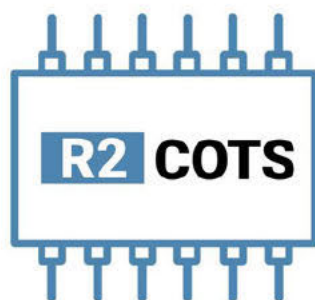


Total Ionizing Dose

TEST REPORT



[REDACTED]
(DC23XX)

From
[REDACTED]

Abstract

The main objective of this test was to evaluate the sensitivity of the [REDACTED], a 1 Mb Ultra-Low Power Serial SRAM versus TID.

The irradiation was performed at Montpellier, up to 100 krad at low dose rate (150 rad/h).

The part number selection and all of the data included in this report are the intellectual property of TRAD

1. INTRODUCTION

This Total Ionizing Dose (TID) report describes the testing and characterization of the [REDACTED] manufactured by [REDACTED] for 23XX project.

2. DOCUMENTS

2.1. Reference documents

[RD1] Basic specification: ESCC No. 22900

[RD2] Data-sheet: [REDACTED] September, 2013 – Rev. 0

3. PART INFORMATION

3.1. Identification

Designation	[REDACTED]
Manufacturer	[REDACTED]
Function	1 Mb Ultra-Low Power Serial SRAM

3.2. Procurement information

Package	TSSOP-8
Date code	23XX
Number of tested samples	6 irradiated samples + 1 reference sample

4. DOSIMETRY AND IRRADIATION FACILITY

4.1. Irradiation time log

Total dose limit (krad)	50						
Levels for measurements (krad)	5	10	15	20	30	40	50
Irradiation facility Temperature (°C)	20	20	20	20	20	20	20
Dose rate (rad/h)	150						

4.2. Annealing time log

Annealing at 25 °C	24 hours
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Annealing at 100 °C	168 hours
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Bias setup

All irradiated samples are biased under the following conditions. One sample is not biased and not irradiated to act as a *REFERENCE*.

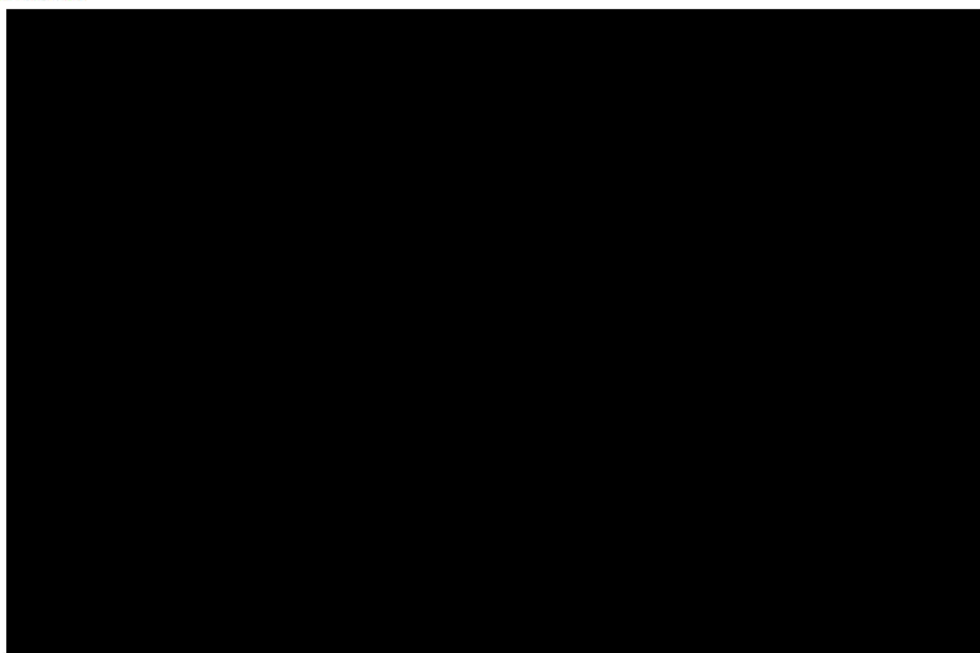
4.3. Samples distribution

	Reference	Samples irradiated					
TRAD marking	1	2	3	4	5	6	7
Bias mode	REF	ON			OFF		

Marking 1-bis: 2nd measurement of the Reference after the irradiated samples.

4.4. Bias condition during irradiation and annealing

4.4.1. ON Mode



4.4.2. OFF Mode

All pins are grounded.

5. TEST SETUP

All the parameters specified in the applicable ITP are measured on the *REFERENCE* and irradiated samples. The *REFERENCE* is measured before and after irradiated samples at each step.

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5.1. Test parameters

PARAMETERS	SYMBOLS	TEST CONDITIONS
Typical values are measured at VCC = VCC Typ., TA = 25°C and are not 100% tested.		
Supply Current (Read Mode)	ICCR	f = 20 MHz, IOUT = 0, SPI / DUAL
Supply Current (Write Mode)	ICCW	
Standby Current	ICCSB	CS = VCC, VIN = VSS or VCC
Functional test	FT	

6. NON CONFORMANCE

Test and measurement conditions were nominal.

7. RESULTS

7.1. Presentation of the results

For each parameter:

- The measurements performed at each irradiation step are registered in a table.
- Drifts between each measurement step and the "0" krad step are computed using the following formulas:
 - For the CTR and the Hfe parameters, the formula used is:

$$\frac{1}{\Delta(\text{parameter})} = \frac{1}{\text{measurement}(X\text{krad})} - \frac{1}{\text{measurement}(0\text{krad})}$$

- For other parameters, the formula used is:

$$\Delta(\text{parameter}) = \text{measurement}(X\text{krad}) - \text{measurement}(0\text{krad})$$

Where X stands for each measurement step.

- The statistical data are also computed per bias (Average data [Avg], standard deviation [s], and [Avg]±3.[s]). (Average data [Avg], corrected sample standard deviation [s], and [Avg]±K.[s] where K is the one-sided tolerance limit).

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8. CONCLUSION

The total dose steady-state irradiation test using gamma rays from Cobalt 60 source has been carried out on [REDACTED], a 1 Mb Ultra-Low Power Serial SRAM from [REDACTED] up to 100 krad at low dose rate (150 rad/h).

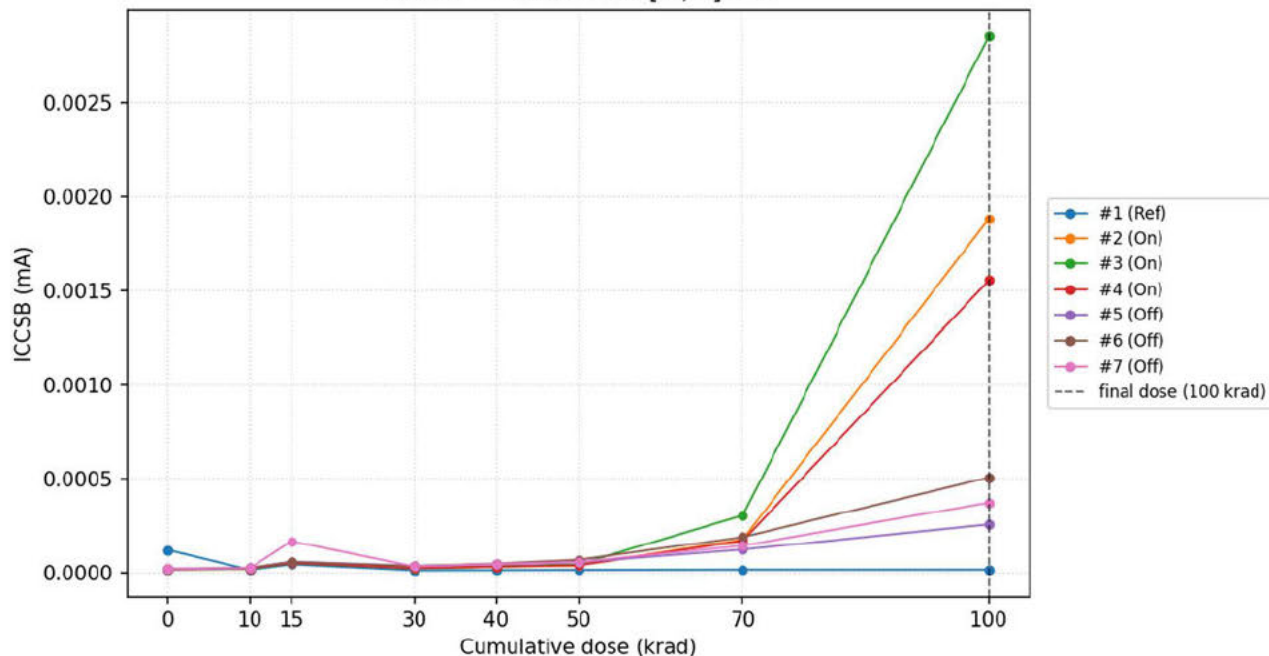
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9. APPENDIX 1 MEASURED

ICCSB

CS = VCC, VIN = VSS or VCC

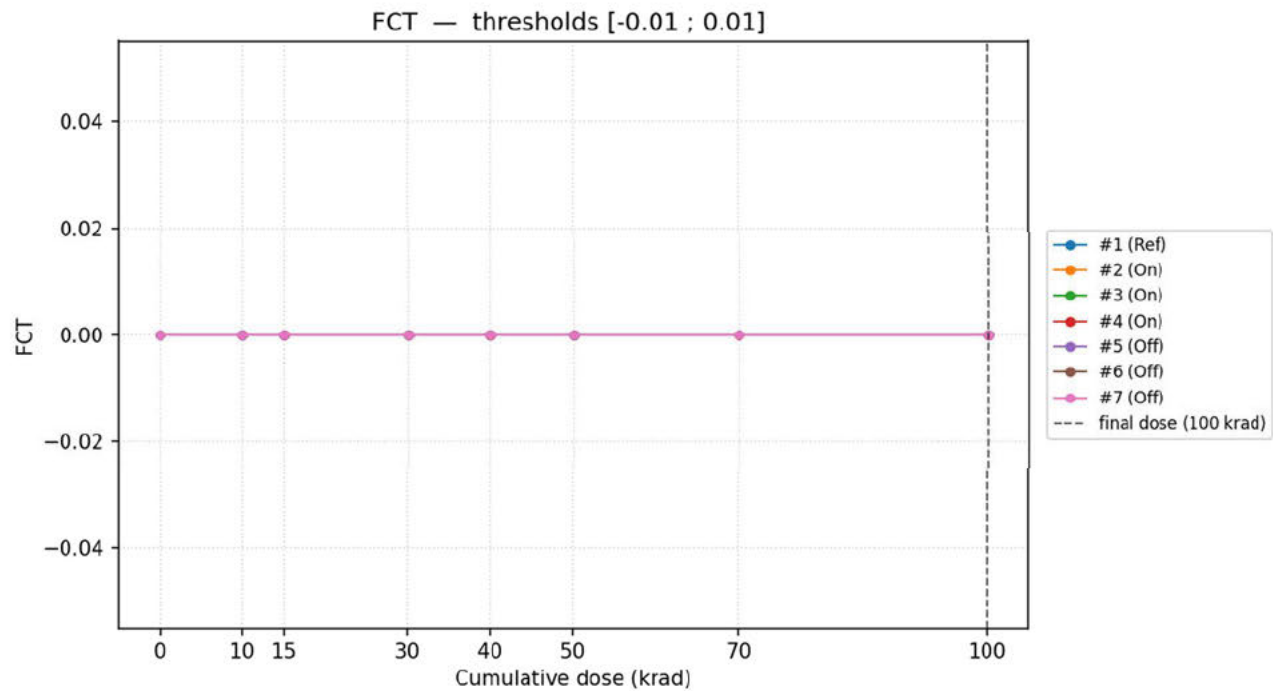
ICCSB — thresholds [0 ; 5] mA



	Dose (krad)							
	0	10	15	30	40	50	70	100
#1 (Ref)	1.20e-04	1.52e-05	4.46e-05	1.29e-05	1.42e-05	1.52e-05	1.67e-05	1.69e-05
#2 (On)	2.07e-05	2.21e-05	5.57e-05	2.44e-05	3.15e-05	4.01e-05	1.76e-04	1.88e-03
#3 (On)	1.75e-05	1.98e-05	5.14e-05	2.37e-05	3.28e-05	4.40e-05	3.05e-04	2.85e-03
#4 (On)	1.82e-05	2.18e-05	5.18e-05	2.46e-05	3.28e-05	3.93e-05	1.69e-04	1.55e-03
#5 (Off)	2.18e-05	2.54e-05	5.86e-05	3.65e-05	4.48e-05	5.55e-05	1.23e-04	2.57e-04
#6 (Off)	1.79e-05	2.48e-05	5.73e-05	3.52e-05	4.85e-05	6.85e-05	1.89e-04	5.07e-04
#7 (Off)	1.89e-05	2.44e-05	1.67e-04	3.35e-05	4.63e-05	5.71e-05	1.44e-04	3.73e-04

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FCT



	Dose (krad)							
	0	10	15	30	40	50	70	100
#1 (Ref)	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
#2 (On)	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
#3 (On)	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
#4 (On)	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
#5 (Off)	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
#6 (Off)	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
#7 (Off)	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00

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