DOCUMENT

document title/ titre du document

EVALUATION OF STM POWER MOSFET:

^{60}Co TID TEST RESULTS ON PART TYPE STRH40N6SY3

(N-CHANNEL 60V 40A)

prepared by/*préparé par* M.Muschitiello TEC-QEC

reference/*réference* ESA TEC-QEC RA0558
issue/*édition* 1
revision/*révision* 1
date of issue/*date d'édition* 14 September 2010
status/*état* issued
Document type/*type de document* Radiation Test Report
Distribution/*distribution*

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Agence spatiale européenne

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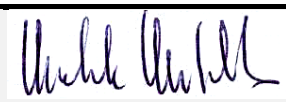
APPROVAL

author *auteur*	Michele Muschitiello TEC-QEC		date *date*	14 September 2010

approved by *approuvé by*	Véronique Ferlet-Cavrois TEC-QEC		date *date*	14 September 2010

CHANGE LOG

reason for change */raison du changement*	issue/*issue*	revision/*revision*	date/*date*
New document	1	1	14 September 2010

CHANGE RECORD

Issue: 1 Revision: 1

reason for change/*raison du changement*	page(s)/*page(s)*	paragraph(s)/*paragraph(s)*

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Test Report Number	**ESA_QEC RA0558**
Project	European Component Initiative - phase I Critical Components
SCC Component no.	***n/a***
Component Designation	STRH40N6SY3
Irradiation Spec. no.	ESA/SCC 22900
Family	N-Channel Power MOSFET
Group	Silicon
Package	TO3
Component Specification	STRH40N6SY3 ***> not issued <*** *Manufacturer Test Conditions Log HG6F.tst, dated 09.09.2009 used instead of.*
Test House Name	ESA / ESTEC
Irradiation Test Plan Number	*TEST PLAN FOR TID EVALUATION STM POWER MOSFETS (draft status), rev.D 31.07.2009*
Manufacturer name	STM
Application type of Acceptance	n/a
Date Code (diffusion lot)	Diffusion Lot nr. 3844736B
Serial Number of samples	001, 002, 003, 004, 005, 006, 007, 008, 009, 010, 011, 012, 013, 014, 015, 016, 017, 018, 019, [034 reference device]
Irradiation Measurement schedule: Bias conditions: Circuit Reference: Temp °C: Duration:	0, 6, 15, 22.5, 30, 55, 70, 110 krad(Si) Total Dose ***BC1*** - s/n's 013, 014, 015, 016, 017: V_{DS} = 0V, V_{GS} = +15V ***BC2*** - s/n's 008, 009, 010, 011, 012: V_{DS} = +48V, V_{GS} = 0V ***BC3*** - s/n's 001, 002, 003, 004, 005: V_{DS} = 0V, V_{GS} = 0V ***BC4*** - s/n's 006, 007: V_{DS} = +60V, V_{GS} = -20V ***BC5*** - s/n's 018, 019: V_{DS} = 0V, V_{GS} = +12V Fig.1 Room temperature 20 ± 5 300 hours
Electrical Measurement Parameters:	I_{GSS_F1}, I_{GSS_R1} I_{DSS} @ Vds 5V, Vgs 0V, I_{DSS} @ Vds 48V, Vgs 0V , I_{DSS} @ Vds 60V, Vgs 0V V_{GS_th} @ Id 0.01 mA, V_{GS_th} @ Id 0.10 mA, V_{GS_th} @ Id 0.25 mA, V_{GS_th} @ Id 1.00 mA $V_{(BR)DSS}$ @Id=100uA, $V_{(BR)DSS}$ @Id=250uA, $V_{(BR)DSS}$ @Id=1mA R_{DS}(on) – Drain Source On-Resistance V_{SD} - Inverse Diode Fwd. Volt. V_{DS}(on) – Drain Source On-Voltage, $I_{D(on)}$ - On-State Drain Current. Gate Charge Qg, Qgs, Qgd
Facility Source: Energy: Dose Rate:	ESA/ESTEC ^{60}Co (gamma) 1.173 MeV 1.332 MeV 5.9 rad(Si)/min

Absorbing Material: Thickness: Temperature °C:	N/A N/A 20 ± 3
Dosimetry / Calibration method.	Calibrated NE2571, 0.6cc air ionisation chamber s/n 3112 Calibrated Farmer 2670 dosimeter s/n 109.
Annealing / Ageing	6 hours at Room Temperature 21 hours at Room Temperature 140 hours at Room Temperature 168 hours at 100 °C
Biasing conditions	***BC1*** - s/n's 013, 014, 015, 016, 017: V_{DS} = 0V, V_{GS} = +15V ***BC2*** - s/n's 008, 009, 010, 011, 012: V_{DS} = +48V, V_{GS} = 0V ***BC3*** - s/n's 001, 002, 003, 004, 005: V_{DS} = 0V, V_{GS} = 0V ***BC4*** - s/n's 006, 007: V_{DS} = +60V, V_{GS} = -20V ***BC5*** - s/n's 018, 019: V_{DS} = 0V, V_{GS} = +12V
Bias Circuit Reference	Fig.1

1 INTRODUCTION

The following document contains the conditions and the results of the total dose test campaign for the evaluation of the radiation tolerance of the discrete N-Channel PowerMOS, based on type STRH40N6SY3, manufactured by STM.
This test was conducted on prototypes from diffusion lot number 3844736B, packaged in TO3, provided by the manufacturer.

2 APPLICABLE DOCUMENTS

AD 1. ESA-ESTEC QEC document: TEST PLAN FOR TID EVALUATION STM POWER MOSFETS (draft status), rev.D 31.07.2009.
AD 2. ESA/SCC 22900 “Total Dose Steady-State Irradiation Test Method”, issue 3.
AD 3. Qualification program of N. And P. channel Rad-Hard Power Mosfets, STMicrolectronics RNS/PB/0907101ce Rev.03, March 12th 2009
AD 4. Manufacturer Test Conditions Log HG6F.tst, dated 09.09.2009
AD 5. ESCC Generic Specification 5000, Issue 5 July 2009

3 TEST DESCRIPTION

Thirty six devices, POWER MOSFET based on type STRH40N6SY3, manufactured by STM have been received for TID testing at the ESTEC ^{60}Co facility. All the devices have been electrically tested (go/no go) and the serialised as shown in Table 1.

According to the Evaluation Test Plan [AD 1], nineteen devices have been irradiated. Table 1 summarise the information on test sample.

Table 1 received samples and their usage.

S/n's	Description
001-005	Unbiased during ^{60}Co irradiation (Bias Condition **BC3**)
006-007	Biased during ^{60}Co irradiation (V_{DS} = +60V, V_{GS} = -20V, Bias Condition **BC4**)
008-012	Biased during ^{60}Co irradiation (V_{DS} = + 48V, V_{GS} = 0V, Bias Condition **BC2**)
013-017	Biased during ^{60}Co irradiation (V_{DS} = 0V, V_{GS} = +15V, Bias Condition **BC1**)
018-019	Biased during ^{60}Co irradiation (V_{DS} = 0V, V_{GS} = +12V, Bias Condition **BC5**)
34	Reference device (not irradiated) - Electrically tested before and after each intermediate measurement run at irradiation step completion
35	Used for Gate Charge Measurement Set-up (not Irradiated).
020-033, 036	Passed initial go/no go electrical measurements. Not Irradiated

Refer to TID Evaluation test plan [AD 1] for more details on test conditions.

4 RADIATION TEST PLAN

The actual radiation test steps are reported in Table 2.

Table 2 Irradiation Test Plan

Step	Total Dose (Si) krad	Dose Rate (Si)rad/min
(Pre irradiation) 0	==	==
Irradiation step # 1	6.20	5.44
Irradiation step # 2	15.00	5.52
Irradiation step # 3	22.50	5.65
Irradiation step # 4	30.06	5.70
Irradiation step # 5	55.00	5.81
Irradiation step # 6	70.07	5.77
Irradiation step # 7	110.50	5.81

At the completion of each irradiation step, intermediate electrical measurements were carried out according to the next paragraph. Fig.1 shows the bias circuits used during the irradiation.

At the end of the final irradiation run, all devices were electrically measured and annealed at room temperature (for 167 hours in total) and subsequently aged at 100°C (168 hrs), maintaining the same bias conditions applied during the TID test.
Table 3 reports the annealing/ageing sequence detail.

Table 3 Anneal/ageing sequence

Step	Temperature	Duration
Anneal	Room temperature	6 hours
Anneal	Room temperature	21 hours
Anneal	Room temperature	140 hours
Ageing	100 °C	168 hours

At the completion of each anneal/ageing step, all devices were electrically tested.

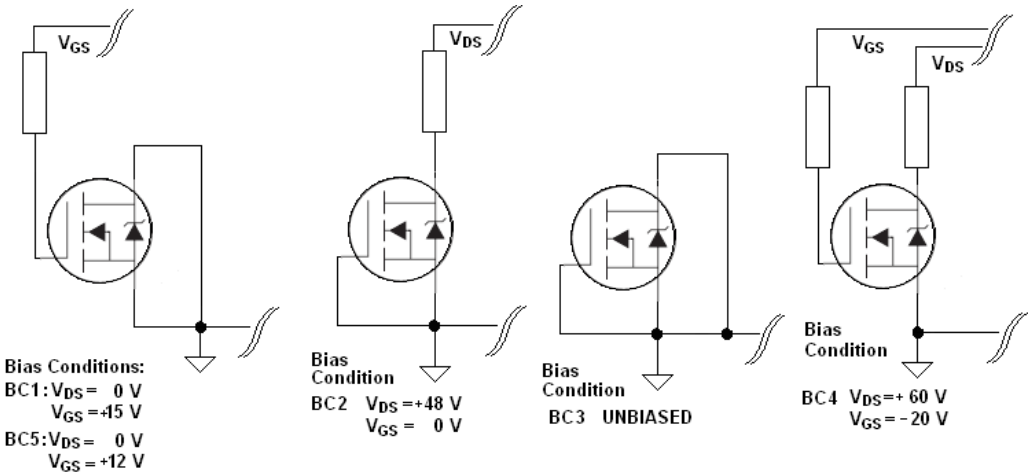


Fig.1 Radiation Test Biasing circuits.

4.1 Measurement set-up

No In-situ measurements were performed during irradiation. The measured parameters, the test conditions and the adopted Min-Max limits (pass/fail criteria) are listed in Table 4.

Table 4 Measured Parameters, Min-Max Limits and Test conditions

nr.	Parameter	Note	Limits		Unit	Mil-Std-750 test method	Test conditions
			Min.	Max.			
0	IGSS_F1	Gate Leakage Current (fwd)		100	nA	3411	V_{GS} = +20V
1	IGSS_R1	Gate Leakage Current (rev.)		100	nA	3411	V_{GS} = -20V
(a)(d) 2	IDSS @ Vds 5V, Vgs 0V	Drain Current (off state)		10	µA	3413	V_{DS} = 5V V_{GS} = 0V
(a) 3	IDSS @ Vds 48V, Vgs 0V			10	µA	3413	V_{DS} = 48V V_{GS} = 0V
(b)4	IDSS @ Vds 60V, Vgs 0V			10	µA	3413	V_{DS} = 60V V_{GS} = 0V
(a)(d) 5	VGS_th @ I_D 0.01 mA	Gate threshold voltage	2000	4500	mV	3403	V_{DS} = V_{GS} I_D = 0.01mA
(a)(d) 6	VGS_th @ I_D 0.10 mA		2000	4500	mV	3403	V_{DS} = V_{GS} I_D = 0.1mA
7	VGS_th @ I_D 0.25 mA		2000	4500	mV	3403	V_{DS} = V_{GS} I_D = 0.25mA
8	VGS_th @ I_D 1.00 mA		2000	4500	mV	3403	V_{DS} = V_{GS} I_D = 1mA
(a)(d) 9	RDS(on) - D-S On-Resistance	Drain-Source On resistance		n.d.	Ohm	3421	*V_{GS} = 10V* *I_{DS} = 20A*
(c) 10	VDS(on) - D-S On-Voltage	Drain-Source On voltage		800	mV	3405	V_{GS} = 10V I_{DS} = 20A
(a) 11	V(BR)DSS @I_D=100uA	V_{DS} Breakdown	60		V	3407	V_{GS} = 0V I_{DS} = 100uA
12	V(BR)DSS @I_D=250uA		60		V	3407	V_{GS} = 0V I_{DS} = 250uA
13	V(BR)DSS @I_D=1mA		60		V	3407	V_{GS} = 0V I_{DS} = 1mA
(a) 14	VSD - Inverse Diode Fwd. Volt.	Fwd voltage inverse diode		1500	mV	4011	I_{SD} = 40A V_{GS} = 0V
(a) 15	ID(on) - On-State Drain Current	Drain-Source max On current	40		A	3413	V_{GS} = 10V V_{DS} = 10V
(a) (d) 16	Q_G Total Gate Charge	Gate Charge switch-on characteristics	n.d.	n.d.	nC	3471	I_G = 1mA, V_{GS} = 12 V V_{DS}= 30V, I_{DS} = 20A
(a) (d) 17	Q_{GS} Gate – Source Charge		n.d.	n.d.	nC		
(a) (d) 18	Q_{GD} Gate – Drain Charge		n.d.	n.d.	nC		

(a) Parameter not listed in Manufacturer Test Condition Log HG6F.tst, dated 09.09.2009.
(b) Maximum limit of 10µA instead of 1 mA has been adopted to enhance ATE accuracy for the parameter measurement.
(c) The actual test conditions deviate from Manufacturer Test Condition Log HG6F.tst, dated 09.09.2009 due to test equipment limitation.
(d) Test conditions and Min-Max limits not defined in Manufacturer Test Condition Log HG6F.tst, dated 09.09.2009

Parameters from nr.0 to nr.15 have been measured by using Unimet M3000 Automatic Test Equipment.

Parameters from nr.16 to nr.18 (Gate Charge) have been measured according to the test set-up schematized in Figure 2. More details are reported in paragraph 4.4.2 *GATE CHARGE WAVEFORMS*.

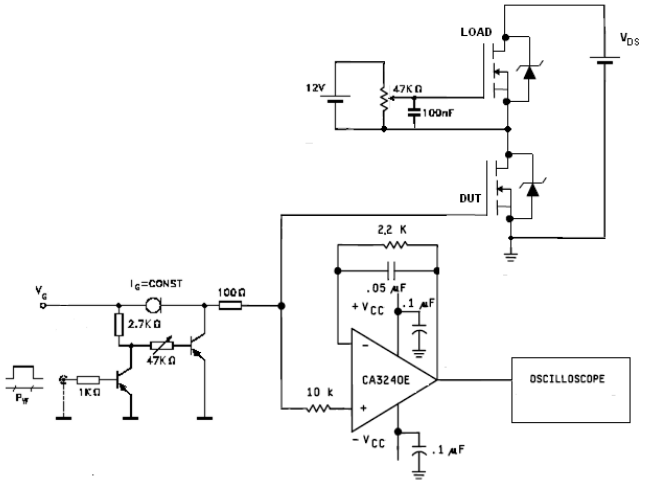


Figure 2 Gate Charge measurement circuit.

4.2 Thermal conditions

All irradiations and measurements were performed at room temperature (20 ± 3 ^{o}C). The environmental conditions were continuously monitored.

4.3 Dosimetry

Calibrated NE2571, 0.6cc air ionisation s/n 3112 chamber, read by calibrated Farmer 2670 s/n 109 dosimeter was used to measure the Total Ionising Dose.

4.4 Test Results

All measurement results are reported from Table 5 to Table 23. Test ended with a registered Total Dose of 110.5 krad(Si). At the end of the last irradiation step, electrical measurements were performed and the devices were tested again after 6, 21 and 140 hours annealing at room temperature. During the entire annealing, the irradiated devices were biased employing the same test board.
After the annealing, the samples went through accelerated ageing for 168 hrs at 100°C under the same bias conditions.

Following the accelerated ageing test, full parametric measurements were performed.

Electrical Measurement uncertainty values, reported in table footnotes, were estimated by observing the variations in the reference device (s/n 34) parameters, during the entire test campaign. Uncertainty has been calculated by using [1] below, with a coverage factor of 3.

[1] $$u = \frac{s}{\sqrt{n}},$$

u = estimated overall uncertainty
s = standard deviation
n= number of observations

Significant data from tables have been plotted from Table 5 to Figure 21. Data, taken during and after the annealing/ageing sequence, have been plotted on the same graph with a gap between the TID X axis scale and the annealing/ageing time scale (arbitrarily set).

Details on the extracted gate charge parameters are reported in paragraph 4.4.2 *GATE CHARGE WAVEFORMS*.

4.4.1 Electrical Measurement Data

Table 5 – I_{GSS_F1} Gate Leakage Current (fwd) [nA] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:		100.0	[nA]

Detailed results - Measurement data in [nA]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	0.180	0.017	0.061	0.022	0.077	0.013	0.041	0.172	0.248	0.001	0.021	0.177	(V_{DS} 0V, V_{GS} 0V)
002	0.056	0.113	0.027	0.299	0.015	0.081	0.178	0.059	0.202	0.026	0.249	0.020	(V_{DS} 0V, V_{GS} 0V)
003	0.048	0.020	0.006	0.052	0.071	0.130	0.129	0.132	0.193	0.003	0.143	0.074	(V_{DS} 0V, V_{GS} 0V)
004	0.033	0.141	0.016	0.198	0.087	0.005	0.211	0.165	0.102	0.160	0.021	0.008	(V_{DS} 0V, V_{GS} 0V)
005	0.145	0.154	0.085	0.016	0.101	0.040	0.159	0.110	0.067	0.147	0.083	0.088	(V_{DS} 0V, V_{GS} 0V)
006	0.102	0.226	0.037	0.098	0.085	0.189	0.124	0.058	0.114	0.138	0.222	0.090	(V_{DS} +60V, V_{GS} -20V)
007	0.019	0.022	0.027	0.060	0.097	0.061	0.048	0.107	0.131	0.088	0.057	0.075	(V_{DS} +60V, V_{GS} -20V)
008	0.045	0.196	0.045	0.075	0.090	0.120	0.064	0.061	0.139	0.050	0.204	0.025	(V_{DS} +48V, V_{GS} 0V)
009	0.040	0.181	0.200	0.037	0.034	0.057	0.022	0.036	0.046	0.119	0.197	0.025	(V_{DS} +48V, V_{GS} 0V)
010	0.153	0.151	0.028	0.064	0.088	0.147	0.211	0.072	0.014	0.089	0.011	0.182	(V_{DS} +48V, V_{GS} 0V)
011	0.090	0.002	0.118	0.018	0.048	0.092	0.038	0.051	0.125	0.042	0.010	0.089	(V_{DS} +48V, V_{GS} 0V)
012	0.213	0.040	0.094	0.056	0.089	0.149	0.023	0.126	0.007	0.071	0.028	0.167	(V_{DS} +48V, V_{GS} 0V)
013	0.040	0.155	0.019	0.094	0.061	0.099	0.143	0.118	0.151	0.049	0.080	0.225	(V_{DS} 0V, V_{GS} +15V)
014	0.147	0.009	0.202	0.133	0.127	0.088	0.064	0.172	0.193	0.029	0.070	0.060	(V_{DS} 0V, V_{GS} +15V)
015	0.177	0.189	0.108	0.138	0.118	0.060	0.115	0.009	0.050	0.015	0.017	0.064	(V_{DS} 0V, V_{GS} +15V)
016	0.223	0.017	0.100	0.146	0.208	0.033	0.019	0.021	0.085	0.016	0.046	0.152	(V_{DS} 0V, V_{GS} +15V)
017	0.222	0.125	0.054	0.055	0.011	0.045	0.243	0.083	0.111	0.078	0.015	0.139	(V_{DS} 0V, V_{GS} +15V)
018	0.142	0.228	0.160	0.229	0.097	0.131	0.031	0.050	0.153	0.027	0.186	0.049	(V_{DS} 0V, V_{GS} +12V)
019	0.015	0.009	0.021	0.185	0.123	0.029	0.011	0.068	0.014	0.108	0.088	0.096	(V_{DS} 0V, V_{GS} +12V)
034	0.241	0.075	0.079	0.149	0.086	0.235	0.142	0.162	0.061	0.082	0.167	0.065	Reference device

Reference device **Mean value:** 0.13 **Estimated uncertainty:** ± 42.97 % (± 0.06 nA)

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:		100.0	[nA]

I_{GSS_F1} Gate Leakage Current (fwd) [nA] vs ^{60}Co Irradiation Total Dose [rad (Si)]

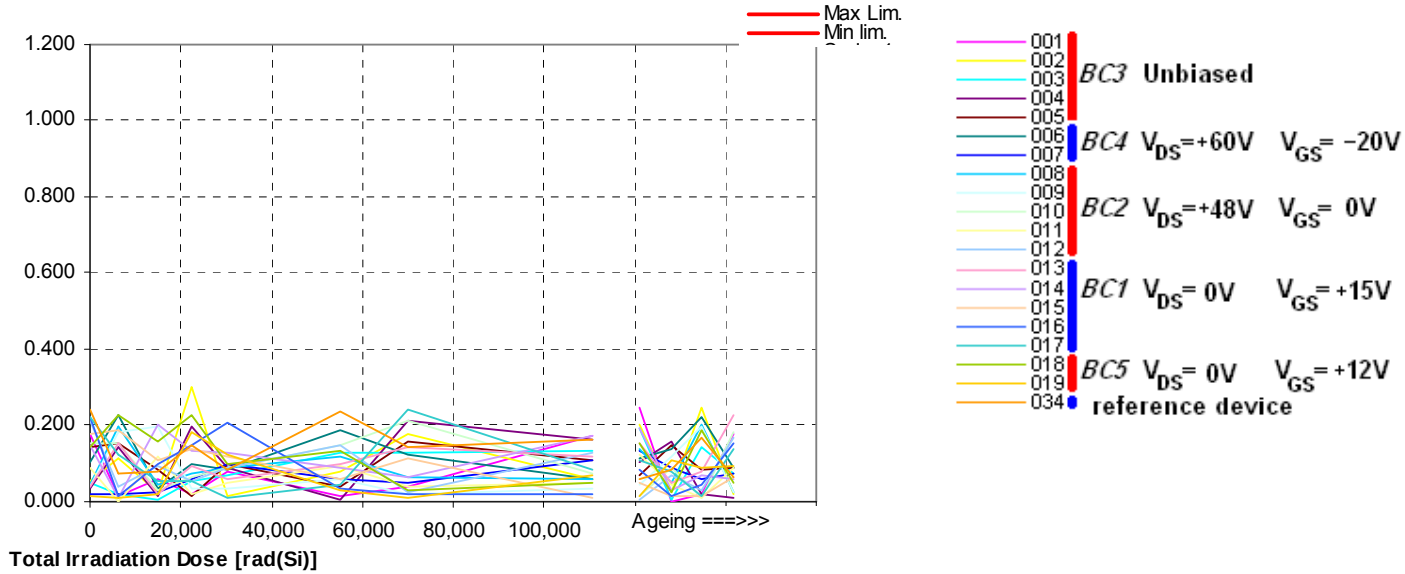


Figure 3 Data from Table 5

Table 6 – I_{GSS_R1} Gate Leakage Current (rev) [nA] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:		100.0	[nA]

Detailed results - Measurement data in [nA]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	0.025	0.040	0.084	0.005	0.009	0.068	0.017	0.054	0.071	0.113	0.082	0.095	(V_{DS} 0V, V_{GS} 0V)
002	0.156	0.228	0.218	0.089	0.020	0.080	0.029	0.202	0.048	0.157	0.168	0.166	(V_{DS} 0V, V_{GS} 0V)
003	0.038	0.002	0.054	0.066	0.029	0.067	0.053	0.087	0.060	0.071	0.045	0.090	(V_{DS} 0V, V_{GS} 0V)
004	0.098	0.072	0.123	0.076	0.044	0.034	0.049	0.057	0.016	0.009	0.031	0.043	(V_{DS} 0V, V_{GS} 0V)
005	0.004	0.091	0.011	0.008	0.039	0.113	0.046	0.014	0.005	0.042	0.058	0.077	(V_{DS} 0V, V_{GS} 0V)
006	0.077	0.047	0.105	0.089	0.048	0.031	0.092	0.025	0.036	0.029	0.050	0.054	(V_{DS} +60V, V_{GS} -20V)
007	0.006	0.033	0.001	1.108	0.041	0.005	0.030	0.049	0.051	0.052	0.052	0.025	(V_{DS} +60V, V_{GS} -20V)
008	0.010	0.031	0.063	0.116	0.032	0.051	0.016	0.034	0.037	0.013	0.007	0.073	(V_{DS} +48V, V_{GS} 0V)
009	0.088	0.035	0.099	0.052	0.033	0.023	0.084	0.124	0.033	0.080	0.107	0.057	(V_{DS} +48V, V_{GS} 0V)
010	0.061	0.023	0.114	0.099	0.039	0.071	0.027	0.002	0.071	0.006	0.087	0.056	(V_{DS} +48V, V_{GS} 0V)
011	0.071	0.083	0.066	0.005	0.065	0.083	0.052	0.011	0.012	0.037	0.011	0.021	(V_{DS} +48V, V_{GS} 0V)
012	0.041	0.023	0.013	0.026	0.082	0.056	0.003	0.001	0.011	0.115	0.046	0.070	(V_{DS} +48V, V_{GS} 0V)
013	0.030	0.069	0.081	0.026	0.038	0.327	0.121	0.074	0.034	0.246	0.236	0.074	(V_{DS} 0V, V_{GS} +15V)
014	0.020	0.001	0.023	0.103	0.104	0.146	0.095	0.010	0.012	0.062	0.050	0.047	(V_{DS} 0V, V_{GS} +15V)
015	0.101	0.064	0.056	0.077	0.070	0.029	0.089	0.167	0.024	0.111	0.015	0.064	(V_{DS} 0V, V_{GS} +15V)
016	0.026	0.103	0.057	0.047	0.029	0.239	0.192	0.041	0.146	0.056	0.215	0.085	(V_{DS} 0V, V_{GS} +15V)
017	0.089	0.028	0.058	0.073	0.001	0.014	0.101	0.041	0.053	0.057	0.078	0.042	(V_{DS} 0V, V_{GS} +15V)
018	0.002	0.086	0.121	0.016	0.057	0.050	0.110	0.191	0.058	0.008	0.021	0.150	(V_{DS} 0V, V_{GS} +12V)
019	0.042	0.013	0.068	0.102	0.013	0.291	0.096	0.222	0.059	0.032	0.025	0.062	(V_{DS} 0V, V_{GS} +12V)
034	0.033	0.033	0.026	0.077	0.036	0.056	0.087	0.038	0.039	0.022	0.096	0.017	Reference device

Reference device **Mean value:** 0.05 **Estimated uncertainty:** ± 48.45 % (± 0.023 nA)

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:		100.0	[nA]

I_{GSS_R1} Gate Leakage Current (rev) [nA] vs ^{60}Co Irradiation Total Dose [rad (Si)]

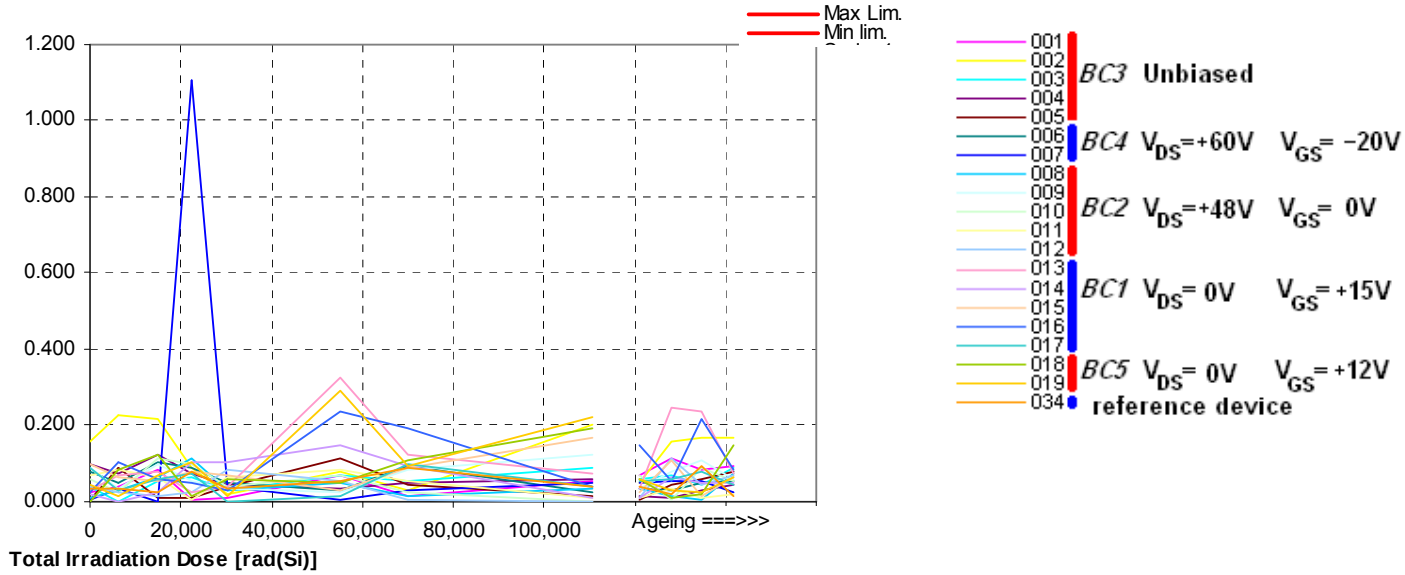


Figure 4 Data from Table 6

Table 7 – I_{DSS} @ V_{DS} 5V, V_{GS} 0V, Drain Current (off state) [nA] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:		10'000	[nA]

Detailed results - Measurement data in [nA]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	0.051	3.654	7.540	18.024	19.386	40.517	62.508	74.805	58.093	91.089	59.520	23.108	(V_{DS} 0V, V_{GS} 0V)
002	0.006	3.239	7.410	17.856	19.567	38.257	59.197	75.382	58.640	92.774	58.947	22.771	(V_{DS} 0V, V_{GS} 0V)
003	0.025	3.344	7.324	17.656	19.087	36.614	60.018	82.524	60.336	91.693	63.156	22.569	(V_{DS} 0V, V_{GS} 0V)
004	0.024	3.297	7.231	17.659	21.373	36.806	60.461	79.229	60.410	92.607	60.539	22.404	(V_{DS} 0V, V_{GS} 0V)
005	0.025	3.173	7.236	17.573	19.469	35.595	58.486	77.907	57.614	89.015	59.472	22.530	(V_{DS} 0V, V_{GS} 0V)
006	0.002	0.889	1.632	4.061	4.579	8.213	12.429	12.952	11.239	17.165	11.574	11.841	(V_{DS} +60V, V_{GS} -20V)
007	0.011	0.936	1.839	4.019	4.432	8.090	12.659	12.331	11.258	16.862	11.650	11.616	(V_{DS} +60V, V_{GS} -20V)
008	0.035	1.067	2.162	4.599	5.066	9.229	15.216	20.136	20.052	25.994	16.650	5.716	(V_{DS} +48V, V_{GS} 0V)
009	0.002	1.136	1.985	4.655	5.063	9.709	15.215	22.504	19.639	25.669	17.971	5.457	(V_{DS} +48V, V_{GS} 0V)
010	0.015	1.145	2.237	4.898	5.473	10.164	15.699	22.384	20.160	26.397	16.105	5.843	(V_{DS} +48V, V_{GS} 0V)
011	0.001	1.084	2.123	5.203	5.452	10.058	17.002	22.608	22.653	27.957	16.516	5.870	(V_{DS} +48V, V_{GS} 0V)
012	0.009	1.132	2.150	4.965	5.415	9.821	17.087	20.203	20.794	26.759	16.644	6.098	(V_{DS} +48V, V_{GS} 0V)
013	0.047	9.175	6.909	12.189	12.331	22.588	38.049	72.711	64.636	76.082	50.157	88.277	(V_{DS} 0V, V_{GS} +15V)
014	0.015	9.188	6.598	12.737	12.341	22.948	37.190	63.631	58.172	75.397	50.516	84.825	(V_{DS} 0V, V_{GS} +15V)
015	0.021	9.109	6.628	12.150	12.249	22.422	37.104	61.317	61.689	73.987	48.124	87.376	(V_{DS} 0V, V_{GS} +15V)
016	0.050	9.315	6.911	12.306	12.166	22.310	38.123	62.499	63.703	77.257	49.316	87.088	(V_{DS} 0V, V_{GS} +15V)
017	0.001	9.364	6.851	12.366	12.002	22.423	36.683	61.684	57.244	79.160	50.349	90.416	(V_{DS} 0V, V_{GS} +15V)
018	0.011	9.316	6.927	12.324	11.957	24.007	39.302	97.280	81.664	106.412	58.079	86.145	(V_{DS} 0V, V_{GS} +12V)
019	0.073	9.189	6.706	12.538	12.229	22.896	39.523	103.992	84.202	110.459	61.466	87.104	(V_{DS} 0V, V_{GS} +12V)
034	0.010	0.006	0.031	0.052	0.007	0.006	0.006	0.081	0.011	0.096	0.071	0.050	Reference device

Reference device **Mean value:** 0.04 **Estimated uncertainty:** ± 80.01 % (± 0.029 nA)

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:		10'000	[nA]

I_{DSS} @ V_{DS} 5V, V_{GS} 0V, Drain Current (off state) [nA] vs ^{60}Co Irradiation Total Dose [rad (Si)]

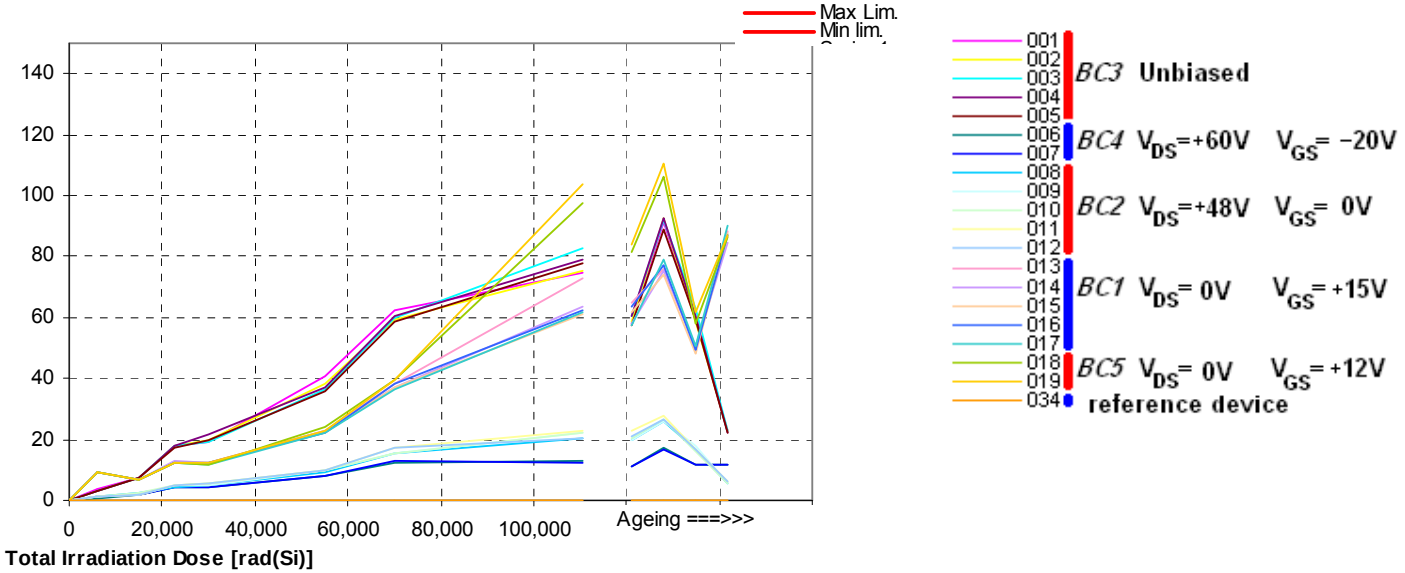


Figure 5 Data from Table 7

Table 8 – I_{DSS} @ V_{DS} 48V, V_{GS} 0V, Drain Current (off state) [nA] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:		10'000	[nA]

Detailed results - Measurement data in [nA]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	0.02	5.22	11.35	26.24	28.39	55.70	82.38	109.19	83.847	129.829	81.665	28.855	(V_{DS} 0V, V_{GS} 0V)
002	0.11	4.95	11.17	26.40	28.59	52.42	77.91	109.75	84.355	131.832	80.612	28.558	(V_{DS} 0V, V_{GS} 0V)
003	0.42	4.78	11.16	25.86	27.83	50.79	79.21	121.90	87.866	131.408	86.533	28.180	(V_{DS} 0V, V_{GS} 0V)
004	0.09	4.81	11.30	26.27	30.99	50.87	79.51	116.00	87.370	131.720	82.489	27.998	(V_{DS} 0V, V_{GS} 0V)
005	0.25	4.52	10.96	25.61	29.12	49.73	77.41	112.73	82.405	125.564	80.760	28.111	(V_{DS} 0V, V_{GS} 0V)
006	0.11	1.32	2.75	5.15	5.38	10.47	15.99	21.31	18.961	27.965	18.036	14.586	(V_{DS} +60V, V_{GS} -20V)
007	0.14	1.39	2.45	5.33	5.52	10.26	15.91	21.14	19.199	27.785	18.435	14.420	(V_{DS} +60V, V_{GS} -20V)
008	0.25	1.89	4.03	9.70	9.12	14.82	23.04	28.12	28.555	36.175	23.153	7.347	(V_{DS} +48V, V_{GS} 0V)
009	0.28	2.16	4.21	9.80	9.13	14.49	22.52	31.16	27.358	35.396	24.317	7.047	(V_{DS} +48V, V_{GS} 0V)
010	0.25	1.96	4.34	10.04	10.06	15.80	24.06	31.38	28.867	37.296	22.746	8.308	(V_{DS} +48V, V_{GS} 0V)
011	0.13	1.99	4.69	9.96	9.47	15.69	25.03	31.49	31.636	38.597	22.595	7.575	(V_{DS} +48V, V_{GS} 0V)
012	0.23	2.10	4.45	10.23	9.53	15.23	25.62	28.02	29.287	37.108	22.868	7.878	(V_{DS} +48V, V_{GS} 0V)
013	0.11	12.24	24.64	61.46	71.05	213.93	416.66	**13,079.6**	775.152	889.478	513.551	312.461	(V_{DS} 0V, V_{GS} +15V)
014	0.00	12.14	24.84	62.48	71.57	216.00	434.63	**13,078.6**	738.818	894.241	534.973	304.619	(V_{DS} 0V, V_{GS} +15V)
015	0.25	12.00	24.67	60.93	71.18	213.46	417.39	**13,077.7**	771.842	883.863	487.617	310.479	(V_{DS} 0V, V_{GS} +15V)
016	0.04	12.36	25.08	61.12	69.51	207.08	427.86	**13,077.0**	799.145	917.650	503.457	310.012	(V_{DS} 0V, V_{GS} +15V)
017	0.08	11.99	24.75	61.81	70.19	211.50	425.91	**13,076.6**	725.095	940.754	505.226	325.554	(V_{DS} 0V, V_{GS} +15V)
018	0.16	12.48	25.89	60.85	67.93	215.28	434.44	**13,075.5**	742.500	947.828	523.830	302.047	(V_{DS} 0V, V_{GS} +12V)
019	0.30	12.50	25.01	61.39	69.85	209.84	427.48	**13,074.9**	768.088	982.995	557.301	312.428	(V_{DS} 0V, V_{GS} +12V)
034	0.08	0.23	0.12	0.01	0.08	0.00	0.02	0.43	0.210	0.004	0.075	0.298	Reference device

Reference device **Mean value:** 0.13 **Estimated uncertainty:** ± 89.78 % (± 0.12 nA)

Red values: greater than max limit
Dark red Values: lower than min limits

Note: the values greater than 13'000 nA are out of range (not actual) values.

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:		10'000	[nA]

I_{DSS} @ V_{DS} 48V, V_{GS} 0V, Drain Current (off state) [nA] vs ^{60}Co Irradiation Total Dose [rad (Si)]

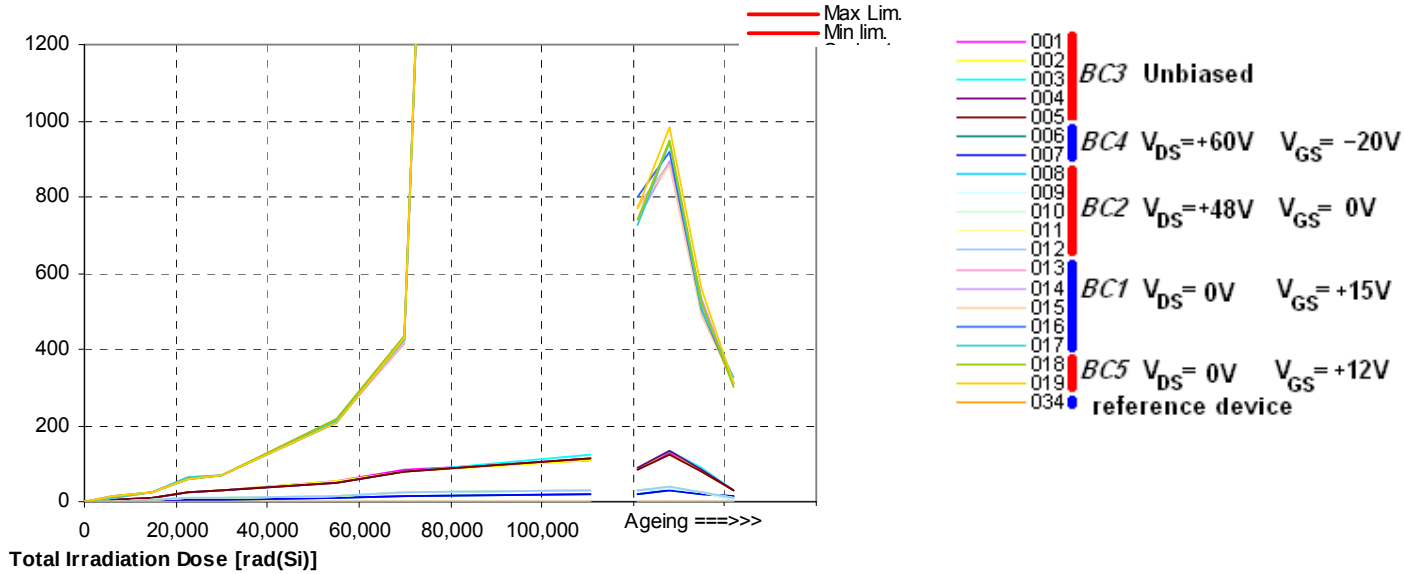


Figure 6 Data from Table 8

Table 9 – I_{DSS} @ V_{DS} 60V, V_{GS} 0V, Drain Current (off state) [nA] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:		10'000	[nA]

Detailed results - Measurement data in [nA]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	0.07	6.10	12.60	29.05	31.33	63.12	94.86	123.68	95.37	146.65	92.75	32.59	(V_{DS} 0V, V_{GS} 0V)
002	0.31	5.88	12.27	28.99	31.45	59.01	89.87	124.08	95.83	148.77	91.05	32.26	(V_{DS} 0V, V_{GS} 0V)
003	0.12	5.60	12.27	27.74	30.80	56.69	90.26	136.15	98.54	146.92	96.87	31.80	(V_{DS} 0V, V_{GS} 0V)
004	0.14	5.61	12.24	28.85	34.52	57.35	91.67	131.46	99.24	148.74	93.20	31.59	(V_{DS} 0V, V_{GS} 0V)
005	0.02	5.34	11.87	28.18	31.43	55.66	88.64	126.52	93.13	141.52	90.87	31.74	(V_{DS} 0V, V_{GS} 0V)
006	0.34	1.79	2.94	6.90	7.84	11.93	18.07	24.78	22.06	32.69	21.58	16.60	(V_{DS} +60V, V_{GS} -20V)
007	0.33	1.78	2.98	7.23	7.66	11.94	18.58	24.22	22.54	32.96	21.92	16.34	(V_{DS} +60V, V_{GS} -20V)
008	0.36	2.89	5.01	11.10	11.43	17.13	25.54	30.10	30.94	39.57	26.13	8.08	(V_{DS} +48V, V_{GS} 0V)
009	0.04	2.70	4.84	11.06	11.06	16.80	24.90	33.32	29.71	38.81	27.63	7.80	(V_{DS} +48V, V_{GS} 0V)
010	0.16	2.93	5.17	11.45	12.29	18.11	26.48	33.67	30.98	40.86	25.70	8.97	(V_{DS} +48V, V_{GS} 0V)
011	0.32	3.19	5.35	11.37	11.86	18.07	27.64	33.49	34.03	41.90	25.74	8.32	(V_{DS} +48V, V_{GS} 0V)
012	0.09	2.90	5.08	11.37	11.66	17.62	28.48	29.89	31.39	40.45	26.15	8.66	(V_{DS} +48V, V_{GS} 0V)
013	0.13	13.91	28.27	69.87	82.13	254.06	561.97	**13,077.7**	**13,085.7**	**13,100.1**	**13,086.0**	368.80	(V_{DS} 0V, V_{GS} +15V)
014	0.12	14.15	28.34	71.25	82.76	257.41	547.20	**13,076.5**	**13,088.6**	**13,105.0**	**13,086.0**	359.39	(V_{DS} 0V, V_{GS} +15V)
015	0.09	13.82	28.22	70.14	82.49	253.47	512.20	**13,076.3**	**13,084.6**	**13,101.9**	**13,083.0**	367.69	(V_{DS} 0V, V_{GS} +15V)
016	0.04	14.55	28.49	69.75	80.24	245.87	562.68	**13,075.4**	**13,083.1**	**13,101.5**	**13,083.0**	366.41	(V_{DS} 0V, V_{GS} +15V)
017	0.13	14.18	28.34	70.50	81.08	251.31	540.40	**13,075.1**	**13,081.4**	**13,100.1**	**13,082.0**	382.47	(V_{DS} 0V, V_{GS} +15V)
018	0.09	14.82	28.91	69.23	79.14	265.49	1,576.33	**13,073.9**	**13,088.7**	**13,098.5**	**13,082.0**	357.85	(V_{DS} 0V, V_{GS} +12V)
019	0.16	14.52	28.58	69.68	80.91	251.39	549.05	**13,073.8**	**13,085.7**	**13,097.9**	**13,081.0**	367.99	(V_{DS} 0V, V_{GS} +12V)
034	0.25	0.33	0.27	0.01	0.24	0.28	0.19	0.30	0.39	0.39	0.22	0.25	Reference device

Reference device **Mean value:** 0.26 **Estimated uncertainty:** ± 33.18 % (± 0.09 nA)

Red values: greater than max limit
Dark red Values: lower than min limits

Note: the values greater than 13'000 nA are out of range (not actual) values.

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:		10'000	[nA]

I_{DSS} @ V_{DS} 60V, V_{GS} 0V, Drain Current (off state) [nA] vs ^{60}Co Irradiation Total Dose [rad (Si)]

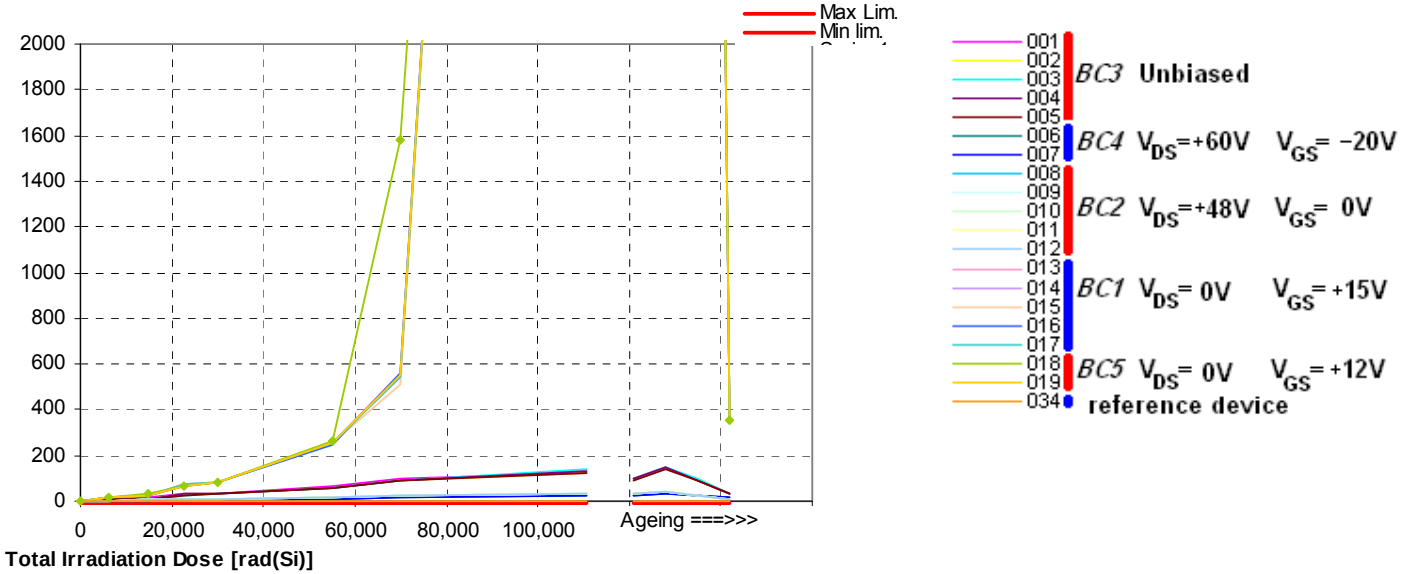


Figure 7 Data from Table 9

Table 10 – V_{GS_th} @ I_{DS} 0.01 mA, Gate Threshold Voltage [mV] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:	2'000	4'500	[mV]

Detailed results - Measurement data in [mV]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	3,773.94	3,576.56	3,330.38	3,098.56	2,934.50	2,441.88	2,180.69	**1,715.63**	**1,755.06**	**1,699.94**	**1,755.56**	2,761.25	(V_{DS} 0V, V_{GS} 0V)
002	3,700.44	3,507.19	3,282.75	3,053.00	2,894.75	2,421.44	2,168.19	**1,702.13**	**1,752.00**	**1,699.56**	**1,753.06**	2,746.06	(V_{DS} 0V, V_{GS} 0V)
003	3,810.25	3,610.19	3,379.63	3,131.75	2,979.00	2,497.44	2,224.50	**1,732.19**	**1,777.38**	**1,742.00**	**1,784.88**	2,820.69	(V_{DS} 0V, V_{GS} 0V)
004	3,818.25	3,624.06	3,387.31	3,149.56	2,982.25	2,503.69	2,240.44	**1,755.06**	**1,805.56**	**1,754.13**	**1,806.63**	2,832.06	(V_{DS} 0V, V_{GS} 0V)
005	3,873.75	3,669.75	3,436.19	3,192.31	3,041.31	2,557.13	2,283.06	**1,796.31**	**1,847.94**	**1,792.94**	**1,844.00**	2,854.31	(V_{DS} 0V, V_{GS} 0V)
006	3,906.25	3,806.88	3,694.63	3,538.88	3,458.13	3,153.69	2,967.63	2,545.81	2,557.44	2,540.19	2,637.50	3,059.81	(V_{DS} +60V, V_{GS} -20V)
007	3,776.06	3,676.50	3,569.69	3,411.44	3,335.13	3,037.00	2,831.31	2,435.94	2,437.56	2,413.50	2,519.00	2,937.88	(V_{DS} +60V, V_{GS} -20V)
008	3,832.44	3,629.81	3,392.94	3,147.00	2,991.81	2,506.88	2,228.00	**1,761.00**	**1,764.38**	**1,722.13**	**1,764.38**	2,791.69	(V_{DS} +48V, V_{GS} 0V)
009	3,835.50	3,626.81	3,399.13	3,155.13	3,005.75	2,514.25	2,241.75	**1,752.94**	**1,780.31**	**1,739.56**	**1,771.25**	2,801.88	(V_{DS} +48V, V_{GS} 0V)
010	3,818.50	3,619.19	3,375.88	3,142.38	2,976.00	2,491.88	2,224.63	**1,738.19**	**1,762.19**	**1,729.38**	**1,766.06**	2,782.00	(V_{DS} +48V, V_{GS} 0V)
011	3,808.13	3,605.50	3,372.88	3,127.06	2,970.69	2,473.00	2,199.88	**1,714.38**	**1,722.50**	**1,702.88**	**1,734.19**	2,792.94	(V_{DS} +48V, V_{GS} 0V)
012	3,741.81	3,532.69	3,307.44	3,069.81	2,909.94	2,425.44	2,144.13	**1,687.94**	**1,688.19**	**1,655.69**	**1,702.31**	2,702.81	(V_{DS} +48V, V_{GS} 0V)
013	3,750.63	3,462.19	3,175.00	2,904.69	2,734.25	2,245.50	**1,915.44**	**1,338.50**	**1,376.8**	**1,400.4**	**1,693.6**	3,644.50	(V_{DS} 0V, V_{GS} +15V)
014	3,835.69	3,538.13	3,248.06	2,968.25	2,797.50	2,289.44	**1,976.69**	**1,407.25**	**1,424.6**	**1,426.4**	**1,745.6**	3,720.06	(V_{DS} 0V, V_{GS} +15V)
015	3,821.94	3,524.31	3,232.75	2,961.44	2,789.75	2,291.63	**1,966.88**	**1,399.94**	**1,406.8**	**1,425.2**	**1,737.6**	3,680.25	(V_{DS} 0V, V_{GS} +15V)
016	3,816.69	3,521.50	3,236.94	2,970.63	2,796.13	2,291.31	**1,964.13**	**1,406.56**	**1,416.6**	**1,426.3**	**1,758.9**	3,711.38	(V_{DS} 0V, V_{GS} +15V)
017	3,742.63	3,449.81	3,162.81	2,894.38	2,720.81	2,224.31	**1,910.25**	**1,359.75**	**1,390.7**	**1,379.3**	**1,703.3**	3,588.56	(V_{DS} 0V, V_{GS} +15V)
018	3,903.88	3,565.00	3,227.75	2,934.19	2,744.44	2,177.13	**1,826.38**	**1,207.81**	**1,241.6**	**1,237.6**	**1,550.8**	3,716.06	(V_{DS} 0V, V_{GS} +12V)
019	3,913.63	3,562.13	3,241.50	2,929.25	2,734.50	2,169.88	**1,808.94**	**1,188.56**	**1,230.8**	**1,221.7**	**1,520.8**	3,682.00	(V_{DS} 0V, V_{GS} +12V)
034	3,840.25	3,859.56	3,878.69	3,835.88	3,853.94	3,854.94	3,833.75	3,858.19	3,871.81	3,842.31	3,882.06	3,875.81	Reference device

Reference device **Mean value:** 3,857.27 **Estimated uncertainty:** ± 0.38 % (± 14.715 mV)

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:	2'000	4'500	[mV]

V_{GS_th} @ I_{DS} 0.01 mA, Gate Threshold Voltage [mV] vs ^{60}Co Irradiation Total Dose [rad (Si)]

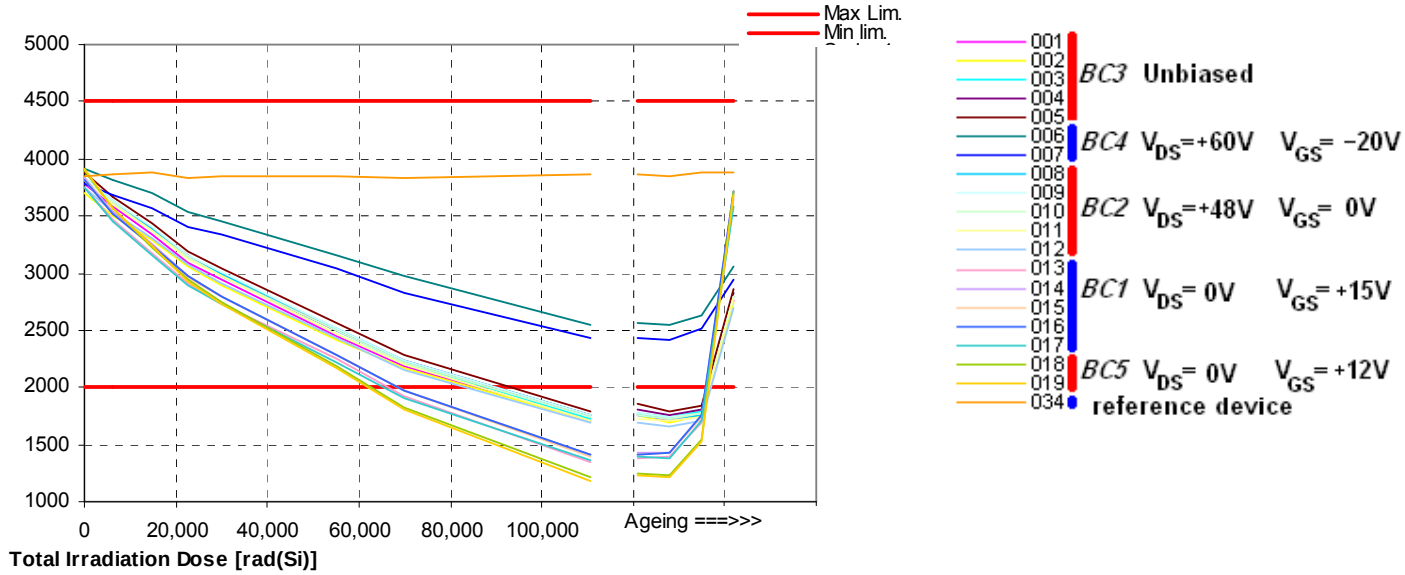


Figure 8 Data from Table 10

Table 11 – V_{GS_th} @ I_{DS} 0.10 mA, Gate Threshold Voltage [mV] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:	2'000	4'500	[mV]

Detailed results - Measurement data in [mV]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	4,032.19	3,838.25	3,607.50	3,374.44	3,228.81	2,743.19	2,491.75	2,043.13	2,083.13	2,034.63	2,076.94	3,029.63	(V_{DS} 0V, V_{GS} 0V)
002	3,970.38	3,782.06	3,557.31	3,333.69	3,188.81	2,730.00	2,478.69	2,034.81	2,074.13	2,032.56	2,073.19	3,011.13	(V_{DS} 0V, V_{GS} 0V)
003	4,073.38	3,881.69	3,650.19	3,424.69	3,268.19	2,797.75	2,541.75	2,071.44	2,113.13	2,067.38	2,109.13	3,097.06	(V_{DS} 0V, V_{GS} 0V)
004	4,091.00	3,897.00	3,664.75	3,435.69	3,270.38	2,809.75	2,550.81	2,092.13	2,124.88	2,090.19	2,129.25	3,099.81	(V_{DS} 0V, V_{GS} 0V)
005	4,138.56	3,951.69	3,715.50	3,486.75	3,326.94	2,855.94	2,597.75	2,137.50	2,171.06	2,126.25	2,164.38	3,130.44	(V_{DS} 0V, V_{GS} 0V)
006	4,171.94	4,083.88	3,968.94	3,826.63	3,743.13	3,458.69	3,270.38	2,877.00	2,877.31	2,857.00	2,957.88	3,379.69	(V_{DS} +60V, V_{GS} -20V)
007	4,027.81	3,945.63	3,833.56	3,695.50	3,618.00	3,329.06	3,140.88	2,752.19	2,750.69	2,729.19	2,826.38	3,250.13	(V_{DS} +60V, V_{GS} -20V)
008	4,095.31	3,906.31	3,673.31	3,437.19	3,287.38	2,803.50	2,548.00	2,084.38	2,085.31	2,060.50	2,076.44	3,061.38	(V_{DS} +48V, V_{GS} 0V)
009	4,096.19	3,908.38	3,680.88	3,447.88	3,289.13	2,818.06	2,556.56	2,086.75	2,102.56	2,065.69	2,085.88	3,074.88	(V_{DS} +48V, V_{GS} 0V)
010	4,076.19	3,888.69	3,658.06	3,423.00	3,271.38	2,797.00	2,533.50	2,067.56	2,078.81	2,050.56	2,079.19	3,060.94	(V_{DS} +48V, V_{GS} 0V)
011	4,065.94	3,880.19	3,647.63	3,409.50	3,255.50	2,776.06	2,514.88	2,051.25	2,053.38	2,032.50	2,061.44	3,061.81	(V_{DS} +48V, V_{GS} 0V)
012	4,002.06	3,804.94	3,580.31	3,344.63	3,188.56	2,722.13	2,451.69	2,013.81	2,009.13	**1,983.94**	2,013.63	2,975.75	(V_{DS} +48V, V_{GS} 0V)
013	4,022.19	3,748.19	3,480.25	3,231.44	3,073.00	2,628.19	2,336.13	**1,832.63**	**1,860.4**	**1,886.1**	2,185.8	4,205.81	(V_{DS} 0V, V_{GS} +15V)
014	4,104.31	3,827.00	3,552.81	3,301.44	3,141.75	2,691.00	2,406.75	**1,892.56**	**1,906.9**	**1,917.5**	2,235.8	4,288.88	(V_{DS} 0V, V_{GS} +15V)
015	4,090.25	3,816.69	3,542.69	3,294.63	3,131.38	2,679.44	2,386.50	**1,884.13**	**1,886.3**	**1,916.3**	2,227.4	4,245.69	(V_{DS} 0V, V_{GS} +15V)
016	4,082.94	3,813.69	3,547.31	3,295.13	3,138.75	2,688.88	2,397.00	**1,901.63**	**1,900.6**	**1,924.8**	2,253.3	4,279.19	(V_{DS} 0V, V_{GS} +15V)
017	4,001.00	3,736.19	3,468.63	3,214.44	3,056.50	2,612.00	2,334.00	**1,844.00**	**1,867.0**	**1,869.1**	2,191.2	4,154.00	(V_{DS} 0V, V_{GS} +15V)
018	4,174.25	3,861.38	3,548.00	3,277.75	3,099.88	2,579.25	2,259.75	**1,698.13**	**1,729.5**	**1,731.1**	2,061.6	4,306.31	(V_{DS} 0V, V_{GS} +12V)
019	4,175.19	3,867.63	3,556.69	3,270.50	3,090.94	2,569.06	2,244.13	**1,678.56**	**1,716.6**	**1,727.2**	2,036.3	4,269.88	(V_{DS} 0V, V_{GS} +12V)
034	4,115.31	4,127.69	4,148.19	4,101.88	4,129.44	4,124.50	4,102.38	4,133.06	4,139.25	4,111.25	4,144.31	4,136.31	Reference device

Reference device **Mean value:** 4,126.13 **Estimated uncertainty:** ± 0.33 % (± 13.44 mV)

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:	2'000	4'500	[mV]

V_{GS_th} @ I_{DS} 0.10 mA, Gate Threshold Voltage [mV] vs ^{60}Co Irradiation Total Dose [rad (Si)]

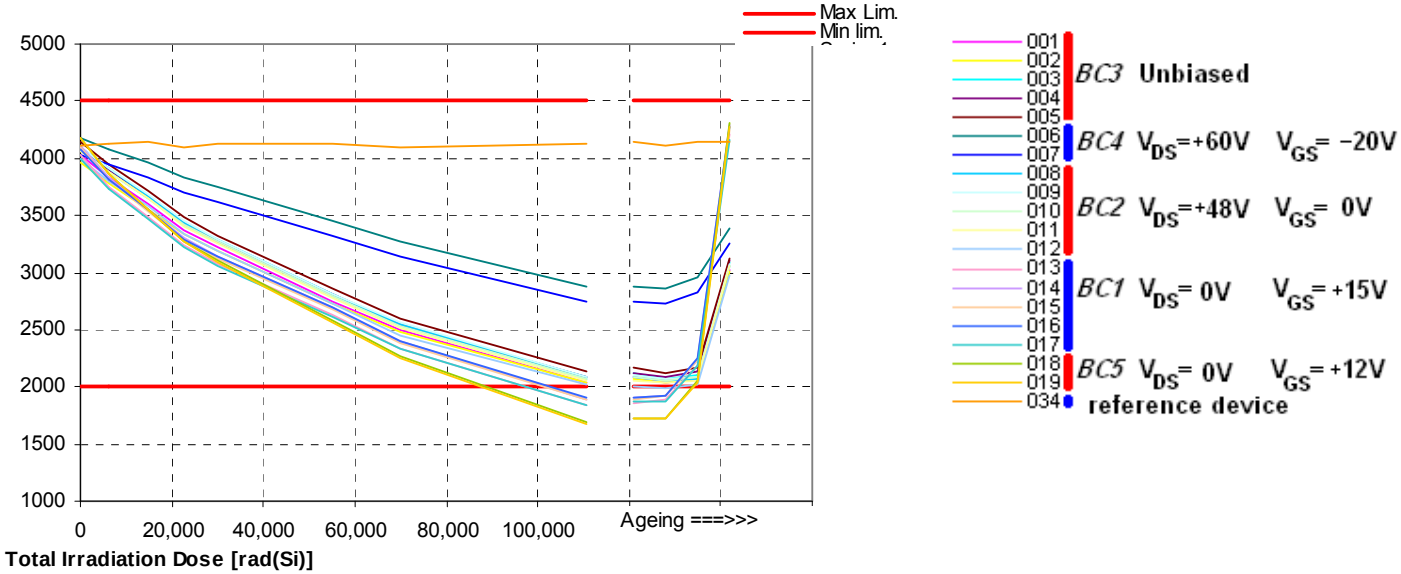


Figure 9 Data from Table 11

Table 12 – V_{GS_th} @ I_{DS} 0.25 mA, Gate Threshold Voltage [mV] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:	2'000	4'500	[mV]

Detailed results - Measurement data in [mV]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	4,143.69	3,944.25	3,712.81	3,494.50	3,341.44	2,871.56	2,621.19	2,186.69	2,213.13	2,174.94	2,213.63	3,140.38	(V_{DS} 0V, V_{GS} 0V)
002	4,075.25	3,890.88	3,675.25	3,450.13	3,305.06	2,851.19	2,609.50	2,177.38	2,217.25	2,164.75	2,212.75	3,119.56	(V_{DS} 0V, V_{GS} 0V)
003	4,182.00	3,998.88	3,759.13	3,537.19	3,381.50	2,923.06	2,670.13	2,210.00	2,250.00	2,201.75	2,241.44	3,213.13	(V_{DS} 0V, V_{GS} 0V)
004	4,186.63	4,005.19	3,777.31	3,553.75	3,389.00	2,937.69	2,681.63	2,235.81	2,269.44	2,227.94	2,264.31	3,214.50	(V_{DS} 0V, V_{GS} 0V)
005	4,248.13	4,052.56	3,826.25	3,600.25	3,439.63	2,980.69	2,727.31	2,273.19	2,311.19	2,263.88	2,301.88	3,244.56	(V_{DS} 0V, V_{GS} 0V)
006	4,282.19	4,195.25	4,080.81	3,944.25	3,859.00	3,580.13	3,394.94	3,006.38	3,007.31	2,983.00	3,084.56	3,509.69	(V_{DS} +60V, V_{GS} -20V)
007	4,134.56	4,053.94	3,946.63	3,809.44	3,731.44	3,444.38	3,263.06	2,880.56	2,881.38	2,858.88	2,956.56	3,381.25	(V_{DS} +60V, V_{GS} -20V)
008	4,203.88	4,012.38	3,780.81	3,554.63	3,396.88	2,936.44	2,676.50	2,224.94	2,224.06	2,195.63	2,212.88	3,173.75	(V_{DS} +48V, V_{GS} 0V)
009	4,211.06	4,019.56	3,784.75	3,562.88	3,408.81	2,944.94	2,686.06	2,225.56	2,238.75	2,201.94	2,215.44	3,186.69	(V_{DS} +48V, V_{GS} 0V)
010	4,186.63	3,995.38	3,771.06	3,540.44	3,389.69	2,923.31	2,664.00	2,210.63	2,216.88	2,190.94	2,209.44	3,166.31	(V_{DS} +48V, V_{GS} 0V)
011	4,173.75	3,986.19	3,758.88	3,531.81	3,376.63	2,909.19	2,645.44	2,195.00	2,190.69	2,160.88	2,187.81	3,177.94	(V_{DS} +48V, V_{GS} 0V)
012	4,105.88	3,916.50	3,690.00	3,461.63	3,312.63	2,843.56	2,582.63	2,147.88	2,146.25	2,124.88	2,142.69	3,087.38	(V_{DS} +48V, V_{GS} 0V)
013	4,125.31	3,867.38	3,610.50	3,363.44	3,213.69	2,786.75	2,510.00	2,034.88	2,055.2	2,086.8	2,393.1	4,459.25	(V_{DS} 0V, V_{GS} +15V)
014	4,211.75	3,946.31	3,686.81	3,436.94	3,276.44	2,847.06	2,580.50	2,095.69	2,112.2	2,129.0	2,450.8	**4,542.31**	(V_{DS} 0V, V_{GS} +15V)
015	4,198.75	3,941.06	3,673.69	3,428.38	3,267.63	2,840.56	2,557.63	2,087.06	2,085.6	2,112.5	2,433.7	4,494.44	(V_{DS} 0V, V_{GS} +15V)
016	4,192.50	3,937.00	3,663.50	3,428.06	3,277.25	2,844.06	2,568.69	2,099.25	2,099.4	2,126.3	2,464.8	**4,540.19**	(V_{DS} 0V, V_{GS} +15V)
017	4,109.38	3,853.00	3,590.56	3,353.75	3,199.63	2,770.88	2,498.81	2,041.94	2,064.4	2,068.8	2,397.8	4,411.13	(V_{DS} 0V, V_{GS} +15V)
018	4,285.56	3,982.38	3,683.38	3,412.63	3,242.88	2,739.31	2,435.06	**1,900.06**	**1,928.6**	**1,943.1**	2,272.5	**4,581.50**	(V_{DS} 0V, V_{GS} +12V)
019	4,284.75	3,988.75	3,675.50	3,407.81	3,229.31	2,740.56	2,427.38	**1,881.25**	**1,911.8**	**1,930.6**	2,247.4	**4,540.13**	(V_{DS} 0V, V_{GS} +12V)
034	4,218.88	4,230.38	4,251.31	4,214.81	4,228.50	4,235.94	4,214.44	4,242.56	4,242.69	4,218.63	4,253.25	4,247.25	Reference device

Reference device **Mean value:** 4,233.22 **Estimated uncertainty:** ± 0.29 % (± 12.39 mV)

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:	2'000	4'500	[mV]

V_{GS_th} @ I_{DS} 0.25 mA, Gate Threshold Voltage [mV] vs ^{60}Co Irradiation Total Dose [rad (Si)]

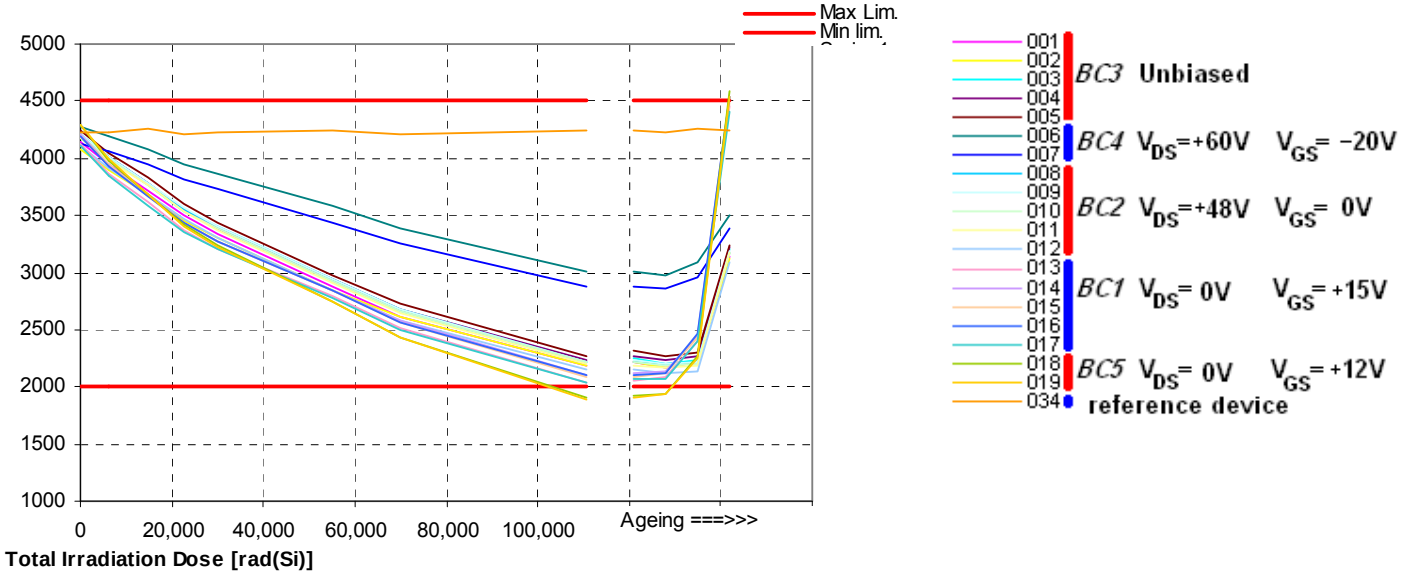


Figure 10 Data from Table 12

Table 13 – V_{GS_th} @ I_{DS} 1.0 mA, Gate Threshold Voltage [mV] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:	2'000	4'500	[mV]

Detailed results - Measurement data in [mV]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	4,303.38	4,119.13	3,884.63	3,667.13	3,514.81	3,057.94	2,819.31	2,395.06	2,416.75	2,387.75	2,416.56	3,307.44	(V_{DS} 0V, V_{GS} 0V)
002	4,238.19	4,057.25	3,845.50	3,628.00	3,480.31	3,045.19	2,802.44	2,396.44	2,420.56	2,380.25	2,415.31	3,294.19	(V_{DS} 0V, V_{GS} 0V)
003	4,344.50	4,157.94	3,932.88	3,716.81	3,570.44	3,113.94	2,865.19	2,428.63	2,455.31	2,419.50	2,447.63	3,371.00	(V_{DS} 0V, V_{GS} 0V)
004	4,355.19	4,172.31	3,950.38	3,726.75	3,569.50	3,135.19	2,883.31	2,453.88	2,474.44	2,439.69	2,467.88	3,381.38	(V_{DS} 0V, V_{GS} 0V)
005	4,411.56	4,223.00	4,002.75	3,781.19	3,621.88	3,171.94	2,924.75	2,488.38	2,515.00	2,477.69	2,507.44	3,419.19	(V_{DS} 0V, V_{GS} 0V)
006	4,438.94	4,363.06	4,255.31	4,123.94	4,039.06	3,763.69	3,589.44	3,209.44	3,205.31	3,183.69	3,285.56	3,717.63	(V_{DS} +60V, V_{GS} -20V)
007	4,301.94	4,215.31	4,109.88	3,983.50	3,899.38	3,633.06	3,454.88	3,078.75	3,074.94	3,050.31	3,146.31	3,582.44	(V_{DS} +60V, V_{GS} -20V)
008	4,361.63	4,174.81	3,952.56	3,731.38	3,580.13	3,121.81	2,869.13	2,433.38	2,426.50	2,396.06	2,408.94	3,339.13	(V_{DS} +48V, V_{GS} 0V)
009	4,368.44	4,185.25	3,959.94	3,738.63	3,586.75	3,133.31	2,878.06	2,437.25	2,446.69	2,420.00	2,419.56	3,350.25	(V_{DS} +48V, V_{GS} 0V)
010	4,342.38	4,162.25	3,939.44	3,723.13	3,565.69	3,113.06	2,863.06	2,425.75	2,426.44	2,393.31	2,410.19	3,341.94	(V_{DS} +48V, V_{GS} 0V)
011	4,333.75	4,150.31	3,927.25	3,709.69	3,560.88	3,100.00	2,843.88	2,403.44	2,395.25	2,371.69	2,387.88	3,347.06	(V_{DS} +48V, V_{GS} 0V)
012	4,263.81	4,085.00	3,858.81	3,642.06	3,482.63	3,030.69	2,778.50	2,360.69	2,352.81	2,325.56	2,341.56	3,258.25	(V_{DS} +48V, V_{GS} 0V)
013	4,281.69	4,045.81	3,798.00	3,571.81	3,422.19	3,022.75	2,770.00	2,334.31	2,351.3	2,384.3	2,692.0	**4,808.19**	(V_{DS} 0V, V_{GS} +15V)
014	4,374.38	4,133.75	3,878.63	3,642.50	3,492.00	3,084.50	2,830.25	2,399.13	2,406.5	2,428.1	2,751.9	**4,898.50**	(V_{DS} 0V, V_{GS} +15V)
015	4,361.81	4,120.19	3,862.63	3,628.25	3,482.31	3,074.56	2,813.75	2,385.63	2,386.1	2,416.3	2,739.3	**4,851.25**	(V_{DS} 0V, V_{GS} +15V)
016	4,356.81	4,113.00	3,863.94	3,638.00	3,491.81	3,086.63	2,826.56	2,395.31	2,403.4	2,428.4	2,762.7	**4,890.00**	(V_{DS} 0V, V_{GS} +15V)
017	4,271.63	4,033.00	3,778.81	3,546.94	3,410.00	3,008.88	2,755.44	2,340.50	2,358.3	2,367.3	2,703.6	**4,758.94**	(V_{DS} 0V, V_{GS} +15V)
018	4,454.63	4,170.75	3,882.50	3,629.88	3,457.63	2,992.69	2,701.88	2,209.56	2,229.2	2,254.0	2,585.3	**4,940.50**	(V_{DS} 0V, V_{GS} +12V)
019	4,455.38	4,177.88	3,883.50	3,624.56	3,449.38	2,982.38	2,682.50	2,179.50	2,211.6	2,236.4	2,565.9	**4,910.88**	(V_{DS} 0V, V_{GS} +12V)
034	4,384.25	4,393.25	4,416.38	4,376.38	4,393.25	4,398.88	4,372.88	4,400.88	4,407.69	4,385.63	4,412.94	4,403.69	Reference device

Reference device **Mean value:** 4,395.51 **Estimated uncertainty:** ± 0.27 % (± 11.99 mV)

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:	**2'000**	**4'500**	**[mV]**

V_{GS_th} @ I_{DS} 1.0 mA, Gate Threshold Voltage [mV] vs ^{60}Co Irradiation Total Dose [rad (Si)]

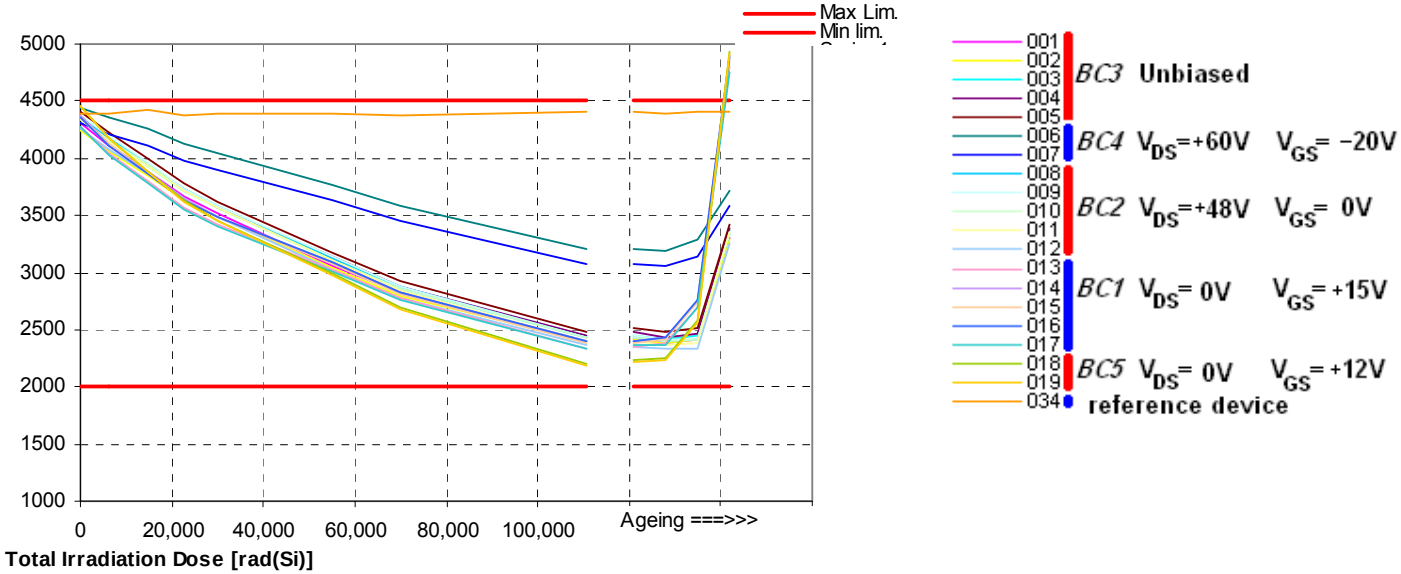


Figure 11 Data from Table 13

Table 14 – RDS(on) Drain-Source On-Resistance [Ohm] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:		n.d.	[Ohm]

Detailed results - Measurement data in [Ohm]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	0.040	0.040	0.039	0.041	0.040	0.040	0.041	0.040	0.040	0.041	0.040	0.039	(V_{DS} 0V, V_{GS} 0V)
002	0.040	0.040	0.039	0.041	0.040	0.040	0.040	0.040	0.040	0.041	0.039	0.039	(V_{DS} 0V, V_{GS} 0V)
003	0.040	0.040	0.039	0.040	0.039	0.039	0.040	0.041	0.040	0.041	0.040	0.039	(V_{DS} 0V, V_{GS} 0V)
004	0.040	0.039	0.039	0.040	0.040	0.040	0.040	0.041	0.039	0.041	0.039	0.039	(V_{DS} 0V, V_{GS} 0V)
005	0.040	0.040	0.039	0.041	0.040	0.039	0.041	0.041	0.040	0.041	0.040	0.039	(V_{DS} 0V, V_{GS} 0V)
006	0.040	0.040	0.040	0.041	0.040	0.040	0.040	0.040	0.039	0.041	0.039	0.039	(V_{DS} +60V, V_{GS} -20V)
007	0.040	0.040	0.039	0.041	0.040	0.039	0.040	0.039	0.039	0.040	0.039	0.039	(V_{DS} +60V, V_{GS} -20V)
008	0.040	0.040	0.040	0.041	0.040	0.040	0.041	0.040	0.040	0.041	0.040	0.040	(V_{DS} +48V, V_{GS} 0V)
009	0.040	0.040	0.039	0.040	0.040	0.039	0.040	0.040	0.040	0.040	0.039	0.039	(V_{DS} +48V, V_{GS} 0V)
010	0.040	0.040	0.039	0.041	0.039	0.040	0.040	0.040	0.040	0.040	0.039	0.039	(V_{DS} +48V, V_{GS} 0V)
011	0.040	0.040	0.039	0.041	0.040	0.039	0.041	0.040	0.040	0.041	0.039	0.039	(V_{DS} +48V, V_{GS} 0V)
012	0.040	0.040	0.039	0.041	0.040	0.040	0.041	0.040	0.040	0.041	0.039	0.039	(V_{DS} +48V, V_{GS} 0V)
013	0.040	0.040	0.039	0.041	0.040	0.040	0.041	0.041	0.041	0.041	0.040	0.043	(V_{DS} 0V, V_{GS} +15V)
014	0.040	0.040	0.039	0.041	0.040	0.040	0.041	0.040	0.040	0.041	0.040	0.043	(V_{DS} 0V, V_{GS} +15V)
015	0.040	0.040	0.039	0.040	0.039	0.040	0.041	0.040	0.040	0.041	0.040	0.043	(V_{DS} 0V, V_{GS} +15V)
016	0.041	0.040	0.040	0.041	0.040	0.040	0.041	0.041	0.041	0.042	0.040	0.043	(V_{DS} 0V, V_{GS} +15V)
017	0.040	0.040	0.039	0.041	0.040	0.040	0.040	0.040	0.040	0.041	0.040	0.043	(V_{DS} 0V, V_{GS} +15V)
018	0.040	0.040	0.039	0.040	0.039	0.040	0.040	0.040	0.040	0.041	0.040	0.042	(V_{DS} 0V, V_{GS} +12V)
019	0.040	0.040	0.039	0.040	0.039	0.039	0.040	0.039	0.040	0.041	0.040	0.042	(V_{DS} 0V, V_{GS} +12V)
034	0.040	0.040	0.039	0.041	0.040	0.040	0.041	0.040	0.040	0.040	0.039	0.040	Reference device

Reference device **Mean value:** 0.04 **Estimated uncertainty:** ± 1.31 %

Red values: greater than max limit
Dark red Values: lower than min limits

Note: This Parameter is not listed in Manufacturer Test Condition Log HG6F.tst, dated 09.09.2009. The parameter was measured to monitor its TID sensitivity.

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:		n.d.	[Ohm]

RDS(on) Drain-Source On-Resistance [Ohm] vs ^{60}Co Irradiation Total Dose [rad (Si)]

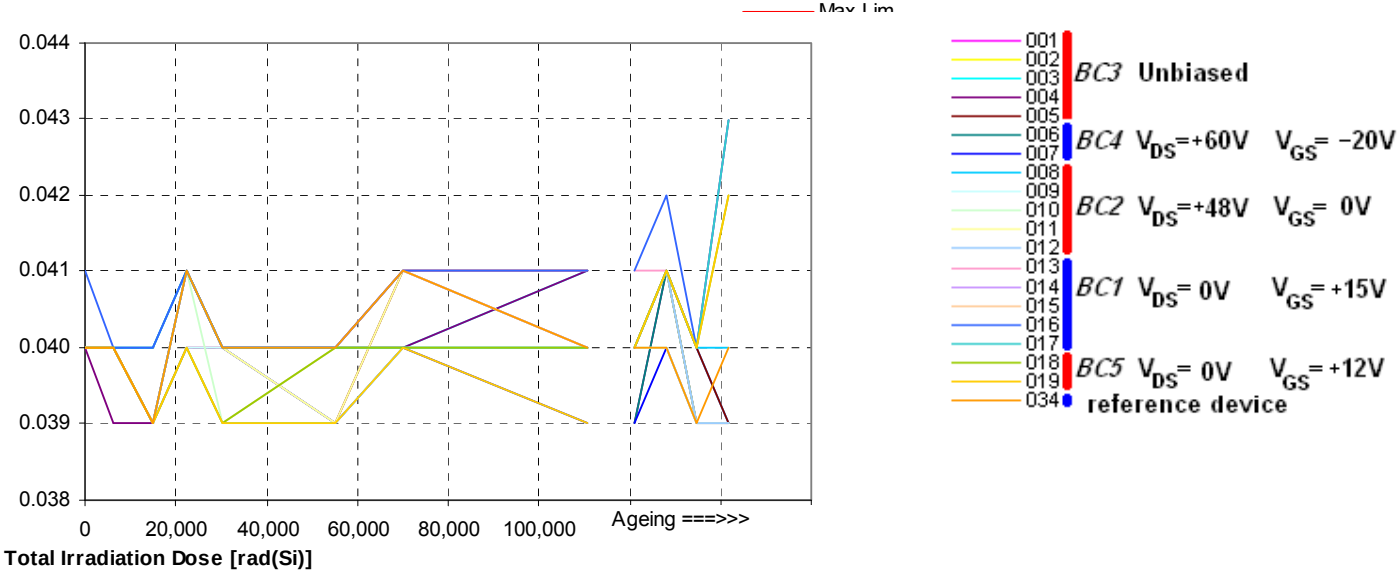


Figure 12 Data from Table 14

Table 15 – V_{SD}(on) Inverse Diode Forward Voltage [mV] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:		1'500	[mV]

Detailed results - Measurement data in [mV]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	1,200.10	1,209.11	1,207.69	1,200.78	1,201.52	1,201.97	1,198.28	1,203.33	1,202.12	1,194.39	1,210.44	1,212.80	(V_{DS} 0V, V_{GS} 0V)
002	1,213.22	1,218.39	1,220.40	1,211.84	1,212.58	1,214.09	1,206.14	1,214.91	1,213.35	1,207.78	1,223.39	1,229.72	(V_{DS} 0V, V_{GS} 0V)
003	1,209.83	1,219.83	1,220.49	1,211.48	1,211.04	1,213.16	1,208.71	1,218.35	1,211.52	1,204.07	1,217.96	1,222.22	(V_{DS} 0V, V_{GS} 0V)
004	1,207.86	1,209.92	1,213.05	1,205.30	1,204.70	1,206.36	1,200.89	1,207.39	1,204.91	1,196.99	1,217.56	1,216.48	(V_{DS} 0V, V_{GS} 0V)
005	1,203.18	1,210.89	1,214.68	1,204.41	1,204.22	1,204.41	1,200.06	1,208.85	1,208.41	1,198.81	1,217.94	1,216.14	(V_{DS} 0V, V_{GS} 0V)
006	1,218.90	1,219.49	1,227.22	1,214.45	1,210.49	1,215.21	1,212.50	1,219.47	1,212.65	1,208.60	1,217.61	1,220.13	(V_{DS} +60V, V_{GS} -20V)
007	1,207.92	1,218.56	1,222.01	1,209.92	1,210.21	1,211.29	1,207.44	1,219.47	1,210.27	1,204.49	1,225.74	1,224.51	(V_{DS} +60V, V_{GS} -20V)
008	1,216.16	1,219.74	1,232.05	1,217.03	1,212.75	1,220.40	1,210.30	1,230.55	1,214.53	1,207.50	1,225.06	1,232.14	(V_{DS} +48V, V_{GS} 0V)
009	1,208.77	1,213.39	1,217.73	1,209.02	1,209.70	1,214.49	1,209.98	1,219.64	1,215.49	1,206.65	1,218.43	1,227.60	(V_{DS} +48V, V_{GS} 0V)
010	1,210.78	1,213.69	1,223.41	1,211.29	1,210.59	1,215.72	1,207.27	1,216.80	1,217.24	1,207.06	1,219.11	1,221.84	(V_{DS} +48V, V_{GS} 0V)
011	1,208.98	1,213.18	1,216.65	1,212.12	1,208.13	1,215.21	1,203.07	1,218.05	1,210.83	1,202.97	1,219.79	1,219.17	(V_{DS} +48V, V_{GS} 0V)
012	1,202.63	1,214.02	1,216.52	1,206.12	1,206.08	1,210.19	1,200.19	1,210.02	1,207.42	1,200.42	1,210.02	1,213.26	(V_{DS} +48V, V_{GS} 0V)
013	1,211.23	1,217.94	1,223.39	1,212.71	1,211.52	1,216.35	1,209.92	1,218.52	1,213.58	1,210.74	1,222.12	1,227.14	(V_{DS} 0V, V_{GS} +15V)
014	1,205.11	1,211.46	1,213.41	1,204.85	1,206.19	1,209.17	1,201.06	1,211.23	1,206.27	1,199.83	1,214.00	1,224.98	(V_{DS} 0V, V_{GS} +15V)
015	1,205.97	1,212.25	1,219.60	1,206.86	1,209.05	1,214.53	1,202.35	1,216.16	1,209.22	1,202.73	1,214.92	1,226.84	(V_{DS} 0V, V_{GS} +15V)
016	1,213.33	1,218.71	1,226.76	1,216.52	1,214.96	1,222.16	1,210.91	1,228.24	1,218.31	1,209.47	1,221.65	1,234.75	(V_{DS} 0V, V_{GS} +15V)
017	1,200.49	1,211.27	1,222.01	1,208.22	1,209.66	1,215.36	1,207.37	1,215.19	1,209.21	1,208.14	1,214.36	1,226.33	(V_{DS} 0V, V_{GS} +15V)
018	1,210.57	1,214.13	1,218.50	1,212.35	1,211.48	1,213.14	1,210.87	1,221.55	1,213.03	1,209.00	1,215.02	1,233.54	(V_{DS} 0V, V_{GS} +12V)
019	1,207.78	1,216.31	1,223.69	1,209.21	1,207.05	1,218.94	1,204.83	1,219.98	1,210.63	1,202.42	1,214.58	1,226.89	(V_{DS} 0V, V_{GS} +12V)
034	1,209.66	1,217.92	1,220.97	1,214.17	1,213.24	1,217.39	1,209.00	1,213.52	1,212.08	1,206.19	1,215.64	1,229.72	Reference device

Reference device **Mean value:** **1,214.96** **Estimated uncertainty:** **± 0.44 % (± 5.4 mV)**

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:		1'500	[mV]

V_{SD}(on) Inverse Diode Forward Voltage [mV] vs ^{60}Co Irradiation Total Dose [rad (Si)]

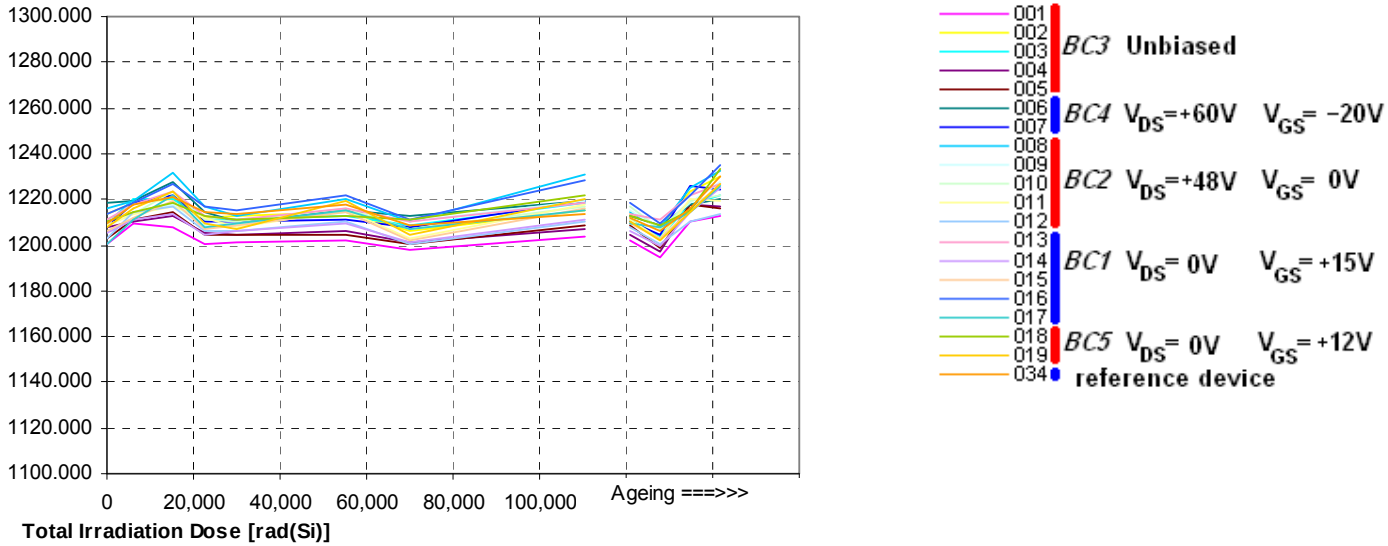


Figure 13 Data from Table 15

Table 16 – $V_{(BR)DSS}$ @I_{DS}=100uA – VDS Breakdown Voltage [V] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:	60		[V]

Detailed results - Measurement data in [V]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	69.05	68.43	68.03	68.29	67.80	65.77	66.03	65.12	64.82	66.68	64.95	65.04	(V_{DS} 0V, V_{GS} 0V)
002	68.66	68.05	68.00	67.63	66.08	67.14	65.60	64.88	66.00	66.71	65.90	66.46	(V_{DS} 0V, V_{GS} 0V)
003	67.47	68.58	67.55	66.58	66.40	65.87	65.66	65.07	64.64	65.53	66.14	67.22	(V_{DS} 0V, V_{GS} 0V)
004	69.39	67.75	68.39	68.14	66.84	66.33	66.32	65.69	65.62	66.15	65.57	65.46	(V_{DS} 0V, V_{GS} 0V)
005	69.59	67.42	68.18	68.26	66.97	67.44	67.20	65.50	65.13	65.51	65.18	65.33	(V_{DS} 0V, V_{GS} 0V)
006	68.97	69.02	67.11	68.72	68.33	67.55	66.48	65.64	65.57	66.18	66.73	67.40	(V_{DS} +60V, V_{GS} -20V)
007	69.30	68.35	67.28	68.88	68.85	67.95	66.81	66.63	66.99	66.47	67.58	66.96	(V_{DS} +60V, V_{GS} -20V)
008	69.81	69.59	68.22	68.60	68.40	66.25	67.92	67.13	67.37	67.41	67.36	68.18	(V_{DS} +48V, V_{GS} 0V)
009	69.46	69.13	67.43	68.56	68.25	66.62	67.88	67.56	65.74	66.34	67.26	67.80	(V_{DS} +48V, V_{GS} 0V)
010	69.57	68.86	67.77	68.73	68.73	68.22	67.03	66.38	66.57	66.93	67.49	68.42	(V_{DS} +48V, V_{GS} 0V)
011	68.07	67.71	67.00	67.13	67.28	66.42	68.57	66.37	66.40	66.44	67.10	67.96	(V_{DS} +48V, V_{GS} 0V)
012	68.91	66.96	66.80	66.85	67.73	67.67	66.21	66.73	67.15	66.08	66.68	67.76	(V_{DS} +48V, V_{GS} 0V)
013	67.39	67.77	66.39	64.35	63.05	60.55	**59.62**	**56.83**	**56.91**	**57.44**	**57.47**	61.79	(V_{DS} 0V, V_{GS} +15V)
014	68.55	67.70	66.08	64.11	64.41	60.86	**59.61**	**57.04**	**56.93**	**57.27**	**57.52**	61.95	(V_{DS} 0V, V_{GS} +15V)
015	69.09	66.73	67.51	64.24	65.00	60.51	60.77	**57.92**	**57.13**	**58.48**	**58.59**	61.75	(V_{DS} 0V, V_{GS} +15V)
016	68.28	67.78	66.31	66.14	63.71	60.89	60.15	**57.62**	**57.73**	**58.07**	**58.25**	62.41	(V_{DS} 0V, V_{GS} +15V)
017	68.42	67.17	65.48	65.87	63.34	62.58	60.01	**58.13**	**57.38**	**57.91**	**58.24**	62.42	(V_{DS} 0V, V_{GS} +15V)
018	69.32	66.85	66.47	66.26	63.25	60.71	**59.53**	**56.52**	**56.52**	**57.18**	**57.46**	61.73	(V_{DS} 0V, V_{GS} +12V)
019	68.34	66.47	65.69	63.80	64.16	60.46	**59.14**	**56.53**	**56.88**	**56.99**	**57.48**	61.41	(V_{DS} 0V, V_{GS} +12V)
034	69.03	68.86	68.37	68.87	69.07	69.87	68.90	69.48	68.63	68.62	68.55	69.69	Reference device

Reference device **Mean value:** 68.99 **Estimated uncertainty:** ± 0.58 % (± 0.40 V)

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:	60		[V]

$V_{(BR)DSS}$ @I_{DS}=100uA – VDS Breakdown Voltage [V] vs ^{60}Co Irradiation Total Dose [rad (Si)]

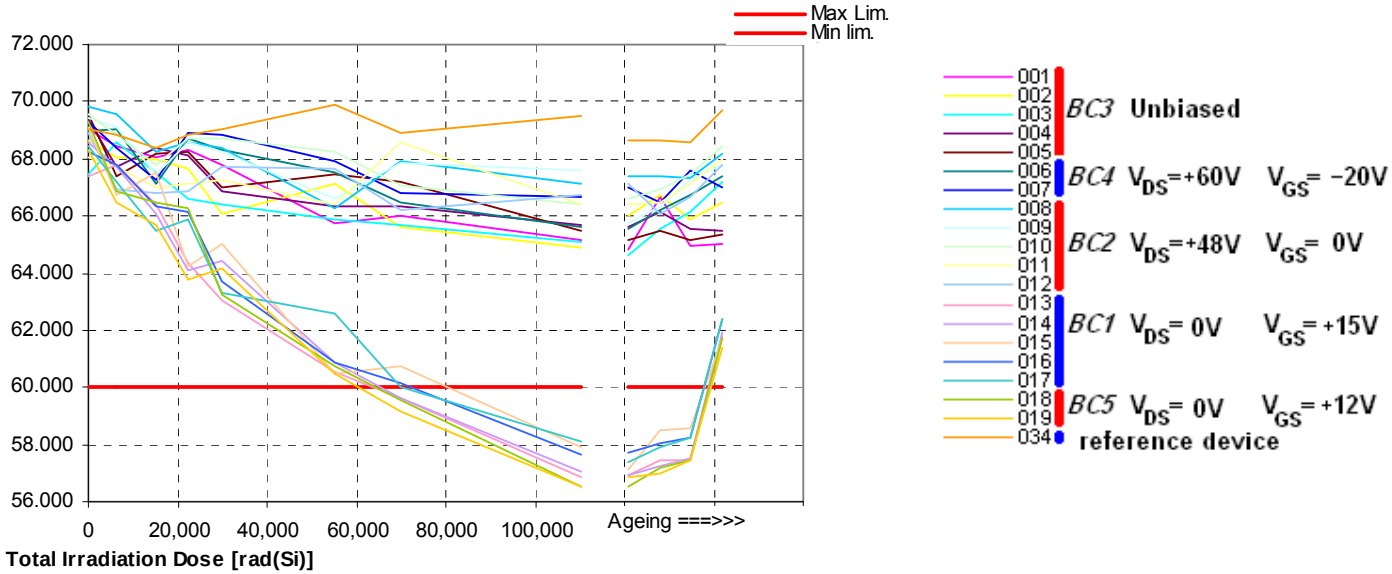


Figure 14 Data from Table 16

Table 17 – $V_{(BR)DSS}$ @I_{DS}=250uA – VDS Breakdown Voltage [V] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:	60		[V]

Detailed results - Measurement data in [V]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	68.93	68.43	67.79	68.37	68.85	67.39	67.20	66.48	66.50	66.80	66.64	66.20	(V_{DS} 0V, V_{GS} 0V)
002	69.65	69.41	67.92	68.03	67.46	67.07	66.82	66.28	66.54	66.47	66.11	66.39	(V_{DS} 0V, V_{GS} 0V)
003	69.56	68.07	68.60	68.12	67.36	67.13	68.03	66.23	66.58	66.59	66.99	66.19	(V_{DS} 0V, V_{GS} 0V)
004	69.02	69.36	68.82	68.45	67.83	67.59	67.35	66.91	66.73	66.95	66.30	67.61	(V_{DS} 0V, V_{GS} 0V)
005	69.69	68.88	68.10	69.59	68.00	67.52	67.12	66.77	67.13	66.95	67.11	67.43	(V_{DS} 0V, V_{GS} 0V)
006	69.16	69.49	69.06	69.21	69.14	68.59	67.83	67.83	67.41	67.79	67.34	68.43	(V_{DS} +60V, V_{GS} -20V)
007	68.84	69.02	68.88	68.71	68.43	67.30	67.76	68.06	67.17	67.44	67.27	67.65	(V_{DS} +60V, V_{GS} -20V)
008	69.52	69.68	68.37	68.61	67.94	67.19	68.10	67.40	66.77	67.62	67.19	68.69	(V_{DS} +48V, V_{GS} 0V)
009	69.47	69.37	69.15	68.62	69.08	68.45	68.01	66.75	67.13	67.63	67.01	68.56	(V_{DS} +48V, V_{GS} 0V)
010	69.71	69.75	68.87	68.75	69.33	68.07	67.96	67.66	67.28	67.55	67.68	68.37	(V_{DS} +48V, V_{GS} 0V)
011	68.83	69.68	68.15	69.68	68.23	68.18	68.39	67.46	67.25	67.65	67.12	68.13	(V_{DS} +48V, V_{GS} 0V)
012	69.96	69.30	68.54	68.99	69.74	68.60	68.61	67.50	67.97	67.83	67.54	68.53	(V_{DS} +48V, V_{GS} 0V)
013	69.71	68.30	66.78	66.35	65.54	62.82	61.64	**59.27**	**59.10**	**59.13**	**59.91**	63.71	(V_{DS} 0V, V_{GS} +15V)
014	68.95	68.05	66.88	66.25	65.14	62.33	61.54	**59.10**	**58.97**	**59.60**	**59.69**	63.62	(V_{DS} 0V, V_{GS} +15V)
015	69.36	68.89	66.94	66.27	65.25	62.85	61.85	**58.92**	**59.31**	**59.50**	**59.81**	63.78	(V_{DS} 0V, V_{GS} +15V)
016	68.70	68.54	66.79	65.85	64.94	62.21	61.86	**59.00**	**58.98**	**59.60**	**59.66**	63.86	(V_{DS} 0V, V_{GS} +15V)
017	68.91	67.76	66.51	65.58	64.65	62.46	61.74	**58.76**	**59.31**	**59.62**	**59.52**	63.36	(V_{DS} 0V, V_{GS} +15V)
018	69.54	68.50	66.94	65.81	64.90	62.96	61.73	**58.76**	**59.15**	**59.20**	**59.58**	63.62	(V_{DS} 0V, V_{GS} +12V)
019	68.54	67.68	66.50	66.02	64.37	61.52	61.28	**58.11**	**58.05**	**58.54**	**58.88**	62.67	(V_{DS} 0V, V_{GS} +12V)
034	69.86	69.45	69.30	69.43	69.12	69.69	70.18	69.80	69.14	69.95	69.54	69.66	Reference device

Reference device **Mean value:** **69.59** **Estimated uncertainty:** **± 0.41 % (± 0.282 V)**

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:	60		[V]

$V_{(BR)DSS}$ @I_{DS}=250uA – VDS Breakdown Voltage [V] vs ^{60}Co Irradiation Total Dose [rad (Si)]

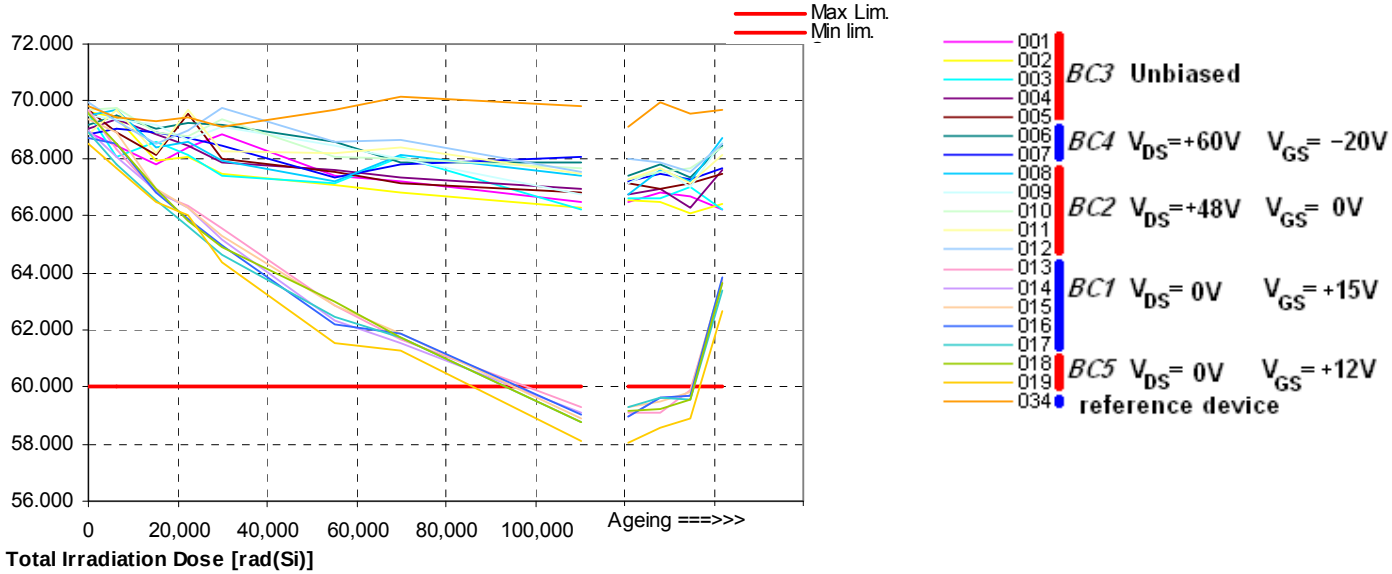


Figure 15 Data from Table 17

Table 18 – $V_{(BR)DSS}$ @I_{DS}= 1 mA – VDS Breakdown Voltage [V] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:	60		[V]

Detailed results - Measurement data in [V]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	69.92	69.48	69.17	69.31	69.11	68.82	69.02	68.36	68.19	68.80	68.41	67.34	(V_{DS} 0V, V_{GS} 0V)
002	69.92	69.36	69.35	69.51	69.05	69.10	68.96	68.18	68.09	68.37	68.09	67.11	(V_{DS} 0V, V_{GS} 0V)
003	70.01	69.77	69.26	69.78	69.43	68.76	68.88	68.27	68.12	68.50	68.38	67.43	(V_{DS} 0V, V_{GS} 0V)
004	69.81	69.70	69.06	69.45	69.32	68.85	69.14	68.07	68.19	68.44	68.13	67.16	(V_{DS} 0V, V_{GS} 0V)
005	69.84	69.39	69.06	69.58	69.20	68.69	69.05	68.09	67.96	68.37	68.21	67.17	(V_{DS} 0V, V_{GS} 0V)
006	69.64	69.63	69.12	69.26	69.18	69.07	68.84	68.22	68.34	68.43	68.33	68.24	(V_{DS} +60V, V_{GS} -20V)
007	69.50	69.18	69.08	69.04	69.04	68.81	68.56	67.97	67.88	68.09	67.94	67.94	(V_{DS} +60V, V_{GS} -20V)
008	69.69	69.50	69.17	69.45	68.98	68.85	68.74	68.62	68.52	68.76	68.47	68.60	(V_{DS} +48V, V_{GS} 0V)
009	69.60	69.17	68.90	69.17	69.13	68.63	68.91	68.51	68.21	68.65	68.32	68.39	(V_{DS} +48V, V_{GS} 0V)
010	69.70	69.83	69.21	69.63	69.25	68.81	68.95	68.58	68.55	68.94	68.70	69.16	(V_{DS} +48V, V_{GS} 0V)
011	70.11	69.75	69.42	69.72	69.32	69.12	69.21	68.72	68.79	69.01	68.70	68.91	(V_{DS} +48V, V_{GS} 0V)
012	70.16	69.71	69.38	69.56	69.31	69.39	69.38	68.57	68.75	68.98	68.57	68.95	(V_{DS} +48V, V_{GS} 0V)
013	70.01	68.95	67.96	67.61	66.42	64.55	63.46	61.01	61.08	61.70	61.68	65.65	(V_{DS} 0V, V_{GS} +15V)
014	69.43	68.76	67.71	67.25	66.36	64.39	63.32	60.73	61.28	61.65	61.89	65.31	(V_{DS} 0V, V_{GS} +15V)
015	69.99	69.02	67.80	67.52	66.65	64.53	63.63	60.74	61.49	61.71	61.92	65.40	(V_{DS} 0V, V_{GS} +15V)
016	69.81	68.82	67.82	67.47	66.27	64.25	63.45	60.66	61.27	61.66	61.83	65.56	(V_{DS} 0V, V_{GS} +15V)
017	69.92	69.11	67.80	67.55	66.25	64.14	63.17	60.68	61.08	61.65	61.65	65.27	(V_{DS} 0V, V_{GS} +15V)
018	69.65	68.69	67.89	67.11	66.26	64.03	63.19	60.62	60.96	61.42	61.24	65.31	(V_{DS} 0V, V_{GS} +12V)
019	69.63	68.47	67.48	67.30	66.20	63.93	63.20	60.51	61.14	61.43	61.43	65.20	(V_{DS} 0V, V_{GS} +12V)
034	69.97	69.82	69.85	70.06	69.80	70.06	69.90	69.87	69.63	70.29	69.80	69.74	Reference device

Reference device **Mean value:** **69.90** **Estimated uncertainty:** **± 0.22 % (± 0.15 V)**

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:	60		[V]

$V_{(BR)DSS}$ @I_{DS}= 1mA – VDS Breakdown Voltage [V] vs ^{60}Co Irradiation Total Dose [rad (Si)]

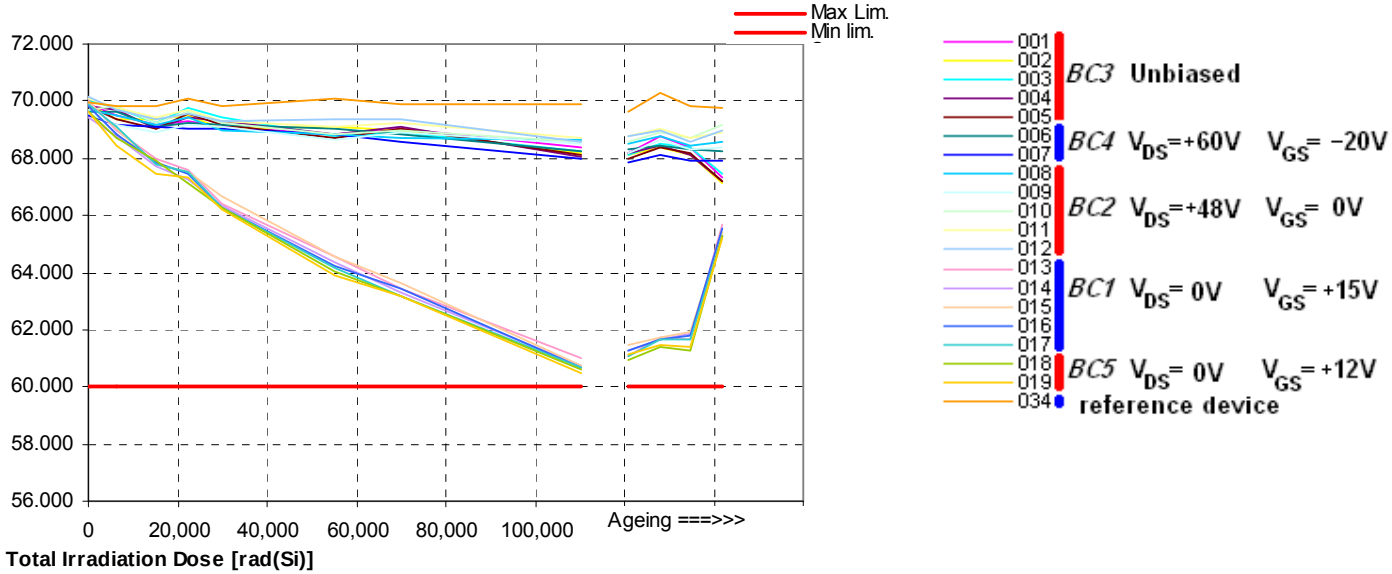


Figure 16 Data from Table 18

Table 19 – V_{DS}(on) Drain-Source On Voltage [mV] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:	-	800	[mV]

Detailed results - Measurement data in [mV]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	804.69	813.19	788.38	817.94	802.00	818.00	820.00	825.00	806.63	831.06	802.69	795.63	(V_{DS} 0V, V_{GS} 0V)
002	806.31	800.69	790.56	820.13	804.69	806.31	816.75	819.06	802.00	828.75	803.38	799.13	(V_{DS} 0V, V_{GS} 0V)
003	807.06	802.44	787.38	813.25	803.63	799.81	823.06	825.75	808.56	826.94	802.19	797.88	(V_{DS} 0V, V_{GS} 0V)
004	805.44	796.25	782.56	814.00	804.19	798.00	814.88	820.69	796.88	827.06	799.19	787.56	(V_{DS} 0V, V_{GS} 0V)
005	810.19	810.13	800.94	813.00	804.19	808.81	816.88	819.25	800.00	826.81	808.25	799.25	(V_{DS} 0V, V_{GS} 0V)
006	813.88	812.50	792.75	821.94	805.94	808.25	820.50	810.06	802.81	818.19	798.88	790.06	(V_{DS} +60V, V_{GS} -20V)
007	810.94	801.38	783.69	817.00	798.25	794.44	814.25	797.81	796.44	814.13	793.69	789.94	(V_{DS} +60V, V_{GS} -20V)
008	817.06	815.00	802.50	823.13	806.75	809.88	819.44	817.13	812.81	831.38	805.50	805.13	(V_{DS} +48V, V_{GS} 0V)
009	810.94	801.13	786.13	818.38	800.25	794.75	814.44	805.38	802.38	820.31	802.63	795.31	(V_{DS} +48V, V_{GS} 0V)
010	801.56	805.63	780.44	817.06	803.94	793.50	814.63	803.88	796.75	823.44	785.94	781.88	(V_{DS} +48V, V_{GS} 0V)
011	804.13	800.19	787.19	824.25	797.31	802.94	810.63	797.31	811.63	825.13	794.31	790.06	(V_{DS} +48V, V_{GS} 0V)
012	810.88	808.88	794.81	817.19	802.75	800.63	817.94	811.06	809.56	825.31	790.75	796.31	(V_{DS} +48V, V_{GS} 0V)
013	809.31	810.81	801.38	824.00	811.94	811.13	830.56	831.50	826.00	844.63	817.00	870.00	(V_{DS} 0V, V_{GS} +15V)
014	805.13	813.06	789.06	822.50	806.25	809.63	823.56	813.94	819.44	834.00	811.13	867.44	(V_{DS} 0V, V_{GS} +15V)
015	801.31	804.00	785.88	815.44	803.88	796.75	811.56	810.50	817.75	830.38	804.81	848.19	(V_{DS} 0V, V_{GS} +15V)
016	812.69	813.63	805.19	828.00	806.13	817.81	831.88	829.69	838.25	835.44	817.75	871.13	(V_{DS} 0V, V_{GS} +15V)
017	803.75	802.31	794.13	821.94	808.06	804.50	824.50	812.56	812.38	834.94	806.13	865.75	(V_{DS} 0V, V_{GS} +15V)
018	811.44	796.63	787.94	818.63	793.56	800.31	820.00	811.00	810.38	830.69	805.38	858.69	(V_{DS} 0V, V_{GS} +12V)
019	801.81	797.19	782.38	807.19	797.31	801.81	817.69	805.75	798.25	829.81	803.25	858.44	(V_{DS} 0V, V_{GS} +12V)
034	813.31	801.56	792.50	815.81	810.88	797.69	826.63	809.75	803.81	815.44	797.88	800.44	Reference device

Reference device **Mean value:** 807.14 **Estimated uncertainty:** ± 1.05 % (± 8.5 mV)

Red values: greater than max limit
Dark red Values: lower than min limits

Note: ***the observed out of max limits are not accounted as failure since (due to test equipment limitation) the applied Test Conditions deviate from Manufacturer Test Conditions Log HG6F.tst, dated 09.09.2009, while the maximum limit there specified was still maintained.***
The parameter was measured to monitor its TID sensitivity.

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:	-	800	[mV]

V_{DS}(on) Drain-Source On Voltage [mV] vs ^{60}Co Irradiation Total Dose [rad (Si)]

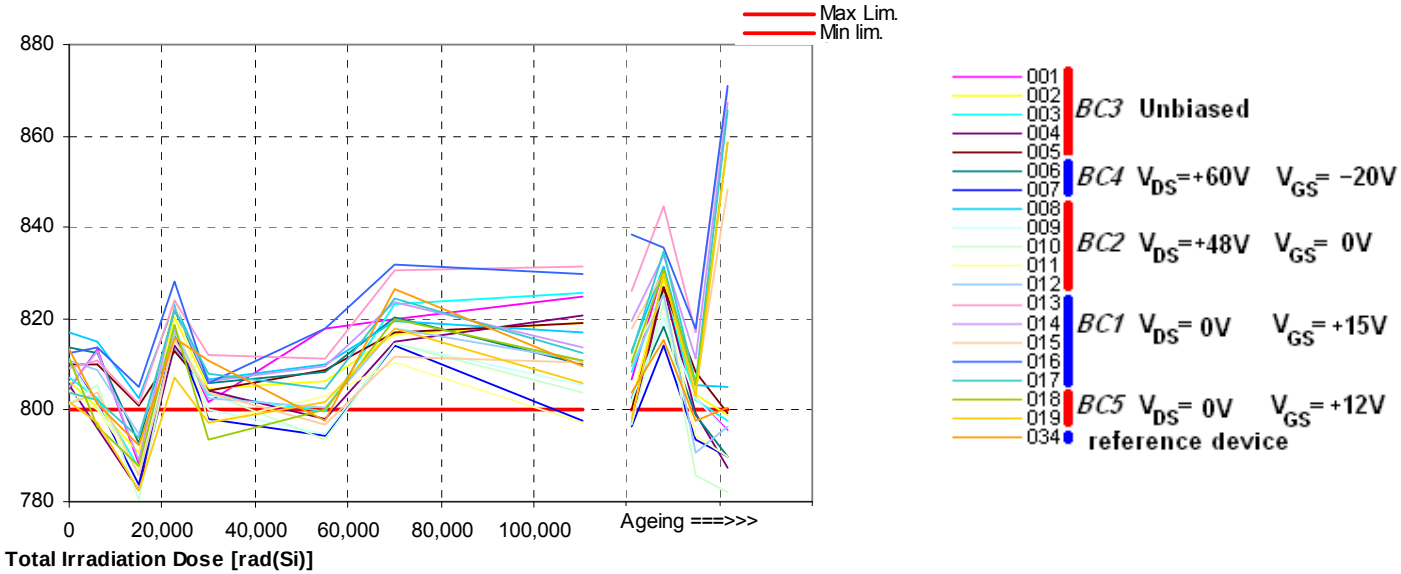


Figure 17 Data from Table 19

Due to test equipment limitation, the following deviation from Detail Spec. Test condition, have been applied:

Required test conditions	Actual Test conditions
I_D = 20A V_{GS} = 12 V	I_D = 20A V_{GS} = 10 V

Table 20 – I_{DS}(on) Drain-Source On Current [A] vs ^{60}Co Irradiation Total Dose [rad (Si)]

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:	40		[A]

Detailed results - Measurement data in [A]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	76.49	76.97	76.63	76.64	76.88	76.60	76.32	76.32	77.10	76.27	76.71	76.06	(V_{DS} 0V, V_{GS} 0V)
002	76.52	77.23	77.09	76.99	77.32	76.70	76.73	76.34	77.24	76.56	76.79	76.12	(V_{DS} 0V, V_{GS} 0V)
003	76.09	77.24	77.11	77.01	77.11	77.34	76.56	76.09	77.28	76.85	76.76	76.38	(V_{DS} 0V, V_{GS} 0V)
004	76.95	77.20	77.35	77.20	77.33	77.21	76.70	76.40	77.56	76.61	77.16	76.49	(V_{DS} 0V, V_{GS} 0V)
005	76.72	77.11	77.24	76.83	77.39	77.16	76.63	76.04	77.27	76.46	76.53	76.25	(V_{DS} 0V, V_{GS} 0V)
006	76.59	77.22	77.39	76.92	76.94	77.13	77.15	77.10	77.19	77.00	76.93	76.19	(V_{DS} +60V, V_{GS} -20V)
007	76.24	76.76	76.96	76.61	77.16	77.09	76.39	76.56	77.32	76.83	76.66	76.06	(V_{DS} +60V, V_{GS} -20V)
008	76.73	77.27	76.70	76.87	77.16	76.88	76.63	77.01	76.97	76.63	76.33	76.46	(V_{DS} +48V, V_{GS} 0V)
009	77.04	77.27	77.31	77.03	77.25	76.96	77.13	76.98	77.55	77.09	77.02	76.80	(V_{DS} +48V, V_{GS} 0V)
010	76.81	77.27	77.64	76.91	77.41	76.82	76.97	77.17	77.22	76.85	77.08	76.49	(V_{DS} +48V, V_{GS} 0V)
011	76.75	77.20	77.64	76.74	77.58	77.55	77.01	76.80	77.38	76.97	77.06	76.58	(V_{DS} +48V, V_{GS} 0V)
012	76.06	76.88	77.51	76.78	77.29	76.96	76.72	76.84	77.03	76.74	76.38	76.19	(V_{DS} +48V, V_{GS} 0V)
013	76.73	77.16	77.50	76.63	77.28	76.88	76.55	76.35	76.73	76.32	76.44	74.33	(V_{DS} 0V, V_{GS} +15V)
014	76.78	76.99	77.70	76.76	77.43	77.00	76.80	76.94	77.32	76.75	76.40	74.19	(V_{DS} 0V, V_{GS} +15V)
015	76.90	77.48	77.91	77.09	77.39	77.27	76.87	76.53	77.02	76.83	77.06	74.53	(V_{DS} 0V, V_{GS} +15V)
016	76.29	76.95	77.35	76.54	77.41	76.99	76.71	76.54	76.80	76.59	76.53	74.01	(V_{DS} 0V, V_{GS} +15V)
017	76.50	77.29	77.69	76.88	77.59	76.66	76.66	76.66	76.54	76.52	76.51	74.24	(V_{DS} 0V, V_{GS} +15V)
018	76.45	77.21	77.38	76.60	77.34	76.91	76.51	77.04	77.17	76.90	76.29	74.36	(V_{DS} 0V, V_{GS} +12V)
019	76.81	76.80	77.27	76.56	77.09	77.09	76.68	76.32	76.80	76.24	76.08	74.26	(V_{DS} 0V, V_{GS} +12V)
034	76.77	76.98	77.28	76.73	77.11	76.92	76.88	77.05	77.08	76.94	77.51	76.76	Reference device

Reference device **Mean value:** 77.00 **Estimated uncertainty:** ± 0.26 % (± 0.2 A)

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:	40		[A]

I_{DS}(on) Drain-Source On Current [A] vs ^{60}Co Irradiation Total Dose [rad (Si)]

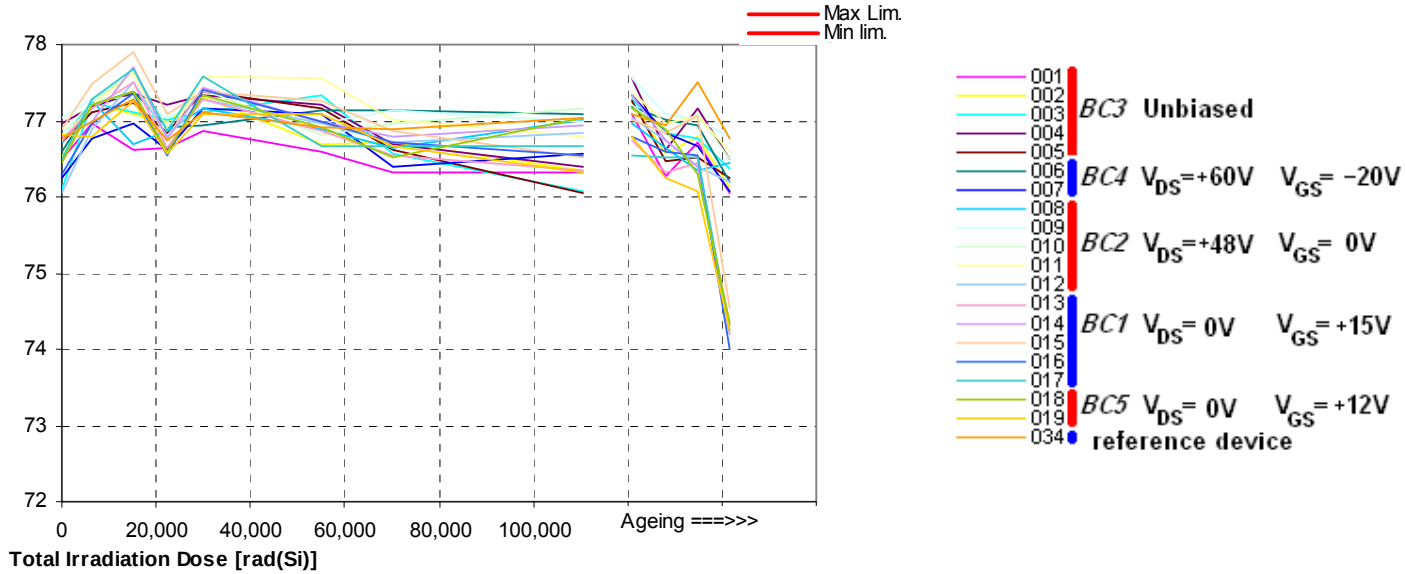


Figure 18 Data from Table 20

Table 21 – Qg Total Gate Charge [nCoulomb] vs ^{60}Co Irradiation Total Dose [rad (Si)]:

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:	n.d.	n.d.	[nC]

Detailed results - Measurement data in [nC]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	50.55	51.07	51.42	51.94	51.70	52.06	52.96	53.80	53.77	53.67	52.91	51.93	(V_{DS} 0V, V_{GS} 0V)
002	50.70	51.17	51.49	52.02	51.77	52.13	52.97	53.84	53.80	53.66	52.96	51.98	(V_{DS} 0V, V_{GS} 0V)
003	50.61	50.95	51.30	51.82	51.60	52.06	52.83	53.73	53.69	53.54	52.82	51.85	(V_{DS} 0V, V_{GS} 0V)
004	50.79	51.20	51.59	52.03	51.78	52.23	53.13	53.92	53.87	53.72	53.02	52.08	(V_{DS} 0V, V_{GS} 0V)
005	50.81	51.22	51.63	52.09	51.79	52.18	53.10	54.01	53.94	53.73	53.06	52.11	(V_{DS} 0V, V_{GS} 0V)
006	50.87	51.15	51.39	51.91	51.62	52.19	53.17	54.20	54.14	53.96	53.47	52.94	(V_{DS} +60V, V_{GS} -20V)
007	50.79	51.09	51.30	51.83	51.56	52.16	53.15	54.08	54.04	53.91	53.37	52.91	(V_{DS} +60V, V_{GS} -20V)
008	50.69	51.01	51.31	51.72	51.44	51.78	52.68	53.41	53.36	53.20	52.58	51.97	(V_{DS} +48V, V_{GS} 0V)
009	51.06	51.37	51.62	52.11	51.81	52.17	53.08	53.77	53.72	53.55	53.06	52.34	(V_{DS} +48V, V_{GS} 0V)
010	51.04	51.33	51.68	52.08	51.79	52.16	53.05	53.80	53.76	53.62	53.02	52.39	(V_{DS} +48V, V_{GS} 0V)
011	50.64	51.00	51.20	51.72	51.38	51.73	52.60	53.31	53.27	53.14	52.59	51.90	(V_{DS} +48V, V_{GS} 0V)
012	50.53	50.88	51.13	51.56	51.25	51.62	52.53	53.23	53.18	53.02	52.50	51.88	(V_{DS} +48V, V_{GS} 0V)
013	50.60	52.29	54.35	56.31	57.37	61.62	64.25	68.65	68.48	67.90	66.59	59.01	(V_{DS} 0V, V_{GS} +15V)
014	50.85	52.57	54.63	56.59	57.65	61.96	64.65	68.97	68.81	68.23	66.80	59.39	(V_{DS} 0V, V_{GS} +15V)
015	50.47	52.16	54.24	56.16	57.29	61.54	64.16	68.47	68.32	67.78	66.45	58.96	(V_{DS} 0V, V_{GS} +15V)
016	50.81	52.44	54.56	56.50	57.57	61.84	64.50	68.81	68.66	68.10	66.69	59.29	(V_{DS} 0V, V_{GS} +15V)
017	50.74	52.45	54.46	56.42	57.46	61.76	64.46	68.74	68.59	68.07	66.48	59.29	(V_{DS} 0V, V_{GS} +15V)
018	50.99	52.76	54.87	56.82	57.90	62.23	64.97	69.33	69.17	68.61	67.16	59.75	(V_{DS} 0V, V_{GS} +12V)
019	50.74	52.52	54.59	56.60	57.68	61.99	64.73	68.99	68.84	68.29	66.91	59.62	(V_{DS} 0V, V_{GS} +12V)
034	50.96	50.98	50.86	51.14	50.64	50.45	50.95	51.26	51.21	51.04	50.64	50.75	Reference device

Reference device **Mean value:** **50.91** **Estimated uncertainty:** **± 0.42 % (± 0.22 nC)**

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:	n.d.	n.d.	[nC]

Qg Total Gate Charge [nCoulomb] vs ^{60}Co Irradiation Total Dose [rad (Si)]

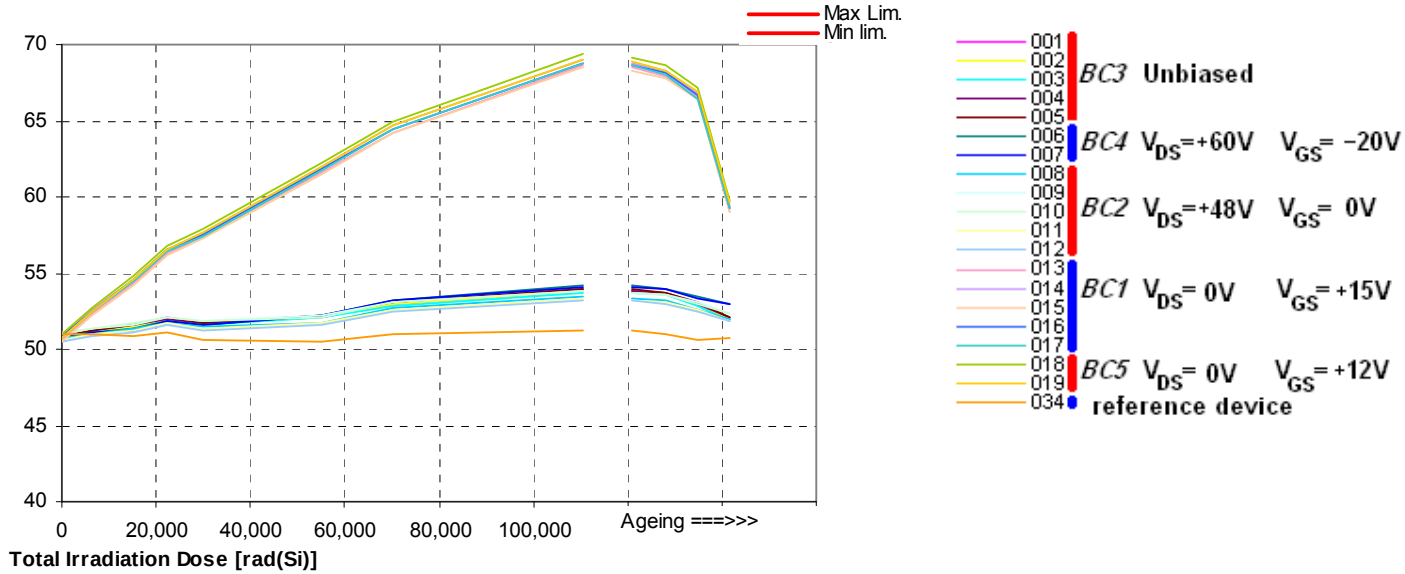


Figure 19 Data from Table 21

Table 22 – Qgs Gate Source Charge [nCoulomb] vs ^{60}Co Irradiation Total Dose [rad (Si)]:

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:	n.d.	n.d.	[nC]

Detailed results - Measurement data in [nC]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	14.21	13.60	13.23	12.88	12.43	11.46	11.09	10.39	10.38	10.32	10.07	11.73	(V_{DS} 0V, V_{GS} 0V)
002	14.09	13.58	13.19	12.84	12.40	11.53	11.14	10.43	10.42	10.37	10.16	11.71	(V_{DS} 0V, V_{GS} 0V)
003	14.28	13.77	13.38	12.99	12.54	11.70	11.23	10.49	10.47	10.43	10.21	11.88	(V_{DS} 0V, V_{GS} 0V)
004	14.29	13.83	13.44	13.04	12.63	11.74	11.29	10.58	10.57	10.53	10.30	11.94	(V_{DS} 0V, V_{GS} 0V)
005	14.37	13.90	13.54	13.14	12.70	11.79	11.34	10.62	10.60	10.54	10.30	11.99	(V_{DS} 0V, V_{GS} 0V)
006	14.51	14.27	14.13	14.01	13.70	13.10	12.81	12.23	12.22	12.18	12.18	12.99	(V_{DS} +60V, V_{GS} -20V)
007	14.20	13.91	13.89	13.65	13.39	12.77	12.55	11.95	11.94	11.92	11.90	12.68	(V_{DS} +60V, V_{GS} -20V)
008	14.39	13.87	13.53	13.16	12.65	11.79	11.32	10.51	10.49	10.44	10.19	11.99	(V_{DS} +48V, V_{GS} 0V)
009	14.40	13.88	13.52	13.16	12.72	11.79	11.34	10.53	10.52	10.48	10.20	12.03	(V_{DS} +48V, V_{GS} 0V)
010	14.39	13.86	13.49	13.12	12.65	11.76	11.33	10.55	10.52	10.43	10.18	12.01	(V_{DS} +48V, V_{GS} 0V)
011	14.23	13.75	13.32	13.04	12.56	11.66	11.18	10.38	10.38	10.38	10.08	11.95	(V_{DS} +48V, V_{GS} 0V)
012	14.17	13.60	13.25	12.91	12.47	11.50	11.10	10.33	10.31	10.24	9.96	11.80	(V_{DS} +48V, V_{GS} 0V)
013	14.16	13.61	13.14	12.80	12.44	11.73	11.33	11.34	11.32	11.27	11.50	16.16	(V_{DS} 0V, V_{GS} +15V)
014	14.38	13.78	13.39	13.09	12.60	11.92	11.49	11.36	11.34	11.27	11.60	16.35	(V_{DS} 0V, V_{GS} +15V)
015	14.31	13.75	13.32	12.91	12.53	11.79	11.47	11.24	11.24	11.24	11.54	16.20	(V_{DS} 0V, V_{GS} +15V)
016	14.37	13.73	13.39	13.04	12.62	11.86	11.55	11.28	11.26	11.21	11.61	16.34	(V_{DS} 0V, V_{GS} +15V)
017	14.13	13.60	13.12	12.82	12.41	11.65	11.25	11.09	11.14	11.29	11.52	16.05	(V_{DS} 0V, V_{GS} +15V)
018	14.56	13.91	13.47	13.14	12.58	11.80	11.35	11.01	11.10	11.42	11.53	16.53	(V_{DS} 0V, V_{GS} +12V)
019	14.52	13.95	13.45	13.06	12.60	11.68	11.29	10.91	10.95	11.09	11.33	16.50	(V_{DS} 0V, V_{GS} +12V)
034	14.44	14.36	14.38	14.51	14.37	14.34	14.39	14.54	14.53	14.48	14.31	14.26	Reference device

Reference device **Mean value:** 14.41 **Estimated uncertainty:** ± 0.55 % (± 0.08 nC)

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:	n.d.	n.d.	[nC]

Qgs Gate Source Charge [nCoulomb] vs ^{60}Co Irradiation Total Dose [rad (Si)]

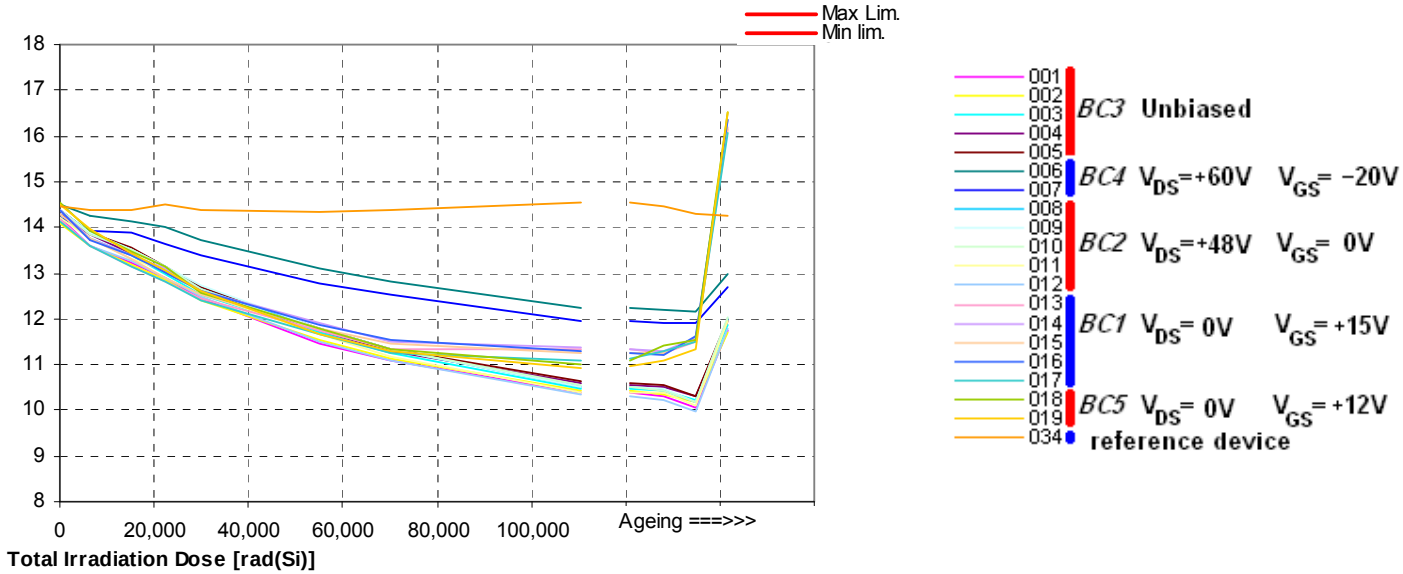


Figure 20 Data from Table 22

Table 23 – Qgd Gate Drain Charge [nCoulomb] vs ^{60}Co Irradiation Total Dose [rad (Si)]:

STRH40N6SY3	*Min.*	*Max.*	*Unit*
Applicable limits:	n.d.	n.d.	[nC]

Detailed results - Measurement data in [nC]

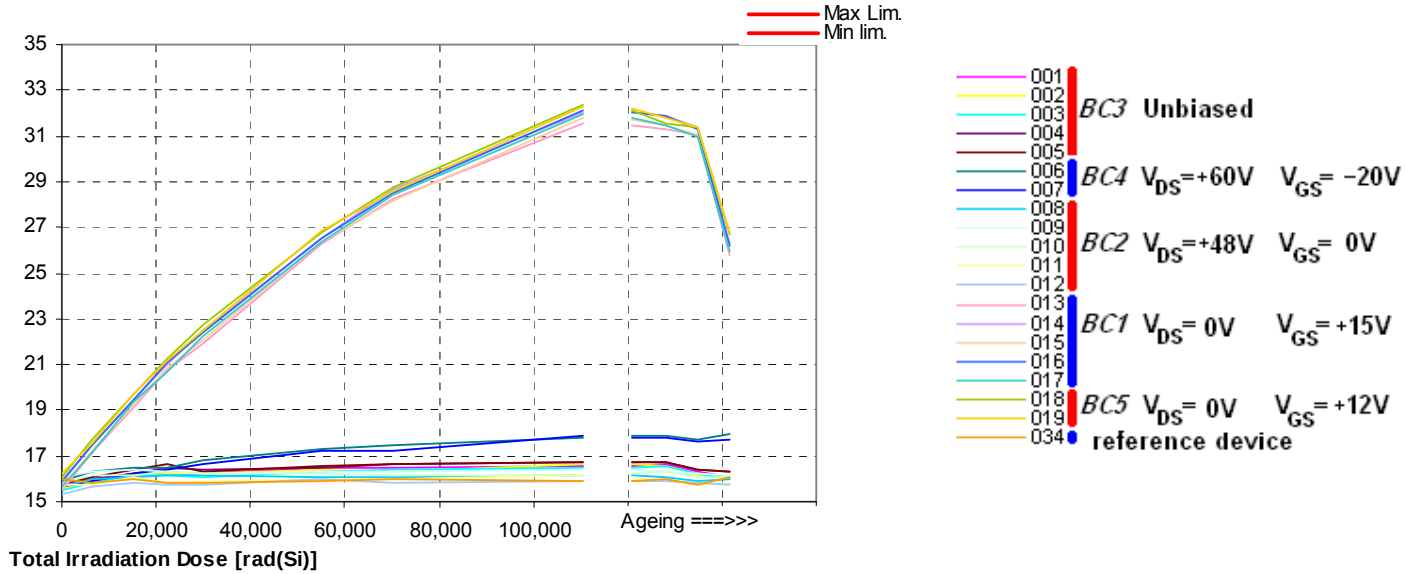
s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C	Applied Bias Condition
001	15.74	15.99	16.24	16.24	16.23	16.46	16.46	16.58	16.59	16.63	16.35	16.08	(V_{DS} 0V, V_{GS} 0V)
002	15.56	15.94	16.09	16.22	16.21	16.40	16.35	16.61	16.61	16.60	16.18	16.09	(V_{DS} 0V, V_{GS} 0V)
003	15.47	15.83	16.13	16.15	16.10	16.30	16.39	16.51	16.52	16.56	16.23	16.02	(V_{DS} 0V, V_{GS} 0V)
004	15.84	16.00	16.27	16.47	16.40	16.46	16.65	16.74	16.74	16.74	16.41	16.28	(V_{DS} 0V, V_{GS} 0V)
005	15.86	16.10	16.40	16.61	16.36	16.57	16.68	16.75	16.74	16.71	16.43	16.30	(V_{DS} 0V, V_{GS} 0V)
006	15.87	16.28	16.48	16.48	16.78	17.32	17.51	17.84	17.85	17.87	17.74	18.00	(V_{DS} +60V, V_{GS} -20V)
007	15.69	15.90	16.23	16.39	16.63	17.21	17.18	17.84	17.83	17.77	17.65	17.71	(V_{DS} +60V, V_{GS} -20V)
008	15.68	15.95	16.11	16.13	16.16	16.05	16.05	16.18	16.15	16.08	15.90	16.02	(V_{DS} +48V, V_{GS} 0V)
009	16.06	16.28	16.40	16.32	16.22	16.29	16.30	16.43	16.40	16.28	16.22	16.18	(V_{DS} +48V, V_{GS} 0V)
010	15.82	16.18	16.14	16.28	16.22	16.19	16.16	16.17	16.20	16.29	16.05	16.05	(V_{DS} +48V, V_{GS} 0V)
011	15.71	15.71	16.07	15.83	15.89	16.01	15.97	16.16	16.11	15.91	15.72	15.86	(V_{DS} +48V, V_{GS} 0V)
012	15.35	15.65	15.83	15.72	15.73	15.97	15.79	15.95	15.94	15.90	15.81	15.71	(V_{DS} +48V, V_{GS} 0V)
013	15.50	17.10	19.12	20.74	21.95	26.25	28.22	31.51	31.47	31.33	31.01	25.82	(V_{DS} 0V, V_{GS} +15V)
014	15.83	17.49	19.45	20.98	22.51	26.50	28.64	32.06	32.03	31.90	31.39	26.26	(V_{DS} 0V, V_{GS} +15V)
015	15.60	17.19	19.16	20.87	22.07	26.35	28.18	31.80	31.73	31.50	31.05	25.94	(V_{DS} 0V, V_{GS} +15V)
016	15.92	17.44	19.47	21.05	22.38	26.52	28.50	32.11	32.07	31.91	31.26	26.19	(V_{DS} 0V, V_{GS} +15V)
017	15.63	17.14	19.37	20.71	22.25	26.38	28.41	31.92	31.81	31.44	30.95	25.99	(V_{DS} 0V, V_{GS} +15V)
018	16.09	17.75	19.72	21.27	22.73	26.73	28.74	32.34	32.16	31.53	31.40	26.71	(V_{DS} 0V, V_{GS} +12V)
019	16.20	17.58	19.67	21.16	22.49	26.82	28.62	32.29	32.18	31.78	31.36	26.74	(V_{DS} 0V, V_{GS} +12V)
034	15.99	15.82	16.01	15.85	15.81	15.93	15.99	15.87	15.89	15.97	15.77	16.03	Reference device

Reference device **Mean value:** 15.91 **Estimated uncertainty:** ± 0.48 % (± 0.08 nC)

Red values: greater than max limit
Dark red Values: lower than min limits

STRH40N6SY3	Min.	Max.	Unit
Applicable limits:	n.d.	n.d.	[nC]

Qgd Gate Drain Charge [nCoulomb] vs ^{60}Co Irradiation Total Dose [rad (Si)]



Data from irradiated devices

Figure 21

4.4.2 Gate Charge Waveforms

The total gate charge was measured according to MIL-STD-750 method 3471 cond.B, using test conditions as specified in Table 4 and the test circuit in Figure 2.

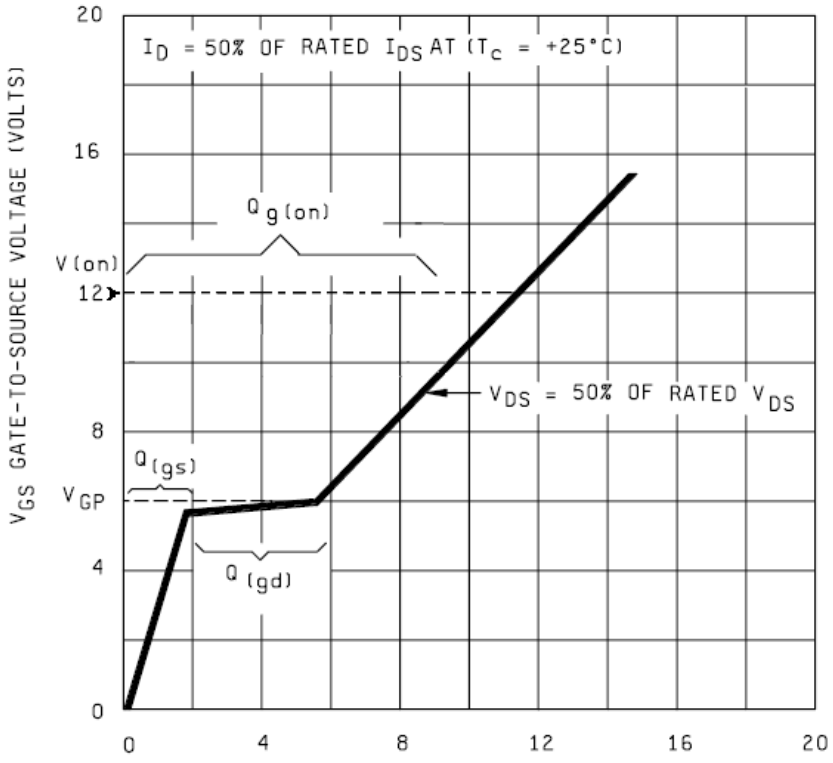


Figure 22 Gate Charge Waveform for N-channel MOSFET (Mil-Std-750E meth.3471) with the identification of Qg, Qgs and Qgd.

Figure 23 to Figure 28 show the measured Gate Voltage Waveforms grouped per bias condition.

For presentation plainness, only the initial and after TID waveform plus the waveform after the annealing and ageing, representative of the group behaviour have been plotted.

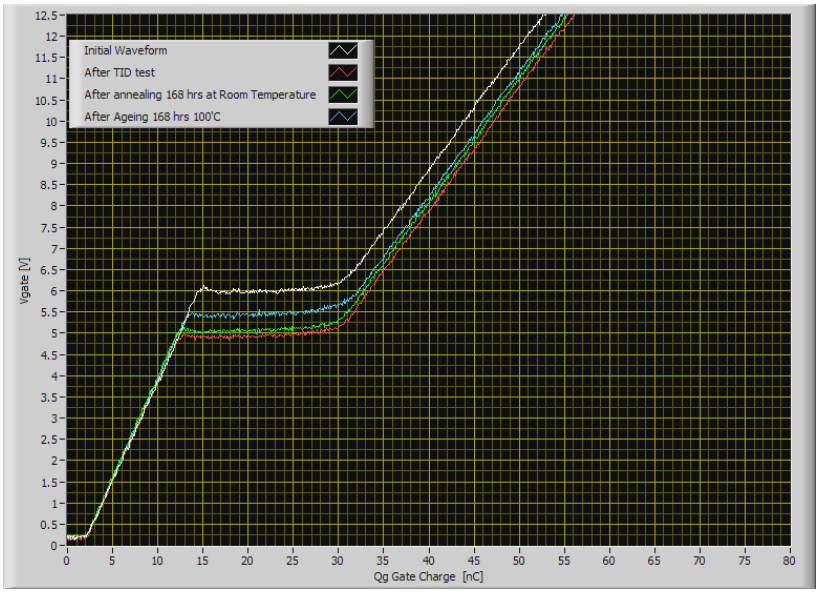


Figure 23

Gate charge waveforms

devices s/n 06 & s/n 07

Bias Conditions:

BC4 V_{GS} = -20V
V_{DS}= +60V

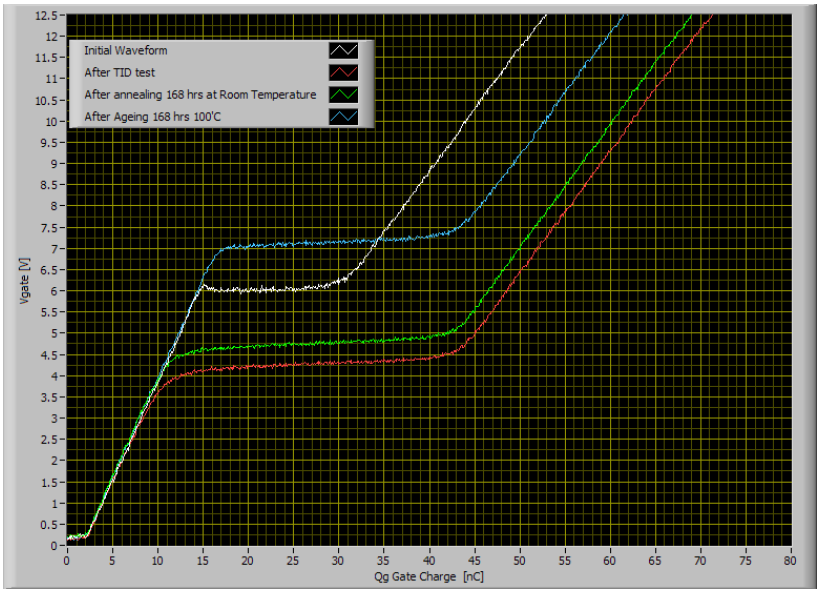


Figure 24

Gate charge waveforms

devices s/n 18 & s/n 19

Bias Conditions:

BC5 V_{GS} = +12V
V_{DS}= 0V

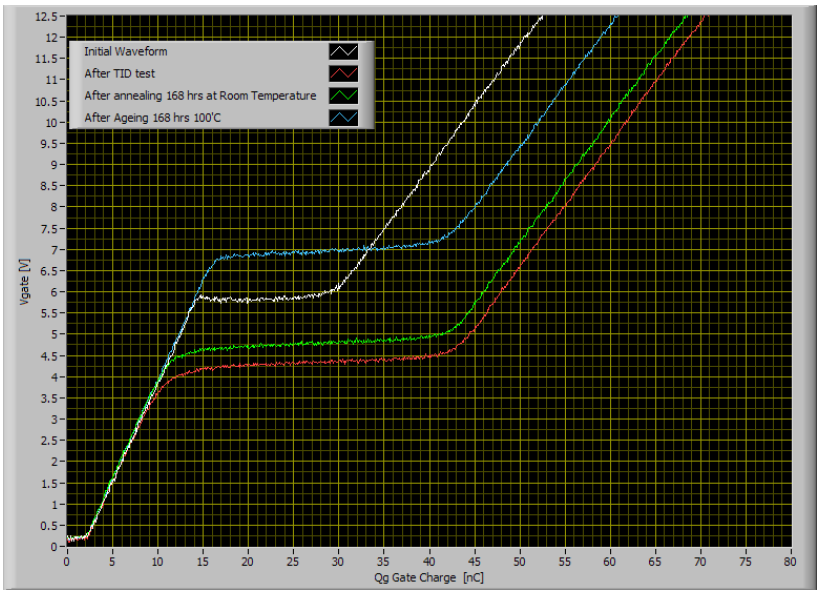


Figure 25

Gate charge waveforms

devices s/n 13 to s/n 17

Bias Conditions:

BC1 V_{GS} =+15V
V_{DS}= 0V

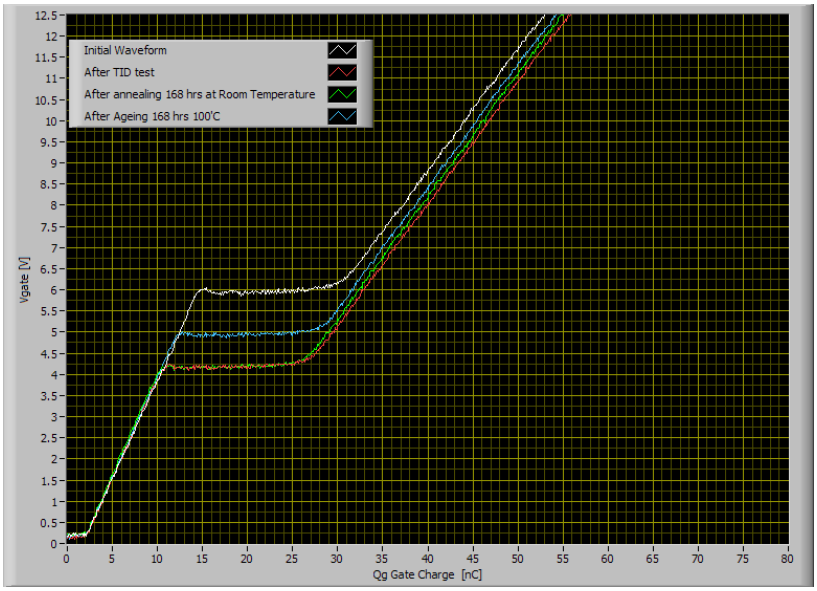


Figure 26

Gate charge waveforms

devices s/n 08 to s/n 12

Bias Conditions:

BC2 V_{GS} = 0V
V_{DS}= +48V

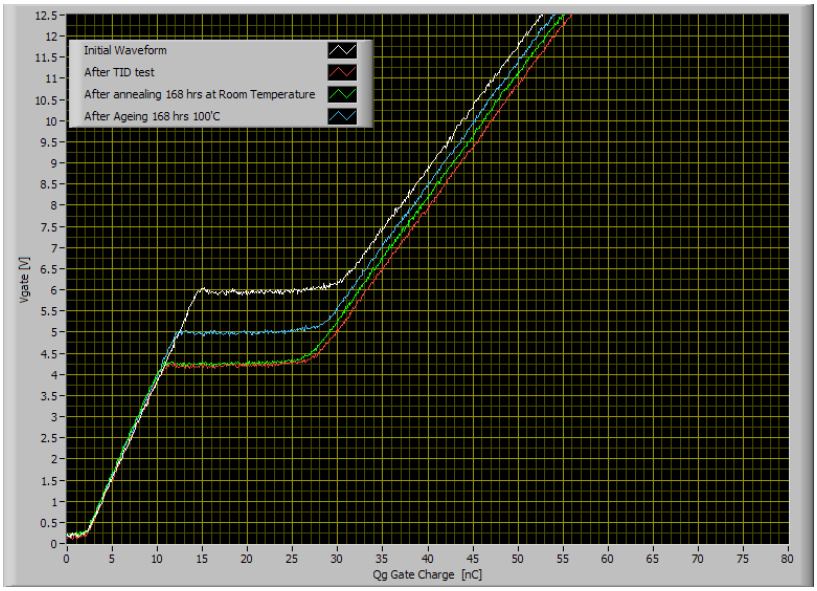


Figure 27

Gate charge waveforms

devices s/n 01 to s/n 05

Bias Conditions:

BC3 V_{GS} =0V
V_{DS}= 0V

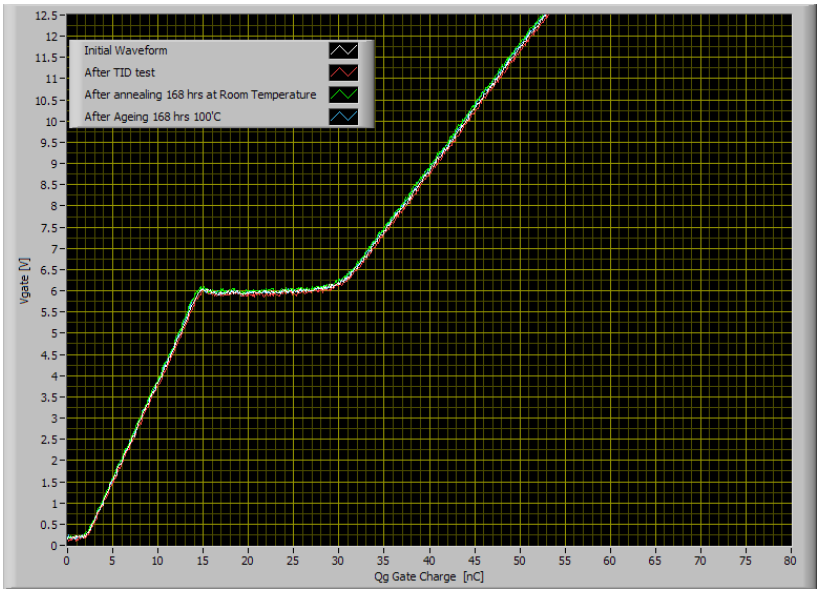


Figure 28

Gate charge waveforms

devices s/n34

Reference device

5 SUMMARY OF RESULTS

No catastrophic failures were observed up to 110.5 krad(Si). The parameter degradations induced by gamma radiation is summarized in Table 25, Table 26 and in Table 27.

Table 25 reports the total doses, recorded before and after the *out of limit* condition, aggregated by the bias condition applied, as described in Table 24:

Table 24 Bias condition descriptions

Bias Condition ID	Description	Irradiated s/n's
BC1	V_{DS} = 0V, V_{GS} = +15V	013, 014, 015, 016, 017
BC2	V_{DS} = +48V, V_{GS} = 0V	008, 009, 010, 011, 012
BC3	V_{DS} = 0V, V_{GS} = 0V	001, 002, 003, 004, 005
BC4	V_{DS} = +60V, V_{GS} = -20V	006, 007
BC5	V_{DS} = 0V, V_{GS} = +12V	018, 019

Table 25 TID levels, in [krad(Si)], before and after out of limit conditions per different BIAS conditions

nr.	Parameter	BC1		BC2		BC3		BC4		BC5	
		pass	*fail*	*pass*	*fail*	*pass*	*fail*	*pass*	*fail*	*pass*	*fail*
(a) 3	IDSS @ Vds 48V, Vgs 0V	70.1	110.5	100.5	-	100.5	-	100.5	-	70.1	110.5
4	IDSS @ Vds 60V, Vgs 0V	70.1	110.5	100.5	-	100.5	-	100.5	-	70.1	110.5
(a) 5	VGS_th @ I_D 0.01 mA	**55.0**	70.1	70.1	110.5	70.1	110.5	100.5	-	**55.0**	70.1
(a) 6	VGS_th @ I_D 0.10 mA	70.1	110.5	100.5	-	100.5	-	100.5	-	70.1	110.5
(a) 7	VGS_th @ I_D 0.25 mA	110.5	**HTB**	100.5	-	100.5	-	100.5	-	70.1	**HTB**
(b) 8	VGS_th @ I_D 1.00 mA	110.5	**HTB**	100.5	-	100.5	-	100.5	-	110.5	**HTB**
(a) 11	V(BR)DSS @I_D=100uA	**55.0**	70.1	100.5	-	100.5	-	100.5	-	**55.0**	70.1
(a) 12	V(BR)DSS @I_D=250uA	70.1	110.5	100.5	-	100.5	-	100.5	-	70.1	110.5
16	Q_G Total Gate Charge	*limits in Manufacturer Test Condition Log HG6F.tst,: not defined*									
17	Q_{GS} Gate – Source Charge										
18	Q_{GD} Gate – Drain Charge										

(a) Parameter not listed in Manufacturer Test Condition Log HG6F.tst, dated 09.09.2009
(b) ***HTB****: High Temperature Bias – failing after ageing at high temperature* ***(rebound)***

Note that Table 25 and Table 26 list only the parameters showing an "out of limit" condition (or not defined limits). Refer to Table 27 for a description of the behaviour of all parameters.

Table 26 Detail of Failures

nr.	Parameter	Bias conditions	Remarks	Table	Fig.
(a) 3	IDSS @ Vds 48V, Vgs 0V	**BC1, BC5**	S/n's 013 to 017 and 018 to 019 pass at 70.1 krad(Si). Failures recovered after 168 hrs H.T. ageing.	8	6
(b) 4	IDSS @ Vds 60V, Vgs 0V	**BC1, BC5**	S/n's 013 to 017 and 018 to 019 pass at 70.1 krad(Si). Failures recovered after 168 hrs H.T. ageing.	9	7
(a) 5	VGS_th @ I_D 0.01 mA	**BC1 , BC5**	S/n's 013 to 017 and 018 to 019 pass at 55.0 krad(Si). Failures recovered after 168 hrs H.T. ageing.	10	8
		BC2, BC3	S/n's 001 to 005 and 008 to 012 pass at 70.1 krad(Si). Failures recovered after 168 hrs H.T. ageing.		

(a) Parameter not listed in Manufacturer Test Condition Log HG6F.tst, dated 09.09.2009

Table 26 Detail of Failures << continued >>

nr.	Parameter	Bias conditions	Remarks	Table	Fig.
(a) 6	VGS_th @ I_D 0.10 mA	**BC1 , BC5**	S/n's 013 to 017 and 018 to 019 pass at 70.1 krad(Si). Failures recovered after 168 hrs R.T. annealing.	11	9
(a) 7	VGS_th @ I_D 0.25 mA	**BC1**	S/n 014 and 016 failed after H.T. ageing. All s/n's show evidence of rebound.	12	10
		BC5	S/n 018 and 019 pass 70.1 krad(Si) S/n 018 and 019 recovered after 168 hrs annealing at R.T. S/n 018 and 019 failed after H.T. ageing (rebound)		
8	VGS_th @ I_D 1.00 mA	**BC1,BC5**	S/n's 013 to 019 failed after H.T. ageing (rebound)	13	11
(a) 11	V(BR)DSS @I_D=100uA	**BC1,**	S/n's 013 and 014 pass at 55.0 krad(Si). S/n's 015 to 017 pass at 70.1 krad(Si). Failures recovered after 168 hrs H.T. ageing.	16	14
		BC5	S/n 018 and 019 pass 55.0 krad(Si) Failures recovered after 168 hrs H.T. ageing.		
(a) 12	V(BR)DSS @I_D=250uA	**BC1, BC5**	S/n's 013 to 017 and 018 to 019 pass at 70.1 krad(Si). Failures recovered after 168 hrs H.T. annealing	17	15

(a) Parameter not listed in Manufacturer Test Condition Log HG6F.tst, dated 09.09.2009

The observations indicate the Gate Threshold Voltage V_{GSTH} @ 0.01mA most affected by the TID degradation with a worst case drift down to – 70% with respect to the initial value.

The Gate Threshold Voltage V_{GSTH} @ 1 mA can still be considered a representative parameter for degradation induced by TID since also exhibs the inversion of degradation trend (rebound effect) after H.T. ageing for the bias conditions BC1 and BC5 (V_{DS}=0V and V_{GS} = +15V V_{GS}=+12V respectively).

In Table 28 and Figure 29 are shown the normalized Gate Threshold Voltage Drift in [%] vs TID and anneal/ageing sequence.

Table 27 Summary of TID test results up to 110.5krad(Si)

nr.	Parameter	Remarks	Worst Case Bias Condition	Table	Fig.
0	IGSS_F1	No evidence of TID dependence. No evidence of Bias condition dependence. All devices still within the limits.	n/a	5	3
1	IGSS_R1	No evidence of TID dependence. No evidence of Bias condition dependence. All devices still within the limits.	n/a	6	4
(a)(d) 2	IDSS @ Vds 5V, Vgs 0V	Weak evidence of TID dependence. Weak evidence of Bias condition dependence. All devices still within the limits.	V_{DS}= 0V V_{GS}= +12/15V	7	5
(a) 3	IDSS @ Vds 48V, Vgs 0V	Evidence of TID dependence. Evidence of Bias condition dependence.	V_{DS}= 0V V_{GS}= +12/15V	8	6
(b)4	IDSS @ Vds 60V, Vgs 0V	Evidence of TID dependence. Evidence of Bias condition dependence.	V_{DS}= 0V V_{GS}= +12V	9	7
(a)(d) 5	VGS_th @ I_D 0.01 mA	Clear TID dependence. Clear Bias condition dependence.	V_{DS}= 0V V_{GS}= +12	10	8
(a)(d) 6	VGS_th @ I_D 0.10 mA	Clear TID dependence. Clear Bias condition dependence.	V_{DS}= 0V V_{GS}= +12	11	9
7	VGS_th @ I_D 0.25 mA	Clear TID dependence. Clear Bias condition dependence.	V_{DS}= 0V V_{GS}= +12	12	10
8	VGS_th @ I_D 1.00 mA	Clear TID dependence. Clear Bias condition dependence.	V_{DS}= 0V V_{GS}= +12	13	11
(a)(d) 9	RDS(on) - D-S On-Resistance	Negligible TID dependence. No evidence of Bias condition dependence.	n/a	14	12
(c) 10	VDS(on) - D-S On-Voltage	Weak evidence of TID dependence. Weak evidence of Bias condition dependence.	V_{DS}= 0V V_{GS}= +12/15V	15	13
(a) 11	V(BR)DSS @I_D=100uA	Evidence of TID dependence. Clear Bias condition dependence.	V_{DS}= 0V V_{GS}= +12/15V	16	14
12	V(BR)DSS @I_D=250uA	Evidence of TID dependence. Clear Bias condition dependence.	V_{DS}= 0V V_{GS}= +12/15V	17	15
13	V(BR)DSS @I_D=1mA	Evidence of TID dependence. Clear Bias condition dependence. All devices still within the limits.	V_{DS}= 0V V_{GS}= +12/15V	18	16
(a) 14	VSD - Inverse Diode Fwd. Volt.	Negligible TID dependence. Negligible Bias condition dependence. All devices still within the limits.	n/a	19	17
(a) 15	ID(on) - On-State Drain Current	Negligible TID dependence. Negligible Bias condition dependence. All devices still within the limits.	n/a	20	18
(a) (d) 16	Q_G Total Gate Charge	Clear Evidence of TID dependence. Clear Evidence of Bias condition dependence.	V_{DS}= 0V V_{GS}= +12/15V	21	19
(a) (d) 17	Q_{GS} Gate – Source Charge	Clear TID dependence. Clear Bias condition dependence.	V_{DS}= 0V V_{GS}= +12/15V	22	20
(a) (d) 18	Q_{GD} Gate – Drain Charge	Clear TID dependence. Clear Bias condition dependence.	V_{DS}= 0V V_{GS}= +12/15V	23	21

(a) Parameter not listed in Manufacturer Test Condition Log HG6F.tst, dated 09.09.2009.
(b) Maximum limit of 10µA instead of 1 mA has been adopted to enhance ATE accuracy for the parameter measurement.
(c) The actual test conditions deviate from Manufacturer Test Condition Log HG6F.tst, dated 09.09.2009 due to test equipment limitation.
(d) Test conditions and Min-Max limits not defined in Manufacturer Test Condition Log HG6F.tst, dated 09.09.2009

Table 28 – V_{GS_th} @ I_{DS} 1.0 mA, Gate Threshold Voltage Drift from initial values [%] vs ^{60}Co Irradiation Total Dose [rad (Si)]

a) Bias Condition BC5 (V_{DS} 0V, V_{GS} +12V), detailed results - V_{GS_th} @ IDS 1.0 mA drift from Initial values in [%]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C
018	0.00%	-6.37%	-12.84%	-18.51%	-22.38%	-32.82%	-39.35%	-50.40%	-49.96%	-49.40%	-41.96%	10.91%
019	0.00%	-6.23%	-12.84%	-18.65%	-22.58%	-33.06%	-39.79%	-51.08%	-50.36%	-49.81%	-42.41%	10.22%
Avg	*0.00%*	*-6.30%*	*-12.84%*	*-18.58%*	*-22.48%*	*-32.94%*	*-39.57%*	*-50.74%*	*-50.16%*	*-49.60%*	*-42.19%*	*10.57%*
St.dev	*0.00%*	*0.10%*	*0.01%*	*0.09%*	*0.14%*	*0.17%*	*0.31%*	*0.48%*	*0.28%*	*0.29%*	*0.31%*	*0.48%*

b) Bias Condition BC1 (V_{DS} 0V, V_{GS} +15V), detailed results - V_{GS_th} @ IDS 1.0 mA drift from Initial values in [%]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C
013	0.00%	-5.51%	-11.30%	-16.58%	-20.07%	-29.40%	-35.31%	-45.48%	-45.09%	-44.31%	-37.13%	12.30%
014	0.00%	-5.50%	-11.33%	-16.73%	-20.17%	-29.49%	-35.30%	-45.16%	-44.99%	-44.49%	-37.09%	11.98%
015	0.00%	-5.54%	-11.44%	-16.82%	-20.16%	-29.51%	-35.49%	-45.31%	-45.30%	-44.60%	-37.20%	11.22%
016	0.00%	-5.60%	-11.31%	-16.50%	-19.85%	-29.15%	-35.12%	-45.02%	-44.84%	-44.26%	-36.59%	12.24%
017	0.00%	-5.59%	-11.54%	-16.97%	-20.17%	-29.56%	-35.49%	-45.21%	-44.79%	-44.58%	-36.71%	11.41%
Min	*0.00%*	*-5.60%*	*-11.54%*	*-16.97%*	*-20.17%*	*-29.56%*	*-35.49%*	*-45.48%*	*-45.30%*	*-44.60%*	*-37.20%*	*11.22%*
Max	*0.00%*	*-5.50%*	*-11.30%*	*-16.50%*	*-19.85%*	*-29.15%*	*-35.12%*	*-45.02%*	*-44.79%*	*-44.26%*	*-36.59%*	*12.30%*
Avg	*0.00%*	*-5.55%*	*-11.38%*	*-16.72%*	*-20.09%*	*-29.42%*	*-35.34%*	*-45.23%*	*-45.00%*	*-44.45%*	*-36.94%*	*11.83%*
St.dev	*0.00%*	*0.04%*	*0.10%*	*0.19%*	*0.14%*	*0.16%*	*0.16%*	*0.17%*	*0.20%*	*0.15%*	*0.27%*	*0.49%*

c) Bias Condition BC2 (V_{DS} +48V, V_{GS} 0V), detailed results - V_{GS_th} @ IDS 1.0 mA drift from Initial values in [%]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C
008	0.00%	-4.28%	-9.38%	-14.45%	-17.92%	-28.43%	-34.22%	-44.21%	-44.37%	-45.06%	-44.77%	-23.44%
009	0.00%	-4.19%	-9.35%	-14.42%	-17.89%	-28.27%	-34.12%	-44.21%	-43.99%	-44.60%	-44.61%	-23.31%
010	0.00%	-4.15%	-9.28%	-14.26%	-17.89%	-28.31%	-34.07%	-44.14%	-44.12%	-44.88%	-44.50%	-23.04%
011	0.00%	-4.23%	-9.38%	-14.40%	-17.83%	-28.47%	-34.38%	-44.54%	-44.73%	-45.27%	-44.90%	-22.77%
012	0.00%	-4.19%	-9.50%	-14.58%	-18.32%	-28.92%	-34.84%	-44.63%	-44.82%	-45.46%	-45.08%	-23.58%
Min	*0.00%*	*-4.28%*	*-9.50%*	*-14.58%*	*-18.32%*	*-28.92%*	*-34.84%*	*-44.63%*	*-44.82%*	*-45.46%*	*-45.08%*	*-23.58%*
Max	*0.00%*	*-4.15%*	*-9.28%*	*-14.26%*	*-17.83%*	*-28.27%*	*-34.07%*	*-44.14%*	*-43.99%*	*-44.60%*	*-44.50%*	*-22.77%*
Avg	*0.00%*	*-4.21%*	*-9.38%*	*-14.42%*	*-17.97%*	*-28.48%*	*-34.32%*	*-44.35%*	*-44.41%*	*-45.06%*	*-44.77%*	*-23.23%*
St.dev	*0.00%*	*0.05%*	*0.08%*	*0.12%*	*0.20%*	*0.26%*	*0.31%*	*0.22%*	*0.36%*	*0.33%*	*0.23%*	*0.33%*

Table 28 – V_{GS_th} @ I_{DS} 1.0 mA, Gate Threshold Voltage Drift from initial values [%] vs ^{60}Co Irradiation Total Dose [rad (Si)] –< Continued >–

d) Bias Condition BC3 (V_{DS} 0V, V_{GS} 0V), detailed results - V_{GS_th} @ IDS 1.0 mA drift from Initial values in [%]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C
001	0.00%	-4.28%	-9.73%	-14.78%	-18.32%	-28.94%	-34.49%	-44.34%	-43.84%	-44.51%	-43.84%	-23.14%
002	0.00%	-4.27%	-9.27%	-14.40%	-17.88%	-28.15%	-33.88%	-43.46%	-42.89%	-43.84%	-43.01%	-22.27%
003	0.00%	-4.29%	-9.47%	-14.45%	-17.82%	-28.32%	-34.05%	-44.10%	-43.48%	-44.31%	-43.66%	-22.41%
004	0.00%	-4.20%	-9.29%	-14.43%	-18.04%	-28.01%	-33.80%	-43.66%	-43.18%	-43.98%	-43.33%	-22.36%
005	0.00%	-4.27%	-9.27%	-14.29%	-17.90%	-28.10%	-33.70%	-43.59%	-42.99%	-43.84%	-43.16%	-22.49%
Min	*0.00%*	*-4.29%*	*-9.73%*	*-14.78%*	*-18.32%*	*-28.94%*	*-34.49%*	*-44.34%*	*-43.84%*	*-44.51%*	*-43.84%*	*-23.14%*
Max	*0.00%*	*-4.20%*	*-9.27%*	*-14.29%*	*-17.82%*	*-28.01%*	*-33.70%*	*-43.46%*	*-42.89%*	*-43.84%*	*-43.01%*	*-22.27%*
Avg	*0.00%*	*-4.26%*	*-9.41%*	*-14.47%*	*-17.99%*	*-28.31%*	*-33.98%*	*-43.83%*	*-43.28%*	*-44.10%*	*-43.40%*	*-22.54%*
St.dev	*0.00%*	*0.04%*	*0.20%*	*0.19%*	*0.20%*	*0.37%*	*0.31%*	*0.38%*	*0.39%*	*0.30%*	*0.35%*	*0.35%*

e) Bias Condition BC4 (V_{DS} +60V, V_{GS} -20V), detailed results - V_{GS_th} @ IDS 1.0 mA drift from Initial values in [%]

s/n	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C
006	0.00%	-1.71%	-4.14%	-7.10%	-9.01%	-15.21%	-19.14%	-27.70%	-27.79%	-28.28%	-25.98%	-16.25%
007	0.00%	-2.01%	-4.46%	-7.40%	-9.36%	-15.55%	-19.69%	-28.43%	-28.52%	-29.09%	-26.86%	-16.73%
Avg	*0.00%*	*-1.86%*	*-4.30%*	*-7.25%*	*-9.18%*	*-15.38%*	*-19.41%*	*-28.07%*	*-28.16%*	*-28.69%*	*-26.42%*	*-16.49%*
St.dev	*0.00%*	*0.22%*	*0.23%*	*0.22%*	*0.25%*	*0.24%*	*0.39%*	*0.52%*	*0.52%*	*0.58%*	*0.62%*	*0.34%*

f) Reference device: V_{GS_th} @ IDS 1.0 mA drift from Initial values in [%]

	0	6'197	15'000	22'500	30'062	55'000	70'067	110'500	Annealing 6hrs RT	Annealing 21hrs RT	Annealing 139hrs RT	Ageing 168hrs 100'C
034	*0.00%*	*0.21%*	*0.73%*	*-0.18%*	*0.21%*	*0.33%*	*-0.26%*	*0.38%*	*0.53%*	*0.03%*	*0.65%*	*0.44%*

VGS_th @ IDS 1.0 mA, Gate Threshold Voltage Drift from initial values [%] vs 60Co Irradiation Total Dose [rad (Si)]

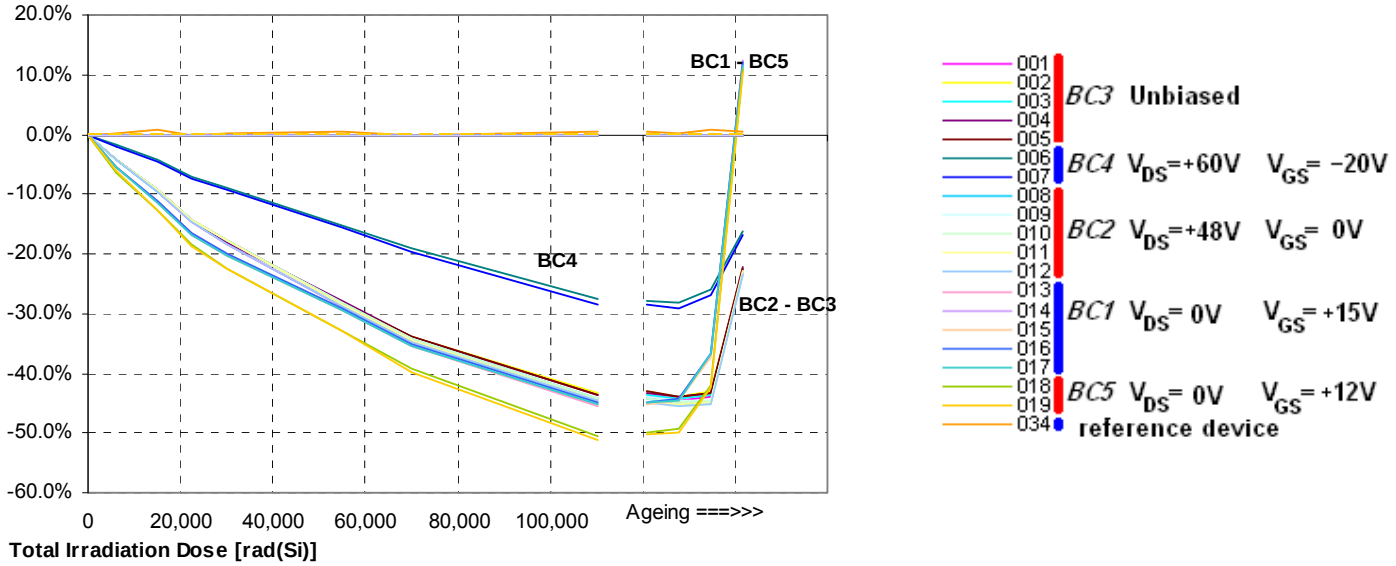


Figure 29

6 CONCLUSION

According to test results the conclusion of radiation test on STRH100N6SY3 are summarized as in the following:

- The electrical parameters to be entered in the “Electrical Measurements for Total Dose Radiation Testing” section of the Detail Specification shall at least include:
  - V_{GSth} Gate Treshold Voltage
  - I_{DSS} Drain Current in Off State
  - $V_{BR(DSS)}$ VDS Breakdown Voltage
  - I_{GSS} Gate Leakage Current

- The bias conditions specified for TID testing shall include the following condition:
  - V_{DS}=0V, V_{GS} ≥ 12V (rated voltage for V_{DSON}).

- Radiation Test Plan for Lot acceptance Test shall include:
  - Low Dose Rate requirement (Window 2 per ESCC 22900)
  - Irradiation according to mission requirement with a minimum of 50Krad(Si).
  - Annealing at R.T. for 168hrs with intermediate electrical measurements after 24hrs.
  - Ageing at 85°C for 168 hrs minimum, with intermediate electrical measurements after 24hrs.
  - Bias condition shall be maintained during the entire test (including annealing/ageing) with duration of the interruption for electrical measurements kept as short as possible (<1hrs).