ISL70591SEH, ISL73591SEH, ISL70592SEH, ISL73592SEH

Single Event Effects (SEE) Testing

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Introduction

The intense proton and heavy ion environment encountered in space applications can cause a variety of Single-Event Effects (SEE) in electronic circuitry, including Single Event Upset (SEU), Single Event Transient (SET), Single Event Functional Interrupt (SEFI), Single Event Latch-Up (SEL), Single Event Gate Rupture (SEGR) and Single Event Burnout (SEB). SEE can lead to system-level performance issues including disruption, degradation, and destruction. For predictable and reliable space system operation, individual electronic components should be characterized to determine their SEE response. This report discusses the results of SEE testing performed on the ISL70591SEH and ISL70592SEH precision current sources.

Although this report is written for the ISL70591SEH and ISL70592SEH, it applies equally to the ISL73591SEH and ISL73592SEH as they are the same silicon die, differing only in radiation assurance testing. The ISL73591SEH and ISL73592SEH see only 75krad(Si) of low dose rate (0.01rad(Si)/s) assurance, while the ISL70591SEH and ISL70592SEH also see assurance testing to 100krad(Si) at high dose rate (50-300rad(Si)/s).

Product Description

The ISL70591SEH and ISL70592SEH are radiation hardened precision current sources. These parts provide precision (±1%) current sources across voltages of 3V to 40V and across temperatures of -55°C to +125°C at 100µA and 1mA, respectively. The parts are manufactured using the proprietary Renesas PR40 SOI complementary bipolar process.

The parts used for the testing described here were from manufacturing wafer lot XAL2X and wafer 01 for the ISL70591SEH and wafer 13 for the ISL70592SEH. They were mounted without lids in the 4 Ld flat-pack production package with code KCW. They did not receive any of the production burn-ins or over-temperature testing because they did not have lids to allow SEE irradiation.

Related Literature

For a full list of related documents, visit our website

- ISL70591SEH, ISL73591SEH, ISL70592SEH, ISL73592SEH product pages

1. SEE Test Objectives

The ISL70591SEH and ISL70592SEH were tested to determine susceptibility to destructive single event effects (SEB) and to characterize Single Event Transient (SET) behavior over different operating conditions.

2. SEE Test Facility

Testing was performed at the Texas A&M University (TAMU) Radiation Effects Facility of the Cyclotron Institute heavy ion facility. This facility is coupled to a K500 super-conducting cyclotron, which is capable of generating a wide range of particle beams with the various energy, flux, and fluence levels needed for advanced radiation testing. Further details on the test facility can be found at http://cyclotron.tamu.edu/. The Devices Under Test (DUTs) were located in air outside an Aramica window for the ion beam. Ion Linear Energy Transfer (LET) values are quoted at the DUT surface. Signals were communicated to and from the DUT test fixture through 20 foot cables connecting to the control room. The testing reported here was conducted on March 15, 2018.

3. SEE Test Setup

For SEB testing, a current meter was placed in series with the Device Under Test (DUT) to monitor the current through the DUT. A voltage supply set the bias across the combination of the DUT and the current meter. The current was recorded before and after irradiation to monitor for permanent changes in the DUT current. The DUT temperature was set to +125°C using a thin film resistor heater on the back of the PCB.

For SET testing, a current sense resistor was placed in series with the DUT and the voltage across the resistor was monitored by oscilloscope. The DUT and resistor combination was biased with a voltage source. The voltage drop across the resistor was set to a nominal 1V by the resistor value selection. The ISL70591SEH used a 10kΩ resistor for its 100µA current. The ISL70592SEH used a 1kΩ sense resistor with its 1mA current. The SET testing was done at ambient temperature, about +25°C. The oscilloscope was set to trigger trace capture and storage on ±10mV (±1%) deviations of the resistor voltage. The captured traces were reviewed at a later time.

The SEE test boards had four DUTs mounted in close proximity so that all four could be irradiated at the same time. Each part was monitored independently during the irradiations. This approach minimized ion beam time needed to accomplish the testing.

4. Destructive SEE Testing of the ISL70591SEH and ISL70592SEH with LET = 86MeV•cm^2/mg

Destructive SEE (SEB) testing of the ISL70591SEH and ISL70592SEH was done by varying the supply voltage from 35V to 38V in 1V steps for sequential irradiations. Before and after irradiations, the device current was measured with a digital current meter. Four units of each type were exposed at each increasing voltage level to 1x10^{7}ion/cm^2 of 2.954GeV normal incidence gold for 86MeV•cm^2/mg in air at 30mm outside the Aramica window. All the units passed (no current change in excess of ±0.5%) at 35V. The ISL70591SEH encountered catastrophic failures at 36V and 37V for the ISL70591SEH, with currents going to milliamps. The ISL70592SEH encountered parametric failures at 37V and 38V. Table 1 summarizes the test data for the ISL70591SEH. Table 2 on page 3 summarizes the test data for the ISL70592SEH. Because the silicon design is identical for the two parts, the lower failure value should be applied to both devices.

Table 1. ISL70591SEH SEB Monitor Measurements for LET = 86MeV·cm^2/mg to a Fluence of 1x10^{7}ion/cm^2 with T_{CASE} = +125ºC ±10ºC. The Highlights Indicate Failures

ISL70591SEH		ID (µA) at 35V	ID (µA) at 36V	ID (µA) at 37V
DUT1	Pre-irradiation	101.3	101.9	101.2
	Post-irradiation	101.7	101.8	101.3
	Delta	0.4%	-0.1%	0.1%

Table 1. ISL70591SEH SEB Monitor Measurements for LET = 86MeV·cm^2/mg to a Fluence of 1x10^{7}ion/cm^2 with T_{CASE} = +125ºC ±10ºC. The Highlights Indicate Failures (Continued)

ISL70591SEH		ID (µA) at 35V	ID (µA) at 36V	ID (µA) at 37V
DUT2	Pre-irradiation	100.1	100.1	100.2
	Post-irradiation	100.2	100.4	100.0
	Delta	0.1%	0.3%	-0.2%
DUT3	Pre-irradiation	101.3	101.4	-
	Post-irradiation	101.4	2mA	-
	Delta	0.1%	-	-
DUT4	Pre-irradiation	101.2	101.4	101.7
	Post-irradiation	101.4	101.6	3mA
	Delta	0.2%	0.2%	-

Table 2. ISL70592SEH SEB Monitor Measurements for LET = 86MeV·cm^2/mg to a Fluence of 1x10^{7}ion/cm^2 with T_{CASE} = +125ºC ±10ºC. The Highlights Indicate Failures

ISL70591SEH		ID (µA) at 35V	ID (µA) at 36V	ID (µA) at 37V	ID (µA) at 38V
DUT5	Pre-irradiation	1.003	1.004	1.004	1.003
	Post-irradiation	1.003	1.004	1.002	1.032
	Delta	0.0%	0.0%	-0.2%	2.9%
DUT6	Pre-irradiation	0.999	1.002	1.006	1.01
	Post-irradiation	1.002	1.006	1.009	1.01
	Delta	0.3%	0.4%	0.3%	0.0%
DUT7	Pre-irradiation	1.000	0.995	0.996	0.999
	Post-irradiation	0.998	0.996	0.999	1.001
	Delta	-0.2%	0.1%	0.3%	0.2%
DUT8	Pre-irradiation	1.002	1.003	1.006	1.029
	Post-irradiation	1.003	1.005	1.027	1.025
	Delta	0.1%	0.2%	2.1%	-0.4%

The data presented in Tables 1 and 2 supports the conclusion that the ISL70591SEH and ISL70592SEH are immune to damaging SEE for operation at V+ = 35V with case temperature of +125°C and irradiation with gold ions of LET 86MeV•cm^2/mg at normal incidence.

5. SET Testing of the ISL70591SEH and ISL70592SEH Current Sources

The SET testing of the ISL70591SEH and ISL70592SEH focused on looking for perturbations of ±10mV (oscilloscope trigger and capture) on a nominal signal of 1V across the appropriated current sense resistor for the 100µA and 1mA currents, respectively. The oscilloscope was programmed to capture the event from 10µs before trigger to 90µs after trigger. Three channels captured the event, one scaled to 20mV/division (±80mV span), one to 1V/division (±4V span), and the last at 10V/division (±40V span). Biasing was done at both 4V and the SEB limit of 35V applied across the series combination of the DUT and the resistor. This resulted in DUT biases of 3V and 34V. Four parts were each irradiated at LET of 86 (Au), 28 (Kr), 20 (Cu), 8.5 (Ar), and 2.7 (Ne) MeV•cm^2/mg at +25°C case temperature. The irradiations were all done at normal incidence. For each irradiation the capture of SET was terminated at just over 1000 counts or at a fluence of 1x10^{7}ion/cm^2, whichever came first. Table 3 summarizes the ISL70591SEH SET capture counts. Table 4 on page 5 summarizes the ISL70592SEH SET capture counts.

Table 3. ISL70591SEH ±10mV Perturbation Counts Across a 10Ω Resistor at +25ºC

ISL70591SEH		4V Bias, 10kΩ			35V Bias, 10kΩ		
Species LET (MeV·cm^2/mg)	DUT	SET Count	Fluence (ion/cm^2)	X-Section (cm^2)	SET Count	Fluence (ion/cm^2)	X-Section (cm^2)
Au 86	5	1006	7.50x10^5	1.34x10^{-3}	1017	5.96x10^5	1.71x10^{-3}
	6	1059	7.70x10^5	1.38x10^{-3}	1022	5.96x10^5	1.71x10^{-3}
	7	1010	9.60x10^5	1.05x10^{-3}	1008	9.40x10^5	1.07x10^{-3}
	8	1351	7.80x10^5	1.73x10^{-3}	1021	5.47x10^5	1.87x10^{-3}
Kr 28	9	1002	1.14x10^6	8.79x10^{-4}	1013	8.80x10^5	1.15x10^{-3}
	10	1003	1.22x10^6	8.22x10^{-4}	1002	9.10x10^5	1.10x10^{-3}
	11	1002	1.33x10^6	7.53x10^{-4}	1025	1.01x10^6	1.01x10^{-3}
	12	1023	9.42x10^5	1.09x10^{-3}	1005	7.87x10^5	1.28x10^{-3}
Cu 20	13	1001	1.79x10^6	5.59x10^{-4}	1004	1.18x10^6	8.51x10^{-4}
	14	1000	1.85x10^6	5.41x10^{-4}	1009	1.23x10^6	8.20x10^{-4}
	15	1015	1.93x10^6	5.26x10^{-4}	1020	1.38x10^6	7.39x10^{-4}
	16	1004	1.32x10^6	7.61x10^{-4}	1011	1.06x10^6	9.54x10^{-4}
Ar 8.5	13	1036	2.50x10^6	4.14x10^{-4}	1168	2.04x10^6	5.73x10^{-4}
	14	1031	2.50x10^6	4.12x10^{-4}	1076	2.04x10^6	5.27x10^{-4}
	15	1005	2.50x10^6	4.02x10^{-4}	1007	2.04x10^6	4.94x10^{-4}
	16	1111	2.50x10^6	4.44x10^{-4}	1250	2.04x10^6	6.13x10^{-4}
Ne 2.7	13	1006	6.71x10^6	1.50x10^{-4}	1008	1.00x10^7	1.01x10^{-4}
	14	1012	7.18x10^6	1.41x10^{-4}	1008	1.00x10^7	1.01x10^{-4}
	15	1014	9.10x10^6	1.11x10^{-4}	1057	1.00x10^7	1.06x10^{-4}
	16	1060	3.47x10^6	3.05x10^{-4}	1009	1.00x10^7	1.01x10^{-4}

Table 4. ISL70592SEH ±10mV Perturbation Counts Across a 1kΩ Series Resistor at +25°C

ISL70592SEH		4V Bias, 1kΩ			35V Bias, 1kΩ		
Species LET (MeV·cm²/mg)	**DUT**	**SET Count**	**Fluence (ion/cm²)**	**X-section (cm²)**	**SET Count**	**Fluence (ion/cm²)**	**X-section (cm²)**
Au 86	5	1004	6.76×10^{5}	1.49×10^{-3}	1023	5.35×10^{5}	1.91×10^{-3}
	6	1006	8.58×10^{5}	1.17×10^{-3}	1004	6.88×10^{5}	1.46×10^{-3}
	7	1009	1.02×10^{6}	9.89×10^{-4}	1013	9.01×10^{5}	1.12×10^{-3}
	8	1016	6.08×10^{5}	1.67×10^{-3}	1026	5.15×10^{5}	1.99×10^{-3}
Kr 28	9	1015	1.13×10^{6}	8.98×10^{-4}	1010	8.53×10^{5}	1.18×10^{-3}
	10	1010	1.08×10^{6}	9.35×10^{-4}	1005	8.45×10^{5}	1.19×10^{-3}
	11	1034	1.18×10^{6}	8.76×10^{-4}	1006	9.58×10^{5}	1.05×10^{-3}
	12	1007	1.02×10^{6}	9.87×10^{-4}	1012	7.45×10^{5}	1.36×10^{-3}
Cu 20	13	1008	1.68×10^{6}	6.00×10^{-4}	1011	1.10×10^{6}	9.19×10^{-4}
	14	1006	1.74×10^{6}	5.78×10^{-4}	1012	1.15×10^{6}	8.80×10^{-4}
	15	1034	1.81×10^{6}	5.71×10^{-4}	1030	1.35×10^{6}	7.63×10^{-4}
	16	1028	1.35×10^{6}	7.61×10^{-4}	1018	1.01×10^{6}	1.01×10^{-3}
Ar 8.5	13	1084	2.11×10^{6}	5.14×10^{-4}	1192	2.00×10^{6}	5.96×10^{-4}
	14	1051	2.11×10^{6}	4.98×10^{-4}	1025	2.00×10^{6}	5.13×10^{-4}
	15	1007	2.11×10^{6}	4.77×10^{-4}	1044	2.00×10^{6}	5.22×10^{-4}
	16	1123	2.11×10^{6}	5.32×10^{-4}	1246	2.00×10^{6}	6.23×10^{-4}
Ne 2.7	13	1114	3.12×10^{6}	3.57×10^{-4}	1019	2.71×10^{6}	3.76×10^{-4}
	14	1149	3.23×10^{6}	3.56×10^{-4}	1010	2.92×10^{6}	3.46×10^{-4}
	15	1047	4.67×10^{6}	2.24×10^{-4}	1193	3.22×10^{6}	3.70×10^{-4}
	16	1021	2.81×10^{6}	3.63×10^{-4}	1010	4.36×10^{6}	2.32×10^{-4}

Figure 1 plots the SET cross section data for both parts (ISL70591SEH and ISL70592SEH) and the two bias conditions (4V and 35V). The two parts exhibit very similar cross sections, as would be expected because the designs are essentially the same. The cross sections are higher for the 35V bias case than for the 4V bias case by about 17% under gold irradiation. The maximum DUT cross section observed was $1.99 \times 10^{-3} cm^2$ seen for the ISL70592SEH, DUT8, irradiated with gold ($86MeV•cm^2/mg$). The minimum cross section encountered was $1.01 \times 10^{-4} cm^2$ for the ISL70591SEH DUT13 with neon ($2.7MeV•cm^2/mg$). The testing did not establish a threshold LET for the ±10mV events defined. In fact, three of the four conditions extrapolate linearly to negative thresholds based on the mean cross sections of the lowest two LET.

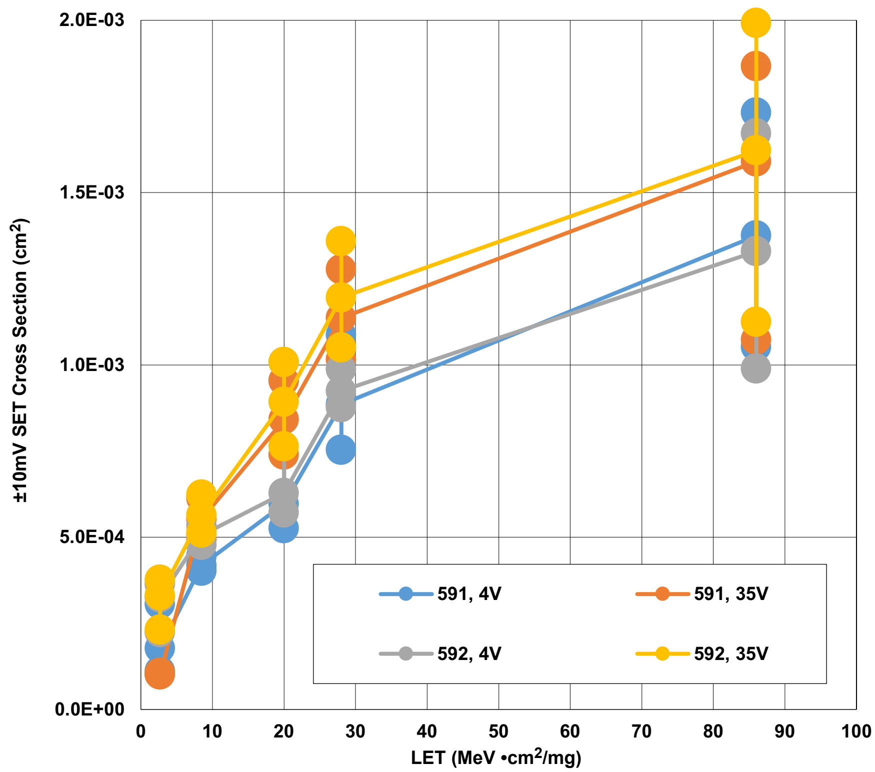

Figure 1. SET cross section versus LET for ±10mV SET criteria. Means are connected between LET, with minimum and maximum by DUT also plotted

The SET can be partitioned by sign of the voltage deviation. This partitioning was done by post processing the SET capture data to determine whether the largest deviation was a positive or negative deviation. This partition of the SET by deviation sign is presented in Tables 5 and 6 for the two parts for the 35V bias case, which yielded the larger cross sections.

Table 5. ISL70591SEH ±10mV SET Partitioned by Sign for the 35V Bias Case

	Au	Kr	Cu	Ar	Ne
Total Fluence (ion/cm^2)	$2.68x10^6$	$3.59x10^6$	$4.85x10^6$	$8.16x10^6$	$4.00x10^7$
Positive 10mV SET Count	2846	3076	3081	3772	2989
Negative 10mV SET Count	1166	969	964	729	1093
Positive 10mV Cross Section (cm^2)	$1.06x10^{-3}$	$8.58x10^{-4}$	$6.35x10^{-4}$	$4.62x10^{-4}$	$7.47x10^{-5}$
Negative 10mV Cross Section (cm^2)	$4.35x10^{-4}$	$2.70x10^{-4}$	$1.99x10^{-4}$	$8.93x10^{-5}$	$2.73x10^{-5}$
Total ±10mV SET Cross Section (cm^2)	$1.50x10^{-3}$	$1.13x10^{-3}$	$8.34x10^{-4}$	$5.52x10^{-4}$	$1.02x10^{-4}$

Table 6. ISL70592SEH ±10mV SET Partitioned by Sign for the 35V Bias Case

	Au	Kr	Cu	Ar	Ne
Total Fluence (ion/cm^2)	$2.64x10^6$	$3.40x10^6$	$4.61x10^6$	$8.00x10^6$	$1.32x10^7$
Positive 10mV SET Count	2898	2919	2996	3049	2929
Negative 10mV SET Count	1167	1115	1076	1458	1303
Positive 10mV Cross Section (cm^2)	$1.10x10^{-3}$	$8.58x10^{-4}$	$6.50x10^{-4}$	$3.81x10^{-4}$	$2.22x10^{-4}$
Negative 10mV Cross Section (cm^2)	$4.42x10^{-4}$	$3.28x10^{-4}$	$2.33x10^{-4}$	$1.82x10^{-4}$	$9.86x10^{-5}$
Total ±10mV SET Cross Section (cm^2)	$1.54x10^{-3}$	$1.19x10^{-3}$	$8.83x10^{-4}$	$5.63x10^{-4}$	$3.20x10^{-4}$

Note that the SET criteria of ±10mV captures many small SET and comparatively few very large SET. This means that the SET cross sections do not represent one type of SET, but rather represent an entire spectrum of SET magnitudes. Because the 35V bias provided the largest cross sections, the nature of the SET spectrum was further explored for the 35V bias cases. Each SET was analyzed to find the larger of the positive and negative deviations to assign that SET a sign. The resulting SET magnitudes for both signs and all four DUTs at each LET were then combined to yield a distribution of SET magnitudes for each LET and sign. These distributions were then plotted in a form similar to a cumulative probability plot.

The distribution of positive SET deviation magnitudes is depicted in Figure 2 for the ISL70591SEH and a 35V bias with an included 10kΩ series resistor. Because the SET criteria was a ±10mV deviation, 100% of the observed events were larger than 10mV deviation. The maximum SET deviations depend on the LET of the irradiating species with gold (86MeV•cm^2/mg) presenting very few (<0.6%) deviations closely approaching the bias voltage. For the ISL70591SEH, this means a current of about 3.5mA flowed at the peak of the SET. Krypton (28MeV•cm^2/mg) produced deviations topping out about 10V (1mA). For the lowest LET of 2.7MeV•cm^2/mg with neon, the SET magnitude topped out about 107mV (10.7µA). For the case of Cu (20MeV•cm^2/mg), only about 14% of the SET exceeded 100mV in size, while approximately 1% exceeded 1V in magnitude. Only about 4% of the gold SET exceeded 10V, meaning that the net cross section of 10V events is about 4% of the +10mV SET cross section of 1.06x10^{-3}cm^2, or 4.24x10^{-5}cm^2 for the 10V gold events.

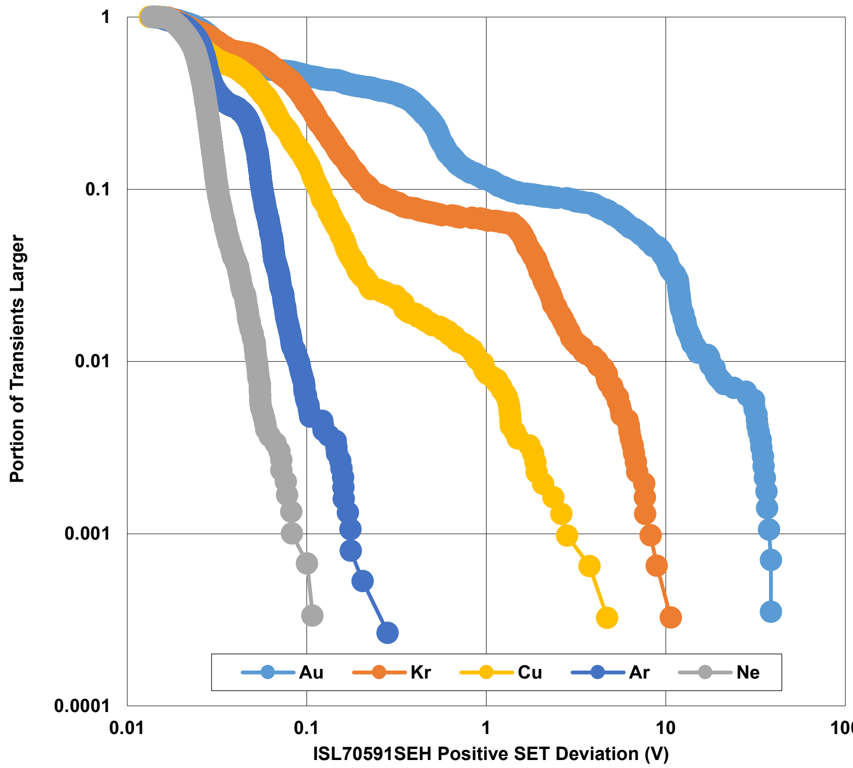

Figure 2. Distributions of the ISL70591SEH positive SET magnitudes across a 10kΩ series resistor (1V nominal on the resistor) with a 35V bias on the combination

The positive SET magnitude distributions for the ISL70592SEH are shown in Figure 3. The general trends are the same as with the ISL70591SEH, but the lower LET seem to favor somewhat larger SET magnitudes. With neon (2.7MeV•cm^2/mg), the SET magnitude tops out at about 340mV instead of the 107mV seen with the ISL70591SEH. About 15% of the neon SET population was larger than 100mV for the ISL70592SEH, while for the ISL70591SEH only 10% was larger than 32mV. For both parts about 3.7% of the events exhibited larger than 10V deviations when irradiated with gold (86MeV•cm^2/mg). For both parts, about 46% of the SET with gold were greater than 100mV in magnitude.

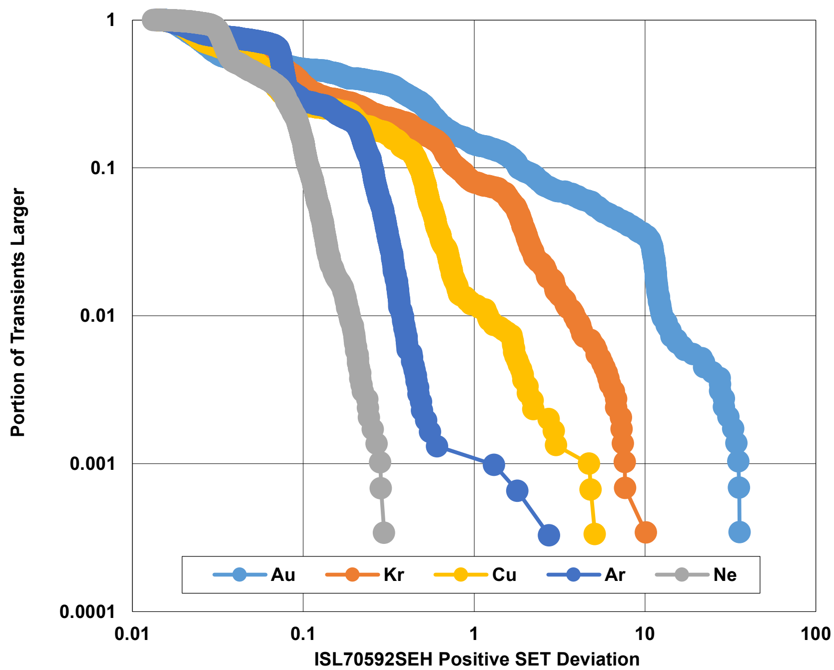

Figure 3. Distributions of the ISL70592SEH positive SET magnitudes across a 1kΩ series resistor (1V nominal on the resistor) with a 35V bias on the combination

Similar distribution plots are possible for the negative SET deviations. The negative deviations are limited to the 1V nominal resistor voltage. A negative deviation distributions plot is shown in Figure 4 for the ISL70591SEH. Again, the LET influences the maximum deviations seen as gold produces the largest maximum deviation (634mV), while neon produces the smallest maximum deviation (121mV).

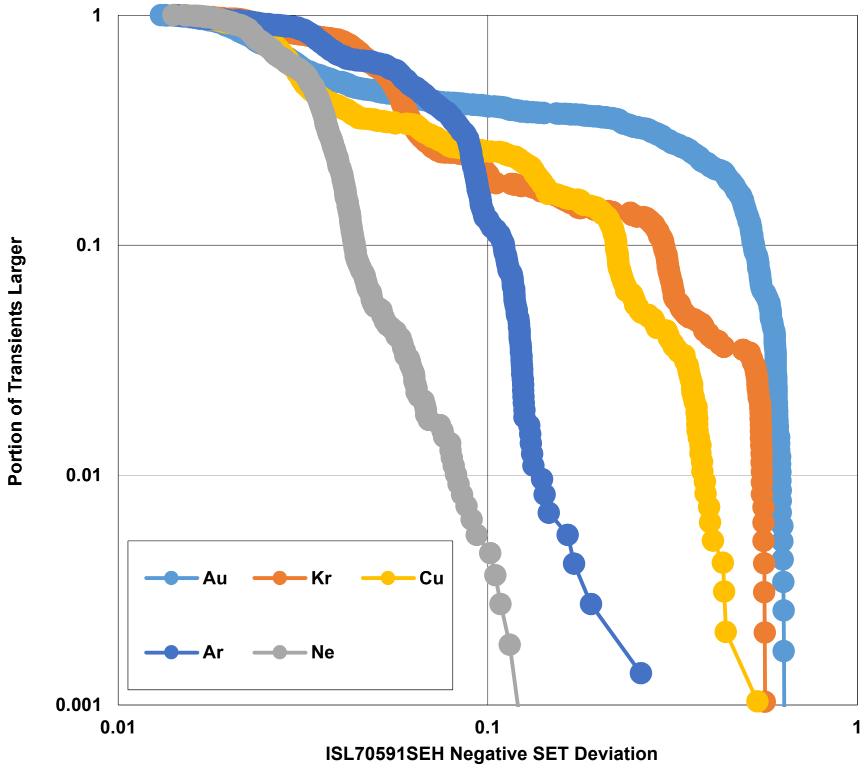

Figure 4. Distributions of the ISL70591SEH negative SET magnitudes across a 10kΩ series resistor (1V nominal on the resistor) with a 35V bias on the combination

The distributions of negative SET magnitudes for the ISl70592SEH are shown in Figure 5. The distributions for the ISL70592SEH are consistently larger than for the ISL70591SEH shown in Figure 4 on page 10.

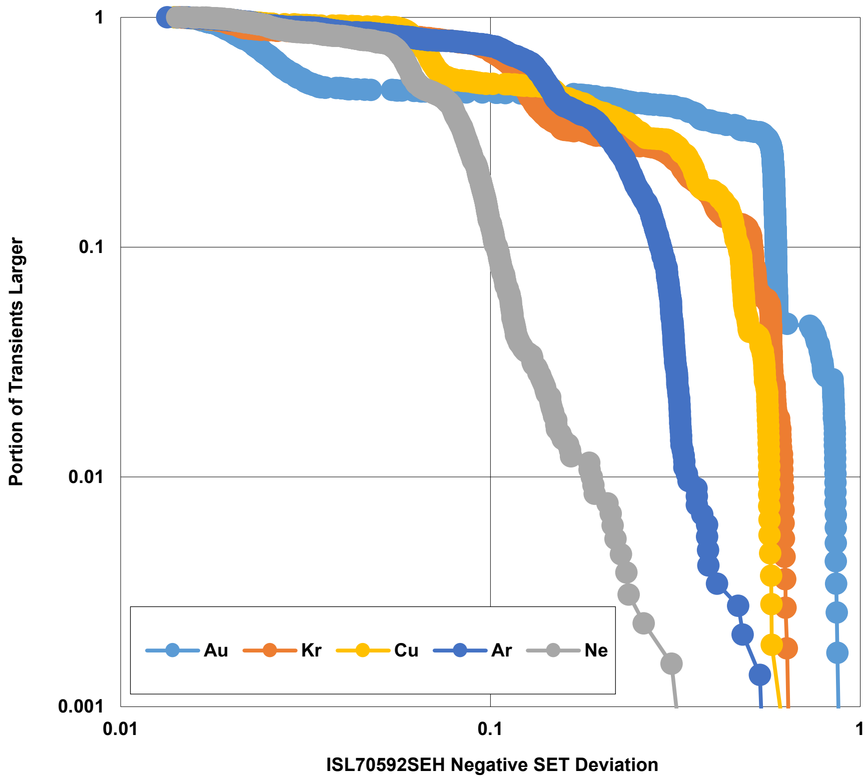

Figure 5. Distributions of the ISL70592SEH negative SET magnitudes across a 1kΩ series resistor (1V nominal on the resistor) with a 35V bias on the combination

The data provided so far does not address the SET durations or the form of the SET. To provide useful information, some composite plots of the actual SET waveforms for gold irradiation are provided in Figures 6 and 7. These plots are composites of the twenty largest positive SET, the twenty largest negative SET, and the twenty longest duration SET for a particular DUT irradiated with gold. The plots provide a worst case envelope for what an SET looks like for ions of high LET.

The gold SET for the ISL70591SEH, shown in Figure 6, show an abrupt onset for positive SET and a recovery with a time constant of about 25µs. The recoveries of positive SET are almost totally complete at 90µs, the end of the SET capture time range. The negative SET have a more gradual onset, reaching the largest deviation at about 20µs. The recovery from the negative SET appears to be of a similar time constant to the recovery from positive transients. The evidence implies that recovery from an SET due to gold should be complete by 125µs.

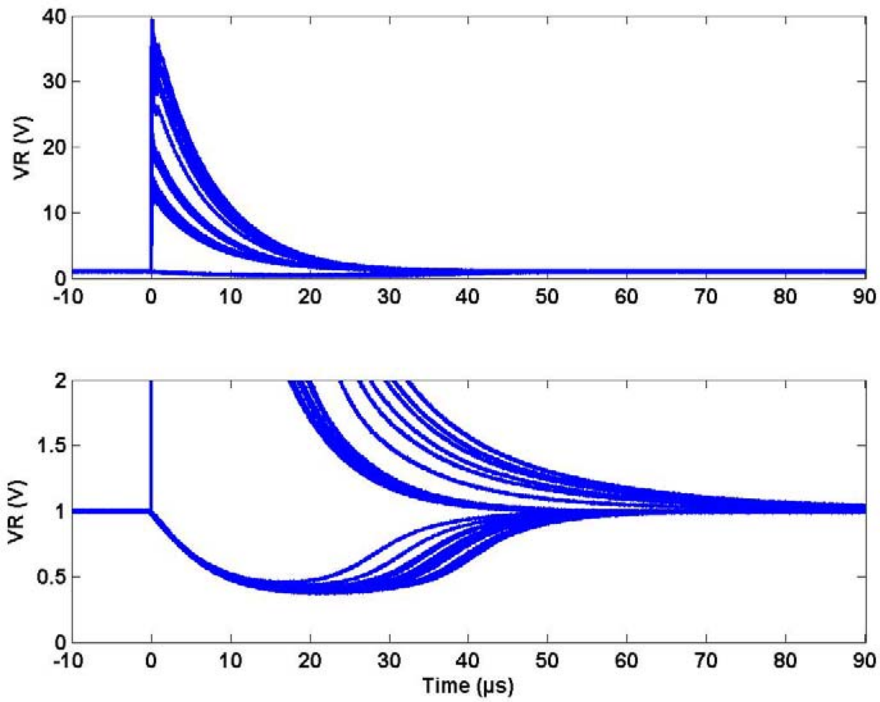

Figure 6. Composite plot of the twenty largest positive, twenty largest negative, and twenty longest duration SET captured for DUT5 of the ISL70591SEH with gold irradiation

The SET due to gold for the ISL70592SEH, shown in Figure 7, are qualitatively different from the SET for the ISL70591SEH. All the events are basically recovered in 50µs. The recoveries of positive-going SET seem to include excursions into negative deviations. Conversely, some negative-going deviations lead to subsequent small positive going deviation periods. Some negative SET appear to be solely negative deviations.

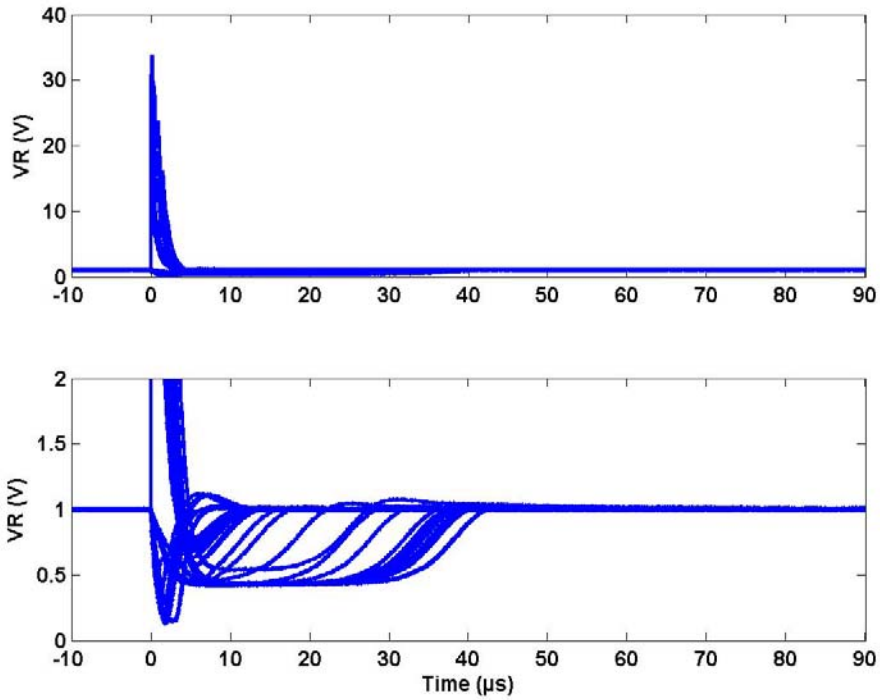

Figure 7. Composite plot of the twenty largest positive, twenty largest negative, and twenty longest duration SET captured for DUT5 of the ISL70592SEH with gold irradiation

6. Discussion and Conclusions

The ISL70591SEH and ISL70592SEH were immune to destructive SEE when tested at a supply voltage of 35V, at a case temperature of +125°C, and irradiated with normal incidence gold for an LET of 86MeV•cm^2/mg to a fluence of 1x10^{7}ion/cm^2 on each of four parts for each part type. Catastrophic failures were seen for the ISL70591SEH when tested at bias voltages of 36V and 37V. Parametric failures (delta in excess of ±0.5%) were seen on the ISL70592SEH at 37V and 38V. The destructive SEE testing data is presented in Tables 1 and 2.

When defined as voltage deviations larger than 10mV on the series resistor delivering a nominal drop of 1V, the SET proved to be quite common, even when tested with neon (2.7MeV•cm^2/mg). With neon and a bias of 35V, the ±10mV SET cross sections averaged 1.02x10^{-4}cm^2 and 3.20x10^{-4}cm^2 for the ISl70591SEH and ISL70592SEH, respectively. The average cross sections for neon were 1.55x10^{-4}cm^2 and 3.13x10^{-4}cm^2, respectively, for the 4V bias condition. For gold irradiations at 35V bias, the respective average cross sections for ±10mV SET were 1.52x10^{-3}cm^2 and 1.54x10^{-3}cm^2. At a 4V bias and gold irradiations the respective average cross sections for ±10mV SET were 1.36x10^{-3}cm^2 and 1.28x10^{-3}cm^2.

The distributions of the SET magnitudes are presented in Figures 2 through 5. These plots give the portion of the SET population that register SET magnitudes larger than a given magnitude. This allows insight into the distribution of the SET magnitudes and the relative cross sections for a particular magnitude SET. For example, with reference to Figure 2, approximately 4% of the total positive SET population with gold registered SET magnitudes larger than 10V. This puts the cross section for 10V gold events at 4.24x10^{-5}cm^2 when the 1.06x10^{-3}cm^2 total positive cross section is applied from Table 5. A similar calculation predicts that the cross section for positive gold events greater than 100mV is 46% of the 1.06 x 10^{-3}cm^2 or 4.88 x 10^{-4}cm^2.

The durations of SET are bounded by the forms depicted in Figure 6 on page 12 for the ISL70591SEH and Figure 7 on page 13 for the ISL70592SEH. In the former case, the longest SET seen for gold irradiations on the ISL70591SEH recovered in 125µs. The latter case indicates the longest gold SET on the ISL70592SEH recovered in 50µs. These represent the worst case SET durations seen in testing.

7. Revision History

Date	Rev.	Description
May 25, 2018	0.00	Initial release

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