

Infineon technologies HiRel Discrete & MW Semiconductors	ESCC Comp. No.: 520503302R	Page: 1
	Wafer Lot: VE840444	Rep.No.: BUY65SR18 Issue: Iss. 1, Dec 2021
	Single Event Effect Test Report BUY65CS family	

§1 COVER SHEET

• Component and Test Identification

Comp. Type	BUY65CS28A-01(ES)
ESCC Comp. No.	520503302R
Lot Ident.	Wafer Lot No. VE840444
	Radiation Testing Level R: 100kRad
Test data	Test Plan TPIFX1522A
	Tested Sample Serial No.s 173-175
	Control Sample Serial No.s R176-R178

• Applicability of Test Results

Comp. Types	BUY65CS08J-01(ES) BUY65CS28A-01(ES)
ESCC Comp. Nos.	520503301R 520503302R

• Applicable Documents

Detail Specification	ESCC 5205/033 Issue 1, May 2020
Generic Specification	ESCC 5000 Issue 8, Jun. 2019
Process Identification Document	A63500-L5491-P000_Detail_PID_BUY25CS_9a
Irradiation Specification	ESCC Basic Specification No. 25100 Iss. 2, Oct 2014

• Manufacturer / Facility


Silicon Die	Infineon Technologies Austria AG Siemensstrasse 2, 9500 Villach, Austria
Assembly & Testing	Infineon Technologies AG Am Campeon 1-15, D 85579 Neubiberg, Germany

• Report Issue, Date / Manufacturers Signatures

Iss. 1, Dec 2021

Total Number of Pages: 7

Process	Department	Name	Signatures
Chip Assembly	PSS RFS D HIR	M. Hildebrandt	
Test Management	PSS RFS D HIR	D. Schwertberger	
Project Management	PSS RFS D HIR	Dr. T. Chirila	
HiRel Management	PSS RFS D HIR	Dr. B. Eisener	

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§2 DOCUMENT INFORMATION

§2.1 CHANGE DESCRIPTION SHEET

Issue	Page	Para	Description
1	All	All	Initial Issue

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§3 SCOPE AND TEST INFORMATION

This Test Report describes Single Event Effects (SEE) tests and results of radiation-hardened power MOSFETs from Infineon Technologies, types BUY65CS28A-01(ES). This test report applies to all BUY65CS power MOSFET family.

Test campaign SEE 3 has been performed at the facility CYCLONE in Louvain-la-Neuve, Belgium on the 3-5.12.2018.

Read and record data from the electrical measurements of the tested and control samples is given in §7.5 of this report.

§4 HEAVY ION IRRADIATION FACILITY

CYCLONE at UCL Louvain-la-Neuve is a cyclotron capable of providing a “cocktail” of heavy ions with about the same M/Q ratio. From a HIF cocktail ^{124}Xe (35+ charge state) are selected with an energy of 995 MeV yielding in silicon an LET = 62.5 MeVcm²/mg and a stopping range of 73.1 µm (which is more than the depth of the active area <50 µm).

The test boards are mounted within a vacuum chamber with feedthroughs for electrical bias and signals. The ion beam is positioned on the device under test.

The homogeneity is ± 10 % on a 25 mm diameter. Control of beam homogeneity and dosimetry as well as beam operation is the responsibility of ion beam provider.

§5 DEVICES MARKINGS AND SAMPLE PREPARATION

In order to contact devices with the test sockets on bias boards, chips have been soldered with AuZn solder material and bonded with 125µm Al wires to respective 3-pin PCB-TO-adaptor boards to connect Gate/Drain/Source contacts of the MOSFETs.

Devices' numbers are written on the PCB with a permanent marker. The number correlates in the sample list to the lot and wafer number.

§6 TEST SETUP

The test board was designed to accommodate up to 10 test samples, each consisting of an individual bias circuit (fig. 1). This test board (fig. 2) was fixed to the mechanical positioning stage provided at the Louvain/GANIL beam line. All voltages UDS and UGS were provided via a flat band cable from a switch board.

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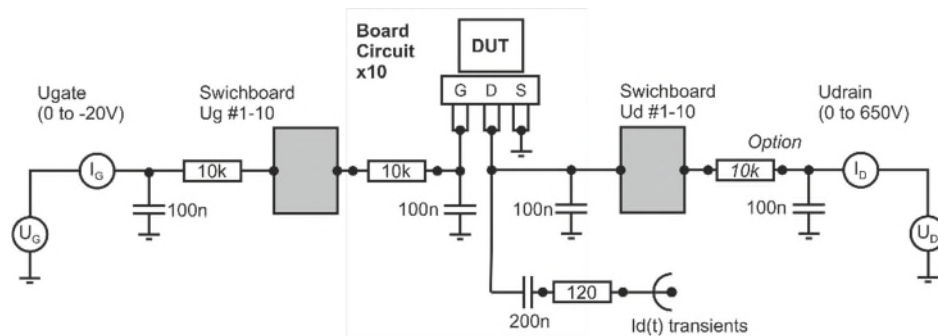


Fig. 1 Bias circuit for SEE tests

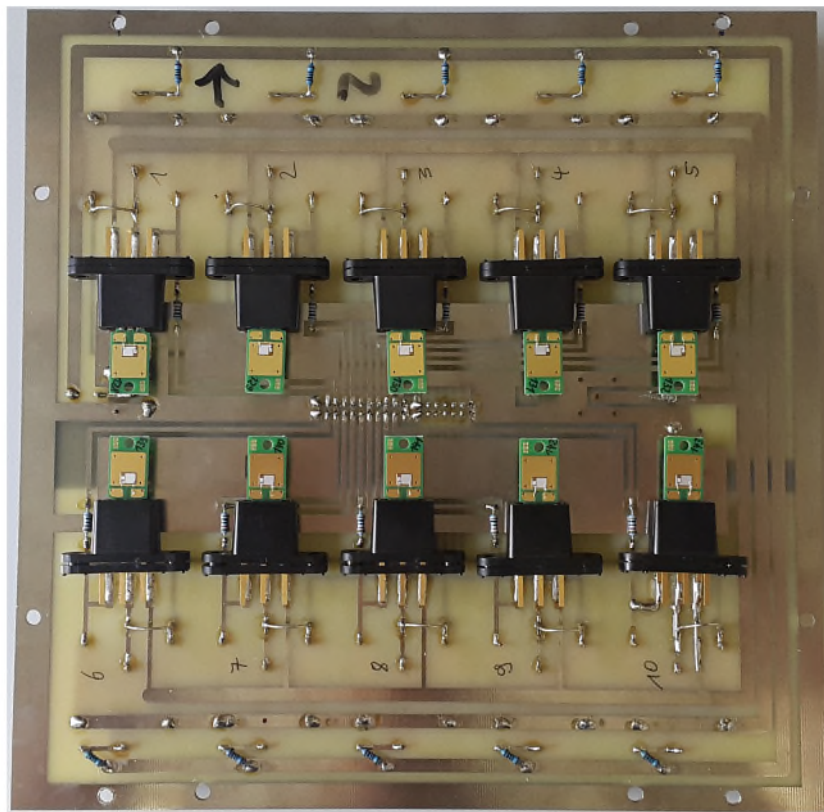


Fig. 2: Test-Board with 10 positions with TO test sockets. Separate bias of UDS and UGS for each device. Flat-band connector on back side.

As a voltage source for UDS and for ID current measurements a Keithley 237 High Voltage Measurement Unit has been employed. Gate voltage UGS and measurement of IG are provided by a Keithley 236 Source Measure Unit.

Voltages were set via computer software as were all recordings of run number, time, and sample number. All current readings, specifically PIGS currents, are logged.

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§7 IRRADIATION TEST SEQUENCE

§7.1 BEAM PARAMETERS AND TEST CRITERIA FOR ALL TESTS

- Ion Type $^{124}\text{Xe}^{35+}$
- LET 62.5 MeVcm²/mg
- Flux 3E+3 ions/cm²/s
- Fluence 3E+5 ions/cm²
- Normal incidence of ion beam
- Destructive mode. FAIL current criteria: IDS>2 µA or IGS>100 nA.
- Required number of test samples per test case: 1(for FAIL)/3(for PASS)
- Post Irradiation Gate Stress (PIGS) test at any UDS (at respective UDS, UGS down to -25V, in steps of -5V). FAIL criteria: either IDS or IGS>100nA

§7.2 TEST BIAS SEQUENCE FOR SEB-SOA

UGS: 0 V

UDS: Start at nominal maximum rated UDS. If *FAIL* occurs UDS is stepped-down by 10V until *PASS*.

§7.3 TEST BIAS SEQUENCE FOR SEGR-SOA

UGS: negative, starting at -5 V, steps of -5 V.

UDS: Start at maximum UDS at which *PASS* value was obtained for previous UGS-test sequence (or UGS=0V). If *FAIL* occurs UDS is stepped-down by 10V until *PASS*.

§7.4 DETAILS OF TEST RUNS

Date/Time	Test Run No.	Board Position	Sample No.	Flux [1/cm ² /s]	Fluence [1/cm ²]	Acc. Dose [krad]	UDS [V]	UGS [V]	PIGS pass/fail	Remarks
05.12.2018 02:45	57	2	173	3000	3.00E+05	0.3	650	0	pass	
05.12.2018 02:48	58							-15	pass	
05.12.2018 02:51	59							-20	pass	
05.12.2018 02:55	60	3	174	3000	3.00E+05	0.3	650	0	pass	
05.12.2018 02:57	61							-15	pass	
05.12.2018 03:00	62							-20	pass	
05.12.2018 03:03	63	4	175	3000	3.00E+05	0.3	650	0	pass	
05.12.2018 03:05	64							-15	pass	
05.12.2018 03:08	65							-20	pass	

§7.5 READ AND RECORD DATA OF ELECTRICAL MEASUREMENTS

This documentation contains the data from all tested parts and control samples.

Due to the mounting process for these tests and very high currents VSD (80A) absolute values are higher than specified in the Detail Specification – see also control samples and initial measurements.

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§7.5.1 INITIAL MEASUREMENTS

S/N	V(BR)DSS [V]	VGS(th) [V]	IGSS [nA]	IGSS- [nA]	IDSS [uA]	RDS(ON) [mOhm]	VSD [V]	Remarks
min	650	2						
max		4	100	100	25	150	1.2	
173	719	3.25	0.4	0.9	0.004	134	1.239	
174	720	3.25	0.5	0.9	0.004	138	1.350	
175	721	3.25	0.6	0.9	0.004	131	1.099	
R176	723	3.22	0.6	0.9	0.004	130	1.072	
R177	733	3.26	0.6	0.9	0.004	129	1.065	
R178	733	3.30	0.6	0.9	0.004	141	1.486	

§7.5.2 ELECTRICAL MEASUREMENTS AFTER IRRADIATION

S/N	V(BR)DSS [V]	VGS(th) [V]	IGSS [nA]	IGSS- [nA]	IDSS [uA]	RDS(ON) [mOhm]	VSD [V]	Remarks.
min	650	2						
max		4	100	100	25	150	1.2	
173	719	3.25	0.6	1.1	0.019	132	1.189	
174	718	3.22	0.7	1.1	0.016	134	1.232	
175	719	3.21	0.6	1.1	0.017	128	1.094	
R176	721	3.22	0.6	1.1	0.004	128	1.071	
R177	732	3.25	0.6	1.1	0.004	127	1.066	
R178	731	3.29	0.7	1.1	0.004	136	1.301	

§8 GRAPHICAL SEE-SOA

