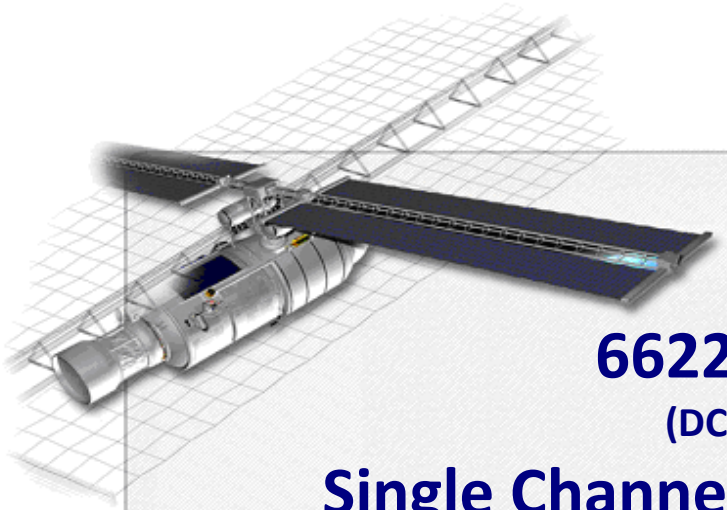
TOTAL IONIZING DOSE TEST REPORT



66224-105

(DC1038)

Single Channel Optocoupler

From

MICROPAC

TRAD/TE/66224/XXX1/ESA/YP/1104		Labège, April 19th, 2012
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Issue : 0		
To: Marc POIZAT	Project/Program:	ESA Contract N°4000102571/10/NL/AF-Radiation Characterization of Laplace RH optocouplers, sensors and detectors

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1 INTRODUCTION

This report includes the test results of 66224-105, a Single Channel Optocoupler from MICROPAC to evaluate Total Ionizing Dose (TID) effects under ^{60}Co irradiation. Between November 2011 and February 2012, TRAD characterized this device for TID sensitivity at the UCL Facility, Belgium using their Gamma irradiation Facility.
The objectives of the test are:

- to detect and measure the degradation of device parameters as a function of TID,
- to determine if device parameters are within specified limits after exposure to final TID level.

2 DOCUMENTS

2.1 Applicable Documents

AD	1.	ESA contract	N°4000102571/10/NL/AF-Radiation Characterization of Laplace RH optocouplers, sensors and detectors
AD	2.	Irradiation Test Plan	TRAD_ ITP-TE-66224-MIC-ESA-1115, Iss.2, 16/06/11

2.2 Reference Documents

RD	1.	Datasheet 66224	PROTON RADIATION TOLERANT OPTOCOUPLER (Single Channel, Electrically Similar to 4N49) dated 29/09/2010
RD	2.	Manufacturer's certificate of traceability and conformance dated 25/07/2011	

3 DEVICE INFORMATION

3.1 Device description

The 66224 device is a single channel (electrically similar to 4N49) optocoupler (850 nm LED, "40 x 40" phototransistor) encapsulated in a hermetically sealed 6 pin leadless chip carrier (LCC). It contains an 850nm LED optically coupled to a silicon planar phototransistor.
This product has been designed to be more tolerant to proton radiation.

Type	66224-105
Manufacturer	MICROPAC
Function	Optocoupler
Package	LCC6
Date Code	1038
Sample size	16 parts (15 + 1 control sample)

3.2 Procurement information

75 parts reference 66224-105 were delivered by MICROPAC through the French distributor ISOTOPE ELECTRONICS.

Their quality level defined by the 105 extension number which corresponds to a commercial standard operating in the temperature range of -55° to +125°C and screened to JANTXV level by the manufacturer prior delivery. Parts were delivered separated in two lots from two different date-codes (25 pcs: 66224-105 DC1038 and 53 pcs DC1111) and together with a Certificate of Conformance [RD2]. Only parts from DC1038 were used for this irradiation test sequence.

3.3 External view

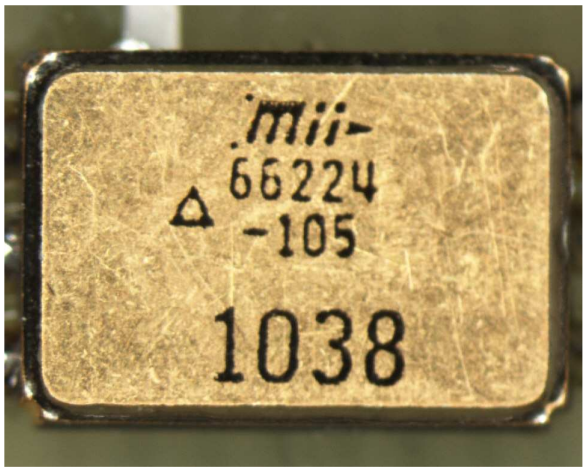


Figure 1: package marking

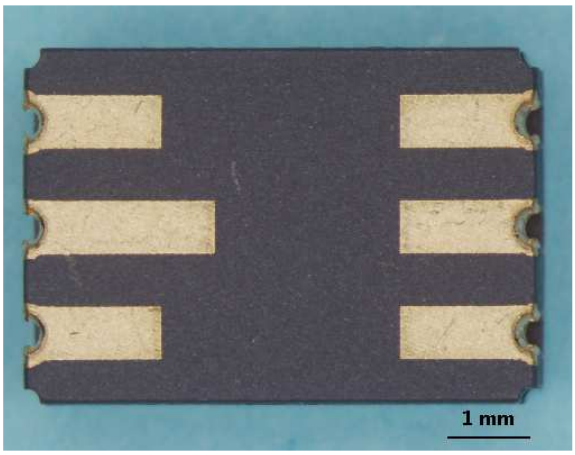


Figure 2: package back side

3.4 Internal view

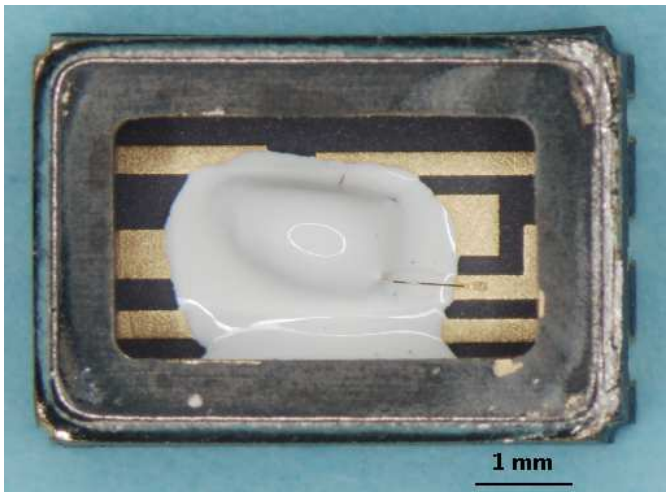


Figure 3: Internal view

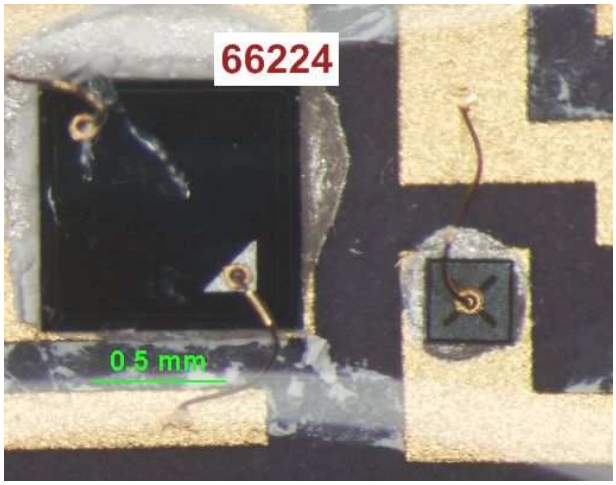


Figure 4: photodetector and LED view

3.5 Serialization

Each part is serialized to enable pre and post test identification and comparison. Control part is identified N°1.

Serial Number	Control sample	Test samples														
Serialization	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Ref	Bias1	Bias1	Bias1	Bias1	Bias1	Bias2	Bias2	Bias2	Bias2	Bias2	OFF	OFF	OFF	OFF	OFF

4 IRRADIATION MEANS AND CONDITIONS

4.1 UCL irradiation facility (Belgium)

Gamma irradiations are performed with Cobalt 60 source.
Gamma emitted radiation energies are 1.17 and 1.33 MeV.
Dose rates is equal 15 kRad(Si) / h at the source centre .
Moreover the irradiation chamber is a cylindrical room with a radius of 2m.
Then dose rate usable vary from 1.8 kRad(Si) / h to 80 Rad(Si) / h for normal irradiation positions and direct field.

4.2 Dose measurement

Alanine dosimeters are used for each test set up to control Total Ionizing Dose.

4.3 Experimental conditions

An Accumulated dose of 200 krad(Si) of ^{60}Co is required [AD2] for this TID (Total Ionizing Dose) evaluation test.
Following steps were planned to determine the component degradation under ^{60}Co irradiation and devices were exposed to the following dose rates:

	Step1	Step2	Step3	Step4	Step5	Step6	Step7	Step8
Accumulated dose krad(Si)	10	20	50	74	102	123	152	203
Dose rate (Si)/h	36	36	36	36	310	310	310	310

Two annealing steps are performed after ^{60}Co irradiation:

Duration (h)	24	168
Temperature (°C)	25	100

5 ELECTRICAL TESTS

Electrical parameters to be measured in pre and post exposure tests are described in the following table. Electrical tests are performed on each part using the test set-up hereunder. All required data are recorded for each device. Test conditions and limits are given in the applicable irradiation test plan [AD2] and shown hereafter.

5.1 Test set-up

TEST BOARD	TRAD/CT1/E/OPTO/ZIP14/BR/1108
TEST PROGRAM	66224_TE_XXX1_B1_V10.llb 66224_TE_XXX1_B1_V20.llb

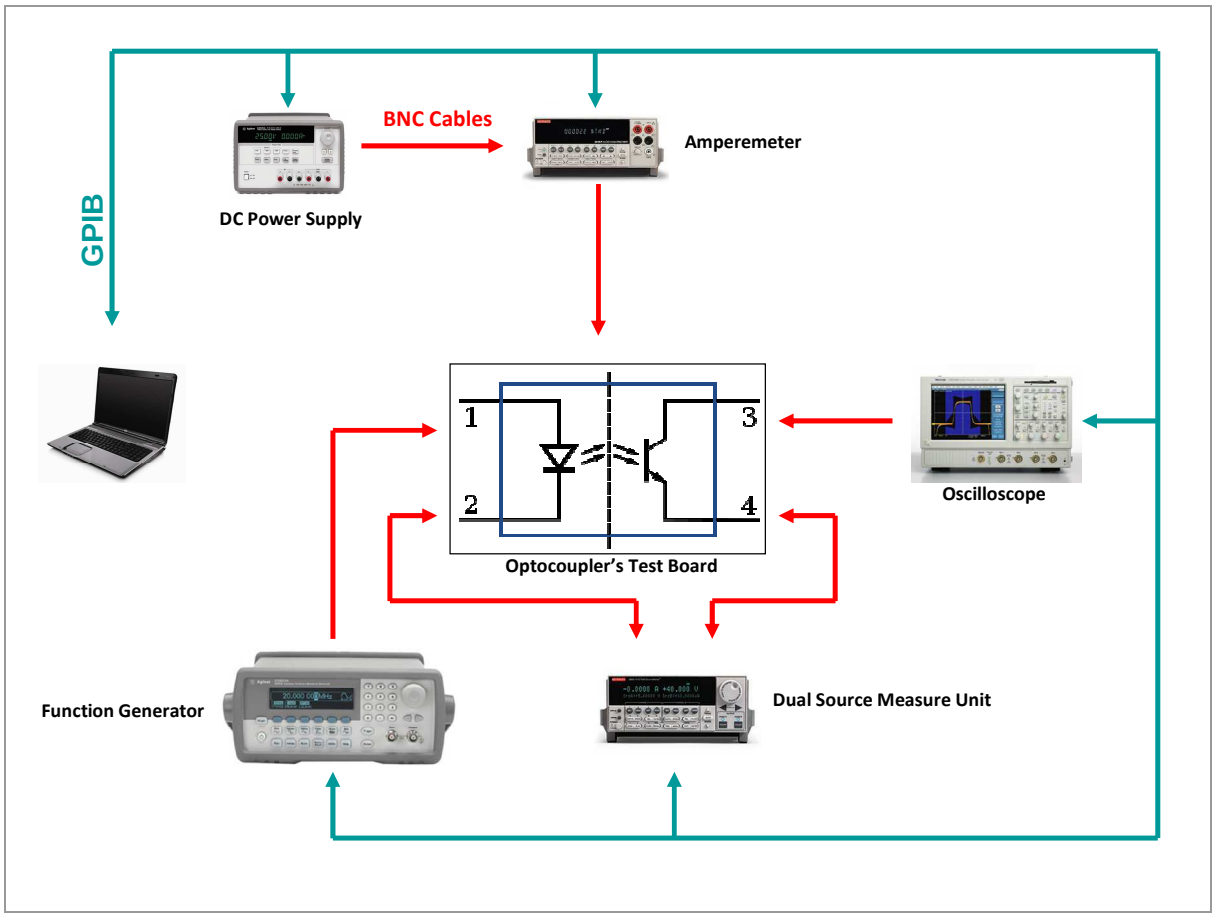


Figure 5: test principle

5.2 Test configuration

Samples were exposed to irradiation in three different modes - two on-modes (Figure 7 and Figure 8) and one in off-mode (all terminal leads short-circuited) –

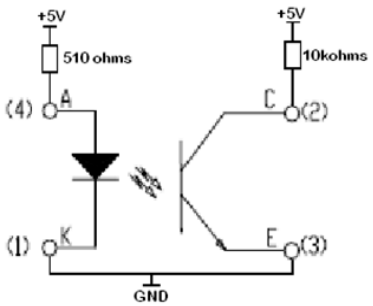


Figure 6: ON bias1

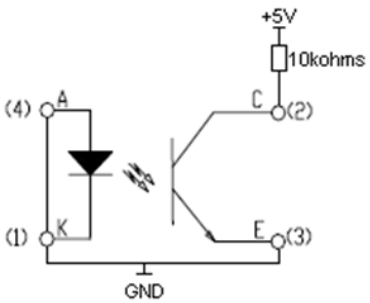


Figure 7: ON bias2

5.3 Electrical parameters

PARAMETER	SYMBOL	TEST CONDITION	MIN	MAX	UNIT
Input Diode Static Reverse Current	I_R	V_R = 6 V		8	µA
Input Diode Static Forward Voltage	V_F	I_F = 10 mA		1,6	V
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	I_C = 100 µA, I_B = 0, I_F = 0	45		V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C = 1 mA, I_B = 0, I_F = 0	40		V
Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	I_C = 0 mA, I_E = 100 µA, I_F = 0	5		V
Off-State Collector Current	I_{CEO}	V_{CE} = 20 V, I_F = 0 mA, I_B = 0		100	nA
On State Collector Current	$I_{C(ON)}$	V_{CE} = 5 V, I_F = 1 mA, I_B=0 *	2		mA
Rise Time- Phototransistor Operation	tr1	V_{CC}=10V,I_F=5mA, R_L=100Ω, I_B=0		25	µs
Fall Time-Phototransistor Operation	tf1	V_{CC}=10V,I_F=5mA, R_L=100Ω, I_B=0		25	µs
Rise Time-Photodiode Operation	tr2	V_{CC}=10V,I_F=5mA, R_L=100Ω, I_E=0		3	µs
Fall Time-Photodiode Operation	tf2	V_{CC}=10V,I_F=5mA, R_L=100Ω, I_E=0		3	µs
Current Transfer Ratio	CTR1	V_{CE} = 5V, I_F = 1mA	200		%
	CTR2	V_{CE} = 5V, I_F = 2mA			%
	CTR3	V_{CE} = 5V, I_F = 10mA			%
	CTR4	V_{CE} = 5V, I_F = 50mA			%
	CTR5	V_{CE} = 30V, I_F = 5mA			%
Input Diode Reverse Recovery Time	Trr	If=5mA,RL=100Ohms,Irec=10% Irm			ns

(*)This parameter must be measured using pulse techniques (tW = 100 µs duty cycle < 1%).

Min/ Max values are those specified in the reference data-sheet [RD1].

Test measurements are performed at 25°C ± 10°C.

6 TEST HISTORY

Initially, 7 steps were planned for this test sequence, as described hereunder:

	Step1	Step2	Step3	Step4	Step5	Step6	Step7
Accumulated dose krad(Si)	10	20	50	100	120	150	200
Dose rate (Si)/h	36	36	36	36	310	310	310

Due to irradiation facility maintenance, tests were stopped for 48 hours between Step 3 and Step 4 (50 krad(Si) and 100 krad(Si). Total Ionizing Dose was estimated to 74 krad(Si).
During this time period, parts were stocked in a cold chamber at -30°C.

7 SUMMARY RESULTS

Only parameters with applicable test limits are shown hereunder.

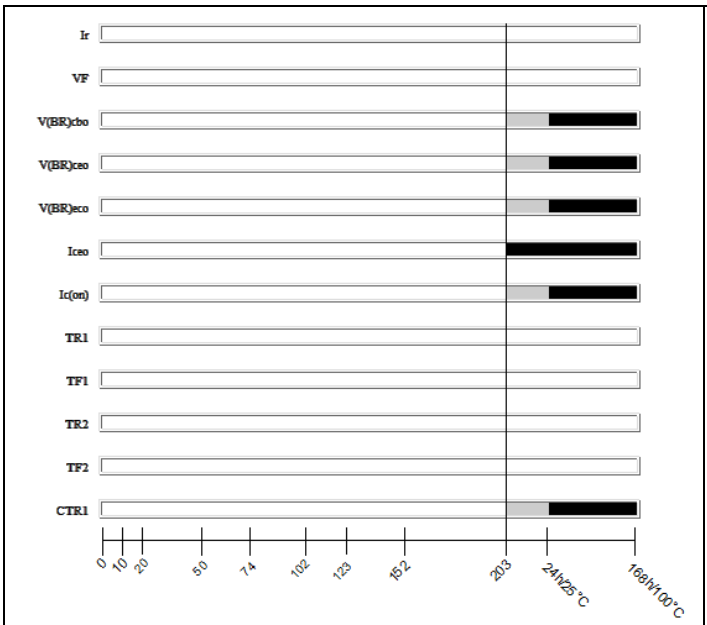


Figure 8: ON Bias 1

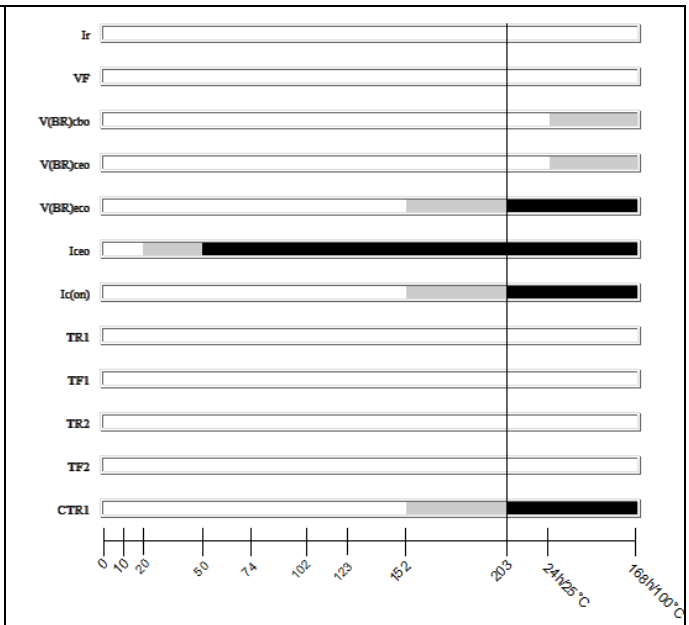


Figure 9: ON Bias 2

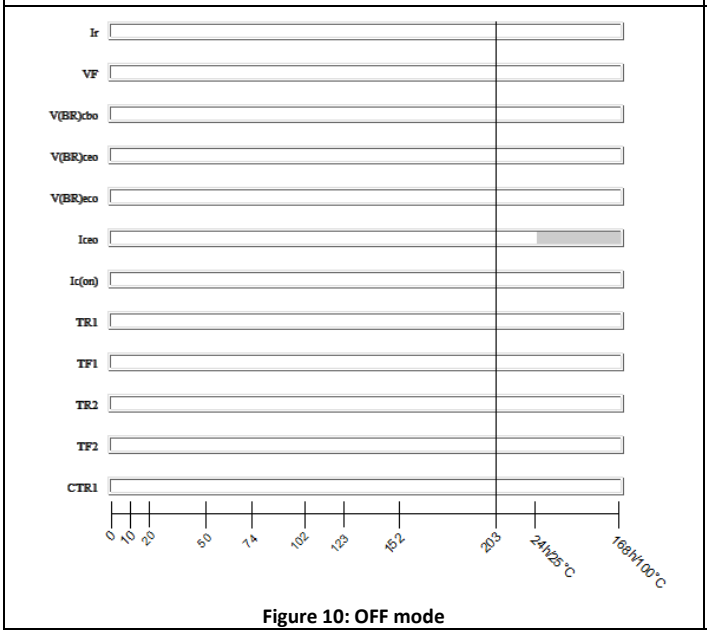
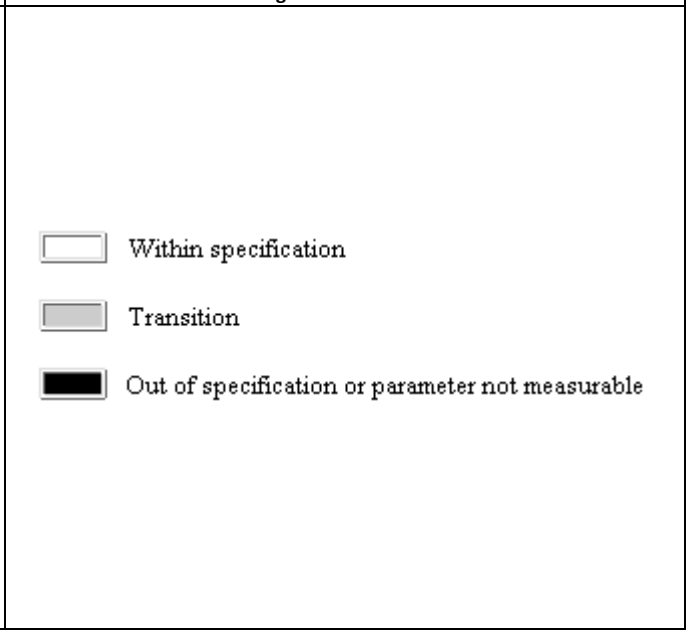


Figure 10: OFF mode



ON Bias 1 condition:

- Iceo is not measurable after 24 hours of annealing at 25°C. Indeed the measured current at this step is higher than 10µA (test equipment limit).
- V(BR)eco, V(BR)cbo, V(BR)ceo, Ic(on) and CTR1 are out of specification after 24 hours of annealing at 25°C.

ON Bias 2 condition:

- Iceo is out of specification at 22.0 krad(Si) by interpolation.
- V(BR)eco is out of specification at 173.4 krad(Si) by interpolation
- Ic(on) is out of specification at 192.9 krad(Si) by interpolation

- CTR1 is out of specification at 193.7 krad(Si) by interpolation
- V(BR)cbo and V(BR)ceo are out of specification after 168 hours of annealing at 100°C.

With OFF mode:

- Iceo is out of specification after 168 hours of annealing at 100°C.

Parameters without applicable test limits and which are not measurable are shown hereunder:

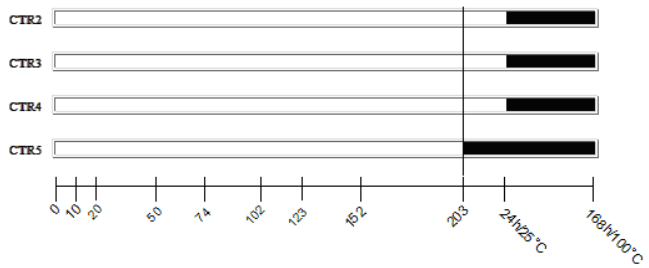


Figure 11: ON Bias 1

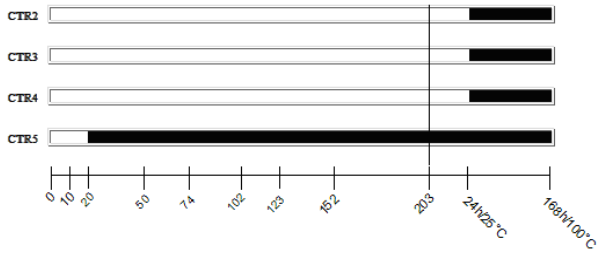


Figure 12: ON Bias 2

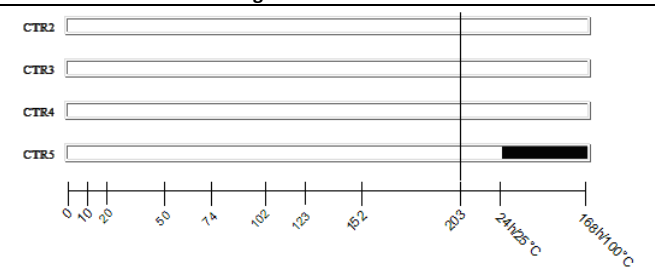
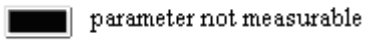


Figure 13: OFF mode



With ON Bias 1 condition:

- CTR2, CTR3 and CTR4 are not measurable after 168 hours of annealing at 100°C.
- CTR5 is not measurable after 24 hours of annealing at 25°C.

With ON Bias 2 condition:

- CTR2, CTR3 and CTR4 are not measurable after 168 hours of annealing at 100°C.
- CTR5 is not measurable at step 50.0 krad(Si)

With OFF mode:

- CTR5 is not measurable after 168 hours of annealing at 100°C.

As shown in Figure 14, Figure 15 and Figure 16, only three devices are out of specification for Vcb0, Vce0 and Vec0:

- device N°3 (ON Bias1)
- device N°6 (ON Bias1)
- device N°8 (ON Bias2)

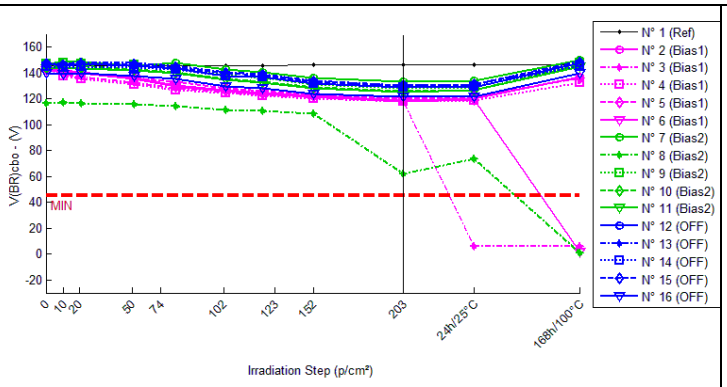


Figure 14: Vcb0 function total ionizing dose

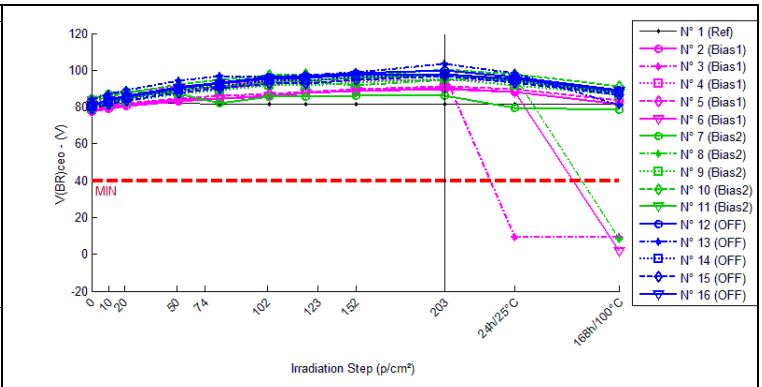


Figure 15: Vce0 function total ionizing dose

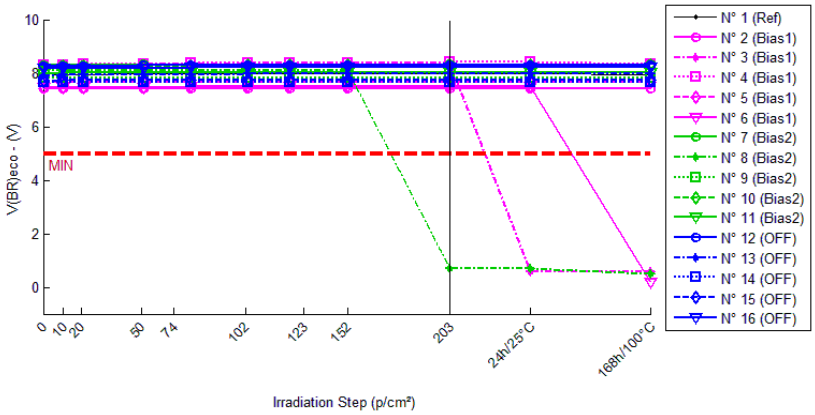


Figure 16: Vec0 function total ionizing dose

Then if test condition cannot be applied (cf. Vceo and Vcbo), Ic(on) and CTRs parameters are then no more measurable.

PARAMETER	SYMBOL	TEST CONDITION
On State Collector Current	$I_{C(ON)}$	V_{CE} = 5 V, I_F = 1 mA, I_B=0
Current Transfer Ratio	CTR1	V_{CE} = 5V, I_F = 1mA
	CTR2	V_{CE} = 5V, I_F = 2mA
	CTR3	V_{CE} = 5V, I_F = 10mA
	CTR4	V_{CE} = 5V, I_F = 50mA
	CTR5	V_{CE} = 30V, I_F = 5mA

8 CONCLUSION

Total Ionizing Dose steady-state irradiation test using Gamma ray has been applied on three bias condition on **66224,** a **Single Channel Optocoupler** from **MICROPAC** up to 200krad(Si).

The results indicate that:

- With ON Bias 1 condition, devices are functional up to 203 krad(Si)
- With ON Bias 2 condition, devices are functional up to 19 krad(Si)
- With OFF mode, devices are out of specification after 168 hours of annealing at 100°C.

However, components N°3, N°6 and N°8 are more sensitive. Indeed, ON Bias1 and ON Bias 2 conditions, all other devices are within specifications at total dose level and after annealing steps.
This sensitivity difference cannot be explained by a disparity in the date code as all tested devices come from the same lot DC1038.

- Average drift current transfer ratio are described in next Figure function of the Bias condition and CTR configuration.

Figure 17 represents average drift CTR with all tested devices.
Figure 18 represents average drift CTR without component N°3(ON Bias1) and N°8(ON Bias2). Moreover device N°6 (ON Bias1) is not measurable at 203krad and after annealing.

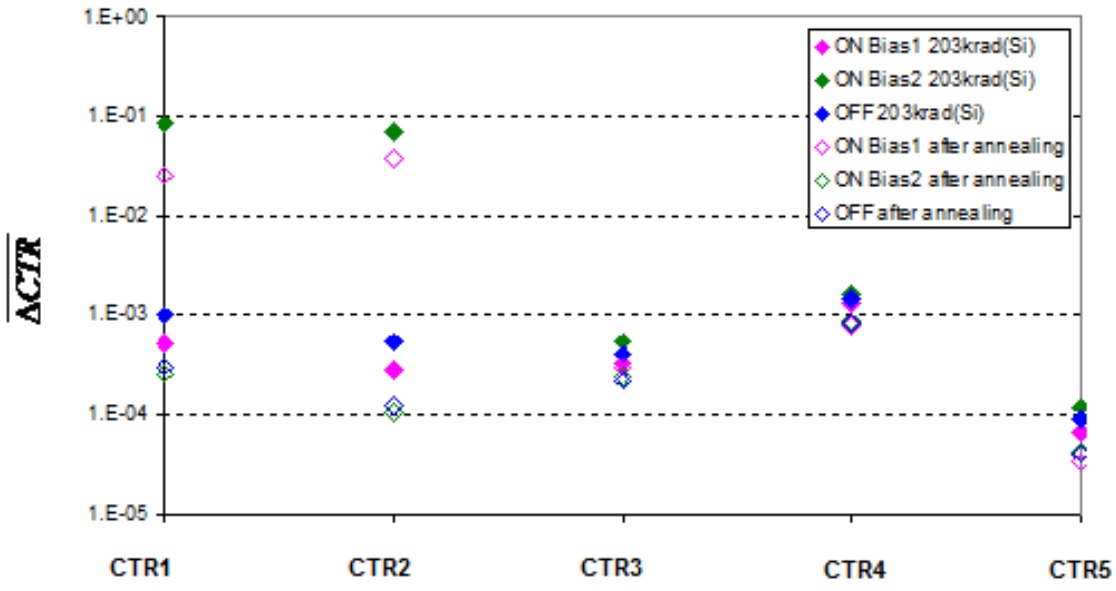


Figure 17: average drift CTR (all tested devices)

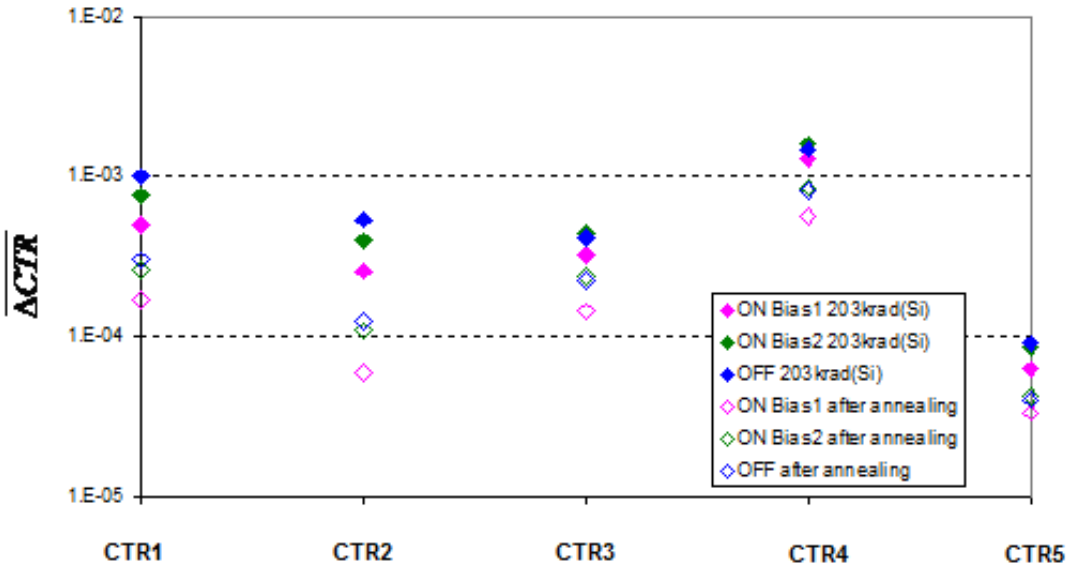


Figure 18: average drift CTR without component N°3(ON Bias1) and N°8(ON Bias2)

As shown in Figure 17 and Figure 18, device N°3(ON Bias1) and N°8(ON Bias2) have a high impact on CTR1 and CTR2 average.

Without considering device N°3(ON Bias1) and N°8(ON Bias2) :

- CTR5 configuration (V_{CE} = 30V, I_F = 5mA) is the least sensitive configuration at 203 krad(Si) total dose.
- Conversely, CRT4 configuration (Vce = 5V; If = 50 mA) exhibits the greatest parameter degradation up to 203krad (Si) total dose.
- The least sensitive configuration for all CTR configuration up to 203krad (Si) total dose is ON Bias1.
- OFF mode is the most sensitive configuration.

Moreover CTR1 (Vce = 5V; If = 1 mA), which is the only CTR configuration for which specification limits are indicated in the data-sheet, is out of limit at step 49 krad(Si) under ON Bias2 configuration.

As shown in previous figures, after annealing, average drift Current Transfer Ratio decrease.

9 DETAILED TESTS RESULTS

The pre and post radiation test results are shown graphically in the following pages (9-2 to 9-35). The data is displayed in the following tables and graphs.

These graphs show parameter's shifts observed during the total ionizing dose sequence. The Control sample results are shown on each graph (black curve).

When available in the device data-sheet/specification, the maximum/minimum/typical values are also shown (red dotted line).

The tables include drift calculation between each measurement step and the "0" kRad(Si) step.

For CTR values, the formula used is:

$$\text{Drift} = \frac{1}{\text{measurement (X kRad(Si))}} - \frac{1}{\text{measurement (0 kRad(Si))}}$$

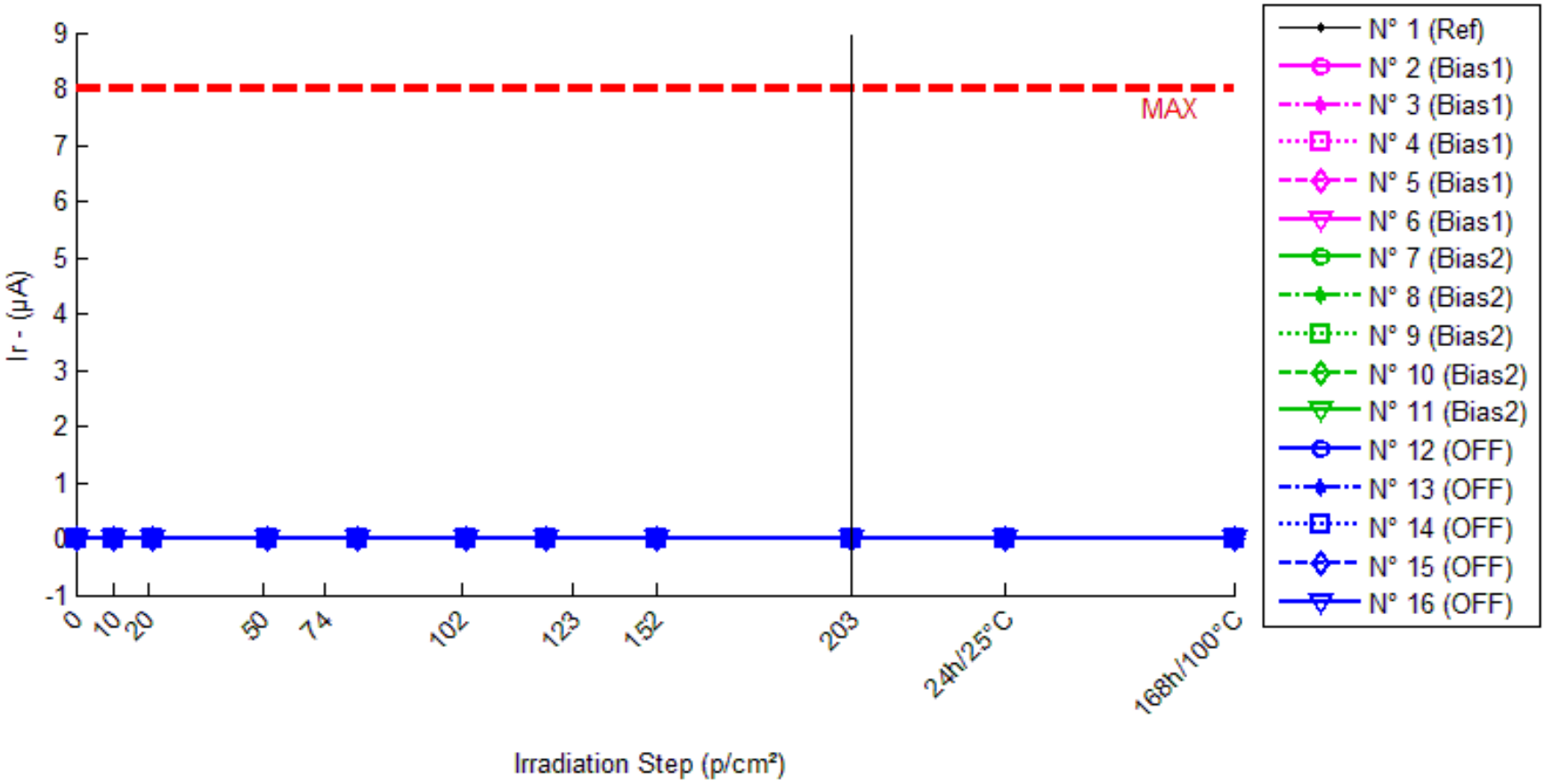
For other parameters, the formula used is:

Drift value= measurement (X kRad(Si)) - measurement (0 kRad(Si))

CONTENTS

1. Ir

Ta=25°C; Vr = 6V



Ir . (µA) **Max = 8.0**

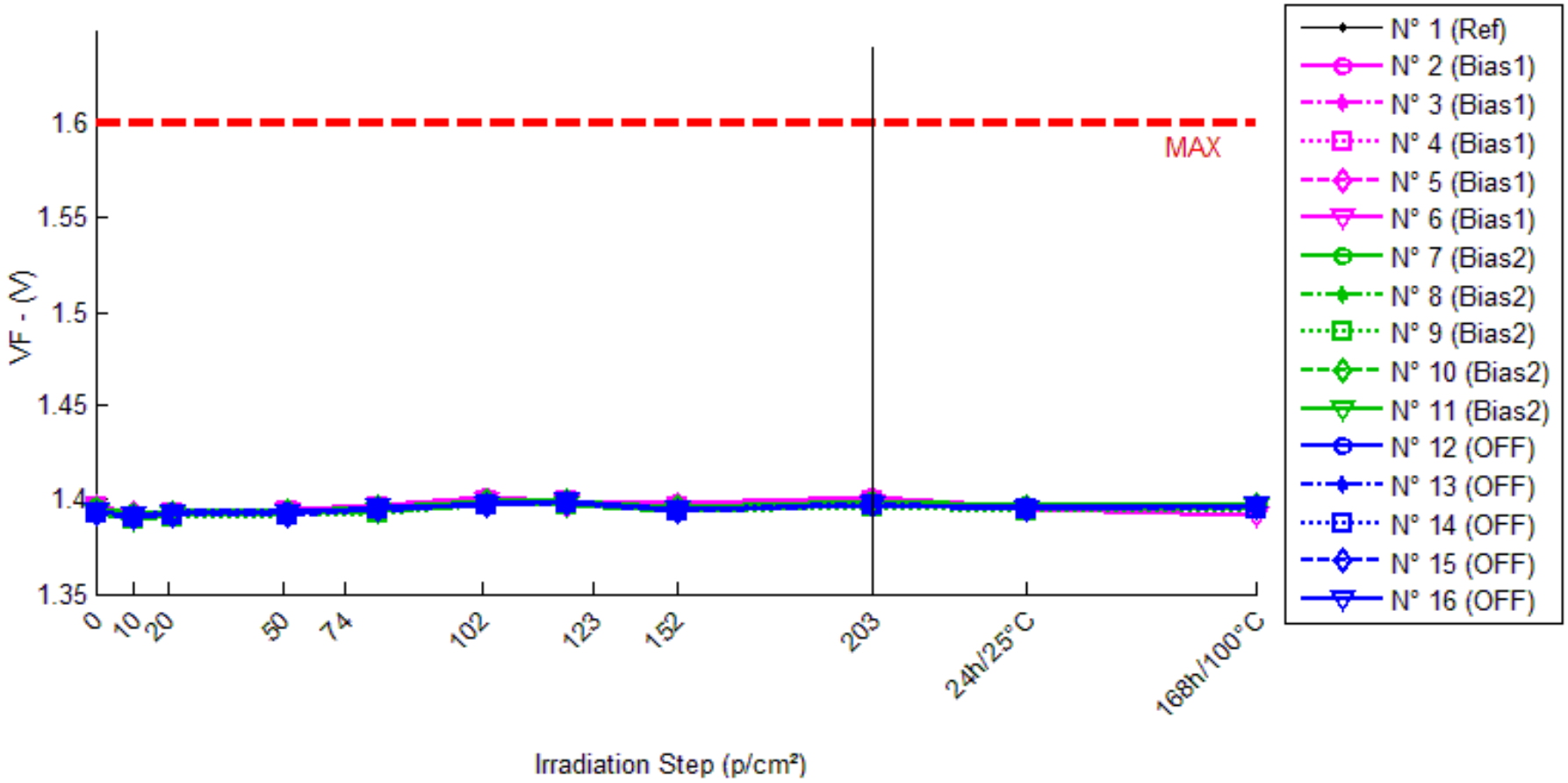
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	2.25E-4	1.56E-4	4.12E-4	1.32E-4	1.33E-4	1.42E-4	1.36E-4	1.28E-4	1.56E-4	1.32E-4	1.22E-4
N° 2 (Bias1)	2.17E-4	1.75E-4	4.92E-4	1.57E-4	1.52E-4	1.48E-4	1.48E-4	1.45E-4	1.49E-4	1.53E-4	1.41E-4
N° 3 (Bias1)	2.18E-4	1.77E-4	4.21E-4	1.57E-4	1.58E-4	1.49E-4	1.56E-4	1.56E-4	1.61E-4	1.61E-4	1.37E-4
N° 4 (Bias1)	2.24E-4	1.91E-4	3.10E-4	1.68E-4	1.62E-4	1.57E-4	1.60E-4	1.55E-4	1.68E-4	1.80E-4	1.36E-4
N° 5 (Bias1)	2.33E-4	2.06E-4	3.26E-4	2.03E-4	1.77E-4	1.80E-4	1.92E-4	1.77E-4	1.85E-4	1.86E-4	1.65E-4
N° 6 (Bias1)	2.19E-4	1.86E-4	3.02E-4	1.65E-4	1.57E-4	1.45E-4	1.66E-4	1.61E-4	1.65E-4	1.57E-4	1.53E-4
N° 7 (Bias2)	2.27E-4	1.65E-4	2.60E-4	1.44E-4	1.43E-4	1.48E-4	1.45E-4	1.41E-4	1.50E-4	1.43E-4	1.21E-4
N° 8 (Bias2)	2.36E-4	1.69E-4	3.03E-4	1.53E-4	1.49E-4	1.45E-4	1.43E-4	1.42E-4	1.61E-4	1.42E-4	1.29E-4
N° 9 (Bias2)	2.17E-4	1.50E-4	2.55E-4	1.29E-4	1.28E-4	1.29E-4	1.30E-4	1.26E-4	1.32E-4	1.26E-4	1.11E-4
N° 10 (Bias2)	2.23E-4	1.58E-4	2.54E-4	1.32E-4	1.36E-4	1.27E-4	1.35E-4	1.38E-4	1.36E-4	1.32E-4	1.19E-4
N° 11 (Bias2)	2.10E-4	1.43E-4	2.34E-4	1.23E-4	1.18E-4	1.21E-4	1.26E-4	1.20E-4	1.26E-4	1.19E-4	1.07E-4
N° 12 (OFF1)	2.57E-4	1.86E-4	2.60E-4	1.52E-4	1.49E-4	1.51E-4	1.44E-4	1.60E-4	1.50E-4	1.49E-4	1.49E-4
N° 13 (OFF1)	2.18E-4	1.48E-4	2.31E-4	1.26E-4	1.24E-4	1.22E-4	1.28E-4	1.20E-4	1.24E-4	1.22E-4	1.10E-4
N° 14 (OFF1)	2.25E-4	1.52E-4	2.41E-4	1.39E-4	1.31E-4	1.36E-4	1.37E-4	1.32E-4	1.36E-4	1.37E-4	1.22E-4
N° 15 (OFF1)	2.21E-4	1.51E-4	2.37E-4	1.36E-4	1.29E-4	1.28E-4	1.36E-4	1.33E-4	1.34E-4	1.30E-4	1.19E-4
N° 16 (OFF1)	2.32E-4	1.64E-4	2.32E-4	1.38E-4	1.46E-4	1.45E-4	1.51E-4	1.47E-4	1.47E-4	1.44E-4	1.30E-4

Delta [Ir]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-6.888E-5	1.867E-4	-9.324E-5	-9.142E-5	-8.291E-5	-8.841E-5	-9.725E-5	-6.875E-5	-9.315E-5	-1.029E-4
N° 2 (Bias1)	---	-4.158E-5	2.752E-4	-5.963E-5	-6.454E-5	-6.851E-5	-6.851E-5	-7.168E-5	-6.779E-5	-6.399E-5	-7.528E-5
N° 3 (Bias1)	---	-4.124E-5	2.028E-4	-6.082E-5	-6.005E-5	-6.931E-5	-6.178E-5	-6.149E-5	-5.709E-5	-5.667E-5	-8.107E-5
N° 4 (Bias1)	---	-3.282E-5	8.589E-5	-5.590E-5	-6.173E-5	-6.718E-5	-6.363E-5	-6.871E-5	-5.611E-5	-4.380E-5	-8.800E-5
N° 5 (Bias1)	---	-2.692E-5	9.292E-5	-2.992E-5	-5.597E-5	-5.241E-5	-4.100E-5	-5.593E-5	-4.760E-5	-4.662E-5	-6.735E-5
N° 6 (Bias1)	---	-3.232E-5	8.342E-5	-5.358E-5	-6.170E-5	-7.311E-5	-5.273E-5	-5.785E-5	-5.383E-5	-6.119E-5	-6.526E-5
N° 7 (Bias2)	---	-6.173E-5	3.295E-5	-8.309E-5	-8.401E-5	-7.940E-5	-8.207E-5	-8.625E-5	-7.754E-5	-8.465E-5	-1.059E-4
N° 8 (Bias2)	---	-6.713E-5	6.704E-5	-8.324E-5	-8.675E-5	-9.119E-5	-9.271E-5	-9.351E-5	-7.487E-5	-9.347E-5	-1.067E-4
N° 9 (Bias2)	---	-6.649E-5	3.792E-5	-8.813E-5	-8.826E-5	-8.745E-5	-8.652E-5	-9.075E-5	-8.483E-5	-9.037E-5	-1.055E-4
N° 10 (Bias2)	---	-6.508E-5	3.066E-5	-9.117E-5	-8.711E-5	-9.624E-5	-8.816E-5	-8.512E-5	-8.740E-5	-9.159E-5	-1.040E-4
N° 11 (Bias2)	---	-6.721E-5	2.362E-5	-8.717E-5	-9.161E-5	-8.903E-5	-8.391E-5	-8.983E-5	-8.379E-5	-9.153E-5	-1.026E-4
N° 12 (OFF1)	---	-7.108E-5	3.645E-6	-1.043E-4	-1.073E-4	-1.060E-4	-1.121E-4	-9.699E-5	-1.070E-4	-1.076E-4	-1.072E-4
N° 13 (OFF1)	---	-7.025E-5	1.264E-5	-9.211E-5	-9.367E-5	-9.587E-5	-9.012E-5	-9.769E-5	-9.380E-5	-9.566E-5	-1.079E-4
N° 14 (OFF1)	---	-7.235E-5	1.603E-5	-8.618E-5	-9.366E-5	-8.909E-5	-8.791E-5	-9.264E-5	-8.901E-5	-8.812E-5	-1.027E-4
N° 15 (OFF1)	---	-7.033E-5	1.590E-5	-8.572E-5	-9.197E-5	-9.290E-5	-8.584E-5	-8.859E-5	-8.698E-5	-9.121E-5	-1.020E-4
N° 16 (OFF1)	---	-6.883E-5	-4.510E-7	-9.433E-5	-8.595E-5	-8.760E-5	-8.151E-5	-8.557E-5	-8.532E-5	-8.828E-5	-1.029E-4
Average (OFF1)	---	-3.497E-5	1.481E-4	-5.197E-5	-6.080E-5	-6.610E-5	-5.753E-5	-6.313E-5	-5.648E-5	-5.446E-5	-7.539E-5
σ (OFF1)	---	6.313E-6	8.697E-5	1.266E-5	3.144E-6	7.966E-6	1.087E-5	6.832E-6	7.321E-6	8.887E-6	9.469E-6
Average+3σ (OFF1)	---	-1.604E-5	4.090E-4	-1.399E-5	-5.137E-5	-4.221E-5	-2.493E-5	-4.263E-5	-3.452E-5	-2.779E-5	-4.698E-5
Average-3σ (OFF1)	---	-5.391E-5	-1.129E-4	-8.995E-5	-7.023E-5	-9.000E-5	-9.013E-5	-8.363E-5	-7.845E-5	-8.112E-5	-1.038E-4
Average (Bias1)	---	-6.553E-5	3.844E-5	-8.656E-5	-8.755E-5	-8.866E-5	-8.667E-5	-8.909E-5	-8.169E-5	-9.032E-5	-1.049E-4
σ (Bias1)	---	2.288E-6	1.680E-5	3.434E-6	2.753E-6	6.147E-6	4.109E-6	3.417E-6	5.260E-6	3.361E-6	1.618E-6
Average+3σ (Bias1)	---	-5.867E-5	8.884E-5	-7.626E-5	-7.929E-5	-7.022E-5	-7.435E-5	-7.884E-5	-6.591E-5	-8.024E-5	-1.001E-4
Average-3σ (Bias1)	---	-7.239E-5	-1.196E-5	-9.686E-5	-9.581E-5	-1.071E-4	-9.900E-5	-9.935E-5	-9.747E-5	-1.004E-4	-1.098E-4
Average (Bias2)	---	-7.057E-5	9.552E-6	-9.252E-5	-9.450E-5	-9.430E-5	-9.149E-5	-9.230E-5	-9.242E-5	-9.418E-5	-1.045E-4
σ (Bias2)	---	1.286E-6	7.528E-6	7.550E-6	7.809E-6	7.320E-6	1.194E-5	5.249E-6	8.737E-6	8.107E-6	2.790E-6
Average+3σ (Bias2)	---	-6.671E-5	3.214E-5	-6.987E-5	-7.108E-5	-7.234E-5	-5.566E-5	-7.655E-5	-6.620E-5	-6.986E-5	-9.614E-5
Average-3σ (Bias2)	---	-7.443E-5	-1.303E-5	-1.152E-4	-1.179E-4	-1.163E-4	-1.273E-4	-1.080E-4	-1.186E-4	-1.185E-4	-1.129E-4

2. VF

Ta=25°C ; If=10 mA



VF . (V) **Max = 1.6**

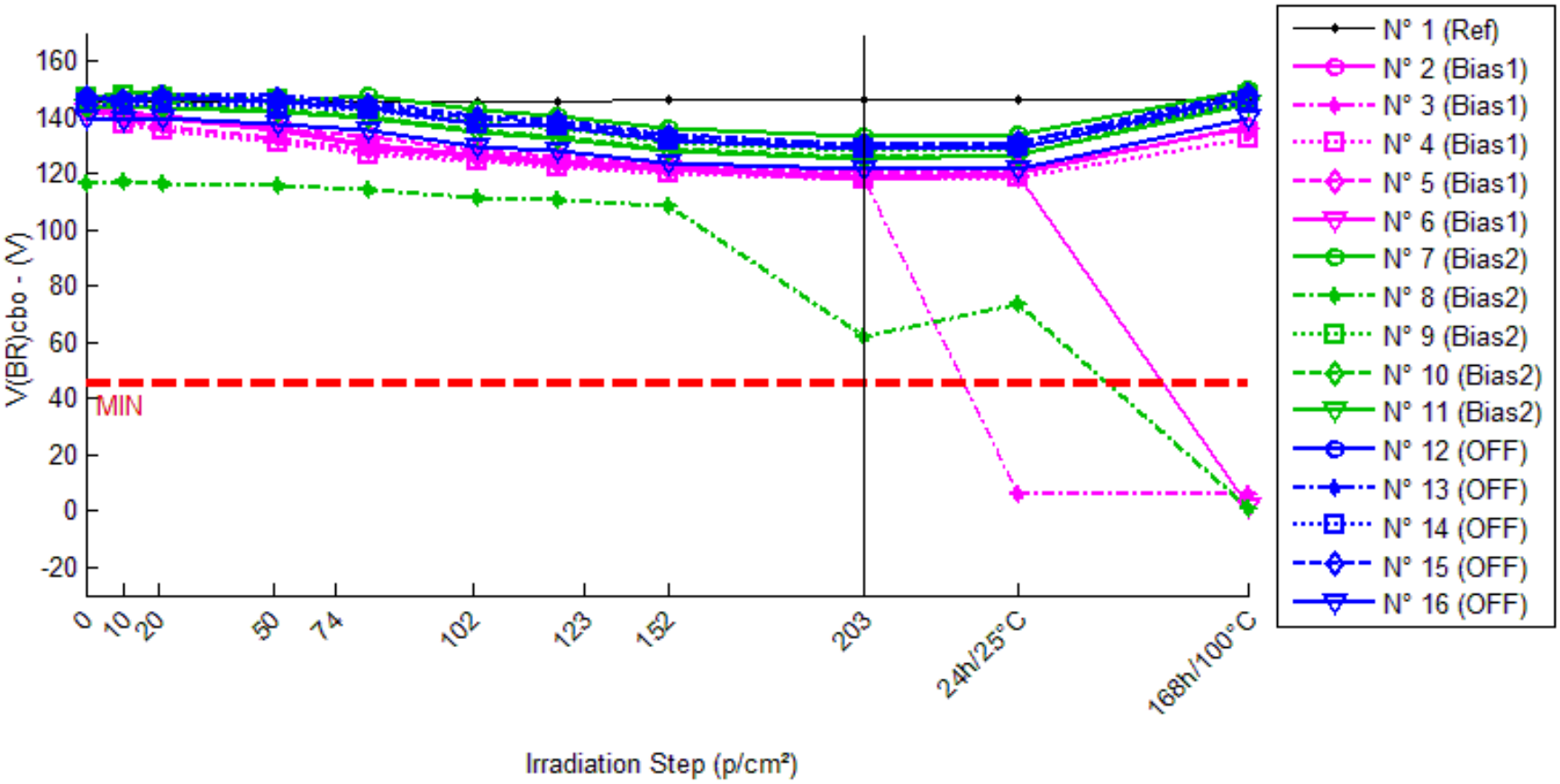
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.394	1.390	1.393	1.394	1.394	1.398	1.397	1.395	1.399	1.395	1.395
N° 2 (Bias1)	1.397	1.393	1.394	1.395	1.397	1.402	1.400	1.398	1.402	1.396	1.397
N° 3 (Bias1)	1.396	1.392	1.393	1.394	1.396	1.401	1.399	1.397	1.400	1.395	1.396
N° 4 (Bias1)	1.396	1.391	1.393	1.394	1.396	1.400	1.399	1.396	1.400	1.395	1.396
N° 5 (Bias1)	1.396	1.393	1.393	1.394	1.396	1.400	1.397	1.397	1.399	1.396	1.396
N° 6 (Bias1)	1.394	1.392	1.393	1.394	1.396	1.399	1.398	1.395	1.398	1.395	1.392
N° 7 (Bias2)	1.396	1.393	1.394	1.394	1.396	1.400	1.400	1.396	1.399	1.397	1.397
N° 8 (Bias2)	1.394	1.391	1.392	1.393	1.395	1.398	1.398	1.395	1.398	1.396	1.395
N° 9 (Bias2)	1.393	1.390	1.391	1.392	1.393	1.397	1.397	1.394	1.396	1.394	1.395
N° 10 (Bias2)	1.395	1.392	1.393	1.394	1.396	1.399	1.399	1.396	1.398	1.396	1.397
N° 11 (Bias2)	1.393	1.390	1.392	1.393	1.394	1.397	1.397	1.394	1.397	1.395	1.396
N° 12 (OFF1)	1.394	1.392	1.393	1.394	1.395	1.398	1.398	1.395	1.397	1.396	1.397
N° 13 (OFF1)	1.394	1.392	1.394	1.394	1.394	1.398	1.399	1.395	1.398	1.395	1.397
N° 14 (OFF1)	1.393	1.391	1.392	1.392	1.395	1.397	1.398	1.394	1.397	1.395	1.395
N° 15 (OFF1)	1.393	1.391	1.392	1.392	1.395	1.397	1.398	1.394	1.397	1.395	1.396
N° 16 (OFF1)	1.394	1.392	1.393	1.393	1.396	1.397	1.399	1.395	1.397	1.395	1.397

Delta [VF]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-4.196E-3	-1.310E-3	-1.550E-4	-6.240E-4	3.279E-3	2.954E-3	9.630E-4	4.553E-3	8.740E-4	3.040E-4
N° 2 (Bias1)	---	-3.643E-3	-2.932E-3	-2.084E-3	-2.680E-4	5.377E-3	3.192E-3	1.126E-3	4.683E-3	-7.570E-4	-1.090E-4
N° 3 (Bias1)	---	-3.475E-3	-2.562E-3	-1.274E-3	1.040E-4	5.110E-3	3.703E-3	1.104E-3	4.673E-3	-7.420E-4	4.000E-5
N° 4 (Bias1)	---	-4.530E-3	-2.642E-3	-1.732E-3	3.440E-4	4.576E-3	3.431E-3	2.720E-4	3.870E-3	-3.010E-4	2.910E-4
N° 5 (Bias1)	---	-3.067E-3	-2.289E-3	-1.295E-3	6.420E-4	4.111E-3	1.743E-3	9.770E-4	3.664E-3	4.110E-4	6.570E-4
N° 6 (Bias1)	---	-2.465E-3	-1.296E-3	-6.970E-4	2.020E-3	4.505E-3	4.015E-3	1.145E-3	3.633E-3	1.065E-3	-2.271E-3
N° 7 (Bias2)	---	-3.268E-3	-1.798E-3	-1.941E-3	-2.160E-4	3.561E-3	3.414E-3	-5.000E-5	3.198E-3	9.430E-4	9.850E-4
N° 8 (Bias2)	---	-3.296E-3	-2.201E-3	-1.075E-3	3.490E-4	3.733E-3	3.982E-3	1.082E-3	3.221E-3	1.462E-3	1.002E-3
N° 9 (Bias2)	---	-2.438E-3	-1.346E-3	-7.600E-4	4.850E-4	4.073E-3	4.250E-3	1.153E-3	3.245E-3	1.285E-3	2.134E-3
N° 10 (Bias2)	---	-2.378E-3	-1.190E-3	-5.890E-4	8.860E-4	4.173E-3	4.241E-3	1.131E-3	3.445E-3	1.391E-3	2.158E-3
N° 11 (Bias2)	---	-2.928E-3	-1.335E-3	-6.210E-4	7.550E-4	3.740E-3	4.128E-3	8.000E-4	3.222E-3	1.654E-3	2.277E-3
N° 12 (OFF1)	---	-2.066E-3	-6.830E-4	6.000E-6	5.880E-4	3.956E-3	4.360E-3	9.500E-4	3.172E-3	1.672E-3	2.652E-3
N° 13 (OFF1)	---	-2.023E-3	-4.480E-4	-2.830E-4	1.390E-4	3.902E-3	4.723E-3	1.378E-3	3.657E-3	1.275E-3	2.691E-3
N° 14 (OFF1)	---	-1.904E-3	-7.630E-4	-6.870E-4	2.511E-3	3.916E-3	4.701E-3	1.536E-3	3.638E-3	1.656E-3	2.512E-3
N° 15 (OFF1)	---	-1.956E-3	-8.870E-4	-1.012E-3	2.213E-3	3.558E-3	4.673E-3	1.137E-3	3.493E-3	1.610E-3	2.988E-3
N° 16 (OFF1)	---	-2.031E-3	-1.000E-3	-1.307E-3	2.313E-3	3.583E-3	4.654E-3	1.343E-3	3.071E-3	1.544E-3	2.831E-3
Average (OFF1)	---	-3.436E-3	-2.344E-3	-1.416E-3	5.684E-4	4.736E-3	3.217E-3	9.248E-4	4.105E-3	-6.480E-5	-2.784E-4
σ (OFF1)	---	7.616E-4	6.292E-4	5.239E-4	8.772E-4	5.051E-4	8.792E-4	3.708E-4	5.313E-4	7.900E-4	1.151E-3
Average+3σ (OFF1)	---	-1.151E-3	-4.567E-4	1.553E-4	3.200E-3	6.251E-3	5.854E-3	2.037E-3	5.699E-3	2.305E-3	3.175E-3
Average-3σ (OFF1)	---	-5.721E-3	-4.232E-3	-2.988E-3	-2.063E-3	3.221E-3	5.791E-4	-1.876E-4	2.511E-3	-2.435E-3	-3.732E-3
Average (Bias1)	---	-2.862E-3	-1.574E-3	-9.972E-4	4.518E-4	3.856E-3	4.003E-3	8.232E-4	3.266E-3	1.347E-3	1.711E-3
σ (Bias1)	---	4.392E-4	4.183E-4	5.615E-4	4.296E-4	2.565E-4	3.466E-4	5.083E-4	1.013E-4	2.629E-4	6.574E-4
Average+3σ (Bias1)	---	-1.544E-3	-3.191E-4	6.874E-4	1.740E-3	4.626E-3	5.043E-3	2.348E-3	3.570E-3	2.136E-3	3.683E-3
Average-3σ (Bias1)	---	-4.179E-3	-2.829E-3	-2.682E-3	-8.369E-4	3.086E-3	2.963E-3	-7.017E-4	2.962E-3	5.583E-4	-2.611E-4
Average (Bias2)	---	-1.996E-3	-7.562E-4	-6.566E-4	1.553E-3	3.783E-3	4.622E-3	1.269E-3	3.406E-3	1.551E-3	2.735E-3
σ (Bias2)	---	6.503E-5	2.103E-4	5.312E-4	1.102E-3	1.952E-4	1.489E-4	2.279E-4	2.699E-4	1.623E-4	1.815E-4
Average+3σ (Bias2)	---	-1.801E-3	-1.252E-4	9.371E-4	4.860E-3	4.369E-3	5.069E-3	1.953E-3	4.216E-3	2.038E-3	3.279E-3
Average-3σ (Bias2)	---	-2.191E-3	-1.387E-3	-2.250E-3	-1.755E-3	3.197E-3	4.175E-3	5.850E-4	2.597E-3	1.064E-3	2.190E-3

3. V(BR)cbo

Ta=25°C; Ic = 100 µA; Ib = 0; If = 0



V(BR)cbo . (V) **Min = 45.0**

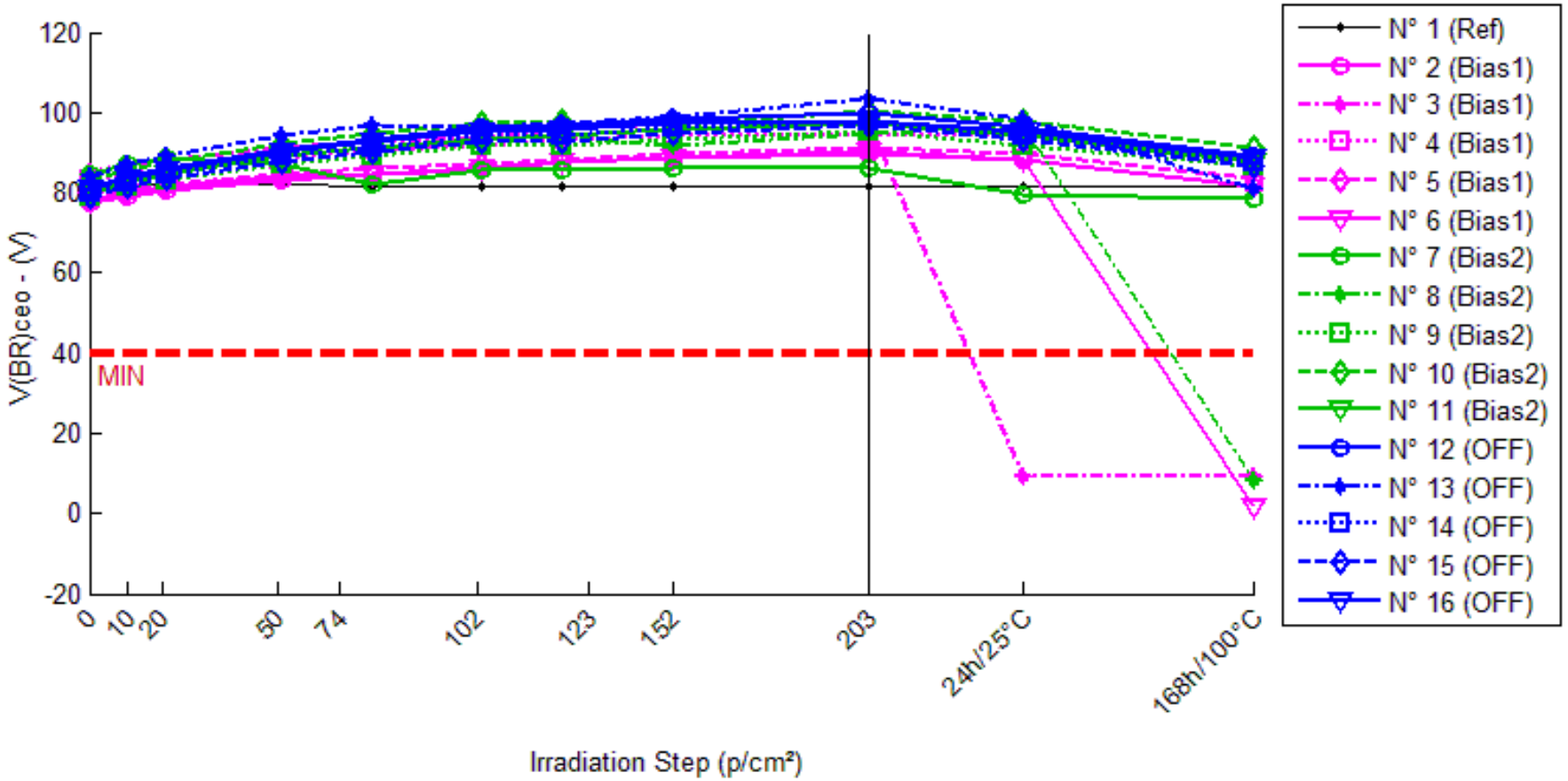
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	145.7	145.7	146.0	146.6	145.5	146.0	145.3	146.2	146.2	146.7	146.1
N° 2 (Bias1)	143.1	142.1	140.4	136.3	130.2	126.6	124.2	122.2	118.4	120.2	137.2
N° 3 (Bias1)	145.2	138.9	136.7	132.7	128.4	125.0	123.2	120.9	118.2	6.2	6.3
N° 4 (Bias1)	144.2	137.7	135.2	131.4	127.0	124.3	122.6	120.4	117.7	118.8	132.7
N° 5 (Bias1)	146.4	141.2	139.5	136.4	133.0	127.9	125.8	123.3	119.9	121.6	136.5
N° 6 (Bias1)	142.2	141.3	139.5	135.2	129.4	126.1	123.7	121.4	117.8	119.4	1.5
N° 7 (Bias2)	147.3	148.6	148.4	145.6	147.9	143.0	140.9	136.4	133.1	134.0	150.3
N° 8 (Bias2)	116.2	117.1	116.9	115.6	114.6	111.5	111.0	108.6	62.0	74.0	1.1
N° 9 (Bias2)	147.2	147.5	147.4	146.3	144.1	138.2	135.9	131.4	128.2	129.1	148.1
N° 10 (Bias2)	144.7	145.8	145.4	143.0	140.3	135.4	133.3	128.8	125.8	126.4	146.3
N° 11 (Bias2)	143.5	144.2	143.8	142.0	139.6	134.7	132.5	128.4	125.5	126.4	144.9
N° 12 (OFF1)	147.0	146.5	147.2	145.8	143.3	137.9	136.8	131.6	128.6	129.2	147.7
N° 13 (OFF1)	147.1	147.2	148.3	147.9	145.6	140.3	139.3	133.8	130.7	131.3	149.5
N° 14 (OFF1)	144.6	144.0	144.8	144.5	142.6	137.6	136.7	131.9	129.1	129.7	145.9
N° 15 (OFF1)	147.0	145.6	146.5	146.5	144.4	139.5	138.4	133.4	130.4	131.0	147.7
N° 16 (OFF1)	139.5	139.0	139.5	137.7	135.2	129.6	128.3	124.0	121.3	121.8	139.8

Delta [V(BR)cbo]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	3.610E-2	3.463E-1	9.693E-1	-1.171E-1	3.108E-1	-3.455E-1	5.745E-1	5.101E-1	1.053E+0	4.551E-1
N° 2 (Bias1)	---	-1.007E+0	-2.674E+0	-6.802E+0	-1.291E+1	-1.649E+1	-1.895E+1	-2.093E+1	-2.473E+1	-2.296E+1	-5.892E+0
N° 3 (Bias1)	---	-6.297E+0	-8.521E+0	-1.248E+1	-1.680E+1	-2.021E+1	-2.205E+1	-2.427E+1	-2.697E+1	-1.390E+2	-1.389E+2
N° 4 (Bias1)	---	-6.447E+0	-8.995E+0	-1.283E+1	-1.723E+1	-1.990E+1	-2.162E+1	-2.375E+1	-2.653E+1	-2.534E+1	-1.153E+1
N° 5 (Bias1)	---	-5.166E+0	-6.840E+0	-9.929E+0	-1.338E+1	-1.843E+1	-2.058E+1	-2.312E+1	-2.646E+1	-2.479E+1	-9.848E+0
N° 6 (Bias1)	---	-9.068E-1	-2.730E+0	-7.037E+0	-1.280E+1	-1.611E+1	-1.854E+1	-2.078E+1	-2.437E+1	-2.278E+1	-1.407E+2
N° 7 (Bias2)	---	1.276E+0	1.061E+0	-1.746E+0	5.878E-1	-4.354E+0	-6.445E+0	-1.094E+1	-1.421E+1	-1.335E+1	2.998E+0
N° 8 (Bias2)	---	8.961E-1	6.866E-1	-6.132E-1	-1.579E+0	-4.639E+0	-5.223E+0	-7.579E+0	-5.421E+1	-4.219E+1	-1.151E+2
N° 9 (Bias2)	---	3.038E-1	1.452E-1	-8.791E-1	-3.094E+0	-9.008E+0	-1.132E+1	-1.581E+1	-1.897E+1	-1.808E+1	9.002E-1
N° 10 (Bias2)	---	1.157E+0	7.545E-1	-1.697E+0	-4.344E+0	-9.281E+0	-1.132E+1	-1.587E+1	-1.886E+1	-1.823E+1	1.664E+0
N° 11 (Bias2)	---	6.979E-1	3.213E-1	-1.542E+0	-3.915E+0	-8.826E+0	-1.095E+1	-1.508E+1	-1.801E+1	-1.705E+1	1.382E+0
N° 12 (OFF1)	---	-4.835E-1	1.662E-1	-1.144E+0	-3.717E+0	-9.050E+0	-1.022E+1	-1.534E+1	-1.834E+1	-1.774E+1	6.681E-1
N° 13 (OFF1)	---	1.141E-1	1.160E+0	7.428E-1	-1.506E+0	-6.804E+0	-7.861E+0	-1.334E+1	-1.643E+1	-1.581E+1	2.405E+0
N° 14 (OFF1)	---	-6.160E-1	1.811E-1	-1.548E-1	-1.993E+0	-7.068E+0	-7.894E+0	-1.273E+1	-1.557E+1	-1.497E+1	1.297E+0
N° 15 (OFF1)	---	-1.400E+0	-5.066E-1	-4.704E-1	-2.558E+0	-7.524E+0	-8.554E+0	-1.361E+1	-1.664E+1	-1.597E+1	6.772E-1
N° 16 (OFF1)	---	-5.051E-1	4.730E-2	-1.717E+0	-4.223E+0	-9.882E+0	-1.118E+1	-1.545E+1	-1.813E+1	-1.766E+1	3.002E-1
Average (OFF1)	---	-3.965E+0	-5.952E+0	-9.816E+0	-1.462E+1	-1.823E+1	-2.035E+1	-2.257E+1	-2.581E+1	-4.697E+1	-6.139E+1
σ (OFF1)	---	2.790E+0	3.073E+0	2.872E+0	2.201E+0	1.888E+0	1.562E+0	1.620E+0	1.177E+0	5.145E+1	7.164E+1
Average+3σ (OFF1)	---	4.406E+0	3.267E+0	-1.199E+0	-8.019E+0	-1.256E+1	-1.566E+1	-1.771E+1	-2.228E+1	1.074E+2	1.535E+2
Average-3σ (OFF1)	---	-1.234E+1	-1.517E+1	-1.843E+1	-2.123E+1	-2.389E+1	-2.504E+1	-2.743E+1	-2.934E+1	-2.013E+2	-2.763E+2
Average (Bias1)	---	8.662E-1	5.937E-1	-1.295E+0	-2.469E+0	-7.222E+0	-9.050E+0	-1.306E+1	-2.485E+1	-2.178E+1	-2.162E+1
σ (Bias1)	---	3.867E-1	3.634E-1	5.157E-1	2.008E+0	2.495E+0	2.971E+0	3.677E+0	1.653E+1	1.158E+1	5.224E+1
Average+3σ (Bias1)	---	2.026E+0	1.684E+0	2.516E-1	3.556E+0	2.638E-1	-1.372E-1	-2.026E+0	2.473E+1	1.296E+1	1.351E+2
Average-3σ (Bias1)	---	-2.940E-1	-4.965E-1	-2.842E+0	-8.494E+0	-1.471E+1	-1.796E+1	-2.409E+1	-7.443E+1	-5.652E+1	-1.783E+2
Average (Bias2)	---	-5.780E-1	2.096E-1	-5.488E-1	-2.799E+0	-8.066E+0	-9.141E+0	-1.409E+1	-1.702E+1	-1.643E+1	1.069E+0
σ (Bias2)	---	5.408E-1	6.011E-1	9.420E-1	1.146E+0	1.337E+0	1.487E+0	1.231E+0	1.183E+0	1.220E+0	8.278E-1
Average+3σ (Bias2)	---	1.044E+0	2.013E+0	2.277E+0	6.374E-1	-4.055E+0	-4.679E+0	-1.040E+1	-1.347E+1	-1.277E+1	3.553E+0
Average-3σ (Bias2)	---	-2.200E+0	-1.594E+0	-3.375E+0	-6.236E+0	-1.208E+1	-1.360E+1	-1.779E+1	-2.057E+1	-2.009E+1	-1.414E+0

4. V(BR)ceo

Ta=25°C; Ic = 1 mA; Ib = 0; If = 0



V(BR)ceo . (V) **Min = 40.0**

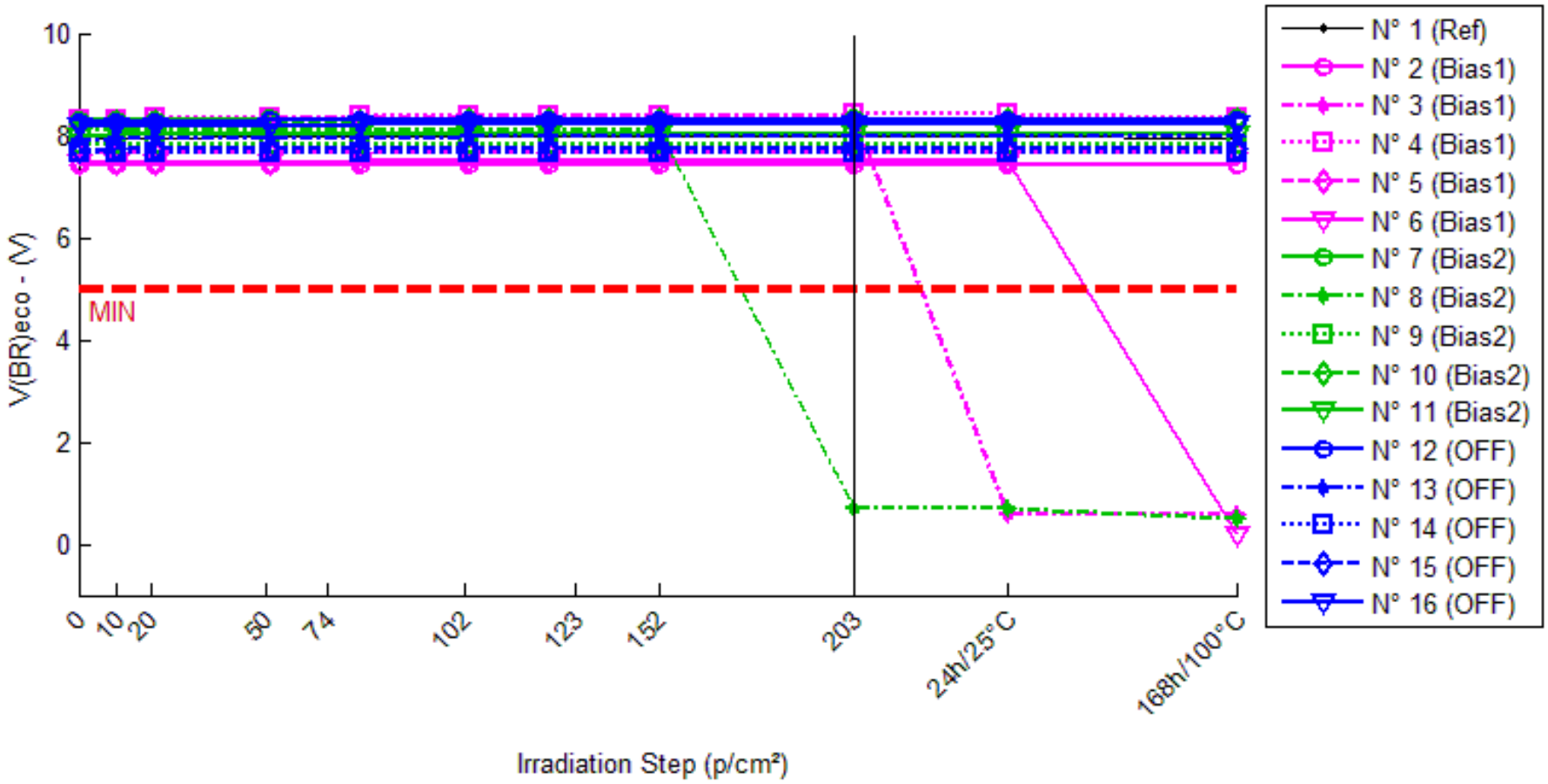
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	81.9	81.9	81.9	81.9	81.6	81.6	81.7	81.7	81.7	81.7	81.7
N° 2 (Bias1)	77.4	79.1	80.5	83.2	84.8	85.7	87.5	88.5	89.8	88.2	81.7
N° 3 (Bias1)	85.2	87.0	88.4	91.2	93.0	94.0	96.0	97.1	97.2	9.4	9.4
N° 4 (Bias1)	83.1	84.6	86.0	88.8	90.5	91.5	93.3	94.4	95.0	94.5	87.8
N° 5 (Bias1)	79.3	80.8	82.0	84.6	86.2	87.2	88.1	89.7	91.2	89.9	83.8
N° 6 (Bias1)	78.1	80.0	81.4	84.2	84.8	86.1	87.9	88.9	90.3	88.3	1.8
N° 7 (Bias2)	84.8	87.0	88.9	87.2	82.3	85.6	85.6	86.1	86.4	79.5	78.4
N° 8 (Bias2)	80.6	83.2	85.1	89.8	91.2	93.0	93.7	91.8	94.8	96.6	8.3
N° 9 (Bias2)	79.1	81.4	83.1	87.4	89.4	91.5	91.8	93.2	95.5	91.9	86.5
N° 10 (Bias2)	82.9	85.6	87.5	92.5	94.8	97.1	97.8	96.6	100.2	98.0	91.0
N° 11 (Bias2)	80.0	82.6	84.4	89.0	91.2	93.4	94.1	95.7	97.1	94.4	87.7
N° 12 (OFF1)	81.1	84.0	85.9	90.9	93.5	96.1	96.7	98.6	99.9	96.5	89.3
N° 13 (OFF1)	84.3	87.1	89.1	94.1	96.6	96.5	97.3	98.8	103.4	98.6	81.3
N° 14 (OFF1)	80.0	82.6	84.4	89.1	91.4	94.1	94.3	96.1	98.0	94.3	87.8
N° 15 (OFF1)	79.1	81.6	83.4	87.9	90.2	92.6	93.0	94.6	96.6	93.1	86.7
N° 16 (OFF1)	80.9	83.6	85.6	90.4	92.8	95.5	95.9	97.6	98.1	95.1	88.9

Delta [V(BR)ceo]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	5.028E-2	-3.170E-3	2.630E-2	-2.206E-1	-2.249E-1	-1.976E-1	-1.795E-1	-2.048E-1	-1.701E-1	-1.484E-1
N° 2 (Bias1)	---	1.735E+0	3.126E+0	5.817E+0	7.373E+0	8.298E+0	1.010E+1	1.115E+1	1.245E+1	1.078E+1	4.309E+0
N° 3 (Bias1)	---	1.773E+0	3.200E+0	5.981E+0	7.715E+0	8.733E+0	1.073E+1	1.181E+1	1.191E+1	-7.585E+1	-7.585E+1
N° 4 (Bias1)	---	1.493E+0	2.900E+0	5.638E+0	7.339E+0	8.336E+0	1.017E+1	1.123E+1	1.191E+1	1.137E+1	4.717E+0
N° 5 (Bias1)	---	1.531E+0	2.761E+0	5.318E+0	6.951E+0	7.958E+0	8.819E+0	1.038E+1	1.188E+1	1.062E+1	4.537E+0
N° 6 (Bias1)	---	1.894E+0	3.291E+0	6.057E+0	6.742E+0	7.968E+0	9.825E+0	1.085E+1	1.217E+1	1.024E+1	-7.630E+1
N° 7 (Bias2)	---	2.191E+0	4.119E+0	2.393E+0	-2.487E+0	8.509E-1	8.686E-1	1.304E+0	1.600E+0	-5.310E+0	-6.318E+0
N° 8 (Bias2)	---	2.630E+0	4.539E+0	9.175E+0	1.062E+1	1.241E+1	1.314E+1	1.122E+1	1.426E+1	1.600E+1	-7.225E+1
N° 9 (Bias2)	---	2.308E+0	3.984E+0	8.369E+0	1.036E+1	1.244E+1	1.275E+1	1.409E+1	1.645E+1	1.285E+1	7.404E+0
N° 10 (Bias2)	---	2.757E+0	4.651E+0	9.579E+0	1.196E+1	1.427E+1	1.491E+1	1.370E+1	1.733E+1	1.514E+1	8.094E+0
N° 11 (Bias2)	---	2.585E+0	4.421E+0	8.994E+0	1.120E+1	1.342E+1	1.406E+1	1.567E+1	1.710E+1	1.440E+1	7.740E+0
N° 12 (OFF1)	---	2.869E+0	4.811E+0	9.848E+0	1.236E+1	1.503E+1	1.560E+1	1.754E+1	1.880E+1	1.544E+1	8.182E+0
N° 13 (OFF1)	---	2.858E+0	4.824E+0	9.863E+0	1.237E+1	1.221E+1	1.306E+1	1.451E+1	1.911E+1	1.430E+1	-2.989E+0
N° 14 (OFF1)	---	2.612E+0	4.452E+0	9.166E+0	1.141E+1	1.410E+1	1.438E+1	1.609E+1	1.800E+1	1.433E+1	7.815E+0
N° 15 (OFF1)	---	2.533E+0	4.284E+0	8.772E+0	1.107E+1	1.346E+1	1.386E+1	1.552E+1	1.750E+1	1.404E+1	7.625E+0
N° 16 (OFF1)	---	2.696E+0	4.630E+0	9.492E+0	1.184E+1	1.455E+1	1.499E+1	1.667E+1	1.714E+1	1.422E+1	7.945E+0
Average (OFF1)	---	1.685E+0	3.056E+0	5.762E+0	7.224E+0	8.259E+0	9.929E+0	1.108E+1	1.206E+1	-6.568E+0	-2.772E+1
σ (OFF1)	---	1.689E-1	2.192E-1	2.961E-1	3.820E-1	3.192E-1	7.028E-1	5.263E-1	2.452E-1	3.873E+1	4.415E+1
Average+3σ (OFF1)	---	2.192E+0	3.713E+0	6.650E+0	8.370E+0	9.216E+0	1.204E+1	1.266E+1	1.280E+1	1.096E+2	1.047E+2
Average-3σ (OFF1)	---	1.179E+0	2.398E+0	4.874E+0	6.078E+0	7.301E+0	7.821E+0	9.504E+0	1.133E+1	-1.228E+2	-1.602E+2
Average (Bias1)	---	2.494E+0	4.343E+0	7.702E+0	8.330E+0	1.068E+1	1.114E+1	1.120E+1	1.335E+1	1.061E+1	-1.107E+1
σ (Bias1)	---	2.357E-1	2.820E-1	3.000E+0	6.078E+0	5.548E+0	5.805E+0	5.755E+0	6.678E+0	8.977E+0	3.474E+1
Average+3σ (Bias1)	---	3.201E+0	5.189E+0	1.670E+1	2.656E+1	2.732E+1	2.856E+1	2.846E+1	3.338E+1	3.755E+1	9.316E+1
Average-3σ (Bias1)	---	1.787E+0	3.497E+0	-1.297E+0	-9.905E+0	-5.964E+0	-6.271E+0	-6.069E+0	-6.687E+0	-1.632E+1	-1.153E+2
Average (Bias2)	---	2.713E+0	4.600E+0	9.428E+0	1.181E+1	1.387E+1	1.438E+1	1.607E+1	1.811E+1	1.446E+1	5.716E+0
σ (Bias2)	---	1.486E-1	2.331E-1	4.659E-1	5.752E-1	1.092E+0	9.854E-1	1.148E+0	8.363E-1	5.563E-1	4.870E+0
Average+3σ (Bias2)	---	3.159E+0	5.300E+0	1.083E+1	1.354E+1	1.715E+1	1.733E+1	1.951E+1	2.062E+1	1.613E+1	2.033E+1
Average-3σ (Bias2)	---	2.268E+0	3.901E+0	8.030E+0	1.008E+1	1.059E+1	1.142E+1	1.262E+1	1.560E+1	1.280E+1	-8.895E+0

5. V(BR)eco

Ta=25°C; Ic = 0; Ie = 100 µA; If = 0



V(BR)eco . (V) **Min = 5.0**

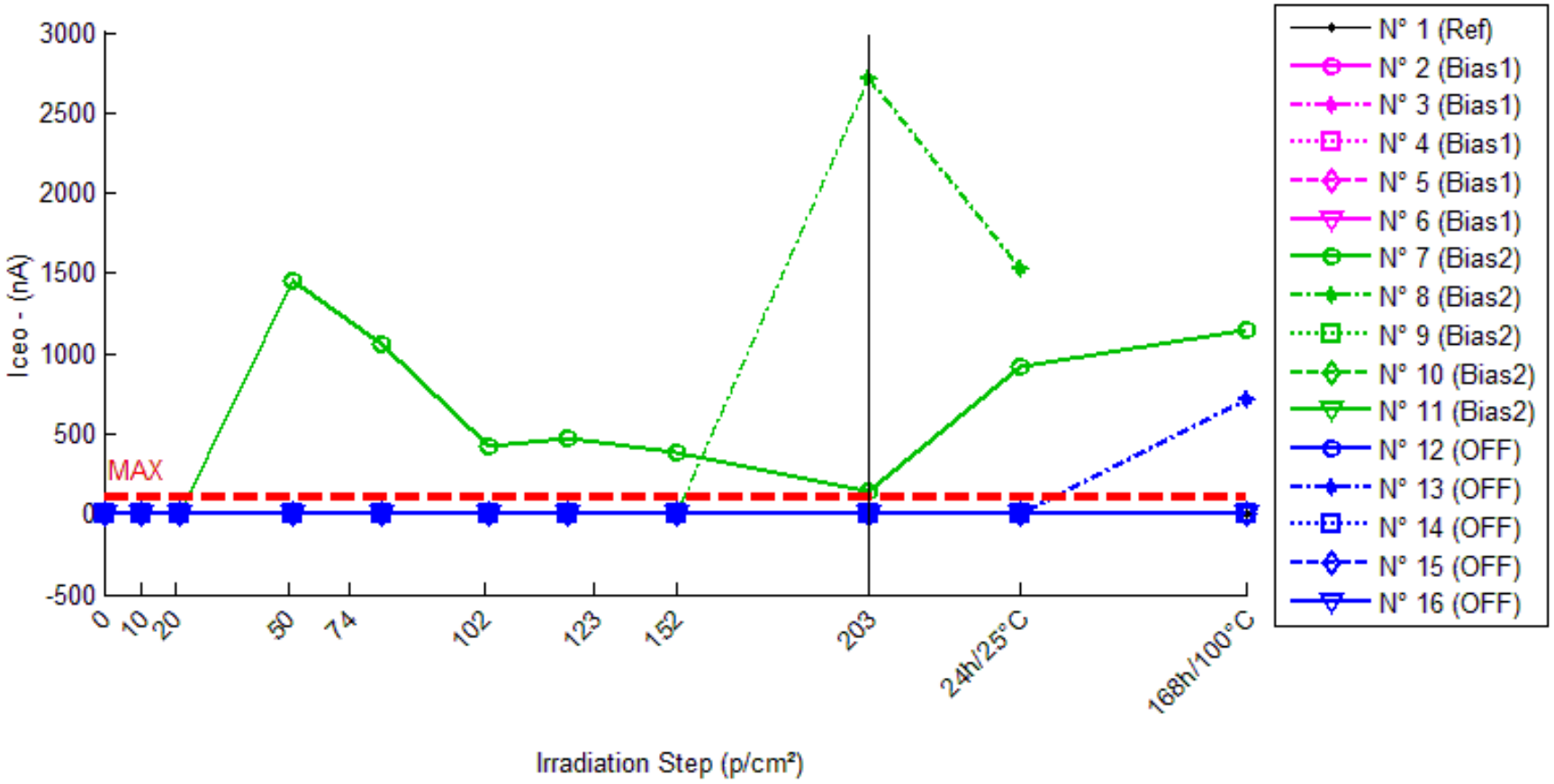
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	7.961	7.958	7.959	7.960	7.960	7.962	7.961	7.960	7.962	7.960	7.959
N° 2 (Bias1)	7.419	7.419	7.422	7.427	7.431	7.435	7.436	7.434	7.437	7.433	7.426
N° 3 (Bias1)	8.297	8.312	8.320	8.338	8.350	8.361	8.368	8.383	8.395	0.565	0.566
N° 4 (Bias1)	8.302	8.319	8.327	8.349	8.361	8.372	8.380	8.393	8.405	8.409	8.336
N° 5 (Bias1)	7.657	7.659	7.662	7.668	7.675	7.677	7.679	7.678	7.681	7.679	7.667
N° 6 (Bias1)	7.466	7.467	7.471	7.476	7.486	7.488	7.490	7.487	7.489	7.488	0.177
N° 7 (Bias2)	8.285	8.300	8.310	8.327	8.307	8.310	8.307	8.309	8.324	8.311	8.324
N° 8 (Bias2)	8.086	8.090	8.097	8.109	8.112	8.117	8.118	8.116	0.683	0.684	0.500
N° 9 (Bias2)	7.807	7.810	7.815	7.827	7.830	7.834	7.837	7.835	7.838	7.837	7.828
N° 10 (Bias2)	8.234	8.243	8.253	8.268	8.276	8.283	8.288	8.292	8.299	8.299	8.293
N° 11 (Bias2)	7.997	8.002	8.010	8.022	8.026	8.030	8.032	8.030	8.033	8.032	8.024
N° 12 (OFF1)	8.250	8.260	8.268	8.286	8.293	8.301	8.304	8.310	8.316	8.315	8.310
N° 13 (OFF1)	7.917	7.924	7.931	7.944	7.954	7.964	7.972	7.979	7.980	7.984	7.985
N° 14 (OFF1)	7.653	7.655	7.660	7.669	7.673	7.676	7.680	7.678	7.680	7.680	7.673
N° 15 (OFF1)	7.719	7.721	7.726	7.734	7.740	7.743	7.747	7.744	7.747	7.747	7.740
N° 16 (OFF1)	8.173	8.178	8.186	8.200	8.206	8.212	8.215	8.213	8.216	8.216	8.207

Delta [V(BR)eco]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-2.608E-3	-1.232E-3	-9.300E-4	-1.091E-3	1.160E-3	5.600E-4	-3.720E-4	1.124E-3	-5.090E-4	-1.393E-3
N° 2 (Bias1)	---	-3.120E-4	2.804E-3	7.366E-3	1.174E-2	1.617E-2	1.687E-2	1.507E-2	1.741E-2	1.359E-2	6.711E-3
N° 3 (Bias1)	---	1.538E-2	2.266E-2	4.081E-2	5.268E-2	6.355E-2	7.056E-2	8.550E-2	9.764E-2	-7.732E+0	-7.731E+0
N° 4 (Bias1)	---	1.629E-2	2.509E-2	4.717E-2	5.927E-2	6.984E-2	7.729E-2	9.075E-2	1.023E-1	1.064E-1	3.380E-2
N° 5 (Bias1)	---	1.466E-3	5.098E-3	1.079E-2	1.755E-2	1.945E-2	2.175E-2	2.115E-2	2.365E-2	2.230E-2	1.021E-2
N° 6 (Bias1)	---	1.149E-3	5.051E-3	1.017E-2	2.004E-2	2.222E-2	2.407E-2	2.076E-2	2.317E-2	2.208E-2	-7.289E+0
N° 7 (Bias2)	---	1.550E-2	2.496E-2	4.185E-2	2.246E-2	2.496E-2	2.195E-2	2.464E-2	3.902E-2	2.629E-2	3.960E-2
N° 8 (Bias2)	---	3.686E-3	1.113E-2	2.268E-2	2.631E-2	3.072E-2	3.192E-2	3.029E-2	-7.403E+0	-7.402E+0	-7.586E+0
N° 9 (Bias2)	---	3.290E-3	8.518E-3	1.960E-2	2.307E-2	2.709E-2	2.958E-2	2.822E-2	3.056E-2	3.017E-2	2.131E-2
N° 10 (Bias2)	---	9.729E-3	1.923E-2	3.440E-2	4.226E-2	4.954E-2	5.434E-2	5.863E-2	6.576E-2	6.521E-2	5.909E-2
N° 11 (Bias2)	---	5.125E-3	1.294E-2	2.564E-2	2.901E-2	3.347E-2	3.563E-2	3.371E-2	3.664E-2	3.571E-2	2.760E-2
N° 12 (OFF1)	---	1.074E-2	1.806E-2	3.620E-2	4.379E-2	5.154E-2	5.438E-2	6.019E-2	6.627E-2	6.520E-2	6.036E-2
N° 13 (OFF1)	---	6.899E-3	1.458E-2	2.680E-2	3.684E-2	4.723E-2	5.546E-2	6.194E-2	6.354E-2	6.754E-2	6.861E-2
N° 14 (OFF1)	---	2.528E-3	7.023E-3	1.599E-2	2.018E-2	2.385E-2	2.777E-2	2.553E-2	2.772E-2	2.790E-2	2.011E-2
N° 15 (OFF1)	---	2.384E-3	6.628E-3	1.550E-2	2.070E-2	2.406E-2	2.838E-2	2.518E-2	2.790E-2	2.789E-2	2.119E-2
N° 16 (OFF1)	---	5.532E-3	1.304E-2	2.743E-2	3.349E-2	3.885E-2	4.273E-2	4.028E-2	4.355E-2	4.332E-2	3.385E-2
Average (OFF1)	---	6.794E-3	1.214E-2	2.326E-2	3.226E-2	3.824E-2	4.211E-2	4.664E-2	5.284E-2	-1.514E+0	-2.994E+0
σ (OFF1)	---	8.286E-3	1.079E-2	1.910E-2	2.198E-2	2.615E-2	2.926E-2	3.798E-2	4.314E-2	3.477E+0	4.126E+0
Average+3σ (OFF1)	---	3.165E-2	4.450E-2	8.056E-2	9.821E-2	1.167E-1	1.299E-1	1.606E-1	1.822E-1	8.916E+0	9.383E+0
Average-3σ (OFF1)	---	-1.806E-2	-2.022E-2	-3.404E-2	-3.370E-2	-4.021E-2	-4.567E-2	-6.731E-2	-7.657E-2	-1.194E+1	-1.537E+1
Average (Bias1)	---	7.466E-3	1.535E-2	2.883E-2	2.862E-2	3.316E-2	3.469E-2	3.510E-2	-1.446E+0	-1.449E+0	-1.488E+0
σ (Bias1)	---	5.170E-3	6.668E-3	9.135E-3	8.066E-3	9.727E-3	1.207E-2	1.356E-2	3.330E+0	3.328E+0	3.409E+0
Average+3σ (Bias1)	---	2.298E-2	3.536E-2	5.624E-2	5.282E-2	6.234E-2	7.091E-2	7.577E-2	8.544E+0	8.534E+0	8.740E+0
Average-3σ (Bias1)	---	-8.043E-3	-4.648E-3	1.428E-3	4.424E-3	3.978E-3	-1.536E-3	-5.577E-3	-1.144E+1	-1.143E+1	-1.172E+1
Average (Bias2)	---	5.616E-3	1.187E-2	2.438E-2	3.100E-2	3.711E-2	4.174E-2	4.263E-2	4.580E-2	4.637E-2	4.082E-2
σ (Bias2)	---	3.460E-3	4.949E-3	8.720E-3	1.034E-2	1.284E-2	1.344E-2	1.791E-2	1.862E-2	1.933E-2	2.245E-2
Average+3σ (Bias2)	---	1.600E-2	2.671E-2	5.054E-2	6.201E-2	7.564E-2	8.207E-2	9.636E-2	1.016E-1	1.044E-1	1.082E-1
Average-3σ (Bias2)	---	-4.763E-3	-2.980E-3	-1.777E-3	-6.767E-6	-1.426E-3	1.412E-3	-1.111E-2	-1.005E-2	-1.162E-2	-2.654E-2

6. Iceo

Ta=25°C; Vce = 20V; If = 0; Ib = 0



Iceo . (nA) **Max = 100.0**

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.578	2.055	3.141	1.564	1.855	1.344	1.487	1.637	1.486	1.548	1.609
N° 2 (Bias1)	0.958	2.883	4.501	4.550	5.072	2.786	3.524	3.636	2.695	5.703	3.735
N° 3 (Bias1)	1.365	2.450	3.782	3.522	4.095	2.302	2.733	3.009	2.221	Not Measurable*	Not Measurable*
N° 4 (Bias1)	1.452	2.676	3.963	4.436	4.696	2.880	3.466	3.829	2.865	5.202	3.442
N° 5 (Bias1)	0.921	2.905	3.887	4.478	4.857	3.056	4.624	4.166	3.097	5.492	3.670
N° 6 (Bias1)	0.905	2.904	3.873	4.373	4.434	3.254	3.655	4.240	3.300	5.584	Not Measurable*
N° 7 (Bias2)	1.188	2.108	2.864	1459.161	1053.508	422.678	477.646	387.495	138.048	922.638	1147.829
N° 8 (Bias2)	1.751	3.358	3.816	2.351	2.425	1.629	2.380	3.287	2712.144	1529.524	Not *Measurable
N° 9 (Bias2)	1.811	2.743	3.415	2.417	2.512	1.653	2.541	3.294	2.789	7.890	3.107
N° 10 (Bias2)	1.724	2.670	3.404	2.181	2.050	1.472	2.130	2.821	2.489	6.130	3.113
N° 11 (Bias2)	0.905	2.659	3.386	2.315	2.233	1.559	2.216	2.937	2.583	6.423	3.093
N° 12 (OFF1)	1.891	2.773	3.483	2.008	1.974	1.258	1.715	1.945	1.756	3.953	2.636
N° 13 (OFF1)	1.596	2.536	3.071	1.982	1.939	1.194	1.633	1.849	1.661	3.847	721.663
N° 14 (OFF1)	0.974	2.771	3.477	2.343	2.194	1.344	1.916	2.150	1.816	4.893	2.878
N° 15 (OFF1)	1.876	2.870	4.160	2.393	2.277	1.404	1.945	2.248	1.837	4.837	2.786
N° 16 (OFF1)	1.611	2.674	3.609	2.313	2.069	1.301	1.704	1.995	1.945	5.184	2.775

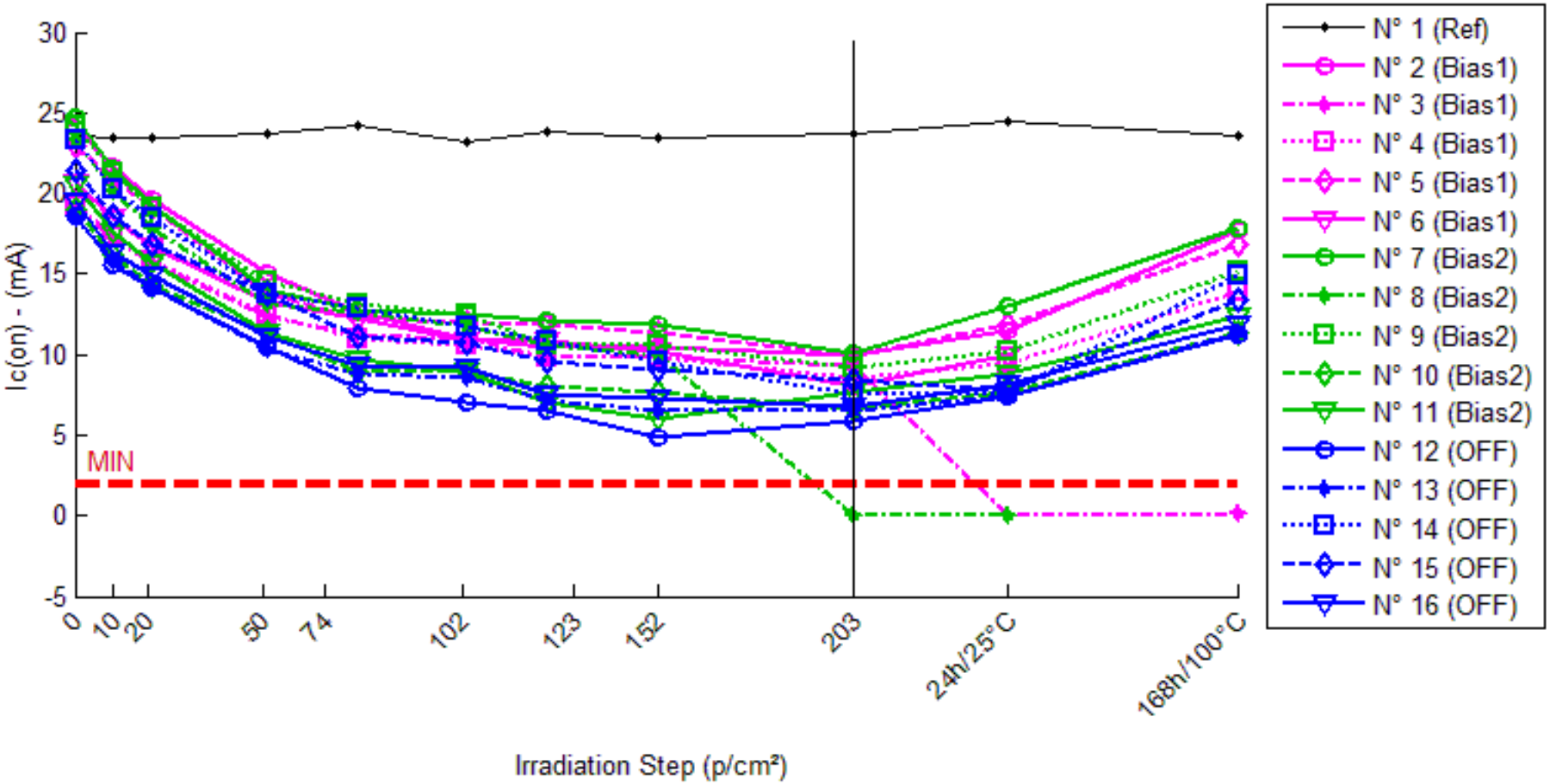
*** Equipment test limit at 10 µA**

Delta [Iceo]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	4.770E-1	1.563E+0	-1.445E-2	2.769E-1	-2.341E-1	-9.134E-2	5.838E-2	-9.265E-2	-2.975E-2	3.116E-2
N° 2 (Bias1)	---	1.925E+0	3.542E+0	3.591E+0	4.113E+0	1.827E+0	2.565E+0	2.677E+0	1.736E+0	4.745E+0	2.776E+0
N° 3 (Bias1)	---	1.085E+0	2.417E+0	2.157E+0	2.729E+0	9.367E-1	1.368E+0	1.644E+0	8.560E-1	NaN	NaN
N° 4 (Bias1)	---	1.224E+0	2.511E+0	2.984E+0	3.244E+0	1.428E+0	2.014E+0	2.377E+0	1.412E+0	3.749E+0	1.990E+0
N° 5 (Bias1)	---	1.984E+0	2.966E+0	3.557E+0	3.937E+0	2.136E+0	3.703E+0	3.245E+0	2.176E+0	4.572E+0	2.750E+0
N° 6 (Bias1)	---	1.998E+0	2.968E+0	3.468E+0	3.529E+0	2.348E+0	2.750E+0	3.335E+0	2.395E+0	4.679E+0	NaN
N° 7 (Bias2)	---	9.201E-1	1.676E+0	1.458E+3	1.052E+3	4.215E+2	4.765E+2	3.863E+2	1.369E+2	9.215E+2	1.147E+3
N° 8 (Bias2)	---	1.607E+0	2.065E+0	5.996E-1	6.742E-1	-1.219E-1	6.294E-1	1.536E+0	2.710E+3	1.528E+3	NaN
N° 9 (Bias2)	---	9.320E-1	1.604E+0	6.062E-1	7.017E-1	-1.575E-1	7.299E-1	1.484E+0	9.781E-1	6.079E+0	1.296E+0
N° 10 (Bias2)	---	9.461E-1	1.680E+0	4.575E-1	3.266E-1	-2.518E-1	4.061E-1	1.097E+0	7.656E-1	4.406E+0	1.389E+0
N° 11 (Bias2)	---	1.754E+0	2.481E+0	1.410E+0	1.328E+0	6.536E-1	1.311E+0	2.032E+0	1.678E+0	5.518E+0	2.188E+0
N° 12 (OFF1)	---	8.817E-1	1.591E+0	1.166E-1	8.268E-2	-6.331E-1	-1.766E-1	5.322E-2	-1.355E-1	2.062E+0	7.441E-1
N° 13 (OFF1)	---	9.403E-1	1.475E+0	3.862E-1	3.429E-1	-4.017E-1	3.727E-2	2.534E-1	6.533E-2	2.251E+0	7.201E+2
N° 14 (OFF1)	---	1.796E+0	2.503E+0	1.368E+0	1.220E+0	3.698E-1	9.416E-1	1.176E+0	8.414E-1	3.919E+0	1.904E+0
N° 15 (OFF1)	---	9.939E-1	2.284E+0	5.163E-1	4.002E-1	-4.728E-1	6.906E-2	3.715E-1	-3.895E-2	2.961E+0	9.093E-1
N° 16 (OFF1)	---	1.063E+0	1.998E+0	7.020E-1	4.581E-1	-3.096E-1	9.315E-2	3.841E-1	3.337E-1	3.573E+0	1.164E+0
Average (OFF1)	---	1.643E+0	2.881E+0	3.151E+0	3.510E+0	1.735E+0	2.480E+0	2.656E+0	1.715E+0	4.436E+0	2.505E+0
σ (OFF1)	---	4.496E-1	4.484E-1	6.074E-1	5.538E-1	5.650E-1	8.705E-1	6.910E-1	6.133E-1	4.633E-1	4.466E-1
Average+3σ (OFF1)	---	2.992E+0	4.226E+0	4.973E+0	5.172E+0	3.430E+0	5.092E+0	4.729E+0	3.555E+0	5.826E+0	3.845E+0
Average-3σ (OFF1)	---	2.945E-1	1.536E+0	1.329E+0	1.849E+0	4.010E-2	-1.314E-1	5.826E-1	-1.248E-1	3.046E+0	1.165E+0
Average (Bias1)	---	1.232E+0	1.901E+0	2.922E+2	2.111E+2	8.432E+1	9.591E+1	7.849E+1	5.701E+2	4.930E+2	2.879E+2
σ (Bias1)	---	4.130E-1	3.709E-1	6.517E+2	4.703E+2	1.885E+2	2.127E+2	1.721E+2	1.198E+3	7.014E+2	5.725E+2
Average+3σ (Bias1)	---	2.471E+0	3.014E+0	2.247E+3	1.622E+3	6.498E+2	7.341E+2	5.947E+2	4.164E+3	2.597E+3	2.005E+3
Average-3σ (Bias1)	---	-7.008E-3	7.883E-1	-1.663E+3	-1.200E+3	-4.811E+2	-5.423E+2	-4.377E+2	-3.024E+3	-1.611E+3	-1.430E+3
Average (Bias2)	---	1.135E+0	1.970E+0	6.179E-1	5.007E-1	-2.895E-1	1.929E-1	4.476E-1	2.132E-1	2.953E+0	1.450E+2
σ (Bias2)	---	3.756E-1	4.392E-1	4.706E-1	4.267E-1	3.871E-1	4.320E-1	4.282E-1	3.925E-1	8.068E-1	3.215E+2
Average+3σ (Bias2)	---	2.262E+0	3.288E+0	2.030E+0	1.781E+0	8.718E-1	1.489E+0	1.732E+0	1.391E+0	5.374E+0	1.109E+3
Average-3σ (Bias2)	---	8.176E-3	6.525E-1	-7.938E-1	-7.794E-1	-1.451E+0	-1.103E+0	-8.371E-1	-9.642E-1	5.326E-1	-8.195E+2

7. Ic(on)

Ta=25°C; Vce = 5V; If = 1 mA; Ib = 0



Ic(on) . (mA) **Min = 2.0**

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	23.568	23.432	23.497	23.704	24.193	23.229	23.869	23.403	23.751	24.413	23.588
N° 2 (Bias1)	24.130	21.684	19.637	15.011	12.653	10.913	10.430	10.411	9.945	11.431	17.767
N° 3 (Bias1)	19.141	17.164	15.628	12.344	11.286	11.025	9.877	9.777	9.307	0.021	0.099
N° 4 (Bias1)	19.190	17.309	15.782	12.562	11.030	10.591	9.838	9.845	8.616	9.450	13.900
N° 5 (Bias1)	22.933	20.837	19.147	13.777	12.184	11.933	11.887	11.394	9.992	11.905	16.889
N° 6 (Bias1)	20.706	18.423	16.712	13.283	12.262	10.824	10.903	10.169	8.014	9.900	Not Measurable*
N° 7 (Bias2)	24.682	21.553	19.259	14.077	12.781	12.526	12.172	11.851	10.087	12.951	17.840
N° 8 (Bias2)	23.337	20.137	17.829	13.147	12.651	11.701	10.619	10.007	0.026	0.027	Not Measurable*
N° 9 (Bias2)	24.250	21.289	19.079	14.545	13.186	12.535	10.554	10.623	9.129	10.224	15.181
N° 10 (Bias2)	19.004	16.156	14.344	11.371	8.951	8.950	7.985	7.704	6.600	7.645	11.325
N° 11 (Bias2)	20.572	17.626	15.725	11.418	9.742	8.995	6.980	6.044	7.640	8.778	12.388
N° 12 (OFF1)	18.648	15.502	14.144	10.459	7.972	7.033	6.467	4.919	5.869	7.359	11.275
N° 13 (OFF1)	18.456	15.762	14.188	10.291	8.849	8.595	7.175	6.494	6.455	7.436	11.304
N° 14 (OFF1)	23.314	20.274	18.479	13.831	12.870	11.725	10.850	9.630	7.491	7.712	14.868
N° 15 (OFF1)	21.374	18.667	16.802	13.762	11.086	10.660	9.629	9.122	8.399	7.779	13.426
N° 16 (OFF1)	19.475	16.260	14.921	11.097	9.294	9.147	7.557	7.276	6.730	8.233	11.900

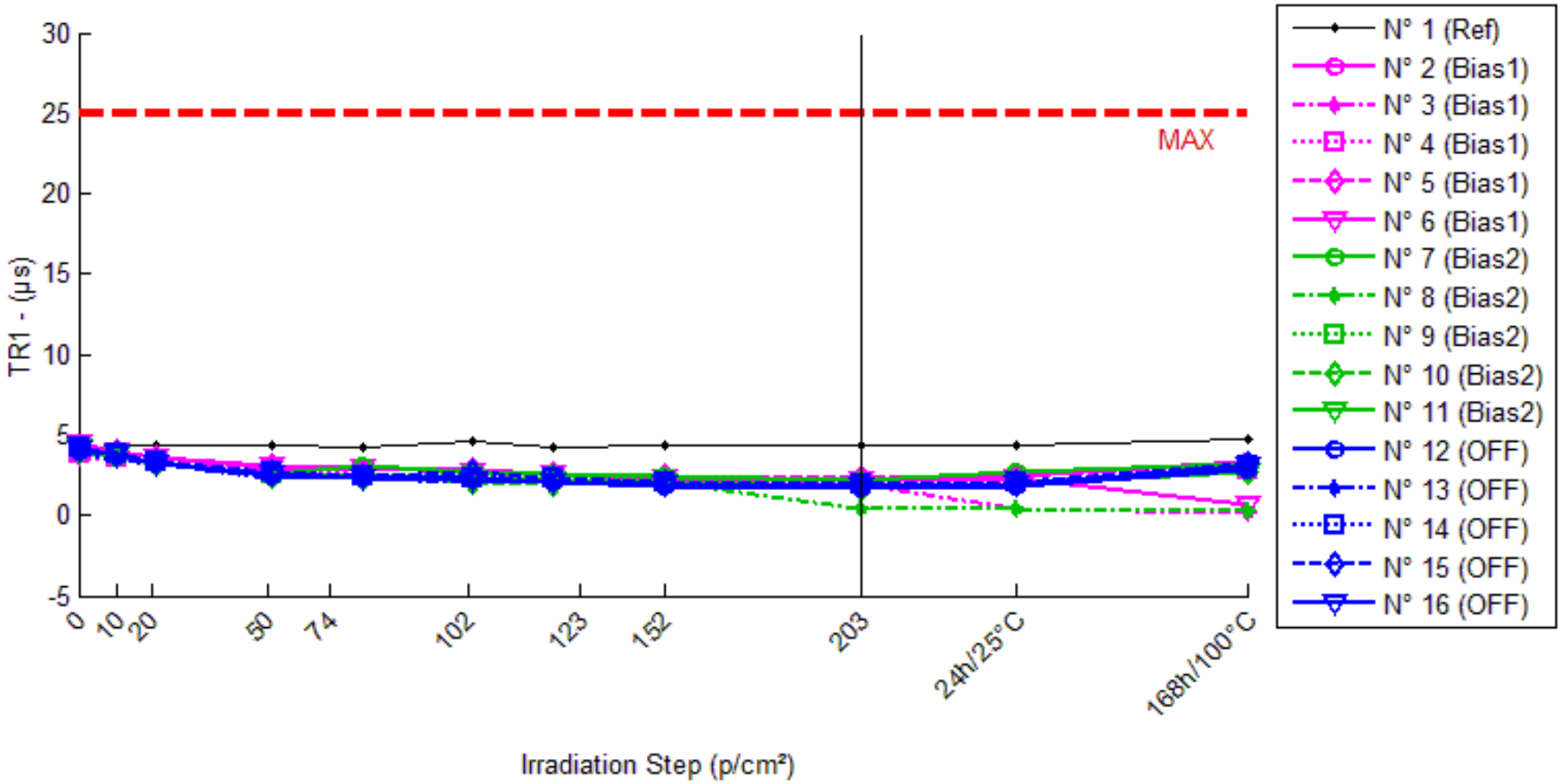
*** Not Measurable because of test condition (cf. Vceo & Vcbo) cannot be applied**

Delta [Ic(on)]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-1.355E-1	-7.093E-2	1.366E-1	6.256E-1	-3.384E-1	3.013E-1	-1.648E-1	1.832E-1	8.457E-1	2.073E-2
N° 2 (Bias1)	---	-2.446E+0	-4.493E+0	-9.119E+0	-1.148E+1	-1.322E+1	-1.370E+1	-1.372E+1	-1.419E+1	-1.270E+1	-6.363E+0
N° 3 (Bias1)	---	-1.977E+0	-3.513E+0	-6.797E+0	-7.855E+0	-8.116E+0	-9.264E+0	-9.364E+0	-9.834E+0	-1.912E+1	-1.904E+1
N° 4 (Bias1)	---	-1.881E+0	-3.408E+0	-6.628E+0	-8.160E+0	-8.599E+0	-9.353E+0	-9.345E+0	-1.057E+1	-9.740E+0	-5.290E+0
N° 5 (Bias1)	---	-2.097E+0	-3.786E+0	-9.156E+0	-1.075E+1	-1.100E+1	-1.105E+1	-1.154E+1	-1.294E+1	-1.103E+1	-6.044E+0
N° 6 (Bias1)	---	-2.284E+0	-3.995E+0	-7.423E+0	-8.445E+0	-9.883E+0	-9.804E+0	-1.054E+1	-1.269E+1	-1.081E+1	NaN
N° 7 (Bias2)	---	-3.130E+0	-5.423E+0	-1.061E+1	-1.190E+1	-1.216E+1	-1.251E+1	-1.283E+1	-1.460E+1	-1.173E+1	-6.842E+0
N° 8 (Bias2)	---	-3.200E+0	-5.507E+0	-1.019E+1	-1.069E+1	-1.164E+1	-1.272E+1	-1.333E+1	-2.331E+1	-2.331E+1	NaN
N° 9 (Bias2)	---	-2.961E+0	-5.171E+0	-9.705E+0	-1.106E+1	-1.171E+1	-1.370E+1	-1.363E+1	-1.512E+1	-1.403E+1	-9.069E+0
N° 10 (Bias2)	---	-2.848E+0	-4.659E+0	-7.633E+0	-1.005E+1	-1.005E+1	-1.102E+1	-1.130E+1	-1.240E+1	-1.136E+1	-7.679E+0
N° 11 (Bias2)	---	-2.947E+0	-4.847E+0	-9.155E+0	-1.083E+1	-1.158E+1	-1.359E+1	-1.453E+1	-1.293E+1	-1.179E+1	-8.185E+0
N° 12 (OFF1)	---	-3.146E+0	-4.504E+0	-8.189E+0	-1.068E+1	-1.162E+1	-1.218E+1	-1.373E+1	-1.278E+1	-1.129E+1	-7.373E+0
N° 13 (OFF1)	---	-2.695E+0	-4.268E+0	-8.165E+0	-9.608E+0	-9.861E+0	-1.128E+1	-1.196E+1	-1.200E+1	-1.102E+1	-7.153E+0
N° 14 (OFF1)	---	-3.040E+0	-4.835E+0	-9.483E+0	-1.044E+1	-1.159E+1	-1.246E+1	-1.368E+1	-1.582E+1	-1.560E+1	-8.446E+0
N° 15 (OFF1)	---	-2.707E+0	-4.572E+0	-7.612E+0	-1.029E+1	-1.071E+1	-1.175E+1	-1.225E+1	-1.297E+1	-1.360E+1	-7.948E+0
N° 16 (OFF1)	---	-3.215E+0	-4.553E+0	-8.378E+0	-1.018E+1	-1.033E+1	-1.192E+1	-1.220E+1	-1.274E+1	-1.124E+1	-7.574E+0
Average (OFF1)	---	-2.137E+0	-3.839E+0	-7.825E+0	-9.337E+0	-1.016E+1	-1.063E+1	-1.090E+1	-1.205E+1	-1.268E+1	-9.185E+0
σ (OFF1)	---	2.290E-1	4.321E-1	1.235E+0	1.655E+0	2.046E+0	1.856E+0	1.821E+0	1.793E+0	3.754E+0	6.587E+0
Average+3σ (OFF1)	---	-1.450E+0	-2.542E+0	-4.120E+0	-4.373E+0	-4.026E+0	-5.065E+0	-5.438E+0	-6.667E+0	-1.418E+0	1.058E+1
Average-3σ (OFF1)	---	-2.824E+0	-5.135E+0	-1.153E+1	-1.430E+1	-1.630E+1	-1.620E+1	-1.636E+1	-1.742E+1	-2.394E+1	-2.895E+1
Average (Bias1)	---	-3.017E+0	-5.121E+0	-9.457E+0	-1.091E+1	-1.143E+1	-1.271E+1	-1.312E+1	-1.567E+1	-1.444E+1	-7.944E+0
σ (Bias1)	---	1.438E-1	3.644E-1	1.155E+0	6.706E-1	8.012E-1	1.078E+0	1.192E+0	4.416E+0	5.066E+0	9.324E-1
Average+3σ (Bias1)	---	-2.586E+0	-4.028E+0	-5.993E+0	-8.895E+0	-9.024E+0	-9.472E+0	-9.548E+0	-2.424E+0	7.552E-1	-5.147E+0
Average-3σ (Bias1)	---	-3.449E+0	-6.215E+0	-1.292E+1	-1.292E+1	-1.383E+1	-1.594E+1	-1.670E+1	-2.892E+1	-2.964E+1	-1.074E+1
Average (Bias2)	---	-2.960E+0	-4.547E+0	-8.366E+0	-1.024E+1	-1.082E+1	-1.192E+1	-1.277E+1	-1.326E+1	-1.255E+1	-7.699E+0
σ (Bias2)	---	2.453E-1	2.020E-1	6.871E-1	3.991E-1	7.743E-1	4.478E-1	8.664E-1	1.477E+0	2.003E+0	5.100E-1
Average+3σ (Bias2)	---	-2.224E+0	-3.941E+0	-6.304E+0	-9.042E+0	-8.499E+0	-1.057E+1	-1.017E+1	-8.833E+0	-6.540E+0	-6.169E+0
Average-3σ (Bias2)	---	-3.696E+0	-5.153E+0	-1.043E+1	-1.144E+1	-1.314E+1	-1.326E+1	-1.536E+1	-1.770E+1	-1.856E+1	-9.229E+0

8. TR1

Ta=25°C; Vcc = 10V; If = 5 mA; RL = 100 Ohms; Ib = 0



TR1 . (µs) **Max = 25.0**

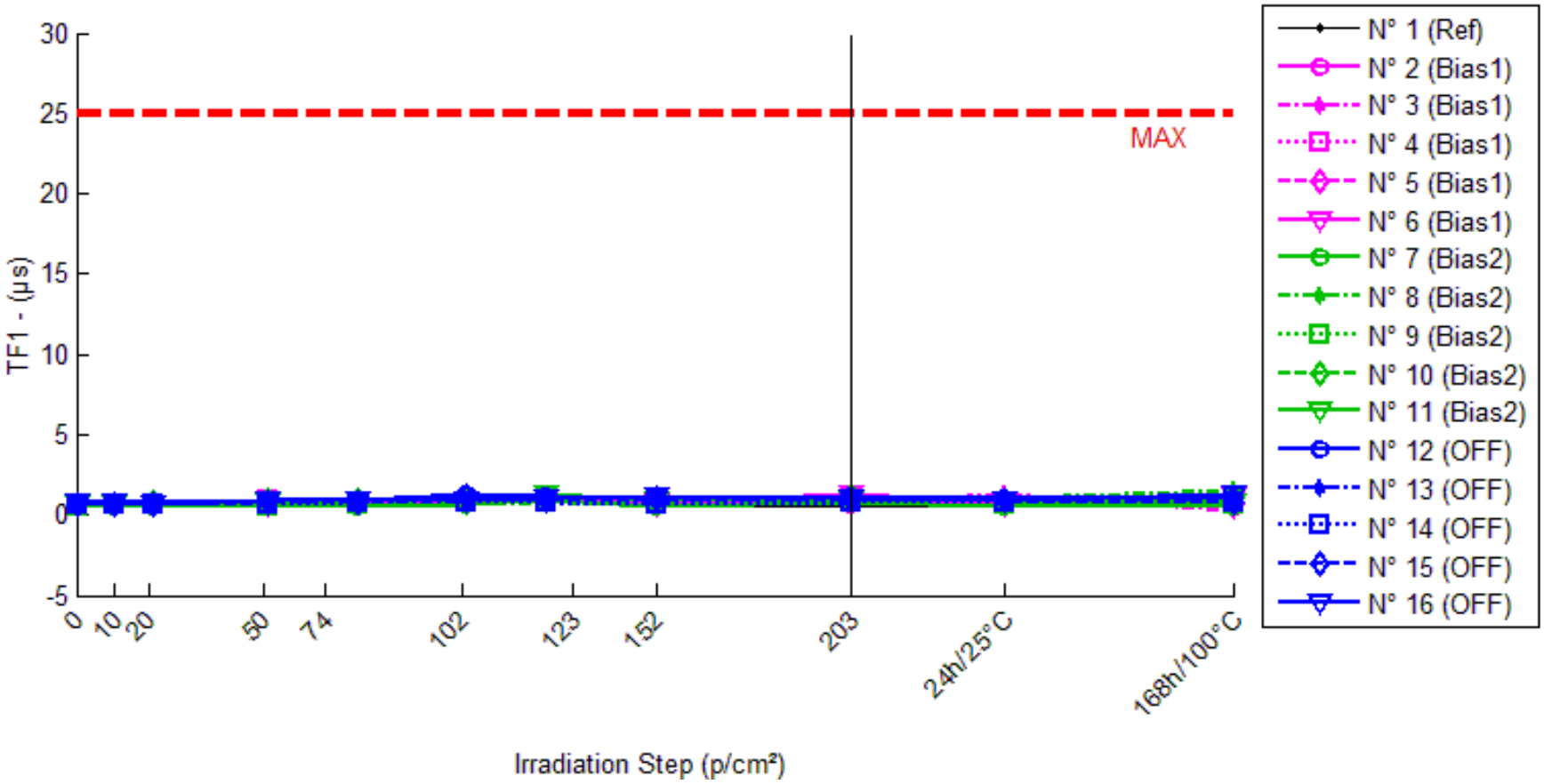
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	4.08	4.30	4.32	4.36	4.18	4.56	4.26	4.32	4.36	4.36	4.80
N° 2 (Bias1)	4.52	3.96	3.62	3.00	2.80	2.80	2.54	2.42	2.24	2.40	3.36
N° 3 (Bias1)	3.64	3.44	3.20	2.68	2.48	2.38	2.28	2.10	1.92	0.38	0.14
N° 4 (Bias1)	3.88	3.54	3.28	2.68	2.60	2.46	2.36	2.16	2.04	2.06	2.84
N° 5 (Bias1)	4.28	3.94	3.64	3.04	2.84	2.80	2.56	2.48	2.32	2.40	3.24
N° 6 (Bias1)	4.44	4.00	3.54	3.08	2.92	2.64	2.52	2.38	2.16	2.28	0.64
N° 7 (Bias2)	4.00	3.54	3.20	2.52	3.04	2.72	2.56	2.48	2.20	2.66	3.16
N° 8 (Bias2)	4.14	3.74	3.20	2.60	2.50	2.28	2.22	2.04	0.40	0.40	0.34
N° 9 (Bias2)	4.24	3.84	3.40	2.62	2.44	2.42	2.30	2.20	1.98	2.10	2.92
N° 10 (Bias2)	4.00	3.68	3.20	2.42	2.28	2.12	1.96	1.88	1.64	1.92	2.68
N° 11 (Bias2)	4.20	3.76	3.26	2.60	2.48	2.36	2.16	2.04	1.84	2.00	2.76
N° 12 (OFF1)	3.96	3.88	3.20	2.48	2.36	2.32	2.08	1.80	1.72	1.84	2.80
N° 13 (OFF1)	3.90	3.44	3.16	2.38	2.38	2.12	2.08	1.84	1.68	1.84	3.20
N° 14 (OFF1)	4.28	3.86	3.36	2.72	2.46	2.28	2.32	2.10	1.92	2.08	3.12
N° 15 (OFF1)	4.16	3.90	3.38	2.76	2.44	2.64	2.30	2.04	1.88	2.02	3.20
N° 16 (OFF1)	4.10	3.80	3.20	2.56	2.32	2.18	2.12	1.88	1.76	1.92	3.12

Delta [TR1]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	2.200E-1	2.400E-1	2.800E-1	1.000E-1	4.800E-1	1.800E-1	2.400E-1	2.800E-1	2.800E-1	7.200E-1
N° 2 (Bias1)	---	-5.600E-1	-9.000E-1	-1.520E+0	-1.720E+0	-1.720E+0	-1.980E+0	-2.100E+0	-2.280E+0	-2.120E+0	-1.160E+0
N° 3 (Bias1)	---	-2.000E-1	-4.400E-1	-9.600E-1	-1.160E+0	-1.260E+0	-1.360E+0	-1.540E+0	-1.720E+0	-3.260E+0	-3.500E+0
N° 4 (Bias1)	---	-3.400E-1	-6.000E-1	-1.200E+0	-1.280E+0	-1.420E+0	-1.520E+0	-1.720E+0	-1.840E+0	-1.820E+0	-1.040E+0
N° 5 (Bias1)	---	-3.400E-1	-6.400E-1	-1.240E+0	-1.440E+0	-1.480E+0	-1.720E+0	-1.800E+0	-1.960E+0	-1.880E+0	-1.040E+0
N° 6 (Bias1)	---	-4.400E-1	-9.000E-1	-1.360E+0	-1.520E+0	-1.800E+0	-1.920E+0	-2.060E+0	-2.280E+0	-2.160E+0	-3.800E+0
N° 7 (Bias2)	---	-4.600E-1	-8.000E-1	-1.480E+0	-9.600E-1	-1.280E+0	-1.440E+0	-1.520E+0	-1.800E+0	-1.340E+0	-8.400E-1
N° 8 (Bias2)	---	-4.000E-1	-9.400E-1	-1.540E+0	-1.640E+0	-1.860E+0	-1.920E+0	-2.100E+0	-3.740E+0	-3.740E+0	-3.800E+0
N° 9 (Bias2)	---	-4.000E-1	-8.400E-1	-1.620E+0	-1.800E+0	-1.820E+0	-1.940E+0	-2.040E+0	-2.260E+0	-2.140E+0	-1.320E+0
N° 10 (Bias2)	---	-3.200E-1	-8.000E-1	-1.580E+0	-1.720E+0	-1.880E+0	-2.040E+0	-2.120E+0	-2.360E+0	-2.080E+0	-1.320E+0
N° 11 (Bias2)	---	-4.400E-1	-9.400E-1	-1.600E+0	-1.720E+0	-1.840E+0	-2.040E+0	-2.160E+0	-2.360E+0	-2.200E+0	-1.440E+0
N° 12 (OFF1)	---	-8.000E-2	-7.600E-1	-1.480E+0	-1.600E+0	-1.640E+0	-1.880E+0	-2.160E+0	-2.240E+0	-2.120E+0	-1.160E+0
N° 13 (OFF1)	---	-4.600E-1	-7.400E-1	-1.520E+0	-1.520E+0	-1.780E+0	-1.820E+0	-2.060E+0	-2.220E+0	-2.060E+0	-7.000E-1
N° 14 (OFF1)	---	-4.200E-1	-9.200E-1	-1.560E+0	-1.820E+0	-2.000E+0	-1.960E+0	-2.180E+0	-2.360E+0	-2.200E+0	-1.160E+0
N° 15 (OFF1)	---	-2.600E-1	-7.800E-1	-1.400E+0	-1.720E+0	-1.520E+0	-1.860E+0	-2.120E+0	-2.280E+0	-2.140E+0	-9.600E-1
N° 16 (OFF1)	---	-3.000E-1	-9.000E-1	-1.540E+0	-1.780E+0	-1.920E+0	-1.980E+0	-2.220E+0	-2.340E+0	-2.180E+0	-9.800E-1
Average (OFF1)	---	-3.760E-1	-6.960E-1	-1.256E+0	-1.424E+0	-1.536E+0	-1.700E+0	-1.844E+0	-2.016E+0	-2.248E+0	-2.108E+0
σ (OFF1)	---	1.337E-1	2.007E-1	2.071E-1	2.165E-1	2.215E-1	2.623E-1	2.355E-1	2.555E-1	5.846E-1	1.412E+0
Average+3σ (OFF1)	---	2.515E-2	-9.390E-2	-6.348E-1	-7.744E-1	-8.714E-1	-9.131E-1	-1.137E+0	-1.250E+0	-4.943E-1	2.129E+0
Average-3σ (OFF1)	---	-7.771E-1	-1.298E+0	-1.877E+0	-2.074E+0	-2.201E+0	-2.487E+0	-2.551E+0	-2.782E+0	-4.002E+0	-6.345E+0
Average (Bias1)	---	-4.040E-1	-8.640E-1	-1.564E+0	-1.568E+0	-1.736E+0	-1.876E+0	-1.988E+0	-2.504E+0	-2.300E+0	-1.744E+0
σ (Bias1)	---	5.367E-2	7.127E-2	5.550E-2	3.446E-1	2.559E-1	2.500E-1	2.652E-1	7.288E-1	8.774E-1	1.172E+0
Average+3σ (Bias1)	---	-2.430E-1	-6.502E-1	-1.398E+0	-5.343E-1	-9.683E-1	-1.126E+0	-1.192E+0	-3.177E-1	3.321E-1	1.773E+0
Average-3σ (Bias1)	---	-5.650E-1	-1.078E+0	-1.730E+0	-2.602E+0	-2.504E+0	-2.626E+0	-2.784E+0	-4.690E+0	-4.932E+0	-5.261E+0
Average (Bias2)	---	-3.040E-1	-8.200E-1	-1.500E+0	-1.688E+0	-1.772E+0	-1.900E+0	-2.148E+0	-2.288E+0	-2.140E+0	-9.920E-1
σ (Bias2)	---	1.499E-1	8.367E-2	6.325E-2	1.254E-1	1.968E-1	6.782E-2	6.099E-2	6.099E-2	5.477E-2	1.890E-1
Average+3σ (Bias2)	---	1.458E-1	-5.690E-1	-1.310E+0	-1.312E+0	-1.182E+0	-1.697E+0	-1.965E+0	-2.105E+0	-1.976E+0	-4.250E-1
Average-3σ (Bias2)	---	-7.538E-1	-1.071E+0	-1.690E+0	-2.064E+0	-2.362E+0	-2.103E+0	-2.331E+0	-2.471E+0	-2.304E+0	-1.559E+0

9. TF1

Ta=25°C; Vcc = 10V; If = 5 mA; RL = 100 Ohms; Ib = 0



TF1 . (µs) **Max = 25.0**

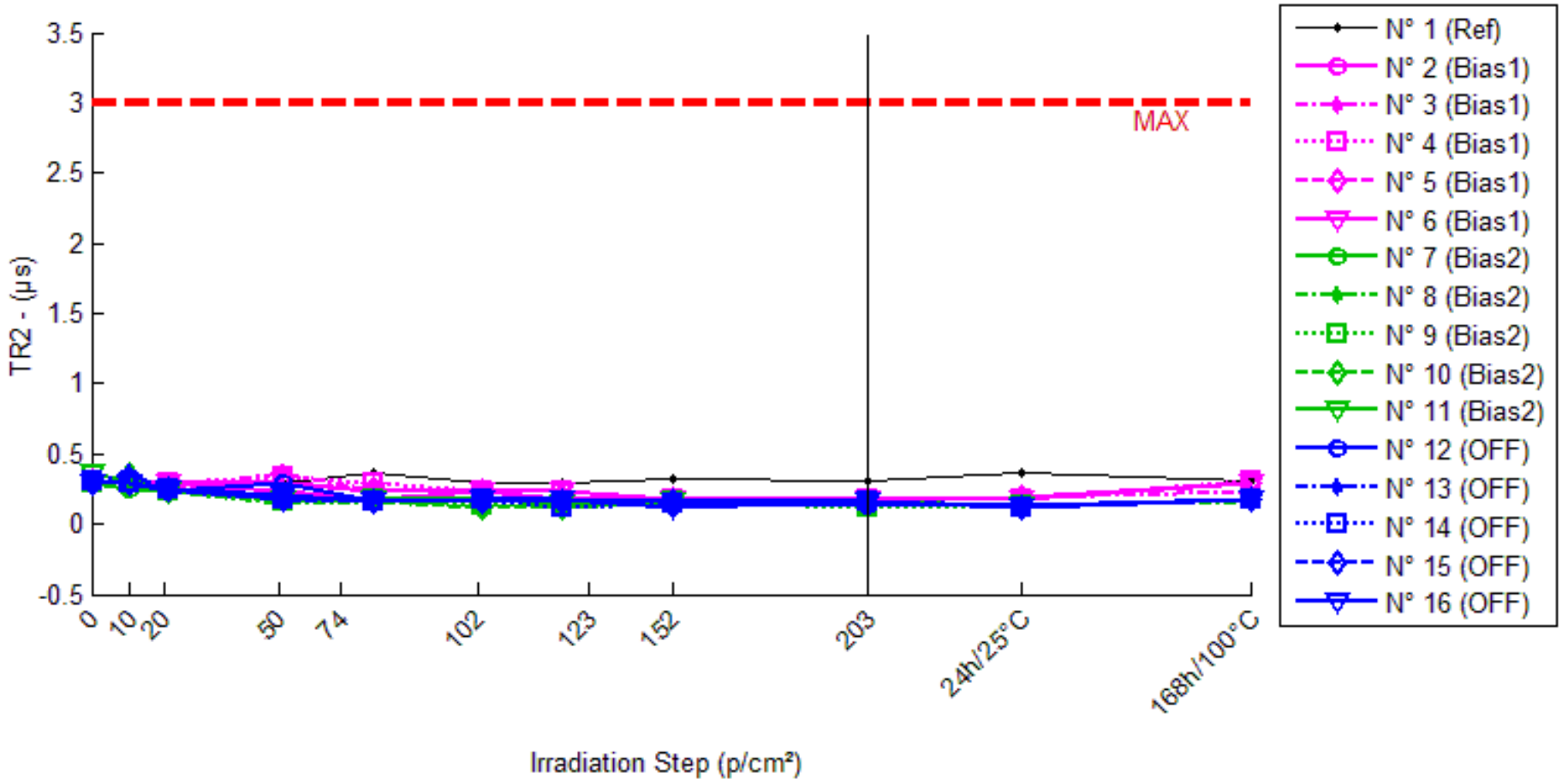
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.64	0.64	0.64	0.66	0.72	0.82	1.00	0.68	0.60	0.70	0.64
N° 2 (Bias1)	0.64	0.64	0.64	0.68	0.68	0.72	0.90	0.66	0.64	0.64	0.64
N° 3 (Bias1)	0.64	0.70	0.68	0.80	0.84	0.84	0.92	0.80	0.84	1.32	0.32
N° 4 (Bias1)	0.68	0.72	0.72	0.96	0.80	0.80	1.04	0.84	1.00	0.80	0.74
N° 5 (Bias1)	0.68	0.68	0.64	0.68	0.80	0.76	1.04	0.68	0.84	0.68	0.72
N° 6 (Bias1)	0.72	0.72	0.72	0.80	0.88	0.88	1.02	0.82	1.32	0.84	1.16
N° 7 (Bias2)	0.64	0.60	0.60	0.58	0.60	0.66	0.98	0.52	0.74	0.56	0.52
N° 8 (Bias2)	0.64	0.64	0.64	0.64	0.62	0.66	0.80	0.68	1.16	1.08	1.52
N° 9 (Bias2)	0.60	0.68	0.62	0.60	0.70	0.76	0.76	0.72	0.78	0.70	0.70
N° 10 (Bias2)	0.72	0.72	0.76	0.88	0.86	0.84	1.06	0.96	1.16	0.88	0.80
N° 11 (Bias2)	0.72	0.72	0.72	0.76	0.88	0.96	1.28	0.86	0.96	0.88	0.80
N° 12 (OFF1)	0.72	0.80	0.76	0.88	0.88	1.24	1.12	1.08	1.14	1.00	1.00
N° 13 (OFF1)	0.72	0.72	0.76	0.80	0.84	0.92	1.12	0.92	0.96	0.90	0.86
N° 14 (OFF1)	0.68	0.68	0.68	0.64	0.78	0.76	0.84	0.72	0.82	0.76	0.78
N° 15 (OFF1)	0.64	0.72	0.70	0.80	0.80	1.12	0.96	1.02	0.88	0.88	0.84
N° 16 (OFF1)	0.74	0.80	0.72	0.86	0.88	0.88	1.04	1.16	1.02	0.96	1.24

Delta [TF1]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	0.000E+0	0.000E+0	2.000E-2	8.000E-2	1.800E-1	3.600E-1	4.000E-2	-4.000E-2	6.000E-2	0.000E+0
N° 2 (Bias1)	---	0.000E+0	0.000E+0	4.000E-2	4.000E-2	8.000E-2	2.600E-1	2.000E-2	0.000E+0	0.000E+0	0.000E+0
N° 3 (Bias1)	---	6.000E-2	4.000E-2	1.600E-1	2.000E-1	2.000E-1	2.800E-1	1.600E-1	2.000E-1	6.800E-1	-3.200E-1
N° 4 (Bias1)	---	4.000E-2	4.000E-2	2.800E-1	1.200E-1	1.200E-1	3.600E-1	1.600E-1	3.200E-1	1.200E-1	6.000E-2
N° 5 (Bias1)	---	0.000E+0	-4.000E-2	0.000E+0	1.200E-1	8.000E-2	3.600E-1	0.000E+0	1.600E-1	0.000E+0	4.000E-2
N° 6 (Bias1)	---	0.000E+0	0.000E+0	8.000E-2	1.600E-1	1.600E-1	3.000E-1	1.000E-1	6.000E-1	1.200E-1	4.400E-1
N° 7 (Bias2)	---	-4.000E-2	-4.000E-2	-6.000E-2	-4.000E-2	2.000E-2	3.400E-1	-1.200E-1	1.000E-1	-8.000E-2	-1.200E-1
N° 8 (Bias2)	---	0.000E+0	0.000E+0	0.000E+0	-2.000E-2	2.000E-2	1.600E-1	4.000E-2	5.200E-1	4.400E-1	8.800E-1
N° 9 (Bias2)	---	8.000E-2	2.000E-2	0.000E+0	1.000E-1	1.600E-1	1.600E-1	1.200E-1	1.800E-1	1.000E-1	1.000E-1
N° 10 (Bias2)	---	0.000E+0	4.000E-2	1.600E-1	1.400E-1	1.200E-1	3.400E-1	2.400E-1	4.400E-1	1.600E-1	8.000E-2
N° 11 (Bias2)	---	0.000E+0	0.000E+0	4.000E-2	1.600E-1	2.400E-1	5.600E-1	1.400E-1	2.400E-1	1.600E-1	8.000E-2
N° 12 (OFF1)	---	8.000E-2	4.000E-2	1.600E-1	1.600E-1	5.200E-1	4.000E-1	3.600E-1	4.200E-1	2.800E-1	2.800E-1
N° 13 (OFF1)	---	0.000E+0	4.000E-2	8.000E-2	1.200E-1	2.000E-1	4.000E-1	2.000E-1	2.400E-1	1.800E-1	1.400E-1
N° 14 (OFF1)	---	0.000E+0	0.000E+0	-4.000E-2	1.000E-1	8.000E-2	1.600E-1	4.000E-2	1.400E-1	8.000E-2	1.000E-1
N° 15 (OFF1)	---	8.000E-2	6.000E-2	1.600E-1	1.600E-1	4.800E-1	3.200E-1	3.800E-1	2.400E-1	2.400E-1	2.000E-1
N° 16 (OFF1)	---	6.000E-2	-2.000E-2	1.200E-1	1.400E-1	1.400E-1	3.000E-1	4.200E-1	2.800E-1	2.200E-1	5.000E-1
Average (OFF1)	---	2.000E-2	8.000E-3	1.120E-1	1.280E-1	1.280E-1	3.120E-1	8.800E-2	2.560E-1	1.840E-1	4.400E-2
σ (OFF1)	---	2.828E-2	3.347E-2	1.110E-1	5.933E-2	5.215E-2	4.604E-2	7.563E-2	2.238E-1	2.837E-1	2.700E-1
Average+3σ (OFF1)	---	1.049E-1	1.084E-1	4.450E-1	3.060E-1	2.845E-1	4.501E-1	3.149E-1	9.274E-1	1.035E+0	8.539E-1
Average-3σ (OFF1)	---	-6.485E-2	-9.240E-2	-2.210E-1	-4.999E-2	-2.846E-2	1.739E-1	-1.389E-1	-4.154E-1	-6.671E-1	-7.659E-1
Average (Bias1)	---	8.000E-3	4.000E-3	2.800E-2	6.800E-2	1.120E-1	3.120E-1	8.400E-2	2.960E-1	1.560E-1	2.040E-1
σ (Bias1)	---	4.382E-2	2.966E-2	8.198E-2	9.230E-2	9.445E-2	1.653E-1	1.345E-1	1.774E-1	1.868E-1	3.884E-1
Average+3σ (Bias1)	---	1.395E-1	9.299E-2	2.739E-1	3.449E-1	3.953E-1	8.079E-1	4.874E-1	8.283E-1	7.163E-1	1.369E+0
Average-3σ (Bias1)	---	-1.235E-1	-8.499E-2	-2.179E-1	-2.089E-1	-1.713E-1	-1.839E-1	-3.194E-1	-2.363E-1	-4.043E-1	-9.613E-1
Average (Bias2)	---	4.400E-2	2.400E-2	9.600E-2	1.360E-1	2.840E-1	3.160E-1	2.800E-1	2.640E-1	2.000E-1	2.440E-1
σ (Bias2)	---	4.099E-2	3.286E-2	8.295E-2	2.608E-2	2.022E-1	9.839E-2	1.581E-1	1.014E-1	7.616E-2	1.584E-1
Average+3σ (Bias2)	---	1.670E-1	1.226E-1	3.448E-1	2.142E-1	8.906E-1	6.112E-1	7.543E-1	5.682E-1	4.285E-1	7.191E-1
Average-3σ (Bias2)	---	-7.896E-2	-7.459E-2	-1.528E-1	5.777E-2	-3.226E-1	2.084E-2	-1.943E-1	-4.017E-2	-2.847E-2	-2.311E-1

10.TR2

Ta=25°C; Vcc = 10V; If = 5 mA; RL = 100 Ohms; Ie = 0



TR2 . (µs) **Max = 3.0**

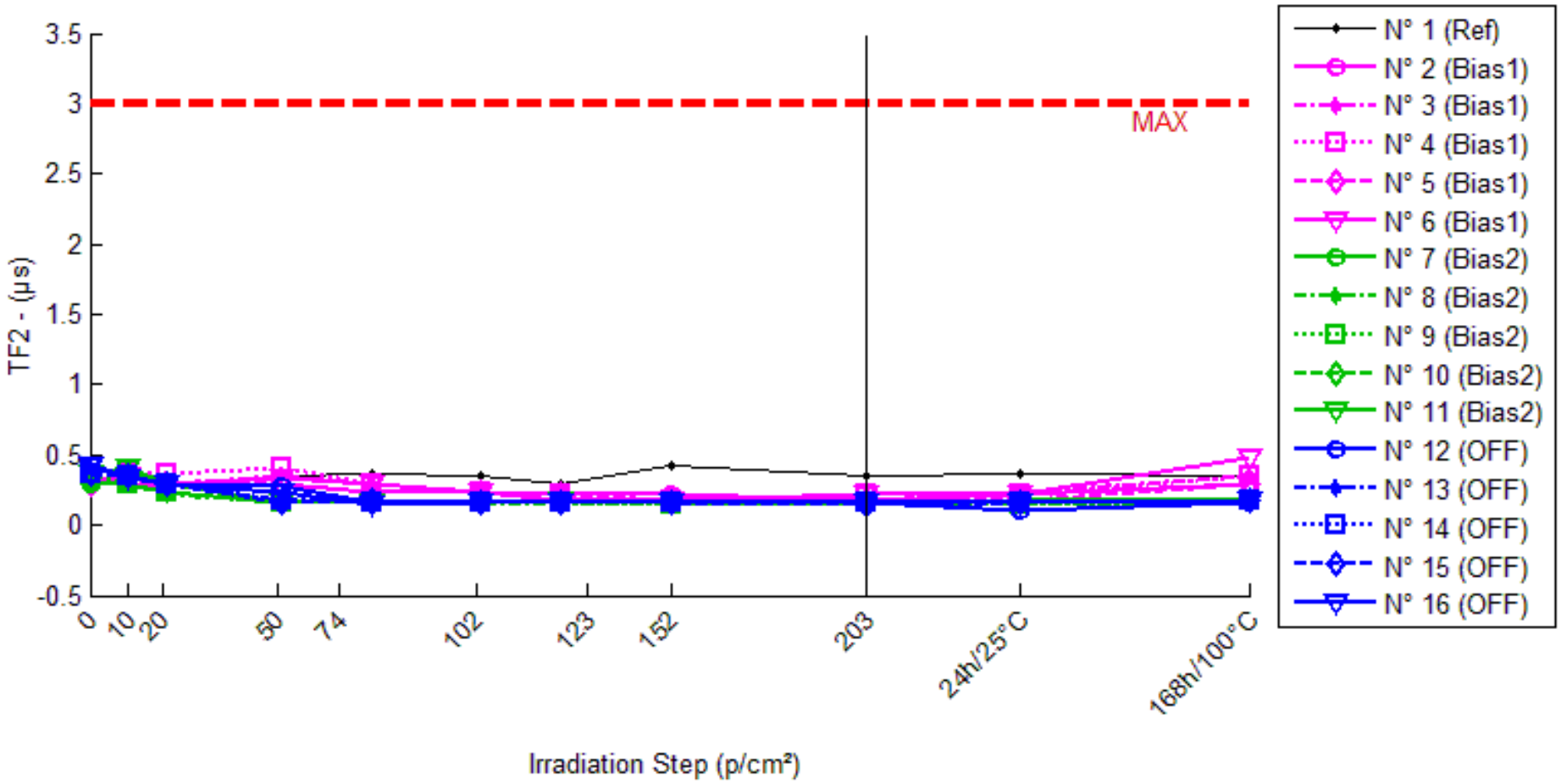
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.29	0.29	0.30	0.29	0.36	0.30	0.29	0.32	0.31	0.37	0.31
N° 2 (Bias1)	0.29	0.30	0.30	0.23	0.18	0.23	0.18	0.18	0.17	0.19	0.29
N° 3 (Bias1)	0.30	0.30	0.25	0.36	0.23	0.23	0.23	0.18	0.17	0.19	0.24
N° 4 (Bias1)	0.30	0.29	0.30	0.34	0.29	0.24	0.23	0.18	0.18	0.18	0.31
N° 5 (Bias1)	0.31	0.30	0.25	0.29	0.25	0.23	0.17	0.18	0.17	0.19	0.30
N° 6 (Bias1)	0.30	0.30	0.30	0.29	0.23	0.24	0.23	0.18	0.18	0.18	0.29
N° 7 (Bias2)	0.30	0.25	0.23	0.17	0.17	0.16	0.16	0.16	0.16	0.13	0.17
N° 8 (Bias2)	0.29	0.30	0.23	0.15	0.16	0.16	0.16	0.13	0.15	0.13	0.16
N° 9 (Bias2)	0.29	0.29	0.24	0.16	0.17	0.13	0.16	0.16	0.12	0.13	0.17
N° 10 (Bias2)	0.30	0.35	0.24	0.17	0.16	0.12	0.12	0.16	0.16	0.12	0.18
N° 11 (Bias2)	0.36	0.30	0.24	0.17	0.17	0.17	0.15	0.16	0.16	0.13	0.17
N° 12 (OFF1)	0.30	0.30	0.24	0.29	0.16	0.16	0.16	0.16	0.13	0.13	0.18
N° 13 (OFF1)	0.29	0.37	0.24	0.17	0.17	0.16	0.16	0.16	0.16	0.13	0.17
N° 14 (OFF1)	0.31	0.30	0.25	0.17	0.16	0.17	0.12	0.15	0.16	0.12	0.18
N° 15 (OFF1)	0.30	0.30	0.25	0.18	0.16	0.16	0.16	0.16	0.16	0.12	0.18
N° 16 (OFF1)	0.30	0.29	0.25	0.21	0.16	0.17	0.17	0.12	0.16	0.12	0.17

Delta [TR2]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	0.000E+0	1.000E-2	0.000E+0	7.000E-2	1.000E-2	0.000E+0	3.000E-2	2.000E-2	8.000E-2	2.000E-2
N° 2 (Bias1)	---	1.000E-2	1.000E-2	-6.000E-2	-1.100E-1	-6.000E-2	-1.100E-1	-1.100E-1	-1.200E-1	-1.000E-1	0.000E+0
N° 3 (Bias1)	---	0.000E+0	-5.000E-2	6.000E-2	-7.000E-2	-7.000E-2	-7.000E-2	-1.200E-1	-1.300E-1	-1.100E-1	-6.000E-2
N° 4 (Bias1)	---	-1.000E-2	0.000E+0	4.000E-2	-1.000E-2	-6.000E-2	-7.000E-2	-1.200E-1	-1.200E-1	-1.200E-1	1.000E-2
N° 5 (Bias1)	---	-1.000E-2	-6.000E-2	-2.000E-2	-6.000E-2	-8.000E-2	-1.400E-1	-1.300E-1	-1.400E-1	-1.200E-1	-1.000E-2
N° 6 (Bias1)	---	0.000E+0	0.000E+0	-1.000E-2	-7.000E-2	-6.000E-2	-7.000E-2	-1.200E-1	-1.200E-1	-1.200E-1	-1.000E-2
N° 7 (Bias2)	---	-5.000E-2	-7.000E-2	-1.300E-1	-1.300E-1	-1.400E-1	-1.400E-1	-1.400E-1	-1.400E-1	-1.700E-1	-1.300E-1
N° 8 (Bias2)	---	1.000E-2	-6.000E-2	-1.400E-1	-1.300E-1	-1.300E-1	-1.300E-1	-1.600E-1	-1.400E-1	-1.600E-1	-1.300E-1
N° 9 (Bias2)	---	0.000E+0	-5.000E-2	-1.300E-1	-1.200E-1	-1.600E-1	-1.300E-1	-1.300E-1	-1.700E-1	-1.600E-1	-1.200E-1
N° 10 (Bias2)	---	5.000E-2	-6.000E-2	-1.300E-1	-1.400E-1	-1.800E-1	-1.800E-1	-1.400E-1	-1.400E-1	-1.800E-1	-1.200E-1
N° 11 (Bias2)	---	-6.000E-2	-1.200E-1	-1.900E-1	-1.900E-1	-1.900E-1	-2.100E-1	-2.000E-1	-2.000E-1	-2.300E-1	-1.900E-1
N° 12 (OFF1)	---	0.000E+0	-6.000E-2	-1.000E-2	-1.400E-1	-1.400E-1	-1.400E-1	-1.400E-1	-1.700E-1	-1.700E-1	-1.200E-1
N° 13 (OFF1)	---	8.000E-2	-5.000E-2	-1.200E-1	-1.200E-1	-1.300E-1	-1.300E-1	-1.300E-1	-1.300E-1	-1.600E-1	-1.200E-1
N° 14 (OFF1)	---	-1.000E-2	-6.000E-2	-1.400E-1	-1.500E-1	-1.400E-1	-1.900E-1	-1.600E-1	-1.500E-1	-1.900E-1	-1.300E-1
N° 15 (OFF1)	---	0.000E+0	-5.000E-2	-1.200E-1	-1.400E-1	-1.400E-1	-1.400E-1	-1.400E-1	-1.400E-1	-1.800E-1	-1.200E-1
N° 16 (OFF1)	---	-1.000E-2	-5.000E-2	-9.000E-2	-1.400E-1	-1.300E-1	-1.300E-1	-1.800E-1	-1.400E-1	-1.800E-1	-1.300E-1
Average (OFF1)	---	-2.000E-3	-2.000E-2	2.000E-3	-6.400E-2	-6.600E-2	-9.200E-2	-1.200E-1	-1.260E-1	-1.140E-1	-1.400E-2
σ (OFF1)	---	8.367E-3	3.240E-2	4.817E-2	3.578E-2	8.944E-3	3.194E-2	7.071E-3	8.944E-3	8.944E-3	2.702E-2
Average+3σ (OFF1)	---	2.310E-2	7.721E-2	1.465E-1	4.333E-2	-3.917E-2	3.812E-3	-9.879E-2	-9.917E-2	-8.717E-2	6.706E-2
Average-3σ (OFF1)	---	-2.710E-2	-1.172E-1	-1.425E-1	-1.713E-1	-9.283E-2	-1.878E-1	-1.412E-1	-1.528E-1	-1.408E-1	-9.506E-2
Average (Bias1)	---	-1.000E-2	-7.200E-2	-1.440E-1	-1.420E-1	-1.600E-1	-1.580E-1	-1.540E-1	-1.580E-1	-1.800E-1	-1.380E-1
σ (Bias1)	---	4.528E-2	2.775E-2	2.608E-2	2.775E-2	2.550E-2	3.564E-2	2.793E-2	2.683E-2	2.915E-2	2.950E-2
Average+3σ (Bias1)	---	1.258E-1	1.125E-2	-6.577E-2	-5.875E-2	-8.351E-2	-5.109E-2	-7.021E-2	-7.750E-2	-9.254E-2	-4.951E-2
Average-3σ (Bias1)	---	-1.458E-1	-1.552E-1	-2.222E-1	-2.252E-1	-2.365E-1	-2.649E-1	-2.378E-1	-2.385E-1	-2.675E-1	-2.265E-1
Average (Bias2)	---	1.200E-2	-5.400E-2	-9.600E-2	-1.380E-1	-1.360E-1	-1.460E-1	-1.500E-1	-1.460E-1	-1.760E-1	-1.240E-1
σ (Bias2)	---	3.834E-2	5.477E-3	5.128E-2	1.095E-2	5.477E-3	2.510E-2	2.000E-2	1.517E-2	1.140E-2	5.477E-3
Average+3σ (Bias2)	---	1.270E-1	-3.757E-2	5.785E-2	-1.051E-1	-1.196E-1	-7.070E-2	-9.000E-2	-1.005E-1	-1.418E-1	-1.076E-1
Average-3σ (Bias2)	---	-1.030E-1	-7.043E-2	-2.499E-1	-1.709E-1	-1.524E-1	-2.213E-1	-2.100E-1	-1.915E-1	-2.102E-1	-1.404E-1

11.TF2

Ta=25°C; Vcc = 10V; If = 5 mA; RL = 100 Ohms; Ie = 0



TF2 . (µs) **Max = 3.0**

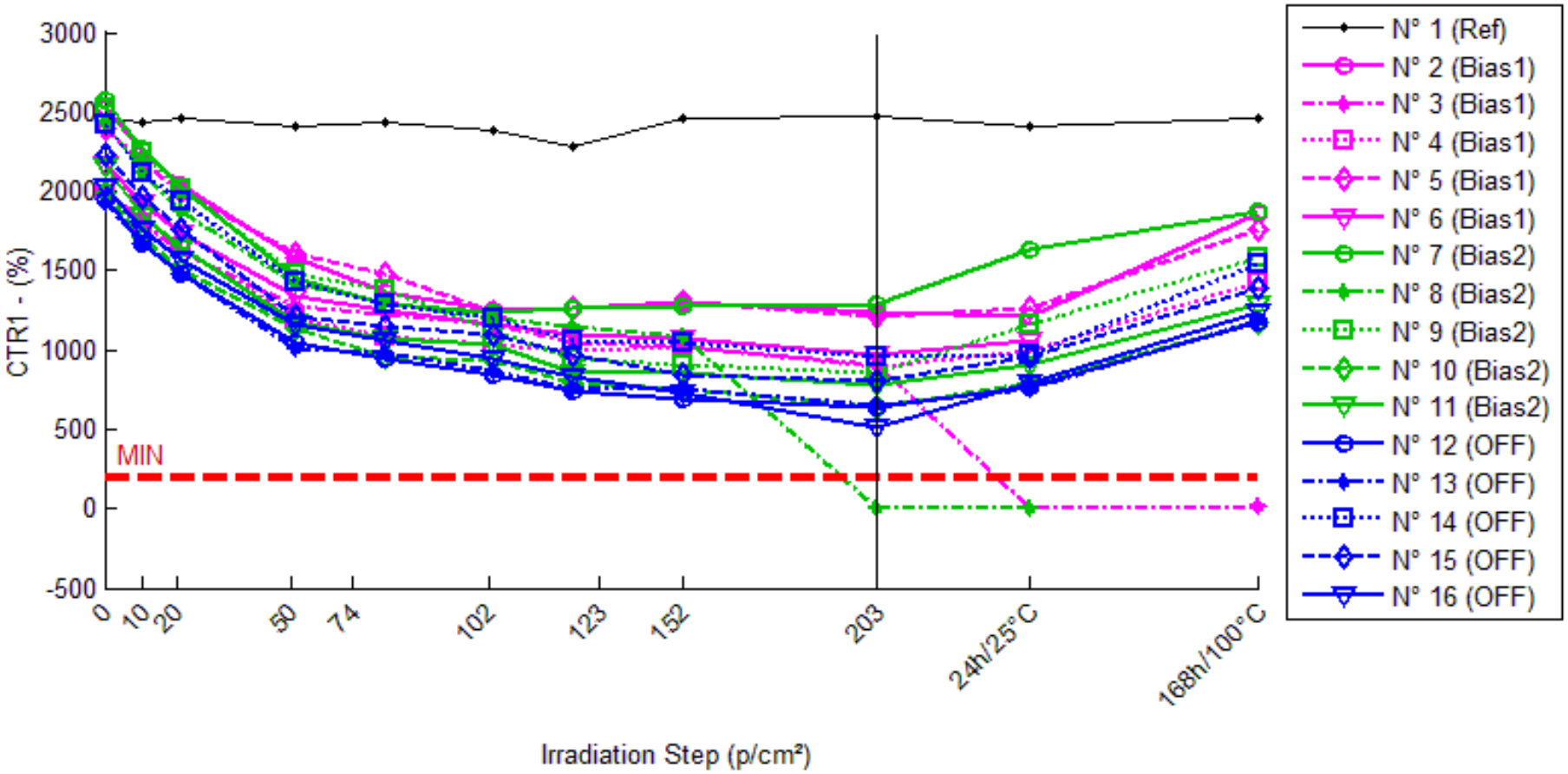
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.30	0.35	0.29	0.35	0.36	0.35	0.30	0.42	0.35	0.37	0.35
N° 2 (Bias1)	0.35	0.29	0.28	0.29	0.24	0.23	0.22	0.22	0.17	0.22	0.29
N° 3 (Bias1)	0.29	0.30	0.29	0.35	0.29	0.23	0.22	0.22	0.17	0.23	0.35
N° 4 (Bias1)	0.36	0.36	0.36	0.41	0.29	0.23	0.22	0.17	0.22	0.22	0.35
N° 5 (Bias1)	0.29	0.35	0.29	0.29	0.23	0.24	0.22	0.17	0.17	0.17	0.29
N° 6 (Bias1)	0.43	0.35	0.30	0.34	0.29	0.23	0.17	0.17	0.22	0.22	0.48
N° 7 (Bias2)	0.30	0.30	0.23	0.16	0.16	0.16	0.16	0.16	0.15	0.17	0.17
N° 8 (Bias2)	0.30	0.29	0.22	0.16	0.16	0.15	0.15	0.15	0.16	0.15	0.16
N° 9 (Bias2)	0.36	0.30	0.24	0.16	0.16	0.16	0.16	0.15	0.16	0.15	0.17
N° 10 (Bias2)	0.36	0.36	0.29	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.17
N° 11 (Bias2)	0.36	0.41	0.29	0.16	0.16	0.16	0.17	0.16	0.16	0.16	0.17
N° 12 (OFF1)	0.42	0.35	0.30	0.28	0.16	0.16	0.16	0.16	0.16	0.11	0.16
N° 13 (OFF1)	0.41	0.35	0.30	0.17	0.17	0.16	0.16	0.16	0.16	0.16	0.17
N° 14 (OFF1)	0.36	0.35	0.29	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.17
N° 15 (OFF1)	0.36	0.35	0.29	0.16	0.17	0.16	0.16	0.16	0.15	0.16	0.17
N° 16 (OFF1)	0.42	0.34	0.30	0.23	0.15	0.16	0.16	0.16	0.16	0.16	0.17

Delta [TF2]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	5.000E-2	-1.000E-2	5.000E-2	6.000E-2	5.000E-2	0.000E+0	1.200E-1	5.000E-2	7.000E-2	5.000E-2
N° 2 (Bias1)	---	-6.000E-2	-7.000E-2	-6.000E-2	-1.100E-1	-1.200E-1	-1.300E-1	-1.300E-1	-1.800E-1	-1.300E-1	-6.000E-2
N° 3 (Bias1)	---	1.000E-2	0.000E+0	6.000E-2	0.000E+0	-6.000E-2	-7.000E-2	-7.000E-2	-1.200E-1	-6.000E-2	6.000E-2
N° 4 (Bias1)	---	0.000E+0	0.000E+0	5.000E-2	-7.000E-2	-1.300E-1	-1.400E-1	-1.900E-1	-1.400E-1	-1.400E-1	-1.000E-2
N° 5 (Bias1)	---	6.000E-2	0.000E+0	0.000E+0	-6.000E-2	-5.000E-2	-7.000E-2	-1.200E-1	-1.200E-1	-1.200E-1	0.000E+0
N° 6 (Bias1)	---	-8.000E-2	-1.300E-1	-9.000E-2	-1.400E-1	-2.000E-1	-2.600E-1	-2.600E-1	-2.100E-1	-2.100E-1	5.000E-2
N° 7 (Bias2)	---	0.000E+0	-7.000E-2	-1.400E-1	-1.400E-1	-1.400E-1	-1.400E-1	-1.400E-1	-1.500E-1	-1.300E-1	-1.300E-1
N° 8 (Bias2)	---	-1.000E-2	-8.000E-2	-1.400E-1	-1.400E-1	-1.500E-1	-1.500E-1	-1.500E-1	-1.400E-1	-1.500E-1	-1.400E-1
N° 9 (Bias2)	---	-6.000E-2	-1.200E-1	-2.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	-2.100E-1	-2.000E-1	-2.100E-1	-1.900E-1
N° 10 (Bias2)	---	0.000E+0	-7.000E-2	-2.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	-1.900E-1
N° 11 (Bias2)	---	5.000E-2	-7.000E-2	-2.000E-1	-2.000E-1	-2.000E-1	-1.900E-1	-2.000E-1	-2.000E-1	-2.000E-1	-1.900E-1
N° 12 (OFF1)	---	-7.000E-2	-1.200E-1	-1.400E-1	-2.600E-1	-2.600E-1	-2.600E-1	-2.600E-1	-2.600E-1	-3.100E-1	-2.600E-1
N° 13 (OFF1)	---	-6.000E-2	-1.100E-1	-2.400E-1	-2.400E-1	-2.500E-1	-2.500E-1	-2.500E-1	-2.500E-1	-2.500E-1	-2.400E-1
N° 14 (OFF1)	---	-1.000E-2	-7.000E-2	-1.900E-1	-2.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	-1.900E-1
N° 15 (OFF1)	---	-1.000E-2	-7.000E-2	-2.000E-1	-1.900E-1	-2.000E-1	-2.000E-1	-2.000E-1	-2.100E-1	-2.000E-1	-1.900E-1
N° 16 (OFF1)	---	-8.000E-2	-1.200E-1	-1.900E-1	-2.700E-1	-2.600E-1	-2.600E-1	-2.600E-1	-2.600E-1	-2.600E-1	-2.500E-1
Average (OFF1)	---	-1.400E-2	-4.000E-2	-8.000E-3	-7.600E-2	-1.120E-1	-1.340E-1	-1.540E-1	-1.540E-1	-1.320E-1	8.000E-3
σ (OFF1)	---	5.639E-2	5.874E-2	6.611E-2	5.320E-2	6.058E-2	7.765E-2	7.301E-2	3.975E-2	5.357E-2	4.868E-2
Average+3σ (OFF1)	---	1.552E-1	1.362E-1	1.903E-1	8.359E-2	6.974E-2	9.896E-2	6.502E-2	-3.475E-2	2.872E-2	1.540E-1
Average-3σ (OFF1)	---	-1.832E-1	-2.162E-1	-2.063E-1	-2.356E-1	-2.937E-1	-3.670E-1	-3.730E-1	-2.732E-1	-2.927E-1	-1.380E-1
Average (Bias1)	---	-4.000E-3	-8.200E-2	-1.760E-1	-1.760E-1	-1.780E-1	-1.760E-1	-1.800E-1	-1.780E-1	-1.780E-1	-1.680E-1
σ (Bias1)	---	3.912E-2	2.168E-2	3.286E-2	3.286E-2	3.033E-2	2.881E-2	3.240E-2	3.033E-2	3.564E-2	3.033E-2
Average+3σ (Bias1)	---	1.133E-1	-1.696E-2	-7.741E-2	-7.741E-2	-8.701E-2	-8.957E-2	-8.279E-2	-8.701E-2	-7.109E-2	-7.701E-2
Average-3σ (Bias1)	---	-1.213E-1	-1.470E-1	-2.746E-1	-2.746E-1	-2.690E-1	-2.624E-1	-2.772E-1	-2.690E-1	-2.849E-1	-2.590E-1
Average (Bias2)	---	-4.600E-2	-9.800E-2	-1.920E-1	-2.320E-1	-2.340E-1	-2.340E-1	-2.340E-1	-2.360E-1	-2.440E-1	-2.260E-1
σ (Bias2)	---	3.362E-2	2.588E-2	3.564E-2	3.564E-2	3.130E-2	3.130E-2	3.130E-2	2.881E-2	4.615E-2	3.362E-2
Average+3σ (Bias2)	---	5.485E-2	-2.035E-2	-8.509E-2	-1.251E-1	-1.401E-1	-1.401E-1	-1.401E-1	-1.496E-1	-1.055E-1	-1.252E-1
Average-3σ (Bias2)	---	-1.468E-1	-1.757E-1	-2.989E-1	-3.389E-1	-3.279E-1	-3.279E-1	-3.279E-1	-3.224E-1	-3.825E-1	-3.268E-1

12.CTR1

Ta=25°C; Vce = 5V; If = 1 mA



CTR1 . (%)

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	2465.37	2438.51	2460.45	2413.34	2438.65	2382.58	2287.24	2459.72	2478.02	2409.24	2455.86
N° 2 (Bias1)	2525.73	2261.45	2042.67	1583.06	1367.78	1254.58	1258.75	1305.33	1242.72	1213.95	1863.00
N° 3 (Bias1)	2010.66	1792.45	1623.31	1280.82	1222.90	1162.70	1043.11	1019.98	910.04	2.20	9.88
N° 4 (Bias1)	2015.94	1796.59	1641.59	1205.05	1078.83	1037.68	989.61	1026.52	897.68	990.84	1425.32
N° 5 (Bias1)	2398.36	2176.66	2001.20	1606.56	1475.56	1235.67	1261.46	1294.66	1215.26	1262.51	1760.18
N° 6 (Bias1)	2166.56	1920.51	1737.15	1333.00	1244.98	1155.12	1101.10	1068.29	973.12	1064.20	Not Measurable*
N° 7 (Bias2)	2567.70	2270.01	2029.20	1459.59	1290.86	1232.51	1258.56	1271.16	1285.68	1629.62	1871.11
N° 8 (Bias2)	2433.34	2115.61	1873.26	1409.86	1302.64	1204.57	1148.96	1085.11	2.39	2.71	Not Measurable*
N° 9 (Bias2)	2521.00	2241.36	2007.49	1481.51	1381.18	1123.37	941.49	900.05	851.94	1155.07	1583.41
N° 10 (Bias2)	1985.69	1713.09	1505.57	1140.14	959.15	926.68	788.55	750.10	644.17	789.56	1177.80
N° 11 (Bias2)	2157.89	1850.53	1648.04	1174.89	1072.84	1028.49	860.94	855.82	777.30	912.47	1291.00
N° 12 (OFF1)	1952.93	1672.02	1478.96	1051.41	940.71	836.89	744.40	683.69	645.13	765.51	1171.35
N° 13 (OFF1)	1929.24	1673.01	1483.28	1006.60	978.22	869.70	753.02	759.18	649.91	748.06	1189.19
N° 14 (OFF1)	2426.45	2117.59	1937.14	1421.84	1282.05	1200.14	1062.74	1050.19	953.53	968.83	1543.55
N° 15 (OFF1)	2234.51	1961.49	1763.98	1214.94	1154.22	1094.52	970.09	841.58	808.45	962.83	1393.06
N° 16 (OFF1)	2031.90	1758.67	1563.05	1158.20	1061.11	938.37	829.85	722.45	506.95	795.63	1238.40

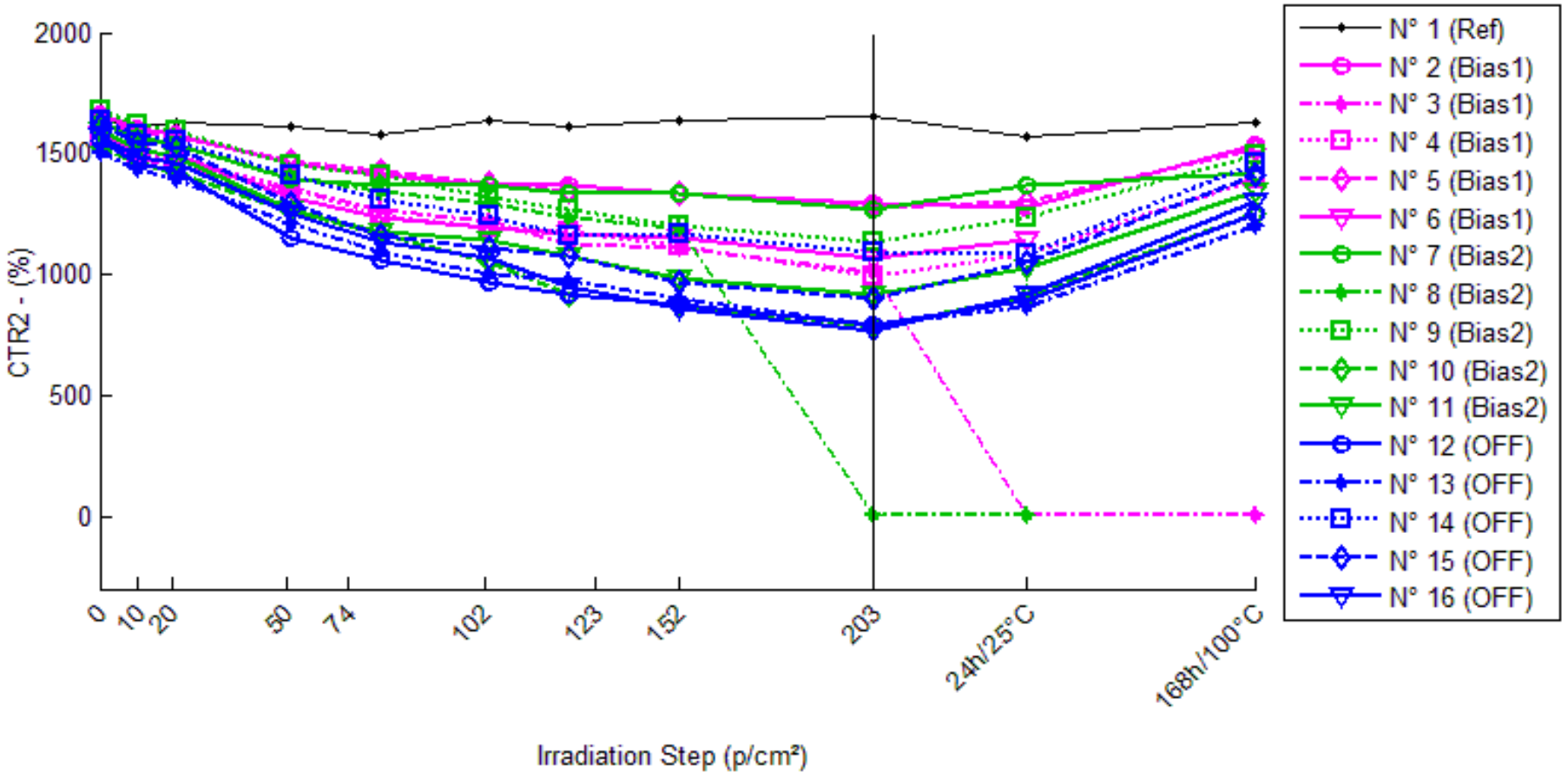
*** Not Measurable because of test condition (cf. Vceo & Vcbo) cannot be applied**

1/Delta [CTR1]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	4.469E-6	8.116E-7	8.745E-6	4.445E-6	1.409E-5	3.159E-5	9.317E-7	-2.070E-6	9.450E-6	1.570E-6
N° 2 (Bias1)	---	4.627E-5	9.363E-5	2.358E-4	3.352E-4	4.012E-4	3.985E-4	3.702E-4	4.088E-4	4.278E-4	1.408E-4
N° 3 (Bias1)	---	6.054E-5	1.187E-4	2.834E-4	3.204E-4	3.627E-4	4.613E-4	4.831E-4	6.015E-4	4.547E-1	1.007E-1
N° 4 (Bias1)	---	6.057E-5	1.131E-4	3.338E-4	4.309E-4	4.676E-4	5.144E-4	4.781E-4	6.179E-4	5.132E-4	2.056E-4
N° 5 (Bias1)	---	4.247E-5	8.275E-5	2.055E-4	2.608E-4	3.923E-4	3.758E-4	3.555E-4	4.059E-4	3.751E-4	1.512E-4
N° 6 (Bias1)	---	5.913E-5	1.141E-4	2.886E-4	3.417E-4	4.041E-4	4.466E-4	4.745E-4	5.661E-4	4.781E-4	NaN
N° 7 (Bias2)	---	5.107E-5	1.034E-4	2.957E-4	3.852E-4	4.219E-4	4.051E-4	3.972E-4	3.883E-4	2.242E-4	1.450E-4
N° 8 (Bias2)	---	6.172E-5	1.229E-4	2.983E-4	3.567E-4	4.192E-4	4.594E-4	5.106E-4	4.175E-1	3.682E-1	NaN
N° 9 (Bias2)	---	4.949E-5	1.015E-4	2.783E-4	3.274E-4	4.935E-4	6.655E-4	7.144E-4	7.771E-4	4.691E-4	2.349E-4
N° 10 (Bias2)	---	8.014E-5	1.606E-4	3.735E-4	5.390E-4	5.755E-4	7.645E-4	8.296E-4	1.049E-3	7.629E-4	3.454E-4
N° 11 (Bias2)	---	7.697E-5	1.434E-4	3.877E-4	4.687E-4	5.089E-4	6.981E-4	7.051E-4	8.231E-4	6.325E-4	3.112E-4
N° 12 (OFF1)	---	8.603E-5	1.641E-4	4.390E-4	5.510E-4	6.828E-4	8.313E-4	9.506E-4	1.038E-3	7.943E-4	3.417E-4
N° 13 (OFF1)	---	7.939E-5	1.558E-4	4.751E-4	5.039E-4	6.315E-4	8.096E-4	7.989E-4	1.020E-3	8.185E-4	3.226E-4
N° 14 (OFF1)	---	6.011E-5	1.041E-4	2.912E-4	3.679E-4	4.211E-4	5.288E-4	5.401E-4	6.366E-4	6.200E-4	2.357E-4
N° 15 (OFF1)	---	6.229E-5	1.194E-4	3.756E-4	4.189E-4	4.661E-4	5.833E-4	7.407E-4	7.894E-4	5.911E-4	2.703E-4
N° 16 (OFF1)	---	7.646E-5	1.476E-4	3.713E-4	4.503E-4	5.735E-4	7.129E-4	8.920E-4	1.480E-3	7.647E-4	3.153E-4
Average (OFF1)	---	5.380E-5	1.045E-4	2.694E-4	3.378E-4	4.056E-4	4.393E-4	4.323E-4	5.200E-4	9.130E-2	2.531E-2
σ (OFF1)	---	8.729E-6	1.548E-5	4.982E-5	6.109E-5	3.836E-5	5.451E-5	6.369E-5	1.046E-4	2.031E-1	5.029E-2
Average+3σ (OFF1)	---	7.998E-5	1.509E-4	4.189E-4	5.210E-4	5.207E-4	6.029E-4	6.233E-4	8.338E-4	7.007E-1	1.762E-1
Average-3σ (OFF1)	---	2.761E-5	5.801E-5	1.200E-4	1.545E-4	2.905E-4	2.758E-4	2.412E-4	2.063E-4	-5.181E-1	-1.256E-1
Average (Bias1)	---	6.388E-5	1.263E-4	3.267E-4	4.154E-4	4.838E-4	5.985E-4	6.314E-4	8.411E-2	7.407E-2	2.591E-4
σ (Bias1)	---	1.424E-5	2.561E-5	5.005E-5	8.692E-5	6.546E-5	1.571E-4	1.739E-4	1.864E-1	1.644E-1	8.902E-5
Average+3σ (Bias1)	---	1.066E-4	2.031E-4	4.769E-4	6.762E-4	6.802E-4	1.070E-3	1.153E-3	6.433E-1	5.674E-1	5.262E-4
Average-3σ (Bias1)	---	2.115E-5	4.951E-5	1.765E-4	1.546E-4	2.874E-4	1.272E-4	1.096E-4	-4.750E-1	-4.193E-1	-7.941E-6
Average (Bias2)	---	7.286E-5	1.382E-4	3.904E-4	4.584E-4	5.550E-4	6.932E-4	7.845E-4	9.930E-4	7.177E-4	2.971E-4
σ (Bias2)	---	1.122E-5	2.544E-5	7.066E-5	7.153E-5	1.100E-4	1.343E-4	1.589E-4	3.197E-4	1.046E-4	4.316E-5
Average+3σ (Bias2)	---	1.065E-4	2.145E-4	6.024E-4	6.730E-4	8.849E-4	1.096E-3	1.261E-3	1.952E-3	1.032E-3	4.266E-4
Average-3σ (Bias2)	---	3.921E-5	6.190E-5	1.785E-4	2.438E-4	2.251E-4	2.904E-4	3.077E-4	3.387E-5	4.038E-4	1.676E-4

13.CTR2

Ta=25°C; Vce = 5V; If = 2 mA



CTR2 . (%)

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1633.91	1613.82	1626.74	1609.56	1574.61	1635.98	1613.13	1634.65	1650.03	1572.21	1628.39
N° 2 (Bias1)	1657.45	1602.06	1575.35	1460.33	1409.94	1369.99	1372.44	1338.00	1289.71	1278.06	1536.53
N° 3 (Bias1)	1536.46	1479.69	1448.37	1353.06	1267.86	1220.28	1124.75	1112.16	1006.66	2.62	6.59
N° 4 (Bias1)	1563.83	1505.50	1474.54	1357.88	1246.04	1193.08	1177.67	1119.53	995.56	1086.19	1392.96
N° 5 (Bias1)	1643.02	1588.11	1566.09	1471.63	1426.88	1373.37	1340.89	1331.92	1274.43	1303.73	1518.36
N° 6 (Bias1)	1581.53	1514.79	1494.51	1314.62	1233.56	1188.89	1165.09	1148.04	1063.59	1140.25	Not Measurable*
N° 7 (Bias2)	1627.05	1563.73	1534.20	1394.30	1366.38	1366.66	1336.87	1335.69	1267.09	1368.86	1419.56
N° 8 (Bias2)	1634.03	1567.65	1532.34	1405.36	1346.96	1291.22	1237.28	1193.62	2.87	6.16	Not Measurable*
N° 9 (Bias2)	1682.02	1617.12	1591.17	1455.15	1406.38	1318.45	1265.55	1197.13	1132.30	1238.51	1495.57
N° 10 (Bias2)	1530.29	1460.58	1416.32	1262.47	1169.76	1050.38	917.62	877.30	779.25	908.53	1252.15
N° 11 (Bias2)	1596.87	1520.17	1488.64	1265.66	1174.89	1143.32	1072.93	979.89	916.63	1024.19	1340.51
N° 12 (OFF1)	1553.26	1464.29	1429.25	1152.81	1056.90	968.21	914.89	871.53	791.89	888.18	1249.35
N° 13 (OFF1)	1503.35	1439.38	1397.81	1207.69	1091.71	1000.03	972.34	896.63	794.12	869.12	1205.13
N° 14 (OFF1)	1640.16	1574.12	1552.59	1410.82	1312.27	1243.47	1162.73	1166.47	1089.71	1082.50	1464.36
N° 15 (OFF1)	1620.93	1546.73	1529.70	1295.69	1159.63	1107.76	1078.06	968.27	902.80	1051.81	1407.17
N° 16 (OFF1)	1570.01	1483.68	1460.28	1248.11	1130.52	1068.70	950.22	857.40	769.53	917.61	1303.50

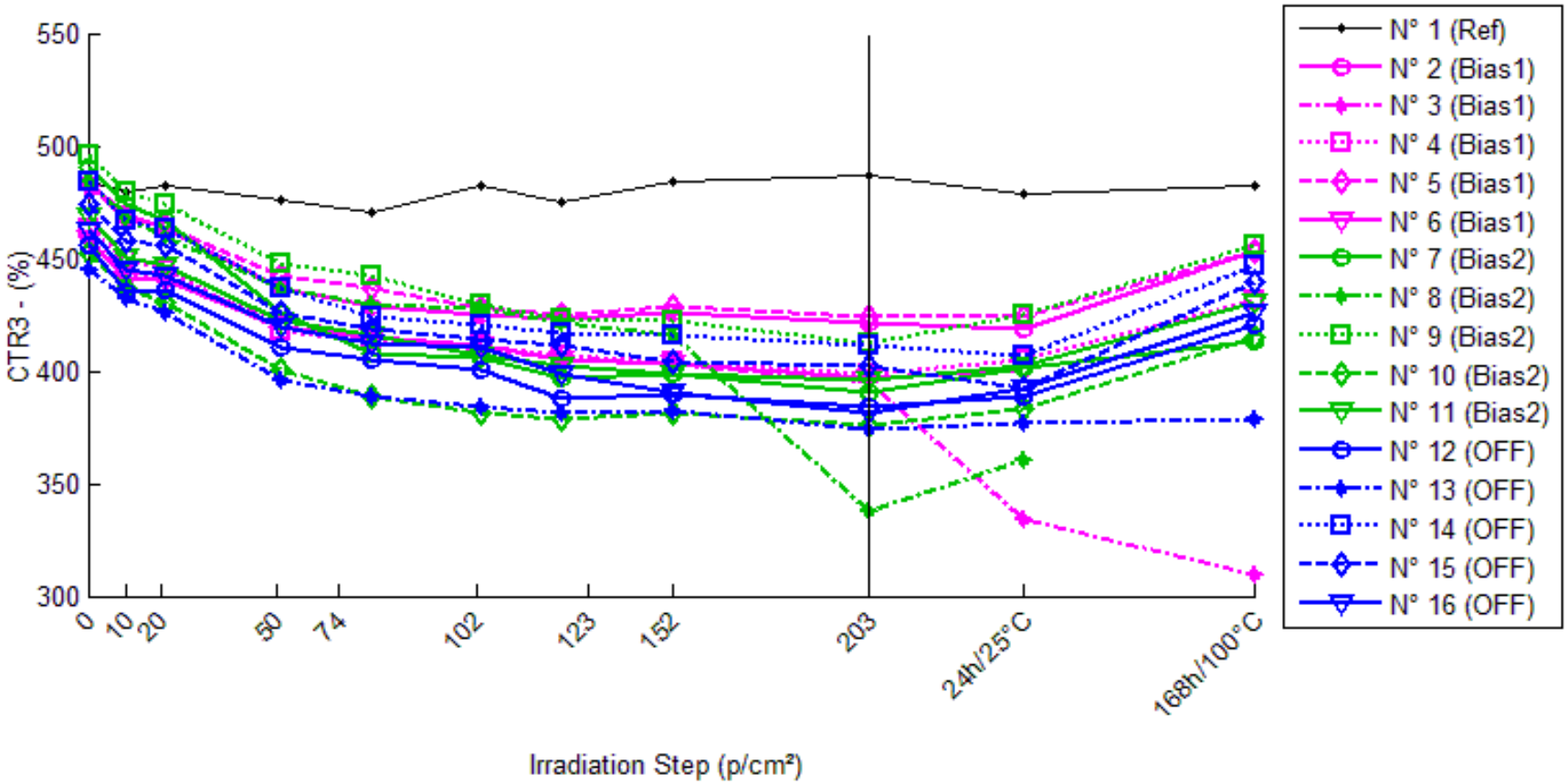
*** Not Measurable because of test condition (cf. Vceo & Vcbo) cannot be applied**

1/Delta [CTR2]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	7.617E-6	2.696E-6	9.260E-6	2.305E-5	-7.737E-7	7.883E-6	-2.782E-7	-5.980E-6	2.402E-5	2.072E-6
N° 2 (Bias1)	---	2.086E-5	3.144E-5	8.144E-5	1.059E-4	1.266E-4	1.253E-4	1.440E-4	1.720E-4	1.791E-4	4.748E-5
N° 3 (Bias1)	---	2.497E-5	3.958E-5	8.822E-5	1.379E-4	1.686E-4	2.382E-4	2.483E-4	3.425E-4	3.807E-1	1.510E-1
N° 4 (Bias1)	---	2.478E-5	3.872E-5	9.698E-5	1.631E-4	1.987E-4	2.097E-4	2.538E-4	3.650E-4	2.812E-4	7.844E-5
N° 5 (Bias1)	---	2.105E-5	2.990E-5	7.088E-5	9.220E-5	1.195E-4	1.371E-4	1.422E-4	1.760E-4	1.584E-4	4.997E-5
N° 6 (Bias1)	---	2.786E-5	3.682E-5	1.284E-4	1.784E-4	2.088E-4	2.260E-4	2.388E-4	3.079E-4	2.447E-4	NaN
N° 7 (Bias2)	---	2.489E-5	3.719E-5	1.026E-4	1.173E-4	1.171E-4	1.334E-4	1.341E-4	1.746E-4	1.159E-4	8.983E-5
N° 8 (Bias2)	---	2.591E-5	4.061E-5	9.957E-5	1.304E-4	1.625E-4	1.962E-4	2.258E-4	3.480E-1	1.618E-1	NaN
N° 9 (Bias2)	---	2.386E-5	3.395E-5	9.269E-5	1.165E-4	1.639E-4	1.956E-4	2.408E-4	2.886E-4	2.129E-4	7.412E-5
N° 10 (Bias2)	---	3.119E-5	5.258E-5	1.386E-4	2.014E-4	2.986E-4	4.363E-4	4.864E-4	6.298E-4	4.472E-4	1.452E-4
N° 11 (Bias2)	---	3.159E-5	4.553E-5	1.639E-4	2.249E-4	2.484E-4	3.058E-4	3.943E-4	4.647E-4	3.502E-4	1.198E-4
N° 12 (OFF1)	---	3.912E-5	5.586E-5	2.236E-4	3.024E-4	3.890E-4	4.492E-4	5.036E-4	6.190E-4	4.821E-4	1.566E-4
N° 13 (OFF1)	---	2.956E-5	5.023E-5	1.628E-4	2.508E-4	3.348E-4	3.633E-4	4.501E-4	5.941E-4	4.854E-4	1.646E-4
N° 14 (OFF1)	---	2.558E-5	3.439E-5	9.911E-5	1.523E-4	1.945E-4	2.504E-4	2.476E-4	3.080E-4	3.141E-4	7.320E-5
N° 15 (OFF1)	---	2.960E-5	3.679E-5	1.549E-4	2.454E-4	2.858E-4	3.107E-4	4.158E-4	4.907E-4	3.338E-4	9.372E-5
N° 16 (OFF1)	---	3.706E-5	4.786E-5	1.643E-4	2.476E-4	2.988E-4	4.154E-4	5.294E-4	6.626E-4	4.529E-4	1.302E-4
Average (OFF1)	---	2.390E-5	3.529E-5	9.318E-5	1.355E-4	1.645E-4	1.873E-4	2.054E-4	2.727E-4	7.630E-2	3.780E-2
σ (OFF1)	---	2.957E-6	4.370E-6	2.187E-5	3.659E-5	4.066E-5	5.233E-5	5.713E-5	9.235E-5	1.701E-1	7.548E-2
Average+3σ (OFF1)	---	3.277E-5	4.840E-5	1.588E-4	2.452E-4	2.864E-4	3.443E-4	3.768E-4	5.498E-4	5.867E-1	2.642E-1
Average-3σ (OFF1)	---	1.503E-5	2.218E-5	2.757E-5	2.573E-5	4.247E-5	3.027E-5	3.401E-5	-4.359E-6	-4.341E-1	-1.886E-1
Average (Bias1)	---	2.749E-5	4.197E-5	1.195E-4	1.581E-4	1.981E-4	2.535E-4	2.963E-4	6.991E-2	3.258E-2	1.072E-4
σ (Bias1)	---	3.639E-6	7.321E-6	3.056E-5	5.124E-5	7.352E-5	1.196E-4	1.415E-4	1.554E-1	7.223E-2	3.159E-5
Average+3σ (Bias1)	---	3.840E-5	6.393E-5	2.112E-4	3.118E-4	4.187E-4	6.122E-4	7.208E-4	5.362E-1	2.493E-1	2.020E-4
Average-3σ (Bias1)	---	1.657E-5	2.001E-5	2.778E-5	4.378E-6	-2.247E-5	-1.053E-4	-1.283E-4	-3.964E-1	-1.841E-1	1.244E-5
Average (Bias2)	---	3.218E-5	4.503E-5	1.609E-4	2.397E-4	3.006E-4	3.578E-4	4.293E-4	5.349E-4	4.137E-4	1.237E-4
σ (Bias2)	---	5.681E-6	9.128E-6	4.418E-5	5.426E-5	7.153E-5	7.981E-5	1.109E-4	1.417E-4	8.315E-5	3.952E-5
Average+3σ (Bias2)	---	4.923E-5	7.241E-5	2.935E-4	4.025E-4	5.152E-4	5.972E-4	7.619E-4	9.600E-4	6.631E-4	2.422E-4
Average-3σ (Bias2)	---	1.514E-5	1.764E-5	2.842E-5	7.693E-5	8.599E-5	1.184E-4	9.669E-5	1.098E-4	1.642E-4	5.102E-6

14.CTR3

Ta=25°C; Vce = 5V; If = 10 mA



CTR3 . (%)

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	483.81	479.61	482.44	476.35	470.67	482.10	474.59	483.70	486.82	478.88	482.31
N° 2 (Bias1)	483.49	469.66	463.31	437.14	428.22	425.15	422.87	425.51	421.63	418.41	453.20
N° 3 (Bias1)	457.88	445.08	439.45	423.13	415.20	409.76	406.08	403.46	395.43	334.26	309.30
N° 4 (Bias1)	462.93	449.97	444.64	417.93	413.26	410.97	407.00	403.67	398.59	404.60	431.65
N° 5 (Bias1)	482.53	467.80	463.71	442.65	437.11	427.70	424.86	428.36	424.51	423.92	452.89
N° 6 (Bias1)	458.70	440.87	440.10	419.89	414.76	411.74	405.38	402.79	397.07	400.78	Not Measurable*
N° 7 (Bias2)	490.71	474.37	466.38	425.97	407.55	405.69	396.62	399.03	390.40	401.51	413.51
N° 8 (Bias2)	483.89	467.53	459.67	436.57	429.52	428.04	421.54	416.22	337.69	360.73	Not Measurable*
N° 9 (Bias2)	495.78	479.34	473.76	448.17	442.70	429.27	423.38	422.65	412.00	425.25	455.56
N° 10 (Bias2)	451.86	436.50	430.27	400.15	388.39	381.14	379.03	381.81	375.49	383.41	414.66
N° 11 (Bias2)	468.48	450.54	446.68	422.33	415.65	407.16	402.05	398.85	395.69	401.82	430.45
N° 12 (OFF1)	456.12	434.91	435.71	410.83	404.88	400.83	387.73	389.46	384.11	389.02	420.81
N° 13 (OFF1)	445.25	431.91	426.19	395.92	388.41	384.18	381.42	381.92	374.45	376.79	379.01
N° 14 (OFF1)	484.13	467.03	463.30	437.07	423.89	420.27	417.15	415.73	411.27	407.02	446.98
N° 15 (OFF1)	474.36	457.73	455.48	425.72	418.22	414.53	411.80	404.14	401.85	392.56	439.20
N° 16 (OFF1)	462.06	444.58	441.90	419.70	412.68	410.35	398.55	390.65	381.40	392.22	426.33

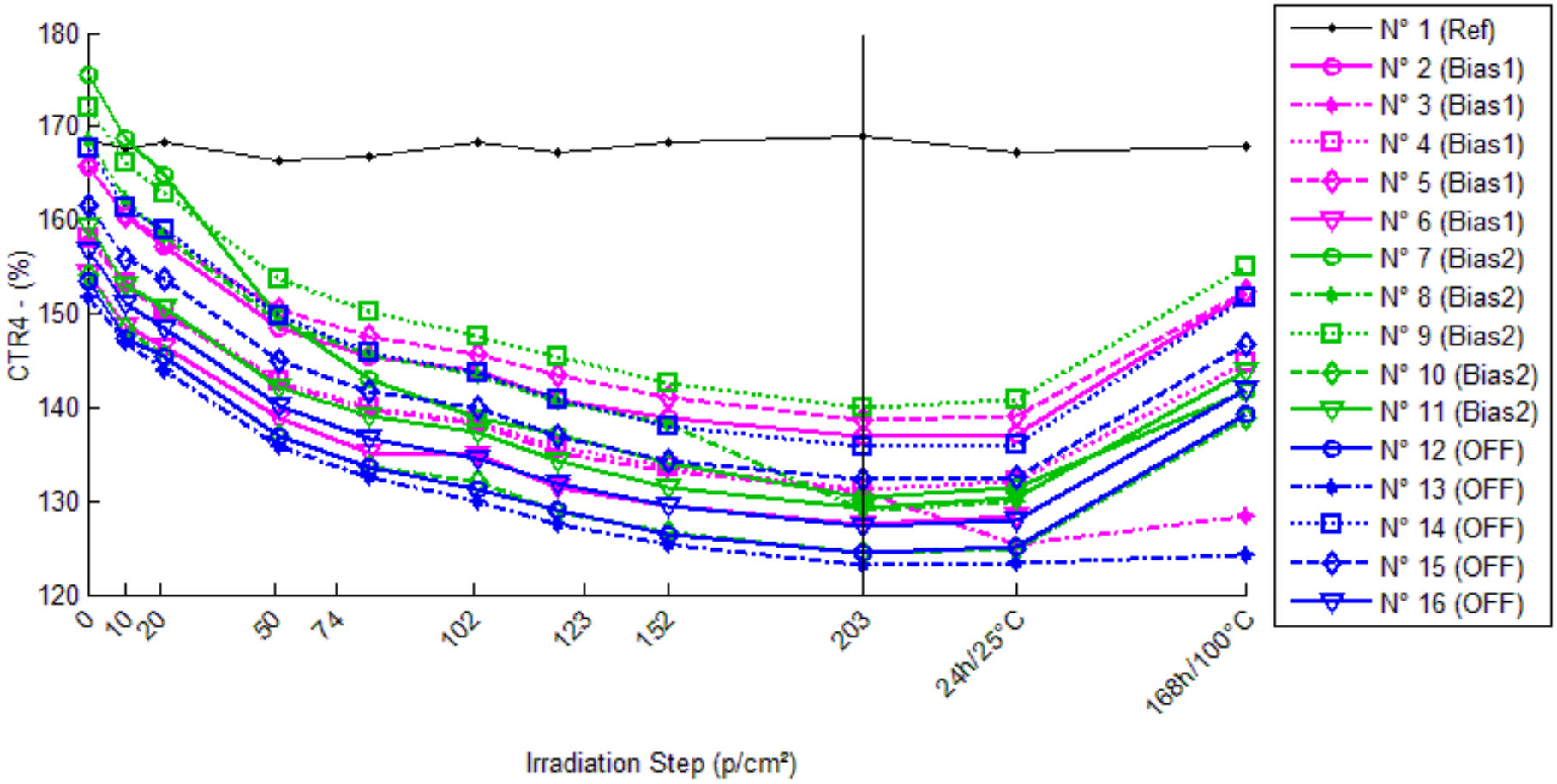
*** Not Measurable because of test condition (cf. Vceo & Vcbo) cannot be applied**

1/Delta [CTR3]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	1.809E-5	5.876E-6	3.238E-5	5.771E-5	7.329E-6	4.016E-5	4.645E-7	-1.278E-5	2.127E-5	6.430E-6
N° 2 (Bias1)	---	6.089E-5	9.010E-5	2.193E-4	2.670E-4	2.838E-4	2.965E-4	2.818E-4	3.034E-4	3.217E-4	1.382E-4
N° 3 (Bias1)	---	6.280E-5	9.160E-5	1.794E-4	2.245E-4	2.565E-4	2.786E-4	2.946E-4	3.449E-4	8.077E-4	1.049E-3
N° 4 (Bias1)	---	6.221E-5	8.884E-5	2.326E-4	2.596E-4	2.731E-4	2.968E-4	3.171E-4	3.487E-4	3.114E-4	1.565E-4
N° 5 (Bias1)	---	6.523E-5	8.410E-5	1.867E-4	2.153E-4	2.657E-4	2.813E-4	2.621E-4	2.832E-4	2.865E-4	1.356E-4
N° 6 (Bias1)	---	8.818E-5	9.215E-5	2.015E-4	2.310E-4	2.487E-4	2.868E-4	3.026E-4	3.384E-4	3.151E-4	NaN
N° 7 (Bias2)	---	7.017E-5	1.063E-4	3.097E-4	4.158E-4	4.271E-4	4.834E-4	4.682E-4	5.236E-4	4.527E-4	3.805E-4
N° 8 (Bias2)	---	7.232E-5	1.089E-4	2.240E-4	2.616E-4	2.697E-4	3.057E-4	3.360E-4	8.947E-4	7.055E-4	NaN
N° 9 (Bias2)	---	6.919E-5	9.377E-5	2.143E-4	2.419E-4	3.126E-4	3.450E-4	3.490E-4	4.102E-4	3.346E-4	1.781E-4
N° 10 (Bias2)	---	7.789E-5	1.111E-4	2.860E-4	3.617E-4	4.106E-4	4.252E-4	4.060E-4	4.502E-4	3.951E-4	1.986E-4
N° 11 (Bias2)	---	8.503E-5	1.042E-4	2.333E-4	2.713E-4	3.215E-4	3.527E-4	3.727E-4	3.927E-4	3.542E-4	1.886E-4
N° 12 (OFF1)	---	1.069E-4	1.027E-4	2.417E-4	2.774E-4	3.024E-4	3.867E-4	3.752E-4	4.110E-4	3.781E-4	1.839E-4
N° 13 (OFF1)	---	6.937E-5	1.005E-4	2.798E-4	3.287E-4	3.570E-4	3.759E-4	3.724E-4	4.247E-4	4.081E-4	3.926E-4
N° 14 (OFF1)	---	7.560E-5	9.287E-5	2.224E-4	2.936E-4	3.138E-4	3.317E-4	3.398E-4	3.659E-4	3.913E-4	1.717E-4
N° 15 (OFF1)	---	7.658E-5	8.737E-5	2.409E-4	2.830E-4	3.043E-4	3.203E-4	3.663E-4	3.804E-4	4.393E-4	1.688E-4
N° 16 (OFF1)	---	8.508E-5	9.871E-5	2.184E-4	2.589E-4	2.727E-4	3.449E-4	3.956E-4	4.577E-4	3.854E-4	1.814E-4
Average (OFF1)	---	6.786E-5	8.936E-5	2.039E-4	2.395E-4	2.656E-4	2.880E-4	2.916E-4	3.237E-4	4.085E-4	3.699E-4
σ (OFF1)	---	1.146E-5	3.212E-6	2.217E-5	2.259E-5	1.377E-5	8.430E-6	2.090E-5	2.888E-5	2.236E-4	4.530E-4
Average+3σ (OFF1)	---	1.023E-4	9.900E-5	2.704E-4	3.072E-4	3.069E-4	3.133E-4	3.544E-4	4.104E-4	1.079E-3	1.729E-3
Average-3σ (OFF1)	---	3.347E-5	7.972E-5	1.374E-4	1.717E-4	2.242E-4	2.627E-4	2.289E-4	2.371E-4	-2.622E-4	-9.890E-4
Average (Bias1)	---	7.492E-5	1.048E-4	2.534E-4	3.104E-4	3.483E-4	3.824E-4	3.864E-4	5.343E-4	4.484E-4	2.364E-4
σ (Bias1)	---	6.582E-6	6.716E-6	4.193E-5	7.475E-5	6.758E-5	7.108E-5	5.292E-5	2.077E-4	1.507E-4	9.638E-5
Average+3σ (Bias1)	---	9.466E-5	1.250E-4	3.792E-4	5.347E-4	5.510E-4	5.957E-4	5.451E-4	1.157E-3	9.005E-4	5.256E-4
Average-3σ (Bias1)	---	5.517E-5	8.470E-5	1.276E-4	8.620E-5	1.455E-4	1.692E-4	2.276E-4	-8.882E-5	-3.635E-6	-5.271E-5
Average (Bias2)	---	8.271E-5	9.642E-5	2.406E-4	2.883E-4	3.100E-4	3.519E-4	3.699E-4	4.079E-4	4.004E-4	2.197E-4
σ (Bias2)	---	1.464E-5	6.227E-6	2.431E-5	2.583E-5	3.046E-5	2.849E-5	2.007E-5	3.637E-5	2.437E-5	9.687E-5
Average+3σ (Bias2)	---	1.266E-4	1.151E-4	3.136E-4	3.658E-4	4.014E-4	4.373E-4	4.301E-4	5.170E-4	4.735E-4	5.103E-4
Average-3σ (Bias2)	---	3.879E-5	7.774E-5	1.677E-4	2.108E-4	2.187E-4	2.664E-4	3.097E-4	2.988E-4	3.273E-4	-7.095E-5

15.CTR4

Ta=25°C; Vce = 5V; If = 50 mA



CTR4 . (%)

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	168.54	167.57	168.22	166.30	166.74	168.25	167.13	168.24	168.98	167.19	167.91
N° 2 (Bias1)	165.79	160.42	157.15	148.46	145.40	143.96	140.79	138.86	136.80	137.17	152.12
N° 3 (Bias1)	157.87	152.96	150.07	142.58	139.73	138.22	135.27	133.12	131.04	125.28	128.37
N° 4 (Bias1)	158.11	153.20	150.39	142.82	140.00	138.52	135.72	133.69	131.31	132.05	144.66
N° 5 (Bias1)	165.86	160.43	157.92	150.37	147.62	145.61	143.36	140.99	138.72	139.14	152.40
N° 6 (Bias1)	154.44	148.75	146.59	138.98	135.12	134.87	131.45	129.58	127.49	128.39	Not Measurable*
N° 7 (Bias2)	175.48	168.82	164.83	149.54	142.98	138.84	137.04	133.98	130.36	131.53	141.72
N° 8 (Bias2)	168.45	162.15	158.39	149.21	145.66	143.44	140.66	138.28	129.11	129.89	Not Measurable*
N° 9 (Bias2)	172.01	166.11	162.79	153.80	150.20	147.63	145.45	142.50	140.03	140.74	155.12
N° 10 (Bias2)	154.10	148.40	145.36	136.88	133.63	132.16	128.90	126.60	124.58	124.86	138.92
N° 11 (Bias2)	159.45	153.00	150.64	142.13	139.02	137.32	134.31	131.51	129.28	130.39	143.97
N° 12 (OFF1)	153.59	147.44	145.40	136.92	133.68	131.21	128.99	126.46	124.49	125.09	139.24
N° 13 (OFF1)	151.74	146.89	143.93	135.80	132.56	130.01	127.48	125.26	123.07	123.28	124.21
N° 14 (OFF1)	167.65	161.24	158.88	149.81	145.76	143.62	140.74	138.09	135.84	136.12	151.75
N° 15 (OFF1)	161.47	155.89	153.69	145.05	141.70	139.88	136.93	134.22	132.34	132.57	146.75
N° 16 (OFF1)	156.70	150.99	148.56	140.10	136.68	134.60	131.88	129.55	127.35	128.07	142.03

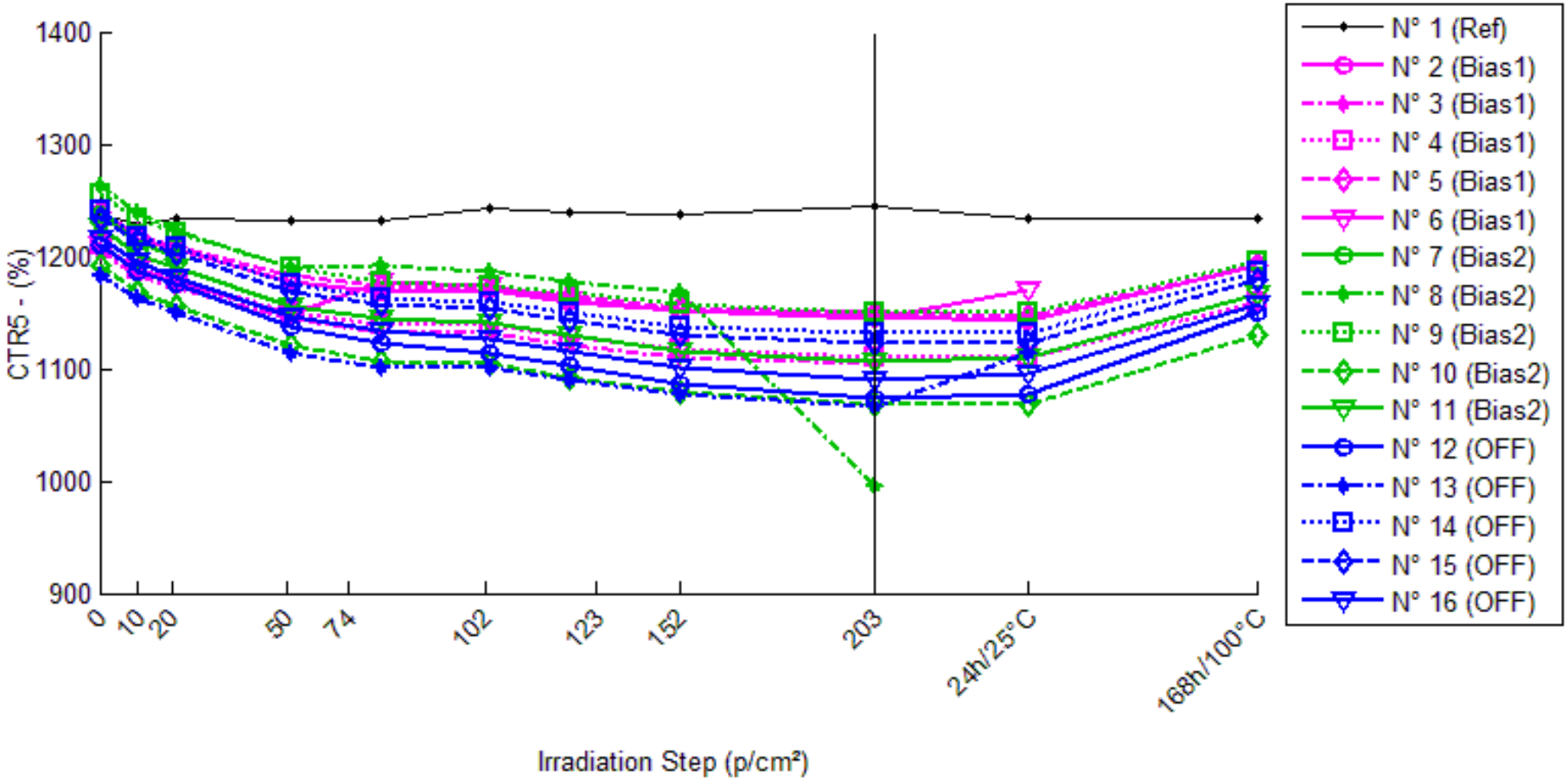
*** Not Measurable because of test condition (cf. Vceo & Vcbo) cannot be applied**

1/Delta [CTR4]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	3.435E-5	1.132E-5	7.983E-5	6.409E-5	1.015E-5	5.001E-5	1.067E-5	-1.546E-5	4.800E-5	2.240E-5
N° 2 (Bias1)	---	2.021E-4	3.317E-4	7.040E-4	8.459E-4	9.145E-4	1.071E-3	1.170E-3	1.278E-3	1.258E-3	5.419E-4
N° 3 (Bias1)	---	2.032E-4	3.290E-4	6.795E-4	8.224E-4	9.006E-4	1.058E-3	1.178E-3	1.297E-3	1.648E-3	1.456E-3
N° 4 (Bias1)	---	2.026E-4	3.247E-4	6.772E-4	8.181E-4	8.943E-4	1.043E-3	1.155E-3	1.291E-3	1.248E-3	5.882E-4
N° 5 (Bias1)	---	2.038E-4	3.031E-4	6.207E-4	7.446E-4	8.384E-4	9.462E-4	1.063E-3	1.179E-3	1.158E-3	5.322E-4
N° 6 (Bias1)	---	2.476E-4	3.467E-4	7.205E-4	9.261E-4	9.396E-4	1.132E-3	1.242E-3	1.369E-3	1.314E-3	NaN
N° 7 (Bias2)	---	2.249E-4	3.681E-4	9.883E-4	1.295E-3	1.504E-3	1.599E-3	1.765E-3	1.972E-3	1.904E-3	1.357E-3
N° 8 (Bias2)	---	2.304E-4	3.770E-4	7.651E-4	9.287E-4	1.035E-3	1.173E-3	1.295E-3	1.809E-3	1.762E-3	NaN
N° 9 (Bias2)	---	2.066E-4	3.293E-4	6.884E-4	8.444E-4	9.600E-4	1.062E-3	1.204E-3	1.328E-3	1.292E-3	6.331E-4
N° 10 (Bias2)	---	2.490E-4	3.900E-4	8.164E-4	9.941E-4	1.078E-3	1.269E-3	1.410E-3	1.538E-3	1.520E-3	7.090E-4
N° 11 (Bias2)	---	2.644E-4	3.665E-4	7.642E-4	9.215E-4	1.010E-3	1.174E-3	1.332E-3	1.464E-3	1.398E-3	6.742E-4
N° 12 (OFF1)	---	2.715E-4	3.667E-4	7.923E-4	9.694E-4	1.110E-3	1.242E-3	1.397E-3	1.522E-3	1.483E-3	6.710E-4
N° 13 (OFF1)	---	2.177E-4	3.577E-4	7.734E-4	9.536E-4	1.101E-3	1.254E-3	1.393E-3	1.535E-3	1.521E-3	1.461E-3
N° 14 (OFF1)	---	2.372E-4	3.291E-4	7.101E-4	8.958E-4	9.980E-4	1.141E-3	1.277E-3	1.397E-3	1.382E-3	6.250E-4
N° 15 (OFF1)	---	2.215E-4	3.133E-4	7.008E-4	8.640E-4	9.559E-4	1.110E-3	1.257E-3	1.363E-3	1.350E-3	6.211E-4
N° 16 (OFF1)	---	2.414E-4	3.496E-4	7.563E-4	9.349E-4	1.048E-3	1.201E-3	1.337E-3	1.471E-3	1.427E-3	6.589E-4
Average (OFF1)	---	2.119E-4	3.270E-4	6.804E-4	8.314E-4	8.975E-4	1.050E-3	1.162E-3	1.283E-3	1.325E-3	7.795E-4
σ (OFF1)	---	1.998E-5	1.574E-5	3.786E-5	6.515E-5	3.732E-5	6.731E-5	6.420E-5	6.790E-5	1.890E-4	4.515E-4
Average+3σ (OFF1)	---	2.718E-4	3.743E-4	7.940E-4	1.027E-3	1.009E-3	1.252E-3	1.354E-3	1.487E-3	1.892E-3	2.134E-3
Average-3σ (OFF1)	---	1.519E-4	2.798E-4	5.668E-4	6.360E-4	7.855E-4	8.483E-4	9.690E-4	1.079E-3	7.583E-4	-5.750E-4
Average (Bias1)	---	2.351E-4	3.662E-4	8.045E-4	9.968E-4	1.117E-3	1.255E-3	1.401E-3	1.622E-3	1.575E-3	8.434E-4
σ (Bias1)	---	2.234E-5	2.264E-5	1.124E-4	1.750E-4	2.203E-4	2.056E-4	2.164E-4	2.629E-4	2.540E-4	3.441E-4
Average+3σ (Bias1)	---	3.021E-4	4.341E-4	1.142E-3	1.522E-3	1.778E-3	1.872E-3	2.050E-3	2.411E-3	2.337E-3	1.876E-3
Average-3σ (Bias1)	---	1.681E-4	2.983E-4	4.671E-4	4.717E-4	4.565E-4	6.384E-4	7.520E-4	8.334E-4	8.130E-4	-1.887E-4
Average (Bias2)	---	2.379E-4	3.433E-4	7.466E-4	9.235E-4	1.043E-3	1.189E-3	1.332E-3	1.458E-3	1.432E-3	8.073E-4
σ (Bias2)	---	2.132E-5	2.178E-5	3.978E-5	4.316E-5	6.631E-5	6.283E-5	6.443E-5	7.582E-5	7.056E-5	3.658E-4
Average+3σ (Bias2)	---	3.019E-4	4.086E-4	8.659E-4	1.053E-3	1.242E-3	1.378E-3	1.526E-3	1.685E-3	1.644E-3	1.905E-3
Average-3σ (Bias2)	---	1.739E-4	2.779E-4	6.273E-4	7.941E-4	8.437E-4	1.001E-3	1.139E-3	1.230E-3	1.221E-3	-2.901E-4

16.CTR5

Ta=25°C; Vce = 30V; If = 5 mA



CTR5 . (%)

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1237.08	1228.51	1234.49	1232.03	1231.90	1242.27	1238.28	1237.02	1244.13	1233.77	1234.19
N° 2 (Bias1)	1238.22	1215.47	1205.97	1177.42	1168.23	1170.25	1159.17	1151.17	1146.59	1143.00	1191.07
N° 3 (Bias1)	1205.18	1182.67	1171.74	1144.43	1132.66	1132.42	1120.43	1110.01	1104.03	Not Measurable**	Not Measurable**
N° 4 (Bias1)	1210.16	1187.96	1179.08	1150.39	1139.61	1138.86	1128.15	1117.21	1109.66	1109.20	1159.85
N° 5 (Bias1)	1239.41	1218.52	1208.32	1183.23	1174.23	1172.69	1163.72	1154.50	1149.12	1146.39	1192.50
N° 6 (Bias1)	1209.29	1187.38	1177.08	1147.96	1177.53	1173.89	1161.13	1152.61	1144.27	1170.81	Not Measurable**
N° 7 (Bias2)	1237.14	1213.26	1199.65	Not Measurable*	Not Measurable*	Not Measurable*	Not Measurable*	Not Measurable*	Not Measurable*	Not Measurable*	Not Measurabl*e
N° 8 (Bias2)	1262.22	1238.43	1222.82	1189.37	1191.26	1185.79	1177.24	1168.00	996.20	Not Measurable	Not Measurable*
N° 9 (Bias2)	1254.56	1233.49	1221.67	1189.75	1178.00	1174.48	1168.30	1156.51	1150.59	1150.38	1195.78
N° 10 (Bias2)	1191.00	1168.73	1155.52	1120.66	1106.88	1103.74	1091.38	1078.25	1068.80	1068.80	1130.62
N° 11 (Bias2)	1225.62	1201.43	1190.32	1155.98	1144.13	1140.39	1129.47	1115.44	1106.11	1109.94	1165.61
N° 12 (OFF1)	1210.44	1186.75	1174.61	1137.46	1123.07	1113.66	1102.65	1086.41	1073.60	1078.02	1150.79
N° 13 (OFF1)	1183.46	1162.10	1149.42	1114.25	1100.82	1101.29	1090.39	1077.52	1066.43	1113.55	Not Measurable*
N° 14 (OFF1)	1241.38	1217.53	1207.91	1175.45	1162.63	1159.07	1150.04	1137.99	1131.24	1131.12	1185.55
N° 15 (OFF1)	1233.93	1212.88	1202.05	1168.45	1156.73	1152.87	1142.64	1129.32	1122.23	1122.42	1179.42
N° 16 (OFF1)	1216.33	1195.36	1181.41	1145.59	1133.10	1126.55	1115.48	1101.68	1090.68	1094.88	1158.07

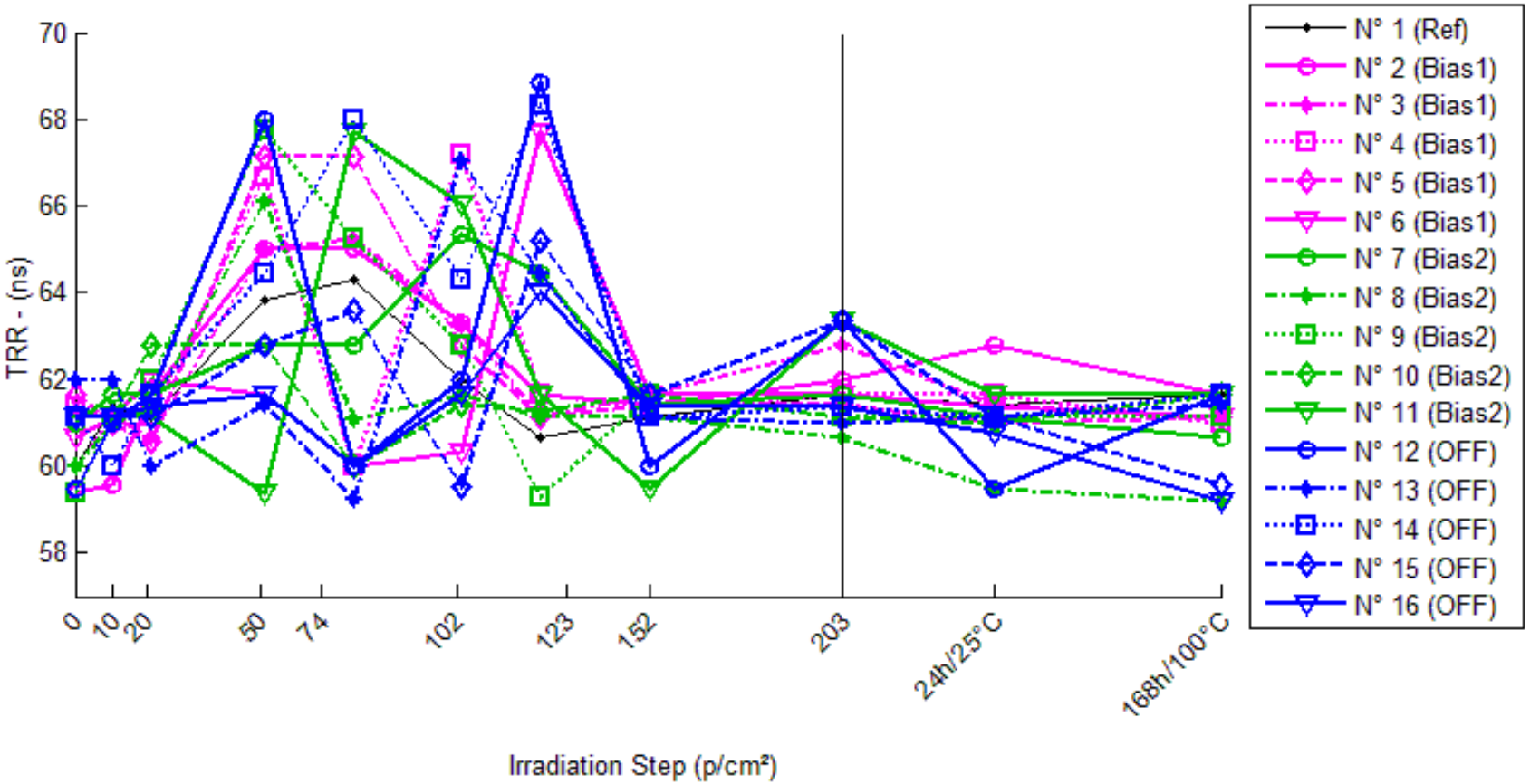
*** Equipment test saturation at 100 mA (probably du to a leakage current Iceo)**
**** Not Measurable because of test condition (cf. Vceo & Vcbo) cannot be applied**

1/Delta [CTR5]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	5.635E-6	1.692E-6	3.313E-6	3.399E-6	-3.378E-6	-7.840E-7	3.790E-8	-4.585E-6	2.169E-6	1.888E-6
N° 2 (Bias1)	---	1.512E-5	2.160E-5	4.171E-5	4.839E-5	4.691E-5	5.507E-5	6.107E-5	6.454E-5	6.728E-5	3.197E-5
N° 3 (Bias1)	---	1.579E-5	2.368E-5	4.404E-5	5.312E-5	5.331E-5	6.276E-5	7.114E-5	7.602E-5	NaN	NaN
N° 4 (Bias1)	---	1.544E-5	2.178E-5	4.294E-5	5.116E-5	5.174E-5	6.007E-5	6.875E-5	7.484E-5	7.521E-5	3.585E-5
N° 5 (Bias1)	---	1.383E-5	2.076E-5	3.831E-5	4.478E-5	4.590E-5	5.247E-5	5.934E-5	6.339E-5	6.547E-5	3.173E-5
N° 6 (Bias1)	---	1.526E-5	2.263E-5	4.418E-5	2.231E-5	2.494E-5	3.430E-5	4.067E-5	4.699E-5	2.718E-5	NaN
N° 7 (Bias2)	---	1.592E-5	2.527E-5	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
N° 8 (Bias2)	---	1.522E-5	2.553E-5	4.852E-5	4.719E-5	5.107E-5	5.719E-5	6.391E-5	2.116E-4	NaN	NaN
N° 9 (Bias2)	---	1.362E-5	2.146E-5	4.342E-5	5.180E-5	5.435E-5	5.885E-5	6.758E-5	7.203E-5	7.219E-5	3.919E-5
N° 10 (Bias2)	---	1.600E-5	2.578E-5	5.270E-5	6.381E-5	6.638E-5	7.664E-5	8.780E-5	9.600E-5	9.600E-5	4.484E-5
N° 11 (Bias2)	---	1.643E-5	2.420E-5	4.916E-5	5.812E-5	6.098E-5	6.946E-5	8.060E-5	8.816E-5	8.504E-5	4.201E-5
N° 12 (OFF1)	---	1.649E-5	2.520E-5	5.300E-5	6.427E-5	7.179E-5	8.076E-5	9.432E-5	1.053E-4	1.015E-4	4.282E-5
N° 13 (OFF1)	---	1.553E-5	2.502E-5	5.249E-5	6.344E-5	6.305E-5	7.213E-5	8.308E-5	9.273E-5	5.305E-5	NaN
N° 14 (OFF1)	---	1.578E-5	2.232E-5	4.518E-5	5.456E-5	5.721E-5	6.398E-5	7.319E-5	7.843E-5	7.853E-5	3.793E-5
N° 15 (OFF1)	---	1.406E-5	2.149E-5	4.542E-5	5.409E-5	5.698E-5	6.475E-5	7.507E-5	8.067E-5	8.051E-5	3.746E-5
N° 16 (OFF1)	---	1.443E-5	2.430E-5	5.077E-5	6.040E-5	6.553E-5	7.433E-5	8.556E-5	9.472E-5	9.120E-5	4.137E-5
Average (OFF1)	---	1.509E-5	2.209E-5	4.224E-5	4.395E-5	4.456E-5	5.294E-5	6.019E-5	6.516E-5	5.879E-5	3.318E-5
σ (OFF1)	---	7.472E-7	1.110E-6	2.411E-6	1.250E-5	1.141E-5	1.118E-5	1.200E-5	1.168E-5	2.149E-5	2.310E-6
Average+3σ (OFF1)	---	1.733E-5	2.542E-5	4.947E-5	8.145E-5	7.878E-5	8.646E-5	9.619E-5	1.002E-4	1.233E-4	4.011E-5
Average-3σ (OFF1)	---	1.285E-5	1.876E-5	3.500E-5	6.452E-6	1.034E-5	1.941E-5	2.420E-5	3.012E-5	-5.684E-6	2.626E-5
Average (Bias1)	---	1.544E-5	2.445E-5	4.845E-5	5.523E-5	5.819E-5	6.554E-5	7.497E-5	1.169E-4	8.441E-5	4.201E-5
σ (Bias1)	---	1.105E-6	1.774E-6	3.822E-6	7.264E-6	6.842E-6	9.185E-6	1.115E-5	6.386E-5	1.192E-5	2.826E-6
Average+3σ (Bias1)	---	1.875E-5	2.977E-5	5.991E-5	7.702E-5	7.872E-5	9.309E-5	1.084E-4	3.085E-4	1.202E-4	5.049E-5
Average-3σ (Bias1)	---	1.212E-5	1.912E-5	3.699E-5	3.344E-5	3.767E-5	3.798E-5	4.151E-5	-7.465E-5	4.866E-5	3.353E-5
Average (Bias2)	---	1.526E-5	2.367E-5	4.937E-5	5.935E-5	6.291E-5	7.119E-5	8.224E-5	9.037E-5	8.095E-5	3.990E-5
σ (Bias2)	---	9.992E-7	1.668E-6	3.809E-6	4.813E-6	6.195E-6	6.997E-6	8.528E-6	1.100E-5	1.810E-5	2.616E-6
Average+3σ (Bias2)	---	1.826E-5	2.867E-5	6.080E-5	7.379E-5	8.150E-5	9.218E-5	1.078E-4	1.234E-4	1.353E-4	4.774E-5
Average-3σ (Bias2)	---	1.226E-5	1.866E-5	3.794E-5	4.491E-5	4.433E-5	5.020E-5	5.666E-5	5.736E-5	2.664E-5	3.205E-5

17.TRR

Ta=25°C; If = 5 mA; RL = 100 Ohms; Irec = 10% Irm



TRR . (ns)

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	60.00	61.39	61.16	63.83	64.29	62.00	60.66	61.16	61.67	61.43	61.67
N° 2 (Bias1)	59.41	59.57	61.67	65.00	65.00	63.33	61.67	61.43	62.00	62.81	61.67
N° 3 (Bias1)	60.00	61.16	60.66	65.00	65.25	63.33	61.16	61.67	62.81	61.43	61.16
N° 4 (Bias1)	61.39	61.16	61.16	66.67	60.00	67.21	61.67	61.39	61.67	61.67	60.99
N° 5 (Bias1)	61.67	60.99	60.56	67.13	67.13	62.81	61.16	61.43	61.43	60.99	61.16
N° 6 (Bias1)	60.66	61.16	62.00	61.67	60.00	60.33	67.69	61.67	61.67	61.39	61.16
N° 7 (Bias2)	60.99	61.67	61.67	62.81	62.81	65.35	64.46	61.43	61.67	61.16	60.66
N° 8 (Bias2)	60.00	60.99	61.39	66.12	61.07	61.67	61.16	61.16	60.66	59.50	59.20
N° 9 (Bias2)	59.41	61.16	62.00	67.77	65.25	62.81	59.31	61.67	61.16	61.16	61.16
N° 10 (Bias2)	61.16	61.16	62.81	62.81	60.00	61.43	61.29	61.67	61.16	60.99	61.67
N° 11 (Bias2)	61.16	61.16	61.16	59.38	67.69	66.03	61.67	59.50	63.37	61.67	61.67
N° 12 (OFF1)	59.50	60.99	61.67	68.00	60.00	62.00	68.85	60.00	63.37	59.50	61.67
N° 13 (OFF1)	62.00	62.00	60.00	61.43	59.26	67.05	64.46	61.16	60.99	61.16	61.43
N° 14 (OFF1)	61.16	60.00	61.67	64.46	68.00	64.29	68.33	61.16	61.39	61.16	61.67
N° 15 (OFF1)	61.16	61.16	61.16	62.81	63.61	59.52	65.18	61.67	63.37	61.16	59.57
N° 16 (OFF1)	61.16	61.16	61.39	61.67	60.00	61.67	64.00	61.39	61.39	60.78	59.20

Delta [TRR]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	1.386E+0	1.157E+0	3.830E+0	4.286E+0	2.000E+0	6.557E-1	1.157E+0	1.667E+0	1.429E+0	1.667E+0
N° 2 (Bias1)	---	1.685E-1	2.261E+0	5.594E+0	5.594E+0	3.927E+0	2.261E+0	2.023E+0	2.594E+0	3.404E+0	2.261E+0
N° 3 (Bias1)	---	1.157E+0	6.557E-1	5.000E+0	5.248E+0	3.333E+0	1.157E+0	1.667E+0	2.810E+0	1.429E+0	1.157E+0
N° 4 (Bias1)	---	-2.291E-1	-2.291E-1	5.281E+0	-1.386E+0	5.827E+0	2.805E-1	0.000E+0	2.805E-1	2.805E-1	-3.932E-1
N° 5 (Bias1)	---	-6.738E-1	-1.103E+0	5.462E+0	5.462E+0	1.143E+0	-5.097E-1	-2.381E-1	-2.381E-1	-6.738E-1	-5.097E-1
N° 6 (Bias1)	---	5.013E-1	1.344E+0	1.011E+0	-6.557E-1	-3.279E-1	7.030E+0	1.011E+0	1.011E+0	7.304E-1	5.013E-1
N° 7 (Bias2)	---	6.738E-1	6.738E-1	1.817E+0	1.817E+0	4.354E+0	3.470E+0	4.357E-1	6.738E-1	1.641E-1	-3.372E-1
N° 8 (Bias2)	---	9.929E-1	1.386E+0	6.116E+0	1.074E+0	1.667E+0	1.157E+0	1.157E+0	6.557E-1	-4.959E-1	-8.000E-1
N° 9 (Bias2)	---	1.751E+0	2.594E+0	8.363E+0	5.842E+0	3.404E+0	-9.901E-2	2.261E+0	1.751E+0	1.751E+0	1.751E+0
N° 10 (Bias2)	---	0.000E+0	1.653E+0	1.653E+0	-1.157E+0	2.715E-1	1.301E-1	5.097E-1	0.000E+0	-1.641E-1	5.097E-1
N° 11 (Bias2)	---	0.000E+0	0.000E+0	-1.777E+0	6.529E+0	4.876E+0	5.097E-1	-1.653E+0	2.209E+0	5.097E-1	5.097E-1
N° 12 (OFF1)	---	1.489E+0	2.163E+0	8.496E+0	4.959E-1	2.496E+0	9.348E+0	4.959E-1	3.862E+0	0.000E+0	2.163E+0
N° 13 (OFF1)	---	0.000E+0	-2.000E+0	-5.714E-1	-2.744E+0	5.049E+0	2.463E+0	-8.430E-1	-1.007E+0	-8.430E-1	-5.714E-1
N° 14 (OFF1)	---	-1.157E+0	5.097E-1	3.306E+0	6.843E+0	3.129E+0	7.176E+0	0.000E+0	2.291E-1	0.000E+0	5.097E-1
N° 15 (OFF1)	---	0.000E+0	0.000E+0	1.653E+0	2.450E+0	-1.639E+0	4.020E+0	5.097E-1	2.209E+0	0.000E+0	-1.583E+0
N° 16 (OFF1)	---	0.000E+0	2.291E-1	5.097E-1	-1.157E+0	5.097E-1	2.843E+0	2.291E-1	2.291E-1	-3.727E-1	-1.957E+0
Average (OFF1)	---	1.848E-1	5.857E-1	4.470E+0	2.852E+0	2.781E+0	2.044E+0	8.924E-1	1.291E+0	1.034E+0	6.032E-1
σ (OFF1)	---	6.989E-1	1.314E+0	1.946E+0	3.548E+0	2.411E+0	2.972E+0	9.957E-1	1.364E+0	1.529E+0	1.151E+0
Average+3σ (OFF1)	---	2.282E+0	4.527E+0	1.031E+1	1.350E+1	1.001E+1	1.096E+1	3.879E+0	5.384E+0	5.620E+0	4.055E+0
Average-3σ (OFF1)	---	-1.912E+0	-3.355E+0	-1.369E+0	-7.790E+0	-4.451E+0	-6.872E+0	-2.095E+0	-2.801E+0	-3.552E+0	-2.849E+0
Average (Bias1)	---	6.836E-1	1.261E+0	3.234E+0	2.821E+0	2.914E+0	1.034E+0	5.420E-1	1.058E+0	3.530E-1	3.266E-1
σ (Bias1)	---	7.365E-1	9.850E-1	4.007E+0	3.269E+0	1.917E+0	1.443E+0	1.428E+0	8.993E-1	8.664E-1	9.754E-1
Average+3σ (Bias1)	---	2.893E+0	4.217E+0	1.526E+1	1.263E+1	8.666E+0	5.361E+0	4.827E+0	3.756E+0	2.952E+0	3.253E+0
Average-3σ (Bias1)	---	-1.526E+0	-1.694E+0	-8.787E+0	-6.987E+0	-2.837E+0	-3.294E+0	-3.743E+0	-1.640E+0	-2.246E+0	-2.600E+0
Average (Bias2)	---	6.635E-2	1.803E-1	2.679E+0	1.178E+0	1.909E+0	5.170E+0	7.833E-2	1.105E+0	-2.431E-1	-2.878E-1
σ (Bias2)	---	9.398E-1	1.485E+0	3.555E+0	3.708E+0	2.561E+0	2.981E+0	5.563E-1	1.925E+0	3.721E-1	1.672E+0
Average+3σ (Bias2)	---	2.886E+0	4.637E+0	1.334E+1	1.230E+1	9.592E+0	1.411E+1	1.747E+0	6.878E+0	8.733E-1	4.728E+0
Average-3σ (Bias2)	---	-2.753E+0	-4.276E+0	-7.987E+0	-9.947E+0	-5.775E+0	-3.773E+0	-1.591E+0	-4.669E+0	-1.360E+0	-5.304E+0