	NOTES	10KRAD(Si)		20KRAD(Si)		50KRAD(Si)		100KRAD(Si)		200KRAD(Si)		UNITS
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
V _{REF}	Reference Voltage	$ V_{IN} - V_{OUT} \leq 5V$, $I_{OUT} = 10mA$		-1.225	-1.275	-1.225	-1.275	-1.225	-1.275	-1.225	-1.275	-1.22	-1.28	V
		$3V \leq V_{IN} - V_{OUT} \leq 30V$, $10mA \leq I_{OUT} \leq I_{MAX}$, $P \leq P_{MAX}$		-1.2	-1.3	-1.2	-1.3	-1.2	-1.3	-1.2	-1.3	-1.2	-1.3	V
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	$3V \leq V_{IN} - V_{OUT} \leq 30V$,	2	0.02		0.02		0.02		0.02		0.02		%/V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation	$10mA \leq I_{OUT} \leq I_{MAX}$, $ V_{OUT} \leq 5V$	2	25		25		25		25		25		mV
		$10mA \leq I_{OUT} \leq I_{MAX}$, $ V_{OUT} \geq 5V$	2	0.5		0.5		0.5		0.5		0.5		%
I _{ADJ}	Adjust Pin Current			100		100		100		100		100		μA
ΔI _{ADJ}	Adjust Pin Current Change	$10mA \leq I_{OUT} \leq I_{MAX}$ $3V \leq V_{IN} - V_{OUT} \leq 30V$		5		5		5		5		5		μA
				5		5		5		5		5		μA
I _{MIN}	Minimum Load Current	$ V_{IN} - V_{OUT} = 30V$		5		5		5		5		5		mA
		$ V_{IN} - V_{OUT} \leq 10V$		3		3		3		3		3		mA
	Current Limit	$ V_{IN} - V_{OUT} \leq 15V$ $ V_{IN} - V_{OUT} = 30V$		0.5		0.5		0.5		0.5		0.5		A
				0.15		0.15		0.15		0.15		0.15		A
	K Package	$ V_{IN} - V_{OUT} \leq 15V$ $ V_{IN} - V_{OUT} = 30V$		1.5		1.5		1.5		1.5		1.5		A
				0.24		0.24		0.24		0.24		0.24		A

Note 1: Unless otherwise specified, these specifications apply for $|V_{IN} - V_{OUT}| = 5V$; and $I_{OUT} = 0.1A$ for the H package (TO-39) and $I_{OUT} = 0.5A$ for the K package (TO-3) package. Although power dissipation is internally limited, these specifications are applicable for power dissipations of 2W for the TO-39 and 20W for the TO-3. I_{MAX} is 0.2A for the TO-39 and 1.5A for the TO-3 package.

Note 2: Regulation is measured at a constant junction temperature using pulse testing with a low duty cycle. Changes in output voltage due to heating effects are covered under the specification for thermal regulation.

Note 3: Guaranteed by design, characterization or correlation to other tested parameters.

Note 4: $T_J = 25^\circ C$ unless otherwise noted.

Note 5: I_{SC} is tested at the ambient temperatures of $25^\circ C$ and $-55^\circ C$. I_{SC} cannot be tested at the maximum ambient temperature of $150^\circ C$ due to the high power level required. I_{SC} specification at $150^\circ C$ ambient is guaranteed by characterization and correlation to $25^\circ C$ testing.