PRODUCT / PROCESS CHANGE NOTIFICATION

1. PCN basic data	
1.1 Company	STMicroelectronics International N.V
1.2 PCN No.	ADG/23/14217
1.3 Title of PCN	Molding compound replacement for DO-247 & TO-247 for SiC 1200V rectifiers and STPS61H1000CWY in ST Shenzhen (China) plant
1.4 Product Category	STPS61H100CWY STPSC20H12WY STPSC31H12CWY STPSC40H12CWY
1.5 Issue date	2023-07-14

2. PCN Team	
2.1 Contact supplier	
2.1.1 Name	ROBERTSON HEATHER
2.1.2 Phone	+1 8475853058
2.1.3 Email	heather.robertson@st.com
2.2 Change responsibility	
2.2.1 Product Manager	Stephane CHAMARD
2.1.2 Marketing Manager	Philippe LEGER
2.1.3 Quality Manager	Jean-Paul REBRASSE

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), Mold compound	ST Shenzhen (China)

4. Description of change		
	Old	New
4.1 Description	Resin supply by Kyocera Singapore	New resin
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	No	

5. Reason / motivation for change	
5.1 Motivation	Molding compound discontinuation from current resin supplier
5.2 Customer Benefit	SERVICE CONTINUITY

6. Marking of parts / traceability of change	
6.1 Description	Traceability of the change will be ensured by Finished Good/Type print on carton labels.

7. Timing / schedule	
7.1 Date of qualification results	2023-12-01
7.2 Intended start of delivery	2024-01-31
7.3 Qualification sample available?	Upon Request

8. Qualification / Validation			
8.1 Description	14217 23020QRP Rev1.pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2023-07-14

9. Attachments (additional documentations)
14217 Public product.pdf 14217 PCN Resin replacement DO247 TO247 STS.pdf 14217 23020QRP Rev1.pdf

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
	STPSC20H12CWY	
	STPSC40H12CWY	

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Qualification Report

Qualification of molding compound replacement for DO247 & TO247 for SiC 1200V rectifiers and STPS61H1000CWY at ST SHENZHEN - CHINA

General Information	
Product Line	*Rectifiers*
Product Description	*1000V and 1200V power Schottky silicon carbide diode*
Product Perimeter	*STPSC20H12WY* *STPSC31H12CWY* *STPSC40H12CWY* *STPSC61H100CWY*
Product Group	*ADG*
Product Division	*Discrete & Filter*
Packages	*DO247* *TO247*
Maturity level step	*MAT 20*

Locations	
Wafer Fab	*ST CATANIA – ITALY* *ST ANG MO KIO - SINGAPORE*
Assembly Plant	*ST SHENZHEN - CHINA*
Reliability Lab	*ST TOURS – FRANCE* *Solderability test done at ST SHENZHEN -CHINA*
Reliability Assessment	*On going*

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comments
1.0	June 11, 2023	10	Henri VIVANT		Qualification of molding compound replacement for DO247 & TO247 for SiC 1200V rectifiers and STPSC61H1000CWY at ST SHENZHEN - CHINA.

TABLE OF CONTENTS

1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
JESD 47	Stress-Test-Driven Qualification of Integrated Circuits
JESD 94	Application specific qualification using knowledge based test methodology
JESD 22	Reliability test methods for packaged devices
MIL-STD-750C	Test method for semiconductor devices

2 GLOSSARY

EV	External Visual
GD	Generic Data
H3TRB	High Humidity High Temperature Reverse Bias
HTRB	High Temperature Reverse Bias
IOLT	Intermittent Operating Life Test
PD	Physical Dimensions
RSH	Resistance to Soldering Heat
SD	Solderability test
SS	Sample Size
TC	Temperature Cycling
UHAST	Unbiased Highly Accelerated Stress Test

3 RELIABILITY EVALUATION OVERVIEW

3.1 Objectives

The objective of this report is to qualify the molding replacement for DO247 & TO247 for SiC 1200V rectifiers and STPSC61H1000CWY at ST SHENZHEN - CHINA.

Product	Description	Package	Assembly Location
STPSC20H12CWY	1200V power Schottky silicon carbide diode	DO-247	ST SHENZHEN - CHINA
STPSC31H12CWY	1200V power Schottky silicon carbide diode	TO-247	
STPSC40H12CWY	1200V power Schottky silicon carbide diode		
STPSC61H100CWY	1000V power Schottky silicon carbide diode		

The reliability test methodology used follows the JESD47: « Stress Test driven Qualification Methodology.

The reliability tests ensuing are:

.

- TC and IOLT to ensure the mechanical robustness of the products.
- HTRB to evaluate the risk of contamination from the resin and the assembly process versus the die layout sensitivity.
- H3TRB, UHAST to check the robustness to corrosion and the good package hermeticity.
- RSH, Solderability to check compatibility of package with customer assembly.

For some tests, similarity methodology is used. See 5.1 “comments” for more details about similarities.

3.2 Conclusion

Qualification Plan Ongoing.

4 DEVICE CHARACTERISTICS

4.1 Device description

Refer to product datasheet(s).

4.2 Construction Note

	STPSC20H12WY
Wafer/Die fab. information	
Wafer fab manufacturing location	ST CATANIA – ITALY
Technology / Process family	1200V power Schottky silicon carbide diode
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST CATANIA – ITALY
Assembly information	
Assembly site	ST SHENZHEN - CHINA
Package description	DO-247
Final testing information	
Testing location	ST SHENZHEN - CHINA

	STPSC31H12CWY
Wafer/Die fab. information	
Wafer fab manufacturing location	ST CATANIA – ITALY
Technology / Process family	1200V power Schottky silicon carbide diode
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST CATANIA – ITALY
Assembly information	
Assembly site	ST SHENZHEN - CHINA
Package description	TO-247
Final testing information	
Testing location	ST SHENZHEN - CHINA

	STPSC40H12CWY
Wafer/Die fab. information	
Wafer fab manufacturing location	ST CATANIA – ITALY
Technology / Process family	1200V (2x20A) power Schottky silicon carbide diode
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST CATANIA – ITALY
Assembly information	
Assembly site	ST SHENZHEN - CHINA
Package description	TO-247
Final testing information	
Testing location	ST SHENZHEN - CHINA

	STPSC61H100CWY
Wafer/Die fab. information	
Wafer fab manufacturing location	ST ANG MO KIO– SINGAPORE
Technology / Process family	1000V power Schottky silicon carbide diode
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST ANG MO KIO– SINGAPORE
Assembly information	
Assembly site	ST SHENZHEN - CHINA
Package description	TO-247
Final testing information	
Testing location	ST SHENZHEN - CHINA

5 TESTS PLAN AND RESULTS SUMMARY

5.1 Test vehicles

Lot #	Part Number	Package	Comments
L1	STPSC61H100CWY	TO-247	1st Qualification lot
L2	STPSC20H12CWY	DO-247	2nd Qualification lot
L3	STPSC30H12CWY	TO-247	3rd Qualification lot

Detailed results in below chapter will refer to these references.

5.2 Test plan

Stress	Abrv	Reference	Lot	SS	Comments	Test plan
Pre and Post-Stress Electrical Test	TEST	User specification or supplier's standard Specification	All qualification parts tested per the requirements of the appropriate device specification.			-
Pre-conditioning	PC	J-STD-020 JESD22-A113	All qualification parts tested per the requirements of the appropriate device specification.		As per targeted MSL Not applicable for PTH and WLCSP without coating	-
MSL research	MSL	J-STD-020	-	-	Not applicable for PTH and WLCSP without coating	-
External Visual	EV	JESD22B-101	All qualification parts tested per the requirements of the appropriate device specification.		Done during Assembly → Test & Finish inspection	X
Parametric Verification	PV	User specification	-	-		-
High Temperature Reverse Bias	HTRB	MIL-STD-750-1 M1038 Method A (for diodes, rectifiers and Zeners) M1039 Method A (for transistors)	L1, L2, L3	231 (3*77)	WBI after HTRB applicable only for dissimilar metal (wire/meta) in case of no Cu wire	X
AC blocking voltage	ACBV	MIL-STD-750-1 M1040 Test condition A	-	-	Required for Thyristor only. Alternative to HTRB	-

Stress	Abrv	Reference	Lot	SS	Comments	Test plan
High Temperature Forward Bias	HTFB	JESD22 A-108	-	-	Not required, applicable only to LEDS Alternative to HTRB	-
High Temperature Operating Life	HTOL		-	-	Covered by HTRB or ACBV	-
Steady State Operational	SSOP	MIL-STD-750-1 M1038 Test condition B	-	-	Required for Voltage Regulator (Zener) only.	-
High Temperature Gate Bias	HTGB	JESD 22A-108	-	-	Required for Power MOSFET – IGBT only.	-
High Temperature Storage Life	HTSL	JESD22 A-103	-	-	Covered by HTRB	-
Temperature Humidity Storage	THS	JESD22 A-118	-	-	Covered by H3TRB	-
Temperature Cycling	TC	JESD22A-104	L1, L2, L3	231 (3*77)		X
Temperature Cycling Hot Test	TCHT	JESD22A-104	-	-	Required for Power MOSFET – IGBT only.	-
Temperature Cycling Delamination Test	TCDT	JESD22A-104 J-STD-035	--		Required for Power MOSFET – IGBT only. Alternative to TCHT	-
Wire Bond Integrity	WBI	MIL-STD-750 Method 2037		--	For dissimilar metal bonding systems only	-
Unbiased Highly Accelerated Stress Test	UHAST	JESD22A-118 or A101	L1, L2, L3	231 (3*77)	Required for SCR/TRIAC RECTIFIER and Protection devices	X
Autoclave	AC	JESD22A-102	-	-	Alternative to UHAST	-
Highly Accelerated Stress Test	HAST	JESD22A-110	-	-	Covered by H3TRB (same failure mechanisms activation).	-
High Humidity High Temperature Reverse Bias	H3TRB	JESD22A-101	L1, L2, L3	231 (3*77)	Alternative to HAST	X
High Temperature High Humidity Bias	HTHHB	JED22A-101	-	-	Not required, LED only	-
Intermittent Operational Life / Thermal Fatigue	IOL	MIL-STD-750 Method 1037	L1, L2, L3	231 (3*77)	For power devices. Not required for Transient Voltage Suppressor (TVS) parts	X
Power and Temperature Cycle	PTC	JED22A-105	-	-	For power devices. Not required for Transient Voltage Suppressor (TVS) parts Perform PTC if $\Delta Tj>100°C$ cannot be achieved with IOL Alternative to IOL	-
ESD Characterization	ESD HBM	AEC Q101-001 and 005	-	-		-
ESD Characterization	ESD CDM	AEC Q101-001 and 005	-	-		-
Destructive Physical Analysis	DPA	AEC-Q101-004 Section 4	L3	4	After H3TRB and TC	X
Physical Dimension	PD	JESD22B-100	-	-		-
Terminal Strength	TS	MIL-STD-750 Method 2036	-	-	Required for leaded parts only	-
Resistance to Solvents	RTS	JESD22B-107	-	-	Not applicable for Laser Marking	-
Constant Acceleration	CA	MIL-STD-750 Method 2006	-	-	Required for hermetic packaged parts only.	-
Vibration Variable Frequency	VVF	JESD22B-103	-	-	Required for hermetic packaged parts only.	-
Mechanical Shock	MS	JESD22 B-104	-	-	Required for hermetic packaged parts only.	-
Hermeticity	HER	JESD22A-109	-	-	Required for hermetic packaged parts only.	-
Resistance to Solder Heat	RSH	JESD22 A-111 (SMD) B-106 (PTH)	L1	30		X
Solderability	SD	J-STD-002 JESD22B102	L3	30		X
Dead Bug Test	DBT	ST Internal specification	-	-	Mandatory for SMD package Data collection for PTH package	-

Stress	Abrv	Reference	Lot	SS	Comments	Test plan
Thermal Resistance	TR	JESD24-3, 24-4, 24-6 as appropriate	-	-	Required in case of process change. Not applicable to protection device as no limit specified in the datasheet	-
Wire Bond Strength	WBS	MIL-STD-750 Method 2037	-	-	Covered during workability trials	-
Bond Shear	BS	AEC-Q101-003	-	-	Covered during workability trials	-
Die Shear	DS	MIL-STD-750 Method 2017	-	-	Not Applicable to parts with solder paste die attach	-
Unclamped Inductive Switching	UIS	AEC-Q101-004 section 2	-	-	Required for Power MOS and internally clamped IGBTs only	-
Dielectric Integrity	DI	AEC-Q101-004 section 3	-	-	Required for Power MOSFET – IGBT only.	-
Short Circuit Reliability Characterization	SCR	AEC-Q101-006	-	-	Required for smart power parts only	-
Whisker Growth Evaluation	WG	AEC-Q005 JESD201	-	-	Not applicable for resin change	
Early Life Failure Rate	ELFR	JESD74	-	-	Recommended for new techno development in case of identified failure mechanism	-
Functional Test (in rush, di/dt,)	FT	Internal specification	-	-		-
Repetitive Surge	RS	Internal specification	-	-	Required for protection devices only.	-
Low Temperature Storage	LTS	JESD-22 A119: 209	-	-	AQG324 test for Modules	-
Thermal shock test	TST	JESD22-A104	-	-	AQG324 test for Modules	-
Power Cycling (seconds)	PC sec	MIL-STD750-1 Method1037	-	-	AQG324 test for Modules	-
Power Cycling (minutes)	PC min	MIL-STD750-1 Method1037	-	-	AQG324 test for Modules	-
Mechanical shock	MS	IEC 600068-2-27	-	-	AQG324 test for Modules	-
Vibration	V	IEC60068-2-6	-	-	AQG324 test for Modules	-

5.3 Results summary

Test	PC	Std ref.	Conditions	Steps / Duration	SS	Failure / SS		
						L1	L2	L3
Pre- and Post-Electrical Test	-	ST datasheet	Ir, Vf, parameters following product datasheet	Week43				
External Visual	-	ST datasheet	All qualification parts submitted for testing passed External & Visual inspection. during manufacturing process					
HTRB	N	MIL-STD-750-1 M1038 Method A	Junction Temperature=175°C Temperature=170°C Voltage=1200V	1Khrs	154	-	Wek35	Week35
			Junction Temperature=175°C Temperature=170°C Voltage=100V	1Khrs	77	Wek43	-	- -
TC	N	JESD22-A104	-55/+150°C 2cy/h	1000cy	231	Week35	Wek35	Week35
RSH	N	JESD22-B106	Dipping 270°C-7s	-	30	Week36	-	-
H3TRB	N	JESD22-A101	Humidity (HR)=85% Temperature=85°C Voltage=100V	1Khrs	154	-	Week42	Week42
H3TRB	N	JESD22-A101	Humidity (HR)=85% Temperature=85°C Voltage=80V	1Khrs	77	Week42	-	-
UHAST	N	JESD22 A-118	130°C; 85% RH 2.3bar	96Hrs	231	Week40	Week40	Week40
IOLT	N	MIL-STD 750 Method 1037	ΔTj=125°C Ton=Toff=300s	500rs	231	Week41	Week41	Week41
SD	N	J-STD-002 JESD22 B-102	Steam ageing SnPb bath 245°C	-	30	-	-	0/15
			Steam ageing SnAgCu bath 245°C	-		-	-	0/15
DPA	N	AEC-Q101-004	After TC 1Khrs		2			Week48
			After H3TRB 1Khrs		2			Week48

Note 1: These data are indicative values given as information only. Please note that the ST guarantee is the compliance of the products to the ST datasheet. Parameters distributions are not considered as a ST guarantee under any circumstances.
Please note that these electrical parameters are 100% tested at 25°C at Final stage of back-end manufacturing before deliveries to customers."

5.4 Tests description

Test name	Description	Purpose
Die Oriented		
HTRB High Temperature Reverse Bias / **HTFB** High Temperature Forward Bias	The device is stressed in static configuration, trying to satisfy as much as possible the following conditions: - Low power dissipation - Max. supply voltage compatible with diffusion process and internal circuitry limitations. Forward: device is forward biased with a current fixed and adjusted to reach the targeted junction temperature	To determine the effects of bias conditions and temperature on solid state devices over time. It simulates the devices' operating condition in an accelerated way. To maximize the electrical field across either reverse-biased junctions or dielectric layers, in order to investigate the failure modes linked to mobile contamination, oxide ageing, layout sensitivity to surface effects. To assess active area and contacts integrity
Package Oriented		
H3TRB High Humidity High Temperature Reverse Bias	The device is biased in static configuration minimizing its internal power dissipation, and stored at controlled conditions of ambient temperature and relative humidity.	To evaluate the package moisture resistance with electrical field applied, both electrolytic and galvanic corrosion are put in evidence.
TC Temperature Cycling	The device is submitted to cycled temperature excursions, between a hot and a cold chamber in air atmosphere.	To investigate failure modes related to the thermo-mechanical stress induced by the different thermal expansion of the materials interacting in the die-package system. Typical failure modes are linked to metal displacement, dielectric cracking, molding compound delamination, wire-bonds failure, die-attach layer degradation.
UHAST Unbiased Highly Accelerated Stress Test	The device is stored in saturated steam, at fixed and controlled conditions of pressure and temperature.	To investigate corrosion phenomena affecting die or package materials, related to chemical contamination and package hermeticity.
IOLT Intermittent Operating Life Test	All test samples shall be subjected to the specified number of cycles. When stabilized after initial warm-up cycles, a cycle shall consist of an "on" period, when power is applied suddenly, not gradually, to the device for the time necessary to achieve a delta case temperature followed by an “off” period, when the power is suddenly removed, for cooling the case through a similar delta temperature.	The purpose of this test is to determine compliance with the specified numbers of cycles for devices subjected to the specified conditions. It accelerates the stresses on all bonds and interfaces between the chip and mounting face of devices subjected to repeated turn on and off of equipment and is therefore most appropriate for case mount style (e.g., stud, flange, and disc) devices.
RSH Resistance to Solder Heat	Package is dipped by the leads in a solder bath after initial wet ageing (for SMDs only). Assessment by electrical test + no external crack	To simulate wave soldering process and verify that package will not be thermally damaged during this step.
SD Solderability	The purpose of this test method is to provide a referee condition for the evaluation of the solderability of terminations (including leads up to 0.125 inch in diameter) that will be assembled using tin lead eutectic solder.	This evaluation is made on the basis of the ability of these terminations to be wetted and to produce a suitable fillet when coated by tin lead eutectic solder. These procedures will test whether the packaging materials and processes used during the manufacturing operations process produce a component that can be successfully soldered to the next level assembly using tin lead eutectic solder. A preconditioning test is included in this test method, which degrades the termination finish to provide a guard band against marginal finish.

PCN
Product/Process Change Notification

Molding compound replacement for DO-247 & TO-247

for SiC 1200V rectifiers and STPS61H1000CWY in ST Shenzhen (China) plant

Notification number:	ADG/23/14217	**Issue Date**	11-Jul-2023
Issued by	Isabelle Ballon		
Product series affected by the change		STPS61H100CWY STPSC20H12WY STPSC31H12CWY STPSC40H12CWY Specific devices not expressly listed above are included in this change.	
Type of change		Back-End realization	

Description of the change

Molding compound replacement for DO-247 and TO-247 packages for SiC 1200V rectifiers and STPS61H100CWY in ST Shenzhen plant (China).

Reason for change

Molding compound discontinuation from current resin supplier.

Former versus changed product:	The changed products do not present modified electrical, dimensional, or thermal parameters, leaving unchanged the current information published in the products datasheets. The footprint recommended by ST remains the same. There is no change in the packing modes and the standard delivery quantities either. The products remain in full compliance with the ST ECOPACK®2 grade (so called “halogen-free”). With Comparative Tracking Index (CTI) improvement of molding compound, the products are now proposed in Material Group I according to IEC 60 664-1.

Disposition of former products

Delivery of current products will be done until stock depletion.

Marking and traceability

Traceability of the change will be ensured by Finished Good/Type print on carton labels.

Commercial part number/Order code (Examples)	Former Finished Good/Type (Examples)	New Finished Good/Type (Examples)
STPS61H100CWY STPSC31H12CWY	YSTPS61H100CWH%7 YPSC31H12CW2A/7	YPS61H100CWH%7 YPSC31H12CW24/7

Qualification completion date	01-Dec-2023

Forecasted sample availability

Product family	Sub-family	Commercial part Number	Availability date
Rectifiers	Power Schottky	STPS61H100CWY	**Week 42-2023**
Rectifiers	1200V SiC	STPSC20H12X	**Week 42-2023**
Rectifiers	1200V SiC	STPSC3xH12CWY	**Week 42-2023**

For sample(s) request, please inform FSE (Field Sales Engineer) in order to insert corresponding **Non-Standard Samples Order** (a single Commercial Product for each request) with **PCN reference** as additional information.

Change implementation schedule

Sales-types	Estimated production start	Estimated first shipments
All	**Jan-2023**	**Jan-2023**

Comments	

Customer's feedback

Please contact your local ST sales representative or quality contact for requests concerning this change notification.
Absence of acknowledgement of this PCN within 30 days of receipt will constitute acceptance of the change
Absence of additional response within 180 days of receipt of this PCN will constitute acceptance of the change

Qualification program and results	23020QRP Attached

Qualification Report

Qualification of molding compound replacement for DO247 & TO247 for SiC 1200V rectifiers and STPS61H1000CWY at ST SHENZHEN - CHINA

General Information	
Product Line	*Rectifiers*
Product Description	*1000V and 1200V power Schottky silicon carbide diode*
Product Perimeter	*STPSC20H12WY* *STPSC31H12CWY* *STPSC40H12CWY* *STPSC61H100CWY*
Product Group	*ADG*
Product Division	*Discrete & Filter*
Packages	*DO247* *TO247*
Maturity level step	*MAT 20*

Locations	
Wafer Fab	*ST CATANIA – ITALY* *ST ANG MO KIO - SINGAPORE*
Assembly Plant	*ST SHENZHEN - CHINA*
Reliability Lab	*ST TOURS – FRANCE* *Solderability test done at ST SHENZHEN -CHINA*
Reliability Assessment	*On going*

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comments
1.0	June 11, 2023	10	Henri VIVANT	Julien Michelon Digitally signed by Julien Michelon Date: 2023.07.11 18:50:50 +02'00'	Qualification of molding compound replacement for DO247 & TO247 for SiC 1200V rectifiers and STPSC61H1000CWY at ST SHENZHEN - CHINA.

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MIL-STD-750C	Test method for semiconductor devices

2 GLOSSARY

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GD	Generic Data
H3TRB	High Humidity High Temperature Reverse Bias
HTRB	High Temperature Reverse Bias
IOLT	Intermittent Operating Life Test
PD	Physical Dimensions
RSH	Resistance to Soldering Heat
SD	Solderability test
SS	Sample Size
TC	Temperature Cycling
UHAST	Unbiased Highly Accelerated Stress Test

3 RELIABILITY EVALUATION OVERVIEW

3.1 Objectives

The objective of this report is to qualify the molding replacement for DO247 & TO247 for SiC 1200V rectifiers and STPSC61H1000CWY at ST SHENZHEN - CHINA.

Product	Description	Package	Assembly Location
STPSC20H12CWY	1200V power Schottky silicon carbide diode	DO-247	ST SHENZHEN - CHINA
STPSC31H12CWY	1200V power Schottky silicon carbide diode	TO-247	
STPSC40H12CWY	1200V power Schottky silicon carbide diode		
STPSC61H100CWY	1000V power Schottky silicon carbide diode		

The reliability test methodology used follows the JESD47: « Stress Test driven Qualification Methodology.

The reliability tests ensuing are:

.

- TC and IOLT to ensure the mechanical robustness of the products.
- HTRB to evaluate the risk of contamination from the resin and the assembly process versus the die layout sensitivity.
- H3TRB, UHAST to check the robustness to corrosion and the good package hermeticity.
- RSH, Solderability to check compatibility of package with customer assembly.

For some tests, similarity methodology is used. See 5.1 “comments” for more details about similarities.

3.2 Conclusion

Qualification Plan Ongoing.

4 DEVICE CHARACTERISTICS

4.1 Device description

Refer to product datasheet(s).

4.2 Construction Note

	STPSC20H12WY
Wafer/Die fab. information	
Wafer fab manufacturing location	ST CATANIA – ITALY
Technology / Process family	1200V power Schottky silicon carbide diode
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST CATANIA – ITALY
Assembly information	
Assembly site	ST SHENZHEN - CHINA
Package description	DO-247
Final testing information	
Testing location	ST SHENZHEN - CHINA

	STPSC31H12CWY
Wafer/Die fab. information	
Wafer fab manufacturing location	ST CATANIA – ITALY
Technology / Process family	1200V power Schottky silicon carbide diode
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST CATANIA – ITALY
Assembly information	
Assembly site	ST SHENZHEN - CHINA
Package description	TO-247
Final testing information	
Testing location	ST SHENZHEN - CHINA

	STPSC40H12CWY
Wafer/Die fab. information	
Wafer fab manufacturing location	ST CATANIA – ITALY
Technology / Process family	1200V (2x20A) power Schottky silicon carbide diode
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST CATANIA – ITALY
Assembly information	
Assembly site	ST SHENZHEN - CHINA
Package description	TO-247
Final testing information	
Testing location	ST SHENZHEN - CHINA

	STPSC61H100CWY
Wafer/Die fab. information	
Wafer fab manufacturing location	ST ANG MO KIO– SINGAPORE
Technology / Process family	1000V power Schottky silicon carbide diode
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST ANG MO KIO– SINGAPORE
Assembly information	
Assembly site	ST SHENZHEN - CHINA
Package description	TO-247
Final testing information	
Testing location	ST SHENZHEN - CHINA

5 TESTS PLAN AND RESULTS SUMMARY

5.1 Test vehicles

Lot #	Part Number	Package	Comments
L1	STPSC61H100CWY	TO-247	1st Qualification lot
L2	STPSC20H12CWY	DO-247	2nd Qualification lot
L3	STPSC30H12CWY	TO-247	3rd Qualification lot

Detailed results in below chapter will refer to these references.

5.2 Test plan

Stress	Abrv	Reference	Lot	SS	Comments	Test plan
Pre and Post-Stress Electrical Test	TEST	User specification or supplier's standard Specification	All qualification parts tested per the requirements of the appropriate device specification.			-
Pre-conditioning	PC	J-STD-020 JESD22-A113	All qualification parts tested per the requirements of the appropriate device specification.		As per targeted MSL Not applicable for PTH and WLCSP without coating	-
MSL research	MSL	J-STD-020	-	-	Not applicable for PTH and WLCSP without coating	-
External Visual	EV	JESD22B-101	All qualification parts tested per the requirements of the appropriate device specification.		Done during Assembly → Test & Finish inspection	X
Parametric Verification	PV	User specification	-	-		-
High Temperature Reverse Bias	HTRB	MIL-STD-750-1 M1038 Method A (for diodes, rectifiers and Zeners) M1039 Method A (for transistors)	L1, L2, L3	231 (3*77)	WBI after HTRB applicable only for dissimilar metal (wire/meta) in case of no Cu wire	X
AC blocking voltage	ACBV	MIL-STD-750-1 M1040 Test condition A	-	-	Required for Thyristor only. Alternative to HTRB	-

Stress	Abrv	Reference	Lot	SS	Comments	Test plan
High Temperature Forward Bias	HTFB	JESD22 A-108	-	-	Not required, applicable only to LEDS Alternative to HTRB	-
High Temperature Operating Life	HTOL		-	-	Covered by HTRB or ACBV	-
Steady State Operational	SSOP	MIL-STD-750-1 M1038 Test condition B	-	-	Required for Voltage Regulator (Zener) only.	-
High Temperature Gate Bias	HTGB	JESD 22A-108	-	-	Required for Power MOSFET – IGBT only.	-
High Temperature Storage Life	HTSL	JESD22 A-103	-	-	Covered by HTRB	-
Temperature Humidity Storage	THS	JESD22 A-118	-	-	Covered by H3TRB	-
Temperature Cycling	TC	JESD22A-104	L1, L2, L3	231 (3*77)		X
Temperature Cycling Hot Test	TCHT	JESD22A-104	-	-	Required for Power MOSFET – IGBT only.	-
Temperature Cycling Delamination Test	TCDT	JESD22A-104 J-STD-035	--		Required for Power MOSFET – IGBT only. Alternative to TCHT	-
Wire Bond Integrity	WBI	MIL-STD-750 Method 2037		--	For dissimilar metal bonding systems only	-
Unbiased Highly Accelerated Stress Test	UHAST	JESD22A-118 or A101	L1, L2, L3	231 (3*77)	Required for SCR/TRIAC RECTIFIER and Protection devices	X
Autoclave	AC	JESD22A-102	-	-	Alternative to UHAST	-
Highly Accelerated Stress Test	HAST	JESD22A-110	-	-	Covered by H3TRB (same failure mechanisms activation).	-
High Humidity High Temperature Reverse Bias	H3TRB	JESD22A-101	L1, L2, L3	231 (3*77)	Alternative to HAST	X
High Temperature High Humidity Bias	HTHHB	JED22A-101	-	-	Not required, LED only	-
Intermittent Operational Life / Thermal Fatigue	IOL	MIL-STD-750 Method 1037	L1, L2, L3	231 (3*77)	For power devices. Not required for Transient Voltage Suppressor (TVS) parts	X
Power and Temperature Cycle	PTC	JED22A-105	-	-	For power devices. Not required for Transient Voltage Suppressor (TVS) parts Perform PTC if $\Delta Tj>100°C$ cannot be achieved with IOL Alternative to IOL	-
ESD Characterization	ESD HBM	AEC Q101-001 and 005	-	-		-
ESD Characterization	ESD CDM	AEC Q101-001 and 005	-	-		-
Destructive Physical Analysis	DPA	AEC-Q101-004 Section 4	L3	4	After H3TRB and TC	X
Physical Dimension	PD	JESD22B-100	-	-		-
Terminal Strength	TS	MIL-STD-750 Method 2036	-	-	Required for leaded parts only	-
Resistance to Solvents	RTS	JESD22B-107	-	-	Not applicable for Laser Marking	-
Constant Acceleration	CA	MIL-STD-750 Method 2006	-	-	Required for hermetic packaged parts only.	-
Vibration Variable Frequency	VVF	JESD22B-103	-	-	Required for hermetic packaged parts only.	-
Mechanical Shock	MS	JESD22 B-104	-	-	Required for hermetic packaged parts only.	-
Hermeticity	HER	JESD22A-109	-	-	Required for hermetic packaged parts only.	-
Resistance to Solder Heat	RSH	JESD22 A-111 (SMD) B-106 (PTH)	L1	30		X
Solderability	SD	J-STD-002 JESD22B102	L3	30		X
Dead Bug Test	DBT	ST Internal specification	-	-	Mandatory for SMD package Data collection for PTH package	-

Stress	Abrv	Reference	Lot	SS	Comments	Test plan
Thermal Resistance	TR	JESD24-3, 24-4, 24-6 as appropriate	-	-	Required in case of process change. Not applicable to protection device as no limit specified in the datasheet	-
Wire Bond Strength	WBS	MIL-STD-750 Method 2037	-	-	Covered during workability trials	-
Bond Shear	BS	AEC-Q101-003	-	-	Covered during workability trials	-
Die Shear	DS	MIL-STD-750 Method 2017	-	-	Not Applicable to parts with solder paste die attach	-
Unclamped Inductive Switching	UIS	AEC-Q101-004 section 2	-	-	Required for Power MOS and internally clamped IGBTs only	-
Dielectric Integrity	DI	AEC-Q101-004 section 3	-	-	Required for Power MOSFET – IGBT only.	-
Short Circuit Reliability Characterization	SCR	AEC-Q101-006	-	-	Required for smart power parts only	-
Whisker Growth Evaluation	WG	AEC-Q005 JESD201	-	-	Not applicable for resin change	
Early Life Failure Rate	ELFR	JESD74	-	-	Recommended for new techno development in case of identified failure mechanism	-
Functional Test (in rush, di/dt,)	FT	Internal specification	-	-		-
Repetitive Surge	RS	Internal specification	-	-	Required for protection devices only.	-
Low Temperature Storage	LTS	JESD-22 A119: 209	-	-	AQG324 test for Modules	-
Thermal shock test	TST	JESD22-A104	-	-	AQG324 test for Modules	-
Power Cycling (seconds)	PC sec	MIL-STD750-1 Method1037	-	-	AQG324 test for Modules	-
Power Cycling (minutes)	PC min	MIL-STD750-1 Method1037	-	-	AQG324 test for Modules	-
Mechanical shock	MS	IEC 600068-2-27	-	-	AQG324 test for Modules	-
Vibration	V	IEC60068-2-6	-	-	AQG324 test for Modules	-

5.3 Results summary

Test	PC	Std ref.	Conditions	Steps / Duration	SS	Failure / SS		
						L1	L2	L3
Pre- and Post-Electrical Test	-	ST datasheet	Ir, Vf, parameters following product datasheet	Week43				
External Visual	-	ST datasheet	All qualification parts submitted for testing passed External & Visual inspection. during manufacturing process					
HTRB	N	MIL-STD-750-1 M1038 Method A	Junction Temperature=175°C Temperature=170°C Voltage=1200V	1Khrs	154	-	Wek35	Week35
			Junction Temperature=175°C Temperature=170°C Voltage=100V	1Khrs	77	Wek43	-	- -
TC	N	JESD22-A104	-55/+150°C 2cy/h	1000cy	231	Week35	Wek35	Week35
RSH	N	JESD22-B106	Dipping 270°C-7s	-	30	Week36	-	-
H3TRB	N	JESD22-A101	Humidity (HR)=85% Temperature=85°C Voltage=100V	1Khrs	154	-	Week42	Week42
H3TRB	N	JESD22-A101	Humidity (HR)=85% Temperature=85°C Voltage=80V	1Khrs	77	Week42	-	-
UHAST	N	JESD22 A-118	130°C; 85% RH 2.3bar	96Hrs	231	Week40	Week40	Week40
IOLT	N	MIL-STD 750 Method 1037	ΔTj=125°C Ton=Toff=300s	500rs	231	Week41	Week41	Week41
SD	N	J-STD-002 JESD22 B-102	Steam ageing SnPb bath 245°C	-	30	-	-	0/15
			Steam ageing SnAgCu bath 245°C	-		-	-	0/15
DPA	N	AEC-Q101-004	After TC 1Khrs		2			Week48
			After H3TRB 1Khrs		2			Week48

Note 1: These data are indicative values given as information only. Please note that the ST guarantee is the compliance of the products to the ST datasheet. Parameters distributions are not considered as a ST guarantee under any circumstances.
Please note that these electrical parameters are 100% tested at 25°C at Final stage of back-end manufacturing before deliveries to customers."

5.4 Tests description

Test name	Description	Purpose
Die Oriented		
HTRB High Temperature Reverse Bias / **HTFB** High Temperature Forward Bias	The device is stressed in static configuration, trying to satisfy as much as possible the following conditions: - Low power dissipation - Max. supply voltage compatible with diffusion process and internal circuitry limitations. Forward: device is forward biased with a current fixed and adjusted to reach the targeted junction temperature	To determine the effects of bias conditions and temperature on solid state devices over time. It simulates the devices' operating condition in an accelerated way. To maximize the electrical field across either reverse-biased junctions or dielectric layers, in order to investigate the failure modes linked to mobile contamination, oxide ageing, layout sensitivity to surface effects. To assess active area and contacts integrity
Package Oriented		
H3TRB High Humidity High Temperature Reverse Bias	The device is biased in static configuration minimizing its internal power dissipation, and stored at controlled conditions of ambient temperature and relative humidity.	To evaluate the package moisture resistance with electrical field applied, both electrolytic and galvanic corrosion are put in evidence.
TC Temperature Cycling	The device is submitted to cycled temperature excursions, between a hot and a cold chamber in air atmosphere.	To investigate failure modes related to the thermo-mechanical stress induced by the different thermal expansion of the materials interacting in the die-package system. Typical failure modes are linked to metal displacement, dielectric cracking, molding compound delamination, wire-bonds failure, die-attach layer degradation.
UHAST Unbiased Highly Accelerated Stress Test	The device is stored in saturated steam, at fixed and controlled conditions of pressure and temperature.	To investigate corrosion phenomena affecting die or package materials, related to chemical contamination and package hermeticity.
IOLT Intermittent Operating Life Test	All test samples shall be subjected to the specified number of cycles. When stabilized after initial warm-up cycles, a cycle shall consist of an "on" period, when power is applied suddenly, not gradually, to the device for the time necessary to achieve a delta case temperature followed by an “off” period, when the power is suddenly removed, for cooling the case through a similar delta temperature.	The purpose of this test is to determine compliance with the specified numbers of cycles for devices subjected to the specified conditions. It accelerates the stresses on all bonds and interfaces between the chip and mounting face of devices subjected to repeated turn on and off of equipment and is therefore most appropriate for case mount style (e.g., stud, flange, and disc) devices.
RSH Resistance to Solder Heat	Package is dipped by the leads in a solder bath after initial wet ageing (for SMDs only). Assessment by electrical test + no external crack	To simulate wave soldering process and verify that package will not be thermally damaged during this step.
SD Solderability	The purpose of this test method is to provide a referee condition for the evaluation of the solderability of terminations (including leads up to 0.125 inch in diameter) that will be assembled using tin lead eutectic solder.	This evaluation is made on the basis of the ability of these terminations to be wetted and to produce a suitable fillet when coated by tin lead eutectic solder. These procedures will test whether the packaging materials and processes used during the manufacturing operations process produce a component that can be successfully soldered to the next level assembly using tin lead eutectic solder. A preconditioning test is included in this test method, which degrades the termination finish to provide a guard band against marginal finish.

Public Products List

Publict Products are off the shelf products. They are not dedicated to specific customers, they are available through ST Sales team, or Distributors, and visible on ST.com

PCN Title : Molding compound replacement for DO-247 & TO-247 for SiC 1200V rectifiers and STPS61H1000CWY in ST Shenzhen (China) plant

PCN Reference : ADG/23/14217

Subject : Public Products List

Dear Customer,

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

STPSC40H12CWY	STPS61H100CWY	STPSC20H12CWY
STPSC31H12CWY		

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