PROTONS TEST REPORT

ESA study: “Survey of Critical Components for 150 kRad Power Systems”

ESTEC Contract N° 22831/09/NL/AF refers

Part Type : SOC3810A

Package : CCP-6

Description : NPN Dual Matched Bipolar Transistors

Manufacturer: STMicroelectronics

Alter Technology Group Spain Purchase Order N° ATGSP-TL-09-JC-CO-9 dated 11/27/2009

Alter Technology Group Spain Project Manager: David NUNEZ

Hirex reference :	HRX/TID/0925	Issue : 01	Date :	June 03rd, 2011
Written by :	G. VIDAL	Technician		
Approved by :	O.PERROTIN	Study Manager		
Authorized by:	J.F. PASCAL	Technical Manager		

CHANGE RECORD

ISSUE	DATE	PAGE	DESCRIPTION OF CHANGES
01	June 03rd, 2011	All	Original Issue

PROTONS TEST REPORT
on
SOC3810A
NPN Dual Matched Bipolar Transistors

From STMicroelectronics

TABLE OF CONTENTS

List of figures:

List of Tables:

1 Introduction

In the scope of the ESA study: “Survey of Critical Components for 150 kRad Power Systems”, a protons test of the STMicroelectronics SOC3810A, NPN Dual Matched Bipolar Transistors has been performed up to a total fluence of about 2E11 p/cm^2, in response to Alter Technology Group Spain purchase order reference ATGSP-TL-09-JC-CO-9 that refers to ESTEC contract N° 22831/09/NL/AF.

Displacement damage effects were investigated using 60 MeV protons energy. Devices were irradiated at UCL in Louvain - Belgium.

The purpose of this test was to characterize degradation due to proton displacement damage so a further mission analysis could determine their suitability for flight use. This test was conducted on samples provided by Alter Technology Group Spain.
Test has been performed in accordance with Hirex Engineering Radiation Test Plan HRX/SPE/0230 issue 3 dated 09/06/2010.

A complete set of electrical measurements together with graphical representation of measured parameters with respect to Equivalent Fluence levels received are also provided.

2 Applicable and Reference Documents

2.1 Applicable Documents

- Hirex Engineering Radiation Test Plan: HRX/SPE/0230 issue 3 dated 09/06/2010
- Alter Technology Group Proposal: ATGSP-OF-648/2009 Issue 1
- Minutes of Meeting: MM-SRP-ATG-0001 dated 29/10/2009
- Hirex specification: Total Ionizing dose test general procedure.
- ESCC detail specification: 5207-005

2.2 Reference Documents

- STMicroelectronics datasheet: Doc ID 15385 Rev 2, January 2010.

3 Test Samples

7 samples of the SOC3810A devices were tested (6 + 1 control sample).
Allocation of samples used for testing is provided in the following table. Serial numbers were arbitrarily defined by Hirex.

Serial Number	Samples Allocation
1	Control sample
2	Biased OFF
3	Biased OFF
4	Biased OFF
5	Biased OFF
6	Biased OFF
7	Biased OFF

Identification of the SOC3810A is given below:

Part Number: SOC3810A

Top Marking: -

Inspection lot: 31018A

Date Code: -

4 Experimental Conditions

4.1 Radiation Source Description

The protons exposures were performed at the UCL facility in Louvain-la-Neuve - Belgium.
The Proton Irradiation facility (Light Ion irradiation Facility -LIF) was used for this experiment. The corresponding experimental set-up is shown in Figure 1.

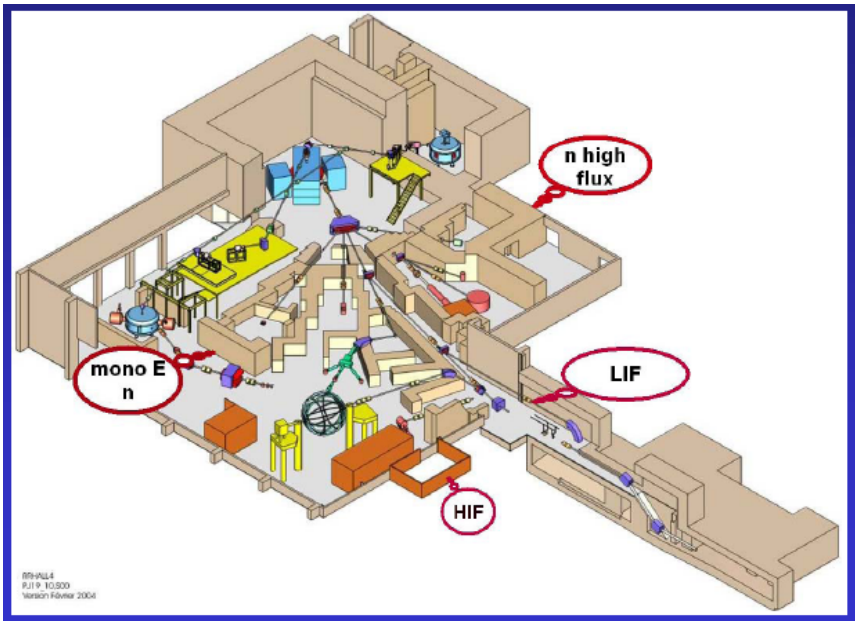


Figure 1 : LIF layout and typical experimental set-up

Light Ion irradiation Facility is characterized by the following beam parameters:
• Initial Proton Energies: 65 MeV;
• Energy Range: 9.3 – 62 MeV using energy degraders (See figure 2)
• Beam Flux at 62 MeV is between 10p/cm2/sec to 5E8 p/cm2/sec
• Irradiation Area: 8 cm diameter maximum

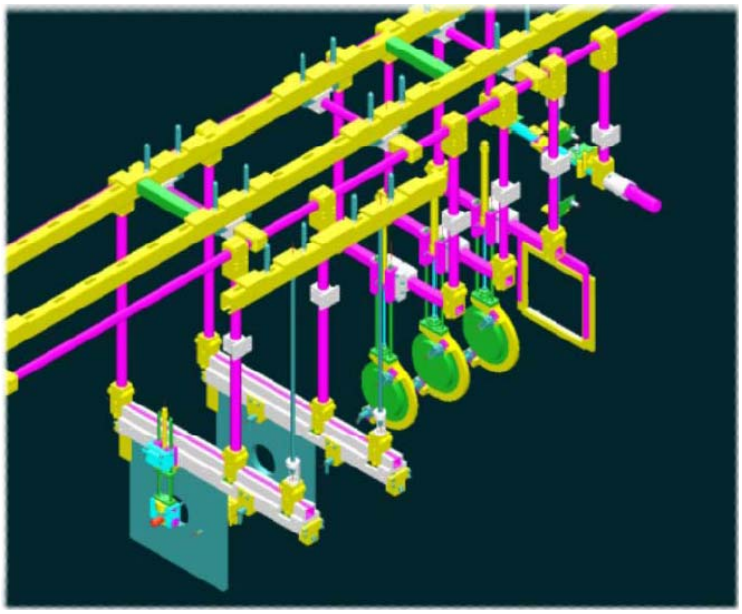


Figure 2: LIF Energy degraders

The irradiation conditions used for this test are provided in the following tables:

Fluence Steps	Total Fluence	Flux	Equivalent Total Dose	T
p/cm² @60MeV	p/cm² @60MeV	p/cm²/s	Rad (Si)	°C
0	0		0	
2E+11	2E+11	5.00E+08	27.5E+3	25

4.2 Bias during Dose Exposures and Measurements conditions

4.2.1 Bias conditions

During exposures all samples were biased OFF with all pins connected to ground.

4.2.2 Electrical Measurements

Electrical parameters test program principle for SOC3810A is provided in Figure 3.

A HP4142 DC tester and a network analyzer HP8714ES were used to perform required measurements.

A dedicated test fixture and a test board were designed to ensure proper measurement conditions.

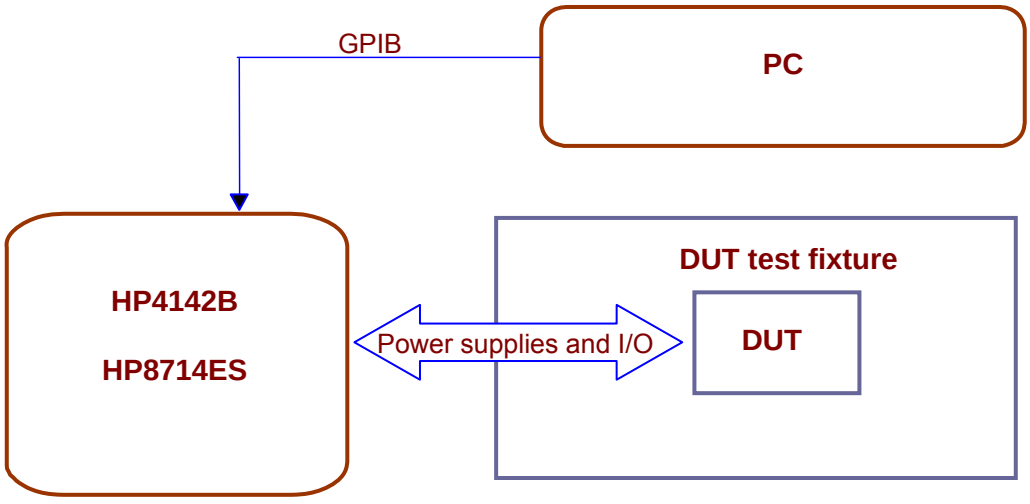


Figure 3 : SOC3810A test program principle

Electrical parameters test conditions and limits used for performing this test are given in Table 1.

Parameter	Description	Conditions	Spec		unit
			Min	Max	
I_{CBO}	Collector-Base cut-off current	V_{CB} = -50 V	-10	-	nA
I_{CEO}	Collector- Emitter cut-off current	V_{CB} = -50 V	-10	-	nA
I_{EBO}	Emitter-Base cut-off current	V_{EB} = -4 V	-20	-	nA
$V_{(BR)CBO}$	Collector-Base breakdown voltage	I_C = -10µA	-	-60	V
$V_{(BR)CEO}$	Collector-Emitter breakdown voltage, Note 1	I_C = -10mA	-	-60	V
$V_{(BR)EBO}$	Emitter-Base breakdown voltage	I_E = -10µA	-	-5	V
$V_{CE(SAT)1}$	Collector-Emitter saturation voltage, Note 1	I_C = -100µA, I_B = -10µA	-0.2	-	V
$V_{CE(SAT)2}$	Collector-Emitter saturation voltage, Note 1	I_C = -1mA, I_B = -100µA	-0.25	-	V
$V_{BE(SAT)1}$	Base-Emitter saturation voltage, Note 1	I_C = -100µA, I_B = -10µA	-0.7	-	V
$V_{BE(SAT)2}$	Base-Emitter saturation voltage, Note 1	I_C = -1mA, I_B = -100µA	-0.8	-	V
h_{FE1}	DC current gain, Note 1	I_C = -100µA, V_{CE} = -5V	150	450	-
h_{FE2}	DC current gain, Note 1	Ic = -500µA, V_{CE} = -5V	150	450	-
h_{FE3}	DC current gain, Note 1	Ic = -1mA, V_{CE} = -5V	150	450	-
h_{FE4}	DC current gain, Note 1	Ic = -5mA, V_{CE} = -5V	150	-	-
h_{FE5}	DC current gain, Note 1	Ic = -10mA, V_{CE} = -5V	125	-	-
H_{FE3-1}/H_{FE3-2}	Forward Current Transfer Ratio Comparison	Ic = -1mA, V_{CE} = -5V	0.9	1.1	-
H_{FE3-1}/H_{FE3-2}	Forward Current Transfer Ratio Comparison	Ic = -5mA, V_{CE} = -5V	0.9	1.1	-
$\Delta\lvert V_{BE1}-V_{BE2}\rvert$	Base-Emitter Voltage Differential	Ic = -1mA, V_{CE} = -5V		5	mV
$\Delta\lvert V_{BE1}-V_{BE2}\rvert$	Base-Emitter Voltage Differential	Ic = -5mA, V_{CE} = -5V		5	mV
F_T	Current Gain Bandwidth Product	V_{CE} = -5V, Ic = -1mA	80	500	MHz

Table 1 : Measured electrical parameters

5 Conclusion

A proton displacement damage test was carried out by Hirex Engineering under Alter Technology Group Spain contract on the STMicroelectronics SOC3810A NPN Dual Matched Bipolar Transistors in CCP-6 package.

Each device was exposed at room temperature to a protons flux of 60 MeV incident energy up to a total fluence of 2E+11p/cm².

A summary of failed parameters is provided in the following table.
Parameters not listed remained within specification limits all along testing.
Detail test results are presented in the following section.

Parameters	Failure Level between :	Comments
ICEO_1	0 and 2E+11p/cm²	
ICEO_2	0 and 2E+11p/cm²	

Table 2 : Summary of failed parameters

6 Test Results

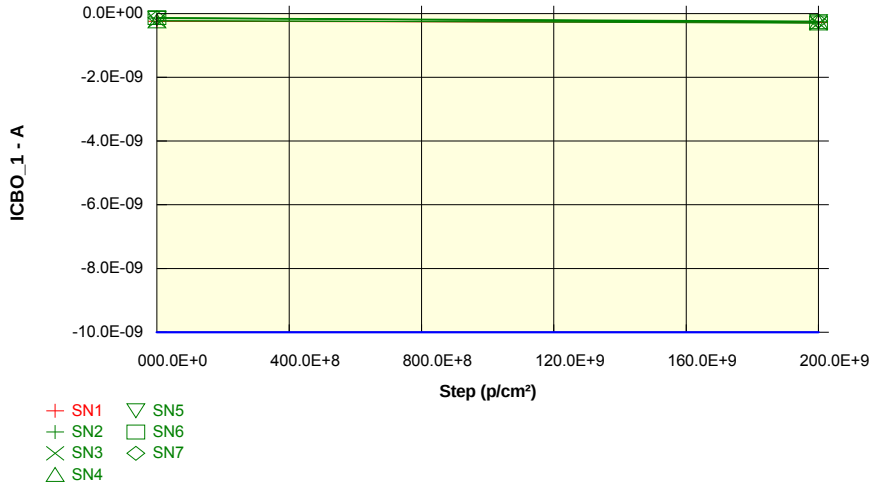
Test results including tables and graphics are provided in this section for each measured parameter.

Parameter measurements values are plotted versus Equivalent Fluence levels for 60 MeV incident energy protons. Fluences are expressed in protons/cm^2 in Silicon.

For each parameter, a drift calculation table is provided computing the drift between a given exposure step with respect to initial readings:

$$\Delta\text{(Parameter value)}=\text{(Parameter value}_{POSTRAD}\text{)} - \text{(Parameter value}_{PRERAD}\text{)}$$

Test conditions : PROTONS
Parameter : Collector-Base cut-off current : ICBO_1
Vcb = -50V
Unit : A
Spec Limit Min : -10.0E-09
Spec limits are represented in bold lines on the graphic.



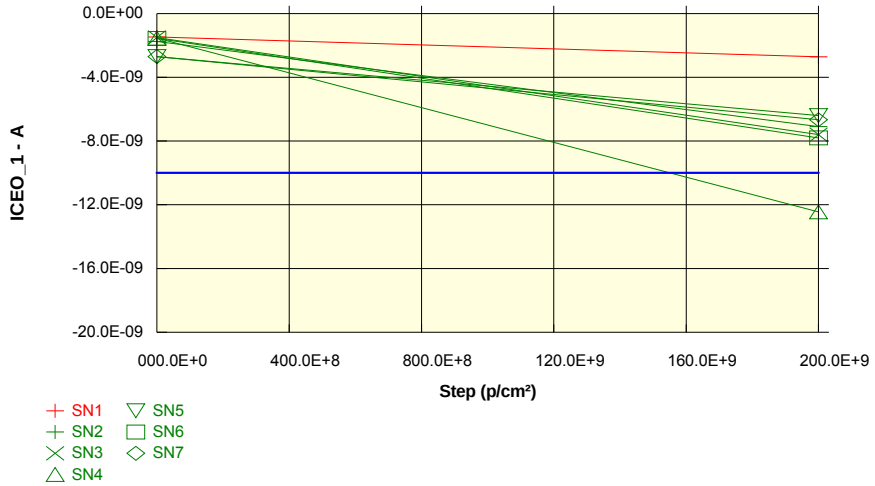
Measurements

ICBO_1	0 p/cm²	200000000000 p/cm²
SN1_REF	-238.2E-12	-279.1E-12
OFF samples		
SN2	-142.0E-12	-260.3E-12
SN3	-223.6E-12	-304.6E-12
SN4	-229.8E-12	-254.0E-12
SN5	-154.3E-12	-252.7E-12
SN6	-126.0E-12	-292.1E-12
SN7	-131.4E-12	-236.9E-12
Statistics		
Min	-229.8E-12	-304.6E-12
Max	-126.0E-12	-236.9E-12
Average	-167.9E-12	-266.8E-12
Sigma	42.6E-12	23.7E-12

Drift Calculation

ICBO_1	0 p/cm²	200000000000 p/cm²
OFF samples		
SN2	-	-118.32E-12
SN3	-	-80.96E-12
SN4	-	-24.24E-12
SN5	-	-98.42E-12
SN6	-	-166.06E-12
SN7	-	-105.48E-12
Average	-	-98.91E-12
Sigma	-	42.48E-12

Test conditions : PROTONS
Parameter : Collector-Emitter cut-off current : ICEO_1
Vcb = -50V
Unit : A
Spec Limit Min : -10.0E-09
Spec limits are represented in bold lines on the graphic.



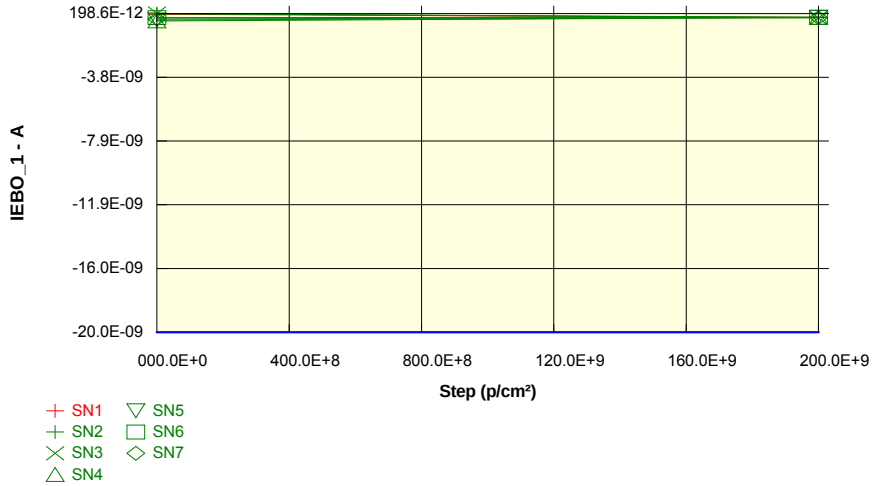
Measurements

ICEO_1	0 p/cm²	200000000000 p/cm²
SN1_REF	-1.5E-09	-2.7E-09
OFF samples		
SN2	-1.7E-09	-7.1E-09
SN3	-1.5E-09	-7.6E-09
SN4	-1.5E-09	**-12.4E-09**
SN5	-2.7E-09	-6.4E-09
SN6	-1.6E-09	-7.8E-09
SN7	-2.7E-09	-6.7E-09
Statistics		
Min	-2.7E-09	-12.4E-09
Max	-1.5E-09	-6.4E-09
Average	-2.0E-09	-8.0E-09
Sigma	527.8E-12	2.0E-09

Drift Calculation

ICEO_1	0 p/cm²	200000000000 p/cm²
OFF samples		
SN2	-	-5.34E-09
SN3	-	-6.09E-09
SN4	-	-10.90E-09
SN5	-	-3.70E-09
SN6	-	-6.24E-09
SN7	-	-3.97E-09
Average	-	-6.04E-09
Sigma	-	2.38E-09

Test conditions : PROTONS
Parameter : Emitter-Base cut-off curent : IEBO_1
Veb = -4V
Unit : A
Spec Limit Min : -20.0E-09
Spec limits are represented in bold lines on the graphic.



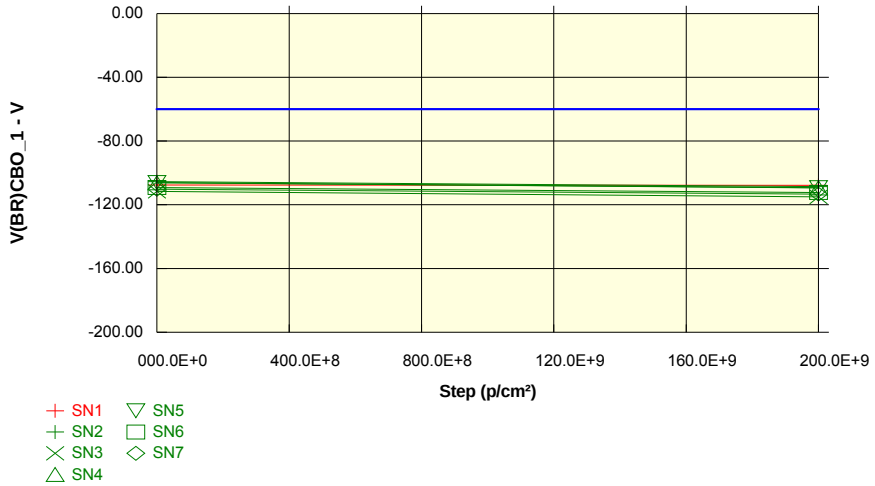
Measurements

IEBO_1	0 p/cm²	200000000000 p/cm²
SN1_REF	151.0E-12	-39.0E-12
OFF samples		
SN2	188.2E-12	-36.5E-12
SN3	198.6E-12	-74.9E-12
SN4	-260.4E-12	-43.1E-12
SN5	-206.4E-12	-42.7E-12
SN6	-57.8E-12	-37.1E-12
SN7	-139.4E-12	-53.4E-12
Statistics		
Min	-260.4E-12	-74.9E-12
Max	198.6E-12	-36.5E-12
Average	-46.2E-12	-47.9E-12
Sigma	180.4E-12	13.3E-12

Drift Calculation

IEBO_1	0 p/cm²	200000000000 p/cm²
OFF samples		
SN2	-	-224.74E-12
SN3	-	-273.52E-12
SN4	-	217.34E-12
SN5	-	163.68E-12
SN6	-	20.74E-12
SN7	-	86.02E-12
Average	-	-1.75E-12
Sigma	-	185.81E-12

Test conditions : PROTONS
Parameter : Collector-Base breakdown voltage : V(BR)CBO_1
Ic = -10µA
Unit : V
Spec Limit Max : -60.00
Spec limits are represented in bold lines on the graphic.



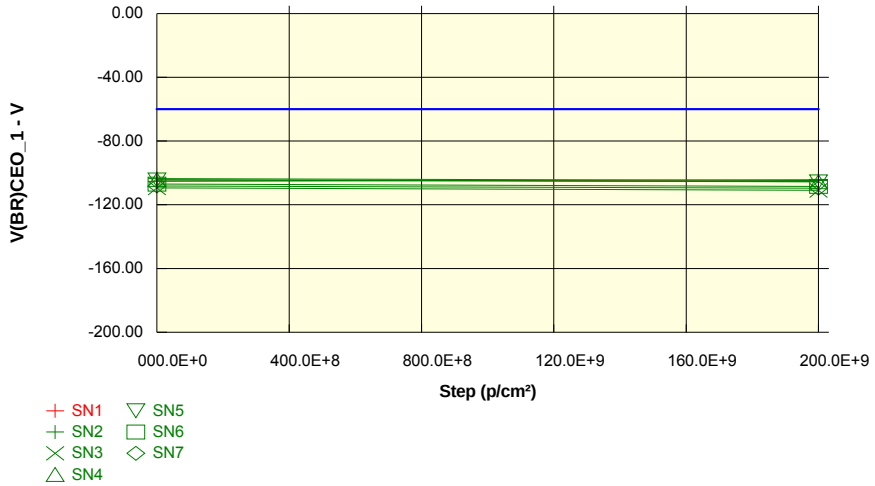
Measurements

V(BR)CBO_1	0 p/cm²	2e+11 p/cm²
SN1_REF	-107.60	-107.82
OFF samples		
SN2	-105.52	-108.59
SN3	-111.62	-115.02
SN4	-106.19	-109.36
SN5	-106.09	-109.35
SN6	-109.18	-112.28
SN7	-110.16	-113.31
Statistics		
Min	-111.62	-115.02
Max	-105.52	-108.59
Average	-108.13	-111.32
Sigma	2.32	2.37

Drift Calculation

V(BR)CBO_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-3.07E+00
SN3	-	-3.40E+00
SN4	-	-3.17E+00
SN5	-	-3.26E+00
SN6	-	-3.10E+00
SN7	-	-3.14E+00
Average	-	-3.19E+00
Sigma	-	109.17E-03

Test conditions : PROTONS
Parameter : Collector-Emitter breakdown voltage : V(BR)CEO_1
Ic = -10mA
Unit : V
Spec Limit Max : -60.00
Spec limits are represented in bold lines on the graphic.



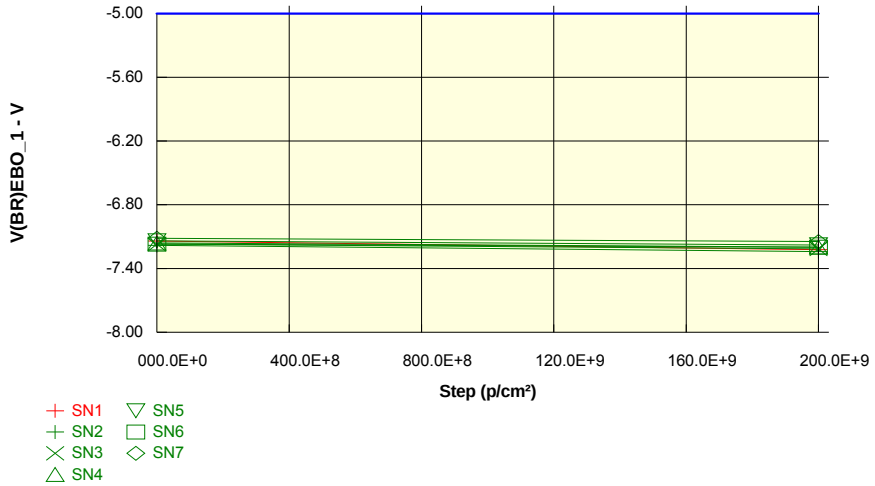
Measurements

V(BR)CEO_1	0 p/cm²	2e+11 p/cm²
SN1_REF	-105.25	-104.22
OFF samples		
SN2	-103.54	-104.86
SN3	-109.43	-110.96
SN4	-104.29	-105.48
SN5	-104.47	-105.67
SN6	-107.05	-108.54
SN7	-108.13	-109.60
Statistics		
Min	-109.43	-110.96
Max	-103.54	-104.86
Average	-106.15	-107.52
Sigma	2.18	2.31

Drift Calculation

V(BR)CEO_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-1.32E+00
SN3	-	-1.54E+00
SN4	-	-1.20E+00
SN5	-	-1.20E+00
SN6	-	-1.49E+00
SN7	-	-1.47E+00
Average	-	-1.37E+00
Sigma	-	138.40E-03

Test conditions : PROTONS
Parameter : Emitter-Base breakdown voltage : V(BR)EBO_1
Ie = -10µA
Unit : V
Spec Limit Max : -5.00
Spec limits are represented in bold lines on the graphic.



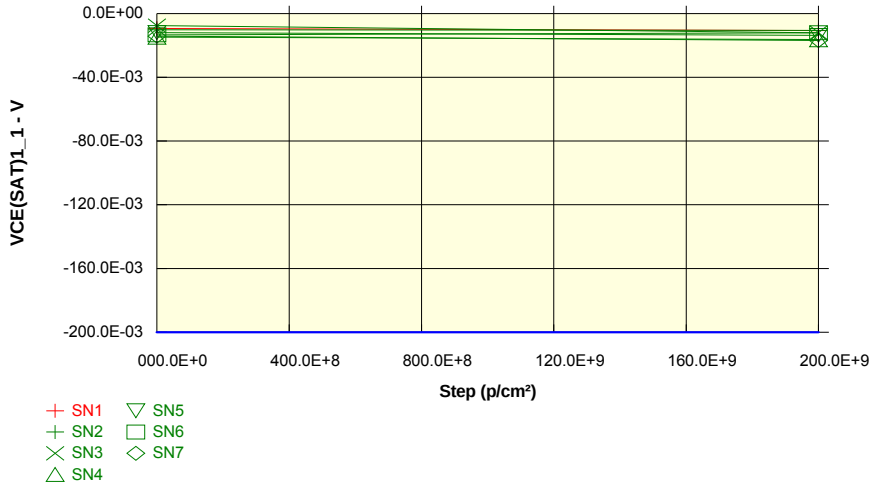
Measurements

V(BR)EBO_1	0 p/cm²	2e+11 p/cm²
SN1_REF	-7.14	-7.22
OFF samples		
SN2	-7.18	-7.24
SN3	-7.17	-7.22
SN4	-7.16	-7.20
SN5	-7.14	-7.18
SN6	-7.17	-7.20
SN7	-7.11	-7.15
Statistics		
Min	-7.18	-7.24
Max	-7.11	-7.15
Average	-7.16	-7.20
Sigma	0.02	0.03

Drift Calculation

V(BR)EBO_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-59.20E-03
SN3	-	-44.80E-03
SN4	-	-37.20E-03
SN5	-	-39.20E-03
SN6	-	-28.80E-03
SN7	-	-32.00E-03
Average	-	-40.20E-03
Sigma	-	9.91E-03

Test conditions : PROTONS
Parameter : Collector-Emitter saturation voltage : VCE(SAT)1_1
Ic = -100µA ; Ib = -10µA
Unit : V
Spec Limit Min : -200.0E-03
Spec limits are represented in bold lines on the graphic.



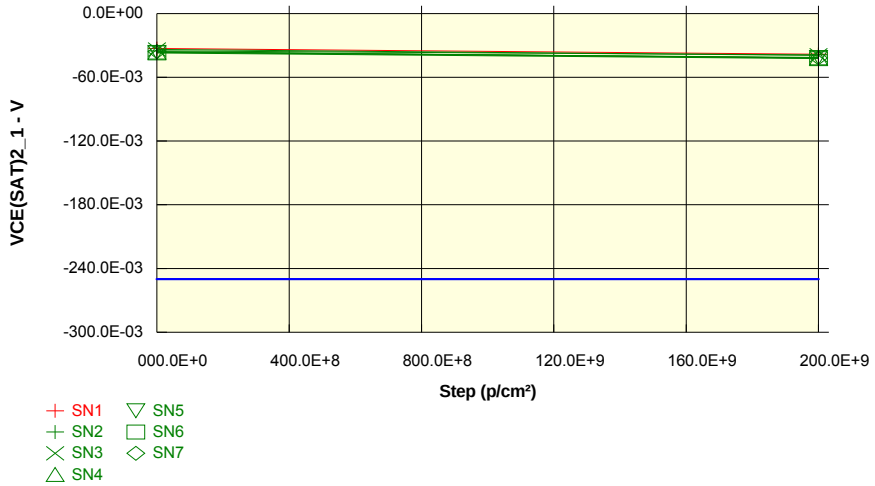
Measurements

VCE(SAT)1_1	0 p/cm²	2e+11 p/cm²
SN1_REF	-9.2E-03	-10.7E-03
OFF samples		
SN2	-10.1E-03	-10.6E-03
SN3	-7.5E-03	-12.0E-03
SN4	-14.8E-03	-16.4E-03
SN5	-11.9E-03	-13.7E-03
SN6	-13.4E-03	-12.0E-03
SN7	-14.2E-03	-16.9E-03
Statistics		
Min	-14.8E-03	-16.9E-03
Max	-7.5E-03	-10.6E-03
Average	-12.0E-03	-13.6E-03
Sigma	2.5E-03	2.3E-03

Drift Calculation

VCE(SAT)1_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-480.00E-06
SN3	-	-4.48E-03
SN4	-	-1.56E-03
SN5	-	-1.76E-03
SN6	-	1.32E-03
SN7	-	-2.72E-03
Average	-	-1.61E-03
Sigma	-	1.80E-03

Test conditions : PROTONS
Parameter : Collector-Emitter saturation voltage : VCE(SAT)2_1
Ic = -1mA ; Ib = -100µA
Unit : V
Spec Limit Min : -250.0E-03
Spec limits are represented in bold lines on the graphic.



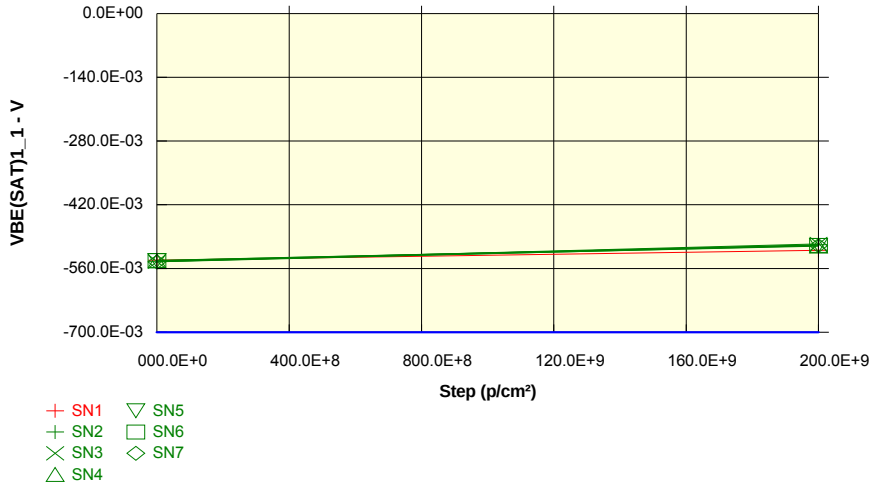
Measurements

VCE(SAT)2_1	0 p/cm²	2e+11 p/cm²
SN1_REF	-33.0E-03	-38.3E-03
OFF samples		
SN2	-35.2E-03	-39.0E-03
SN3	-33.8E-03	-39.4E-03
SN4	-36.2E-03	-41.6E-03
SN5	-36.5E-03	-41.4E-03
SN6	-37.0E-03	-42.3E-03
SN7	-35.9E-03	-41.7E-03
Statistics		
Min	-37.0E-03	-42.3E-03
Max	-33.8E-03	-39.0E-03
Average	-35.8E-03	-40.9E-03
Sigma	1.0E-03	1.3E-03

Drift Calculation

VCE(SAT)2_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-3.80E-03
SN3	-	-5.56E-03
SN4	-	-5.44E-03
SN5	-	-4.92E-03
SN6	-	-5.28E-03
SN7	-	-5.84E-03
Average	-	-5.14E-03
Sigma	-	660.81E-06

Test conditions : PROTONS
Parameter : Base-Emitter saturation voltage : VBE(SAT)1_1
Ic = -100µA ; Ib = -10µA
Unit : V
Spec Limit Min : -700.0E-03
Spec limits are represented in bold lines on the graphic.



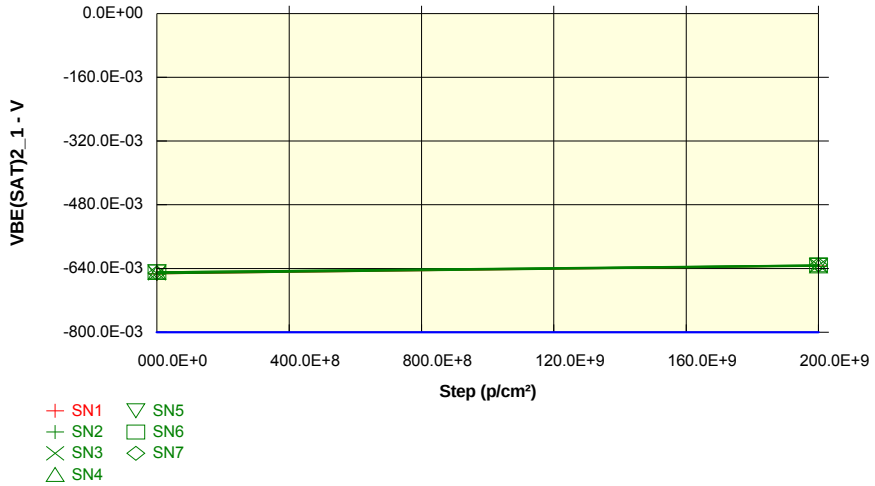
Measurements

VBE(SAT)1_1	0 p/cm²	2e+11 p/cm²
SN1_REF	-541.8E-03	-520.1E-03
OFF samples		
SN2	-545.0E-03	-507.6E-03
SN3	-544.6E-03	-506.1E-03
SN4	-543.3E-03	-510.9E-03
SN5	-542.7E-03	-509.3E-03
SN6	-542.3E-03	-509.4E-03
SN7	-545.7E-03	-509.8E-03
Statistics		
Min	-545.7E-03	-510.9E-03
Max	-542.3E-03	-506.1E-03
Average	-544.0E-03	-508.8E-03
Sigma	1.2E-03	1.6E-03

Drift Calculation

VBE(SAT)1_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	37.44E-03
SN3	-	38.52E-03
SN4	-	32.40E-03
SN5	-	33.44E-03
SN6	-	32.96E-03
SN7	-	35.92E-03
Average	-	35.11E-03
Sigma	-	2.33E-03

Test conditions : PROTONS
Parameter : Base-Emitter saturation voltage : VBE(SAT)2_1
Ic = -1mA ; Ib = -100µA
Unit : V
Spec Limit Min : -800.0E-03
Spec limits are represented in bold lines on the graphic.



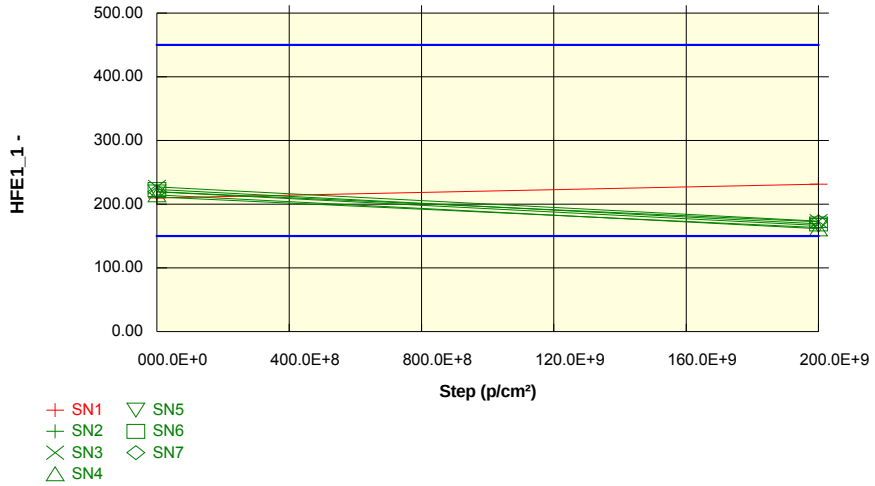
Measurements

VBE(SAT)2_1	0 p/cm²	2e+11 p/cm²
SN1_REF	-653.4E-03	-633.3E-03
OFF samples		
SN2	-653.3E-03	-634.2E-03
SN3	-651.8E-03	-632.1E-03
SN4	-650.1E-03	-633.6E-03
SN5	-648.4E-03	-632.3E-03
SN6	-648.2E-03	-630.8E-03
SN7	-651.3E-03	-630.7E-03
Statistics		
Min	-653.3E-03	-634.2E-03
Max	-648.2E-03	-630.7E-03
Average	-650.5E-03	-632.3E-03
Sigma	1.8E-03	1.3E-03

Drift Calculation

VBE(SAT)2_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	19.08E-03
SN3	-	19.68E-03
SN4	-	16.52E-03
SN5	-	16.08E-03
SN6	-	17.32E-03
SN7	-	20.60E-03
Average	-	18.21E-03
Sigma	-	1.67E-03

Test conditions : PROTONS
Parameter : DC current gain : HFE1_1
Ic = -100µA ; Vce = -5V
Unit :
Spec Limit Min : 150.00
Spec Limit Max : 450.00
Spec limits are represented in bold lines on the graphic.



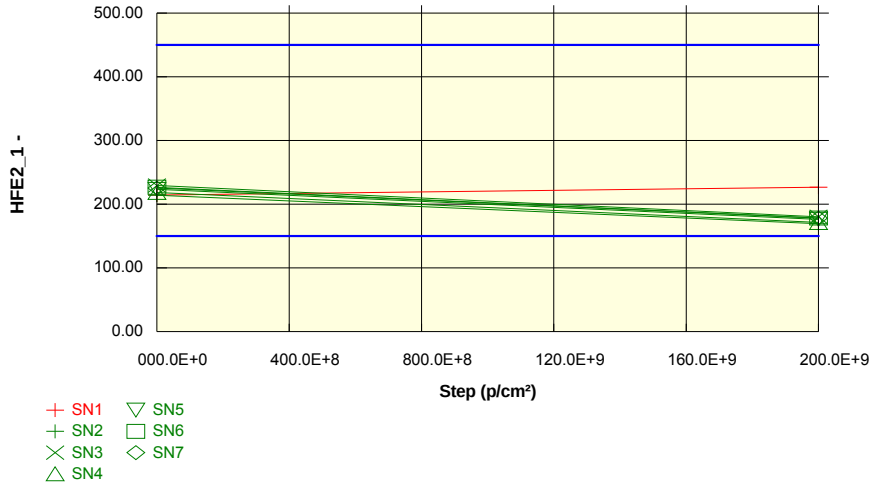
Measurements

HFE1_1	0 p/cm²	2e+11 p/cm²
SN1_REF	209.81	231.24
OFF samples		
SN2	211.21	163.18
SN3	226.93	173.20
SN4	214.64	161.39
SN5	219.20	166.69
SN6	222.95	169.10
SN7	219.60	172.42
Statistics		
Min	211.21	161.39
Max	226.93	173.20
Average	219.09	167.66
Sigma	5.14	4.39

Drift Calculation

HFE1_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	1.39E-03
SN3	-	1.37E-03
SN4	-	1.54E-03
SN5	-	1.44E-03
SN6	-	1.43E-03
SN7	-	1.25E-03
Average	-	1.40E-03
Sigma	-	87.51E-06

Test conditions : PROTONS
Parameter : DC current gain : HFE2_1
Ic = -500µA ; Vce = -5V
Unit :
Spec Limit Min : 150.00
Spec Limit Max : 450.00
Spec limits are represented in bold lines on the graphic.



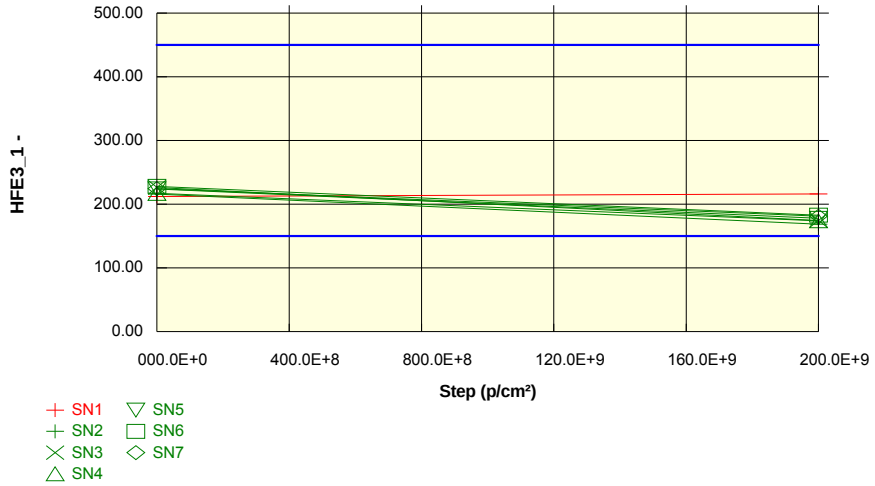
Measurements

HFE2_1	0 p/cm²	2e+11 p/cm²
SN1_REF	214.30	226.88
OFF samples		
SN2	214.21	169.33
SN3	229.36	180.27
SN4	218.40	171.43
SN5	223.17	176.08
SN6	226.60	178.23
SN7	225.30	178.10
Statistics		
Min	214.21	169.33
Max	229.36	180.27
Average	222.84	175.57
Sigma	5.12	3.91

Drift Calculation

HFE2_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	1.24E-03
SN3	-	1.19E-03
SN4	-	1.25E-03
SN5	-	1.20E-03
SN6	-	1.20E-03
SN7	-	1.18E-03
Average	-	1.21E-03
Sigma	-	27.79E-06

Test conditions : PROTONS
Parameter : DC current gain : HFE3_1
Ic = -1mA ; Vce = -5V
Unit :
Spec Limit Min : 150.00
Spec Limit Max : 450.00
Spec limits are represented in bold lines on the graphic.



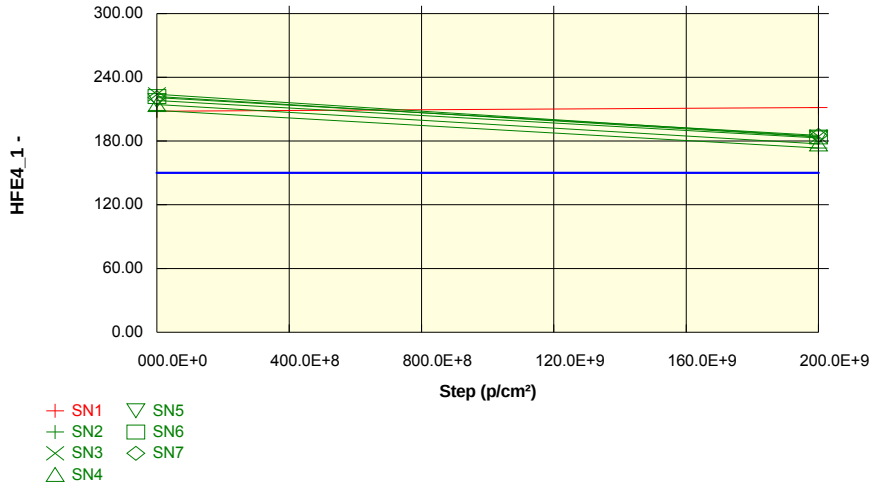
Measurements

HFE3_1	0 p/cm²	2e+11 p/cm²
SN1_REF	212.08	216.06
OFF samples		
SN2	215.74	168.70
SN3	226.32	174.40
SN4	217.04	173.78
SN5	223.94	177.92
SN6	227.93	182.85
SN7	224.58	181.00
Statistics		
Min	215.74	168.70
Max	227.93	182.85
Average	222.59	176.44
Sigma	4.58	4.75

Drift Calculation

HFE3_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	1.29E-03
SN3	-	1.32E-03
SN4	-	1.15E-03
SN5	-	1.16E-03
SN6	-	1.08E-03
SN7	-	1.07E-03
Average	-	1.18E-03
Sigma	-	94.77E-06

Test conditions : PROTONS
Parameter : DC current gain : HFE4_1
Ic = -5mA ; Vce = -5V
Unit :
Spec Limit Min : 150.00
Spec limits are represented in bold lines on the graphic.



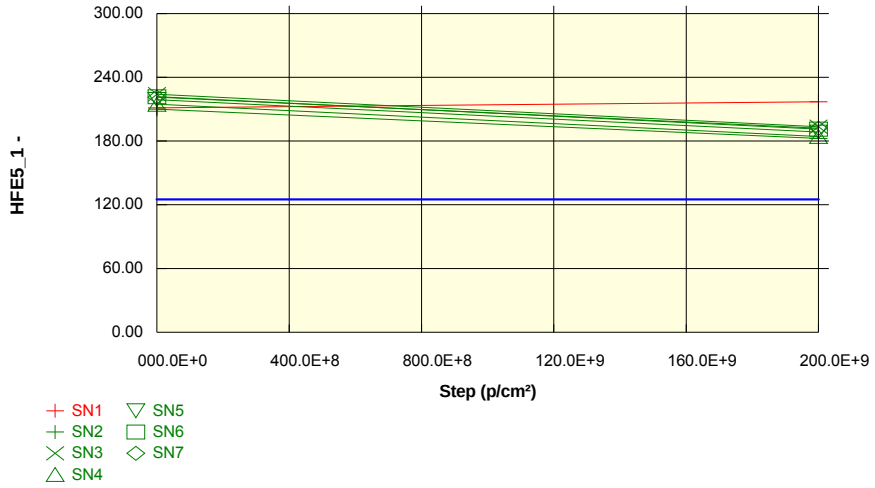
Measurements

HFE4_1	0 p/cm²	2e+11 p/cm²
SN1_REF	208.15	211.61
OFF samples		
SN2	208.85	173.52
SN3	224.06	184.32
SN4	214.30	177.20
SN5	218.14	182.99
SN6	221.85	183.85
SN7	220.88	185.33
Statistics		
Min	208.85	173.52
Max	224.06	185.33
Average	218.01	181.20
Sigma	5.12	4.32

Drift Calculation

HFE4_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	974.81E-06
SN3	-	962.30E-06
SN4	-	976.92E-06
SN5	-	880.49E-06
SN6	-	931.62E-06
SN7	-	868.30E-06
Average	-	932.41E-06
Sigma	-	43.74E-06

Test conditions : PROTONS
Parameter : DC current gain : HFE5_1
Ic = -10mA ; Vce = -5V
Unit :
Spec Limit Min : 125.00
Spec limits are represented in bold lines on the graphic.



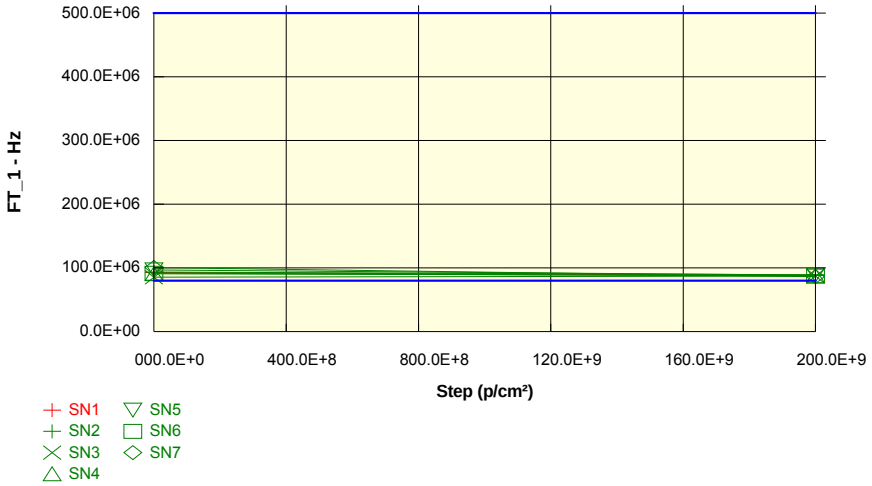
Measurements

HFE5_1	0 p/cm²	2e+11 p/cm²
SN1_REF	211.20	216.86
OFF samples		
SN2	210.08	182.46
SN3	224.07	193.52
SN4	214.73	184.27
SN5	219.07	188.53
SN6	221.75	191.15
SN7	221.40	192.03
Statistics		
Min	210.08	182.46
Max	224.07	193.52
Average	218.52	188.66
Sigma	4.75	4.06

Drift Calculation

HFE5_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	720.46E-06
SN3	-	704.56E-06
SN4	-	769.85E-06
SN5	-	739.35E-06
SN6	-	722.00E-06
SN7	-	690.84E-06
Average	-	724.51E-06
Sigma	-	25.27E-06

Test conditions : PROTONS
Parameter : Current gain bandwidth product : FT_1
Vce = -5V ; Ic = -1mA
Unit : Hz
Spec Limit Min : 80.0E+06
Spec Limit Max : 500.0E+06
Spec limits are represented in bold lines on the graphic.



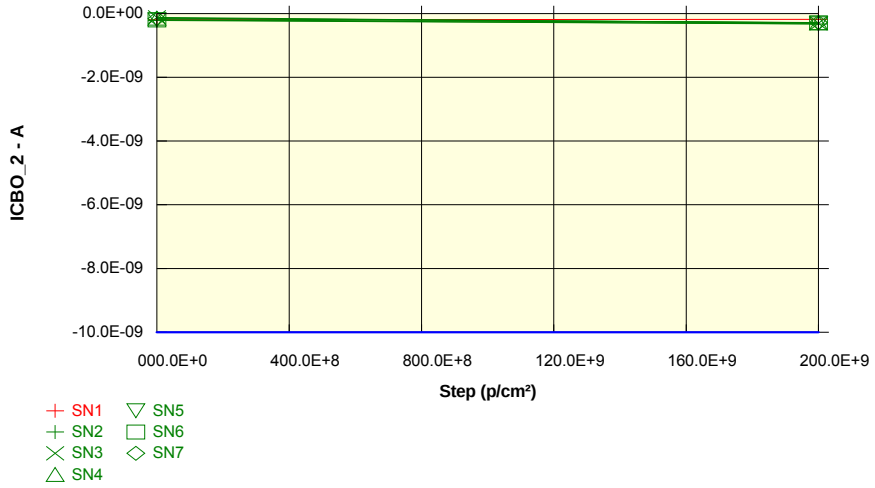
Measurements

FT_1	0 p/cm²	2e+11 p/cm²
SN1_REF	92.7E+06	88.1E+06
OFF samples		
SN2	93.5E+06	89.1E+06
SN3	85.3E+06	87.0E+06
SN4	90.8E+06	87.8E+06
SN5	96.9E+06	88.8E+06
SN6	91.8E+06	87.1E+06
SN7	100.7E+06	86.1E+06
Statistics		
Min	85.3E+06	86.1E+06
Max	100.7E+06	89.1E+06
Average	93.2E+06	87.7E+06
Sigma	4.8E+06	1.0E+06

Drift Calculation

FT_1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-4.41E+06
SN3	-	1.73E+06
SN4	-	-2.95E+06
SN5	-	-8.09E+06
SN6	-	-4.75E+06
SN7	-	-14.57E+06
Average	-	-5.51E+06
Sigma	-	4.99E+06

Test conditions : PROTONS
Parameter : Collector-Base cut-off current : ICBO_2
Vcb = -50V
Unit : A
Spec Limit Min : -10.0E-09
Spec limits are represented in bold lines on the graphic.



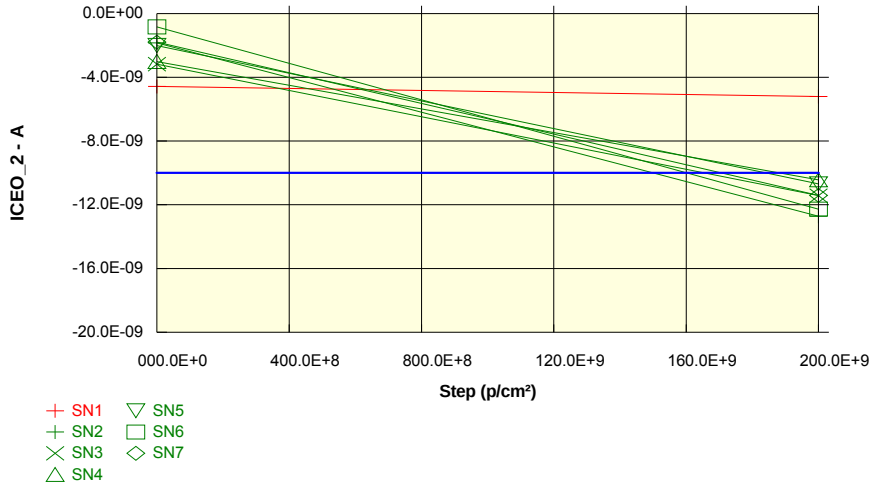
Measurements

ICBO_2	0 p/cm²	2e+11 p/cm²
SN1_REF	-186.0E-12	-181.1E-12
OFF samples		
SN2	-218.0E-12	-329.5E-12
SN3	-117.8E-12	-303.6E-12
SN4	-144.4E-12	-284.2E-12
SN5	-199.8E-12	-320.7E-12
SN6	-197.2E-12	-288.8E-12
SN7	-154.0E-12	-281.8E-12
Statistics		
Min	-218.0E-12	-329.5E-12
Max	-117.8E-12	-281.8E-12
Average	-171.9E-12	-301.4E-12
Sigma	35.5E-12	18.3E-12

Drift Calculation

ICBO_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-111.48E-12
SN3	-	-185.82E-12
SN4	-	-139.76E-12
SN5	-	-120.94E-12
SN6	-	-91.60E-12
SN7	-	-127.78E-12
Average	-	-129.56E-12
Sigma	-	29.20E-12

Test conditions : PROTONS
Parameter : Collector-Emitter cut-off current : ICEO_2
Vcb = -50V
Unit : A
Spec Limit Min : -10.0E-09
Spec limits are represented in bold lines on the graphic.



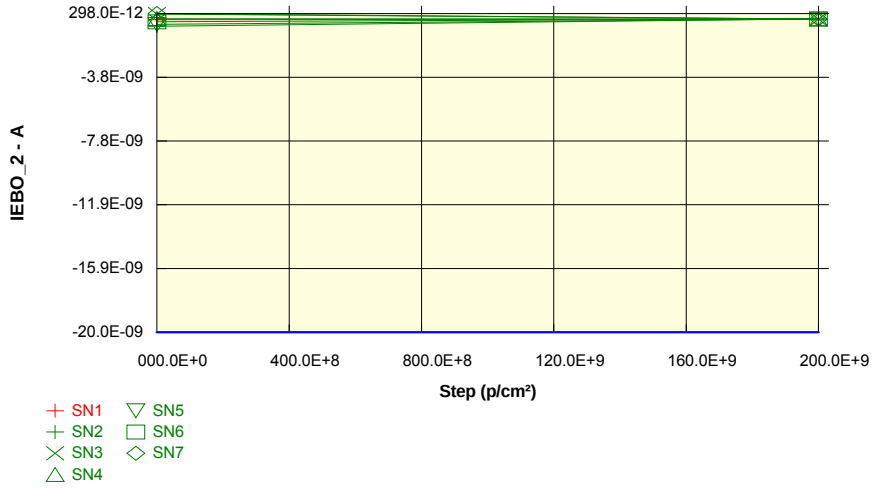
Measurements

ICEO_2	0 p/cm²	2e+11 p/cm²
SN1_REF	-4.6E-09	-5.2E-09
OFF samples		
SN2	-1.8E-09	-12.7E-09
SN3	-3.2E-09	-11.4E-09
SN4	-3.0E-09	-10.4E-09
SN5	-2.0E-09	-10.7E-09
SN6	-832.2E-12	-12.3E-09
SN7	-1.8E-09	-11.4E-09
Statistics		
Min	-3.2E-09	-12.7E-09
Max	-832.2E-12	-10.4E-09
Average	-2.1E-09	-11.5E-09
Sigma	791.3E-12	805.2E-12

Drift Calculation

ICEO_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-10.88E-09
SN3	-	-8.24E-09
SN4	-	-7.43E-09
SN5	-	-8.68E-09
SN6	-	-11.44E-09
SN7	-	-9.62E-09
Average	-	-9.38E-09
Sigma	-	1.42E-09

Test conditions : PROTONS
Parameter : Emitter-Base cut-off curent : IEBO_2
Veb = -4V
Unit : A
Spec Limit Min : -20.0E-09
Spec limits are represented in bold lines on the graphic.



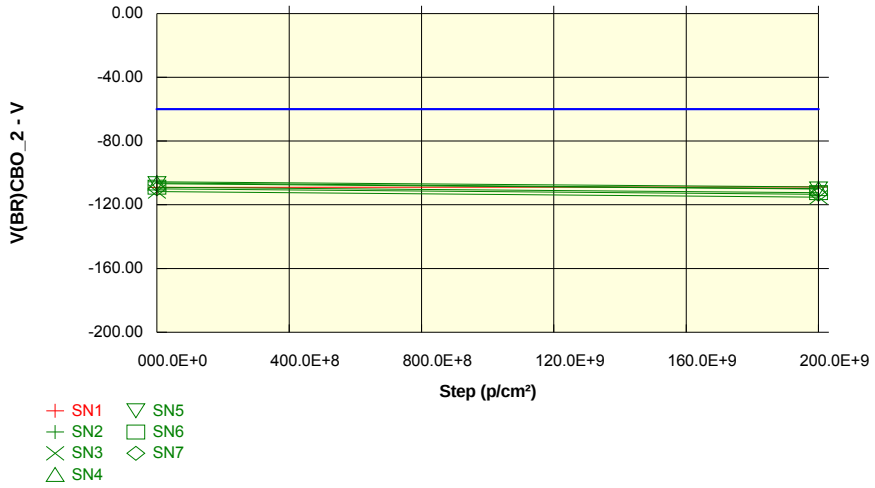
Measurements

IEBO_2	0 p/cm²	2e+11 p/cm²
SN1_REF	-83.8E-12	-65.9E-12
OFF samples		
SN2	-500.0E-12	-35.0E-12
SN3	264.8E-12	-53.3E-12
SN4	-27.8E-12	-46.4E-12
SN5	-386.0E-12	-46.6E-12
SN6	-230.0E-12	-38.2E-12
SN7	298.0E-12	-52.4E-12
Statistics		
Min	-500.0E-12	-53.3E-12
Max	298.0E-12	-35.0E-12
Average	-96.8E-12	-45.3E-12
Sigma	304.2E-12	6.8E-12

Drift Calculation

IEBO_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	465.02E-12
SN3	-	-318.10E-12
SN4	-	-18.64E-12
SN5	-	339.42E-12
SN6	-	191.82E-12
SN7	-	-350.40E-12
Average	-	51.52E-12
Sigma	-	310.01E-12

Test conditions : PROTONS
Parameter : Collector-Base breakdown voltage : V(BR)CBO_2
Ic = -10µA
Unit : V
Spec Limit Max : -60.00
Spec limits are represented in bold lines on the graphic.



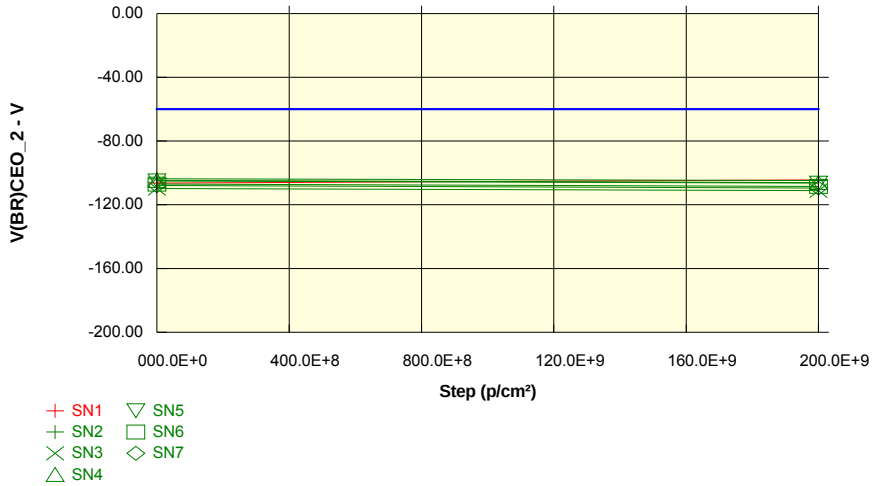
Measurements

V(BR)CBO_2	0 p/cm²	2e+11 p/cm²
SN1_REF	-109.04	-108.89
OFF samples		
SN2	-105.64	-108.80
SN3	-111.72	-115.28
SN4	-106.30	-109.84
SN5	-106.73	-110.09
SN6	-108.99	-112.36
SN7	-110.01	-113.38
Statistics		
Min	-111.72	-115.28
Max	-105.64	-108.80
Average	-108.23	-111.62
Sigma	2.19	2.26

Drift Calculation

V(BR)CBO_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-3.16E+00
SN3	-	-3.56E+00
SN4	-	-3.53E+00
SN5	-	-3.36E+00
SN6	-	-3.36E+00
SN7	-	-3.37E+00
Average	-	-3.39E+00
Sigma	-	130.72E-03

Test conditions : PROTONS
Parameter : Collector-Emitter breakdown voltage : V(BR)CEO_2
Ic = -10mA
Unit : V
Spec Limit Max : -60.00
Spec limits are represented in bold lines on the graphic.



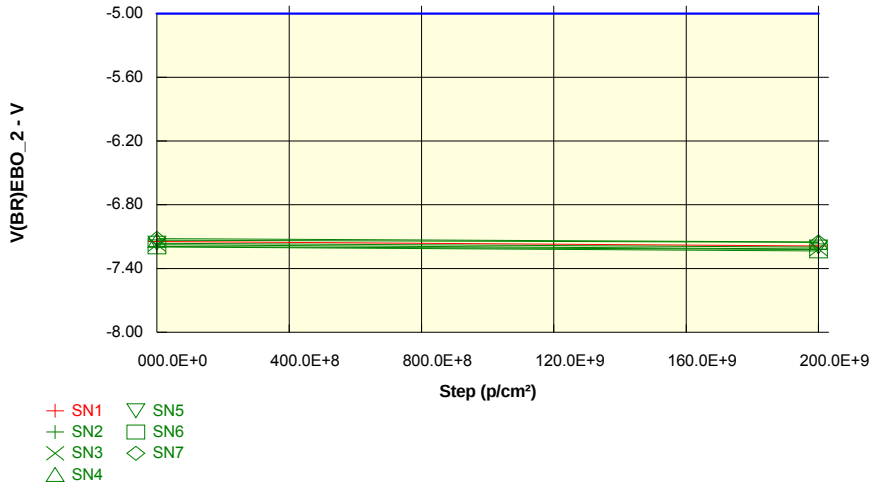
Measurements

V(BR)CEO_2	0 p/cm²	2e+11 p/cm²
SN1_REF	-106.40	-104.33
OFF samples		
SN2	-103.68	-104.78
SN3	-109.76	-111.16
SN4	-104.64	-106.05
SN5	-105.01	-106.42
SN6	-107.04	-108.54
SN7	-107.98	-109.52
Statistics		
Min	-109.76	-111.16
Max	-103.68	-104.78
Average	-106.35	-107.75
Sigma	2.10	2.19

Drift Calculation

V(BR)CEO_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-1.10E+00
SN3	-	-1.40E+00
SN4	-	-1.40E+00
SN5	-	-1.41E+00
SN6	-	-1.51E+00
SN7	-	-1.55E+00
Average	-	-1.40E+00
Sigma	-	142.09E-03

Test conditions : PROTONS
Parameter : Emitter-Base breakdown voltage : V(BR)EBO_2
Ie = -10µA
Unit : V
Spec Limit Max : -5.00
Spec limits are represented in bold lines on the graphic.



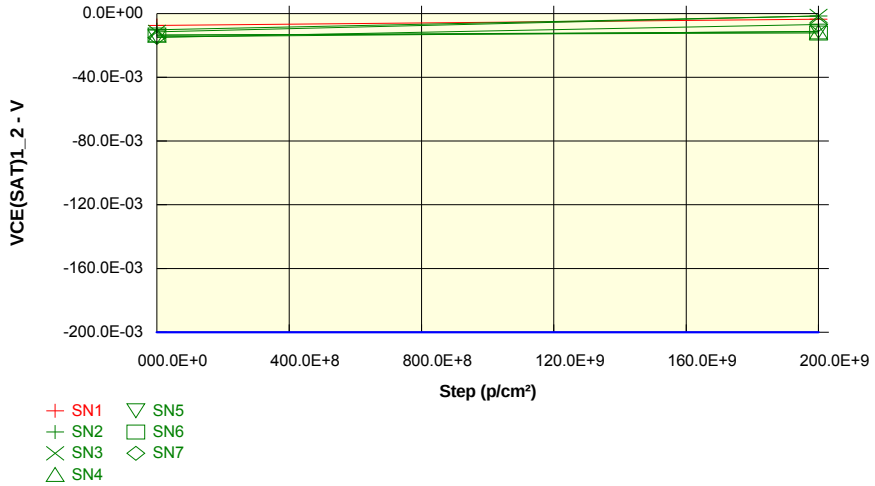
Measurements

V(BR)EBO_2	0 p/cm²	2e+11 p/cm²
SN1_REF	-7.15	-7.19
OFF samples		
SN2	-7.19	-7.22
SN3	-7.18	-7.22
SN4	-7.13	-7.15
SN5	-7.16	-7.20
SN6	-7.20	-7.23
SN7	-7.12	-7.15
Statistics		
Min	-7.20	-7.23
Max	-7.12	-7.15
Average	-7.16	-7.20
Sigma	0.03	0.03

Drift Calculation

V(BR)EBO_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-28.40E-03
SN3	-	-41.20E-03
SN4	-	-18.80E-03
SN5	-	-36.80E-03
SN6	-	-38.00E-03
SN7	-	-32.40E-03
Average	-	-32.60E-03
Sigma	-	7.40E-03

Test conditions : PROTONS
Parameter : Collector-Emitter saturation voltage : VCE(SAT)1_2
Ic = -100µA ; Ib = -10µA
Unit : V
Spec Limit Min : -200.0E-03
Spec limits are represented in bold lines on the graphic.



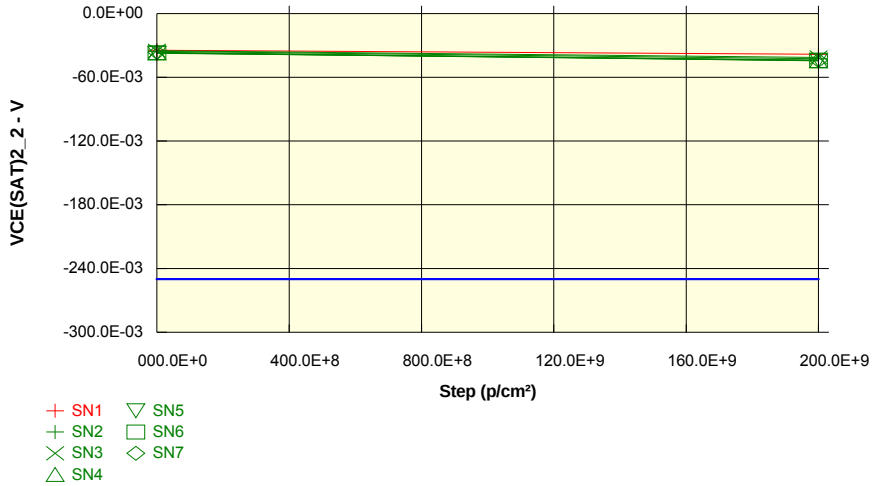
Measurements

VCE(SAT)1_2	0 p/cm²	2e+11 p/cm²
SN1_REF	-7.4E-03	-3.5E-03
OFF samples		
SN2	-10.1E-03	-1.5E-03
SN3	-11.5E-03	-1.5E-03
SN4	-13.5E-03	-11.5E-03
SN5	-14.6E-03	-11.1E-03
SN6	-13.4E-03	-12.2E-03
SN7	-14.9E-03	-6.8E-03
Statistics		
Min	-14.9E-03	-12.2E-03
Max	-10.1E-03	-1.5E-03
Average	-13.0E-03	-7.4E-03
Sigma	1.7E-03	4.5E-03

Drift Calculation

VCE(SAT)1_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	8.64E-03
SN3	-	10.00E-03
SN4	-	2.04E-03
SN5	-	3.52E-03
SN6	-	1.28E-03
SN7	-	8.04E-03
Average	-	5.59E-03
Sigma	-	3.42E-03

Test conditions : PROTONS
Parameter : Collector-Emitter saturation voltage : VCE(SAT)2_2
Ic = -1mA ; Ib = -100µA
Unit : V
Spec Limit Min : -250.0E-03
Spec limits are represented in bold lines on the graphic.



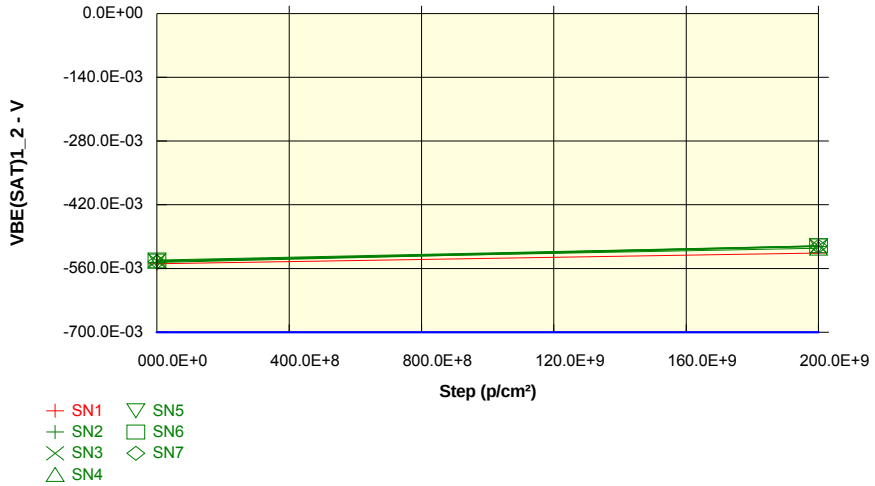
Measurements

VCE(SAT)2_2	0 p/cm²	2e+11 p/cm²
SN1_REF	-34.5E-03	-38.2E-03
OFF samples		
SN2	-35.5E-03	-42.6E-03
SN3	-34.9E-03	-41.3E-03
SN4	-37.0E-03	-44.4E-03
SN5	-37.3E-03	-43.8E-03
SN6	-36.9E-03	-44.4E-03
SN7	-36.5E-03	-44.1E-03
Statistics		
Min	-37.3E-03	-44.4E-03
Max	-34.9E-03	-41.3E-03
Average	-36.4E-03	-43.4E-03
Sigma	872.8E-06	1.1E-03

Drift Calculation

VCE(SAT)2_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-7.16E-03
SN3	-	-6.40E-03
SN4	-	-7.36E-03
SN5	-	-6.48E-03
SN6	-	-7.44E-03
SN7	-	-7.60E-03
Average	-	-7.07E-03
Sigma	-	466.71E-06

Test conditions : PROTONS
Parameter : Base-Emitter saturation voltage : VBE(SAT)1_2
Ic = -100µA ; Ib = -10µA
Unit : V
Spec Limit Min : -700.0E-03
Spec limits are represented in bold lines on the graphic.



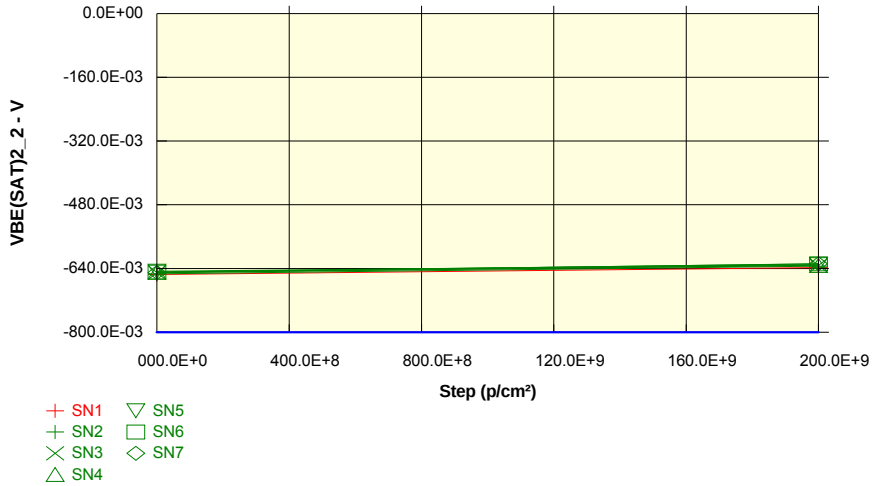
Measurements

VBE(SAT)1_2	0 p/cm²	2e+11 p/cm²
SN1_REF	-549.4E-03	-526.4E-03
OFF samples		
SN2	-546.8E-03	-511.5E-03
SN3	-543.4E-03	-511.0E-03
SN4	-543.4E-03	-515.3E-03
SN5	-541.4E-03	-509.9E-03
SN6	-543.8E-03	-510.2E-03
SN7	-545.1E-03	-511.2E-03
Statistics		
Min	-546.8E-03	-515.3E-03
Max	-541.4E-03	-509.9E-03
Average	-544.0E-03	-511.5E-03
Sigma	1.7E-03	1.8E-03

Drift Calculation

VBE(SAT)1_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	35.28E-03
SN3	-	32.36E-03
SN4	-	28.12E-03
SN5	-	31.52E-03
SN6	-	33.60E-03
SN7	-	33.92E-03
Average	-	32.47E-03
Sigma	-	2.28E-03

Test conditions : PROTONS
Parameter : Base-Emitter saturation voltage : VBE(SAT)2_2
Ic = -1mA ; Ib = -100µA
Unit : V
Spec Limit Min : -800.0E-03
Spec limits are represented in bold lines on the graphic.



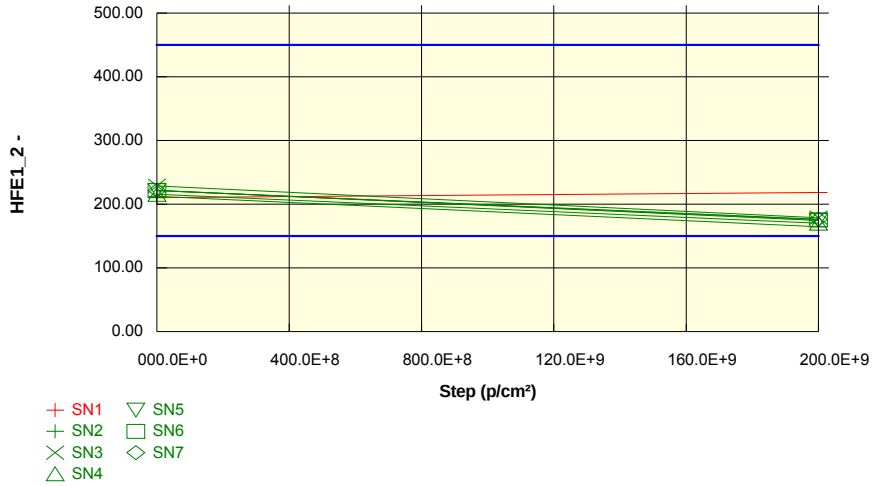
Measurements

VBE(SAT)2_2	0 p/cm²	2e+11 p/cm²
SN1_REF	-655.2E-03	-637.8E-03
OFF samples		
SN2	-653.4E-03	-634.1E-03
SN3	-650.5E-03	-632.1E-03
SN4	-649.1E-03	-632.2E-03
SN5	-647.0E-03	-630.5E-03
SN6	-649.0E-03	-628.4E-03
SN7	-650.2E-03	-628.2E-03
Statistics		
Min	-653.4E-03	-634.1E-03
Max	-647.0E-03	-628.2E-03
Average	-649.9E-03	-630.9E-03
Sigma	1.9E-03	2.2E-03

Drift Calculation

VBE(SAT)2_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	19.32E-03
SN3	-	18.40E-03
SN4	-	16.88E-03
SN5	-	16.52E-03
SN6	-	20.64E-03
SN7	-	22.08E-03
Average	-	18.97E-03
Sigma	-	1.97E-03

Test conditions : PROTONS
Parameter : DC current gain : HFE1_2
Ic = -100µA ; Vce = -5V
Unit :
Spec Limit Min : 150.00
Spec Limit Max : 450.00
Spec limits are represented in bold lines on the graphic.



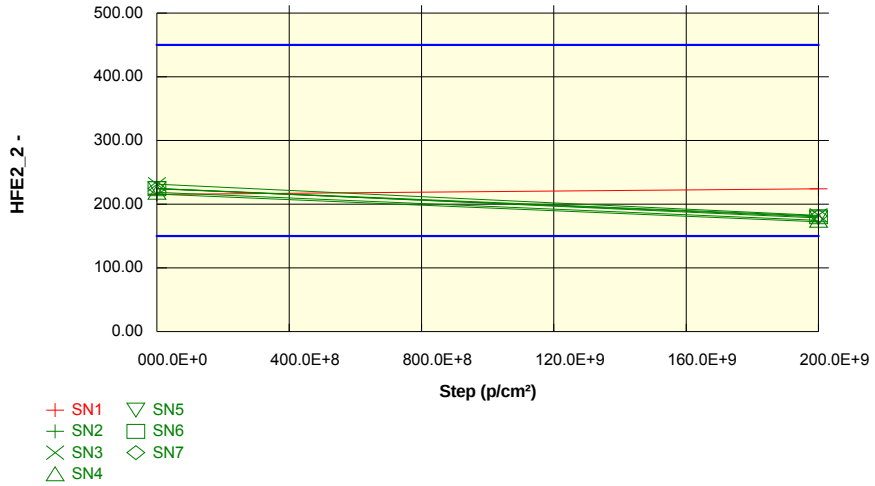
Measurements

HFE1_2	0 p/cm²	2e+11 p/cm²
SN1_REF	210.37	218.37
OFF samples		
SN2	212.43	164.77
SN3	228.68	178.69
SN4	215.61	170.27
SN5	221.71	174.52
SN6	221.25	175.69
SN7	221.66	176.50
Statistics		
Min	212.43	164.77
Max	228.68	178.69
Average	220.22	173.40
Sigma	5.15	4.63

Drift Calculation

HFE1_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	1.36E-03
SN3	-	1.22E-03
SN4	-	1.24E-03
SN5	-	1.22E-03
SN6	-	1.17E-03
SN7	-	1.15E-03
Average	-	1.23E-03
Sigma	-	66.57E-06

Test conditions : PROTONS
Parameter : DC current gain : HFE2_2
Ic = -500µA ; Vce = -5V
Unit :
Spec Limit Min : 150.00
Spec Limit Max : 450.00
Spec limits are represented in bold lines on the graphic.



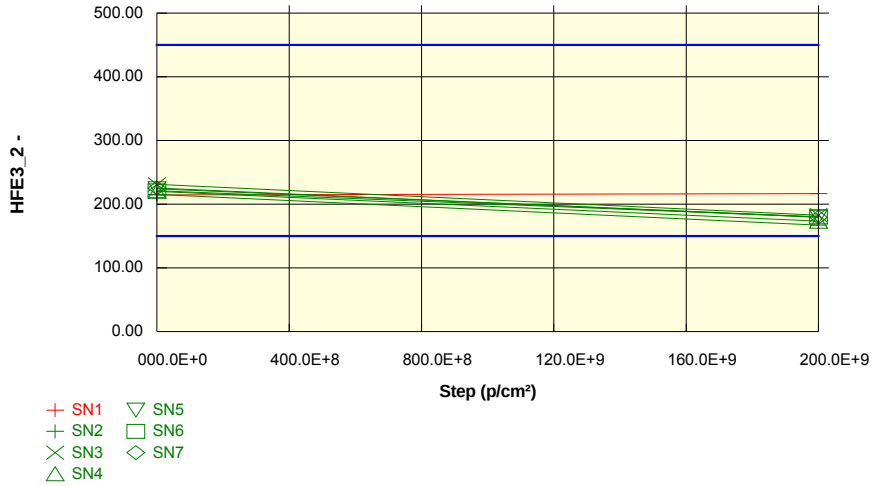
Measurements

HFE2_2	0 p/cm²	2e+11 p/cm²
SN1_REF	215.26	224.04
OFF samples		
SN2	215.90	172.31
SN3	231.42	182.54
SN4	218.80	174.87
SN5	224.73	178.59
SN6	224.26	180.22
SN7	224.75	181.42
Statistics		
Min	215.90	172.31
Max	231.42	182.54
Average	223.31	178.32
Sigma	4.93	3.63

Drift Calculation

HFE2_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	1.17E-03
SN3	-	1.16E-03
SN4	-	1.15E-03
SN5	-	1.15E-03
SN6	-	1.09E-03
SN7	-	1.06E-03
Average	-	1.13E-03
Sigma	-	39.50E-06

Test conditions : PROTONS
Parameter : DC current gain : HFE3_2
Ic = -1mA ; Vce = -5V
Unit :
Spec Limit Min : 150.00
Spec Limit Max : 450.00
Spec limits are represented in bold lines on the graphic.



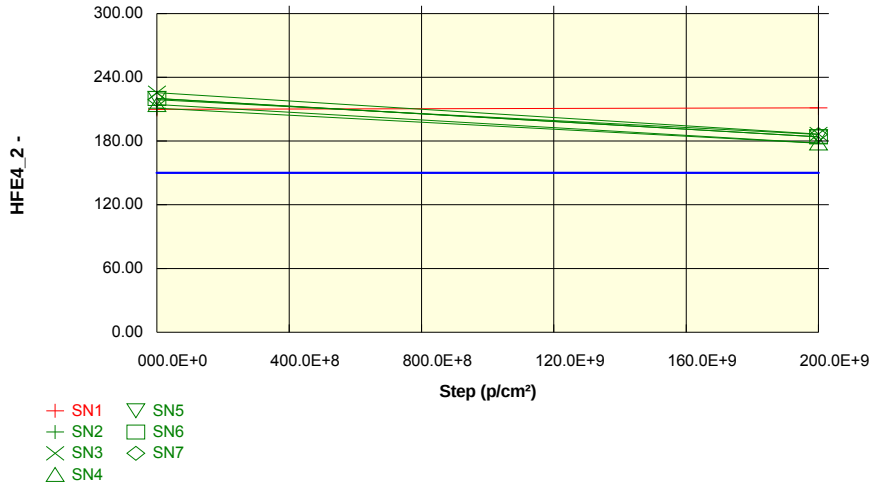
Measurements

HFE3_2	0 p/cm²	2e+11 p/cm²
SN1_REF	214.55	216.65
OFF samples		
SN2	215.35	166.93
SN3	231.11	182.68
SN4	220.11	173.41
SN5	224.17	180.13
SN6	221.12	179.92
SN7	225.28	179.43
Statistics		
Min	215.35	166.93
Max	231.11	182.68
Average	222.86	177.09
Sigma	4.88	5.34

Drift Calculation

HFE3_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	1.35E-03
SN3	-	1.15E-03
SN4	-	1.22E-03
SN5	-	1.09E-03
SN6	-	1.04E-03
SN7	-	1.13E-03
Average	-	1.16E-03
Sigma	-	100.12E-06

Test conditions : PROTONS
Parameter : DC current gain : HFE4_2
Ic = -5mA ; Vce = -5V
Unit :
Spec Limit Min : 150.00
Spec limits are represented in bold lines on the graphic.



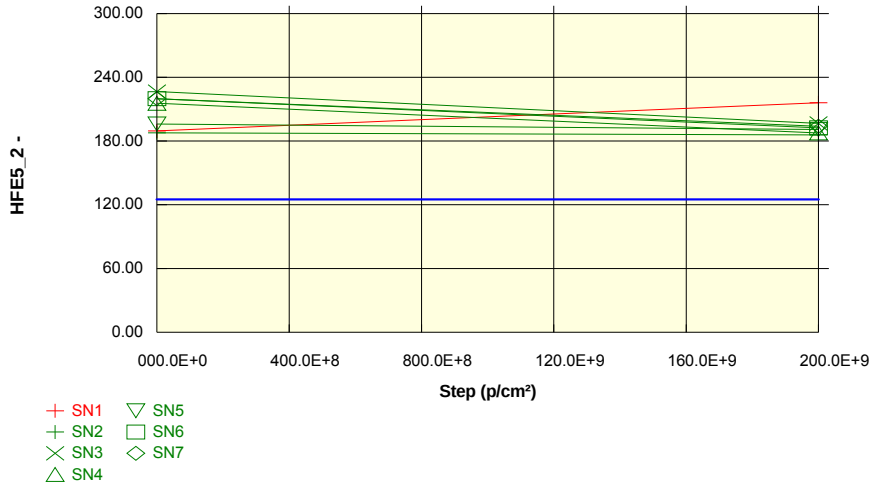
Measurements

HFE4_2	0 p/cm²	2e+11 p/cm²
SN1_REF	209.90	211.23
OFF samples		
SN2	210.97	177.95
SN3	225.56	186.51
SN4	214.29	178.15
SN5	220.16	183.91
SN6	220.08	183.91
SN7	218.95	186.29
Statistics		
Min	210.97	177.95
Max	225.56	186.51
Average	218.34	182.79
Sigma	4.65	3.50

Drift Calculation

HFE4_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	879.40E-06
SN3	-	928.14E-06
SN4	-	946.78E-06
SN5	-	895.36E-06
SN6	-	893.66E-06
SN7	-	800.77E-06
Average	-	890.68E-06
Sigma	-	46.18E-06

Test conditions : PROTONS
Parameter : DC current gain : HFE5_2
Ic = -10mA ; Vce = -5V
Unit :
Spec Limit Min : 125.00
Spec limits are represented in bold lines on the graphic.



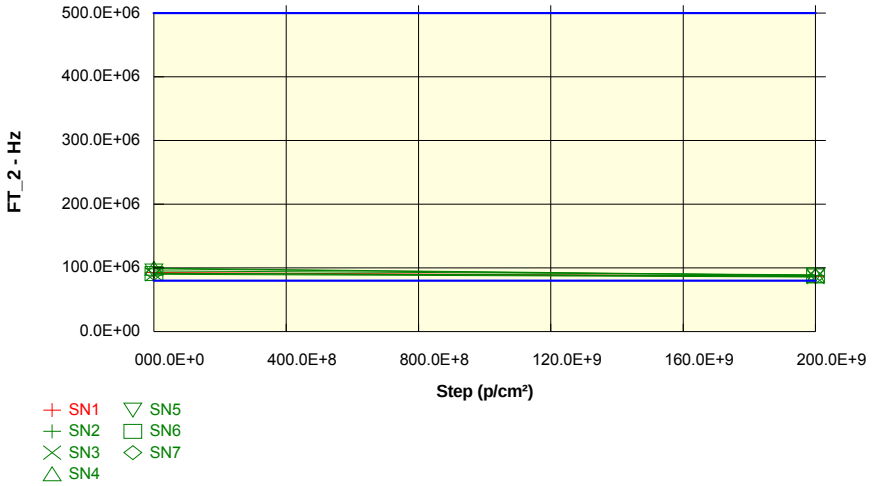
Measurements

HFE5_2	0 p/cm²	2e+11 p/cm²
SN1_REF	189.52	215.98
OFF samples		
SN2	187.77	185.65
SN3	226.55	196.55
SN4	215.60	187.64
SN5	196.02	190.92
SN6	219.83	192.37
SN7	219.89	194.02
Statistics		
Min	187.77	185.65
Max	226.55	196.55
Average	210.94	191.19
Sigma	14.05	3.68

Drift Calculation

HFE5_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	60.66E-06
SN3	-	673.74E-06
SN4	-	691.18E-06
SN5	-	136.13E-06
SN6	-	649.40E-06
SN7	-	606.24E-06
Average	-	469.56E-06
Sigma	-	264.64E-06

Test conditions : PROTONS
Parameter : Current gain bandwidth product : FT_2
Vce = -5V ; Ic = -1mA
Unit : Hz
Spec Limit Min : 80.0E+06
Spec Limit Max : 500.0E+06
Spec limits are represented in bold lines on the graphic.



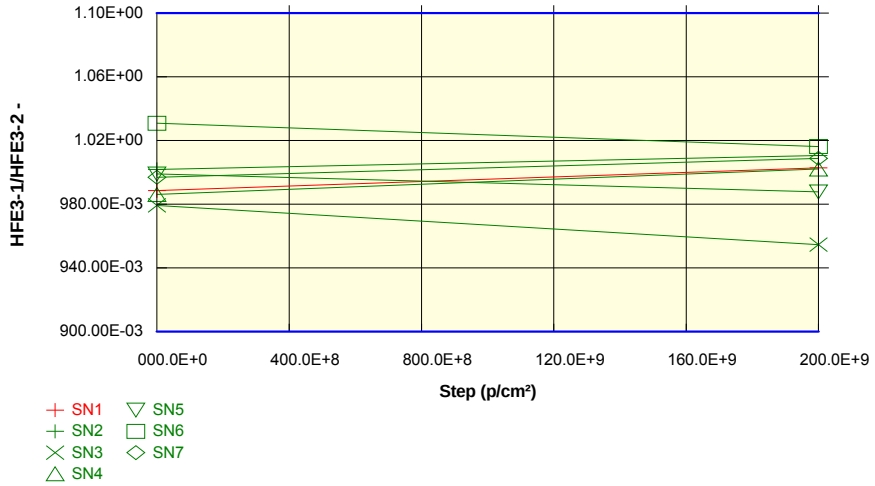
Measurements

FT_2	0 p/cm²	2e+11 p/cm²
SN1_REF	92.8E+06	86.9E+06
OFF samples		
SN2	98.7E+06	88.0E+06
SN3	90.0E+06	85.6E+06
SN4	99.4E+06	88.1E+06
SN5	95.2E+06	89.2E+06
SN6	91.1E+06	87.3E+06
SN7	91.6E+06	86.1E+06
Statistics		
Min	90.0E+06	85.6E+06
Max	99.4E+06	89.2E+06
Average	94.3E+06	87.4E+06
Sigma	3.7E+06	1.2E+06

Drift Calculation

FT_2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-10.65E+06
SN3	-	-4.39E+06
SN4	-	-11.26E+06
SN5	-	-6.02E+06
SN6	-	-3.84E+06
SN7	-	-5.53E+06
Average	-	-6.95E+06
Sigma	-	2.93E+06

Test conditions : PROTONS
Parameter : Forward current transfer ratio comparison : HFE3-1/HFE3-2
Ic = -1mA ; Vce = -5V
Unit :
Spec Limit Min : 900.00E-03
Spec Limit Max : 1.10E+00
Spec limits are represented in bold lines on the graphic.



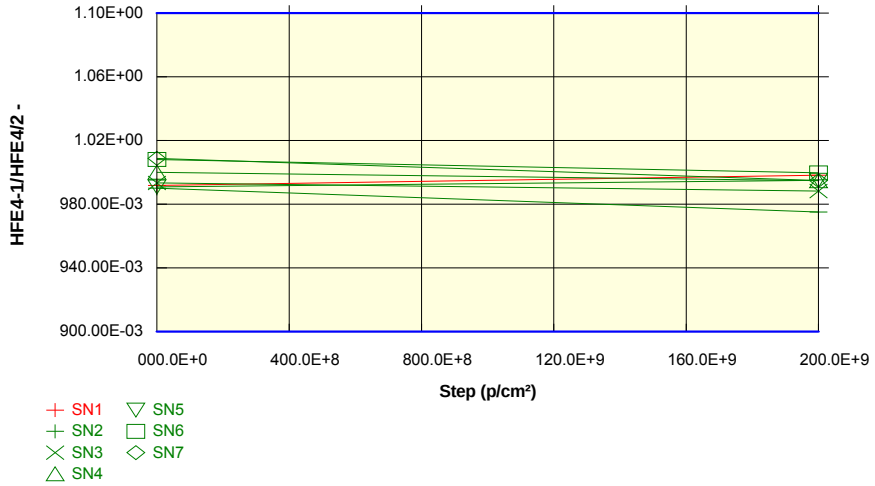
Measurements

HFE3-1/HFE3-2	0 p/cm²	2e+11 p/cm²
SN1_REF	988.46E-03	1.00E+00
OFF samples		
SN2	1.00E+00	1.01E+00
SN3	979.26E-03	954.65E-03
SN4	986.08E-03	1.00E+00
SN5	998.99E-03	987.70E-03
SN6	1.03E+00	1.02E+00
SN7	996.89E-03	1.01E+00
Statistics		
Min	979.26E-03	954.65E-03
Max	1.03E+00	1.02E+00
Average	998.97E-03	996.67E-03
Sigma	16.24E-03	20.81E-03

Drift Calculation

HFE3-1/HFE3-2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	-8.71E-03
SN3	-	26.32E-03
SN4	-	-16.22E-03
SN5	-	11.44E-03
SN6	-	13.91E-03
SN7	-	-11.75E-03
Average	-	2.50E-03
Sigma	-	15.58E-03

Test conditions : PROTONS
Parameter : Forward current transfer ratio comparison : HFE4-1/HFE4/2
Ic = -5mA ; Vce = -5V
Unit :
Spec Limit Min : 900.00E-03
Spec Limit Max : 1.10E+00
Spec limits are represented in bold lines on the graphic.



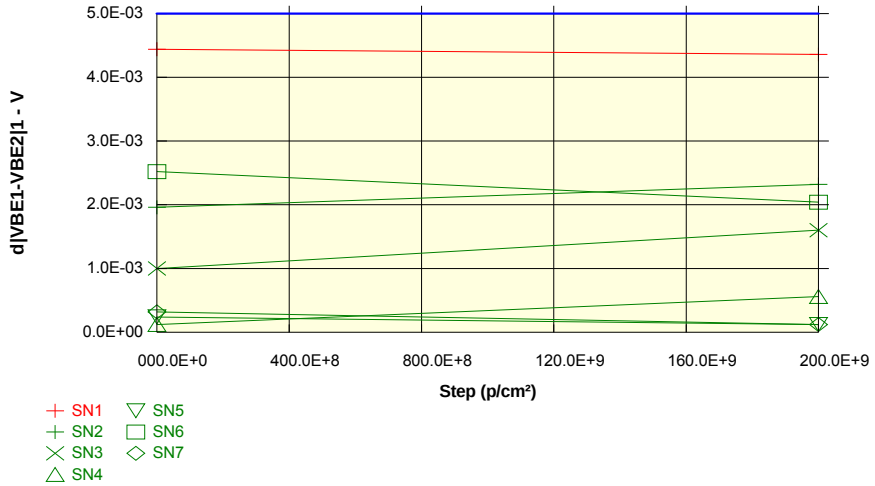
Measurements

HFE4-1/HFE4/2	0 p/cm²	2e+11 p/cm²
SN1_REF	991.69E-03	998.21E-03
OFF samples		
SN2	989.96E-03	975.10E-03
SN3	993.35E-03	988.23E-03
SN4	1.00E+00	994.71E-03
SN5	990.81E-03	995.01E-03
SN6	1.01E+00	999.68E-03
SN7	1.01E+00	994.85E-03
Statistics		
Min	989.96E-03	975.10E-03
Max	1.01E+00	999.68E-03
Average	998.50E-03	991.26E-03
Sigma	7.72E-03	7.96E-03

Drift Calculation

HFE4-1/HFE4/2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	15.39E-03
SN3	-	5.21E-03
SN4	-	5.38E-03
SN5	-	-4.26E-03
SN6	-	8.29E-03
SN7	-	13.88E-03
Average	-	7.32E-03
Sigma	-	6.47E-03

Test conditions : PROTONS
Parameter : Base-Emitter voltage differential : d|VBE1-VBE2|1
Ic = -1mA ; Vce = -5V
Unit : V
Spec Limit Max : 5.0E-03
Spec limits are represented in bold lines on the graphic.



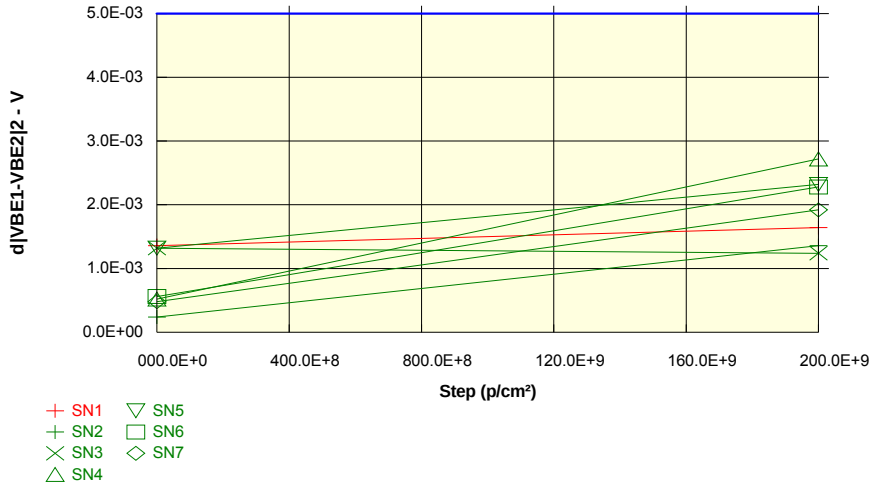
Measurements

d|VBE1-VBE2|1	0 p/cm²	2e+11 p/cm²
SN1_REF	4.4E-03	4.4E-03
OFF samples		
SN2	2.0E-03	2.3E-03
SN3	1000.0E-06	1.6E-03
SN4	120.0E-06	559.9E-06
SN5	240.0E-06	120.0E-06
SN6	2.5E-03	2.0E-03
SN7	320.0E-06	120.0E-06
Statistics		
Min	120.0E-06	120.0E-06
Max	2.5E-03	2.3E-03
Average	1.0E-03	1.1E-03
Sigma	916.7E-06	897.2E-06

Drift Calculation

d|VBE1-VBE2|1	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	360.03E-06
SN3	-	600.04E-06
SN4	-	439.90E-06
SN5	-	-119.92E-06
SN6	-	-480.04E-06
SN7	-	-199.97E-06
Average	-	100.01E-06
Sigma	-	389.01E-06

Test conditions : PROTONS
Parameter : Base-Emitter voltage differential : d|VBE1-VBE2|2
Ic = -5mA ; Vce = -5V
Unit : V
Spec Limit Max : 5.0E-03
Spec limits are represented in bold lines on the graphic.



Measurements

d|VBE1-VBE2|2	0 p/cm²	2e+11 p/cm²
SN1_REF	1.4E-03	1.6E-03
OFF samples		
SN2	240.0E-06	1.4E-03
SN3	1.3E-03	1.2E-03
SN4	520.0E-06	2.7E-03
SN5	1.3E-03	2.3E-03
SN6	560.0E-06	2.3E-03
SN7	480.1E-06	1.9E-03
Statistics		
Min	240.0E-06	1.2E-03
Max	1.3E-03	2.7E-03
Average	740.0E-06	2.0E-03
Sigma	422.5E-06	530.5E-06

Drift Calculation

d|VBE1-VBE2|2	0 p/cm²	2e+11 p/cm²
OFF samples		
SN2	-	1.12E-03
SN3	-	-79.99E-06
SN4	-	2.20E-03
SN5	-	999.99E-06
SN6	-	1.72E-03
SN7	-	1.44E-03
Average	-	1.23E-03
Sigma	-	707.83E-06