

TOTAL IONIZING DOSE TEST REPORT

OLS0449

(DC0949)

Radiation Tolerant Hermetic Surface Mount Optocoupler From ISOLINK

TRAD/TE/OLS0449/XXX1/ESA/YP/1104		Labège, April 30th, 2012
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1 INTRODUCTION

This report includes the test results of OLS0449, a Radiation Tolerant Phototransistor hermetic surface mount Optocoupler from ISOLINK 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	ITP-TE-OLS449-ISO-ESA-1115-Iss.4, dated 19/03/2012

2.2 Reference Documents

RD	1.	Datasheet OLS449	Radiation Tolerant Phototransistor Hermetic Surface Mount Optocouplers
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3 DEVICE INFORMATION

3.1 Device description

The OL449 is designed for hi-rel and space applications requiring optical isolation in radiation environments such as gamma, neutron and proton radiation with high current transfer ratio (CTR) and low saturation Vce. OLH449 presents same reliable processing and construction as the well-known OLS249 but with higher CTR and using a GaAlAs LED generating three times more current. Each optocoupler consists of a light emitting diode and a NPN silicon phototransistor electrically isolated but optically coupled inside a hermetic 6-pin leadless chip carrier package. Electrical parameters are similar to the JEDEC registered 4N49U optocoupler but with higher CTR and much better CTR degradation characteristics due to radiation exposure.

Type	OLS0449
Manufacturer	ISOLINK
Function	Optocoupler
Package	LCC4
Date Code	0949
Sample size	16 parts (15 + 1 control sample)

3.2 Procurement information

75 parts OLS449 were procured from ISOLINK through the French representative EUROMIP. Parts delivered are OLS0449, containing same die than the OLS449 but packaged in a LCC4 instead of a LCC6.

3.2.1 External view



Figure 1: package marking

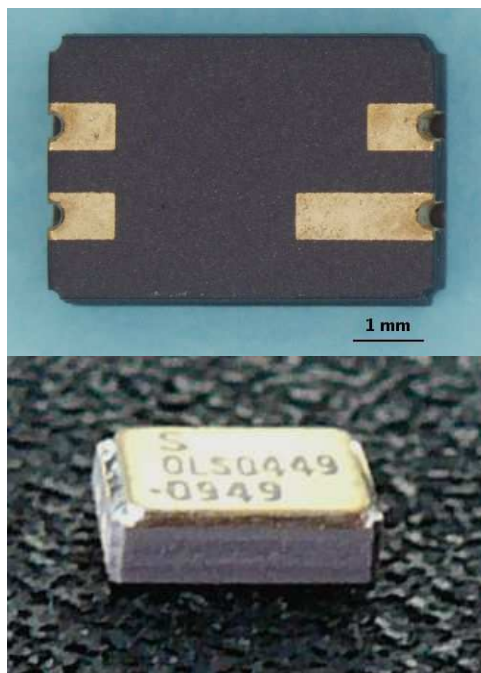


Figure 2: package view and back-side

3.2.2 Internal view

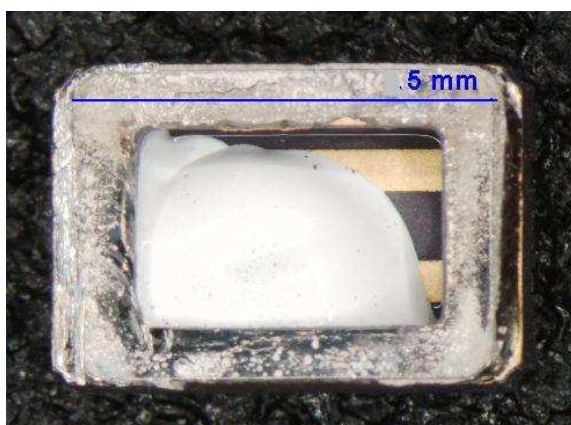


Figure 3: Internal overall view

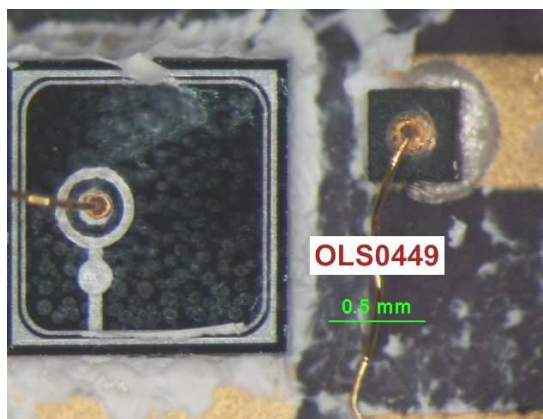


Figure 4: view of photodetector and LED

3.3 Serialization

Each part is serialized to enable pre and post test identification and comparison.

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.

The test devices have been exposed to the following dose rates:

	Step1	Step2	Step3	Step4	Step5	Step6	Step7	Step8
Accumulated dose krad(Si)	10	19	49	65	101	130	152	203
Dose rate (Si)/h	36	36	36	36	310	310	310	310

Two annealing steps are performed after Co60 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	OLS049_TE_XXX1_B1_V10.IIb OLS049_TE_XXX1_B1_V20.IIb

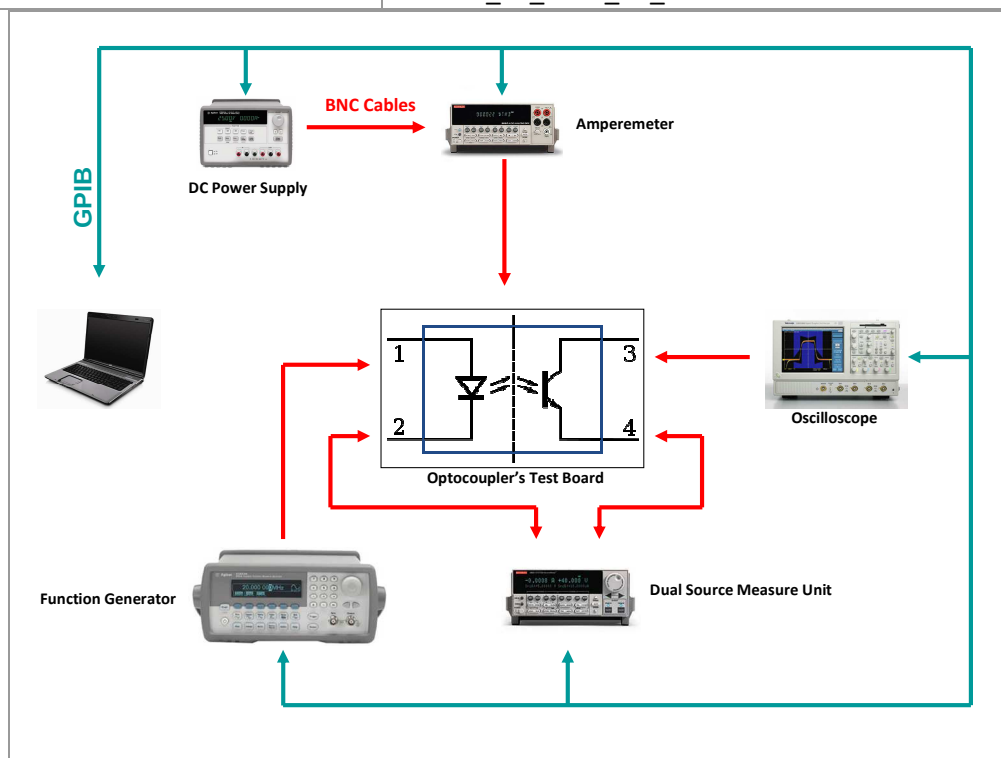


Figure 5: test principle

5.2 Test configuration

Samples were exposed to irradiation in three different modes - two on-modes (Figure 6 and Figure 7) and one off-mode (all terminal leads short-circuited) –

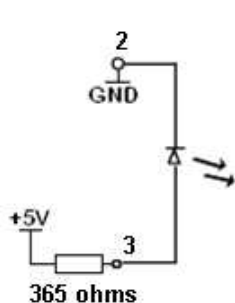


Figure 6: ON bias1

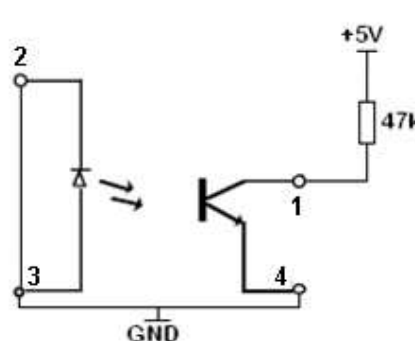


Figure 7: ON bias2

5.3 Electrical parameters

PARAMETER	SYMBOL	TEST CONDITION	MIN	MAX	UNIT
On-State Collector Current	CTR1/IC(ON)	IF = 1 mA, VCE = 5.0V	15	40	mA
Saturation Voltage	VCE(SAT)	IF = 1 mA, IC = 5.0mA		0,3	V
Breakdown Voltage Collector to Emitter	BV _{CEO}	ICE = 1mA	65		V
Breakdown Voltage Collector to Emitter	BV _{ECO}	IEC=100μA			V
Leakage Current Collector to Emitter	ICE(OFF)	VCE = 20V		100	nA
Input Forward Voltage	VF	IF = 10mA	1,2	1,7	V
Input Reverse Current	IR	VR = 2.0V		100	μA
Rise Time	tr	VCC = 10V, RL = 100Ω, IF = 5mA		25	μs
Fall Time	tf	VCC = 10V, RL = 100Ω, IF = 5mA		25	μs
Current transfer ratio	CTR1	IF = 1 mA, Vce = 5.0V	1500	4000	%
	CTR2	If = 2mA, Vce = 5V			%
	CTR3	If = 10mA, Vce = 5V			%
	CTR4	If = 40mA, Vce = 5V			%
	CTR5	If = 10mA, Vce = 32V			%
Input Diode Reverse Recovery Time	Trr	If = 2mA, RI = 100Ω, Irec = 10% Irm			ns

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

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

6 TEST HISTORY

Seven steps were defined to determine the component degradation under ⁶⁰Co irradiation.

	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, between Step 3 and Step 4 (50 krad(Si) and 100 krad(Si)), tests were stopped for 48 hours. Total Ionizing Dose was estimated at 65 krad(Si).

During this time period, parts were stored in a cold chamber at -30°C.

7 SUMMARY RESULTS

Only parameters with applicable test limits are shown hereunder.

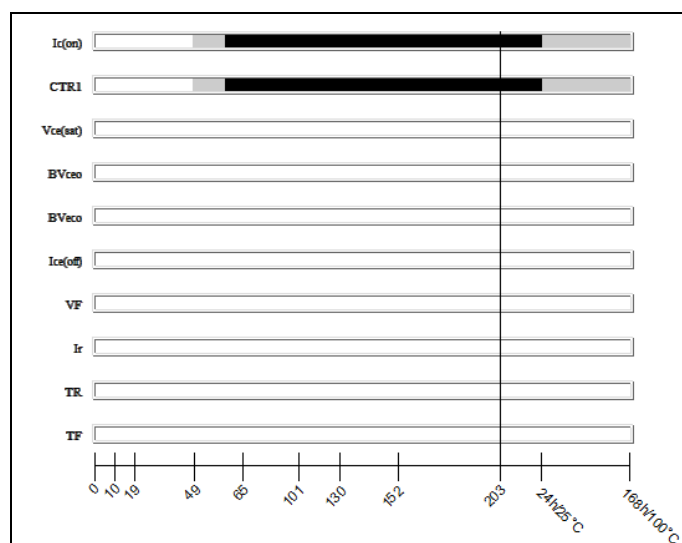


Figure 8: ON Bias 1

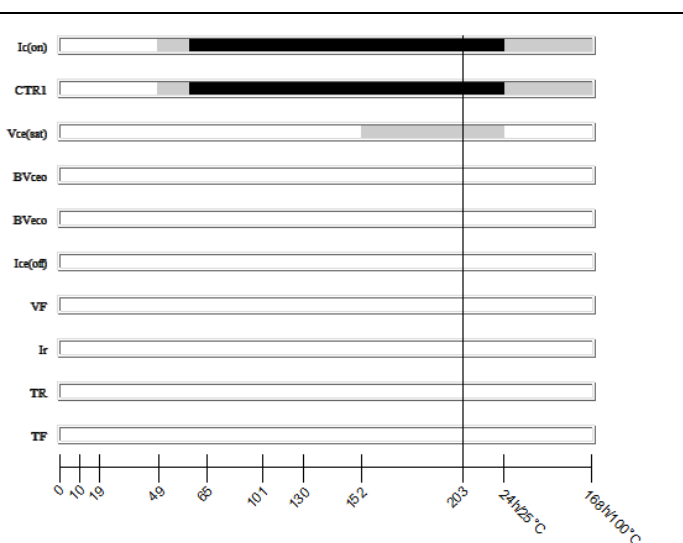


Figure 9: ON Bias 2

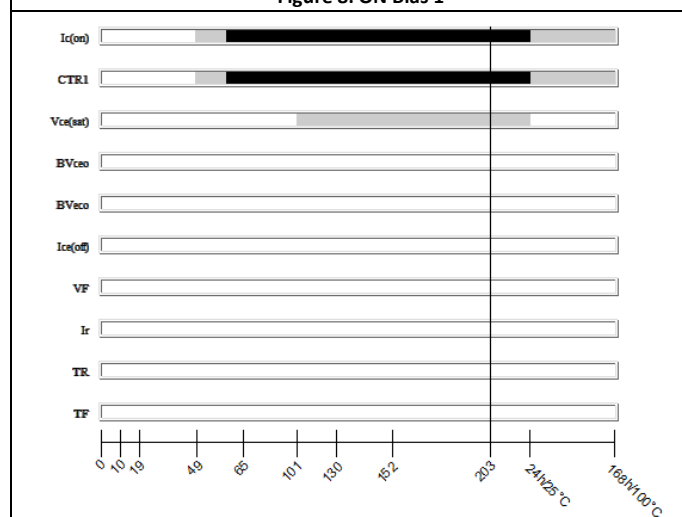
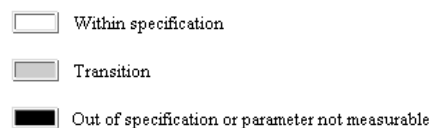


Figure 10: OFF



- ON Bias1: Ic(on) and CTR1 are out of specification at 56.5 kRad(Si) by interpolation.
- ON Bias 2: Ic(on) and CTR1 are out of specification at 49.3 kRad(Si) by interpolation. However, Vce(sat) is out of specification at 203kRad(Si) by interpolation.
- Unbiased parts: Ic(on) and CTR1 are out of specification at 51.2 kRad(Si) by interpolation. However, Vce(sat) is out of specification at 122.2 krad(Si) by interpolation.

8 CONCLUSION

Total Ionizing Dose steady-state irradiation test using Gamma ray was applied on OLS0449 type, a Radiation Tolerant Phototransistor Hermetic Surface Mount Optocoupler from ISOLINK up to 200krad(Si) under three bias conditions.

The results indicate that:

- All devices are still functional up to the total dose.
- Average drift current transfer ratio function of the Bias condition and CTR configuration are described in the next Figure:

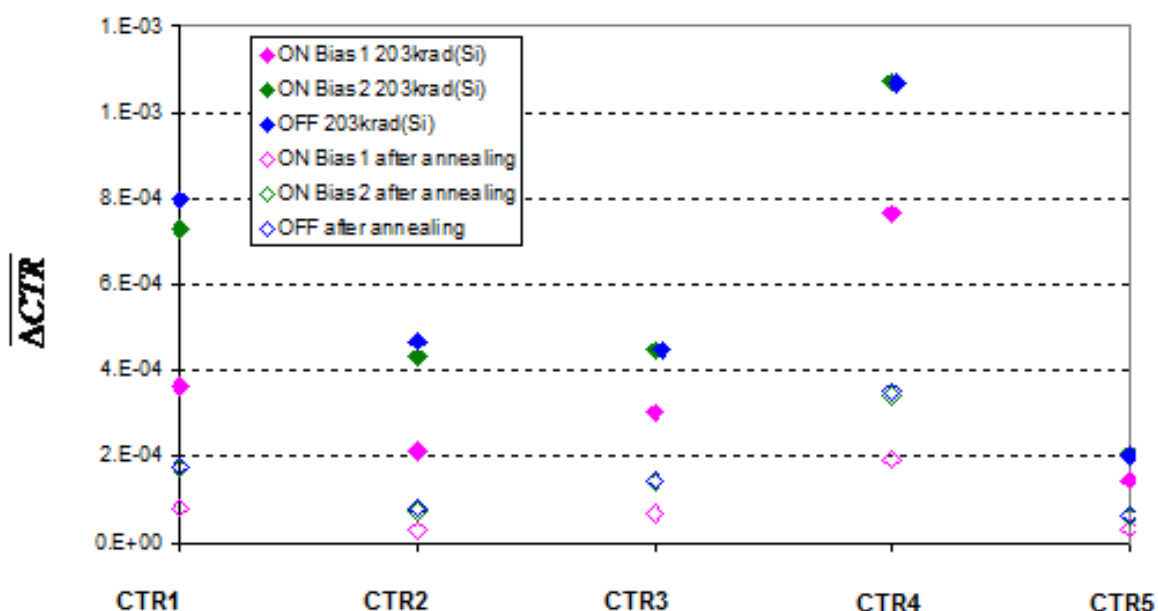


Figure 11: Average drift current transfer ratio function of the Bias condition and CTR configuration

- CTR5 configuration ($I_f = 10 \text{ mA}$, $V_{ce} = 32\text{V}$) is the least sensitive configuration at 203 krad(Si) total dose.
- Conversely, CRT4 configuration ($I_f = 40 \text{ mA}$, $V_{ce} = 5\text{V}$) exhibits the greatest parameter degradation up to 203krad (Si) total dose.
- ON Bias1 mode is the least sensitive configuration for all CTR configuration.
- OFF mode is the most sensitive configuration.
- Moreover, CTR1 ($I_f = 1 \text{ mA}$, $V_{ce} = 5.0\text{V}$), which is the only CTR configuration for which limits are indicated in the data-sheet, is out of specification at step 65 kRad(Si).

As shown in previous figure, 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 9-31). 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:

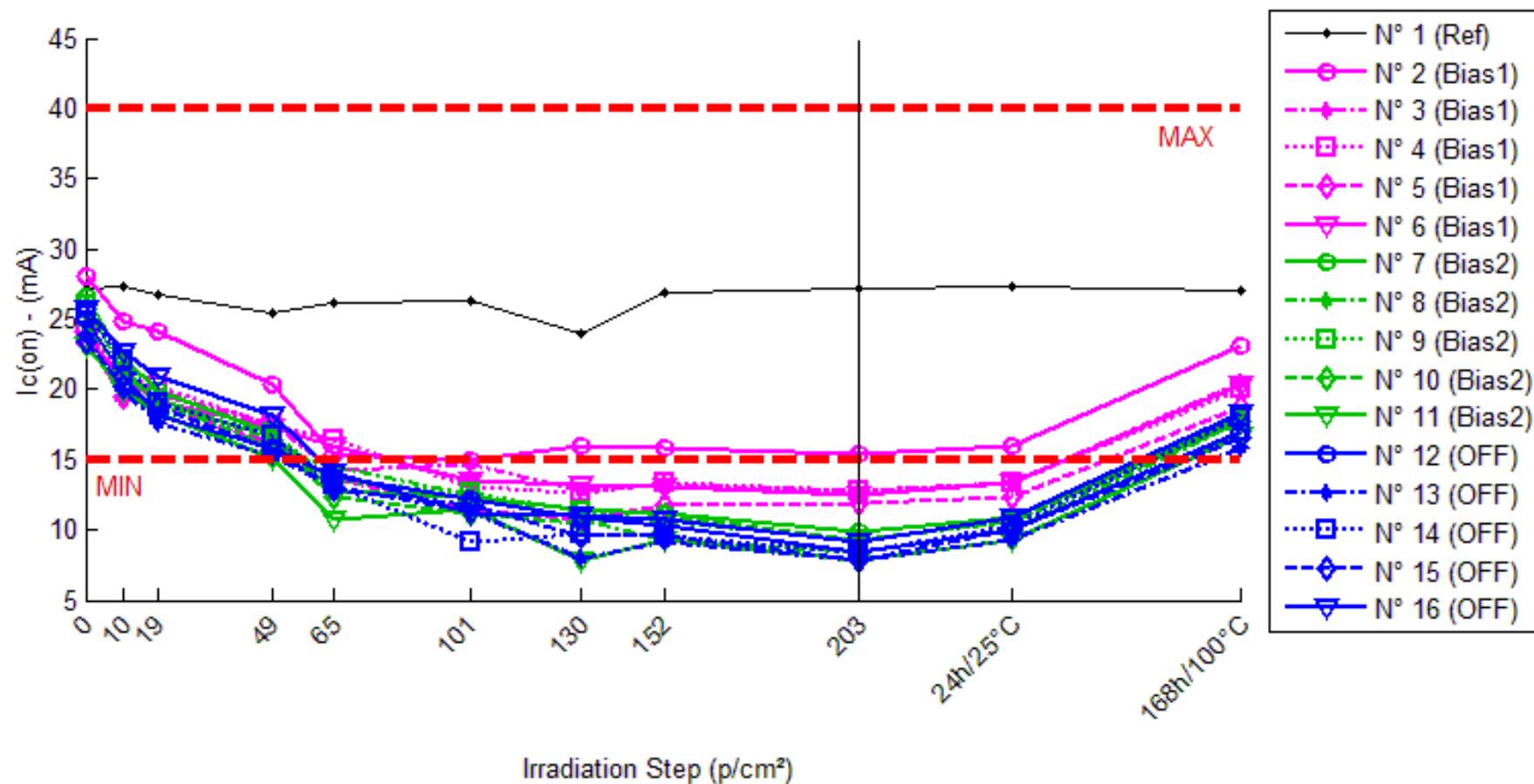
$$\text{Drift value} = \text{measurement (X kRad(Si))} - \text{measurement (0 kRad(Si))}$$

CONTENTS

1. Ic(on)	2
2. Vce(sat)	4
3. BVceo	6
4. BVeco	8
5. Ice(off)	10
6. VF	12
7. Ir	14
8. TR	16
9. TF	18
10. CTR1	20
11. CTR2	22
12. CTR3	24
13. CTR4	26
14. CTR5	28
15. TRR	30

1. $I_{c(on)}$

$T_a = 25^\circ\text{C}$; $I_F = 1\text{ mA}$; $V_{ce} = 5\text{ V}$



Ic(on) . (mA)

Min = 15.0 Max = 40.0

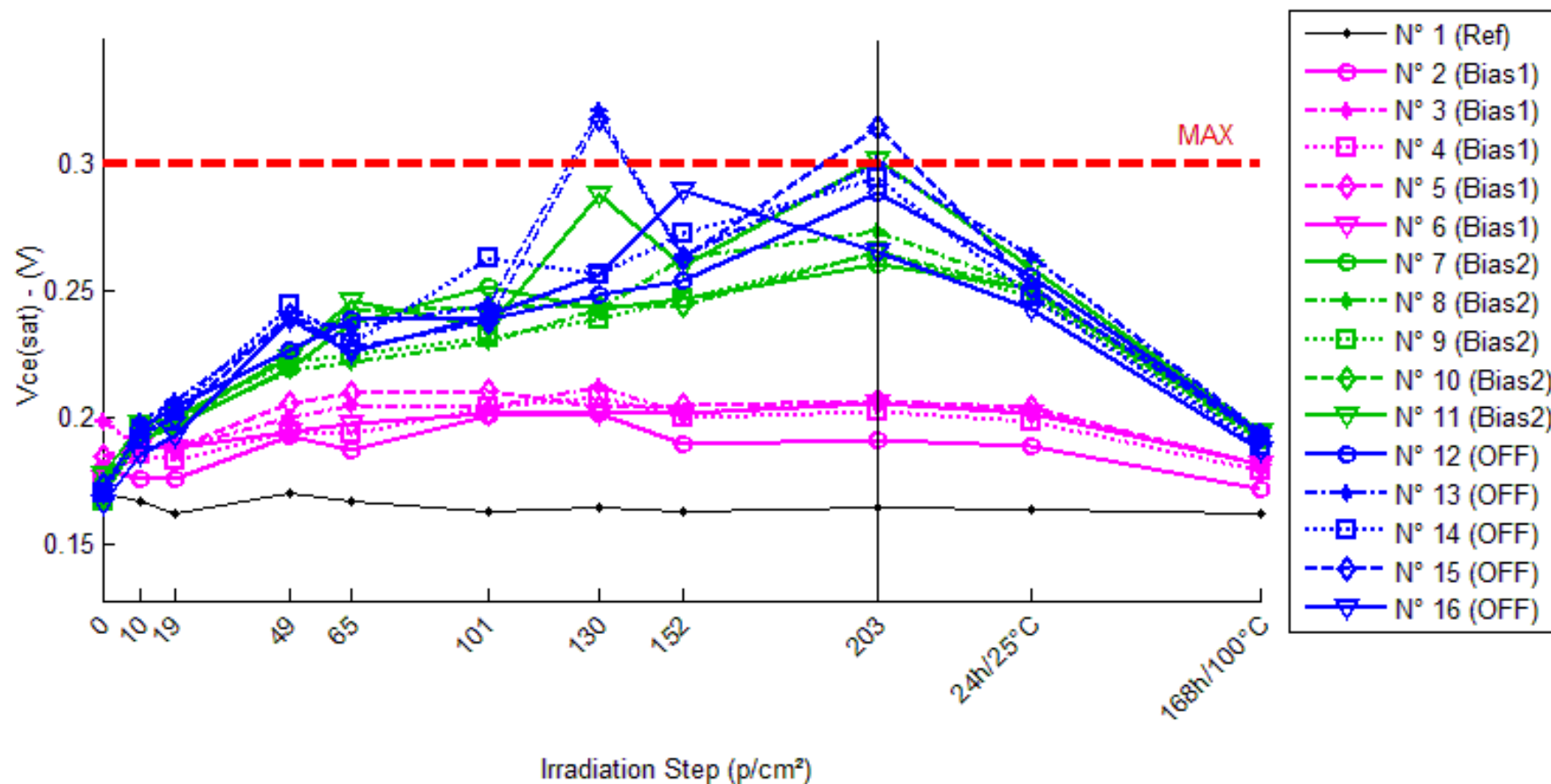
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	27.233	27.288	26.808	26.400	26.122	26.291	26.051	26.893	27.224	27.266	27.078
N° 2 (Bias1)	28.044	24.905	24.199	20.392	19.410	16.895	15.937	15.796	15.353	15.935	23.120
N° 3 (Bias1)	23.790	19.140	19.614	17.636	14.180	13.688	12.833	13.230	12.746	13.393	20.434
N° 4 (Bias1)	24.153	20.866	20.171	17.433	16.482	13.138	12.701	13.336	12.760	13.343	20.087
N° 5 (Bias1)	23.212	19.410	18.953	16.146	13.709	11.542	10.679	11.763	11.865	12.388	18.733
N° 6 (Bias1)	23.569	20.934	19.163	17.293	15.960	13.545	13.245	13.056	12.546	13.318	20.366
N° 7 (Bias2)	26.651	22.201	19.939	16.796	12.801	12.348	11.458	11.214	9.888	10.838	17.895
N° 8 (Bias2)	24.536	21.154	19.126	15.832	14.496	12.560	10.728	9.321	8.445	10.029	17.759
N° 9 (Bias2)	26.056	21.600	18.695	16.809	13.557	12.705	11.400	10.535	9.231	10.634	17.967
N° 10 (Bias2)	25.752	21.349	19.294	16.473	12.344	11.168	10.406	11.039	9.275	10.556	17.661
N° 11 (Bias2)	23.180	19.868	18.260	15.079	12.784	11.432	9.787	9.261	7.804	9.314	16.685
N° 12 (OFF)	25.026	20.888	18.142	15.872	13.789	12.269	10.937	10.337	8.451	10.030	16.971
N° 13 (OFF)	23.813	19.857	17.546	15.307	13.086	11.326	9.994	9.179	7.813	9.252	15.887
N° 14 (OFF)	25.297	22.125	19.048	16.761	13.206	11.193	9.784	9.564	8.476	10.321	17.980
N° 15 (OFF)	23.377	20.185	18.807	15.760	12.890	11.699	9.533	9.573	7.856	10.043	16.587
N° 16 (OFF)	25.714	22.666	20.953	18.129	14.125	11.221	10.986	10.789	9.132	10.889	18.259

Delta [Ic(on)]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	5.508E-2	-4.245E-1	-8.332E-1	-1.111E+0	-9.417E-1	-1.182E+0	-3.404E-1	-8.820E-3	3.299E-2	-1.548E-1
N° 2 (Bias1)	---	-3.139E+0	-3.844E+0	-7.652E+0	-8.634E+0	-1.115E+1	-1.211E+1	-1.225E+1	-1.269E+1	-1.211E+1	-4.924E+0
N° 3 (Bias1)	---	-4.649E+0	-4.176E+0	-6.154E+0	-9.609E+0	-1.010E+1	-1.096E+1	-1.056E+1	-1.104E+1	-1.040E+1	-3.356E+0
N° 4 (Bias1)	---	-3.287E+0	-3.982E+0	-6.720E+0	-7.671E+0	-1.102E+1	-1.145E+1	-1.082E+1	-1.139E+1	-1.081E+1	-4.066E+0
N° 5 (Bias1)	---	-3.802E+0	-4.259E+0	-7.066E+0	-9.502E+0	-1.167E+1	-1.253E+1	-1.145E+1	-1.135E+1	-1.082E+1	-4.478E+0
N° 6 (Bias1)	---	-2.635E+0	-4.405E+0	-6.275E+0	-7.608E+0	-1.002E+1	-1.032E+1	-1.051E+1	-1.102E+1	-1.025E+1	-3.203E+0
N° 7 (Bias2)	---	-4.450E+0	-6.712E+0	-9.854E+0	-1.385E+1	-1.430E+1	-1.519E+1	-1.544E+1	-1.676E+1	-1.581E+1	-8.756E+0
N° 8 (Bias2)	---	-3.382E+0	-5.410E+0	-8.704E+0	-1.004E+1	-1.198E+1	-1.381E+1	-1.522E+1	-1.609E+1	-1.451E+1	-6.778E+0
N° 9 (Bias2)	---	-4.456E+0	-7.361E+0	-9.247E+0	-1.250E+1	-1.335E+1	-1.466E+1	-1.552E+1	-1.682E+1	-1.542E+1	-8.088E+0
N° 10 (Bias2)	---	-4.403E+0	-6.458E+0	-9.278E+0	-1.341E+1	-1.458E+1	-1.535E+1	-1.471E+1	-1.648E+1	-1.520E+1	-8.091E+0
N° 11 (Bias2)	---	-3.311E+0	-4.920E+0	-8.100E+0	-1.040E+1	-1.175E+1	-1.339E+1	-1.392E+1	-1.538E+1	-1.387E+1	-6.495E+0
N° 12 (OFF)	---	-4.138E+0	-6.884E+0	-9.154E+0	-1.124E+1	-1.276E+1	-1.409E+1	-1.469E+1	-1.657E+1	-1.500E+1	-8.054E+0
N° 13 (OFF)	---	-3.956E+0	-6.267E+0	-8.506E+0	-1.073E+1	-1.249E+1	-1.382E+1	-1.463E+1	-1.600E+1	-1.456E+1	-7.925E+0
N° 14 (OFF)	---	-3.172E+0	-6.249E+0	-8.536E+0	-1.209E+1	-1.410E+1	-1.551E+1	-1.573E+1	-1.682E+1	-1.498E+1	-7.317E+0
N° 15 (OFF)	---	-3.192E+0	-4.569E+0	-7.617E+0	-1.049E+1	-1.168E+1	-1.384E+1	-1.380E+1	-1.552E+1	-1.333E+1	-6.790E+0
N° 16 (OFF)	---	-3.047E+0	-4.761E+0	-7.585E+0	-1.159E+1	-1.449E+1	-1.473E+1	-1.493E+1	-1.658E+1	-1.482E+1	-7.454E+0
Average (OFF)	---	-3.502E+0	-4.133E+0	-6.773E+0	-8.605E+0	-1.079E+1	-1.147E+1	-1.112E+1	-1.150E+1	-1.088E+1	-4.005E+0
σ (OFF)	---	7.642E-1	2.224E-1	6.107E-1	9.591E-1	7.097E-1	8.822E-1	7.337E-1	6.870E-1	7.326E-1	7.308E-1
Average+3σ (OFF)	---	-1.210E+0	-3.466E+0	-4.941E+0	-5.728E+0	-8.663E+0	-8.828E+0	-8.916E+0	-9.439E+0	-8.680E+0	-1.813E+0
Average-3σ (OFF)	---	-5.795E+0	-4.800E+0	-8.606E+0	-1.148E+1	-1.292E+1	-1.412E+1	-1.332E+1	-1.356E+1	-1.308E+1	-6.198E+0
Average (Bias1)	---	-4.000E+0	-6.172E+0	-9.037E+0	-1.204E+1	-1.319E+1	-1.448E+1	-1.496E+1	-1.631E+1	-1.496E+1	-7.641E+0
σ (Bias1)	---	5.976E-1	9.917E-1	6.631E-1	1.736E+0	1.300E+0	8.545E-1	6.619E-1	5.958E-1	7.743E-1	9.623E-1
Average+3σ (Bias1)	---	-2.208E+0	-3.197E+0	-7.048E+0	-6.829E+0	-9.293E+0	-1.192E+1	-1.297E+1	-1.452E+1	-1.264E+1	-4.755E+0
Average-3σ (Bias1)	---	-5.793E+0	-9.147E+0	-1.103E+1	-1.725E+1	-1.709E+1	-1.704E+1	-1.695E+1	-1.809E+1	-1.728E+1	-1.053E+1
Average (Bias2)	---	-3.501E+0	-5.746E+0	-8.279E+0	-1.123E+1	-1.310E+1	-1.440E+1	-1.476E+1	-1.630E+1	-1.454E+1	-7.508E+0
σ (Bias2)	---	5.052E-1	1.021E+0	6.716E-1	6.470E-1	1.169E+0	7.231E-1	6.910E-1	5.301E-1	6.954E-1	5.068E-1
Average+3σ (Bias2)	---	-1.985E+0	-2.682E+0	-6.265E+0	-9.285E+0	-9.597E+0	-1.223E+1	-1.268E+1	-1.471E+1	-1.245E+1	-5.988E+0
Average-3σ (Bias2)	---	-5.017E+0	-8.810E+0	-1.029E+1	-1.317E+1	-1.661E+1	-1.657E+1	-1.683E+1	-1.789E+1	-1.662E+1	-9.029E+0

2. Vce(sat)

Ta = 25°C; IF = 1 mA; Ic = 5 mA



Vce(sat) . (V)

Max = 0.3

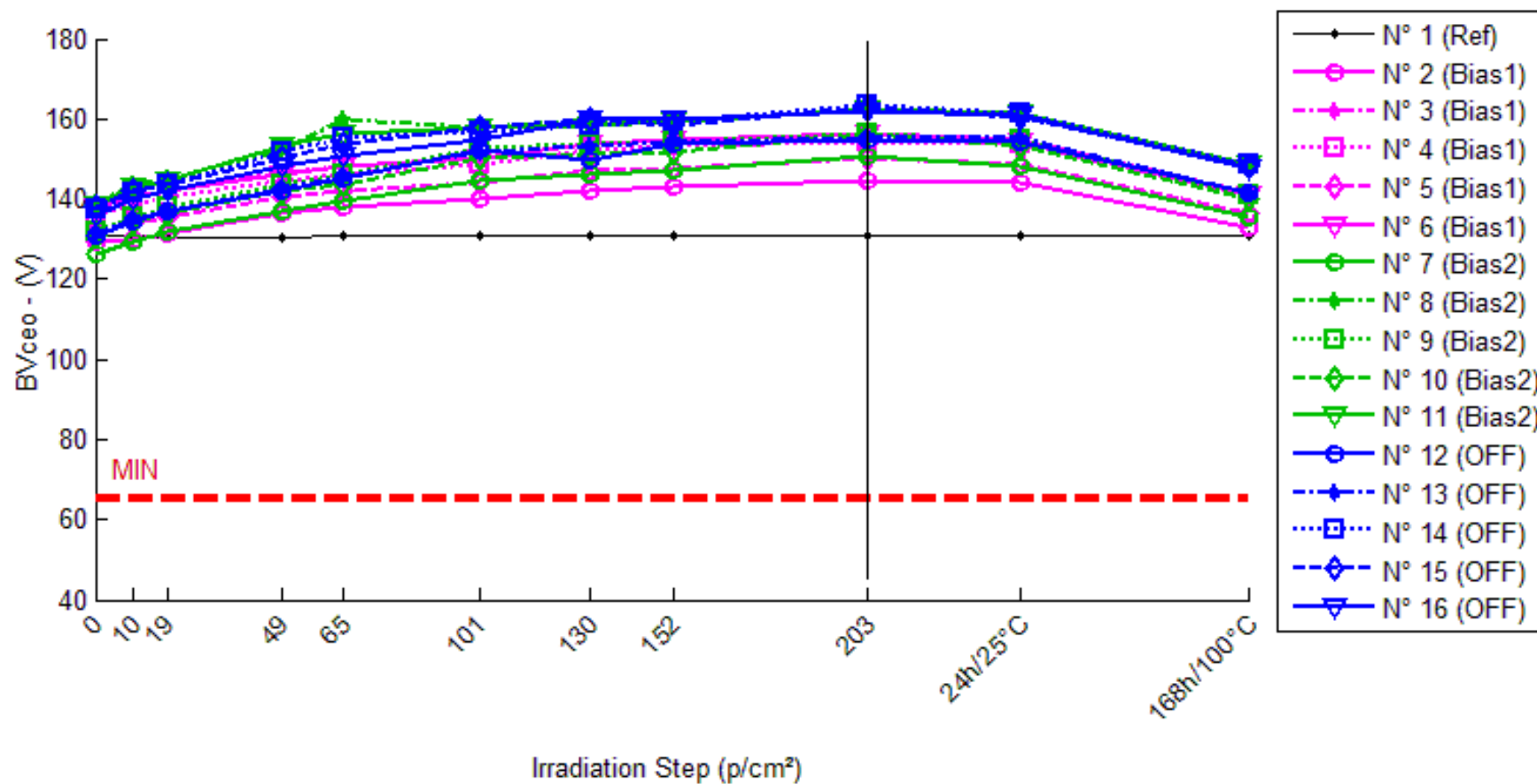
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.170	0.167	0.162	0.170	0.167	0.163	0.165	0.163	0.165	0.164	0.162
N° 2 (Bias1)	0.180	0.176	0.176	0.193	0.197	0.201	0.202	0.190	0.191	0.189	0.172
N° 3 (Bias1)	0.199	0.189	0.188	0.200	0.205	0.204	0.212	0.202	0.207	0.203	0.182
N° 4 (Bias1)	0.177	0.186	0.183	0.195	0.194	0.204	0.208	0.200	0.203	0.199	0.179
N° 5 (Bias1)	0.185	0.189	0.188	0.206	0.210	0.211	0.204	0.205	0.207	0.204	0.182
N° 6 (Bias1)	0.176	0.189	0.188	0.195	0.198	0.202	0.202	0.202	0.206	0.202	0.182
N° 7 (Bias2)	0.170	0.191	0.197	0.220	0.237	0.242	0.243	0.247	0.261	0.251	0.195
N° 8 (Bias2)	0.175	0.194	0.198	0.219	0.222	0.230	0.243	0.263	0.274	0.251	0.191
N° 9 (Bias2)	0.167	0.195	0.201	0.222	0.225	0.232	0.239	0.247	0.266	0.248	0.191
N° 10 (Bias2)	0.169	0.195	0.198	0.225	0.242	0.244	0.244	0.245	0.266	0.250	0.193
N° 11 (Bias2)	0.178	0.198	0.200	0.224	0.236	0.236	0.248	0.260	0.302	0.259	0.195
N° 12 (OFF)	0.171	0.196	0.204	0.227	0.239	0.239	0.249	0.254	0.289	0.256	0.194
N° 13 (OFF)	0.171	0.199	0.207	0.229	0.236	0.245	0.251	0.264	0.300	0.264	0.195
N° 14 (OFF)	0.170	0.191	0.203	0.225	0.229	0.243	0.257	0.273	0.295	0.248	0.189
N° 15 (OFF)	0.174	0.194	0.200	0.221	0.228	0.238	0.258	0.273	0.315	0.252	0.193
N° 16 (OFF)	0.166	0.186	0.193	0.229	0.226	0.241	0.257	0.260	0.266	0.243	0.187

Delta [Vce(sat)]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-2.790E-3	-7.441E-3	1.388E-4	-3.038E-3	-6.900E-3	-5.155E-3	-7.135E-3	-4.932E-3	-5.451E-3	-7.611E-3
N° 2 (Bias1)	---	-4.351E-3	-3.984E-3	1.336E-2	1.708E-2	2.071E-2	2.245E-2	9.770E-3	1.049E-2	9.153E-3	-7.715E-3
N° 3 (Bias1)	---	-9.133E-3	-1.097E-2	1.127E-3	6.256E-3	5.195E-3	1.362E-2	3.805E-3	7.938E-3	4.295E-3	-1.617E-2
N° 4 (Bias1)	---	8.596E-3	5.475E-3	1.785E-2	1.650E-2	2.685E-2	3.093E-2	2.281E-2	2.526E-2	2.158E-2	1.323E-3
N° 5 (Bias1)	---	3.356E-3	3.054E-3	2.019E-2	2.416E-2	2.533E-2	1.898E-2	1.934E-2	2.182E-2	1.847E-2	-2.974E-3
N° 6 (Bias1)	---	1.284E-2	1.251E-2	1.914E-2	2.167E-2	2.650E-2	2.651E-2	2.646E-2	2.976E-2	2.555E-2	5.771E-3
N° 7 (Bias2)	---	2.029E-2	2.680E-2	4.989E-2	6.705E-2	7.143E-2	7.326E-2	7.631E-2	9.028E-2	8.073E-2	2.456E-2
N° 8 (Bias2)	---	1.923E-2	2.333E-2	4.446E-2	4.770E-2	5.525E-2	6.784E-2	8.856E-2	9.903E-2	7.584E-2	1.663E-2
N° 9 (Bias2)	---	2.744E-2	3.400E-2	5.495E-2	5.732E-2	6.454E-2	7.173E-2	8.013E-2	9.896E-2	8.028E-2	2.368E-2
N° 10 (Bias2)	---	2.605E-2	2.856E-2	5.542E-2	7.268E-2	7.479E-2	7.489E-2	7.542E-2	9.711E-2	8.034E-2	2.350E-2
N° 11 (Bias2)	---	1.970E-2	2.216E-2	4.587E-2	5.845E-2	5.811E-2	7.008E-2	8.246E-2	1.243E-1	8.106E-2	1.663E-2
N° 12 (OFF)	---	2.550E-2	3.296E-2	5.674E-2	6.862E-2	6.862E-2	7.880E-2	8.340E-2	1.185E-1	8.527E-2	2.373E-2
N° 13 (OFF)	---	2.789E-2	3.567E-2	5.756E-2	6.503E-2	7.364E-2	8.043E-2	9.328E-2	1.292E-1	9.314E-2	2.432E-2
N° 14 (OFF)	---	2.107E-2	3.234E-2	5.502E-2	5.906E-2	7.294E-2	8.649E-2	1.024E-1	1.243E-1	7.741E-2	1.833E-2
N° 15 (OFF)	---	2.084E-2	2.643E-2	4.739E-2	5.472E-2	6.397E-2	8.449E-2	9.971E-2	1.410E-1	7.839E-2	1.924E-2
N° 16 (OFF)	---	2.006E-2	2.643E-2	6.241E-2	6.007E-2	7.453E-2	9.073E-2	9.422E-2	9.988E-2	7.713E-2	2.058E-2
Average (OFF)	---	2.261E-3	1.217E-3	1.433E-2	1.713E-2	2.092E-2	2.250E-2	1.644E-2	1.905E-2	1.581E-2	-3.953E-3
σ (OFF)	---	9.038E-3	9.006E-3	7.828E-3	6.868E-3	9.125E-3	6.681E-3	9.402E-3	9.456E-3	8.834E-3	8.467E-3
Average+3σ (OFF)	---	2.938E-2	2.824E-2	3.782E-2	3.773E-2	4.829E-2	4.254E-2	4.464E-2	4.742E-2	4.231E-2	2.145E-2
Average-3σ (OFF)	---	-2.485E-2	-2.580E-2	-9.150E-3	-3.471E-3	-6.457E-3	2.455E-3	-1.177E-2	-9.315E-3	-1.069E-2	-2.935E-2
Average (Bias1)	---	2.254E-2	2.697E-2	5.012E-2	6.064E-2	6.482E-2	7.156E-2	8.057E-2	1.019E-1	7.965E-2	2.100E-2
σ (Bias1)	---	3.886E-3	4.700E-3	5.039E-3	9.607E-3	8.364E-3	2.741E-3	5.298E-3	1.301E-2	2.154E-3	4.008E-3
Average+3σ (Bias1)	---	3.420E-2	4.107E-2	6.523E-2	8.946E-2	8.991E-2	7.978E-2	9.647E-2	1.410E-1	8.611E-2	3.302E-2
Average-3σ (Bias1)	---	1.088E-2	1.287E-2	3.500E-2	3.182E-2	3.973E-2	6.334E-2	6.468E-2	6.290E-2	7.319E-2	8.977E-3
Average (Bias2)	---	2.307E-2	3.077E-2	5.582E-2	6.150E-2	7.074E-2	8.419E-2	9.460E-2	1.226E-1	8.227E-2	2.124E-2
σ (Bias2)	---	3.433E-3	4.151E-3	5.454E-3	5.414E-3	4.413E-3	4.780E-3	7.311E-3	1.514E-2	6.932E-3	2.673E-3
Average+3σ (Bias2)	---	3.337E-2	4.322E-2	7.219E-2	7.774E-2	8.398E-2	9.853E-2	1.165E-1	1.680E-1	1.031E-1	2.926E-2
Average-3σ (Bias2)	---	1.277E-2	1.831E-2	3.946E-2	4.526E-2	5.750E-2	6.985E-2	7.266E-2	7.715E-2	6.147E-2	1.322E-2

3. BV_{ceo}

T_a = 25°C; I_{ce} = 1 mA



BVceo . (V) Min = 65.0

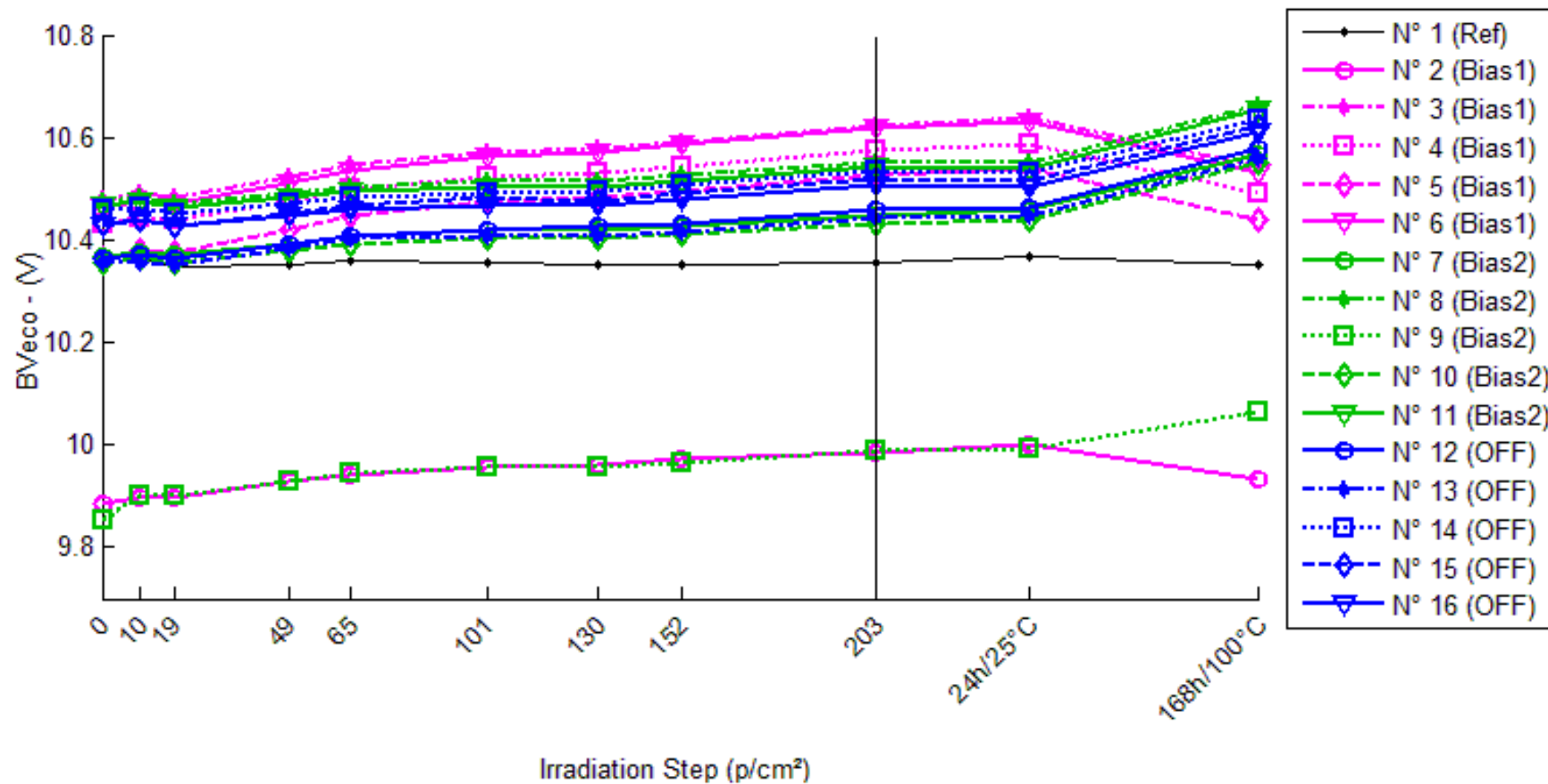
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	130.64	130.74	130.50	130.60	130.72	130.68	130.64	130.64	130.73	130.83	130.65
N° 2 (Bias1)	129.43	129.68	131.27	136.50	137.77	139.94	142.17	143.22	144.86	144.31	133.00
N° 3 (Bias1)	138.05	140.57	142.31	146.41	148.11	150.37	153.84	154.88	156.42	154.63	141.62
N° 4 (Bias1)	135.95	138.76	140.43	144.46	146.20	148.52	152.01	153.12	154.38	153.70	140.95
N° 5 (Bias1)	132.38	133.72	135.61	140.35	142.01	144.06	147.17	147.72	150.07	148.57	136.65
N° 6 (Bias1)	137.87	140.41	142.17	146.35	148.05	150.29	153.92	154.81	156.41	154.36	141.06
N° 7 (Bias2)	126.26	129.55	131.65	137.16	139.36	144.74	146.07	147.20	150.58	148.13	135.54
N° 8 (Bias2)	138.86	143.45	145.14	152.02	156.00	157.87	160.14	159.19	162.69	161.14	148.79
N° 9 (Bias2)	131.67	135.64	137.88	143.75	146.16	152.90	153.64	154.37	156.32	155.01	140.95
N° 10 (Bias2)	130.65	134.33	136.40	142.00	143.70	150.47	151.42	151.61	156.29	153.02	140.04
N° 11 (Bias2)	138.46	143.09	144.83	153.30	156.44	157.72	158.45	159.53	162.48	161.49	148.56
N° 12 (OFF)	130.94	134.59	136.74	142.04	145.10	152.29	149.80	153.57	154.84	154.41	141.49
N° 13 (OFF)	131.33	134.78	136.87	142.70	145.39	151.79	153.45	154.54	155.43	155.21	141.60
N° 14 (OFF)	137.52	141.72	143.49	151.52	155.06	156.74	158.15	159.39	163.45	161.47	148.78
N° 15 (OFF)	138.03	141.98	143.66	150.33	153.83	157.78	159.69	158.43	163.16	160.63	148.26
N° 16 (OFF)	135.96	140.04	141.86	148.15	150.59	155.01	159.69	159.90	161.84	160.93	147.72

Delta [BVceo]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	9.740E-2	-1.447E-1	-4.590E-2	7.210E-2	3.250E-2	-7.800E-3	-4.400E-3	8.430E-2	1.825E-1	2.600E-3
N° 2 (Bias1)	---	2.442E-1	1.835E+0	7.066E+0	8.335E+0	1.051E+1	1.274E+1	1.379E+1	1.543E+1	1.488E+1	3.566E+0
N° 3 (Bias1)	---	2.521E+0	4.265E+0	8.359E+0	1.007E+1	1.232E+1	1.579E+1	1.683E+1	1.837E+1	1.658E+1	3.571E+0
N° 4 (Bias1)	---	2.809E+0	4.485E+0	8.513E+0	1.025E+1	1.258E+1	1.606E+1	1.717E+1	1.843E+1	1.775E+1	5.008E+0
N° 5 (Bias1)	---	1.335E+0	3.227E+0	7.965E+0	9.634E+0	1.167E+1	1.478E+1	1.534E+1	1.769E+1	1.619E+1	4.269E+0
N° 6 (Bias1)	---	2.541E+0	4.295E+0	8.481E+0	1.018E+1	1.242E+1	1.605E+1	1.694E+1	1.854E+1	1.649E+1	3.188E+0
N° 7 (Bias2)	---	3.293E+0	5.389E+0	1.090E+1	1.311E+1	1.849E+1	1.981E+1	2.094E+1	2.432E+1	2.187E+1	9.281E+0
N° 8 (Bias2)	---	4.593E+0	6.283E+0	1.316E+1	1.715E+1	1.901E+1	2.128E+1	2.033E+1	2.383E+1	2.228E+1	9.926E+0
N° 9 (Bias2)	---	3.974E+0	6.212E+0	1.208E+1	1.449E+1	2.124E+1	2.197E+1	2.270E+1	2.465E+1	2.334E+1	9.284E+0
N° 10 (Bias2)	---	3.678E+0	5.747E+0	1.135E+1	1.305E+1	1.982E+1	2.077E+1	2.096E+1	2.564E+1	2.236E+1	9.392E+0
N° 11 (Bias2)	---	4.630E+0	6.373E+0	1.484E+1	1.798E+1	1.926E+1	2.000E+1	2.108E+1	2.403E+1	2.304E+1	1.010E+1
N° 12 (OFF)	---	3.649E+0	5.799E+0	1.110E+1	1.416E+1	2.135E+1	1.886E+1	2.263E+1	2.390E+1	2.348E+1	1.055E+1
N° 13 (OFF)	---	3.446E+0	5.545E+0	1.137E+1	1.406E+1	2.046E+1	2.212E+1	2.321E+1	2.410E+1	2.388E+1	1.027E+1
N° 14 (OFF)	---	4.196E+0	5.964E+0	1.400E+1	1.754E+1	1.922E+1	2.062E+1	2.186E+1	2.593E+1	2.395E+1	1.126E+1
N° 15 (OFF)	---	3.954E+0	5.636E+0	1.230E+1	1.580E+1	1.975E+1	2.166E+1	2.040E+1	2.513E+1	2.260E+1	1.023E+1
N° 16 (OFF)	---	4.085E+0	5.898E+0	1.219E+1	1.464E+1	1.905E+1	2.374E+1	2.394E+1	2.588E+1	2.497E+1	1.176E+1
Average (OFF)	---	1.890E+0	3.622E+0	8.077E+0	9.694E+0	1.190E+1	1.509E+1	1.601E+1	1.769E+1	1.638E+1	3.920E+0
σ (OFF)	---	1.082E+0	1.114E+0	6.056E-1	7.969E-1	8.510E-1	1.412E+0	1.439E+0	1.308E+0	1.029E+0	7.226E-1
Average+3σ (OFF)	---	5.135E+0	6.963E+0	9.894E+0	1.209E+1	1.445E+1	1.932E+1	2.033E+1	2.162E+1	1.946E+1	6.088E+0
Average-3σ (OFF)	---	-1.356E+0	2.801E-1	6.260E+0	7.304E+0	9.346E+0	1.085E+1	1.170E+1	1.377E+1	1.329E+1	1.752E+0
Average (Bias1)	---	4.033E+0	6.001E+0	1.247E+1	1.515E+1	1.956E+1	2.077E+1	2.120E+1	2.449E+1	2.258E+1	9.597E+0
σ (Bias1)	---	5.803E-1	4.189E-1	1.580E+0	2.293E+0	1.052E+0	8.976E-1	8.848E-1	7.105E-1	5.989E-1	3.881E-1
Average+3σ (Bias1)	---	5.774E+0	7.257E+0	1.720E+1	2.203E+1	2.272E+1	2.346E+1	2.386E+1	2.662E+1	2.437E+1	1.076E+1
Average-3σ (Bias1)	---	2.292E+0	4.744E+0	7.726E+0	8.277E+0	1.641E+1	1.807E+1	1.855E+1	2.236E+1	2.078E+1	8.433E+0
Average (Bias2)	---	3.866E+0	5.768E+0	1.219E+1	1.524E+1	1.997E+1	2.140E+1	2.241E+1	2.499E+1	2.377E+1	1.081E+1
σ (Bias2)	---	3.114E-1	1.758E-1	1.134E+0	1.460E+0	9.495E-1	1.808E+0	1.356E+0	9.577E-1	8.577E-1	6.704E-1
Average+3σ (Bias2)	---	4.800E+0	6.296E+0	1.559E+1	1.962E+1	2.282E+1	2.683E+1	2.648E+1	2.786E+1	2.635E+1	1.283E+1
Average-3σ (Bias2)	---	2.932E+0	5.241E+0	8.790E+0	1.086E+1	1.712E+1	1.597E+1	1.834E+1	2.211E+1	2.120E+1	8.804E+0

4. BV_{eco}

T_a = 25°C; I_{ec} = 100 µA



BVeco . (V)

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	10.366	10.365	10.347	10.352	10.358	10.354	10.352	10.352	10.356	10.366	10.351
N° 2 (Bias1)	9.885	9.899	9.897	9.930	9.942	9.957	9.961	9.972	9.985	9.999	9.934
N° 3 (Bias1)	10.478	10.490	10.485	10.524	10.548	10.572	10.578	10.591	10.621	10.638	10.543
N° 4 (Bias1)	10.433	10.444	10.440	10.476	10.499	10.523	10.531	10.544	10.574	10.586	10.492
N° 5 (Bias1)	10.365	10.379	10.377	10.421	10.446	10.475	10.482	10.496	10.526	10.539	10.440
N° 6 (Bias1)	10.463	10.477	10.473	10.510	10.535	10.564	10.572	10.585	10.618	10.629	10.529
N° 7 (Bias2)	10.367	10.377	10.370	10.391	10.407	10.418	10.419	10.429	10.447	10.459	10.567
N° 8 (Bias2)	10.476	10.485	10.471	10.491	10.503	10.515	10.515	10.528	10.552	10.551	10.662
N° 9 (Bias2)	9.854	9.901	9.901	9.930	9.944	9.957	9.959	9.967	9.988	9.992	10.066
N° 10 (Bias2)	10.357	10.364	10.355	10.380	10.393	10.402	10.402	10.411	10.430	10.439	10.549
N° 11 (Bias2)	10.466	10.475	10.462	10.482	10.496	10.503	10.505	10.516	10.541	10.538	10.654
N° 12 (OFF)	10.364	10.373	10.364	10.393	10.408	10.421	10.426	10.433	10.459	10.464	10.580
N° 13 (OFF)	10.354	10.356	10.350	10.382	10.402	10.406	10.406	10.417	10.442	10.446	10.559
N° 14 (OFF)	10.458	10.465	10.452	10.470	10.484	10.490	10.496	10.507	10.536	10.529	10.635
N° 15 (OFF)	10.431	10.439	10.428	10.451	10.466	10.482	10.477	10.492	10.520	10.516	10.622
N° 16 (OFF)	10.429	10.440	10.427	10.447	10.461	10.469	10.468	10.480	10.508	10.505	10.610

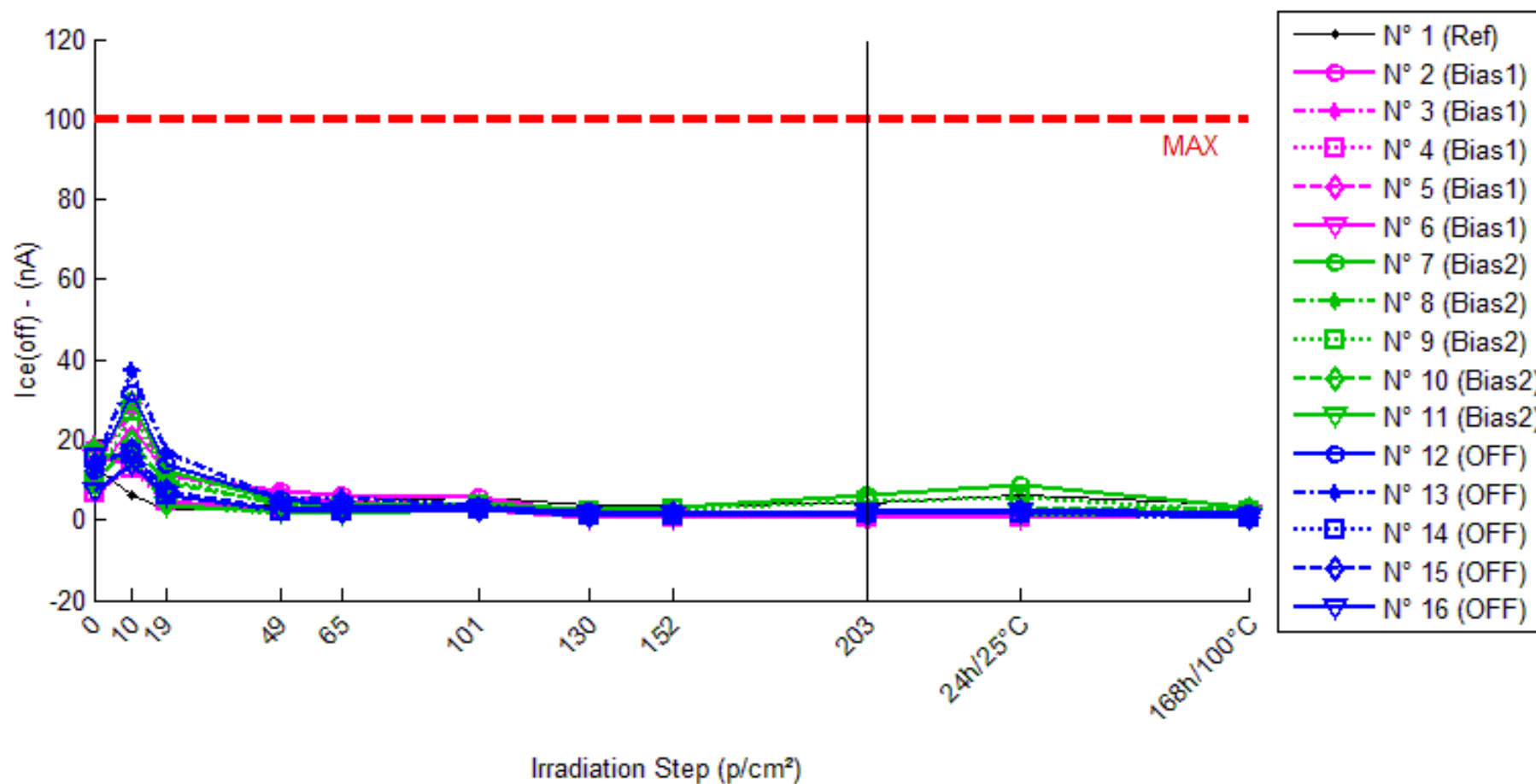
Delta [BVeco]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-7.300E-4	-1.948E-2	-1.429E-2	-7.910E-3	-1.198E-2	-1.434E-2	-1.409E-2	-9.810E-3	1.000E-4	-1.475E-2
N° 2 (Bias1)	---	1.397E-2	1.198E-2	4.463E-2	5.715E-2	7.236E-2	7.582E-2	8.674E-2	9.961E-2	1.139E-1	4.913E-2
N° 3 (Bias1)	---	1.205E-2	6.970E-3	4.648E-2	7.034E-2	9.444E-2	1.001E-1	1.133E-1	1.432E-1	1.603E-1	6.546E-2
N° 4 (Bias1)	---	1.082E-2	6.880E-3	4.325E-2	6.615E-2	8.994E-2	9.830E-2	1.114E-1	1.408E-1	1.538E-1	5.960E-2
N° 5 (Bias1)	---	1.410E-2	1.201E-2	5.638E-2	8.145E-2	1.105E-1	1.173E-1	1.313E-1	1.615E-1	1.745E-1	7.543E-2
N° 6 (Bias1)	---	1.355E-2	9.110E-3	4.671E-2	7.170E-2	1.001E-1	1.082E-1	1.216E-1	1.540E-1	1.659E-1	6.586E-2
N° 7 (Bias2)	---	1.037E-2	3.950E-3	2.406E-2	4.063E-2	5.130E-2	5.250E-2	6.254E-2	8.090E-2	9.287E-2	2.009E-1
N° 8 (Bias2)	---	8.870E-3	-4.700E-3	1.543E-2	2.709E-2	3.878E-2	3.920E-2	5.192E-2	7.661E-2	7.566E-2	1.860E-1
N° 9 (Bias2)	---	4.665E-2	4.689E-2	7.587E-2	8.906E-2	1.022E-1	1.049E-1	1.129E-1	1.336E-1	1.373E-1	2.114E-1
N° 10 (Bias2)	---	7.010E-3	-2.000E-3	2.306E-2	3.628E-2	4.520E-2	4.489E-2	5.408E-2	7.248E-2	8.200E-2	1.918E-1
N° 11 (Bias2)	---	8.120E-3	-4.770E-3	1.558E-2	2.962E-2	3.683E-2	3.874E-2	4.919E-2	7.460E-2	7.178E-2	1.871E-1
N° 12 (OFF)	---	8.920E-3	5.500E-4	2.914E-2	4.428E-2	5.712E-2	6.246E-2	6.910E-2	9.540E-2	9.982E-2	2.160E-1
N° 13 (OFF)	---	2.100E-3	-3.620E-3	2.812E-2	4.802E-2	5.244E-2	5.187E-2	6.335E-2	8.855E-2	9.165E-2	2.047E-1
N° 14 (OFF)	---	7.270E-3	-6.020E-3	1.243E-2	2.610E-2	3.267E-2	3.809E-2	4.964E-2	7.820E-2	7.131E-2	1.770E-1
N° 15 (OFF)	---	8.160E-3	-2.790E-3	2.016E-2	3.531E-2	5.159E-2	4.629E-2	6.127E-2	8.941E-2	8.555E-2	1.907E-1
N° 16 (OFF)	---	1.078E-2	-1.580E-3	1.844E-2	3.159E-2	4.041E-2	3.919E-2	5.121E-2	7.870E-2	7.611E-2	1.806E-1
Average (OFF)	---	1.290E-2	9.390E-3	4.749E-2	6.936E-2	9.348E-2	9.995E-2	1.129E-1	1.398E-1	1.537E-1	6.310E-2
σ (OFF)	---	1.418E-3	2.540E-3	5.167E-3	8.832E-3	1.409E-2	1.544E-2	1.659E-2	2.399E-2	2.351E-2	9.651E-3
Average+3σ (OFF)	---	1.715E-2	1.701E-2	6.299E-2	9.585E-2	1.358E-1	1.463E-1	1.627E-1	2.118E-1	2.242E-1	9.205E-2
Average-3σ (OFF)	---	8.642E-3	1.771E-3	3.199E-2	4.286E-2	5.120E-2	5.364E-2	6.309E-2	6.787E-2	8.316E-2	3.414E-2
Average (Bias1)	---	1.620E-2	7.874E-3	3.080E-2	4.454E-2	5.486E-2	5.604E-2	6.612E-2	8.765E-2	9.193E-2	1.955E-1
σ (Bias1)	---	1.706E-2	2.210E-2	2.552E-2	2.546E-2	2.707E-2	2.786E-2	2.660E-2	2.590E-2	2.661E-2	1.068E-2
Average+3σ (Bias1)	---	6.739E-2	7.417E-2	1.073E-1	1.209E-1	1.361E-1	1.396E-1	1.459E-1	1.653E-1	1.718E-1	2.275E-1
Average-3σ (Bias1)	---	-3.498E-2	-5.842E-2	-4.575E-2	-3.184E-2	-2.634E-2	-2.754E-2	-1.369E-2	9.946E-3	1.210E-2	1.634E-1
Average (Bias2)	---	7.446E-3	-2.692E-3	2.166E-2	3.706E-2	4.685E-2	4.758E-2	5.891E-2	8.605E-2	8.489E-2	1.938E-1
σ (Bias2)	---	3.256E-3	2.434E-3	6.991E-3	9.019E-3	1.002E-2	1.002E-2	8.282E-3	7.426E-3	1.152E-2	1.640E-2
Average+3σ (Bias2)	---	1.721E-2	4.609E-3	4.263E-2	6.412E-2	7.691E-2	7.765E-2	8.376E-2	1.083E-1	1.194E-1	2.430E-1
Average-3σ (Bias2)	---	-2.322E-3	-9.993E-3	6.852E-4	1.000E-2	1.678E-2	1.751E-2	3.407E-2	6.377E-2	5.034E-2	1.446E-1

c

5. Ice(off)

Ta = 25°C; Vce = 20 V



Ice(off) . (nA)

Max = 100.0

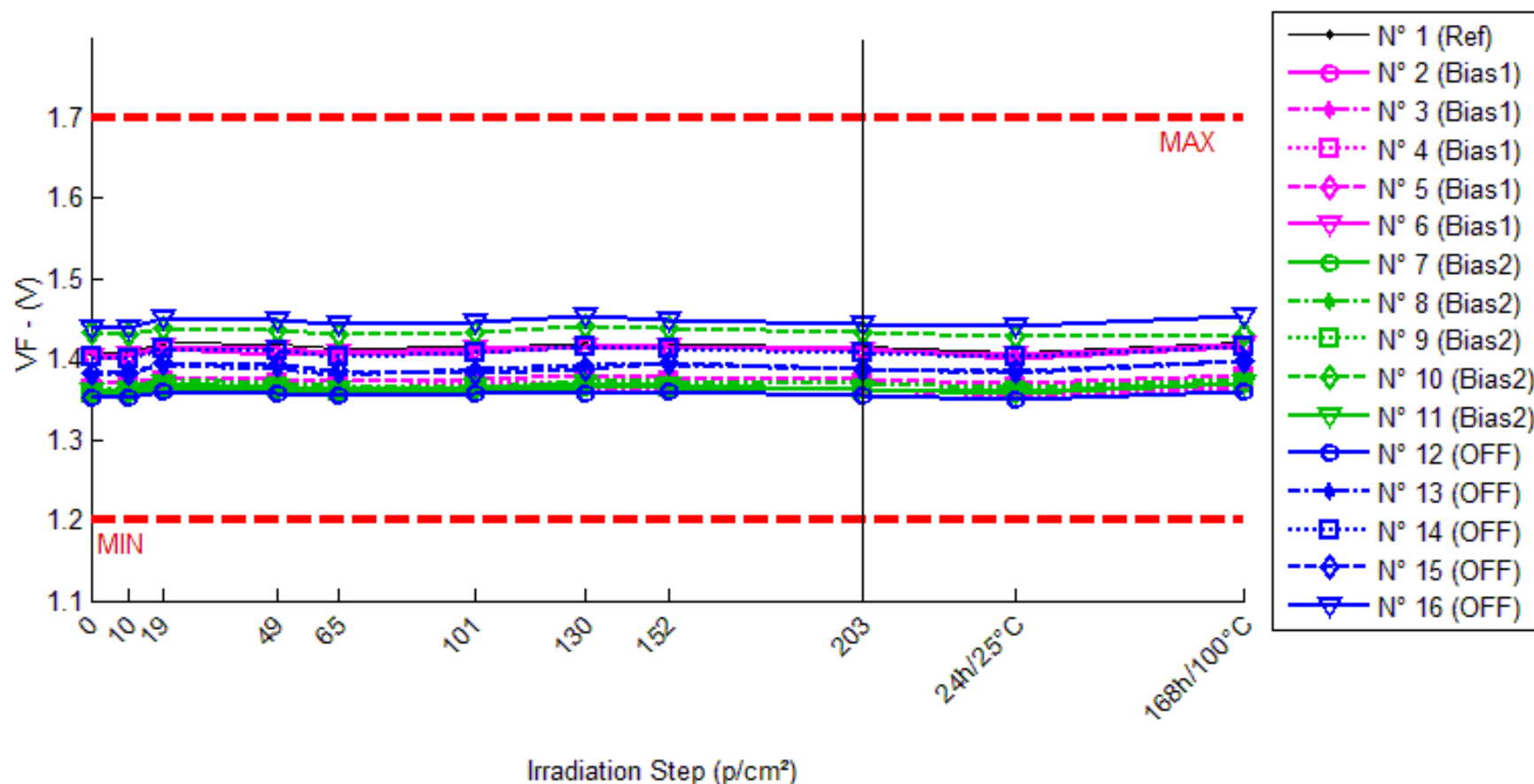
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	13.561	5.983	2.716	3.791	4.452	5.909	3.776	3.652	4.285	6.290	3.723
N° 2 (Bias1)	10.655	11.335	11.192	7.184	5.979	5.696	1.679	1.405	1.024	1.513	1.791
N° 3 (Bias1)	18.908	15.315	4.504	2.727	2.160	3.091	0.927	0.698	0.605	0.725	1.673
N° 4 (Bias1)	6.579	12.629	4.490	2.777	2.223	3.110	0.950	0.820	0.701	0.794	0.776
N° 5 (Bias1)	12.138	11.903	11.224	5.554	4.440	3.535	1.309	1.053	0.867	1.039	1.693
N° 6 (Bias1)	15.390	14.164	4.588	2.252	1.845	2.874	0.850	0.703	0.620	0.671	1.513
N° 7 (Bias2)	13.152	12.876	12.210	4.694	3.806	4.218	2.863	3.222	6.172	8.728	3.063
N° 8 (Bias2)	18.191	15.117	3.556	1.656	1.537	2.803	1.158	1.221	1.641	1.769	0.997
N° 9 (Bias2)	9.711	10.184	10.327	3.680	3.233	3.829	2.263	2.483	4.638	5.467	2.039
N° 10 (Bias2)	9.226	19.344	9.275	4.037	3.404	3.031	1.606	1.695	1.890	2.443	2.461
N° 11 (Bias2)	16.592	15.648	3.823	2.080	1.646	2.712	1.258	1.246	1.727	1.837	0.992
N° 12 (OFF)	12.081	12.803	13.990	5.334	3.915	3.058	2.296	1.830	2.049	2.666	1.872
N° 13 (OFF)	13.594	18.318	16.697	5.239	5.892	3.434	1.721	1.830	2.074	2.615	1.518
N° 14 (OFF)	15.594	16.585	6.203	1.984	1.914	2.687	1.327	1.370	1.725	1.858	0.708
N° 15 (OFF)	13.658	17.181	7.085	2.514	2.135	2.845	1.302	1.387	1.758	2.094	0.683
N° 16 (OFF)	7.401	13.728	6.207	2.440	2.436	2.598	1.280	1.360	1.720	1.955	0.679

Delta [Ice(off)]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-7.577E+0	-1.084E+1	-9.770E+0	-9.109E+0	-7.652E+0	-9.785E+0	-9.908E+0	-9.275E+0	-7.271E+0	-9.838E+0
N° 2 (Bias1)	---	6.799E-1	5.365E-1	-3.471E+0	-4.676E+0	-4.959E+0	-8.976E+0	-9.250E+0	-9.631E+0	-9.142E+0	-8.864E+0
N° 3 (Bias1)	---	-3.593E+0	-1.440E+1	-1.618E+1	-1.675E+1	-1.582E+1	-1.798E+1	-1.821E+1	-1.830E+1	-1.818E+1	-1.723E+1
N° 4 (Bias1)	---	6.050E+0	-2.089E+0	-3.802E+0	-4.356E+0	-3.469E+0	-5.629E+0	-5.760E+0	-5.878E+0	-5.785E+0	-5.803E+0
N° 5 (Bias1)	---	-2.351E-1	-9.135E-1	-6.584E+0	-7.698E+0	-8.602E+0	-1.083E+1	-1.108E+1	-1.127E+1	-1.110E+1	-1.044E+1
N° 6 (Bias1)	---	-1.227E+0	-1.080E+1	-1.314E+1	-1.354E+1	-1.252E+1	-1.454E+1	-1.469E+1	-1.477E+1	-1.472E+1	-1.388E+1
N° 7 (Bias2)	---	-2.765E-1	-9.418E-1	-8.458E+0	-9.346E+0	-8.934E+0	-1.029E+1	-9.930E+0	-6.980E+0	-4.424E+0	-1.009E+1
N° 8 (Bias2)	---	-3.074E+0	-1.464E+1	-1.653E+1	-1.665E+1	-1.539E+1	-1.703E+1	-1.697E+1	-1.655E+1	-1.642E+1	-1.719E+1
N° 9 (Bias2)	---	4.735E-1	6.163E-1	-6.031E+0	-6.478E+0	-5.882E+0	-7.448E+0	-7.228E+0	-5.073E+0	-4.244E+0	-7.672E+0
N° 10 (Bias2)	---	1.012E+1	4.925E-2	-5.188E+0	-5.821E+0	-6.195E+0	-7.619E+0	-7.531E+0	-7.336E+0	-6.783E+0	-6.764E+0
N° 11 (Bias2)	---	-9.440E-1	-1.277E+1	-1.451E+1	-1.495E+1	-1.388E+1	-1.533E+1	-1.535E+1	-1.486E+1	-1.475E+1	-1.560E+1
N° 12 (OFF)	---	7.218E-1	1.909E+0	-6.746E+0	-8.166E+0	-9.023E+0	-9.785E+0	-1.025E+1	-1.003E+1	-9.415E+0	-1.021E+1
N° 13 (OFF)	---	4.724E+0	3.103E+0	-8.355E+0	-7.702E+0	-1.016E+1	-1.187E+1	-1.176E+1	-1.152E+1	-1.098E+1	-1.208E+1
N° 14 (OFF)	---	9.910E-1	-9.391E+0	-1.361E+1	-1.368E+1	-1.291E+1	-1.427E+1	-1.422E+1	-1.387E+1	-1.374E+1	-1.489E+1
N° 15 (OFF)	---	3.523E+0	-6.573E+0	-1.114E+1	-1.152E+1	-1.081E+1	-1.236E+1	-1.227E+1	-1.190E+1	-1.156E+1	-1.298E+1
N° 16 (OFF)	---	6.328E+0	-1.194E+0	-4.961E+0	-4.965E+0	-4.802E+0	-6.121E+0	-6.041E+0	-5.681E+0	-5.445E+0	-6.721E+0
Average (OFF)	---	3.349E-1	-5.534E+0	-8.635E+0	-9.404E+0	-9.073E+0	-1.159E+1	-1.180E+1	-1.197E+1	-1.179E+1	-1.124E+1
σ (OFF)	---	3.570E+0	6.643E+0	5.733E+0	5.519E+0	5.145E+0	4.809E+0	4.820E+0	4.770E+0	4.822E+0	4.437E+0
Average+3σ (OFF)	---	1.104E+1	1.439E+1	8.563E+0	7.152E+0	6.363E+0	2.835E+0	2.661E+0	2.339E+0	2.680E+0	2.065E+0
Average-3σ (OFF)	---	-1.037E+1	-2.546E+1	-2.583E+1	-2.596E+1	-2.451E+1	-2.602E+1	-2.626E+1	-2.628E+1	-2.625E+1	-2.455E+1
Average (Bias1)	---	1.260E+0	-5.536E+0	-1.014E+1	-1.065E+1	-1.006E+1	-1.154E+1	-1.140E+1	-1.016E+1	-9.325E+0	-1.146E+1
σ (Bias1)	---	5.126E+0	7.504E+0	5.105E+0	4.923E+0	4.377E+0	4.423E+0	4.504E+0	5.170E+0	5.834E+0	4.698E+0
Average+3σ (Bias1)	---	1.664E+1	1.698E+1	5.169E+0	4.119E+0	3.076E+0	1.725E+0	2.110E+0	5.350E+0	8.177E+0	2.631E+0
Average-3σ (Bias1)	---	-1.412E+1	-2.805E+1	-2.546E+1	-2.542E+1	-2.319E+1	-2.481E+1	-2.491E+1	-2.567E+1	-2.683E+1	-2.556E+1
Average (Bias2)	---	3.257E+0	-2.429E+0	-8.963E+0	-9.207E+0	-9.541E+0	-1.088E+1	-1.091E+1	-1.060E+1	-1.023E+1	-1.137E+1
σ (Bias2)	---	2.409E+0	5.399E+0	3.452E+0	3.418E+0	3.002E+0	3.102E+0	3.070E+0	3.072E+0	3.090E+0	3.098E+0
Average+3σ (Bias2)	---	1.048E+1	1.377E+1	1.391E+0	1.046E+0	-5.346E-1	-1.575E+0	-1.699E+0	-1.385E+0	-9.585E-1	-2.079E+0
Average-3σ (Bias2)	---	-3.970E+0	-1.863E+1	-1.932E+1	-1.946E+1	-1.855E+1	-2.018E+1	-2.012E+1	-1.982E+1	-1.950E+1	-2.067E+1

6. VF

Ta = 25°C; VF = 10 mA



VF . (V) **Min = 1.2 Max = 1.7**

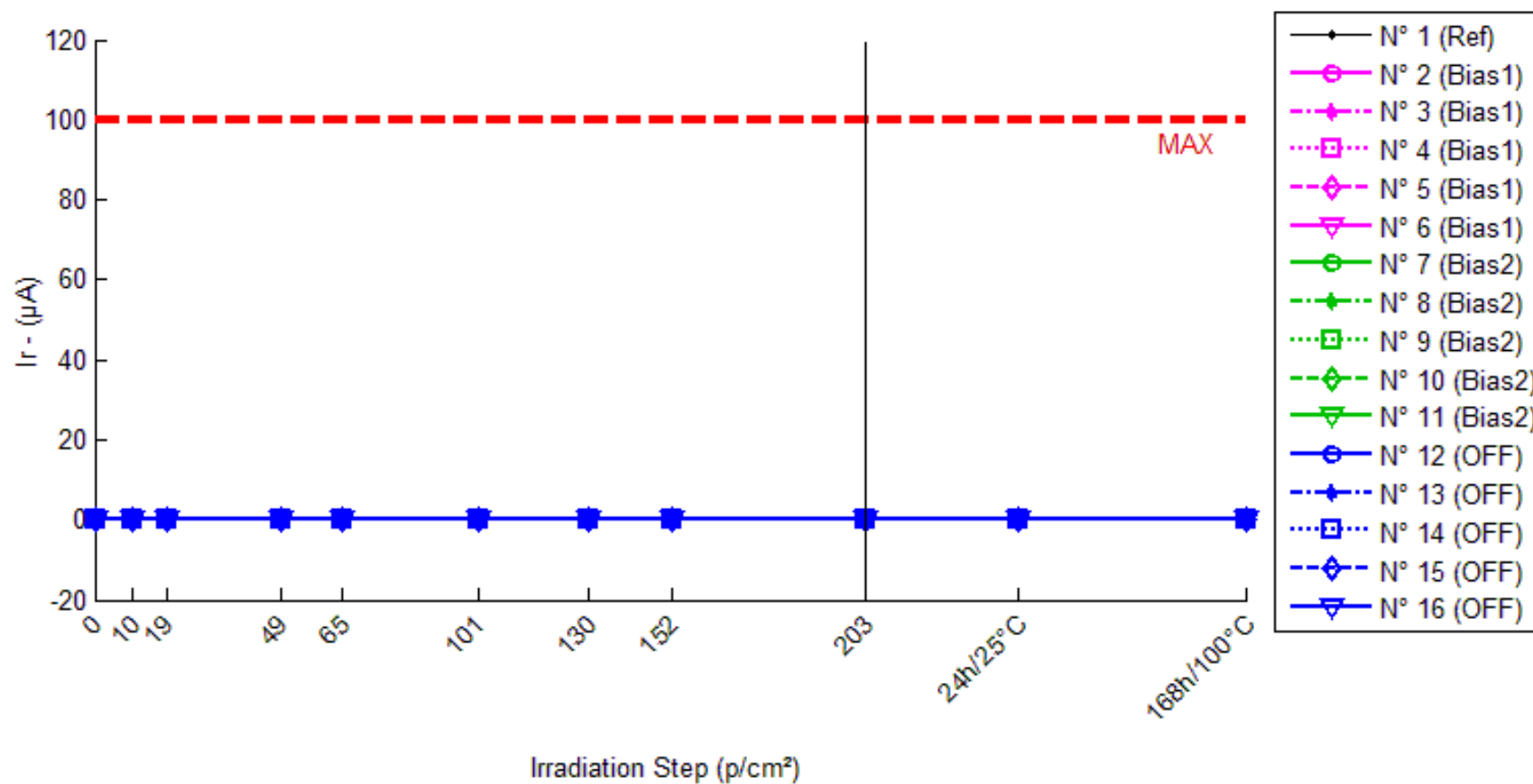
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.407	1.408	1.421	1.418	1.414	1.417	1.418	1.419	1.416	1.409	1.420
N° 2 (Bias1)	1.400	1.402	1.413	1.406	1.405	1.409	1.416	1.412	1.413	1.400	1.415
N° 3 (Bias1)	1.354	1.356	1.364	1.361	1.357	1.361	1.364	1.363	1.362	1.354	1.366
N° 4 (Bias1)	1.362	1.365	1.373	1.371	1.365	1.370	1.372	1.372	1.369	1.364	1.377
N° 5 (Bias1)	1.369	1.370	1.378	1.376	1.372	1.376	1.379	1.378	1.375	1.370	1.381
N° 6 (Bias1)	1.404	1.405	1.416	1.414	1.409	1.413	1.416	1.415	1.411	1.406	1.419
N° 7 (Bias2)	1.356	1.357	1.363	1.363	1.359	1.362	1.366	1.364	1.362	1.358	1.370
N° 8 (Bias2)	1.363	1.364	1.374	1.371	1.367	1.365	1.373	1.373	1.369	1.365	1.376
N° 9 (Bias2)	1.358	1.359	1.367	1.365	1.361	1.364	1.368	1.366	1.362	1.359	1.370
N° 10 (Bias2)	1.434	1.431	1.439	1.435	1.432	1.434	1.440	1.438	1.434	1.429	1.431
N° 11 (Bias2)	1.359	1.360	1.369	1.366	1.362	1.366	1.369	1.368	1.362	1.361	1.371
N° 12 (OFF)	1.352	1.352	1.360	1.357	1.355	1.358	1.358	1.360	1.356	1.351	1.361
N° 13 (OFF)	1.379	1.383	1.394	1.389	1.381	1.389	1.394	1.392	1.387	1.382	1.398
N° 14 (OFF)	1.402	1.401	1.412	1.410	1.404	1.409	1.415	1.412	1.407	1.402	1.416
N° 15 (OFF)	1.384	1.384	1.395	1.392	1.386	1.383	1.389	1.395	1.389	1.385	1.399
N° 16 (OFF)	1.439	1.438	1.452	1.448	1.443	1.447	1.454	1.449	1.444	1.440	1.453

Delta [VF]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	1.168E-3	1.437E-2	1.145E-2	6.685E-3	1.002E-2	1.130E-2	1.204E-2	8.678E-3	1.650E-3	1.358E-2
N° 2 (Bias1)	---	2.186E-3	1.291E-2	6.295E-3	4.648E-3	8.710E-3	1.604E-2	1.201E-2	1.280E-2	-1.070E-4	1.530E-2
N° 3 (Bias1)	---	1.833E-3	9.706E-3	7.084E-3	2.558E-3	6.873E-3	1.005E-2	9.525E-3	7.709E-3	3.780E-4	1.211E-2
N° 4 (Bias1)	---	2.821E-3	1.063E-2	8.635E-3	3.605E-3	8.545E-3	9.769E-3	9.888E-3	6.775E-3	1.727E-3	1.507E-2
N° 5 (Bias1)	---	1.519E-3	9.617E-3	7.537E-3	3.480E-3	7.054E-3	1.033E-2	9.136E-3	6.202E-3	1.112E-3	1.231E-2
N° 6 (Bias1)	---	6.420E-4	1.124E-2	9.679E-3	4.117E-3	8.595E-3	1.146E-2	1.094E-2	6.849E-3	1.644E-3	1.439E-2
N° 7 (Bias2)	---	8.900E-4	7.083E-3	6.749E-3	2.854E-3	5.560E-3	9.703E-3	7.805E-3	5.501E-3	1.317E-3	1.332E-2
N° 8 (Bias2)	---	1.097E-3	1.085E-2	8.073E-3	3.881E-3	1.979E-3	1.046E-2	9.688E-3	5.944E-3	2.114E-3	1.311E-2
N° 9 (Bias2)	---	1.036E-3	8.792E-3	6.549E-3	3.242E-3	5.847E-3	9.599E-3	8.442E-3	4.133E-3	1.425E-3	1.156E-2
N° 10 (Bias2)	---	-3.056E-3	4.348E-3	4.970E-4	-2.746E-3	-1.100E-5	5.409E-3	3.621E-3	-2.400E-4	-5.179E-3	-3.061E-3
N° 11 (Bias2)	---	8.270E-4	1.008E-2	6.857E-3	3.077E-3	6.859E-3	1.070E-2	9.201E-3	3.670E-3	1.798E-3	1.205E-2
N° 12 (OFF)	---	3.560E-4	8.397E-3	5.726E-3	3.211E-3	6.322E-3	6.017E-3	8.206E-3	4.194E-3	-1.410E-4	9.050E-3
N° 13 (OFF)	---	4.383E-3	1.509E-2	1.050E-2	2.468E-3	1.044E-2	1.547E-2	1.310E-2	7.683E-3	2.603E-3	1.870E-2
N° 14 (OFF)	---	-4.390E-4	1.020E-2	8.281E-3	2.655E-3	7.722E-3	1.306E-2	1.026E-2	4.799E-3	3.870E-4	1.436E-2
N° 15 (OFF)	---	-3.530E-4	1.033E-2	7.841E-3	1.530E-3	-1.360E-3	4.232E-3	1.012E-2	4.544E-3	1.970E-4	1.495E-2
N° 16 (OFF)	---	-6.480E-4	1.360E-2	9.420E-3	4.146E-3	8.262E-3	1.479E-2	1.073E-2	5.175E-3	1.263E-3	1.431E-2
Average (OFF)	---	1.800E-3	1.082E-2	7.846E-3	3.682E-3	7.955E-3	1.153E-2	1.030E-2	8.067E-3	9.508E-4	1.384E-2
σ (OFF)	---	8.082E-4	1.347E-3	1.329E-3	7.798E-4	9.097E-4	2.602E-3	1.169E-3	2.700E-3	7.994E-4	1.523E-3
Average+3σ (OFF)	---	4.225E-3	1.486E-2	1.183E-2	6.021E-3	1.068E-2	1.934E-2	1.381E-2	1.617E-2	3.349E-3	1.841E-2
Average-3σ (OFF)	---	-6.243E-4	6.782E-3	3.859E-3	1.342E-3	5.226E-3	3.722E-3	6.794E-3	-3.195E-5	-1.447E-3	9.266E-3
Average (Bias1)	---	1.588E-4	8.231E-3	5.745E-3	2.062E-3	4.047E-3	9.175E-3	7.751E-3	3.802E-3	2.950E-4	9.395E-3
σ (Bias1)	---	1.800E-3	2.597E-3	2.994E-3	2.715E-3	2.923E-3	2.158E-3	2.418E-3	2.446E-3	3.076E-3	7.001E-3
Average+3σ (Bias1)	---	5.560E-3	1.602E-2	1.473E-2	1.021E-2	1.282E-2	1.565E-2	1.501E-2	1.114E-2	9.524E-3	3.040E-2
Average-3σ (Bias1)	---	-5.242E-3	4.387E-4	-3.236E-3	-6.082E-3	-4.723E-3	2.701E-3	4.966E-4	-3.538E-3	-8.934E-3	-1.161E-2
Average (Bias2)	---	6.598E-4	1.152E-2	8.354E-3	2.802E-3	6.277E-3	1.071E-2	1.048E-2	5.279E-3	8.618E-4	1.427E-2
σ (Bias2)	---	2.115E-3	2.737E-3	1.797E-3	9.650E-4	4.518E-3	5.215E-3	1.753E-3	1.391E-3	1.103E-3	3.439E-3
Average+3σ (Bias2)	---	7.006E-3	1.973E-2	1.375E-2	5.697E-3	1.983E-2	2.636E-2	1.574E-2	9.452E-3	4.171E-3	2.459E-2
Average-3σ (Bias2)	---	-5.686E-3	3.312E-3	2.962E-3	-9.295E-5	-7.278E-3	-4.932E-3	5.223E-3	1.106E-3	-2.447E-3	3.957E-3

7. I_r

$T_a = 25^\circ\text{C}$; $V_r = 2\text{ V}$



Ir . (μA)

Max = 100.0

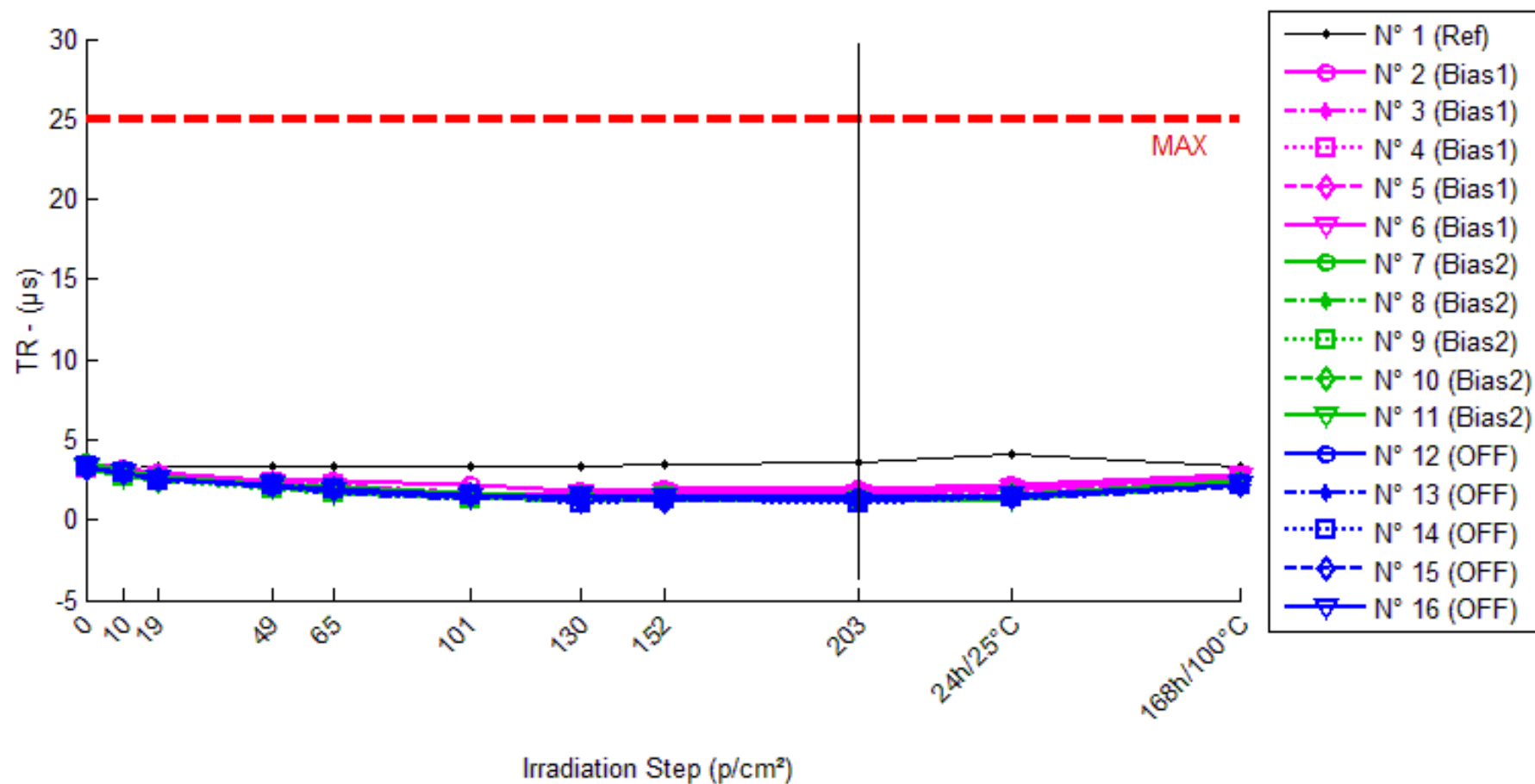
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	8.154E-4	5.890E-5	6.297E-5	1.400E-4	7.979E-5	3.166E-4	1.105E-4	5.510E-5	4.211E-5	4.338E-5	7.904E-5
N° 2 (Bias1)	6.179E-4	5.704E-5	6.255E-5	1.307E-4	7.146E-5	3.919E-4	9.777E-5	5.332E-5	4.220E-5	4.655E-5	7.823E-5
N° 3 (Bias1)	5.357E-4	4.074E-4	5.950E-5	1.465E-4	7.463E-5	3.091E-4	9.498E-5	5.070E-5	4.317E-5	3.966E-5	6.939E-5
N° 4 (Bias1)	4.566E-4	3.891E-4	6.107E-5	1.021E-4	5.831E-5	2.973E-4	8.352E-5	5.294E-5	4.190E-5	4.317E-5	7.079E-5
N° 5 (Bias1)	6.952E-4	5.597E-4	6.297E-5	1.350E-4	7.209E-5	2.805E-4	8.834E-5	5.298E-5	4.452E-5	4.258E-5	7.781E-5
N° 6 (Bias1)	6.749E-4	4.602E-4	6.335E-5	9.451E-5	6.393E-5	2.820E-4	8.475E-5	5.320E-5	4.313E-5	4.456E-5	7.409E-5
N° 7 (Bias1)	6.651E-4	7.364E-4	6.707E-5	1.142E-4	4.135E-5	2.808E-4	9.181E-5	5.091E-5	4.300E-5	4.439E-5	6.741E-5
N° 8 (Bias2)	6.663E-4	4.693E-4	6.411E-5	6.842E-5	6.782E-5	2.209E-4	8.225E-5	5.184E-5	4.199E-5	4.266E-5	7.832E-5
N° 9 (Bias2)	6.513E-4	3.177E-4	6.449E-5	9.426E-5	7.670E-5	2.667E-4	8.272E-5	5.345E-5	4.165E-5	4.076E-5	8.335E-5
N° 10 (Bias2)	6.474E-4	8.643E-5	8.263E-5	1.139E-4	7.366E-5	2.115E-4	8.652E-5	5.218E-5	4.427E-5	4.029E-5	8.077E-5
N° 11 (Bias2)	4.851E-4	4.969E-4	6.720E-5	1.514E-4	7.797E-5	2.522E-4	9.557E-5	5.692E-5	4.161E-5	5.298E-5	8.546E-5
N° 12 (OFF)	5.334E-4	1.465E-4	6.221E-5	1.160E-4	7.493E-5	2.035E-4	8.073E-5	5.290E-5	4.067E-5	4.126E-5	7.248E-5
N° 13 (OFF)	4.294E-4	2.240E-4	6.145E-5	4.609E-5	6.114E-5	2.363E-4	8.174E-5	5.146E-5	4.139E-5	4.313E-5	7.405E-5
N° 14 (OFF)	4.274E-4	2.416E-4	6.585E-5	8.440E-5	7.095E-5	2.291E-4	8.534E-5	5.734E-5	4.482E-5	4.325E-5	7.599E-5
N° 15 (OFF)	5.923E-4	1.737E-4	6.847E-5	1.131E-4	7.328E-5	1.956E-4	8.606E-5	5.878E-5	5.006E-5	5.344E-5	7.734E-5
N° 16 (OFF)	3.807E-3	3.400E-3	2.578E-3	2.997E-3	2.718E-3	2.161E-4	8.267E-5	5.117E-5	4.325E-5	4.448E-5	7.193E-5

Delta [Ir]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-7.565E-4	-7.524E-4	-6.754E-4	-7.356E-4	-4.988E-4	-7.049E-4	-7.603E-4	-7.733E-4	-7.720E-4	-7.364E-4
N° 2 (Bias1)	---	-5.609E-4	-5.554E-4	-4.872E-4	-5.464E-4	-2.260E-4	-5.201E-4	-5.646E-4	-5.757E-4	-5.714E-4	-5.397E-4
N° 3 (Bias1)	---	-1.283E-4	-4.762E-4	-3.892E-4	-4.611E-4	-2.266E-4	-4.407E-4	-4.850E-4	-4.925E-4	-4.960E-4	-4.663E-4
N° 4 (Bias1)	---	-6.753E-5	-3.955E-4	-3.545E-4	-3.983E-4	-1.593E-4	-3.731E-4	-4.037E-4	-4.147E-4	-4.134E-4	-3.858E-4
N° 5 (Bias1)	---	-1.355E-4	-6.323E-4	-5.602E-4	-6.231E-4	-4.147E-4	-6.069E-4	-6.422E-4	-6.507E-4	-6.526E-4	-6.174E-4
N° 6 (Bias1)	---	-2.147E-4	-6.116E-4	-5.804E-4	-6.110E-4	-3.929E-4	-5.902E-4	-6.217E-4	-6.318E-4	-6.303E-4	-6.008E-4
N° 7 (Bias2)	---	7.127E-5	-5.980E-4	-5.509E-4	-6.238E-4	-3.843E-4	-5.733E-4	-6.142E-4	-6.221E-4	-6.207E-4	-5.977E-4
N° 8 (Bias2)	---	-1.970E-4	-6.021E-4	-5.978E-4	-5.984E-4	-4.453E-4	-5.840E-4	-6.144E-4	-6.243E-4	-6.236E-4	-5.879E-4
N° 9 (Bias2)	---	-3.336E-4	-5.868E-4	-5.570E-4	-5.746E-4	-3.846E-4	-5.685E-4	-5.978E-4	-6.096E-4	-6.105E-4	-5.679E-4
N° 10 (Bias2)	---	-5.610E-4	-5.647E-4	-5.335E-4	-5.737E-4	-4.359E-4	-5.609E-4	-5.952E-4	-6.031E-4	-6.071E-4	-5.666E-4
N° 11 (Bias2)	---	1.176E-5	-4.179E-4	-3.337E-4	-4.071E-4	-2.329E-4	-3.895E-4	-4.282E-4	-4.435E-4	-4.321E-4	-3.996E-4
N° 12 (OFF)	---	-3.869E-4	-4.712E-4	-4.173E-4	-4.584E-4	-3.298E-4	-4.526E-4	-4.805E-4	-4.927E-4	-4.921E-4	-4.609E-4
N° 13 (OFF)	---	-2.054E-4	-3.680E-4	-3.833E-4	-3.683E-4	-1.931E-4	-3.477E-4	-3.779E-4	-3.880E-4	-3.863E-4	-3.554E-4
N° 14 (OFF)	---	-1.858E-4	-3.616E-4	-3.430E-4	-3.565E-4	-1.984E-4	-3.421E-4	-3.701E-4	-3.826E-4	-3.842E-4	-3.514E-4
N° 15 (OFF)	---	-4.186E-4	-5.239E-4	-4.792E-4	-5.190E-4	-3.967E-4	-5.063E-4	-5.335E-4	-5.423E-4	-5.389E-4	-5.150E-4
N° 16 (OFF)	---	-4.069E-4	-1.229E-3	-8.097E-4	-1.089E-3	-3.591E-3	-3.724E-3	-3.756E-3	-3.764E-3	-3.762E-3	-3.735E-3
Average (OFF)	---	-2.214E-4	-5.342E-4	-4.743E-4	-5.280E-4	-2.839E-4	-5.062E-4	-5.434E-4	-5.531E-4	-5.528E-4	-5.220E-4
σ (OFF)	---	1.969E-4	9.828E-5	1.005E-4	9.693E-5	1.131E-4	9.923E-5	9.911E-5	9.881E-5	9.871E-5	9.654E-5
Average+3σ (OFF)	---	3.692E-4	-2.393E-4	-1.729E-4	-2.372E-4	5.530E-5	-2.085E-4	-2.461E-4	-2.567E-4	-2.566E-4	-2.324E-4
Average-3σ (OFF)	---	-8.119E-4	-8.290E-4	-7.758E-4	-8.188E-4	-6.231E-4	-8.039E-4	-8.408E-4	-8.495E-4	-8.489E-4	-8.116E-4
Average (Bias1)	---	-2.017E-4	-5.539E-4	-5.146E-4	-5.555E-4	-3.766E-4	-5.352E-4	-5.700E-4	-5.805E-4	-5.788E-4	-5.440E-4
σ (Bias1)	---	2.581E-4	7.741E-5	1.038E-4	8.546E-5	8.515E-5	8.189E-5	7.976E-5	7.710E-5	8.228E-5	8.176E-5
Average+3σ (Bias1)	---	5.727E-4	-3.217E-4	-2.031E-4	-2.992E-4	-1.211E-4	-2.896E-4	-3.307E-4	-3.492E-4	-3.320E-4	-2.987E-4
Average-3σ (Bias1)	---	-9.761E-4	-7.861E-4	-8.261E-4	-8.119E-4	-6.320E-4	-7.809E-4	-8.092E-4	-8.118E-4	-8.257E-4	-7.892E-4
Average (Bias2)	---	-3.207E-4	-5.907E-4	-4.865E-4	-5.583E-4	-9.417E-4	-1.075E-3	-1.104E-3	-1.114E-3	-1.113E-3	-1.084E-3
σ (Bias2)	---	1.150E-4	3.633E-4	1.874E-4	3.043E-4	1.483E-3	1.483E-3	1.484E-3	1.483E-3	1.483E-3	1.484E-3
Average+3σ (Bias2)	---	2.425E-5	4.993E-4	7.573E-5	3.545E-4	3.508E-3	3.374E-3	3.349E-3	3.335E-3	3.335E-3	3.368E-3
Average-3σ (Bias2)	---	-6.657E-4	-1.681E-3	-1.049E-3	-1.471E-3	-5.392E-3	-5.523E-3	-5.556E-3	-5.562E-3	-5.561E-3	-5.535E-3

8. TR

Ta = 25°C; Vcc = 10 V; RL = 100 Ohms; IF = 10 mA



TR . (µs) Max = 25.0

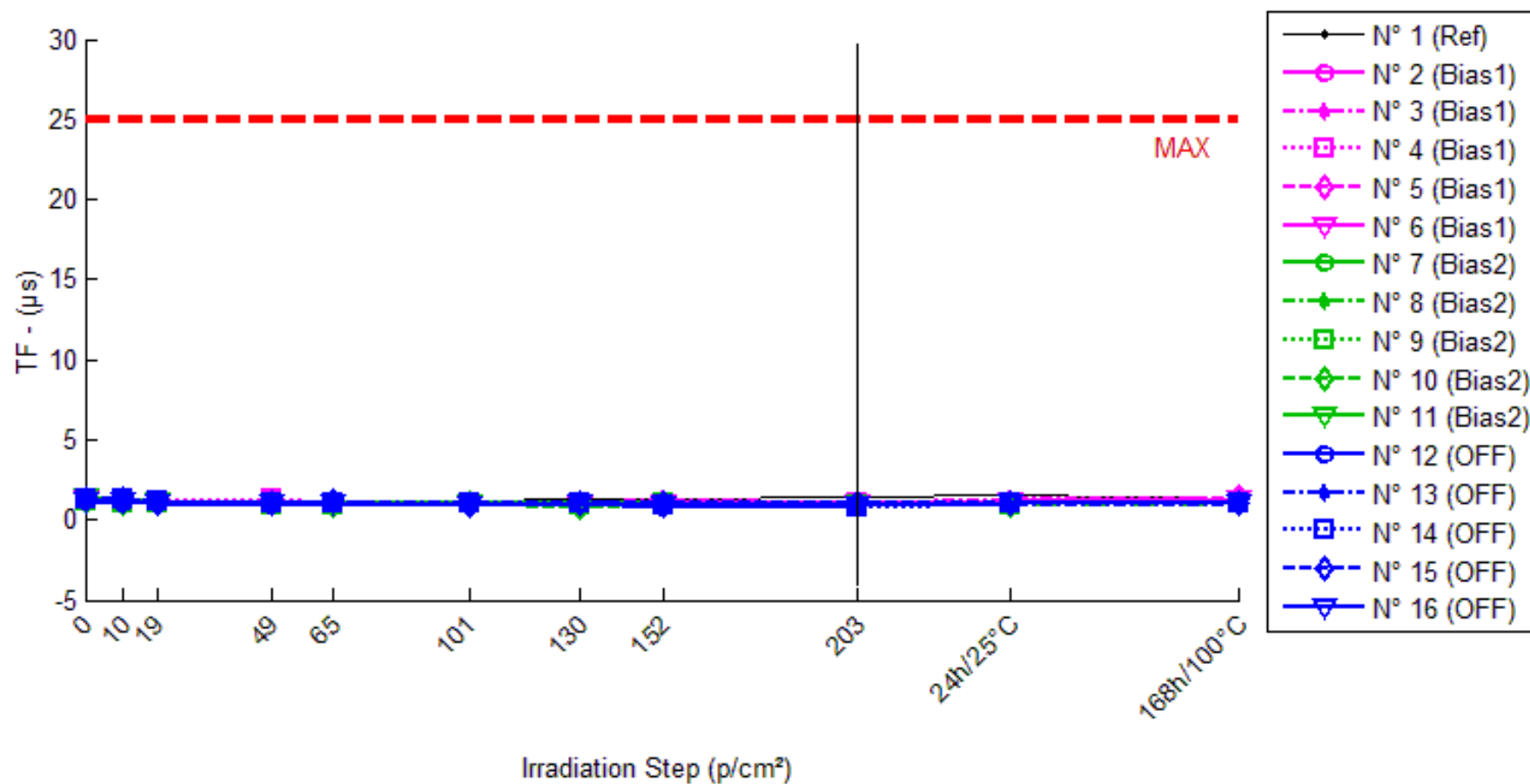
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	3.60	3.20	3.40	3.30	3.30	3.30	3.40	3.50	3.60	4.05	3.40
N° 2 (Bias1)	3.60	3.20	3.00	2.50	2.40	2.15	1.80	1.90	1.90	2.20	2.80
N° 3 (Bias1)	3.50	3.00	2.70	2.40	2.20	1.70	1.40	1.80	1.70	2.00	2.80
N° 4 (Bias1)	3.25	2.90	2.70	2.35	2.20	1.60	1.60	1.70	1.60	1.90	2.70
N° 5 (Bias1)	3.30	2.90	2.60	2.30	2.10	1.60	1.60	1.60	1.60	1.80	2.60
N° 6 (Bias1)	3.30	2.85	2.60	2.30	2.10	1.60	1.70	1.70	1.70	1.90	2.75
N° 7 (Bias2)	3.60	3.10	2.70	2.20	2.10	1.70	1.40	1.50	1.40	1.60	2.40
N° 8 (Bias2)	3.40	2.85	2.50	2.20	2.00	1.60	1.40	1.30	1.20	1.40	2.20
N° 9 (Bias2)	3.30	2.70	2.40	2.00	1.70	1.30	1.40	1.40	1.20	1.40	2.20
N° 10 (Bias2)	3.40	2.90	2.50	2.20	1.90	1.50	1.40	1.40	1.25	1.50	2.20
N° 11 (Bias2)	3.20	2.70	2.55	2.10	1.70	1.40	1.20	1.30	1.20	1.35	2.20
N° 12 (OFF)	3.30	2.90	2.55	2.10	2.00	1.50	1.40	1.40	1.40	1.40	2.20
N° 13 (OFF)	3.30	2.80	2.55	2.10	1.70	1.35	1.30	1.30	1.30	1.30	2.05
N° 14 (OFF)	3.30	2.90	2.50	2.20	2.00	1.55	1.10	1.35	1.10	1.40	2.20
N° 15 (OFF)	3.20	2.90	2.60	2.20	2.00	1.50	1.20	1.20	1.20	1.40	2.20
N° 16 (OFF)	3.35	2.90	2.60	2.25	1.80	1.40	1.55	1.40	1.20	1.50	2.20

Delta [TR]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-4.000E-1	-2.000E-1	-3.000E-1	-3.000E-1	-3.000E-1	-2.000E-1	-1.000E-1	0.000E+0	4.500E-1	-2.000E-1
N° 2 (Bias1)	---	-4.000E-1	-6.000E-1	-1.100E+0	-1.200E+0	-1.450E+0	-1.800E+0	-1.700E+0	-1.700E+0	-1.400E+0	-8.000E-1
N° 3 (Bias1)	---	-5.000E-1	-8.000E-1	-1.100E+0	-1.300E+0	-1.800E+0	-2.100E+0	-1.700E+0	-1.800E+0	-1.500E+0	-7.000E-1
N° 4 (Bias1)	---	-3.500E-1	-5.500E-1	-9.000E-1	-1.050E+0	-1.650E+0	-1.650E+0	-1.550E+0	-1.650E+0	-1.350E+0	-5.500E-1
N° 5 (Bias1)	---	-4.000E-1	-7.000E-1	-1.000E+0	-1.200E+0	-1.700E+0	-1.700E+0	-1.700E+0	-1.700E+0	-1.500E+0	-7.000E-1
N° 6 (Bias1)	---	-4.500E-1	-7.000E-1	-1.000E+0	-1.200E+0	-1.700E+0	-1.600E+0	-1.600E+0	-1.600E+0	-1.400E+0	-5.500E-1
N° 7 (Bias2)	---	-5.000E-1	-9.000E-1	-1.400E+0	-1.500E+0	-1.900E+0	-2.200E+0	-2.100E+0	-2.200E+0	-2.000E+0	-1.200E+0
N° 8 (Bias2)	---	-5.500E-1	-9.000E-1	-1.200E+0	-1.400E+0	-1.800E+0	-2.000E+0	-2.100E+0	-2.200E+0	-2.000E+0	-1.200E+0
N° 9 (Bias2)	---	-6.000E-1	-9.000E-1	-1.300E+0	-1.600E+0	-2.000E+0	-1.900E+0	-1.900E+0	-2.100E+0	-1.900E+0	-1.100E+0
N° 10 (Bias2)	---	-5.000E-1	-9.000E-1	-1.200E+0	-1.500E+0	-1.900E+0	-2.000E+0	-2.000E+0	-2.150E+0	-1.900E+0	-1.200E+0
N° 11 (Bias2)	---	-5.000E-1	-6.500E-1	-1.100E+0	-1.500E+0	-1.800E+0	-2.000E+0	-1.900E+0	-2.000E+0	-1.850E+0	-1.000E+0
N° 12 (OFF)	---	-4.000E-1	-7.500E-1	-1.200E+0	-1.300E+0	-1.800E+0	-1.900E+0	-1.900E+0	-1.900E+0	-1.900E+0	-1.100E+0
N° 13 (OFF)	---	-5.000E-1	-7.500E-1	-1.200E+0	-1.600E+0	-1.950E+0	-2.000E+0	-2.000E+0	-2.000E+0	-2.000E+0	-1.250E+0
N° 14 (OFF)	---	-4.000E-1	-8.000E-1	-1.100E+0	-1.300E+0	-1.750E+0	-2.200E+0	-1.950E+0	-2.200E+0	-1.900E+0	-1.100E+0
N° 15 (OFF)	---	-3.000E-1	-6.000E-1	-1.000E+0	-1.200E+0	-1.700E+0	-2.000E+0	-2.000E+0	-2.000E+0	-1.800E+0	-1.000E+0
N° 16 (OFF)	---	-4.500E-1	-7.500E-1	-1.100E+0	-1.550E+0	-1.950E+0	-1.800E+0	-1.950E+0	-2.150E+0	-1.850E+0	-1.150E+0
Average (OFF)	---	-4.200E-1	-6.700E-1	-1.020E+0	-1.190E+0	-1.660E+0	-1.770E+0	-1.650E+0	-1.690E+0	-1.430E+0	-6.600E-1
σ (OFF)	---	5.701E-2	9.747E-2	8.367E-2	8.944E-2	1.294E-1	1.987E-1	7.071E-2	7.416E-2	6.708E-2	1.084E-1
Average+3σ (OFF)	---	-2.490E-1	-3.776E-1	-7.690E-1	-9.217E-1	-1.272E+0	-1.174E+0	-1.438E+0	-1.468E+0	-1.229E+0	-3.348E-1
Average-3σ (OFF)	---	-5.910E-1	-9.624E-1	-1.271E+0	-1.458E+0	-2.048E+0	-2.366E+0	-1.862E+0	-1.912E+0	-1.631E+0	-9.852E-1
Average (Bias1)	---	-5.300E-1	-8.500E-1	-1.240E+0	-1.500E+0	-1.880E+0	-2.020E+0	-2.000E+0	-2.130E+0	-1.930E+0	-1.140E+0
σ (Bias1)	---	4.472E-2	1.118E-1	1.140E-1	7.071E-2	8.367E-2	1.095E-1	1.000E-1	8.367E-2	6.708E-2	8.944E-2
Average+3σ (Bias1)	---	-3.958E-1	-5.146E-1	-8.979E-1	-1.288E+0	-1.629E+0	-1.691E+0	-1.700E+0	-1.879E+0	-1.729E+0	-8.717E-1
Average-3σ (Bias1)	---	-6.642E-1	-1.185E+0	-1.582E+0	-1.712E+0	-2.131E+0	-2.349E+0	-2.300E+0	-2.381E+0	-2.131E+0	-1.408E+0
Average (Bias2)	---	-4.100E-1	-7.300E-1	-1.120E+0	-1.390E+0	-1.830E+0	-1.980E+0	-1.960E+0	-2.050E+0	-1.890E+0	-1.120E+0
σ (Bias2)	---	7.416E-2	7.583E-2	8.367E-2	1.746E-1	1.151E-1	1.483E-1	4.183E-2	1.225E-1	7.416E-2	9.083E-2
Average+3σ (Bias2)	---	-1.875E-1	-5.025E-1	-8.690E-1	-8.661E-1	-1.485E+0	-1.535E+0	-1.835E+0	-1.683E+0	-1.668E+0	-8.475E-1
Average-3σ (Bias2)	---	-6.325E-1	-9.575E-1	-1.371E+0	-1.914E+0	-2.175E+0	-2.425E+0	-2.085E+0	-2.417E+0	-2.112E+0	-1.392E+0

9. TF

Ta = 25°C; Vcc = 10 V; RL = 100 Ohms; IF = 10 mA



TF . (µs) Max = 25.0

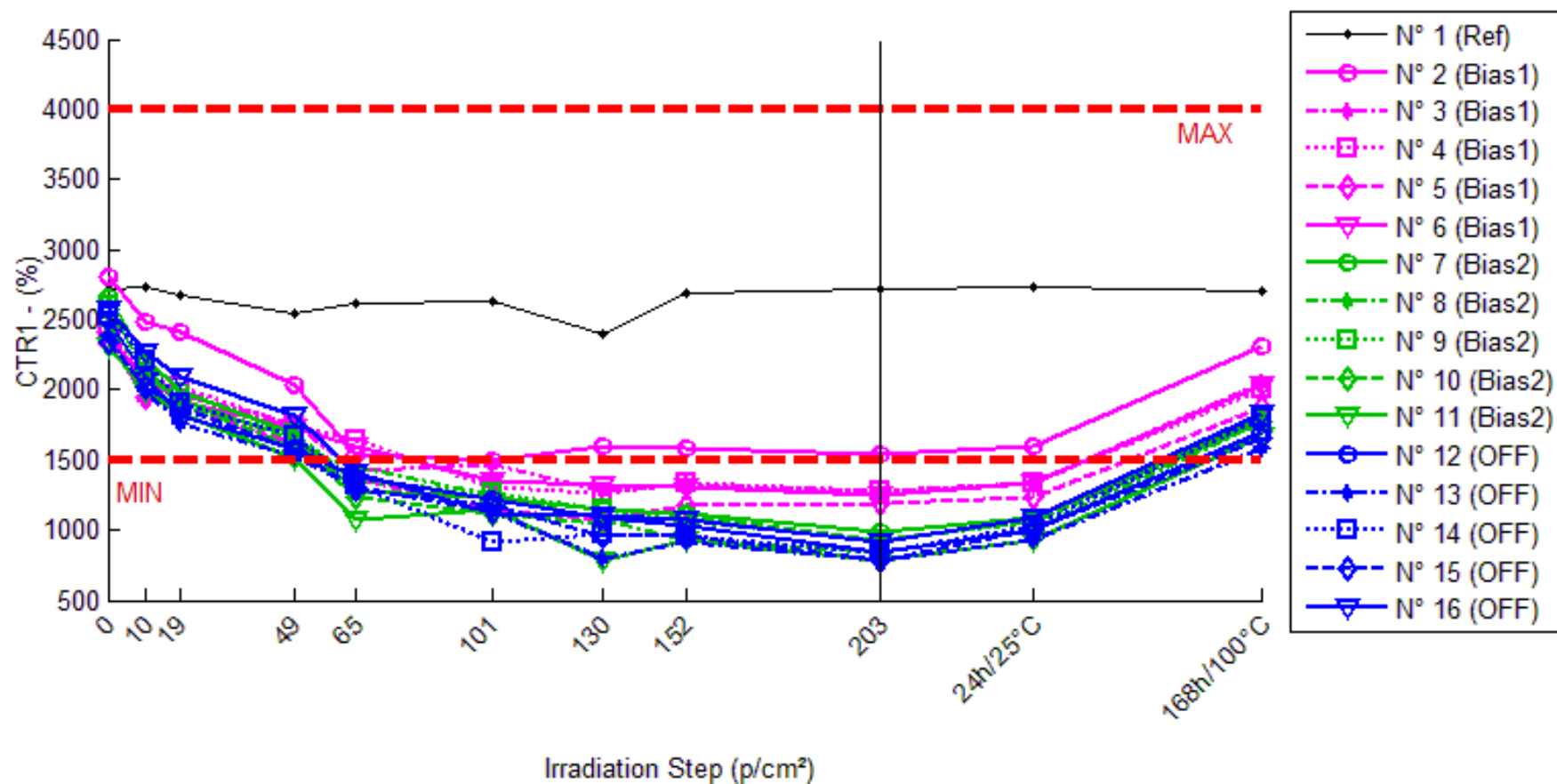
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.30	1.20	1.20	1.20	1.20	1.20	1.30	1.35	1.40	1.60	1.25
N° 2 (Bias1)	1.25	1.05	1.00	1.00	1.00	1.00	0.90	0.90	0.90	1.10	1.10
N° 3 (Bias1)	1.40	1.30	1.20	1.10	1.10	1.10	1.00	1.30	1.00	1.30	1.30
N° 4 (Bias1)	1.30	1.20	1.20	1.30	1.00	1.00	0.95	0.90	1.00	1.10	1.20
N° 5 (Bias1)	1.20	1.10	1.00	1.00	0.90	1.00	0.90	0.90	0.90	1.00	1.40
N° 6 (Bias1)	1.30	1.20	1.10	1.10	1.10	1.00	0.90	1.00	1.00	1.20	1.30
N° 7 (Bias2)	1.15	1.10	1.00	1.00	0.90	1.00	1.20	1.10	0.90	1.00	1.00
N° 8 (Bias2)	1.40	1.30	1.20	1.10	1.10	1.10	0.90	0.90	0.90	1.00	1.20
N° 9 (Bias2)	1.20	1.10	1.00	0.95	0.90	1.00	0.90	1.10	0.90	0.90	1.00
N° 10 (Bias2)	1.20	1.10	1.00	1.00	0.90	1.00	0.85	1.00	1.00	0.90	1.00
N° 11 (Bias2)	1.40	1.20	1.20	1.00	1.00	1.00	1.00	0.90	0.90	1.00	1.10
N° 12 (OFF)	1.20	1.10	1.10	0.90	1.00	0.90	1.00	0.80	0.95	1.00	1.00
N° 13 (OFF)	1.20	1.10	1.00	0.90	1.00	1.00	1.20	0.90	0.90	0.90	1.00
N° 14 (OFF)	1.30	1.30	1.20	1.10	1.00	1.00	1.10	0.90	0.80	1.00	1.10
N° 15 (OFF)	1.25	1.30	1.10	1.00	1.20	0.90	1.00	1.10	1.10	1.00	1.00
N° 16 (OFF)	1.20	1.20	1.10	1.10	1.00	0.95	1.00	0.90	0.95	1.00	1.10

Delta [TF]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-1.000E-1	-1.000E-1	-1.000E-1	-1.000E-1	-1.000E-1	0.000E+0	5.000E-2	1.000E-1	3.000E-1	-5.000E-2
N° 2 (Bias1)	---	-2.000E-1	-2.500E-1	-2.500E-1	-2.500E-1	-2.500E-1	-3.500E-1	-3.500E-1	-3.500E-1	-1.500E-1	-1.500E-1
N° 3 (Bias1)	---	-1.000E-1	-2.000E-1	-3.000E-1	-3.000E-1	-3.000E-1	-4.000E-1	-1.000E-1	-4.000E-1	-1.000E-1	-1.000E-1
N° 4 (Bias1)	---	-1.000E-1	-1.000E-1	0.000E+0	-3.000E-1	-3.000E-1	-3.500E-1	-4.000E-1	-3.000E-1	-2.000E-1	-1.000E-1
N° 5 (Bias1)	---	-1.000E-1	-2.000E-1	-2.000E-1	-3.000E-1	-2.000E-1	-3.000E-1	-3.000E-1	-3.000E-1	-2.000E-1	2.000E-1
N° 6 (Bias1)	---	-1.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	-3.000E-1	-4.000E-1	-3.000E-1	-3.000E-1	-1.000E-1	0.000E+0
N° 7 (Bias2)	---	-5.000E-2	-1.500E-1	-1.500E-1	-2.500E-1	-1.500E-1	5.000E-2	-5.000E-2	-2.500E-1	-1.500E-1	-1.500E-1
N° 8 (Bias2)	---	-1.000E-1	-2.000E-1	-3.000E-1	-3.000E-1	-3.000E-1	-5.000E-1	-5.000E-1	-5.000E-1	-4.000E-1	-2.000E-1
N° 9 (Bias2)	---	-1.000E-1	-2.000E-1	-2.500E-1	-3.000E-1	-2.000E-1	-3.000E-1	-1.000E-1	-3.000E-1	-3.000E-1	-2.000E-1
N° 10 (Bias2)	---	-1.000E-1	-2.000E-1	-2.000E-1	-3.000E-1	-2.000E-1	-3.500E-1	-2.000E-1	-2.000E-1	-3.000E-1	-2.000E-1
N° 11 (Bias2)	---	-2.000E-1	-2.000E-1	-4.000E-1	-4.000E-1	-4.000E-1	-4.000E-1	-5.000E-1	-5.000E-1	-4.000E-1	-3.000E-1
N° 12 (OFF)	---	-1.000E-1	-1.000E-1	-3.000E-1	-2.000E-1	-3.000E-1	-2.000E-1	-4.000E-1	-2.500E-1	-2.000E-1	-2.000E-1
N° 13 (OFF)	---	-1.000E-1	-2.000E-1	-3.000E-1	-2.000E-1	-2.000E-1	0.000E+0	-3.000E-1	-3.000E-1	-3.000E-1	-2.000E-1
N° 14 (OFF)	---	0.000E+0	-1.000E-1	-2.000E-1	-3.000E-1	-3.000E-1	-2.000E-1	-4.000E-1	-5.000E-1	-3.000E-1	-2.000E-1
N° 15 (OFF)	---	5.000E-2	-1.500E-1	-2.500E-1	-5.000E-2	-3.500E-1	-2.500E-1	-1.500E-1	-1.500E-1	-2.500E-1	-2.500E-1
N° 16 (OFF)	---	0.000E+0	-1.000E-1	-1.000E-1	-2.000E-1	-2.500E-1	-2.000E-1	-3.000E-1	-2.500E-1	-2.000E-1	-1.000E-1
Average (OFF)	---	-1.200E-1	-1.900E-1	-1.900E-1	-2.700E-1	-2.700E-1	-3.600E-1	-2.900E-1	-3.300E-1	-1.500E-1	-3.000E-2
σ (OFF)	---	4.472E-2	5.477E-2	1.140E-1	4.472E-2	4.472E-2	4.183E-2	1.140E-1	4.472E-2	5.000E-2	1.396E-1
Average+3σ (OFF)	---	1.416E-2	-2.568E-2	1.521E-1	-1.358E-1	-1.358E-1	-2.345E-1	5.205E-2	-1.958E-1	0.000E+0	3.889E-1
Average-3σ (OFF)	---	-2.542E-1	-3.543E-1	-5.321E-1	-4.042E-1	-4.042E-1	-4.855E-1	-6.321E-1	-4.642E-1	-3.000E-1	-4.489E-1
Average (Bias1)	---	-1.100E-1	-1.900E-1	-2.600E-1	-3.100E-1	-2.500E-1	-3.000E-1	-2.700E-1	-3.500E-1	-3.100E-1	-2.100E-1
σ (Bias1)	---	5.477E-2	2.236E-2	9.618E-2	5.477E-2	1.000E-1	2.092E-1	2.168E-1	1.414E-1	1.025E-1	5.477E-2
Average+3σ (Bias1)	---	5.432E-2	-1.229E-1	2.853E-2	-1.457E-1	5.000E-2	3.275E-1	3.804E-1	7.426E-2	-2.591E-3	-4.568E-2
Average-3σ (Bias1)	---	-2.743E-1	-2.571E-1	-5.485E-1	-4.743E-1	-5.500E-1	-9.275E-1	-9.204E-1	-7.743E-1	-6.174E-1	-3.743E-1
Average (Bias2)	---	-3.000E-2	-1.300E-1	-2.300E-1	-1.900E-1	-2.800E-1	-1.700E-1	-3.100E-1	-2.900E-1	-2.500E-1	-1.900E-1
σ (Bias2)	---	6.708E-2	4.472E-2	8.367E-2	8.944E-2	5.701E-2	9.747E-2	1.025E-1	1.294E-1	5.000E-2	5.477E-2
Average+3σ (Bias2)	---	1.712E-1	4.164E-3	2.100E-2	7.833E-2	-1.090E-1	1.224E-1	-2.591E-3	9.827E-2	-1.000E-1	-2.568E-2
Average-3σ (Bias2)	---	-2.312E-1	-2.642E-1	-4.810E-1	-4.583E-1	-4.510E-1	-4.624E-1	-6.174E-1	-6.783E-1	-4.000E-1	-3.543E-1

10.CTR1

Ta = 25°C; IF = 1 mA; Vce = 5 V



CTR1 . (%) Min = 1500.0 Max = 4000.0

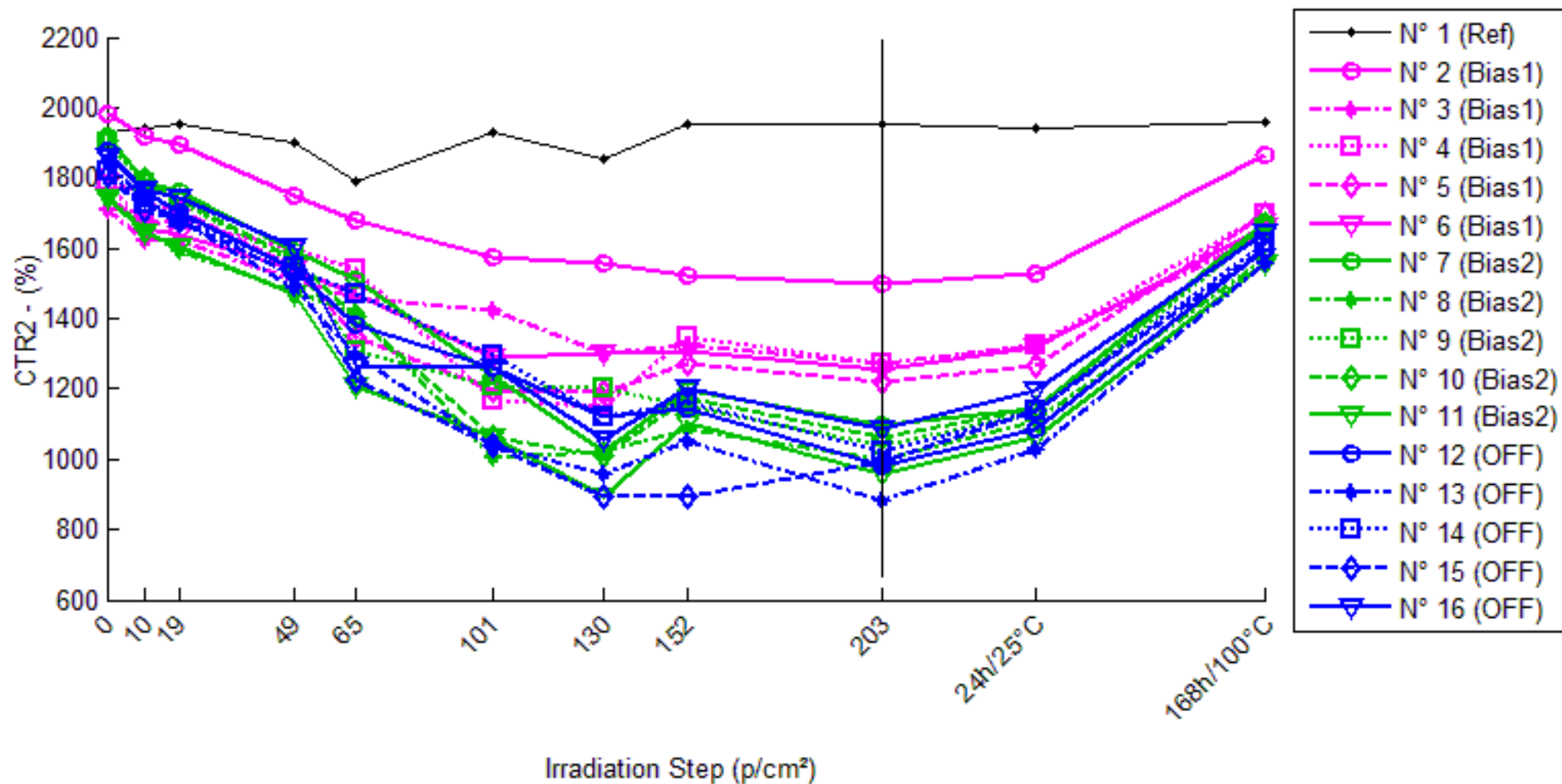
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	2723.30	2728.81	2680.85	2539.97	2612.19	2629.13	2605.11	2689.26	2722.42	2726.60	2707.82
N° 2 (Bias1)	2804.38	2490.49	2419.94	2039.19	1841.03	1689.48	1593.66	1579.64	1535.35	1593.54	2312.03
N° 3 (Bias1)	2378.95	1914.03	1961.39	1763.58	1618.04	1468.81	1383.31	1323.00	1274.60	1339.32	2043.39
N° 4 (Bias1)	2415.34	2086.61	2017.11	1743.33	1648.22	1413.82	1370.07	1333.57	1275.96	1334.31	2008.74
N° 5 (Bias1)	2321.16	1940.99	1895.27	1614.59	1370.93	1154.23	1067.90	1176.27	1186.48	1238.83	1873.34
N° 6 (Bias1)	2356.86	2093.36	1916.34	1729.32	1596.02	1354.54	1324.50	1305.56	1254.57	1331.76	2036.58
N° 7 (Bias2)	2665.07	2220.05	1993.92	1679.64	1280.14	1234.82	1145.83	1121.42	988.80	1083.79	1789.51
N° 8 (Bias2)	2453.64	2115.41	1912.61	1583.24	1449.62	1256.00	1072.77	932.14	844.54	1002.91	1775.85
N° 9 (Bias2)	2605.57	2160.01	1869.51	1680.89	1355.73	1270.48	1140.02	1053.46	923.08	1063.37	1796.72
N° 10 (Bias2)	2575.19	2134.92	1929.42	1647.34	1234.42	1116.77	1040.63	1103.92	927.51	1055.59	1766.09
N° 11 (Bias2)	2317.96	1986.84	1825.99	1507.93	1278.41	1143.16	978.70	926.10	780.45	931.35	1668.49
N° 12 (OFF)	2502.59	2088.84	1814.23	1587.18	1378.90	1226.86	1093.72	1033.67	845.10	1002.98	1697.14
N° 13 (OFF)	2381.26	1985.70	1754.55	1530.66	1308.56	1132.63	999.39	917.91	781.33	925.18	1588.71
N° 14 (OFF)	2529.73	2212.50	1904.83	1676.13	1320.64	1119.33	978.39	956.39	847.56	1032.07	1798.04
N° 15 (OFF)	2337.70	2018.46	1880.75	1576.03	1288.99	1169.93	953.30	957.31	785.57	1004.28	1658.66
N° 16 (OFF)	2571.38	2266.64	2095.28	1812.93	1412.54	1122.10	1098.58	1078.86	913.23	1088.93	1825.94

1/Delta [CTR1]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-7.412E-7	5.815E-6	2.650E-5	1.562E-5	1.315E-5	1.666E-5	4.648E-6	1.190E-7	-4.443E-7	2.099E-6
N° 2 (Bias1)	---	4.494E-5	5.665E-5	1.338E-4	1.866E-4	2.353E-4	2.709E-4	2.947E-4	2.765E-4	2.709E-4	7.594E-5
N° 3 (Bias1)	---	1.021E-4	8.949E-5	1.467E-4	1.977E-4	2.605E-4	3.025E-4	3.355E-4	3.642E-4	3.263E-4	6.903E-5
N° 4 (Bias1)	---	6.522E-5	8.174E-5	1.596E-4	1.927E-4	2.933E-4	3.159E-4	3.358E-4	3.697E-4	3.354E-4	8.380E-5
N° 5 (Bias1)	---	8.438E-5	9.681E-5	1.885E-4	2.986E-4	4.356E-4	5.056E-4	4.193E-4	4.120E-4	3.764E-4	1.030E-4
N° 6 (Bias1)	---	5.341E-5	9.754E-5	1.540E-4	2.023E-4	3.140E-4	3.307E-4	3.417E-4	3.728E-4	3.266E-4	6.673E-5
N° 7 (Bias2)	---	7.522E-5	1.263E-4	2.201E-4	4.059E-4	4.346E-4	4.975E-4	5.165E-4	6.361E-4	5.475E-4	1.836E-4
N° 8 (Bias2)	---	6.516E-5	1.153E-4	2.241E-4	2.823E-4	3.886E-4	5.246E-4	6.652E-4	7.765E-4	5.895E-4	1.556E-4
N° 9 (Bias2)	---	7.917E-5	1.511E-4	2.111E-4	3.538E-4	4.033E-4	4.934E-4	5.655E-4	6.995E-4	5.566E-4	1.728E-4
N° 10 (Bias2)	---	8.008E-5	1.300E-4	2.187E-4	4.218E-4	5.071E-4	5.726E-4	5.175E-4	6.898E-4	5.590E-4	1.779E-4
N° 11 (Bias2)	---	7.190E-5	1.162E-4	2.317E-4	3.508E-4	4.434E-4	5.903E-4	6.484E-4	8.499E-4	6.423E-4	1.679E-4
N° 12 (OFF)	---	7.915E-5	1.516E-4	2.305E-4	3.256E-4	4.155E-4	5.147E-4	5.678E-4	7.837E-4	5.974E-4	1.896E-4
N° 13 (OFF)	---	8.365E-5	1.500E-4	2.334E-4	3.443E-4	4.630E-4	5.807E-4	6.695E-4	8.599E-4	6.609E-4	2.095E-4
N° 14 (OFF)	---	5.668E-5	1.297E-4	2.013E-4	3.619E-4	4.981E-4	6.268E-4	6.503E-4	7.846E-4	5.736E-4	1.609E-4
N° 15 (OFF)	---	6.766E-5	1.039E-4	2.067E-4	3.480E-4	4.270E-4	6.212E-4	6.168E-4	8.452E-4	5.680E-4	1.751E-4
N° 16 (OFF)	---	5.229E-5	8.837E-5	1.627E-4	3.191E-4	5.023E-4	5.214E-4	5.380E-4	7.061E-4	5.294E-4	1.588E-4
Average (OFF)	---	7.001E-5	8.444E-5	1.565E-4	2.156E-4	3.077E-4	3.451E-4	3.418E-4	3.627E-4	3.271E-4	7.970E-5
σ (OFF)	---	2.326E-5	1.681E-5	2.033E-5	4.679E-5	7.756E-5	9.238E-5	5.088E-5	4.244E-5	3.759E-5	1.462E-5
Average+3σ (OFF)	---	1.398E-4	1.349E-4	2.175E-4	3.559E-4	5.404E-4	6.223E-4	4.944E-4	4.900E-4	4.399E-4	1.236E-4
Average-3σ (OFF)	---	2.397E-7	3.403E-5	9.552E-5	7.520E-5	7.503E-5	6.798E-5	1.891E-4	2.354E-4	2.144E-4	3.583E-5
Average (Bias1)	---	7.430E-5	1.278E-4	2.212E-4	3.629E-4	4.354E-4	5.357E-4	5.826E-4	7.304E-4	5.790E-4	1.715E-4
σ (Bias1)	---	6.066E-6	1.449E-5	7.551E-6	5.488E-5	4.589E-5	4.394E-5	7.081E-5	8.351E-5	3.877E-5	1.067E-5
Average+3σ (Bias1)	---	9.250E-5	1.713E-4	2.438E-4	5.276E-4	5.731E-4	6.675E-4	7.950E-4	9.809E-4	6.953E-4	2.036E-4
Average-3σ (Bias1)	---	5.611E-5	8.429E-5	1.985E-4	1.983E-4	2.977E-4	4.039E-4	3.702E-4	4.798E-4	4.627E-4	1.395E-4
Average (Bias2)	---	6.788E-5	1.247E-4	2.069E-4	3.398E-4	4.612E-4	5.730E-4	6.085E-4	7.959E-4	5.859E-4	1.788E-4
σ (Bias2)	---	1.364E-5	2.802E-5	2.846E-5	1.738E-5	3.972E-5	5.324E-5	5.513E-5	6.097E-5	4.853E-5	2.119E-5
Average+3σ (Bias2)	---	1.088E-4	2.088E-4	2.923E-4	3.919E-4	5.803E-4	7.327E-4	7.739E-4	9.788E-4	7.315E-4	2.424E-4
Average-3σ (Bias2)	---	2.696E-5	4.066E-5	1.215E-4	2.876E-4	3.420E-4	4.132E-4	4.431E-4	6.130E-4	4.403E-4	1.152E-4

11.CTR2

Ta = 25°C; IF = 2 mA; Vce = 5 V



CTR2 . (%)

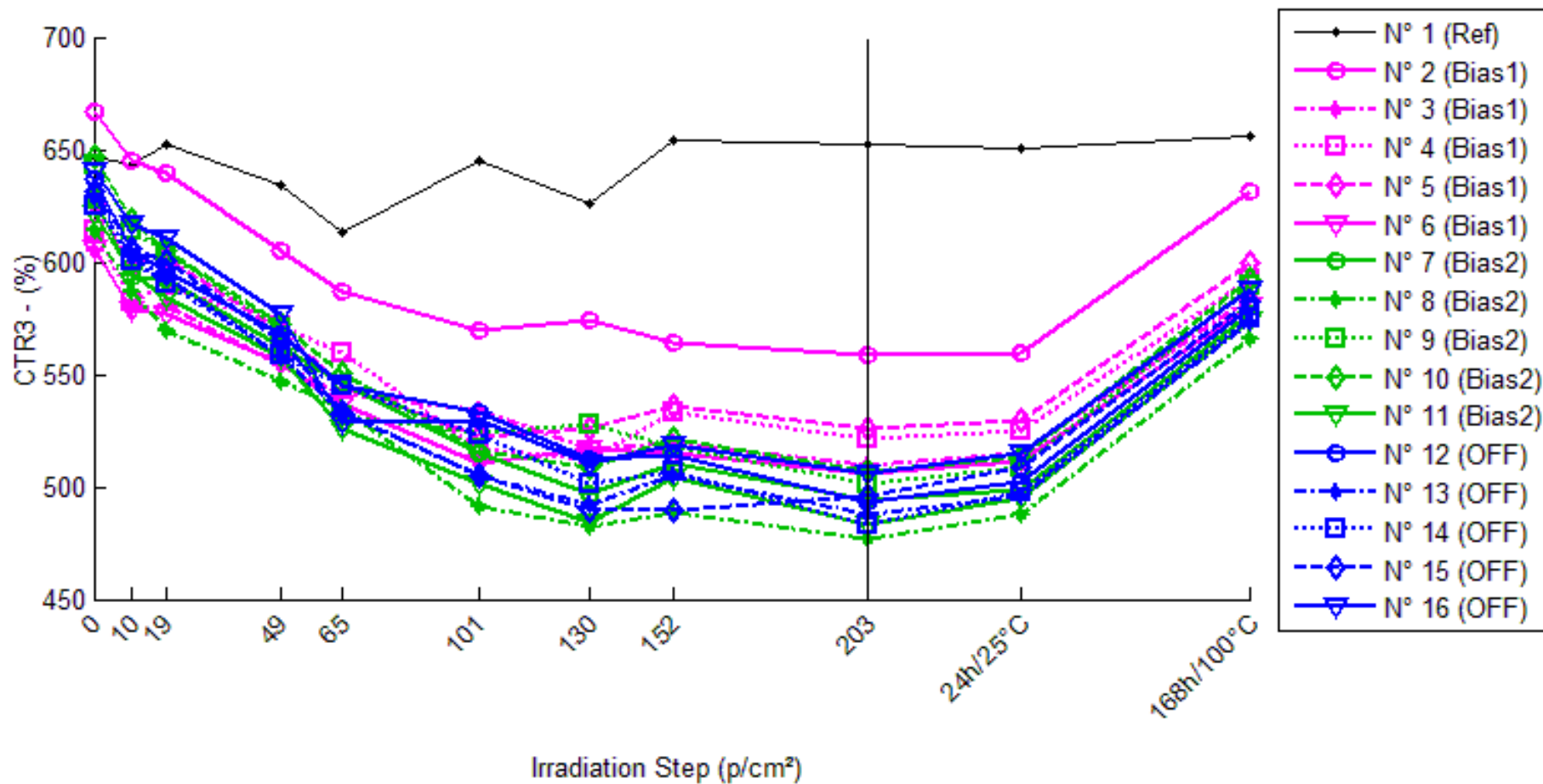
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1928.55	1941.99	1950.77	1899.13	1887.24	1930.96	1854.40	1954.75	1950.11	1938.80	1959.03
N° 2 (Bias1)	1979.01	1915.19	1896.56	1749.00	1677.94	1577.33	1557.28	1525.02	1501.30	1525.50	1862.77
N° 3 (Bias1)	1708.25	1623.54	1618.59	1513.02	1460.36	1421.96	1349.11	1323.83	1274.59	1321.83	1640.31
N° 4 (Bias1)	1779.83	1666.45	1679.15	1597.52	1537.69	1416.59	1401.29	1345.05	1273.57	1326.13	1696.62
N° 5 (Bias1)	1812.81	1724.42	1707.94	1543.61	1449.69	1348.93	1341.88	1273.99	1222.17	1268.85	1697.02
N° 6 (Bias1)	1746.78	1653.66	1637.63	1541.96	1469.70	1341.61	1302.08	1308.24	1257.23	1319.50	1664.11
N° 7 (Bias2)	1919.03	1790.39	1762.08	1589.81	1509.68	1384.44	1269.09	1195.32	1095.86	1142.87	1672.69
N° 8 (Bias2)	1748.29	1649.93	1592.42	1477.64	1419.42	1204.93	1120.41	1088.69	997.87	1107.27	1569.15
N° 9 (Bias2)	1898.07	1783.09	1729.60	1563.52	1408.41	1307.81	1202.79	1148.96	1038.93	1130.26	1658.27
N° 10 (Bias2)	1906.98	1796.99	1734.55	1570.25	1405.29	1261.09	1207.62	1170.72	1063.06	1145.11	1666.68
N° 11 (Bias2)	1743.85	1644.52	1602.74	1471.05	1459.70	1312.06	1145.68	1102.34	956.72	1064.92	1555.99
N° 12 (OFF)	1878.72	1758.26	1702.36	1537.70	1382.23	1259.65	1168.93	1142.62	983.17	1082.98	1598.26
N° 13 (OFF)	1844.73	1738.78	1680.24	1486.79	1447.69	1187.67	1106.64	1053.31	884.52	1025.08	1554.59
N° 14 (OFF)	1820.46	1726.26	1686.28	1546.00	1468.35	1296.98	1218.80	1159.09	1020.85	1140.64	1617.27
N° 15 (OFF)	1805.28	1708.54	1681.11	1523.73	1425.96	1236.75	1092.08	1094.24	993.54	1135.97	1595.47
N° 16 (OFF)	1856.94	1768.38	1743.02	1605.49	1465.96	1360.20	1255.80	1200.21	1083.14	1198.34	1642.97

1/Delta [CTR2]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-3.588E-6	-5.907E-6	8.033E-6	1.135E-5	-6.472E-7	2.073E-5	-6.949E-6	-5.731E-6	-2.740E-6	-8.067E-6
N° 2 (Bias1)	---	1.684E-5	2.197E-5	6.645E-5	9.066E-5	1.287E-4	1.368E-4	1.504E-4	1.608E-4	1.502E-4	3.153E-5
N° 3 (Bias1)	---	3.054E-5	3.243E-5	7.553E-5	9.937E-5	1.179E-4	1.558E-4	1.700E-4	1.992E-4	1.711E-4	2.425E-5
N° 4 (Bias1)	---	3.822E-5	3.369E-5	6.412E-5	8.847E-5	1.441E-4	1.518E-4	1.816E-4	2.233E-4	1.922E-4	2.755E-5
N° 5 (Bias1)	---	2.828E-5	3.387E-5	9.620E-5	1.382E-4	1.897E-4	1.936E-4	2.333E-4	2.666E-4	2.365E-4	3.764E-5
N° 6 (Bias1)	---	3.224E-5	3.815E-5	7.604E-5	1.079E-4	1.729E-4	1.955E-4	1.919E-4	2.229E-4	1.854E-4	2.844E-5
N° 7 (Bias2)	---	3.744E-5	4.641E-5	1.079E-4	1.413E-4	2.012E-4	2.669E-4	3.155E-4	3.914E-4	3.539E-4	7.674E-5
N° 8 (Bias2)	---	3.410E-5	5.599E-5	1.048E-4	1.325E-4	2.579E-4	3.205E-4	3.465E-4	4.302E-4	3.311E-4	6.530E-5
N° 9 (Bias2)	---	3.397E-5	5.132E-5	1.127E-4	1.832E-4	2.378E-4	3.046E-4	3.435E-4	4.357E-4	3.579E-4	7.619E-5
N° 10 (Bias2)	---	3.209E-5	5.213E-5	1.125E-4	1.872E-4	2.686E-4	3.037E-4	3.298E-4	4.163E-4	3.489E-4	7.560E-5
N° 11 (Bias2)	---	3.464E-5	5.049E-5	1.063E-4	1.116E-4	1.887E-4	2.994E-4	3.337E-4	4.718E-4	3.656E-4	6.924E-5
N° 12 (OFF)	---	3.647E-5	5.514E-5	1.180E-4	1.912E-4	2.616E-4	3.232E-4	3.429E-4	4.848E-4	3.911E-4	9.340E-5
N° 13 (OFF)	---	3.303E-5	5.307E-5	1.305E-4	1.487E-4	2.999E-4	3.615E-4	4.073E-4	5.885E-4	4.334E-4	1.012E-4
N° 14 (OFF)	---	2.998E-5	4.371E-5	9.752E-5	1.317E-4	2.217E-4	2.712E-4	3.134E-4	4.303E-4	3.274E-4	6.901E-5
N° 15 (OFF)	---	3.136E-5	4.092E-5	1.024E-4	1.474E-4	2.546E-4	3.618E-4	3.599E-4	4.526E-4	3.264E-4	7.285E-5
N° 16 (OFF)	---	2.697E-5	3.520E-5	8.434E-5	1.436E-4	1.967E-4	2.578E-4	2.947E-4	3.847E-4	2.960E-4	7.013E-5
Average (OFF)	---	2.922E-5	3.202E-5	7.567E-5	1.049E-4	1.506E-4	1.667E-4	1.854E-4	2.146E-4	1.871E-4	2.988E-5
σ (OFF)	---	7.844E-6	6.021E-6	1.265E-5	2.012E-5	3.009E-5	2.639E-5	3.087E-5	3.867E-5	3.195E-5	5.054E-6
Average+3σ (OFF)	---	5.275E-5	5.008E-5	1.136E-4	1.653E-4	2.409E-4	2.459E-4	2.781E-4	3.306E-4	2.829E-4	4.504E-5
Average-3σ (OFF)	---	5.691E-6	1.396E-5	3.772E-5	4.456E-5	6.038E-5	8.754E-5	9.284E-5	9.854E-5	9.124E-5	1.472E-5
Average (Bias1)	---	3.445E-5	5.127E-5	1.088E-4	1.512E-4	2.308E-4	2.990E-4	3.338E-4	4.291E-4	3.515E-4	7.261E-5
σ (Bias1)	---	1.928E-6	3.434E-6	3.599E-6	3.291E-5	3.485E-5	1.968E-5	1.232E-5	2.937E-5	1.291E-5	5.090E-6
Average+3σ (Bias1)	---	4.023E-5	6.157E-5	1.196E-4	2.499E-4	3.354E-4	3.581E-4	3.708E-4	5.172E-4	3.902E-4	8.788E-5
Average-3σ (Bias1)	---	2.867E-5	4.096E-5	9.804E-5	5.245E-5	1.263E-4	2.400E-4	2.968E-4	3.410E-4	3.127E-4	5.735E-5
Average (Bias2)	---	3.156E-5	4.561E-5	1.066E-4	1.525E-4	2.469E-4	3.151E-4	3.436E-4	4.682E-4	3.549E-4	8.131E-5
σ (Bias2)	---	3.530E-6	8.374E-6	1.801E-5	2.263E-5	3.950E-5	4.903E-5	4.368E-5	7.647E-5	5.595E-5	1.490E-5
Average+3σ (Bias2)	---	4.215E-5	7.073E-5	1.606E-4	2.204E-4	3.654E-4	4.622E-4	4.747E-4	6.976E-4	5.227E-4	1.260E-4
Average-3σ (Bias2)	---	2.097E-5	2.048E-5	5.251E-5	8.462E-5	1.284E-4	1.680E-4	2.126E-4	2.387E-4	1.870E-4	3.660E-5

12.CTR3

Ta = 25°C; IF = 10 mA; Vce = 5 V



CTR3 . (%)

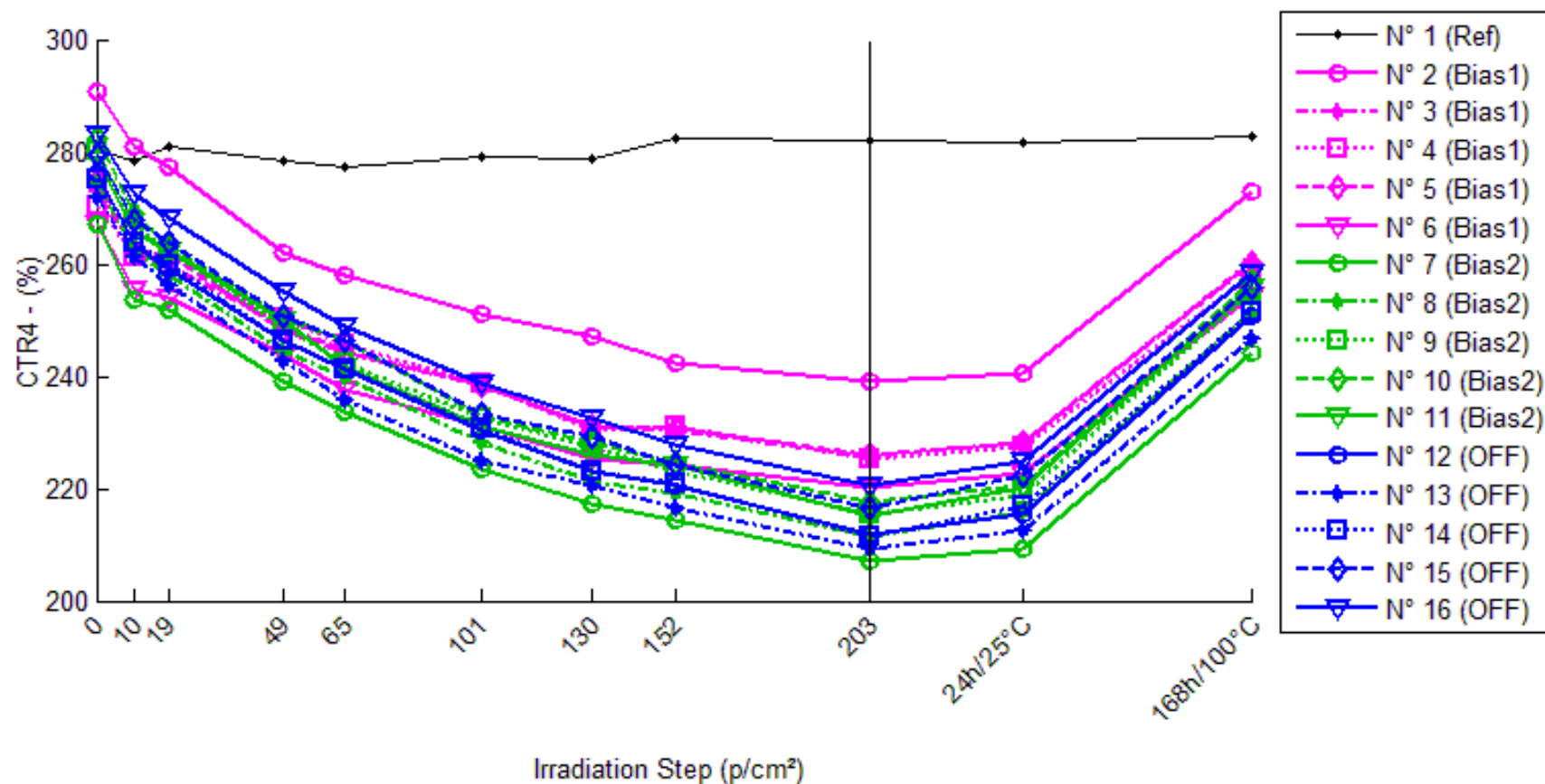
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	646.42	643.59	652.11	634.41	653.09	644.61	645.74	654.39	652.50	650.53	655.47
N° 2 (Bias1)	666.48	645.25	639.82	604.78	586.70	569.33	564.28	563.95	558.95	559.45	631.62
N° 3 (Bias1)	604.88	579.78	580.66	554.12	540.91	534.43	526.62	519.92	509.98	514.55	583.99
N° 4 (Bias1)	614.29	582.35	589.22	571.71	559.64	537.13	531.95	533.29	521.08	525.34	592.47
N° 5 (Bias1)	625.94	599.08	601.58	569.37	545.26	521.99	525.65	535.64	525.82	529.52	599.29
N° 6 (Bias1)	605.63	578.96	577.20	554.64	536.82	520.88	516.92	514.91	505.99	511.79	580.25
N° 7 (Bias2)	628.33	592.73	592.06	562.12	546.03	515.06	506.77	510.47	493.93	498.57	576.77
N° 8 (Bias2)	614.19	587.18	569.80	547.06	535.14	490.94	481.89	488.69	476.44	487.51	566.01
N° 9 (Bias2)	643.21	613.76	604.03	570.64	531.40	523.98	527.61	517.83	501.19	508.80	589.38
N° 10 (Bias2)	646.79	618.36	604.89	572.33	550.30	515.54	508.67	521.14	506.84	513.09	592.55
N° 11 (Bias2)	621.38	595.21	584.06	557.99	555.49	531.20	514.09	504.47	483.34	495.11	573.78
N° 12 (OFF)	636.39	605.34	596.04	567.92	544.79	533.30	512.65	513.85	493.53	502.54	579.45
N° 13 (OFF)	628.45	602.49	592.83	558.04	533.31	524.60	512.17	504.80	487.93	495.97	573.22
N° 14 (OFF)	625.42	600.22	590.64	558.70	544.88	523.19	511.06	506.59	483.17	498.00	574.87
N° 15 (OFF)	631.65	606.17	600.75	564.69	533.30	505.13	499.43	499.58	495.86	508.85	581.83
N° 16 (OFF)	640.54	617.11	610.85	576.59	529.09	519.32	510.64	518.28	506.01	514.90	587.57

1/Delta [CTR3]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	6.792E-6	-1.351E-5	2.930E-5	-1.579E-5	4.355E-6	1.625E-6	-1.885E-5	-1.442E-5	-9.774E-6	-2.136E-5
N° 2 (Bias1)	---	4.936E-5	6.253E-5	1.531E-4	2.040E-4	2.560E-4	2.717E-4	2.728E-4	2.886E-4	2.870E-4	8.280E-5
N° 3 (Bias1)	---	7.157E-5	6.896E-5	1.514E-4	1.955E-4	2.179E-4	2.457E-4	2.702E-4	3.076E-4	2.902E-4	5.914E-5
N° 4 (Bias1)	---	8.930E-5	6.927E-5	1.212E-4	1.590E-4	2.338E-4	2.520E-4	2.473E-4	2.912E-4	2.756E-4	5.996E-5
N° 5 (Bias1)	---	7.163E-5	6.471E-5	1.587E-4	2.364E-4	3.182E-4	3.048E-4	2.693E-4	3.042E-4	2.909E-4	7.105E-5
N° 6 (Bias1)	---	7.606E-5	8.133E-5	1.518E-4	2.117E-4	2.687E-4	2.834E-4	2.909E-4	3.252E-4	3.028E-4	7.224E-5
N° 7 (Bias2)	---	9.559E-5	9.750E-5	1.875E-4	2.399E-4	3.500E-4	3.818E-4	3.674E-4	4.330E-4	4.142E-4	1.423E-4
N° 8 (Bias2)	---	7.488E-5	1.268E-4	1.998E-4	2.405E-4	4.087E-4	4.470E-4	4.181E-4	4.707E-4	4.231E-4	1.386E-4
N° 9 (Bias2)	---	7.458E-5	1.008E-4	1.977E-4	3.271E-4	3.538E-4	3.406E-4	3.764E-4	4.406E-4	4.107E-4	1.420E-4
N° 10 (Bias2)	---	7.108E-5	1.071E-4	2.012E-4	2.711E-4	3.936E-4	4.198E-4	3.728E-4	4.269E-4	4.029E-4	1.415E-4
N° 11 (Bias2)	---	7.075E-5	1.028E-4	1.828E-4	1.909E-4	2.732E-4	3.359E-4	3.729E-4	4.596E-4	4.104E-4	1.335E-4
N° 12 (OFF)	---	8.061E-5	1.064E-4	1.894E-4	2.642E-4	3.037E-4	3.793E-4	3.747E-4	4.549E-4	4.185E-4	1.544E-4
N° 13 (OFF)	---	6.854E-5	9.559E-5	2.007E-4	2.839E-4	3.150E-4	3.613E-4	3.897E-4	4.583E-4	4.250E-4	1.533E-4
N° 14 (OFF)	---	6.714E-5	9.417E-5	1.909E-4	2.364E-4	3.124E-4	3.578E-4	3.751E-4	4.707E-4	4.091E-4	1.406E-4
N° 15 (OFF)	---	6.655E-5	8.144E-5	1.877E-4	2.920E-4	3.966E-4	4.191E-4	4.185E-4	4.335E-4	3.821E-4	1.356E-4
N° 16 (OFF)	---	5.927E-5	7.588E-5	1.732E-4	3.289E-4	3.644E-4	3.972E-4	3.683E-4	4.151E-4	3.809E-4	1.407E-4
Average (OFF)	---	7.159E-5	6.936E-5	1.473E-4	2.013E-4	2.589E-4	2.715E-4	2.701E-4	3.034E-4	2.893E-4	6.904E-5
σ (OFF)	---	1.439E-5	7.275E-6	1.484E-5	2.816E-5	3.847E-5	2.396E-5	1.552E-5	1.465E-5	9.705E-6	9.802E-6
Average+3σ (OFF)	---	1.147E-4	9.118E-5	1.918E-4	2.858E-4	3.743E-4	3.434E-4	3.167E-4	3.473E-4	3.184E-4	9.844E-5
Average-3σ (OFF)	---	2.842E-5	4.753E-5	1.027E-4	1.168E-4	1.435E-4	1.996E-4	2.236E-4	2.594E-4	2.602E-4	3.963E-5
Average (Bias1)	---	7.738E-5	1.070E-4	1.938E-4	2.539E-4	3.559E-4	3.850E-4	3.815E-4	4.462E-4	4.123E-4	1.396E-4
σ (Bias1)	---	1.036E-5	1.161E-5	8.148E-6	5.001E-5	5.267E-5	4.860E-5	2.069E-5	1.843E-5	7.329E-6	3.709E-6
Average+3σ (Bias1)	---	1.084E-4	1.419E-4	2.182E-4	4.039E-4	5.139E-4	5.308E-4	4.436E-4	5.014E-4	4.342E-4	1.507E-4
Average-3σ (Bias1)	---	4.630E-5	7.219E-5	1.693E-4	1.039E-4	1.979E-4	2.392E-4	3.195E-4	3.909E-4	3.903E-4	1.284E-4
Average (Bias2)	---	6.842E-5	9.069E-5	1.884E-4	2.811E-4	3.384E-4	3.829E-4	3.853E-4	4.465E-4	4.031E-4	1.449E-4
σ (Bias2)	---	7.704E-6	1.211E-5	9.902E-6	3.426E-5	4.025E-5	2.563E-5	2.019E-5	2.208E-5	2.054E-5	8.422E-6
Average+3σ (Bias2)	---	9.153E-5	1.270E-4	2.181E-4	3.838E-4	4.592E-4	4.598E-4	4.458E-4	5.127E-4	4.648E-4	1.702E-4
Average-3σ (Bias2)	---	4.531E-5	5.435E-5	1.587E-4	1.783E-4	2.177E-4	3.061E-4	3.247E-4	3.803E-4	3.415E-4	1.197E-4

13.CTR4

Ta = 25°C; IF = 40 mA; Vce = 5 V



CTR4 . (%)

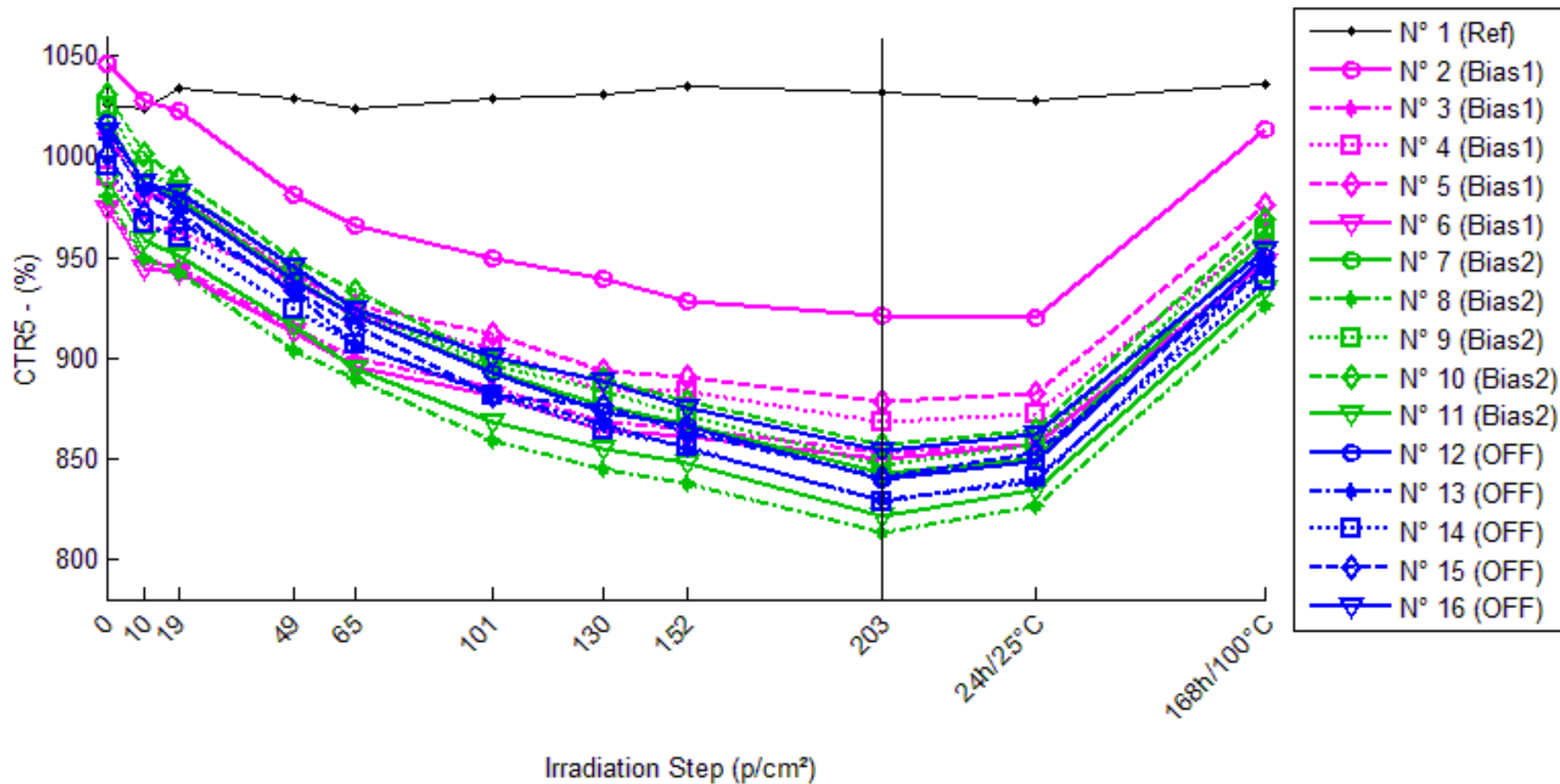
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	280.03	278.54	280.80	278.52	277.20	279.03	278.73	282.46	282.01	281.70	282.76
N° 2 (Bias1)	290.62	281.05	277.14	262.01	258.00	250.94	247.16	242.46	239.20	240.40	273.05
N° 3 (Bias1)	273.09	262.50	259.88	248.78	244.60	238.54	231.05	230.52	225.64	228.14	260.60
N° 4 (Bias1)	270.44	261.40	259.51	250.22	245.50	238.56	230.29	231.11	225.24	227.39	258.00
N° 5 (Bias1)	274.65	262.48	261.62	248.03	244.36	238.28	231.04	230.74	226.01	228.04	260.07
N° 6 (Bias1)	267.08	255.63	253.93	243.68	237.67	231.24	225.36	224.30	220.07	222.85	254.46
N° 7 (Bias2)	267.07	253.52	251.81	239.00	233.69	223.36	217.11	214.20	206.99	209.27	244.12
N° 8 (Bias2)	274.46	262.50	258.07	244.70	239.93	228.24	221.15	219.10	211.35	215.92	251.36
N° 9 (Bias2)	280.01	266.83	262.50	248.79	242.27	232.47	227.57	223.02	215.38	218.68	255.00
N° 10 (Bias2)	282.19	268.79	263.18	250.26	246.42	232.91	228.30	224.63	217.58	220.60	257.08
N° 11 (Bias2)	278.88	265.81	262.50	250.06	241.75	231.24	226.11	224.08	215.16	220.09	255.92
N° 12 (OFF)	276.22	263.30	259.18	246.33	241.29	230.41	223.12	220.72	211.66	215.61	250.87
N° 13 (OFF)	271.92	261.28	256.19	242.55	235.89	224.96	220.40	216.62	209.42	212.47	246.87
N° 14 (OFF)	275.05	263.73	259.71	246.22	241.21	230.88	223.23	220.90	211.47	216.82	251.55
N° 15 (OFF)	279.52	267.89	263.96	250.77	246.54	233.32	229.11	224.05	216.42	222.46	255.88
N° 16 (OFF)	283.21	272.53	268.25	254.94	248.78	238.88	232.53	227.94	220.68	224.84	258.21

1/Delta [CTR4]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	1.910E-5	-9.869E-6	1.932E-5	3.640E-5	1.268E-5	1.656E-5	-3.076E-5	-2.515E-5	-2.122E-5	-3.455E-5
N° 2 (Bias1)	---	1.172E-4	1.673E-4	3.757E-4	4.350E-4	5.441E-4	6.050E-4	6.834E-4	7.396E-4	7.189E-4	2.214E-4
N° 3 (Bias1)	---	1.477E-4	1.861E-4	3.578E-4	4.264E-4	5.304E-4	6.662E-4	6.762E-4	7.700E-4	7.215E-4	1.755E-4
N° 4 (Bias1)	---	1.279E-4	1.557E-4	2.988E-4	3.756E-4	4.941E-4	6.447E-4	6.292E-4	7.421E-4	7.000E-4	1.782E-4
N° 5 (Bias1)	---	1.688E-4	1.814E-4	3.908E-4	4.513E-4	5.557E-4	6.873E-4	6.929E-4	7.836E-4	7.441E-4	2.041E-4
N° 6 (Bias1)	---	1.677E-4	1.939E-4	3.597E-4	4.634E-4	5.805E-4	6.931E-4	7.142E-4	7.999E-4	7.431E-4	1.858E-4
N° 7 (Bias2)	---	2.001E-4	2.270E-4	4.398E-4	5.349E-4	7.327E-4	8.617E-4	9.243E-4	1.087E-3	1.034E-3	3.521E-4
N° 8 (Bias2)	---	1.659E-4	2.314E-4	4.431E-4	5.243E-4	7.377E-4	8.783E-4	9.205E-4	1.088E-3	9.878E-4	3.348E-4
N° 9 (Bias2)	---	1.763E-4	2.382E-4	4.480E-4	5.563E-4	7.302E-4	8.228E-4	9.126E-4	1.072E-3	1.002E-3	3.503E-4
N° 10 (Bias2)	---	1.766E-4	2.558E-4	4.520E-4	5.144E-4	7.498E-4	8.364E-4	9.080E-4	1.052E-3	9.892E-4	3.461E-4
N° 11 (Bias2)	---	1.763E-4	2.238E-4	4.134E-4	5.508E-4	7.388E-4	8.369E-4	8.770E-4	1.062E-3	9.579E-4	3.218E-4
N° 12 (OFF)	---	1.777E-4	2.381E-4	4.394E-4	5.241E-4	7.198E-4	8.617E-4	9.104E-4	1.104E-3	1.018E-3	3.659E-4
N° 13 (OFF)	---	1.498E-4	2.258E-4	4.454E-4	5.617E-4	7.678E-4	8.597E-4	9.388E-4	1.097E-3	1.029E-3	3.732E-4
N° 14 (OFF)	---	1.561E-4	2.147E-4	4.257E-4	5.100E-4	6.954E-4	8.439E-4	8.912E-4	1.093E-3	9.764E-4	3.396E-4
N° 15 (OFF)	---	1.554E-4	2.109E-4	4.102E-4	4.786E-4	7.085E-4	7.872E-4	8.858E-4	1.043E-3	9.177E-4	3.305E-4
N° 16 (OFF)	---	1.384E-4	1.970E-4	3.916E-4	4.887E-4	6.552E-4	7.696E-4	8.561E-4	1.001E-3	9.166E-4	3.418E-4
Average (OFF)	---	1.458E-4	1.769E-4	3.566E-4	4.303E-4	5.410E-4	6.593E-4	6.792E-4	7.670E-4	7.255E-4	1.930E-4
σ (OFF)	---	2.321E-5	1.530E-5	3.494E-5	3.375E-5	3.199E-5	3.584E-5	3.138E-5	2.615E-5	1.850E-5	1.942E-5
Average+3σ (OFF)	---	2.155E-4	2.228E-4	4.614E-4	5.316E-4	6.369E-4	7.668E-4	7.733E-4	8.455E-4	7.810E-4	2.513E-4
Average-3σ (OFF)	---	7.623E-5	1.310E-4	2.518E-4	3.291E-4	4.450E-4	5.517E-4	5.851E-4	6.886E-4	6.700E-4	1.347E-4
Average (Bias1)	---	1.791E-4	2.352E-4	4.393E-4	5.362E-4	7.378E-4	8.472E-4	9.085E-4	1.072E-3	9.941E-4	3.410E-4
σ (Bias1)	---	1.262E-5	1.271E-5	1.521E-5	1.758E-5	7.554E-6	2.233E-5	1.872E-5	1.556E-5	2.756E-5	1.268E-5
Average+3σ (Bias1)	---	2.169E-4	2.734E-4	4.849E-4	5.889E-4	7.605E-4	9.142E-4	9.647E-4	1.119E-3	1.077E-3	3.790E-4
Average-3σ (Bias1)	---	1.412E-4	1.971E-4	3.937E-4	4.834E-4	7.152E-4	7.802E-4	8.523E-4	1.025E-3	9.114E-4	3.029E-4
Average (Bias2)	---	1.555E-4	2.173E-4	4.225E-4	5.126E-4	7.094E-4	8.244E-4	8.964E-4	1.068E-3	9.715E-4	3.502E-4
σ (Bias2)	---	1.430E-5	1.553E-5	2.193E-5	3.269E-5	4.076E-5	4.301E-5	3.064E-5	4.467E-5	5.338E-5	1.833E-5
Average+3σ (Bias2)	---	1.984E-4	2.639E-4	4.882E-4	6.107E-4	8.316E-4	9.535E-4	9.884E-4	1.202E-3	1.132E-3	4.052E-4
Average-3σ (Bias2)	---	1.126E-4	1.707E-4	3.567E-4	4.145E-4	5.871E-4	6.954E-4	8.045E-4	9.337E-4	8.114E-4	2.952E-4

14.CTR5

Ta = 25°C; IF = 10 mA; Vce = 32 V



CTR5 . (%)

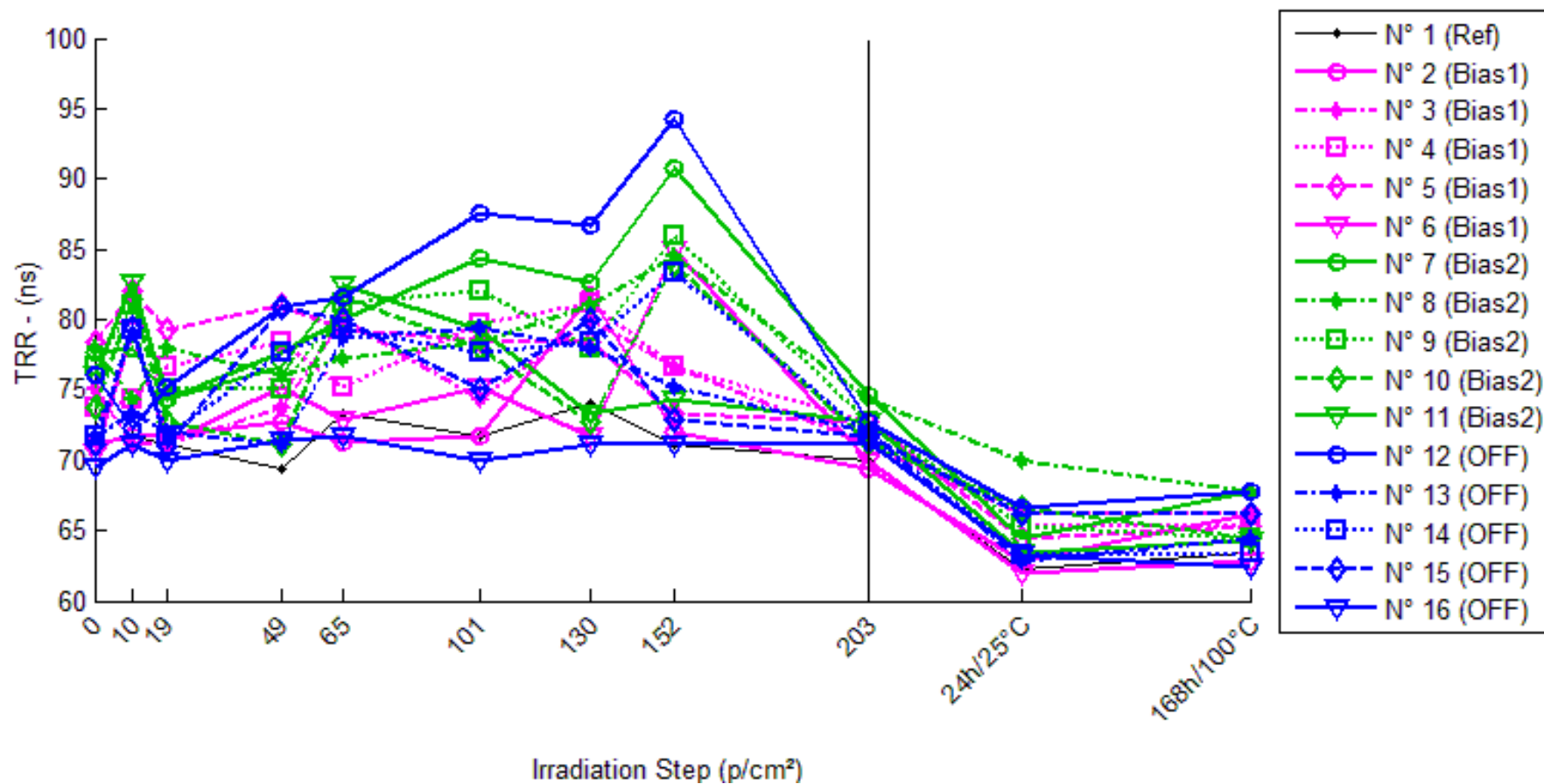
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1025.71	1023.69	1034.52	1029.22	1023.64	1028.53	1030.54	1035.05	1032.40	1028.33	1036.34
N° 2 (Bias1)	1046.19	1028.42	1022.78	981.04	965.48	949.47	939.79	928.10	920.76	919.99	1013.71
N° 3 (Bias1)	976.71	948.01	944.53	915.00	899.30	885.32	867.71	865.00	852.66	857.07	948.74
N° 4 (Bias1)	990.34	965.56	963.21	937.04	920.71	905.05	883.35	883.67	868.20	872.65	961.47
N° 5 (Bias1)	1011.92	980.89	979.01	941.11	926.52	912.16	893.99	890.51	877.83	882.26	976.24
N° 6 (Bias1)	974.33	944.87	942.18	913.00	895.85	880.94	864.26	861.38	849.71	856.55	947.83
N° 7 (Bias2)	1018.50	985.78	979.53	939.84	921.04	893.74	876.05	866.75	842.64	849.69	958.55
N° 8 (Bias2)	980.11	949.72	942.31	903.22	889.87	858.61	844.15	837.45	812.83	826.04	926.24
N° 9 (Bias2)	1024.91	993.61	983.10	943.99	923.67	896.41	883.58	870.98	846.77	856.75	963.87
N° 10 (Bias2)	1030.53	1001.01	989.22	948.92	933.13	899.07	889.29	878.31	856.86	864.22	968.72
N° 11 (Bias2)	988.16	958.27	950.65	915.83	895.00	868.36	854.44	847.48	821.28	834.66	934.33
N° 12 (OFF)	1016.57	986.75	976.60	938.07	920.82	892.39	873.01	865.65	839.44	848.38	950.93
N° 13 (OFF)	1008.54	982.77	972.43	931.85	907.16	882.00	867.31	854.71	829.20	838.65	944.98
N° 14 (OFF)	994.92	966.90	959.28	923.64	906.55	881.80	863.56	855.64	828.80	840.89	937.92
N° 15 (OFF)	1001.06	972.25	967.94	932.73	916.16	881.74	876.02	863.07	840.83	853.28	945.08
N° 16 (OFF)	1013.12	986.87	981.66	945.24	923.95	901.00	887.93	875.61	853.89	862.39	953.13

1/Delta [CTR5]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	1.920E-6	-8.304E-6	-3.327E-6	1.967E-6	-2.676E-6	-4.568E-6	-8.800E-6	-6.316E-6	-2.485E-6	-1.000E-5
N° 2 (Bias1)	---	1.652E-5	2.188E-5	6.347E-5	7.990E-5	9.737E-5	1.082E-4	1.216E-4	1.302E-4	1.311E-4	3.063E-5
N° 3 (Bias1)	---	3.099E-5	3.488E-5	6.905E-5	8.812E-5	1.057E-4	1.286E-4	1.322E-4	1.490E-4	1.429E-4	3.018E-5
N° 4 (Bias1)	---	2.591E-5	2.845E-5	5.744E-5	7.637E-5	9.516E-5	1.223E-4	1.219E-4	1.421E-4	1.362E-4	3.032E-5
N° 5 (Bias1)	---	3.126E-5	3.322E-5	7.435E-5	9.108E-5	1.081E-4	1.304E-4	1.347E-4	1.510E-4	1.452E-4	3.611E-5
N° 6 (Bias1)	---	3.200E-5	3.502E-5	6.895E-5	8.991E-5	1.088E-4	1.307E-4	1.346E-4	1.505E-4	1.411E-4	2.869E-5
N° 7 (Bias2)	---	3.259E-5	3.907E-5	8.217E-5	1.039E-4	1.371E-4	1.597E-4	1.719E-4	2.049E-4	1.951E-4	6.141E-5
N° 8 (Bias2)	---	3.265E-5	4.093E-5	8.686E-5	1.035E-4	1.444E-4	1.643E-4	1.738E-4	2.100E-4	1.903E-4	5.935E-5
N° 9 (Bias2)	---	3.074E-5	4.149E-5	8.364E-5	1.069E-4	1.399E-4	1.561E-4	1.724E-4	2.053E-4	1.915E-4	6.179E-5
N° 10 (Bias2)	---	2.862E-5	4.052E-5	8.345E-5	1.013E-4	1.419E-4	1.541E-4	1.682E-4	1.967E-4	1.867E-4	6.192E-5
N° 11 (Bias2)	---	3.156E-5	3.992E-5	7.993E-5	1.053E-4	1.396E-4	1.584E-4	1.680E-4	2.056E-4	1.861E-4	5.830E-5
N° 12 (OFF)	---	2.972E-5	4.025E-5	8.232E-5	1.023E-4	1.369E-4	1.618E-4	1.715E-4	2.076E-4	1.950E-4	6.790E-5
N° 13 (OFF)	---	2.600E-5	3.681E-5	8.160E-5	1.108E-4	1.423E-4	1.615E-4	1.785E-4	2.144E-4	2.009E-4	6.669E-5
N° 14 (OFF)	---	2.912E-5	3.734E-5	7.757E-5	9.798E-5	1.289E-4	1.529E-4	1.636E-4	2.015E-4	1.841E-4	6.109E-5
N° 15 (OFF)	---	2.960E-5	3.417E-5	7.318E-5	9.257E-5	1.352E-4	1.426E-4	1.597E-4	1.904E-4	1.730E-4	5.917E-5
N° 16 (OFF)	---	2.625E-5	3.163E-5	7.088E-5	9.526E-5	1.228E-4	1.392E-4	1.550E-4	1.841E-4	1.725E-4	6.212E-5
Average (OFF)	---	2.734E-5	3.069E-5	6.665E-5	8.508E-5	1.030E-4	1.240E-4	1.290E-4	1.445E-4	1.393E-4	3.119E-5
σ (OFF)	---	6.512E-6	5.599E-6	6.429E-6	6.547E-6	6.321E-6	9.470E-6	6.692E-6	8.777E-6	5.664E-6	2.853E-6
Average+3σ (OFF)	---	4.687E-5	4.749E-5	8.594E-5	1.047E-4	1.220E-4	1.525E-4	1.491E-4	1.709E-4	1.563E-4	3.975E-5
Average-3σ (OFF)	---	7.803E-6	1.389E-5	4.737E-5	6.544E-5	8.406E-5	9.563E-5	1.089E-4	1.182E-4	1.223E-4	2.263E-5
Average (Bias1)	---	3.123E-5	4.039E-5	8.321E-5	1.042E-4	1.406E-4	1.585E-4	1.709E-4	2.045E-4	1.899E-4	6.055E-5
σ (Bias1)	---	1.660E-6	9.354E-7	2.522E-6	2.117E-6	2.737E-6	3.891E-6	2.634E-6	4.824E-6	3.665E-6	1.633E-6
Average+3σ (Bias1)	---	3.621E-5	4.319E-5	9.078E-5	1.105E-4	1.488E-4	1.702E-4	1.788E-4	2.190E-4	2.009E-4	6.545E-5
Average-3σ (Bias1)	---	2.625E-5	3.758E-5	7.565E-5	9.784E-5	1.324E-4	1.468E-4	1.630E-4	1.900E-4	1.789E-4	5.566E-5
Average (Bias2)	---	2.814E-5	3.604E-5	7.711E-5	9.978E-5	1.332E-4	1.516E-4	1.657E-4	1.996E-4	1.851E-4	6.339E-5
σ (Bias2)	---	1.854E-6	3.279E-6	5.043E-6	7.133E-6	7.503E-6	1.046E-5	9.368E-6	1.239E-5	1.277E-5	3.740E-6
Average+3σ (Bias2)	---	3.370E-5	4.588E-5	9.224E-5	1.212E-4	1.557E-4	1.830E-4	1.938E-4	2.368E-4	2.234E-4	7.461E-5
Average-3σ (Bias2)	---	2.257E-5	2.621E-5	6.198E-5	7.838E-5	1.107E-4	1.202E-4	1.376E-4	1.624E-4	1.468E-4	5.217E-5

15.TRR

Ta = 25°C; IF = 2 mA; RL = 100 Ohms; Irec = 10% Irm



TRR . (ns)

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	71.07	71.67	71.07	69.42	73.27	71.67	74.08	71.07	70.00	70.30	71.37
N° 2 (Bias1)	71.07	71.67	71.67	72.73	71.29	71.67	73.69	72.00	69.42	70.81	74.12
N° 3 (Bias1)	75.00	71.07	71.07	73.76	80.00	74.38	80.00	76.67	71.07	74.12	74.12
N° 4 (Bias1)	73.77	74.38	76.67	78.33	75.18	79.67	81.19	76.67	72.73	73.35	73.35
N° 5 (Bias1)	78.33	82.00	79.21	80.99	79.34	78.57	78.40	73.27	72.73	72.46	73.35
N° 6 (Bias1)	70.49	71.34	71.29	75.18	72.86	75.25	71.67	77.00	70.00	70.00	70.81
N° 7 (Bias2)	77.69	78.00	74.38	77.69	80.00	76.30	74.64	74.78	74.65	72.46	75.77
N° 8 (Bias2)	78.00	74.38	78.01	76.03	77.23	78.33	80.99	76.51	74.38	78.00	75.77
N° 9 (Bias2)	76.67	80.99	75.00	75.00	81.19	82.00	78.00	78.00	72.73	73.25	72.46
N° 10 (Bias2)	73.77	73.43	72.73	71.07	81.67	78.01	72.73	76.00	71.29	74.67	72.46
N° 11 (Bias2)	76.03	74.64	74.38	76.67	82.50	79.21	73.33	74.38	72.73	71.37	72.29
N° 12 (OFF)	76.03	72.34	75.25	80.85	81.67	79.60	78.67	78.21	72.73	74.67	75.77
N° 13 (OFF)	71.67	73.33	72.00	71.07	78.69	79.43	78.00	75.25	72.00	70.81	72.46
N° 14 (OFF)	71.67	79.34	71.67	77.69	79.21	77.69	78.33	75.33	71.67	71.33	71.37
N° 15 (OFF)	71.07	71.43	70.92	80.85	80.00	75.00	80.00	72.86	71.67	74.12	74.12
N° 16 (OFF)	69.50	71.07	70.00	71.43	71.67	70.00	71.07	71.07	71.29	71.33	70.41

Delta [TRR]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	102krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	5.923E-1	0.000E+0	-1.653E+0	2.193E+0	5.923E-1	3.007E+0	0.000E+0	-1.074E+0	-7.793E-1	2.920E-1
N° 2 (Bias1)	---	5.923E-1	5.923E-1	1.653E+0	2.127E-1	5.923E-1	2.616E+0	9.256E-1	-1.653E+0	-2.645E-1	3.041E+0
N° 3 (Bias1)	---	-3.926E+0	-3.926E+0	-1.241E+0	5.000E+0	-6.198E-1	5.000E+0	1.667E+0	-3.926E+0	-8.843E-1	-8.843E-1
N° 4 (Bias1)	---	6.097E-1	2.896E+0	4.563E+0	1.407E+0	5.904E+0	7.418E+0	2.896E+0	-1.043E+0	-4.240E-1	-4.240E-1
N° 5 (Bias1)	---	3.667E+0	8.746E-1	2.658E+0	1.006E+0	2.381E-1	6.667E-2	-5.066E+0	-5.606E+0	-5.871E+0	-4.987E+0
N° 6 (Bias1)	---	8.470E-1	7.953E-1	4.686E+0	2.365E+0	4.756E+0	1.175E+0	6.508E+0	-4.918E-1	-4.918E-1	3.181E-1
N° 7 (Bias2)	---	3.140E-1	-3.306E+0	0.000E+0	2.314E+0	-1.388E+0	-3.041E+0	-2.906E+0	-3.038E+0	-5.223E+0	-1.917E+0
N° 8 (Bias2)	---	-3.620E+0	1.418E-2	-1.967E+0	-7.723E-1	3.333E-1	2.992E+0	-1.493E+0	-3.620E+0	0.000E+0	-2.231E+0
N° 9 (Bias2)	---	4.325E+0	-1.667E+0	-1.667E+0	4.521E+0	5.333E+0	1.333E+0	1.333E+0	-3.939E+0	-3.418E+0	-4.204E+0
N° 10 (Bias2)	---	-3.419E-1	-1.043E+0	-2.696E+0	7.896E+0	4.244E+0	-1.043E+0	2.230E+0	-2.483E+0	8.962E-1	-1.308E+0
N° 11 (Bias2)	---	-1.388E+0	-1.653E+0	6.336E-1	6.467E+0	3.175E+0	-2.700E+0	-1.653E+0	-3.306E+0	-4.667E+0	-3.747E+0
N° 12 (OFF)	---	-3.693E+0	-7.855E-1	4.818E+0	5.634E+0	3.570E+0	2.634E+0	2.182E+0	-3.306E+0	-1.366E+0	-2.645E-1
N° 13 (OFF)	---	1.667E+0	3.333E-1	-5.923E-1	7.022E+0	7.766E+0	6.333E+0	3.581E+0	3.333E-1	-8.567E-1	7.961E-1
N° 14 (OFF)	---	7.672E+0	0.000E+0	6.019E+0	7.541E+0	6.019E+0	6.667E+0	3.667E+0	0.000E+0	-3.333E-1	-3.003E-1
N° 15 (OFF)	---	3.582E-1	-1.524E-1	9.777E+0	8.926E+0	3.926E+0	8.926E+0	1.783E+0	5.923E-1	3.041E+0	3.041E+0
N° 16 (OFF)	---	1.571E+0	4.964E-1	1.925E+0	2.163E+0	4.964E-1	1.571E+0	1.571E+0	1.784E+0	1.830E+0	9.078E-1
Average (OFF)	---	3.580E-1	2.466E-1	2.464E+0	1.998E+0	2.174E+0	3.255E+0	1.386E+0	-2.544E+0	-1.587E+0	-5.871E-1
σ (OFF)	---	2.723E+0	2.512E+0	2.437E+0	1.849E+0	2.943E+0	2.970E+0	4.196E+0	2.153E+0	2.405E+0	2.892E+0
Average+3σ (OFF)	---	8.526E+0	7.783E+0	9.776E+0	7.544E+0	1.100E+1	1.216E+1	1.398E+1	3.915E+0	5.629E+0	8.089E+0
Average-3σ (OFF)	---	-7.810E+0	-7.290E+0	-4.849E+0	-3.548E+0	-6.654E+0	-5.654E+0	-1.120E+1	-9.003E+0	-8.803E+0	-9.263E+0
Average (Bias1)	---	-1.422E-1	-1.531E+0	-1.139E+0	4.085E+0	2.339E+0	-4.918E-1	-4.978E-1	-3.277E+0	-2.482E+0	-2.682E+0
σ (Bias1)	---	2.909E+0	1.205E+0	1.399E+0	3.432E+0	2.793E+0	2.605E+0	2.175E+0	5.577E-1	2.772E+0	1.238E+0
Average+3σ (Bias1)	---	8.585E+0	2.084E+0	3.058E+0	1.438E+1	1.072E+1	7.323E+0	6.026E+0	-1.604E+0	5.834E+0	1.032E+0
Average-3σ (Bias1)	---	-8.870E+0	-5.146E+0	-5.336E+0	-6.211E+0	-6.040E+0	-8.307E+0	-7.021E+0	-4.950E+0	-1.080E+1	-6.395E+0
Average (Bias2)	---	1.515E+0	-2.163E-2	4.389E+0	6.257E+0	4.356E+0	5.226E+0	2.557E+0	-1.193E-1	4.629E-1	8.361E-1
σ (Bias2)	---	4.074E+0	4.989E-1	3.961E+0	2.574E+0	2.743E+0	3.044E+0	9.990E-1	1.904E+0	1.887E+0	1.358E+0
Average+3σ (Bias2)	---	1.374E+1	1.475E+0	1.627E+1	1.398E+1	1.258E+1	1.436E+1	5.554E+0	5.593E+0	6.123E+0	4.909E+0
Average-3σ (Bias2)	---	-1.071E+1	-1.518E+0	-7.493E+0	-1.465E+0	-3.873E+0	-3.907E+0	-4.405E-1	-5.831E+0	-5.197E+0	-3.237E+0