

PRODUCT / PROCESS CHANGE NOTIFICATION

1. PCN basic data

1.1 Company		STMicroelectronics International N.V
1.2 PCN No.		ADG/21/13194
1.3 Title of PCN		TO247 SiC MOS frame swap
1.4 Product Category		SiC
1.5 Issue date		2021-12-20

2. PCN Team

2.1 Contact supplier	
2.1.1 Name	ROBERTSON HEATHER
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2.1.3 Email	heather.robertson@st.com
2.2 Change responsibility	
2.2.1 Product Manager	Maurizio Maria FERRARA
2.2.2 Marketing Manager	Michele MACAUDA
2.2.3 Quality Manager	Vincenzo MILITANO

3. Change

3.1 Category	3.2 Type of change	3.3 Manufacturing Location
Materials	New direct material part number (same supplier, different supplier or new supplier), Lead frame base material	Shenzhen

4. Description of change

	Old	New
4.1 Description	TO247 1.27mm and 2.0mm frame	2.0mm frame with larger screw hole insulation resin circle
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	no impacts	

5. Reason / motivation for change

5.1 Motivation	larger circular resin around the screw hole backside
5.2 Customer Benefit	QUALITY IMPROVEMENT

6. Marking of parts / traceability of change

6.1 Description	by Q.A. number
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7. Timing / schedule

7.1 Date of qualification results	2021-12-20
7.2 Intended start of delivery	2022-03-20
7.3 Qualification sample available?	Upon Request

8. Qualification / Validation

8.1 Description	13194 Acrobat Document.pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2021-12-20

9. Attachments (additional documentations)

10. Affected parts		
10. 1 Current		10.2 New (if applicable)
10.1.1 Customer Part No	10.1.2 Supplier Part No	10.1.2 Supplier Part No
	SCT10N120	
	SCT20N120	
	SCT30N120	
	SCT50N120	
	SCTW35N65G2V	
	SCTW40N120G2V	
	SCTW70N120G2V	
	SCTW90N65G2V	

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Reliability Evaluation Report

SiC Gen1 and Gen2 Technology – Package HiP247

Shenzhen (China)

New frame qualification

general Information	
Commercial Product used as test vehicle for change evaluation	SCTW40N120G2VAG
Product Line used as test vehicle for change evaluation	SQK9
Silicon process Technology	SiC MOSFET GEN2
Package	HiP247

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Revision history

Rev.	Changes description	Author	Date
1.0	New release	V. Giuffrida	March 24 th , 2021

Approved by

Function	Location	Name	Date
Division Reliability Manager	ST Catania (Italy)	A. Marmoni	March 24 th , 2021

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1. Reliability Evaluation Overview

1.1. Objective

Aim of this report is to present the reliability evaluations performed in order to qualify new 2mm frame with enlarged circular backside hole to improve the backside insulation performance on Hip247 ST Shenzhen package in combination with SiC GEN1 and GEN2 Technology products diffused in CT6 Catania (Italy) 6" Wafer Fab.

The test vehicle used for this evaluation is SCTW40N120G2VAG (SQK9 as ST internal silicon line) This product is an Automotive Power MOSFET designed in SiC MOSFET Technology Gen2, diffused in CT6 Catania (Italy) 6" Wafer Fab, assembled in Hip247 package in ST Shenzhen (China). Considering that there is no difference in terms of front side and back side die features between Gen1 and Gen2 products the chosen test vehicle is representative both for Gen1 and Gen2 families.

1.2. Reliability Strategy and Test Plan

1.2.1. Reliability strategy

The SCTW40N120G2VAG was fully AEC-Q101 qualified in 2020.

A delta qualification to specifically address failure mechanism linked with change was performed on 1 lot. Reliability trials performed are in agreement with **ST 0061692** and **AEC-Q101 Rev.D1** specification and are listed in below Test Plan.

1.2.2. Test Plan

AEC-Q101 Test Plan Table

#	Data Type	TEST NAME	DESCRIPTION / COMMENTS	TEST FLAG
1	1	TEST	Pre- and Post- Stress Electrical Test	Yes
2	1	PC	Preconditioning	No
3	1	EV	Eternal Visual	Yes
4	1	PV	Parametric Verification	No
5	1	HTRB	High Temperature Reverse Bias	No
6	1	HTGB	High Temperature Gate Bias	No
7	1	TC	Temperature Cycling	Yes
7a	1	TCHT	Temperature Cycling Hot Test	Yes
7a alt	1	TCDT	Temperature Cycling Delamination Test	Yes
8	1	UHAST	Unbiased Highly Accelerated Stress Test	No
8 alt	1	AC	Autoclave	No
9	1	HAST	Highly Accelerated Stress Test	No
9 alt	1	H3TRB	High Humidity High Temp. Reverse Bias	No
9a	1	HTHBB	High Temperature High Humidity Bias	No
10	1	IOL	Intermittent Operational Life	No
10alt	1	PTC	Power Temperature Cycling	No
11	1	ESD	ESD Characterization	No
12	1	DPA	Destructive Physical Analysis	Yes
13	2	PD	Physical Dimension	Yes
14	2	TS	Terminal Strength	No
15	2	RTS	Resistance to Solvents	Not Applicable
16	2	CA	Constant Acceleration	Not Applicable
17	2	VVF	Vibration Variable Frequency	Not Applicable
18	2	MS	Mechanical Shock	Not Applicable
19	2	HER	Hermeticity	Not Applicable
20	2	RSH	Resistance to Soder Heat	No
21	2	SD	Solderability	No
22	3	TR	Thermal Resistance	Yes
23	3	WBS	Wire Bond Strength	No
24	3	BS	Bond Shear	No
25	3	DS	Die Shear	No
26	3	UIS	Unclamped Inductive Switching	Not Applicable
27	3	DI	Dielectric Integrity	No
28	3	SCR	Short Circuit Reliability Characterization	Not Applicable
29	3	LF	Lead Free	Not Applicable

1.3. Conclusion

All reliability tests have been completed with positive results. Neither functional nor parametric rejects were detected at final electrical testing.

Based on the overall results obtained, the new frame with enlarged circular backside hole on Hip247 ST Shenzhen package in combination with SiC GEN1 and GEN2 Technology diffused in CT6 Catania (Italy) 6" Wafer Fab, has positively passed reliability evaluation performed in agreement with ST 0061692 and **AEC-Q101 Rev.D1** specification.

2. Product Characteristics

2.1. Traceability

2.1.1. Wafer Fab information

Wafer fab name / location	CTWF 6" (Catania - Italy)
Wafer diameter (inches)	6"
Silicon process technology	SiC MOSFET Gen2
Die finishing front side	Polymide
Die finishing back side	Ti-Ni-Au
Die size (micron)	2930 x 2930
Metal levels/ materials/ thicknesses	1 / AlSiCu /4.5um

2.1.2. Assembly information

Assembly plant name / location	ST SHENZHEN (China)
Package description	Hip247
Lead frame/Substrate	FRAME TO247 3L
Die attach material	Preform Pb/Ag/Sn 95.5/2.5/2
Wire bonding material/diameter	WIRE Al 5 and 7 MILS
Molding compound material	KEG-300S-1
Package Moisture Sensitivity Level (JEDEC J-STD020D)	Not applicable

2.1.3. Reliability Testing information

Reliability laboratory location	STM Catania (Italy)
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3. Tests Results Summary

3.1. Lot Information

Lot #	Commercial Product	Product Line	Tracecode/assy lot
Lot1	SCTW40N120G2VAG	SQK9	GK9460GT

3.2. Test results summary (table)

Test method revision reference is the one active at the date of reliability trial execution.

Test	#	Reference	AEC-Q101 (Data Type 1) STM Test Conditions	Lots	S.S.	Total	Results FAIL/SS/Lots	Comments
TEST	1		User specification or supplier's standard specification	1	77	77	0/77/1	All qualification parts
PC	2	-	-	-	-	-	-	Not applicable
EV	3	JESD22B-101I	All qualification parts submitted for testing	1	77	77	0/77/1	All qualification parts
PV	4	-	All parameters according to user specification at room, hot and cold temperature	-	-	-	-	Not applicable
HTRB	5	MIL-STD-750-1 M1038 Method A	-	-	-	-	-	Not applicable
HTGB1	6	JESD22 A-108	-	-	-	-	-	Not applicable
HTGB2			-	-	-	-	-	Not applicable
TC	7	JESD22A-104	Ta=-55°C /+150°C Duration= 1000cy	1	77	77	0/77/1	
TCHT	7a	JESD22 A-104 Appendix 6	125°C TEST after TC	1	77	77	0/77/1	
TCDT	7a alt	JESD22 A-104 Appendix 6 J-STD-035	100% C-SAM inspection after TC	1	77	77	0/77/1	
AC	8	JESD22 A-102	Ta=121°C, Pa=2atm for 96 hours	-	-	-	-	Not applicable
H3TRB	9	JESD22A-101	1000h @ Ta=85°C, RH=85% Vds=100V	-	-	-	-	Not applicable
IOL	10	MIL-STD-750 Method 1037	15Kcy @ Ta=25°C with parts powered to insure $\Delta T_j \geq 100^\circ\text{C}$ (not to exceed absolute maximum ratings).	-	-	-	-	Not applicable
ESD	11	AEC-Q101-001 and AEC-Q101-005	HBM / CDM	-	-	-	-	Not applicable
DPA	12	AEC-Q101-004 section 4	Devices after TC	1	2	2	Passed	

Test	#	Reference	AEC-Q101 (Data Type 2) STM Test Conditions	Lots	S.S.	Total	Results FAIL/SS/Lots	Comments
PD	13	JESD22 B-100	Physical Dimension	1	30	30	Passed	
TS	14	MIL-STD-750 Method 2036	Terminal Strength	-	-	-		
RTS	15	Not applicable		-	-	-		
CA	16			-	-	-		
VVF	17			-	-	-		
MS	18			-	-	-		
HER	19			-	-	-		
RSH	20	JESD22 B-106	Resistance to solder heat	-	-	-		
SD	21	JESD22 B-102	Solderability	-	-	-		

Test	#	Reference	AEC-Q101 (Data Type 3) STM Test Conditions	Lots	S.S.	Total	Results FAIL/SS/Lots	Comments
TR	22	JESD24-3	-	1	10	10	Done	
WBS	23	MIL-STD-750 Method 2037	-	-	-	-		
BS	24	AEC-Q101-003	-	-	-	-		
DS	25	MIL-STD-750 Method 2017	-	-	-	-		
UIS	26	Not Applicable		-	-	-		
DI	27	AEC-Q101-004 Section 3	-	-	-	-		
SCR	28	-	-	-	-	-		
LF	29	-	-	-	-	-		

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PCN Title : TO247 SiC MOS frame swap

PCN Reference : ADG/21/13194

Subject : Public Products List

Dear Customer,

Please find below the Standard Public Products List impacted by the change.

SCTW40N120G2V	SCT20N120	SCTW90N65G2V
SCT30N120	SCTW35N65G2V	SCTW70N120G2V
SCT50N120	SCT10N120	



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