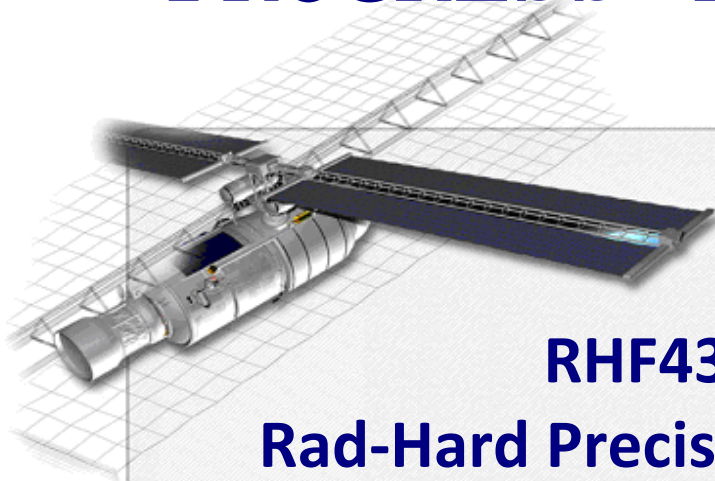




TOTAL IONIZING DOSE PROGRESS TEST REPORT



RHF43BK-01V Rad-Hard Precision Single Opamp DC1407A From STMicroelectronics

TRAD/TE/RHF43BK-01V/1407A/ESA/MV/1410		Labège, May 22 nd , 2015
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Revision: 0	Creation of the document	
Revision: 1	Addition of table of test parameters	
To: ESA Mr Christian POIVEY	Project/Program: Ref:	

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1. INTRODUCTION

This progress report describes the testing and characterization of the **RHF43BK-01V** manufactured by **STMicroelectronics**. Testing began on February 09th, 2015 and is expected to end on March 31th, 2015.

2. PART INFORMATION

Identification

Part designation	RHF43-01V
Manufacturer	STMicroelectronics
Part function	Rad-Hard Precision Single Opamp

Procurement information

Package	FP-8
Date Code	1407A
LOT ID No	33324005ZS / 33324005ZZ
Number of tested parts	22 irradiated samples (Biased OFF) + 1 reference sample from an other lot

3. COMMENTS

The irradiation test on **22 RHF43BK-01V**, a **Rad-Hard Precision Single Opamp** from **STMicroelectronics** is using gamma rays from Cobalt 60 source, at low dose rate (210 rad(Si)/h).

For an easier result visualisation, measurements and graphs have been separated per lot.

The black curve with no drift is the DUT reference (not irradiated).

4. TEST PARAMETERS

Parameters	Symbols	Test conditions
Ta=25°C, load to Vcc/2 unless otherwise specified		
Input Offset Voltage	Vio1	Vcc=+16V; Vicm=Vcc/2
	Vio2	Vcc=+3V; Vicm=Vcc/2
Positive Input Bias Current	Iib+1	Vcc=+16V; Vicm=Vcc/2
	Iib+2	Vcc=+4V; Vicm=Vcc/2
Negative Input Bias Current	Iib-1	Vcc=+16V; Vicm=Vcc/2
	Iib-2	Vcc=+4V; Vicm=Vcc/2
Input Offset Current	Iio1	Vcc=+16V; Vicm=Vcc/2
	Iio2	Vcc=+4V; Vicm=Vcc/2
Voltage Gain	AVD1	Vcc=+16V; RL=1kΩ; 0.5V<Vout<15.5V; Vicm=Vcc/2
	AVD2	Vcc=+3V; RL=1kΩ; 0.5V<Vout<2.5V; Vicm=Vcc/2
Power Supply Current	Icc1	Vcc=+16V; no load
	Icc2	Vcc=+3V; no load
Common Mode Rejection Ratio	CMR1	Vcc=+16V; 0V<Vicm<16V
	CMR2	Vcc=+3V; 0V<Vicm<3V
High Level Output Voltage	VOH1	Vcc=+16V; RL=1kΩ
	VOH2	Vcc=+16V; RL=10kΩ
	VOH3	Vcc=+3V; RL=1kΩ
	VOH4	Vcc=+3V; RL=10kΩ
Low Level Output Voltage	VOL1	Vcc=+16V; RL=1kΩ
	VOL2	Vcc=+16V; RL=10kΩ
	VOL3	Vcc=+3V; RL=1kΩ
	VOL4	Vcc=+3V; RL=10kΩ
Slew Rate	SR+1	Vcc=+16V; RL=1kΩ
	SR-1	Vcc=+16V; RL=1kΩ
	SR+2	Vcc=+3V; RL=1kΩ
	SR-2	Vcc=+3V; RL=1kΩ

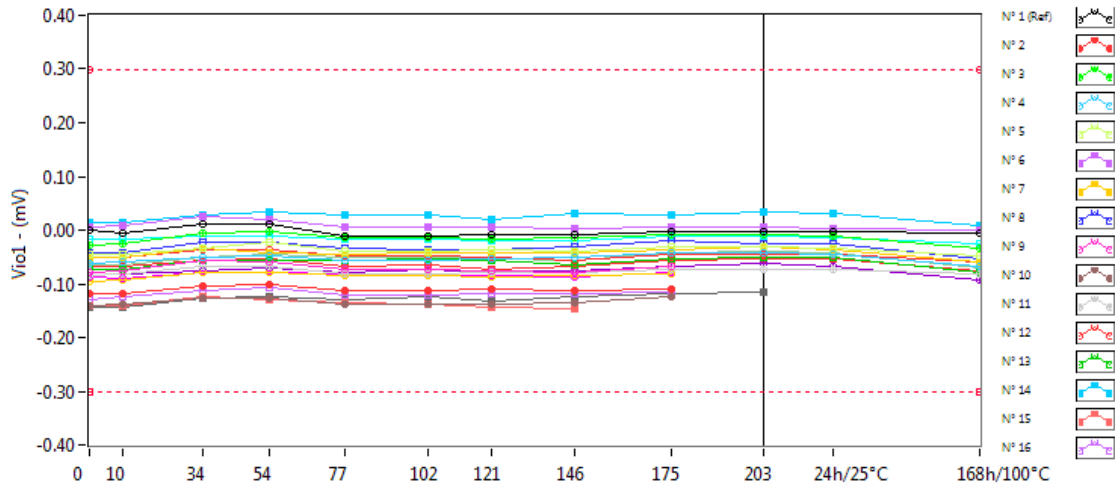
5. APPENDIX 1 MEASURED PARAMETERS

Contents :

1 Vio1	.....	A-2
2 Vio2	.....	A-3
3 lb+1	.....	A-4
4 lb+2	.....	A-5
5 lb-1	.....	A-6
6 lb-2	.....	A-7
7 lio1	.....	A-8
8 lio2	.....	A-9
9 AVD1	.....	A-10
10 AVD2	.....	A-11
11 lcc1	.....	A-12
12 lcc2	.....	A-13
13 CMR1	.....	A-14
14 CMR2	.....	A-15
15 VOH1	.....	A-16
16 VOH2	.....	A-17
17 VOH3	.....	A-18
18 VOH4	.....	A-19
19 VOL1	.....	A-20
20 VOL2	.....	A-21
21 VOL3	.....	A-22
22 VOL4	.....	A-23
23 SR+1	.....	A-24
24 SR-1	.....	A-25
25 SR+2	.....	A-26
26 SR-2	.....	A-27

1. Vio1

Ta=25°C; load to Vcc/2; Vcc=+16V; Vicm=Vcc/2

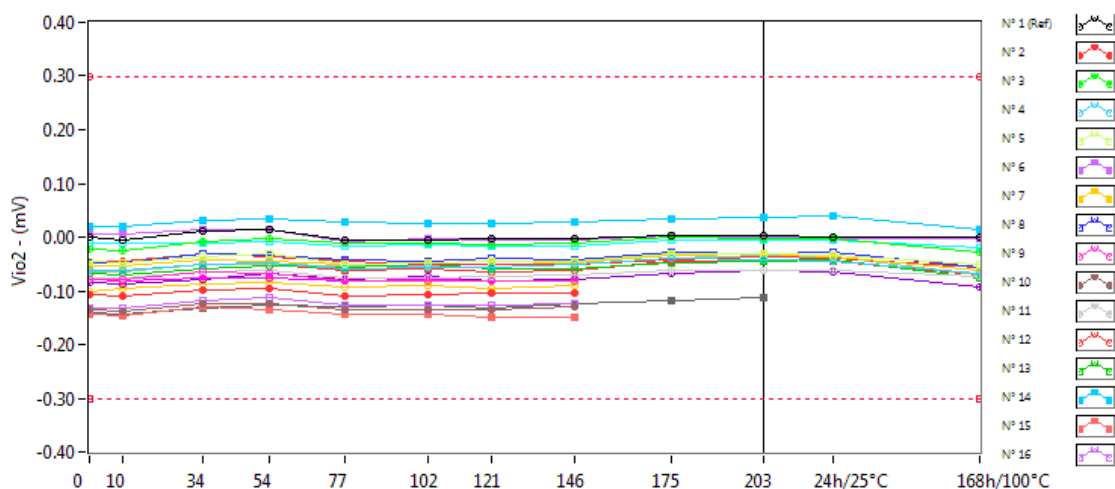


Vio1 . (mV) Min = -0.3 Max = 0.3

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.000	-0.006	0.010	0.011	-0.011	-0.012	-0.009	-0.009	-0.002	-0.002	-0.004	-0.005
N° 2	-0.117	-0.118	-0.104	-0.102	-0.114	-0.113	-0.111	-0.113	-0.111	Not Measurable	Not Measurable	Not Measurable
N° 3	-0.028	-0.025	-0.007	-0.002	-0.013	-0.014	-0.017	-0.014	-0.008	-0.008	-0.011	-0.034
N° 4	-0.062	-0.060	-0.050	-0.048	-0.056	-0.057	-0.053	-0.051	-0.043	-0.042	-0.046	-0.069
N° 5	-0.044	-0.045	-0.033	-0.023	-0.040	-0.039	-0.038	-0.040	-0.031	-0.031	-0.033	-0.049
N° 6	0.007	0.009	0.024	0.021	0.005	0.006	0.006	0.003	0.006	0.006	0.003	0.001
N° 7	-0.052	-0.051	-0.035	-0.043	-0.046	-0.042	-0.041	-0.041	-0.036	-0.032	-0.036	-0.059
N° 8	-0.043	-0.041	-0.022	-0.023	-0.033	-0.036	-0.036	-0.032	-0.021	-0.025	-0.024	-0.053
N° 9	-0.078	-0.076	-0.056	-0.058	-0.072	-0.074	-0.077	-0.080	-0.069	Not Measurable	Not Measurable	Not Measurable
N° 10	-0.140	-0.139	-0.126	-0.126	-0.137	-0.138	-0.138	-0.136	-0.124	Not Measurable	Not Measurable	Not Measurable
N° 11	-0.085	-0.083	-0.067	-0.069	-0.083	-0.081	-0.079	-0.079	-0.072	-0.074	-0.074	-0.083
N° 12	-0.052	-0.050	-0.036	-0.037	-0.049	-0.048	-0.051	-0.055	-0.046	-0.044	-0.046	-0.060
N° 13	-0.072	-0.072	-0.055	-0.057	-0.055	-0.053	-0.056	-0.064	-0.053	-0.051	-0.052	-0.079
N° 14	0.014	0.014	0.029	0.034	0.027	0.027	0.021	0.030	0.029	0.035	0.031	0.009
N° 15	-0.141	-0.142	-0.123	-0.130	-0.136	-0.139	-0.145	-0.146	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	-0.129	-0.125	-0.112	-0.107	-0.121	-0.120	-0.119	-0.119	-0.116	Not Measurable	Not Measurable	Not Measurable
N° 17	-0.097	-0.092	-0.080	-0.078	-0.085	-0.085	-0.088	-0.084	-0.082	Not Measurable	Not Measurable	Not Measurable
N° 18	-0.088	-0.089	-0.080	-0.080	-0.081	-0.085	-0.085	-0.086	-0.079	Not Measurable	Not Measurable	Not Measurable
N° 19	-0.084	-0.083	-0.075	-0.070	-0.080	-0.072	-0.080	-0.075	-0.068	-0.063	-0.067	-0.093
N° 20	-0.065	-0.064	-0.050	-0.046	-0.052	-0.051	-0.053	-0.055	-0.043	-0.040	-0.041	-0.071
N° 21	-0.018	-0.018	-0.010	-0.012	-0.016	-0.017	-0.021	-0.020	-0.012	-0.012	-0.014	-0.026
N° 22	-0.068	-0.068	-0.057	-0.053	-0.068	-0.065	-0.073	-0.069	-0.056	-0.053	-0.053	-0.075
N° 23	-0.143	-0.145	-0.128	-0.123	-0.130	-0.125	-0.131	-0.125	-0.119	-0.116	Not Measurable	Not Measurable

2. Vio2

Ta=25°C; load to Vcc/2; Vcc=+3V; Vicm=Vcc/2

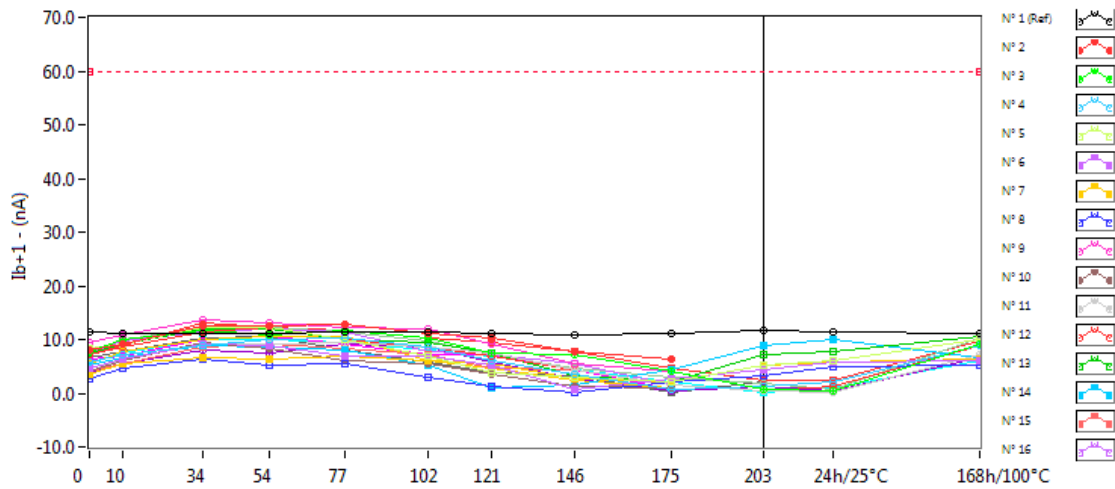


Vio2 . (mV) Min = -0.3 Max = 0.3

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.001	-0.005	0.012	0.013	-0.007	-0.007	-0.004	-0.004	0.003	0.002	0.001	0.000
N° 2	-0.107	-0.110	-0.098	-0.097	-0.109	-0.108	-0.103	-0.105	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	-0.023	-0.024	-0.008	-0.003	-0.012	-0.011	-0.013	-0.012	-0.001	-0.002	-0.004	-0.029
N° 4	-0.061	-0.061	-0.050	-0.047	-0.059	-0.055	-0.055	-0.052	-0.040	-0.043	-0.045	-0.068
N° 5	-0.044	-0.047	-0.036	-0.030	-0.050	-0.048	-0.044	-0.045	-0.031	-0.030	-0.034	-0.051
N° 6	0.005	0.006	0.014	0.013	-0.008	-0.004	-0.006	-0.007	0.002	0.001	-0.004	-0.003
N° 7	-0.053	-0.053	-0.042	-0.045	-0.050	-0.047	-0.044	-0.047	-0.033	-0.032	-0.037	-0.061
N° 8	-0.047	-0.047	-0.032	-0.033	-0.042	-0.044	-0.040	-0.041	-0.029	-0.031	-0.028	-0.057
N° 9	-0.078	-0.078	-0.064	-0.068	-0.081	-0.081	-0.082	-0.081	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	-0.136	-0.137	-0.124	-0.124	-0.134	-0.136	-0.135	-0.130	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	-0.077	-0.076	-0.064	-0.063	-0.077	-0.076	-0.072	-0.070	-0.062	-0.062	-0.062	-0.074
N° 12	-0.045	-0.044	-0.032	-0.036	-0.045	-0.050	-0.050	-0.051	-0.043	-0.038	-0.039	-0.055
N° 13	-0.068	-0.070	-0.058	-0.053	-0.057	-0.051	-0.058	-0.059	-0.048	-0.044	-0.043	-0.076
N° 14	0.020	0.020	0.030	0.034	0.027	0.026	0.025	0.029	0.034	0.038	0.039	0.015
N° 15	-0.144	-0.146	-0.129	-0.134	-0.144	-0.145	-0.148	-0.148	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	-0.133	-0.131	-0.117	-0.114	-0.127	-0.126	-0.127	-0.124	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	-0.100	-0.097	-0.086	-0.084	-0.093	-0.090	-0.095	-0.090	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	-0.078	-0.082	-0.076	-0.076	-0.081	-0.080	-0.081	-0.083	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	-0.084	-0.086	-0.078	-0.069	-0.080	-0.074	-0.083	-0.080	-0.068	-0.063	-0.064	-0.093
N° 20	-0.064	-0.065	-0.050	-0.051	-0.053	-0.053	-0.055	-0.052	-0.040	-0.035	-0.037	-0.070
N° 21	-0.010	-0.012	-0.010	-0.009	-0.016	-0.014	-0.018	-0.018	-0.007	-0.006	-0.007	-0.020
N° 22	-0.063	-0.065	-0.052	-0.050	-0.061	-0.060	-0.066	-0.061	-0.046	-0.043	-0.044	-0.070
N° 23	-0.141	-0.144	-0.132	-0.126	-0.130	-0.128	-0.131	-0.124	-0.118	-0.113	Not Measurable	Not Measurable

3. Ib+1

Ta=25°C; load to Vcc/2; Vcc=+16V; Vicm=Vcc/2

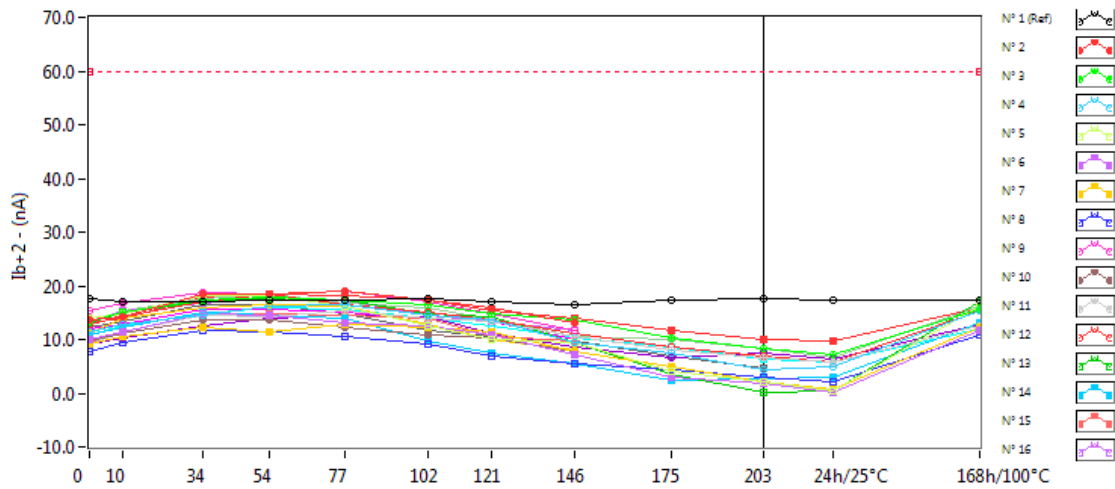


Ib+1 . (nA) Max = 60.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	11.431	10.987	11.023	11.252	11.381	11.476	10.992	10.908	11.163	11.566	11.281	11.266
N° 2	8.033	9.179	12.635	12.576	12.905	11.104	10.254	7.637	6.379	Not Measurable	Not Measurable	Not Measurable
N° 3	7.650	10.005	11.718	10.941	11.629	10.161	7.447	7.077	4.074	0.828	0.436	9.146
N° 4	5.688	7.296	8.847	9.961	10.231	8.557	5.987	3.650	0.667	1.179	2.163	8.955
N° 5	8.217	9.043	12.171	12.114	9.935	6.906	3.868	3.023	2.131	5.265	5.954	10.075
N° 6	4.745	6.380	9.050	8.961	7.036	6.924	5.237	0.809	2.757	4.417	5.824	5.973
N° 7	3.661	5.480	6.587	6.229	6.761	6.147	5.601	2.782	2.194	5.347	5.824	6.380
N° 8	2.658	4.665	6.396	5.340	5.426	3.090	1.138	0.125	1.994	3.328	4.844	5.072
N° 9	9.389	10.936	13.645	12.989	12.362	12.086	9.280	5.569	4.077	Not Measurable	Not Measurable	Not Measurable
N° 10	4.196	6.046	9.417	8.217	6.132	5.604	3.550	1.282	0.903	Not Measurable	Not Measurable	Not Measurable
N° 11	3.991	6.345	9.023	9.063	9.552	8.466	7.376	4.464	1.517	0.429	0.027	7.130
N° 12	7.230	8.592	11.512	12.231	10.099	8.507	6.905	4.291	1.434	0.318	1.308	8.999
N° 13	7.513	9.025	11.960	11.970	9.996	9.456	7.547	3.204	2.182	7.052	7.629	10.550
N° 14	5.151	6.635	8.869	8.530	7.981	5.350	1.010	1.473	4.242	8.958	9.877	6.699
N° 15	4.090	5.506	8.635	9.276	8.306	7.182	4.691	4.350	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	7.396	9.651	11.460	12.098	11.458	7.710	7.096	5.555	1.681	Not Measurable	Not Measurable	Not Measurable
N° 17	5.611	7.887	10.074	10.661	10.443	5.930	4.736	2.392	0.922	Not Measurable	Not Measurable	Not Measurable
N° 18	6.430	7.010	10.062	10.521	9.173	7.262	7.063	4.461	0.762	Not Measurable	Not Measurable	Not Measurable
N° 19	3.728	5.577	7.953	7.363	9.104	8.522	5.646	2.699	0.318	1.207	0.370	6.617
N° 20	7.700	9.910	11.907	12.186	11.544	9.666	7.220	4.704	3.050	1.950	0.710	10.148
N° 21	5.411	7.577	9.944	9.929	9.455	8.030	6.998	4.424	2.160	0.200	0.909	6.136
N° 22	7.471	8.784	13.032	12.279	11.643	10.279	9.315	7.769	4.666	2.487	2.488	9.662
N° 23	6.512	7.847	10.313	10.461	8.142	5.644	3.704	3.117	0.052	2.056	Not Measurable	Not Measurable

4. Ib+2

Ta=25°C; load to Vcc/2; Vcc=+4V; Vicm=Vcc/2

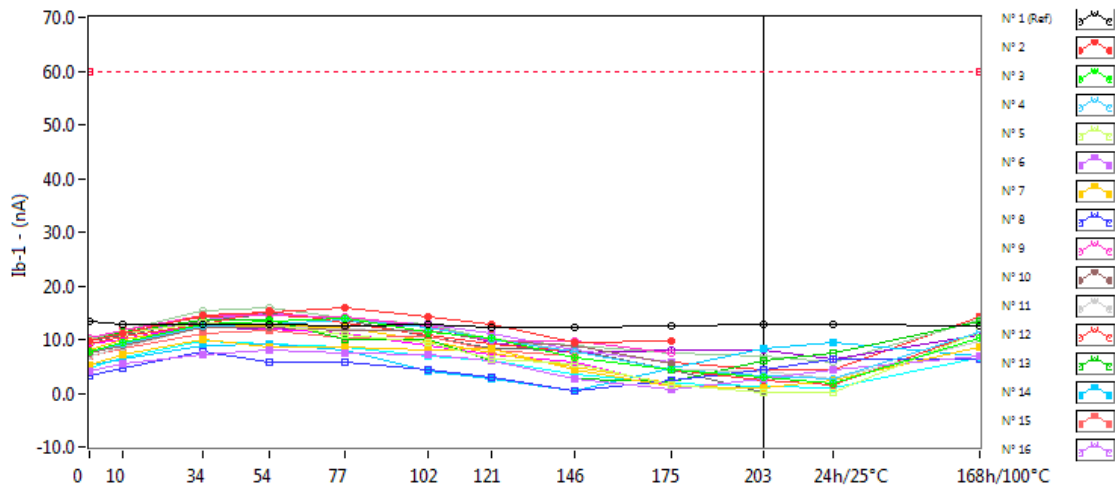


Ib+2 . (nA) Max = 60.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	17.682	17.180	17.003	17.343	17.330	17.634	17.026	16.595	17.235	17.568	17.272	17.214
N° 2	13.664	14.364	18.557	18.552	18.874	17.434	16.026	13.125	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	13.413	15.206	17.266	17.980	17.323	16.508	14.788	13.563	10.355	8.276	7.098	15.651
N° 4	11.285	12.694	14.371	16.117	16.541	14.535	13.552	9.415	7.420	4.414	5.056	15.348
N° 5	13.941	14.769	18.096	18.132	16.313	12.515	9.874	9.388	4.081	2.115	0.453	16.216
N° 6	10.030	11.519	14.671	14.453	13.212	12.525	10.846	7.277	3.051	1.714	0.032	11.704
N° 7	9.145	10.627	12.132	11.373	12.893	12.279	11.424	7.822	4.972	2.033	0.662	12.189
N° 8	7.878	9.566	11.665	11.415	10.451	9.249	6.862	5.562	4.257	3.007	2.107	10.907
N° 9	15.219	16.726	18.686	18.487	19.149	16.967	14.827	11.784	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	9.680	11.042	13.548	13.554	12.276	10.837	10.145	7.872	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	9.155	11.299	14.557	14.366	15.259	13.879	13.278	10.639	7.949	6.664	5.789	12.587
N° 12	12.874	14.159	16.927	18.355	16.601	15.018	13.550	11.168	8.626	6.787	5.800	15.356
N° 13	13.176	14.994	17.152	17.684	17.317	14.864	14.221	9.368	3.619	0.253	0.365	16.963
N° 14	10.798	12.160	14.948	14.634	13.984	9.848	7.428	5.393	2.449	2.713	2.963	13.018
N° 15	9.427	11.278	14.691	14.801	14.407	13.983	10.546	9.677	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	12.981	15.444	16.866	17.826	17.313	14.621	13.389	11.765	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	11.240	13.823	15.851	16.488	16.170	12.803	9.881	8.036	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	12.017	12.687	15.767	15.763	15.077	14.046	13.495	9.966	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	9.167	10.168	12.568	14.071	14.589	14.205	11.199	8.507	6.705	7.432	6.452	12.693
N° 20	13.418	15.428	17.691	18.361	16.745	15.792	13.553	10.626	9.986	8.196	6.644	16.197
N° 21	10.732	12.566	14.661	16.030	15.553	14.017	12.533	10.346	8.723	6.419	5.688	12.100
N° 22	13.199	14.035	17.897	18.327	18.226	17.206	15.220	13.962	11.694	10.120	9.828	15.971
N° 23	12.158	13.245	16.529	16.370	14.768	11.611	10.523	9.831	6.821	4.736	Not Measurable	Not Measurable

5. Ib-1

Ta=25°C; load to Vcc/2; Vcc=+16V; Vicm=Vcc/2



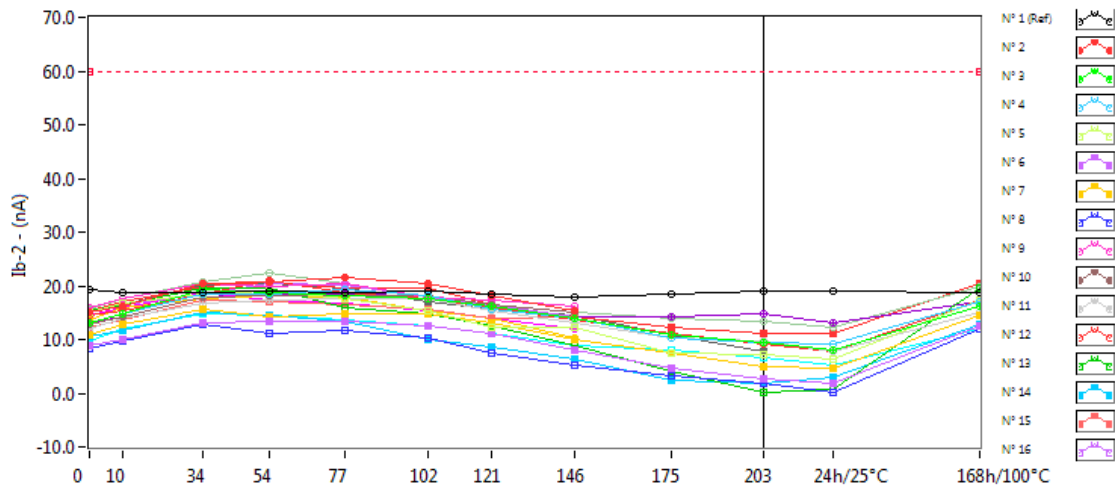
Ib-1 . (nA)

Max = 60.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	13.245	12.732	12.681	12.882	12.603	12.762	12.375	12.120	12.537	12.949	12.756	12.586
N° 2	9.620	10.988	14.644	15.170	15.954	14.351	12.885	9.334	9.831	Not Measurable	Not Measurable	Not Measurable
N° 3	7.773	9.387	12.908	13.286	13.906	11.294	10.254	6.537	4.389	2.973	1.790	10.251
N° 4	7.717	9.144	12.497	12.721	13.586	12.323	10.019	7.831	4.459	3.166	2.706	11.284
N° 5	9.590	11.242	13.159	12.748	10.730	9.379	6.226	5.408	1.595	0.264	0.079	11.462
N° 6	3.946	5.503	7.147	8.085	7.519	7.129	6.143	2.540	0.831	2.553	4.382	6.787
N° 7	5.318	7.124	9.991	8.583	8.606	8.024	8.198	4.232	1.259	0.870	2.318	8.501
N° 8	3.125	4.649	7.776	5.693	5.849	4.239	2.991	0.414	2.293	4.357	6.254	6.407
N° 9	10.157	11.780	14.468	14.459	14.167	12.587	9.804	9.851	7.405	Not Measurable	Not Measurable	Not Measurable
N° 10	7.353	8.765	12.143	12.325	11.605	11.731	9.852	8.901	5.545	Not Measurable	Not Measurable	Not Measurable
N° 11	6.854	8.603	12.173	12.388	11.948	11.489	10.230	7.731	4.480	4.138	2.571	9.795
N° 12	9.111	10.459	12.699	15.485	13.148	10.926	9.291	7.702	4.442	2.296	1.409	11.405
N° 13	9.706	11.269	13.710	13.624	9.965	10.033	6.188	2.540	2.194	6.085	7.369	13.375
N° 14	5.297	6.438	8.826	9.168	8.032	4.003	2.551	0.315	4.682	8.338	9.376	6.964
N° 15	6.855	8.213	11.005	11.603	10.168	10.680	7.989	6.769	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	9.707	11.129	13.756	15.023	13.755	12.814	11.135	8.017	5.886	Not Measurable	Not Measurable	Not Measurable
N° 17	8.030	9.981	12.239	12.626	12.177	9.614	7.425	5.054	1.718	Not Measurable	Not Measurable	Not Measurable
N° 18	9.092	10.123	12.716	11.842	11.079	8.787	7.170	5.823	1.268	Not Measurable	Not Measurable	Not Measurable
N° 19	7.653	8.783	12.210	11.836	12.512	12.669	9.551	7.464	8.046	8.119	6.424	10.866
N° 20	10.123	11.579	15.306	16.019	13.948	12.898	9.954	8.758	7.376	6.941	5.686	13.533
N° 21	4.734	6.523	9.771	9.284	8.615	6.934	6.181	3.536	1.860	1.151	1.073	6.638
N° 22	9.738	11.598	14.155	14.490	13.931	12.871	11.090	7.965	5.803	4.476	4.371	14.127
N° 23	9.612	10.777	13.290	14.922	13.745	10.595	8.401	8.027	4.418	0.138	Not Measurable	Not Measurable

6. Ib-2

Ta=25°C; load to Vcc/2; Vcc=+4V; Vicm=Vcc/2



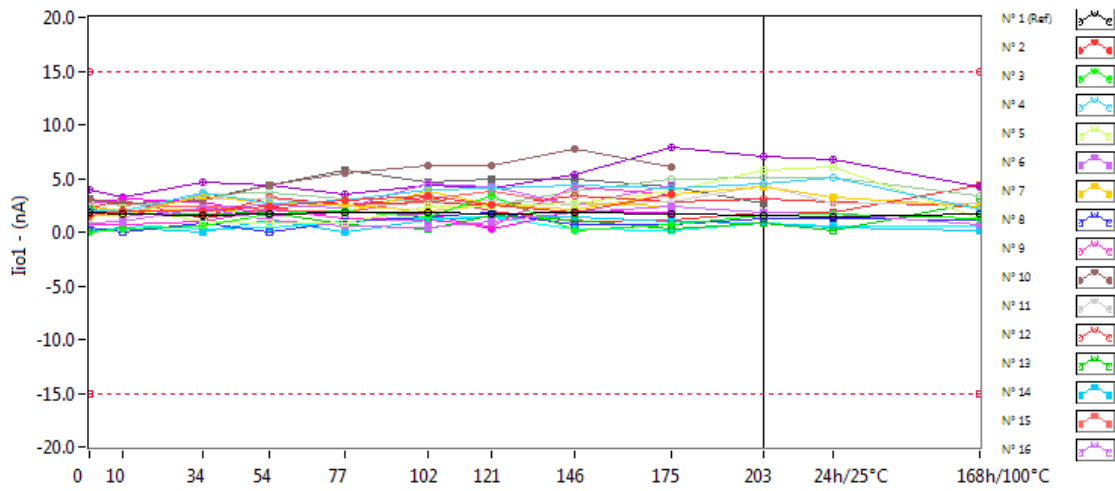
Ib-2 . (nA)

Max = 60.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	19.336	18.860	18.741	19.036	18.718	18.961	18.441	17.979	18.578	19.144	18.911	18.727
N° 2	14.960	16.261	20.455	20.823	21.436	20.538	18.172	15.213	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	13.196	14.697	19.262	18.766	18.205	17.606	16.313	14.069	10.904	9.333	8.098	16.336
N° 4	13.113	14.665	18.504	18.421	19.157	18.187	15.606	13.847	10.271	9.416	9.225	17.062
N° 5	15.200	16.666	18.423	19.052	17.482	15.234	12.142	12.367	7.575	7.147	6.446	17.317
N° 6	8.897	10.093	13.046	13.463	13.431	12.500	11.158	8.154	4.731	2.763	1.783	12.407
N° 7	10.715	12.782	15.519	14.254	14.893	14.908	13.210	10.102	7.533	5.020	4.698	14.613
N° 8	8.245	9.854	12.765	11.153	11.586	10.404	7.382	5.250	3.282	1.751	0.121	12.001
N° 9	15.802	17.711	20.345	19.783	20.473	17.856	17.221	16.197	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	12.822	14.313	17.874	18.299	18.111	18.289	16.498	15.122	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	11.861	13.899	16.874	17.349	17.477	17.690	15.403	13.006	10.296	9.846	7.827	15.176
N° 12	14.474	15.411	18.413	20.983	18.649	17.720	16.005	13.773	11.220	9.176	7.767	17.412
N° 13	15.258	16.444	19.681	19.545	15.848	14.894	12.640	8.917	4.190	0.048	0.802	19.668
N° 14	10.609	11.558	15.148	14.509	13.264	10.122	8.548	6.261	2.262	1.907	2.929	12.854
N° 15	12.251	13.657	17.313	17.161	16.588	15.632	13.951	14.157	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	15.319	16.541	18.470	20.310	20.236	17.818	16.461	14.353	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	13.669	15.778	17.695	18.248	18.021	15.318	13.991	10.343	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	14.459	15.783	18.629	17.379	16.751	15.263	14.075	11.900	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	13.203	14.244	18.010	18.570	18.337	18.171	15.935	14.338	14.337	14.836	12.996	16.966
N° 20	15.763	17.639	20.748	22.436	20.333	17.757	16.565	15.040	13.919	13.411	12.243	19.790
N° 21	9.599	12.057	14.662	14.451	13.664	12.482	11.123	8.920	8.013	6.556	5.127	12.100
N° 22	15.365	16.964	19.861	20.815	19.588	19.676	16.567	14.341	12.247	10.993	11.150	20.292
N° 23	15.197	16.378	20.253	20.306	19.582	16.995	15.600	14.643	10.870	7.835	Not Measurable	Not Measurable

7. Iio1

Ta=25°C; load to Vcc/2; Vcc=+16V; Vicm=Vcc/2

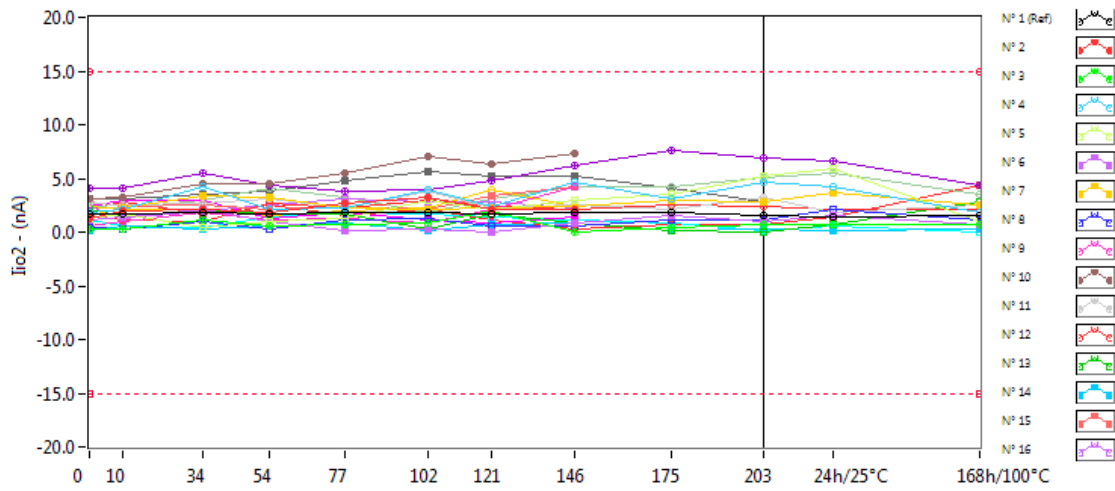


Iio1 . (nA) Min = -15.0 Max = 15.0

Iio1 . (nA)	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.800	1.747	1.566	1.647	1.841	1.768	1.712	1.794	1.727	1.573	1.442	1.625
N° 2	1.547	1.909	1.967	2.362	2.894	3.443	2.555	1.840	3.480	Not Measurable	Not Measurable	Not Measurable
N° 3	0.063	0.295	0.571	1.753	2.017	1.457	3.336	0.172	0.733	1.592	1.687	1.270
N° 4	1.917	2.034	3.703	2.659	2.908	3.990	4.142	4.350	4.137	4.447	5.131	2.118
N° 5	1.332	2.310	0.992	0.862	0.816	2.394	2.336	2.700	3.751	5.773	6.063	1.336
N° 6	0.846	0.942	2.235	1.096	0.500	0.475	0.994	1.797	2.325	1.807	1.629	0.774
N° 7	1.603	1.506	3.324	2.630	2.492	1.929	2.599	2.178	3.481	4.267	3.233	2.365
N° 8	0.431	0.061	0.876	0.067	0.972	1.402	1.846	0.725	0.678	1.251	1.302	1.175
N° 9	0.725	0.652	1.011	2.082	1.295	1.155	0.579	4.273	3.579	Not Measurable	Not Measurable	Not Measurable
N° 10	3.119	2.726	2.978	4.327	5.554	6.219	6.159	7.728	6.009	Not Measurable	Not Measurable	Not Measurable
N° 11	2.812	2.433	3.168	3.059	2.328	2.706	2.952	2.586	2.874	4.297	2.675	2.679
N° 12	1.832	2.036	1.339	3.248	2.581	2.846	2.411	3.311	2.815	3.045	2.817	2.330
N° 13	2.154	1.661	1.686	1.859	0.730	0.240	1.606	1.102	0.240	0.800	0.102	2.809
N° 14	0.088	0.439	0.059	1.164	0.024	1.059	1.470	1.413	0.955	0.891	0.476	0.189
N° 15	2.723	2.501	2.401	2.123	1.774	3.095	3.791	2.482	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	2.274	1.343	2.285	2.555	2.229	4.496	4.295	2.542	4.373	Not Measurable	Not Measurable	Not Measurable
N° 17	2.380	1.997	2.127	1.757	1.830	3.779	2.545	2.665	2.368	Not Measurable	Not Measurable	Not Measurable
N° 18	2.630	3.031	2.817	1.589	1.800	1.704	0.240	2.008	1.864	Not Measurable	Not Measurable	Not Measurable
N° 19	3.889	3.309	4.693	4.311	3.555	4.299	4.102	5.284	7.913	7.103	6.709	4.272
N° 20	2.374	1.706	3.525	3.709	3.063	2.998	2.536	3.747	4.861	5.021	5.044	3.422
N° 21	0.711	0.665	0.325	0.438	0.929	1.203	1.355	0.338	0.135	0.834	0.493	0.517
N° 22	2.239	2.976	1.202	2.186	2.468	3.171	1.979	0.965	1.084	1.836	1.774	4.354
N° 23	3.064	2.546	3.153	4.417	5.782	4.712	4.888	4.865	4.268	2.610	Not Measurable	Not Measurable

8. Iio2

Ta=25°C; load to Vcc/2; Vcc=+4V; Vicm=Vcc/2

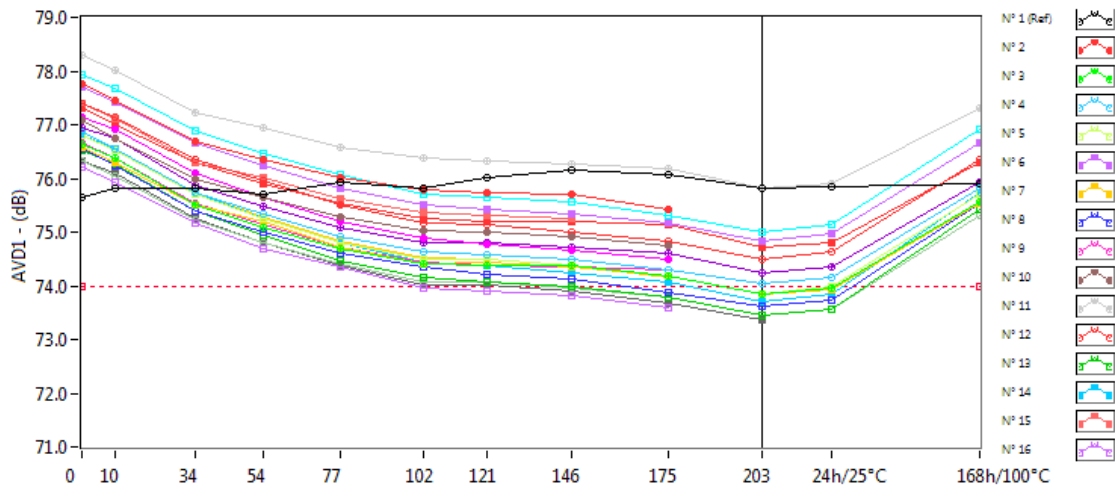


Iio2 . (nA) Min = -15.0 Max = 15.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.759	1.730	1.783	1.671	1.803	1.828	1.721	1.793	1.790	1.580	1.400	1.575
N° 2	1.300	1.917	2.171	1.780	2.669	3.197	2.057	2.156	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	0.233	0.329	1.137	0.606	0.696	0.880	2.002	0.070	0.408	0.744	0.761	0.716
N° 4	1.835	2.047	4.288	2.154	2.233	3.921	2.459	4.625	3.071	4.632	4.175	1.862
N° 5	1.253	1.737	0.436	0.956	1.249	2.934	2.069	2.933	3.574	5.267	5.870	1.030
N° 6	1.125	1.352	2.083	1.011	0.142	0.269	0.040	0.860	1.518	1.034	1.559	0.640
N° 7	1.550	2.221	3.346	3.180	2.207	2.127	2.270	2.397	2.956	2.818	3.612	2.467
N° 8	0.359	0.253	1.023	0.221	1.142	1.299	0.622	0.507	1.113	1.128	2.179	1.124
N° 9	0.548	0.950	1.838	1.089	1.303	0.915	2.114	4.181	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	3.148	3.300	4.479	4.461	5.553	7.073	6.400	7.367	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	2.687	2.603	2.702	3.118	2.214	3.740	2.231	2.603	2.169	3.298	1.791	2.566
N° 12	1.597	1.140	1.002	2.744	2.208	2.926	2.408	2.183	2.517	2.415	2.087	2.103
N° 13	2.072	1.410	2.143	1.694	1.633	0.337	1.722	0.838	0.181	0.070	0.744	2.831
N° 14	0.210	0.521	0.333	0.594	0.830	0.138	0.766	0.852	0.079	0.334	0.143	0.231
N° 15	2.852	2.431	2.599	2.175	2.455	2.090	3.338	4.228	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	2.338	1.240	1.919	2.483	3.121	2.768	2.832	2.251	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	2.410	2.143	2.068	1.542	1.956	2.263	3.879	2.402	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	2.455	2.989	3.012	1.201	1.856	1.077	0.907	1.478	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	4.015	4.063	5.466	4.386	3.845	3.992	4.841	6.170	7.593	6.943	6.582	4.330
N° 20	2.334	2.239	2.901	4.039	3.268	1.888	3.078	4.228	4.245	5.078	5.555	3.570
N° 21	1.140	0.576	0.367	1.477	1.893	1.722	1.403	1.078	0.821	0.081	0.631	0.062
N° 22	2.163	2.876	1.677	2.523	1.527	2.174	1.165	0.334	0.660	0.691	1.376	4.334
N° 23	3.030	3.141	3.514	3.825	4.763	5.627	5.195	5.155	4.043	2.824	Not Measurable	Not Measurable

9. AVD1

Ta=25°C; load to Vcc/2; Vcc=+16V; Vicm=Vcc/2; RI=1kOhms; 0.5V<Vout<15.5V



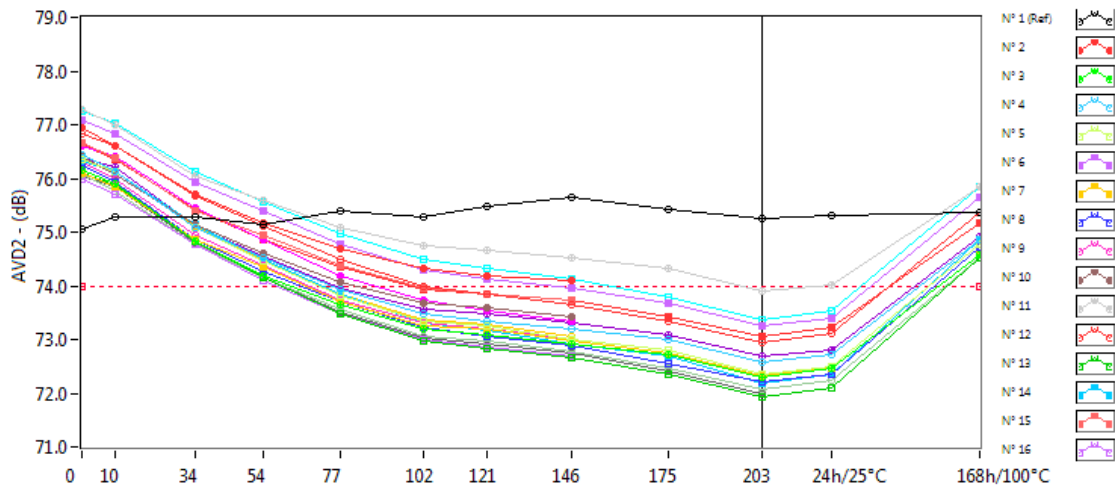
AVD1 . (dB)

Min = 74.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	75.6350	75.8040	75.8070	75.7060	75.9200	75.8150	76.0100	76.1410	76.0840	75.8080	75.8480	75.9010
N° 2	77.7690	77.4410	76.6910	76.3510	76.0260	75.7750	75.7230	75.6960	75.4230	Not Measurable	Not Measurable	Not Measurable
N° 3	76.6210	76.3740	75.5070	75.0750	74.6910	74.4030	74.3710	74.3680	74.1840	73.8360	73.9480	75.5620
N° 4	76.8590	76.5520	75.7340	75.3520	74.9210	74.6390	74.5670	74.5040	74.2970	74.0500	74.1590	75.8100
N° 5	76.7920	76.5340	75.6990	75.2590	74.8150	74.4950	74.4880	74.3870	74.1960	73.8560	73.9750	75.7070
N° 6	77.7060	77.4290	76.6580	76.2480	75.8240	75.5010	75.4340	75.3440	75.1760	74.8410	74.9730	76.6710
N° 7	76.5640	76.3080	75.4970	75.2060	74.7280	74.4210	74.4330	74.3550	74.1820	73.8320	73.9350	75.5290
N° 8	76.5540	76.2460	75.3960	74.9900	74.5980	74.3630	74.1990	74.1130	73.8840	73.6300	73.7440	75.5400
N° 9	76.6650	76.3770	75.5320	75.1540	74.7080	74.4260	74.3740	74.3600	74.2930	Not Measurable	Not Measurable	Not Measurable
N° 10	77.0740	76.7590	75.9990	75.6410	75.2730	75.0200	75.0010	74.9220	74.7600	Not Measurable	Not Measurable	Not Measurable
N° 11	78.2980	78.0040	77.2370	76.9340	76.5890	76.3710	76.3270	76.2660	76.1880	75.8080	75.8980	77.2990
N° 12	77.4070	77.1450	76.3660	75.9450	75.5150	75.1790	75.1280	75.0060	74.8350	74.5030	74.6400	76.3640
N° 13	76.5150	76.2600	75.3980	74.9310	74.4640	74.1470	74.0680	73.9910	73.8010	73.4410	73.5730	75.4120
N° 14	76.7940	76.5440	75.7320	75.2630	74.7910	74.4310	74.3690	74.2410	74.0680	73.7120	73.8540	75.7390
N° 15	77.3840	77.1210	76.3030	76.0010	75.6200	75.3580	75.3060	75.2610	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	76.2050	75.9160	75.1600	74.6950	74.3460	73.9480	73.8900	73.8140	73.5820	Not Measurable	Not Measurable	Not Measurable
N° 17	76.7910	76.5470	75.7270	75.2810	74.8400	74.5220	74.5040	74.3810	74.1550	Not Measurable	Not Measurable	Not Measurable
N° 18	77.1320	76.9250	76.0950	75.6550	75.1990	74.8790	74.7820	74.6680	74.4820	Not Measurable	Not Measurable	Not Measurable
N° 19	76.9500	76.7440	75.8710	75.4800	75.0880	74.8100	74.8040	74.7280	74.6020	74.2450	74.3420	75.9370
N° 20	76.3370	76.0330	75.2350	74.8140	74.4160	74.0780	74.0600	73.9510	73.7770	73.4390	73.5600	75.3000
N° 21	77.9250	77.6730	76.8800	76.4720	76.0700	75.7050	75.6560	75.5520	75.3220	75.0010	75.1390	76.9020
N° 22	77.3050	77.0090	76.2840	75.8960	75.5420	75.2630	75.2080	75.1980	75.1290	74.7130	74.8130	76.3030
N° 23	76.3200	76.0850	75.2540	74.8060	74.3700	74.0150	74.0230	73.8950	73.6900	73.3710	Not Measurable	Not Measurable

10. AVD2

Ta=25°C; load to Vcc/2; Vcc=+3V; Vicm=Vcc/2; RI=1kOhms; 0.5V<Vout<2.5V

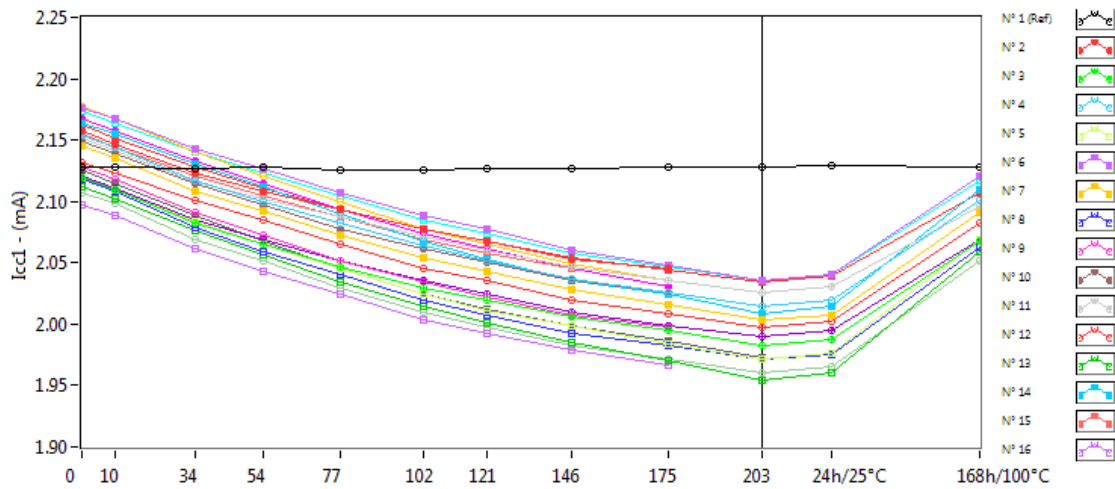


AVD2 . (dB) Min = 74.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	75.06	75.28	75.28	75.15	75.39	75.27	75.49	75.64	75.42	75.26	75.32	75.37
N° 2	76.95	76.62	75.69	75.16	74.68	74.32	74.18	74.09	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	76.14	75.91	74.82	74.19	73.64	73.19	73.09	72.92	72.72	72.30	72.46	74.59
N° 4	76.42	76.12	75.09	74.53	73.92	73.48	73.33	73.19	73.00	72.57	72.71	74.87
N° 5	76.36	76.12	75.10	74.46	73.81	73.34	73.25	73.01	72.80	72.35	72.48	74.78
N° 6	77.08	76.82	75.94	75.39	74.77	74.30	74.13	73.97	73.67	73.25	73.41	75.66
N° 7	76.11	75.85	74.85	74.36	73.72	73.26	73.21	72.98	72.74	72.33	72.47	74.57
N° 8	76.23	75.93	74.87	74.27	73.69	73.22	73.05	72.88	72.56	72.22	72.36	74.72
N° 9	76.28	76.00	74.94	74.38	73.73	73.30	73.19	73.00	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	76.40	76.08	75.14	74.60	74.06	73.69	73.58	73.42	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	77.28	77.00	76.04	75.59	75.09	74.76	74.65	74.52	74.33	73.89	74.01	75.84
N° 12	76.83	76.60	75.68	75.11	74.48	73.98	73.85	73.64	73.33	72.94	73.11	75.37
N° 13	76.11	75.89	74.82	74.16	73.49	72.98	72.82	72.67	72.35	71.93	72.09	74.51
N° 14	76.34	76.11	75.15	74.50	73.84	73.31	73.16	72.91	72.68	72.17	72.35	74.85
N° 15	76.66	76.39	75.38	74.93	74.37	73.96	73.84	73.72	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	76.00	75.70	74.76	74.10	73.47	73.00	72.85	72.70	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	76.35	76.11	75.12	74.49	73.84	73.38	73.28	73.06	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	76.59	76.41	75.46	74.85	74.19	73.74	73.53	73.34	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	76.39	76.20	75.12	74.55	73.96	73.55	73.48	73.31	73.09	72.68	72.80	74.91
N° 20	76.06	75.76	74.77	74.16	73.56	73.05	72.97	72.78	72.46	72.06	72.24	74.53
N° 21	77.26	77.04	76.13	75.56	74.97	74.49	74.32	74.13	73.79	73.38	73.54	75.85
N° 22	76.64	76.35	75.43	74.87	74.35	73.94	73.83	73.72	73.43	73.06	73.22	75.17
N° 23	76.06	75.84	74.81	74.16	73.52	73.03	72.91	72.74	72.40	72.00	Not Measurable	Not Measurable

11. Icc1

Ta=25°C; load to Vcc/2; Vcc=+16V; no load



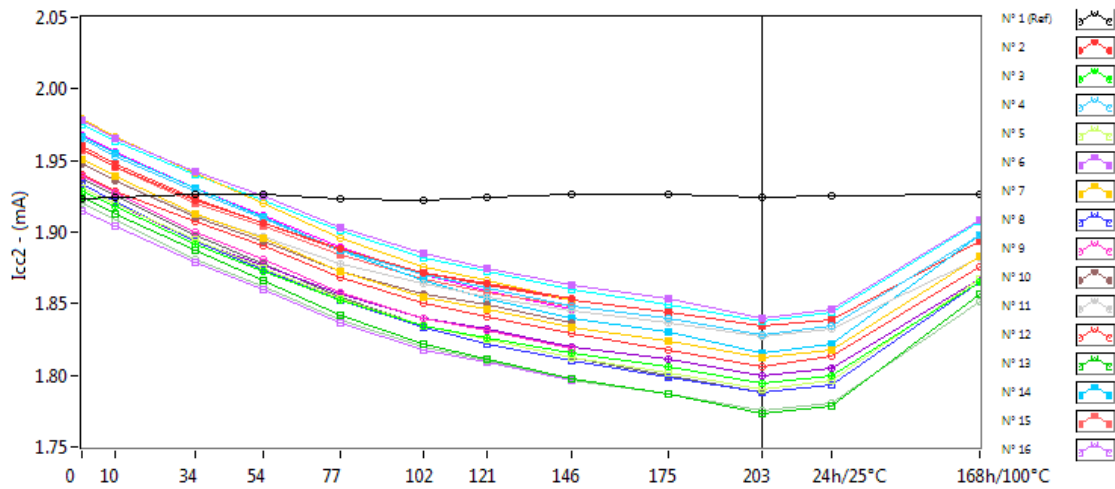
Icc1 . (mA)

Max = 2.9

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	2.128	2.128	2.127	2.128	2.126	2.126	2.127	2.127	2.128	2.128	2.129	2.128
N° 2	2.157	2.147	2.123	2.108	2.093	2.077	2.067	2.053	2.045	Not Measurable	Not Measurable	Not Measurable
N° 3	2.119	2.110	2.083	2.065	2.047	2.029	2.019	2.006	1.995	1.983	1.987	2.068
N° 4	2.154	2.144	2.117	2.100	2.082	2.064	2.051	2.037	2.026	2.015	2.020	2.101
N° 5	2.119	2.109	2.084	2.065	2.045	2.024	2.011	1.998	1.984	1.972	1.977	2.069
N° 6	2.176	2.167	2.143	2.127	2.107	2.089	2.077	2.060	2.048	2.036	2.041	2.121
N° 7	2.145	2.135	2.108	2.092	2.072	2.054	2.043	2.028	2.016	2.003	2.007	2.091
N° 8	2.118	2.108	2.079	2.059	2.041	2.020	2.007	1.993	1.982	1.971	1.975	2.063
N° 9	2.128	2.118	2.091	2.072	2.052	2.034	2.022	2.007	1.997	Not Measurable	Not Measurable	Not Measurable
N° 10	2.149	2.139	2.114	2.097	2.078	2.061	2.050	2.036	2.026	Not Measurable	Not Measurable	Not Measurable
N° 11	2.151	2.142	2.116	2.102	2.087	2.071	2.060	2.047	2.036	2.026	2.031	2.096
N° 12	2.132	2.123	2.101	2.085	2.065	2.046	2.035	2.020	2.009	1.997	2.002	2.082
N° 13	2.112	2.102	2.076	2.057	2.034	2.015	2.001	1.985	1.970	1.954	1.960	2.059
N° 14	2.164	2.155	2.130	2.112	2.090	2.068	2.053	2.035	2.024	2.008	2.014	2.109
N° 15	2.155	2.144	2.120	2.105	2.087	2.069	2.058	2.046	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	2.097	2.088	2.062	2.043	2.024	2.003	1.993	1.979	1.966	Not Measurable	Not Measurable	Not Measurable
N° 17	2.177	2.167	2.140	2.121	2.100	2.077	2.065	2.049	2.036	Not Measurable	Not Measurable	Not Measurable
N° 18	2.168	2.158	2.133	2.115	2.094	2.074	2.062	2.046	2.031	Not Measurable	Not Measurable	Not Measurable
N° 19	2.120	2.111	2.085	2.069	2.052	2.035	2.024	2.010	1.999	1.990	1.995	2.069
N° 20	2.107	2.098	2.069	2.051	2.030	2.010	1.997	1.983	1.972	1.960	1.965	2.051
N° 21	2.173	2.164	2.140	2.123	2.104	2.085	2.074	2.058	2.047	2.035	2.040	2.117
N° 22	2.162	2.152	2.128	2.111	2.094	2.077	2.067	2.054	2.044	2.034	2.039	2.107
N° 23	2.125	2.115	2.088	2.068	2.046	2.024	2.012	1.998	1.986	1.973	Not Measurable	Not Measurable

12. Icc2

Ta=25°C; load to Vcc/2; Vcc=+3V; no load

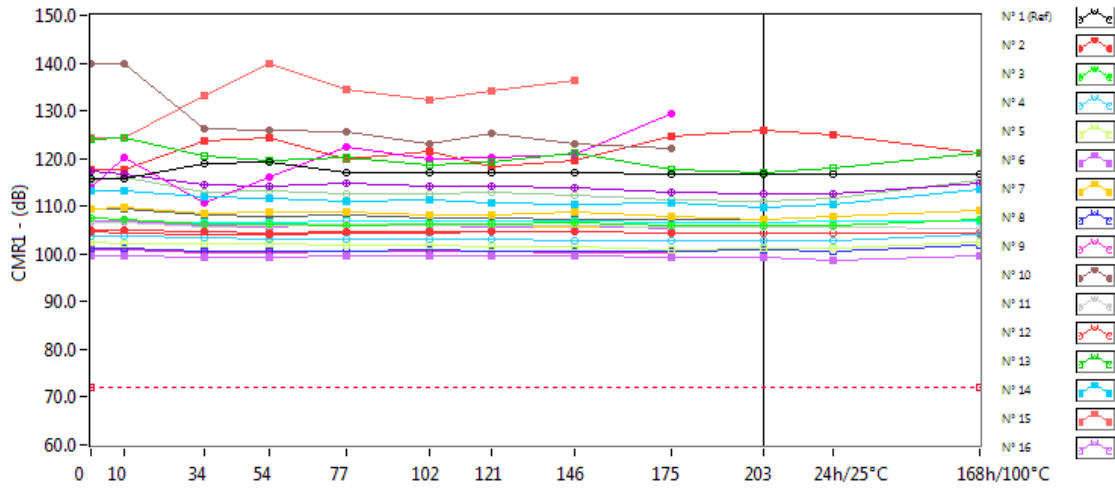


Icc2 . (mA) Max = 2.6

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.923	1.924	1.926	1.926	1.923	1.922	1.924	1.926	1.926	1.924	1.925	1.926
N° 2	1.958	1.945	1.922	1.906	1.888	1.872	1.864	1.854	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	1.929	1.918	1.892	1.873	1.852	1.835	1.826	1.815	1.806	1.794	1.800	1.865
N° 4	1.966	1.953	1.928	1.909	1.887	1.870	1.861	1.848	1.840	1.828	1.834	1.898
N° 5	1.931	1.920	1.895	1.875	1.853	1.834	1.825	1.812	1.802	1.790	1.796	1.867
N° 6	1.978	1.966	1.942	1.925	1.903	1.885	1.875	1.863	1.853	1.840	1.846	1.908
N° 7	1.951	1.939	1.913	1.896	1.873	1.855	1.846	1.833	1.824	1.812	1.818	1.883
N° 8	1.934	1.921	1.894	1.874	1.852	1.833	1.822	1.810	1.799	1.788	1.793	1.865
N° 9	1.939	1.927	1.900	1.881	1.858	1.840	1.831	1.819	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	1.948	1.936	1.911	1.894	1.873	1.857	1.849	1.837	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	1.948	1.936	1.912	1.897	1.878	1.864	1.855	1.845	1.837	1.827	1.832	1.882
N° 12	1.940	1.929	1.907	1.890	1.868	1.850	1.841	1.829	1.818	1.806	1.813	1.876
N° 13	1.924	1.913	1.887	1.866	1.842	1.822	1.811	1.798	1.787	1.773	1.779	1.857
N° 14	1.967	1.955	1.931	1.911	1.887	1.866	1.854	1.840	1.830	1.815	1.822	1.898
N° 15	1.957	1.945	1.920	1.904	1.884	1.867	1.858	1.848	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	1.915	1.904	1.879	1.860	1.837	1.818	1.809	1.796	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	1.979	1.967	1.941	1.920	1.896	1.876	1.866	1.852	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	1.968	1.956	1.931	1.912	1.889	1.870	1.859	1.846	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	1.931	1.920	1.894	1.877	1.857	1.840	1.832	1.820	1.811	1.800	1.805	1.867
N° 20	1.920	1.908	1.881	1.862	1.839	1.820	1.810	1.797	1.787	1.775	1.781	1.851
N° 21	1.975	1.963	1.940	1.922	1.901	1.882	1.873	1.860	1.849	1.838	1.844	1.907
N° 22	1.960	1.948	1.923	1.906	1.887	1.871	1.863	1.852	1.844	1.834	1.839	1.894
N° 23	1.937	1.925	1.898	1.878	1.855	1.834	1.825	1.812	1.800	1.788	Not Measurable	Not Measurable

13. CMR1

Ta=25°C; load to Vcc/2; Vcc=+16V; 0V<Vicm<16V

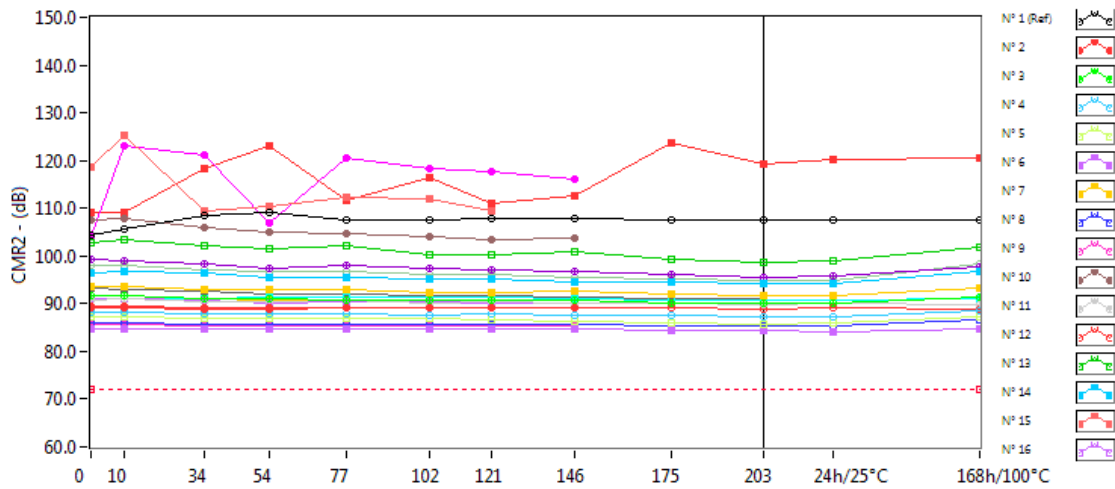


CMR1 . (dB) Min = 72.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	115.88	115.72	118.83	119.14	116.93	116.96	117.06	117.06	116.78	116.75	116.83	116.77
N° 2	105.00	104.95	104.58	104.50	104.65	104.69	104.69	104.65	104.40	Not Measurable	Not Measurable	Not Measurable
N° 3	107.44	107.37	106.33	106.36	106.11	106.33	106.19	106.47	105.85	105.94	105.84	107.11
N° 4	103.80	103.83	103.26	102.98	103.19	103.13	103.06	102.92	102.70	102.72	102.78	103.95
N° 5	102.32	102.29	102.11	102.01	101.95	101.81	101.60	101.55	101.00	101.05	101.10	102.44
N° 6	99.59	99.52	99.38	99.41	99.57	99.54	99.53	99.56	99.34	99.40	98.74	99.59
N° 7	109.56	109.61	108.49	108.91	108.72	108.14	108.03	108.66	107.74	107.26	107.73	109.25
N° 8	101.20	101.18	100.66	100.67	100.70	100.73	100.70	100.70	100.52	100.74	100.69	101.80
N° 9	100.85	100.85	100.23	100.38	100.52	100.45	100.59	100.39	100.39	Not Measurable	Not Measurable	Not Measurable
N° 10	140.00	140.00	126.34	125.91	125.66	123.11	125.26	123.00	121.98	Not Measurable	Not Measurable	Not Measurable
N° 11	106.50	106.59	105.70	105.86	106.14	105.94	105.93	105.93	105.56	105.63	105.70	105.22
N° 12	104.67	104.46	104.18	104.15	104.23	104.36	104.74	104.60	104.32	104.34	104.49	104.49
N° 13	124.09	124.18	120.61	119.52	120.25	118.70	119.18	121.15	117.69	117.20	118.05	121.11
N° 14	113.34	113.09	111.93	111.63	111.09	111.24	110.66	110.44	110.67	109.71	110.27	113.44
N° 15	124.31	124.19	133.15	140.00	134.50	132.33	134.00	136.31	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	106.79	106.87	105.92	105.76	106.14	105.83	105.71	105.85	105.37	Not Measurable	Not Measurable	Not Measurable
N° 17	107.41	107.11	106.42	106.20	106.17	105.92	106.06	105.61	105.54	Not Measurable	Not Measurable	Not Measurable
N° 18	113.97	120.10	110.72	116.15	122.35	120.05	120.37	120.97	129.36	Not Measurable	Not Measurable	Not Measurable
N° 19	117.33	116.66	114.55	114.19	114.89	114.13	114.27	113.94	112.77	112.52	112.73	114.82
N° 20	115.46	116.20	112.92	113.16	112.66	112.62	112.82	112.24	111.47	111.12	111.75	115.61
N° 21	106.95	106.88	106.63	106.47	107.00	107.00	106.87	106.92	106.52	106.45	106.78	106.83
N° 22	117.77	117.71	123.85	124.23	119.85	121.56	118.40	119.56	124.49	126.01	125.09	121.10
N° 23	109.50	109.40	108.10	107.82	108.07	107.66	107.44	107.31	107.17	107.07	Not Measurable	Not Measurable

14. CMR2

Ta=25°C; load to Vcc/2; Vcc=+3V; 0V<Vicm<3V

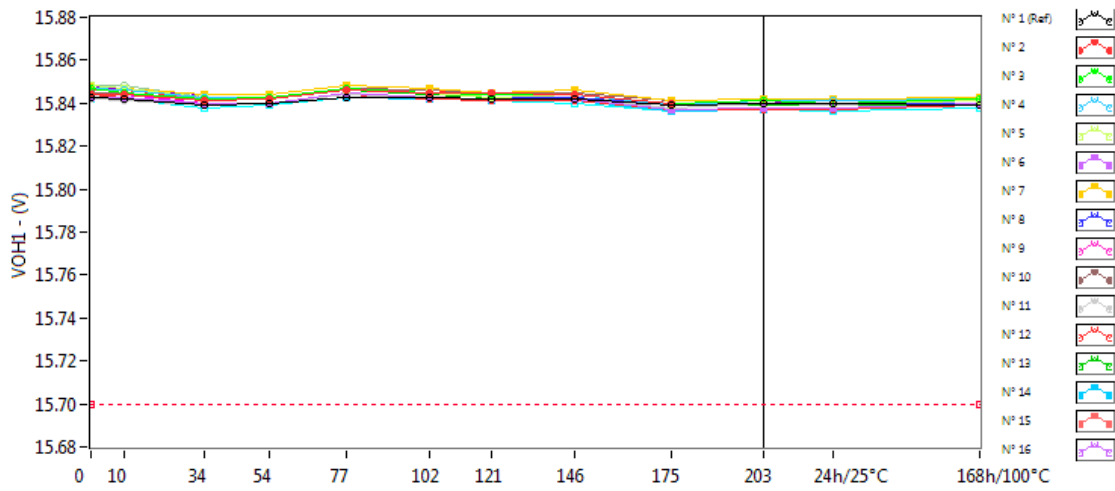


CMR2 . (dB) Min = 72.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	104.44	105.55	108.55	109.25	107.62	107.62	107.71	107.72	107.51	107.50	107.47	107.51
N° 2	89.38	89.39	89.09	89.13	89.04	89.00	89.07	89.04	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	91.61	91.60	90.99	90.91	90.72	90.71	90.62	90.73	90.02	90.15	90.11	91.25
N° 4	88.34	88.34	88.02	87.84	87.97	87.73	87.74	87.58	87.46	87.30	87.36	88.56
N° 5	87.15	87.14	87.04	86.82	86.85	86.86	86.48	86.28	85.92	85.79	85.95	87.24
N° 6	84.62	84.67	84.69	84.72	84.70	84.67	84.68	84.73	84.44	84.53	83.98	84.67
N° 7	93.52	93.52	92.93	92.95	92.94	92.27	92.29	92.67	91.86	91.76	91.79	93.29
N° 8	86.04	86.04	85.70	85.61	85.73	85.61	85.77	85.75	85.46	85.46	85.48	86.63
N° 9	85.70	85.72	85.39	85.49	85.42	85.30	85.41	85.23	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	107.43	107.80	105.90	104.90	104.81	104.20	103.52	103.61	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	90.78	90.92	90.48	90.32	90.69	90.23	90.33	90.20	89.95	89.81	90.14	89.72
N° 12	89.10	89.02	88.83	88.96	89.01	89.11	89.19	89.16	89.02	88.97	89.01	88.99
N° 13	102.80	103.48	102.14	101.60	102.11	100.24	100.27	100.88	99.31	98.80	99.13	101.83
N° 14	96.53	96.78	96.32	95.52	95.63	95.19	95.20	94.40	94.50	94.22	94.19	96.71
N° 15	118.47	125.32	109.44	110.23	112.29	111.95	109.31	Not Measurable	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	90.99	90.92	90.64	90.26	90.52	90.27	90.04	89.99	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	91.66	91.54	91.14	90.84	90.69	90.48	90.58	90.15	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	104.16	122.92	121.18	107.01	120.39	118.19	117.69	115.95	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	99.33	98.93	98.22	97.44	97.95	97.29	97.22	96.74	96.10	95.65	95.89	97.65
N° 20	98.13	98.14	96.96	96.69	96.77	96.16	96.07	95.61	95.05	94.92	94.93	98.40
N° 21	91.13	91.13	91.16	91.22	91.36	91.39	91.24	91.17	90.86	90.80	90.87	91.13
N° 22	109.24	109.00	118.46	122.96	111.59	116.31	110.96	112.75	123.57	119.29	120.06	120.61
N° 23	93.15	93.00	92.55	92.12	92.01	91.80	91.76	91.43	91.13	91.10	Not Measurable	Not Measurable

15. VOH1

Ta=25°C; load to Vcc/2; Vcc=+16V; RL=1kOhms

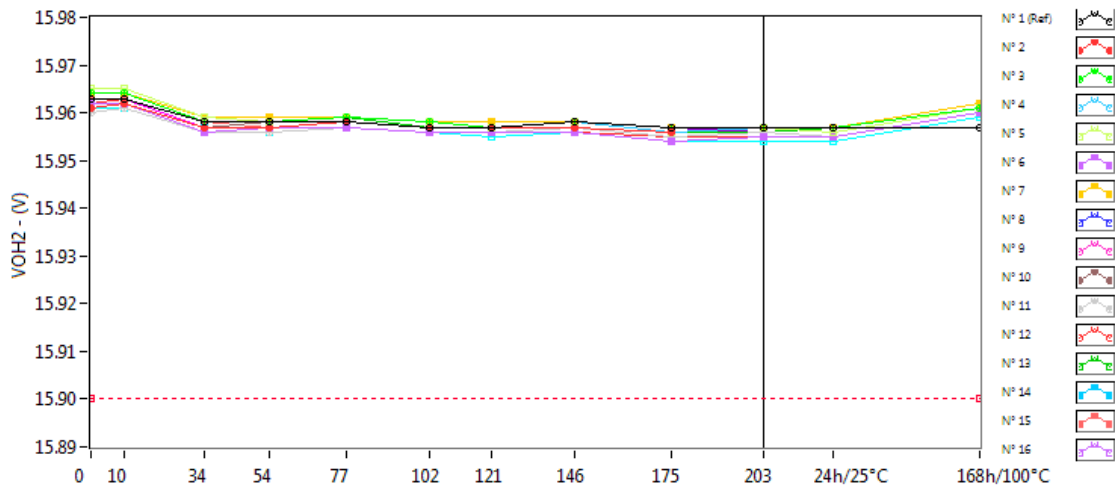


VOH1 . (V) Min = 15.7

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	15.843	15.842	15.839	15.840	15.843	15.843	15.842	15.842	15.839	15.840	15.840	15.839
N° 2	15.844	15.844	15.841	15.842	15.846	15.845	15.845	15.844	15.840	Not Measurable	Not Measurable	Not Measurable
N° 3	15.847	15.845	15.842	15.843	15.847	15.845	15.844	15.844	15.840	15.841	15.840	15.842
N° 4	15.847	15.846	15.843	15.843	15.847	15.845	15.845	15.844	15.839	15.841	15.841	15.842
N° 5	15.848	15.847	15.843	15.843	15.846	15.845	15.843	15.844	15.839	15.840	15.840	15.841
N° 6	15.843	15.843	15.840	15.840	15.845	15.843	15.842	15.842	15.837	15.838	15.838	15.840
N° 7	15.848	15.847	15.844	15.844	15.848	15.847	15.845	15.846	15.841	15.842	15.842	15.843
N° 8	15.848	15.847	15.843	15.843	15.846	15.845	15.843	15.843	15.839	15.840	15.840	15.840
N° 9	15.848	15.847	15.843	15.843	15.847	15.845	15.844	15.844	15.840	Not Measurable	Not Measurable	Not Measurable
N° 10	15.845	15.845	15.842	15.842	15.847	15.846	15.845	15.845	15.841	Not Measurable	Not Measurable	Not Measurable
N° 11	15.842	15.841	15.839	15.840	15.844	15.843	15.842	15.843	15.838	15.840	15.839	15.841
N° 12	15.844	15.843	15.840	15.840	15.844	15.842	15.841	15.841	15.837	15.837	15.837	15.839
N° 13	15.848	15.847	15.843	15.842	15.846	15.844	15.843	15.843	15.839	15.839	15.839	15.840
N° 14	15.843	15.842	15.839	15.840	15.843	15.842	15.841	15.841	15.836	15.837	15.837	15.839
N° 15	15.845	15.845	15.842	15.842	15.846	15.845	15.845	15.844	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	15.848	15.847	15.842	15.843	15.846	15.845	15.844	15.843	15.839	Not Measurable	Not Measurable	Not Measurable
N° 17	15.847	15.846	15.843	15.843	15.847	15.845	15.844	15.844	15.840	Not Measurable	Not Measurable	Not Measurable
N° 18	15.845	15.844	15.840	15.840	15.844	15.842	15.841	15.841	15.837	Not Measurable	Not Measurable	Not Measurable
N° 19	15.848	15.846	15.844	15.844	15.848	15.847	15.845	15.845	15.841	15.840	15.842	15.843
N° 20	15.848	15.848	15.843	15.843	15.846	15.845	15.844	15.844	15.840	15.840	15.840	15.841
N° 21	15.842	15.842	15.838	15.839	15.843	15.842	15.841	15.840	15.836	15.837	15.836	15.838
N° 22	15.846	15.846	15.842	15.843	15.847	15.846	15.844	15.845	15.841	15.842	15.842	15.843
N° 23	15.847	15.846	15.842	15.842	15.846	15.844	15.843	15.843	15.839	15.839	Not Measurable	Not Measurable

16. VOH2

Ta=25°C; load to Vcc/2; Vcc=+16V; RL=10kOhms

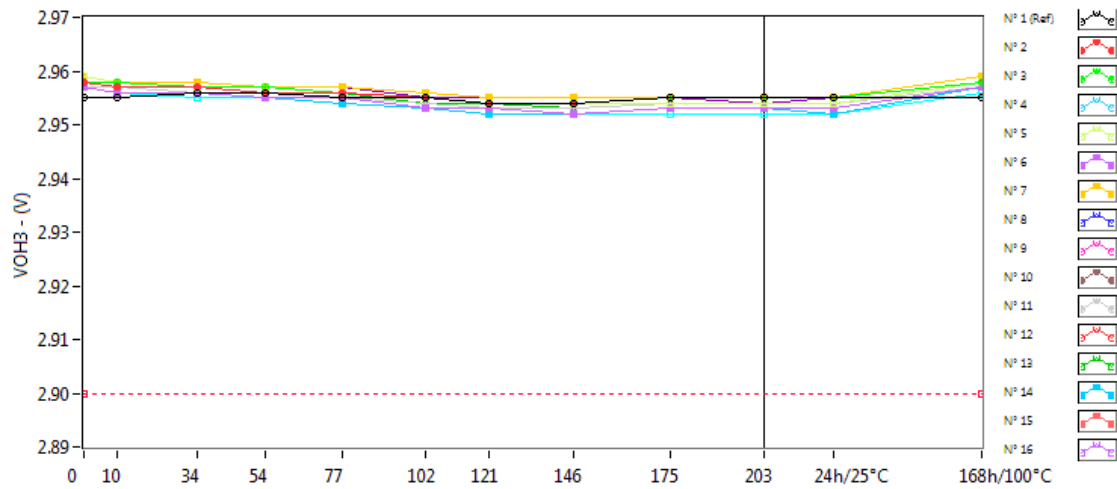


VOH2 . (V) Min = 15.9

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	15.963	15.963	15.958	15.958	15.958	15.957	15.957	15.958	15.957	15.957	15.957	15.957
N° 2	15.961	15.962	15.957	15.957	15.958	15.957	15.957	15.957	15.956	Not Measurable	Not Measurable	Not Measurable
N° 3	15.964	15.964	15.958	15.958	15.959	15.958	15.957	15.958	15.957	15.957	15.957	15.961
N° 4	15.964	15.964	15.958	15.958	15.959	15.958	15.957	15.958	15.956	15.957	15.957	15.961
N° 5	15.965	15.965	15.959	15.958	15.959	15.958	15.957	15.958	15.956	15.957	15.956	15.961
N° 6	15.962	15.962	15.956	15.957	15.957	15.956	15.956	15.956	15.954	15.955	15.955	15.960
N° 7	15.964	15.964	15.959	15.959	15.959	15.958	15.958	15.958	15.957	15.957	15.957	15.962
N° 8	15.965	15.965	15.959	15.959	15.959	15.958	15.957	15.958	15.956	15.957	15.957	15.961
N° 9	15.965	15.965	15.959	15.958	15.959	15.958	15.957	15.958	15.957	Not Measurable	Not Measurable	Not Measurable
N° 10	15.962	15.962	15.957	15.958	15.958	15.957	15.957	15.958	15.956	Not Measurable	Not Measurable	Not Measurable
N° 11	15.960	15.961	15.956	15.956	15.957	15.956	15.956	15.957	15.955	15.956	15.955	15.960
N° 12	15.962	15.962	15.957	15.957	15.957	15.956	15.956	15.956	15.955	15.955	15.955	15.960
N° 13	15.965	15.965	15.959	15.958	15.959	15.957	15.957	15.958	15.956	15.956	15.957	15.961
N° 14	15.961	15.962	15.957	15.957	15.957	15.956	15.956	15.956	15.955	15.955	15.955	15.960
N° 15	15.963	15.963	15.958	15.957	15.958	15.957	15.957	15.958	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	15.965	15.965	15.959	15.958	15.959	15.957	15.957	15.958	15.957	Not Measurable	Not Measurable	Not Measurable
N° 17	15.964	15.964	15.958	15.958	15.958	15.957	15.957	15.958	15.956	Not Measurable	Not Measurable	Not Measurable
N° 18	15.963	15.963	15.957	15.957	15.957	15.956	15.956	15.956	15.955	Not Measurable	Not Measurable	Not Measurable
N° 19	15.964	15.964	15.959	15.959	15.959	15.958	15.958	15.958	15.957	15.956	15.957	15.961
N° 20	15.965	15.965	15.959	15.958	15.959	15.958	15.957	15.958	15.957	15.957	15.957	15.961
N° 21	15.961	15.961	15.956	15.956	15.957	15.956	15.955	15.956	15.954	15.954	15.954	15.959
N° 22	15.962	15.963	15.958	15.958	15.959	15.958	15.957	15.958	15.956	15.957	15.957	15.961
N° 23	15.964	15.964	15.958	15.958	15.958	15.957	15.957	15.958	15.956	15.956	Not Measurable	Not Measurable

17. VOH3

Ta=25°C; load to Vcc/2; Vcc=+3V; RL=1kOhms

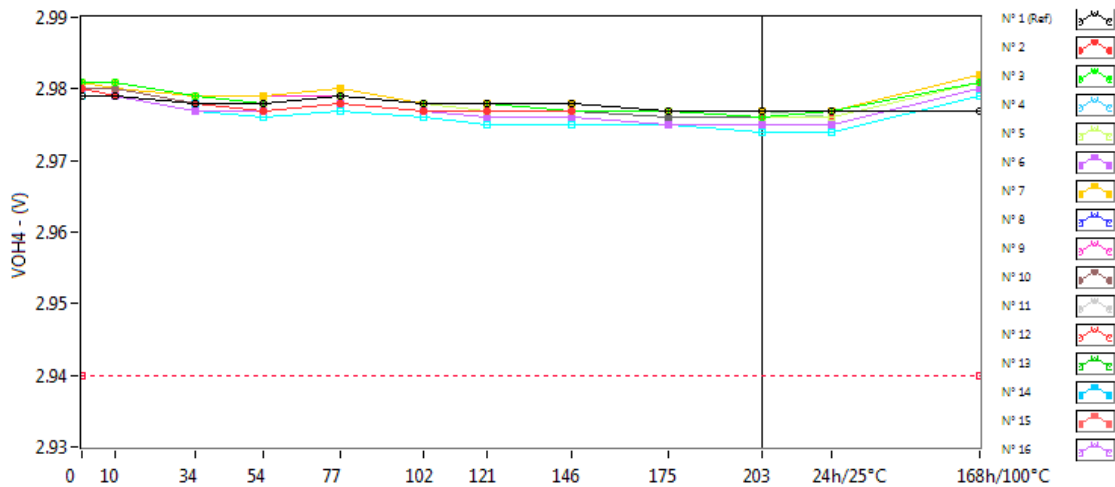


VOH3 . (V) Min = 2.9

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	2.955	2.955	2.956	2.956	2.955	2.955	2.954	2.954	2.955	2.955	2.955	2.955
N° 2	2.958	2.957	2.957	2.956	2.956	2.955	2.954	2.954	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	2.958	2.958	2.957	2.957	2.956	2.955	2.954	2.954	2.955	2.955	2.955	2.958
N° 4	2.958	2.958	2.957	2.957	2.956	2.955	2.954	2.954	2.955	2.955	2.955	2.958
N° 5	2.959	2.958	2.957	2.957	2.956	2.955	2.954	2.954	2.954	2.954	2.954	2.958
N° 6	2.957	2.956	2.956	2.955	2.955	2.953	2.953	2.952	2.953	2.953	2.953	2.957
N° 7	2.959	2.958	2.958	2.957	2.957	2.956	2.955	2.955	2.955	2.955	2.955	2.959
N° 8	2.958	2.958	2.957	2.957	2.956	2.955	2.954	2.954	2.954	2.954	2.954	2.958
N° 9	2.959	2.958	2.957	2.957	2.956	2.955	2.954	2.954	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	2.958	2.957	2.957	2.957	2.956	2.955	2.954	2.954	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	2.957	2.957	2.956	2.956	2.955	2.954	2.953	2.953	2.954	2.954	2.954	2.957
N° 12	2.957	2.956	2.956	2.955	2.955	2.953	2.953	2.952	2.953	2.953	2.953	2.957
N° 13	2.959	2.958	2.957	2.956	2.956	2.954	2.954	2.953	2.954	2.954	2.954	2.958
N° 14	2.957	2.957	2.956	2.955	2.954	2.953	2.952	2.952	2.953	2.953	2.952	2.957
N° 15	2.958	2.957	2.957	2.956	2.956	2.955	2.954	2.954	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	2.958	2.958	2.957	2.957	2.956	2.955	2.954	2.954	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	2.958	2.958	2.957	2.956	2.956	2.955	2.954	2.954	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	2.957	2.957	2.956	2.955	2.955	2.953	2.953	2.952	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	2.959	2.958	2.958	2.957	2.957	2.955	2.955	2.955	2.955	2.954	2.955	2.959
N° 20	2.958	2.958	2.957	2.957	2.956	2.955	2.954	2.954	2.955	2.954	2.954	2.958
N° 21	2.957	2.956	2.955	2.955	2.954	2.953	2.952	2.952	2.952	2.952	2.952	2.956
N° 22	2.958	2.958	2.957	2.957	2.956	2.955	2.954	2.954	2.955	2.955	2.955	2.958
N° 23	2.958	2.957	2.957	2.956	2.956	2.954	2.953	2.953	2.954	2.954	Not Measurable	Not Measurable

18. VOH4

Ta=25°C; load to Vcc/2; Vcc=+3V; RL=10kOhms

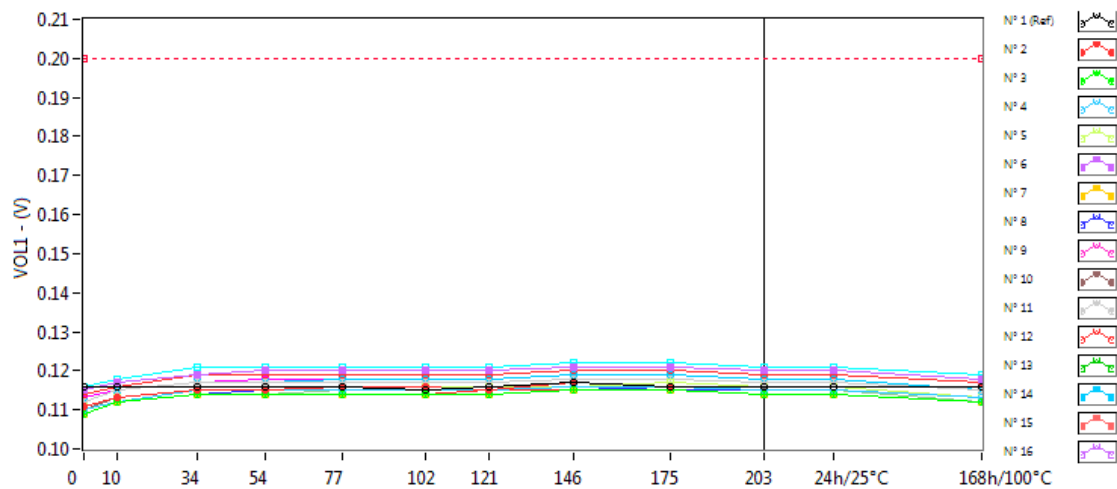


VOH4 . (V) Min = 2.94

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	2.979	2.979	2.978	2.978	2.979	2.978	2.978	2.978	2.977	2.977	2.977	2.977
N° 2	2.980	2.979	2.978	2.977	2.978	2.977	2.977	2.977	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	2.981	2.981	2.979	2.978	2.979	2.978	2.978	2.977	2.977	2.976	2.977	2.981
N° 4	2.981	2.981	2.979	2.978	2.979	2.978	2.978	2.977	2.977	2.976	2.977	2.981
N° 5	2.981	2.981	2.979	2.978	2.979	2.978	2.977	2.977	2.977	2.976	2.976	2.981
N° 6	2.980	2.979	2.977	2.977	2.978	2.977	2.976	2.976	2.975	2.975	2.975	2.980
N° 7	2.981	2.981	2.979	2.979	2.980	2.978	2.978	2.978	2.977	2.977	2.977	2.982
N° 8	2.981	2.981	2.979	2.978	2.979	2.978	2.978	2.978	2.977	2.977	2.977	2.982
N° 9	2.981	2.981	2.979	2.979	2.979	2.978	2.978	2.978	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	2.980	2.980	2.978	2.978	2.979	2.978	2.977	2.977	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	2.979	2.979	2.977	2.977	2.978	2.977	2.976	2.976	2.975	2.975	2.975	2.980
N° 12	2.980	2.979	2.977	2.977	2.978	2.977	2.976	2.976	2.975	2.975	2.975	2.980
N° 13	2.981	2.981	2.979	2.978	2.979	2.978	2.977	2.977	2.977	2.977	2.977	2.982
N° 14	2.980	2.979	2.978	2.977	2.978	2.977	2.976	2.976	2.975	2.975	2.975	2.980
N° 15	2.980	2.980	2.978	2.978	2.979	2.978	2.977	2.977	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	2.981	2.981	2.979	2.978	2.979	2.978	2.978	2.977	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	2.981	2.980	2.979	2.978	2.979	2.978	2.977	2.977	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	2.980	2.980	2.978	2.977	2.978	2.977	2.976	2.976	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	2.981	2.981	2.979	2.979	2.980	2.978	2.978	2.978	2.977	2.976	2.977	2.981
N° 20	2.981	2.981	2.979	2.978	2.979	2.978	2.978	2.978	2.977	2.977	2.976	2.981
N° 21	2.979	2.979	2.977	2.976	2.977	2.976	2.975	2.975	2.975	2.974	2.974	2.979
N° 22	2.981	2.980	2.978	2.978	2.979	2.978	2.977	2.977	2.977	2.976	2.976	2.981
N° 23	2.981	2.981	2.979	2.978	2.979	2.978	2.977	2.977	2.976	2.976	Not Measurable	Not Measurable

19. VOL1

Ta=25°C; load to Vcc/2; Vcc=+16V; RL=1kOhms



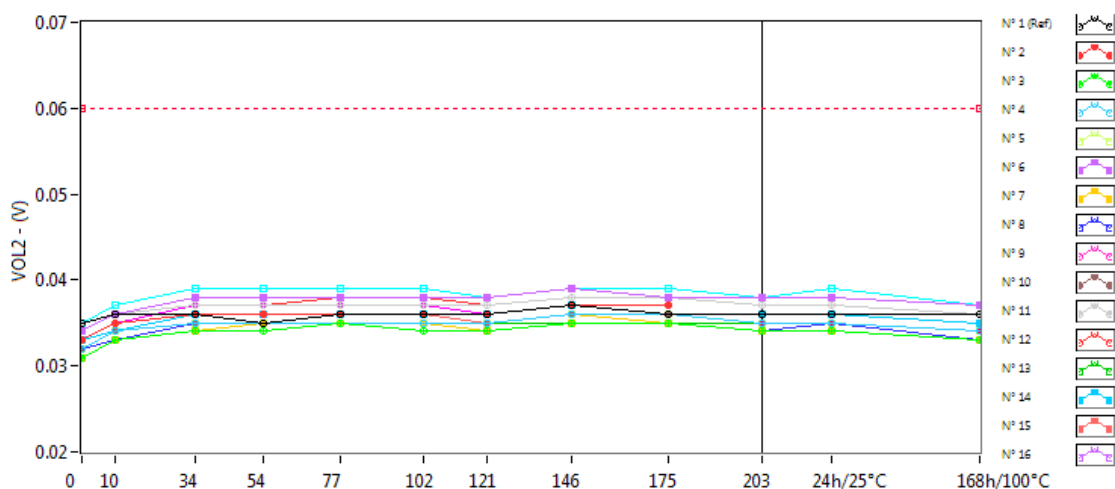
VOL1 . (V)

Max = 0.2

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.116	0.116	0.116	0.116	0.116	0.115	0.116	0.117	0.116	0.116	0.116	0.116
N° 2	0.111	0.113	0.115	0.115	0.116	0.116	0.115	0.117	0.116	Not Measurable	Not Measurable	Not Measurable
N° 3	0.109	0.112	0.114	0.114	0.114	0.114	0.114	0.115	0.115	0.114	0.114	0.112
N° 4	0.110	0.112	0.115	0.115	0.115	0.115	0.115	0.116	0.116	0.115	0.115	0.113
N° 5	0.111	0.113	0.115	0.115	0.115	0.116	0.116	0.116	0.117	0.116	0.116	0.113
N° 6	0.115	0.117	0.119	0.120	0.120	0.120	0.120	0.121	0.121	0.120	0.120	0.118
N° 7	0.109	0.112	0.114	0.114	0.114	0.114	0.114	0.115	0.115	0.114	0.114	0.112
N° 8	0.110	0.112	0.114	0.115	0.115	0.115	0.115	0.116	0.115	0.115	0.115	0.113
N° 9	0.110	0.112	0.114	0.115	0.115	0.115	0.115	0.116	0.115	Not Measurable	Not Measurable	Not Measurable
N° 10	0.110	0.113	0.115	0.115	0.115	0.115	0.115	0.116	0.116	Not Measurable	Not Measurable	Not Measurable
N° 11	0.112	0.115	0.117	0.117	0.117	0.117	0.117	0.118	0.118	0.117	0.117	0.115
N° 12	0.114	0.116	0.119	0.119	0.119	0.119	0.119	0.120	0.120	0.119	0.119	0.117
N° 13	0.110	0.113	0.115	0.115	0.116	0.116	0.116	0.117	0.116	0.116	0.116	0.113
N° 14	0.112	0.115	0.117	0.117	0.118	0.118	0.118	0.119	0.119	0.118	0.118	0.115
N° 15	0.110	0.113	0.115	0.115	0.115	0.115	0.115	0.116	0.116	Not Measurable	Not Measurable	Not Measurable
N° 16	0.110	0.112	0.114	0.115	0.115	0.115	0.115	0.116	0.116	Not Measurable	Not Measurable	Not Measurable
N° 17	0.110	0.112	0.114	0.115	0.115	0.115	0.115	0.116	0.116	Not Measurable	Not Measurable	Not Measurable
N° 18	0.113	0.115	0.117	0.118	0.118	0.118	0.118	0.119	0.119	Not Measurable	Not Measurable	Not Measurable
N° 19	0.109	0.112	0.114	0.114	0.114	0.114	0.114	0.115	0.115	0.114	0.114	0.112
N° 20	0.110	0.112	0.114	0.114	0.115	0.115	0.115	0.116	0.115	0.115	0.115	0.112
N° 21	0.116	0.118	0.121	0.121	0.121	0.121	0.121	0.122	0.122	0.121	0.121	0.119
N° 22	0.109	0.112	0.114	0.114	0.114	0.114	0.115	0.115	0.115	0.114	0.114	0.112
N° 23	0.111	0.113	0.115	0.115	0.116	0.116	0.116	0.117	0.116	0.116	Not Measurable	Not Measurable

20. VOL2

Ta=25°C; load to Vcc/2; Vcc=+16V; RL=10kOhms



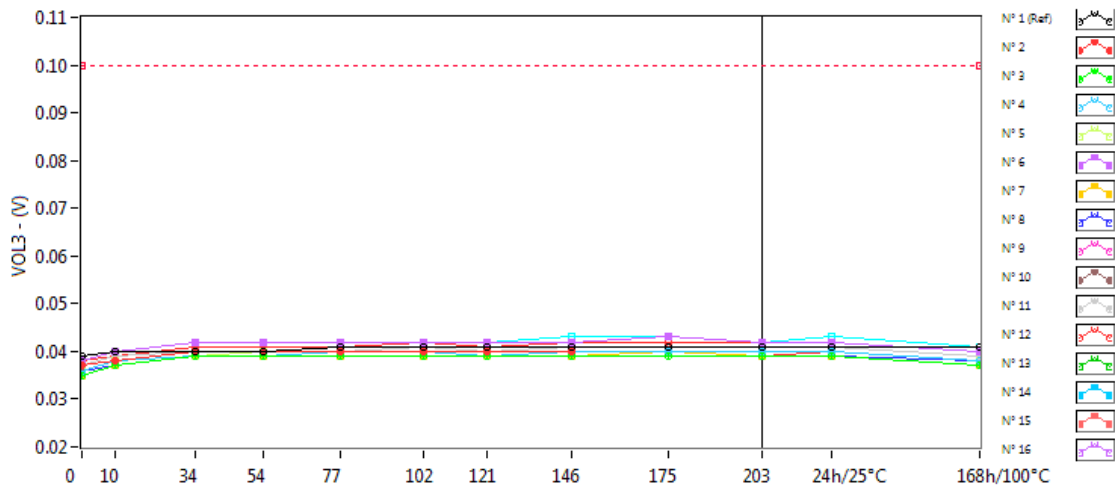
VOL2 . (V)

Max = 0.06

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.035	0.036	0.036	0.035	0.036	0.036	0.036	0.037	0.036	0.036	0.036	0.036
N° 2	0.033	0.035	0.036	0.036	0.036	0.036	0.036	0.037	0.037	Not Measurable	Not Measurable	Not Measurable
N° 3	0.031	0.033	0.034	0.034	0.035	0.034	0.034	0.035	0.035	0.034	0.034	0.033
N° 4	0.032	0.034	0.035	0.035	0.035	0.035	0.035	0.036	0.036	0.035	0.035	0.034
N° 5	0.032	0.034	0.035	0.035	0.035	0.035	0.035	0.036	0.036	0.035	0.035	0.034
N° 6	0.034	0.036	0.038	0.038	0.038	0.038	0.038	0.039	0.038	0.038	0.038	0.037
N° 7	0.031	0.033	0.034	0.035	0.035	0.035	0.034	0.035	0.035	0.034	0.034	0.033
N° 8	0.032	0.033	0.035	0.035	0.035	0.035	0.034	0.035	0.035	0.034	0.035	0.033
N° 9	0.032	0.033	0.035	0.035	0.035	0.035	0.034	0.035	0.035	Not Measurable	Not Measurable	Not Measurable
N° 10	0.032	0.034	0.035	0.035	0.035	0.035	0.035	0.036	0.036	Not Measurable	Not Measurable	Not Measurable
N° 11	0.034	0.036	0.037	0.037	0.037	0.037	0.037	0.038	0.038	0.037	0.037	0.036
N° 12	0.034	0.036	0.037	0.037	0.038	0.038	0.037	0.038	0.038	0.037	0.037	0.036
N° 13	0.032	0.033	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.033
N° 14	0.033	0.034	0.036	0.036	0.036	0.036	0.036	0.037	0.036	0.036	0.036	0.035
N° 15	0.032	0.034	0.036	0.036	0.036	0.036	0.035	0.036	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	0.031	0.033	0.035	0.035	0.035	0.035	0.034	0.035	0.035	Not Measurable	Not Measurable	Not Measurable
N° 17	0.032	0.034	0.035	0.035	0.035	0.035	0.035	0.036	0.035	Not Measurable	Not Measurable	Not Measurable
N° 18	0.033	0.035	0.037	0.037	0.037	0.037	0.036	0.037	0.037	Not Measurable	Not Measurable	Not Measurable
N° 19	0.032	0.034	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.034
N° 20	0.031	0.033	0.034	0.035	0.035	0.035	0.034	0.035	0.035	0.034	0.034	0.033
N° 21	0.035	0.037	0.039	0.039	0.039	0.039	0.038	0.039	0.039	0.038	0.039	0.037
N° 22	0.032	0.034	0.035	0.035	0.035	0.035	0.035	0.036	0.036	0.035	0.035	0.034
N° 23	0.032	0.033	0.035	0.035	0.035	0.035	0.035	0.036	0.035	0.035	Not Measurable	Not Measurable

21. VOL3

Ta=25°C; load to Vcc/2; Vcc=+3V; RL=1kOhms



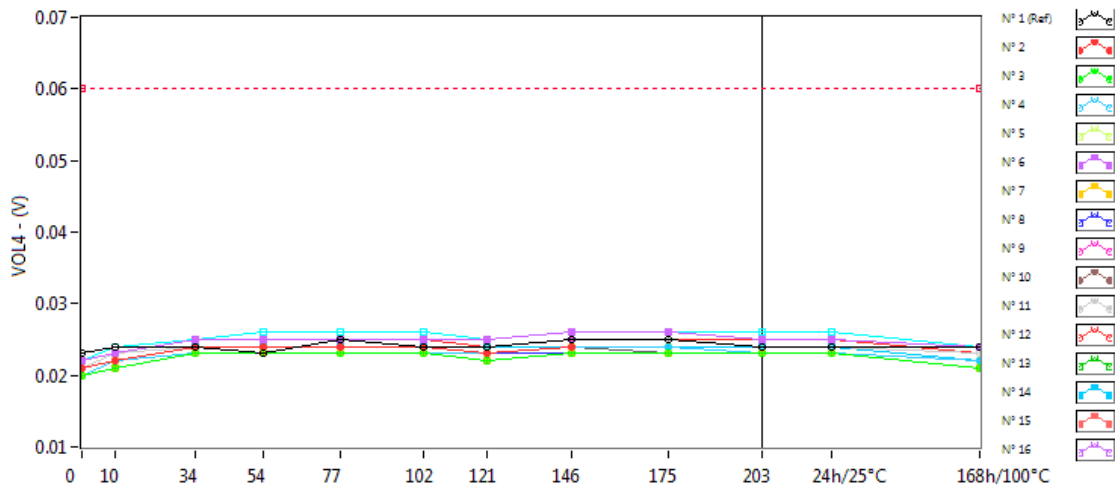
VOL3 . (V)

Max = 0.1

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.039	0.040	0.040	0.040	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
N° 2	0.037	0.038	0.040	0.040	0.040	0.040	0.040	0.040	0.040	Not Measurable	Not Measurable	Not Measurable
N° 3	0.035	0.037	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.037
N° 4	0.036	0.038	0.039	0.039	0.040	0.040	0.039	0.040	0.040	0.040	0.040	0.038
N° 5	0.036	0.038	0.039	0.040	0.040	0.040	0.039	0.040	0.040	0.040	0.040	0.038
N° 6	0.038	0.040	0.042	0.042	0.042	0.042	0.042	0.042	0.043	0.042	0.042	0.040
N° 7	0.035	0.037	0.039	0.039	0.039	0.039	0.039	0.039	0.040	0.039	0.039	0.037
N° 8	0.036	0.037	0.039	0.039	0.039	0.039	0.039	0.040	0.040	0.039	0.039	0.038
N° 9	0.036	0.037	0.039	0.039	0.039	0.039	0.039	0.040	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	0.036	0.038	0.039	0.039	0.039	0.039	0.039	0.040	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	0.037	0.039	0.040	0.040	0.040	0.041	0.040	0.041	0.041	0.041	0.041	0.039
N° 12	0.038	0.039	0.041	0.041	0.041	0.042	0.041	0.042	0.042	0.042	0.042	0.040
N° 13	0.036	0.037	0.039	0.039	0.040	0.040	0.039	0.040	0.040	0.040	0.040	0.038
N° 14	0.037	0.038	0.040	0.040	0.041	0.041	0.040	0.041	0.041	0.041	0.041	0.039
N° 15	0.036	0.038	0.039	0.039	0.040	0.040	0.039	0.040	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	0.036	0.037	0.039	0.039	0.039	0.039	0.039	0.040	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	0.036	0.038	0.039	0.039	0.039	0.039	0.039	0.040	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	0.037	0.039	0.041	0.041	0.041	0.041	0.040	0.041	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	0.036	0.037	0.039	0.039	0.039	0.039	0.039	0.040	0.040	0.039	0.039	0.038
N° 20	0.036	0.037	0.039	0.039	0.039	0.039	0.039	0.040	0.040	0.039	0.039	0.038
N° 21	0.038	0.040	0.042	0.042	0.042	0.042	0.042	0.043	0.043	0.042	0.043	0.041
N° 22	0.036	0.037	0.039	0.039	0.039	0.039	0.039	0.040	0.040	0.039	0.040	0.038
N° 23	0.036	0.038	0.039	0.040	0.040	0.040	0.039	0.040	0.040	0.040	Not Measurable	Not Measurable

22. VOL4

Ta=25°C; load to Vcc/2; Vcc=+3V; RL=10kOhms



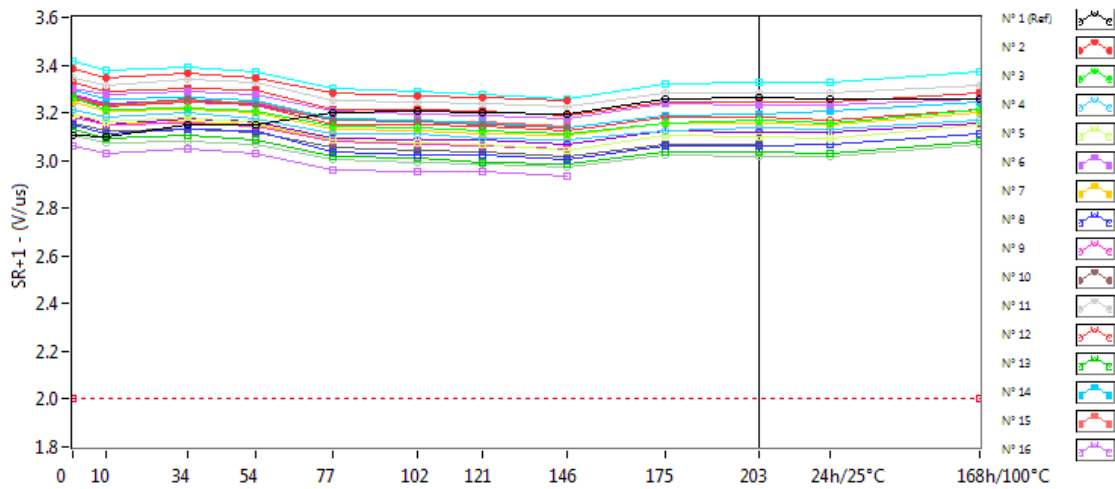
VOL4 . (V)

Max = 0.06

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.023	0.024	0.024	0.023	0.025	0.024	0.024	0.025	0.025	0.024	0.024	0.024
N° 2	0.021	0.022	0.024	0.024	0.024	0.024	0.023	0.024	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	0.020	0.021	0.023	0.023	0.023	0.023	0.022	0.023	0.023	0.023	0.023	0.021
N° 4	0.020	0.022	0.023	0.023	0.023	0.023	0.023	0.024	0.024	0.023	0.023	0.022
N° 5	0.020	0.022	0.023	0.023	0.023	0.023	0.023	0.024	0.024	0.023	0.023	0.022
N° 6	0.022	0.023	0.025	0.025	0.025	0.025	0.025	0.026	0.026	0.025	0.025	0.024
N° 7	0.020	0.021	0.023	0.023	0.023	0.023	0.022	0.023	0.023	0.023	0.023	0.021
N° 8	0.020	0.021	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.022
N° 9	0.020	0.021	0.023	0.023	0.023	0.023	0.023	0.023	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	0.020	0.022	0.023	0.023	0.023	0.023	0.023	0.024	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	0.021	0.023	0.024	0.024	0.024	0.024	0.024	0.025	0.025	0.024	0.024	0.023
N° 12	0.021	0.023	0.025	0.025	0.025	0.025	0.024	0.025	0.025	0.025	0.025	0.023
N° 13	0.020	0.021	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.022
N° 14	0.020	0.022	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.022
N° 15	0.020	0.022	0.023	0.023	0.023	0.023	0.023	0.024	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	0.020	0.021	0.023	0.023	0.023	0.023	0.022	0.023	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	0.020	0.022	0.023	0.023	0.023	0.023	0.023	0.024	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	0.021	0.022	0.024	0.024	0.024	0.024	0.024	0.025	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	0.020	0.022	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.022
N° 20	0.020	0.021	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.021
N° 21	0.022	0.024	0.025	0.026	0.026	0.026	0.025	0.026	0.026	0.026	0.026	0.024
N° 22	0.020	0.022	0.023	0.023	0.023	0.023	0.023	0.024	0.024	0.023	0.023	0.022
N° 23	0.020	0.022	0.023	0.023	0.023	0.023	0.023	0.024	0.023	0.023	Not Measurable	Not Measurable

23. SR+1

Ta=25°C; load to Vcc/2; Vcc=+16V; RL=1kOhms



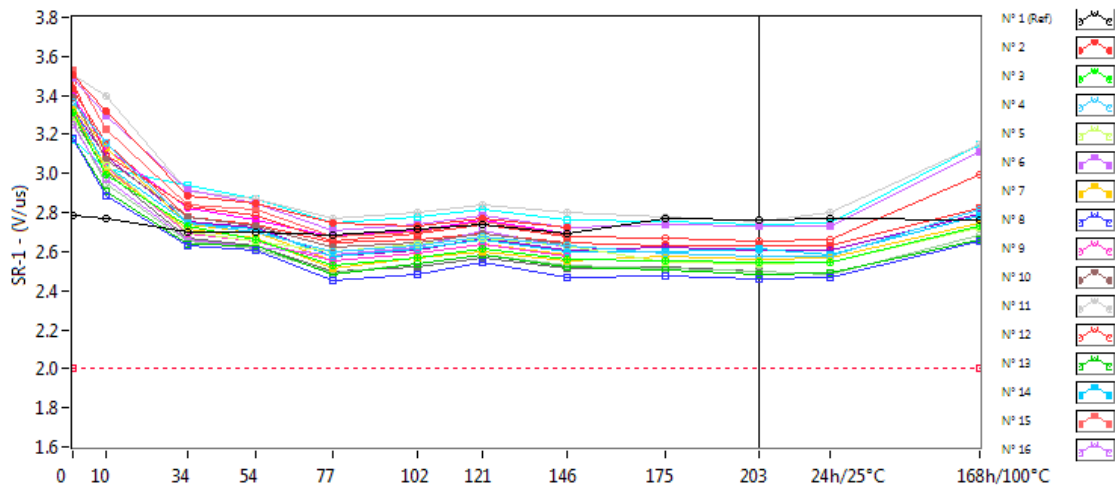
SR+1 . (V/us)

Min = 2.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	3.104	3.097	3.149	3.153	3.201	3.208	3.200	3.192	3.257	3.265	3.257	3.258
N° 2	3.382	3.348	3.367	3.345	3.284	3.271	3.261	3.251	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	3.261	3.212	3.221	3.205	3.142	3.136	3.123	3.112	3.159	3.169	3.159	3.214
N° 4	3.216	3.183	3.200	3.178	3.113	3.110	3.094	3.086	3.127	3.137	3.129	3.170
N° 5	3.197	3.160	3.179	3.158	3.086	3.076	3.065	3.045	3.103	3.101	3.094	3.151
N° 6	3.299	3.276	3.289	3.277	3.208	3.197	3.190	3.177	3.238	3.232	3.235	3.259
N° 7	3.247	3.205	3.215	3.202	3.133	3.127	3.110	3.103	3.156	3.157	3.149	3.201
N° 8	3.152	3.111	3.134	3.126	3.033	3.026	3.022	3.003	3.060	3.063	3.065	3.109
N° 9	3.179	3.149	3.159	3.144	3.078	3.066	3.059	3.046	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	3.271	3.234	3.255	3.233	3.169	3.160	3.153	3.140	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	3.348	3.315	3.338	3.330	3.251	3.246	3.239	3.225	3.280	3.286	3.283	3.312
N° 12	3.255	3.227	3.248	3.231	3.153	3.152	3.141	3.127	3.181	3.184	3.169	3.213
N° 13	3.130	3.092	3.105	3.085	3.016	3.010	2.992	2.983	3.035	3.039	3.029	3.083
N° 14	3.293	3.257	3.264	3.249	3.175	3.167	3.158	3.139	3.185	3.194	3.204	3.245
N° 15	3.267	3.233	3.251	3.246	3.169	3.162	3.161	3.146	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	3.061	3.027	3.046	3.031	2.963	2.955	2.953	2.934	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	3.182	3.149	3.164	3.152	3.082	3.072	3.062	3.051	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	3.276	3.241	3.252	3.241	3.168	3.162	3.151	3.136	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	3.197	3.152	3.175	3.162	3.095	3.087	3.084	3.067	3.122	3.117	3.117	3.155
N° 20	3.106	3.073	3.081	3.070	3.004	2.994	2.988	2.970	3.024	3.014	3.017	3.067
N° 21	3.415	3.379	3.388	3.375	3.303	3.291	3.277	3.258	3.320	3.325	3.325	3.372
N° 22	3.325	3.289	3.303	3.294	3.216	3.212	3.205	3.185	3.244	3.248	3.245	3.281
N° 23	3.157	3.123	3.131	3.120	3.055	3.043	3.034	3.017	3.068	3.068	Not Measurable	Not Measurable

24. SR-1

Ta=25°C; load to Vcc/2; Vcc=+16V; RL=1kOhms

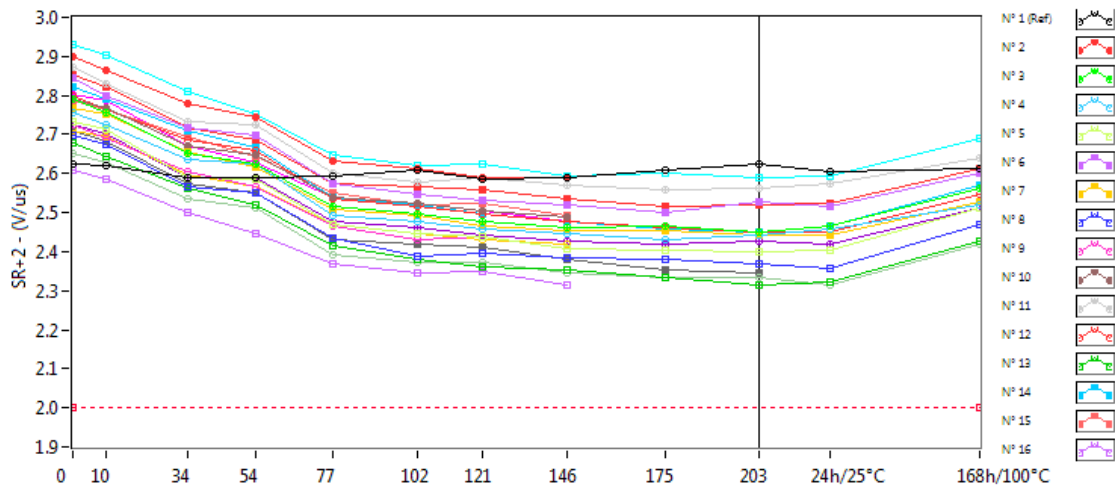


SR-1 . (V/us) Min = 2.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	2.787	2.770	2.697	2.699	2.683	2.713	2.739	2.693	2.769	2.762	2.768	2.764
N° 2	3.504	3.323	2.886	2.844	2.748	2.733	2.767	2.723	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	3.313	2.993	2.734	2.659	2.529	2.566	2.617	2.561	2.555	2.545	2.548	2.729
N° 4	3.367	3.158	2.745	2.702	2.598	2.633	2.680	2.631	2.590	2.577	2.579	2.815
N° 5	3.288	3.037	2.699	2.656	2.598	2.636	2.670	2.631	2.548	2.537	2.542	2.726
N° 6	3.489	3.298	2.917	2.845	2.709	2.741	2.783	2.722	2.738	2.729	2.732	3.113
N° 7	3.330	3.020	2.717	2.669	2.511	2.570	2.600	2.549	2.573	2.560	2.570	2.745
N° 8	3.181	2.888	2.627	2.608	2.453	2.483	2.545	2.469	2.475	2.460	2.465	2.656
N° 9	3.305	3.033	2.692	2.655	2.555	2.590	2.635	2.574	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	3.393	3.068	2.775	2.733	2.625	2.642	2.690	2.636	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	3.507	3.397	2.913	2.871	2.772	2.802	2.840	2.797	2.776	2.757	2.799	3.147
N° 12	3.469	3.098	2.828	2.783	2.657	2.695	2.738	2.677	2.668	2.650	2.660	2.998
N° 13	3.179	2.913	2.641	2.631	2.486	2.537	2.587	2.522	2.506	2.484	2.488	2.662
N° 14	3.325	3.042	2.747	2.712	2.578	2.616	2.662	2.596	2.597	2.614	2.587	2.783
N° 15	3.529	3.223	2.842	2.813	2.676	2.699	2.754	2.685	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	3.252	2.972	2.658	2.620	2.583	2.626	2.705	2.620	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	3.338	3.132	2.735	2.698	2.552	2.588	2.640	2.583	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	3.395	3.129	2.823	2.763	2.680	2.711	2.763	2.691	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	3.324	3.088	2.757	2.720	2.573	2.609	2.672	2.606	2.622	2.606	2.606	2.795
N° 20	3.263	2.951	2.652	2.614	2.493	2.539	2.584	2.529	2.512	2.495	2.486	2.685
N° 21	3.174	3.026	2.937	2.871	2.743	2.776	2.814	2.760	2.757	2.735	2.745	3.146
N° 22	3.427	3.156	2.780	2.739	2.649	2.659	2.692	2.643	2.634	2.627	2.629	2.823
N° 23	3.292	3.013	2.666	2.632	2.495	2.525	2.572	2.513	2.521	2.500	Not Measurable	Not Measurable

25. SR+2

Ta=25°C; load to Vcc/2; Vcc=+3V; RL=1kOhms



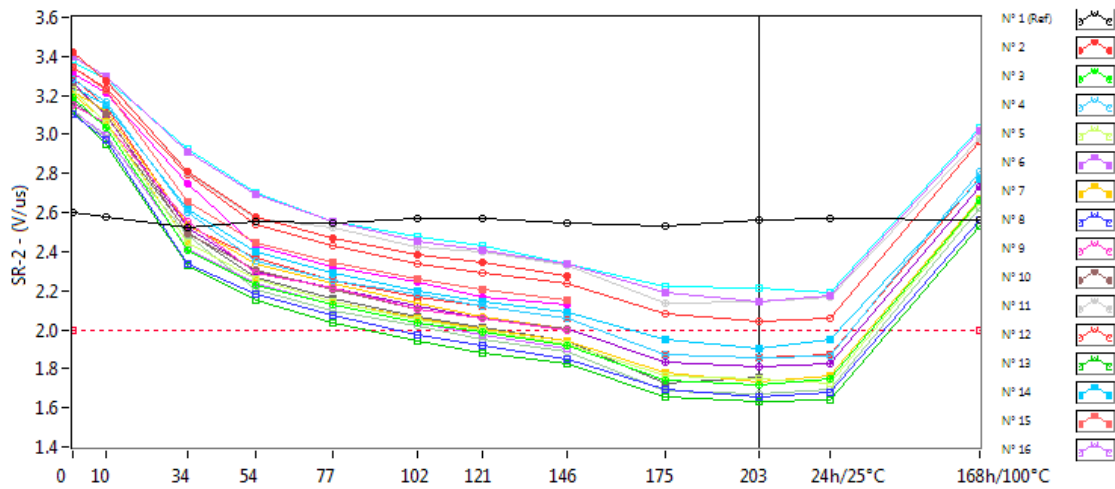
SR+2 . (V/us)

Min = 2.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	2.624	2.621	2.591	2.591	2.595	2.609	2.584	2.591	2.608	2.626	2.604	2.612
N° 2	2.900	2.864	2.780	2.745	2.633	2.612	2.591	2.588	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	2.792	2.755	2.651	2.623	2.515	2.495	2.479	2.461	2.464	2.451	2.467	2.564
N° 4	2.755	2.726	2.637	2.626	2.492	2.479	2.457	2.448	2.431	2.444	2.457	2.518
N° 5	2.733	2.712	2.591	2.584	2.470	2.448	2.439	2.409	2.402	2.399	2.402	2.511
N° 6	2.845	2.799	2.718	2.699	2.574	2.547	2.531	2.521	2.501	2.529	2.515	2.600
N° 7	2.769	2.751	2.655	2.616	2.508	2.492	2.467	2.454	2.454	2.444	2.444	2.529
N° 8	2.698	2.674	2.567	2.551	2.436	2.388	2.394	2.385	2.381	2.368	2.356	2.471
N° 9	2.726	2.691	2.605	2.567	2.464	2.430	2.439	2.409	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	2.792	2.766	2.669	2.648	2.541	2.524	2.505	2.489	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	2.872	2.829	2.733	2.725	2.602	2.578	2.591	2.571	2.557	2.564	2.575	2.638
N° 12	2.799	2.762	2.688	2.658	2.537	2.515	2.498	2.476	2.461	2.451	2.451	2.546
N° 13	2.678	2.644	2.564	2.518	2.415	2.382	2.359	2.354	2.332	2.314	2.323	2.428
N° 14	2.822	2.792	2.710	2.666	2.541	2.521	2.495	2.476	2.457	2.451	2.467	2.571
N° 15	2.788	2.762	2.695	2.644	2.551	2.518	2.524	2.492	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	2.608	2.586	2.502	2.445	2.368	2.345	2.348	2.315	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	2.709	2.695	2.598	2.567	2.470	2.448	2.430	2.418	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	2.803	2.788	2.669	2.630	2.541	2.524	2.505	2.479	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	2.726	2.702	2.591	2.591	2.476	2.461	2.442	2.427	2.418	2.425	2.418	2.511
N° 20	2.651	2.628	2.537	2.511	2.391	2.371	2.374	2.345	2.332	2.332	2.314	2.418
N° 21	2.932	2.904	2.812	2.752	2.648	2.619	2.623	2.595	2.600	2.589	2.593	2.692
N° 22	2.852	2.822	2.718	2.688	2.574	2.567	2.557	2.534	2.515	2.518	2.522	2.612
N° 23	2.709	2.681	2.574	2.551	2.430	2.418	2.412	2.382	2.353	2.347	Not Measurable	Not Measurable

26. SR-2

Ta=25°C; load to Vcc/2; Vcc=+3V; RL=1kOhms



SR-2 . (V/us) Min = 2.0

	0krad(Si)	10krad(Si)	34krad(Si)	54krad(Si)	77krad(Si)	102krad(Si)	121krad(Si)	146krad(Si)	175krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	2.598	2.574	2.524	2.554	2.544	2.566	2.569	2.548	2.528	2.561	2.571	2.564
N° 2	3.418	3.275	2.808	2.578	2.467	2.382	2.342	2.274	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 3	3.189	3.035	2.409	2.232	2.130	2.039	1.987	1.920	1.742	1.720	1.748	2.662
N° 4	3.286	3.163	2.598	2.356	2.253	2.180	2.118	2.056	1.872	1.860	1.867	2.812
N° 5	3.226	3.054	2.442	2.261	2.146	2.054	1.993	1.930	1.762	1.750	1.728	2.655
N° 6	3.400	3.297	2.908	2.695	2.551	2.451	2.409	2.340	2.190	2.142	2.178	3.016
N° 7	3.205	3.068	2.445	2.258	2.146	2.058	2.003	1.939	1.777	1.736	1.761	2.669
N° 8	3.108	2.970	2.337	2.185	2.071	1.973	1.916	1.851	1.691	1.659	1.677	2.564
N° 9	3.148	3.054	2.551	2.287	2.215	2.105	2.056	1.993	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 10	3.253	3.103	2.489	2.306	2.205	2.107	2.058	2.007	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 11	3.406	3.286	2.800	2.571	2.524	2.424	2.400	2.328	2.137	2.142	2.165	2.984
N° 12	3.342	3.237	2.792	2.537	2.427	2.337	2.293	2.238	2.084	2.045	2.062	2.961
N° 13	3.118	2.948	2.331	2.154	2.039	1.943	1.883	1.823	1.655	1.631	1.642	2.531
N° 14	3.247	3.148	2.616	2.403	2.287	2.200	2.144	2.093	1.949	1.903	1.949	2.768
N° 15	3.342	3.231	2.655	2.442	2.348	2.258	2.207	2.154	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 16	3.118	2.993	2.418	2.235	2.125	2.032	1.977	1.902	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 17	3.220	3.122	2.537	2.334	2.238	2.135	2.069	2.005	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 18	3.314	3.210	2.745	2.427	2.323	2.243	2.170	2.128	Not Measurable	Not Measurable	Not Measurable	Not Measurable
N° 19	3.264	3.093	2.524	2.295	2.215	2.121	2.058	2.001	1.835	1.810	1.823	2.733
N° 20	3.128	2.979	2.482	2.202	2.100	2.018	1.949	1.885	1.686	1.670	1.691	2.623
N° 21	3.371	3.280	2.926	2.703	2.557	2.476	2.430	2.340	2.220	2.212	2.192	3.035
N° 22	3.291	3.143	2.534	2.365	2.253	2.165	2.121	2.056	1.872	1.854	1.871	2.780
N° 23	3.163	3.049	2.502	2.269	2.163	2.065	2.009	1.941	1.729	1.756	Not Measurable	Not Measurable