STMicroelectronics
ADG - ASD & IPAD™ Division[1]
BU Rectifier

(1) ADG: Automotive and Discretes Group - ASD: Application Specific Device – IPAD™: Integrated Passive and Active Devices

PCN
Product/Process Change Notification

Conversion from 4” to 6” of 600V & 650V SiC Schottky diodes production line

Notification number:	ADG-DIS/17/10610	**Issue Date**	04/12/2017
Issued by	Aline AUGIS		
Product series affected by the change:		600 & 650V Power Schottky SiC diodes	
Type of change: Wafer diameter change		Front end realization	

Description of the change

Wafer diameter conversion from 4’’ (100mm) to 6’’ (150mm) for 600V & 650V Power Schottky SiC diodes

Reason for change

6’’ conversion and 4’’ production line phase out

Former versus changed product:	The changed products do not present modified electrical, dimensional or thermal parameters, leaving unchanged the current information published in the product datasheet The Moisture Sensitivity Level of the part (according to the IPC/JEDEC JSTD-020D standard) remains unchanged. 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 (“halogen-free”).

Disposition of former products

Units of current production with 4’’ wafers will be delivered until stock depletion.

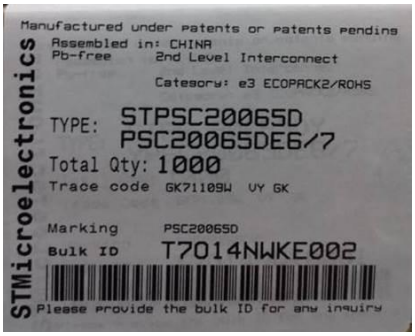
Marking and traceability

New finished good codes created for 6'' products. Examples of FG codes and labels here below:

Sales type	4'' Finished Good code	6'' Finished good code
STPSC406D	**PSC406DE/7**	**PSC406DE6/7**
STPSC10H065GY-TR	**YPSC10H065GHM/7**	**YPSC10H065GHM6/7**
STPSC4H065D	**STPSC4H065DM/7**	**STPSC4H065DM6/7**
STPSC40065CWY	**YPSC40065CWE/7**	**YPSC40065CWE6/7**

4 '' product label

6'' product label



Qualification complete date	Week 48-2017

Forecasted sample availability

Product family	Sub-family	Commercial part Number	Availability date
SiC Power Schottky	600V	STPSCxxx06xx	See pages 3 to 5
SiC Power Schottky	650V	STPSCxxx065xx	See pages 3 to 5

Change implementation schedule

Sales types	Estimated production start	Estimated first shipments
STPSCxxx6xx	W48- 2017	W09- 2018
STPSCxx065xx	W48- 2017	W09- 2018
STPSCxx13xx	W48- 2017	W09- 2018

Comments:	Shipments can be anticipated before W09-2018 upon customer acceptance.

Customer's feedback

Please contact your local ST sales representative or quality contact for requests concerning this change notification.

According JEDEC JESD46, absence of acknowledgement of this PCN within 30 days of receipt will constitute acceptance of the change.

Absence of additional response within 90 days of receipt of this PCN will constitute acceptance of the change.

In case the customer rejects this PCN, STMicroelectronics will not be able to deliver units to customer any more once 4'' production terminated and 4'' stock fully depleted.

Qualification program and results	17092QRP Attached

Samples availability date

Commercial product	Availability date
STPSC10065D	Available
STPSC10065DY	Available
STPSC10065GY-TR	W01 2018
STPSC1006D	Available
STPSC10C065D-L	On customer request
STPSC10H065B-TR	On customer request
STPSC10H065D	W03 2018
STPSC10H065DI	W05 2018
STPSC10H065DY	W03 2018
STPSC10H065G-TR	W03 2018
STPSC10H065GY-TR	W03 2018
STPSC10TH13TI	On customer request
STPSC12065D	Available
STPSC12065DY	On customer request
STPSC12065GY-TR	On customer request
STPSC1206D	Available
STPSC12C065D-L	On customer request
STPSC12C065DY	On customer request
STPSC12H065CT	On customer request
STPSC12H065D	On customer request
STPSC12H065DY	On customer request

STPSC16C065D-L	On customer request
STPSC16H065CT	On customer request
STPSC20065D	Available
STPSC20065DI	W04 2018
STPSC20065DY	Available
STPSC20065GY-TR	W01 2018
STPSC20065W	Available
STPSC20065WY	Available
STPSC2006CW	Available
STPSC20H065CT	On customer request
STPSC20H065CTY	On customer request
STPSC20H065CW	W03 2018
STPSC20H065CWY	W03 2018
STPSC40065CW	Available
STPSC40065CWY	Available
STPSC406B-TR	Available
STPSC406D	Available
STPSC4C065D-L	W08 2018
STPSC4H065B-TR	Available
STPSC4H065D	Available
STPSC4H065DI	On customer request
STPSC606D	Available
STPSC606G-TR	Available
STPSC6C065D-L	W10 2018
STPSC6C065DY	On customer request

STPSC6H065B-TR	W02 2018
STPSC6H065D	W02 2018
STPSC6H065DI	W08 2018
STPSC6H065G-TR	W08 2018
STPSC6TH13TI	W02 2018
STPSc8065D	W02 2018
STPSC8065DY	W02 2018
STPSC806D	Available
STPSC806G-TR	On customer request
STPSC8C065D-L	W51 2017
STPSC8H065B-TR	W06 2018
STPSC8H065CT	On customer request
STPSC8H065D	W06 2018
STPSC8H065DI	W08 2018
STPSC8H065G-TR	W08 2018
STPSC8TH13TI	W08 2018

Reliability Evaluation Report

Qualification of SiC Power Schottky 600V & 650V
6 inches (150mm) conversion for wafer diameter

General Information	
Product Line	*Rectifiers*
Product Description	*SiC Power Schottky 600V & 650V*
Product perimeter	*STPSCxx06x* *STPSCxx065x / STPSCxx065xY*
Product Group	*ADG*
Product division	*ASD&IPAD*
Package	*Multiple*
Maturity level step	*QUALIFIED*

Locations	
Wafer fab	*ST Catania - ITALY*
Assembly plant	*Multiple*
Reliability Lab	*ST TOURS - FRANCE*
Reliability assessment	PASS

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comments
1.0	30-Nov-2017	7	Isabelle BALLON	Julien MICHELON	Initial qualification

Note: This report is a summary of the reliability trials performed in good faith by STMicroelectronics in order to evaluate the potential reliability risks during the product life using a set of defined test methods.
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1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
AEC-Q101 (rev. D1)	Stress test qualification for automotive grade discrete semiconductors
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

2 GLOSSARY

SS	Sample Size
HTRB	High Temperature Reverse Bias
TC	Temperature Cycling
THB	Temperature Humidity Bias
DPA	Destructive Physical Analysis
PCT/AC	Pressure Cooker Test (Autoclave)
IOLT	Intermittent Operating Life Test
PC	Pre-conditioning (before test)
GD	Generic Data

3 RELIABILITY EVALUATION OVERVIEW

3.1 Objectives

The objective of this report is to qualify 6inches wafer diameter conversion for SiC 600V & 650V Power Schottky products assembled in all available packages.

The product series involved in this qualification are listed below.

Product sub-Family	Product devices
Silicon Carbide Power Schottky Rectifiers 600V & 650V	All STPSCxx 600V & 650V (STPSCxx06x – STPSxx065x – STPSCxx065xY)

The reliability test methodology used follows the JESD47-H and AEC-Q101 RevD1: « Stress Test Driven Qualification Methodology » The following reliability tests ensuing are:

- HTRB to evaluate the risk of contamination from the resin and the assembly process versus the die layout sensitivity.
- TC and IOLT to ensure the mechanical robustness of the products.
- THB and PCT to check the robustness to corrosion and the good package hermeticity

Similarity methodology is used. See 5.1 “comments” for more details about similarities.

3.2 Conclusion

Qualification Plan requirements have been fulfilled without exception. Reliability tests have shown that the devices behave correctly against environmental tests (no failure). Moreover, the stability of electrical parameters during the accelerated tests demonstrates the robustness of the products and safe operation, which is consequently expected during their lifetime.

4 DEVICE CHARACTERISTICS

4.1 Change description

No change in terms of performances.
The process key parameters comparison and the different tests have shown that there is no impact on electrical results of the products with the reference to their datasheet.

4.2 Construction Note

	STPSCxx06x **STPSCxx065x – STPSCxx065xY**
Wafer/Die fab. information	
Wafer fab manufacturing location	ST Catania - ITALY
Technology / Process family	SiC 600V Power Schottky SiC 650V Power Schottky
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST Catania - ITALY
Assembly information	
Assembly site	Multiple
Package description	Multiple
Final testing information	
Testing location	Multiple

5 TESTS RESULTS SUMMARY

5.1 Test vehicles

Lot #	Part Number	Package	Comments
L1a	STPSC406D	TO-220AC	1st Qualification lot - SiC 600V
L1b			
L2a	STPSC20065DY	TO-220AC	2nd Qualification lot - SiC 650V Blank serie Automotive Grade
L2b			
L3a	STPSC20H065CWY	TO-247	3rd Qualification lot - SiC 650V H serie Automotive Grade
L3b			

Detailed results in below chapter will refer to these references.

5.2 Test plan and results summary

Test	Std ref.	Test conditions	SS total	Steps / duration	Failure/SS					
					L1a	L1b	L2a	L2b	L3a	L3b
Die Oriented										
HTRB	MIL-STD-750-1 M1038 Method.A	VR = VRRM Tj ≥ 175°C (Ta=175°C)	462	1Khrs	0/77	0/77	0/77	0/77	0/77	0/77
Package Oriented										
THB	JESD22 A-101	85% RH, 85°C VR=100V	231	1Khrs	0/77		0/77		0/77	
DPA after THB	AEC-Q101-004	-	2	-			0/2			
PCT	JESD22 A-102	121°C 2bar 100% RH	154	96hrs	0/77				0/77	
TC	JESD22 A-104	-65/+150°C 2 cy/h	308	1Kcy	0/77		0/77	0/77	0/77	
DPA after TC	AEC-Q101-004	-	2	-			0/2			
IOLT	MIL-STD-750 method 1037	ΔTj = 100°C t_{on} = t_{off} = 210s (for L1a-L2a: TO-220AC)	231	8572cy (TO-220AC)	0/77		0/77			
		ΔTj = 100°C t_{on} = t_{off} = 300s (for L3: TO-247)		6000cy (TO-247)					0/77	

6 ANNEXES

6.1 Tests description

Test name	Description	Purpose
Die-oriented		
HTRB High Temperature Reverse 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	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.
Package-oriented		
THB Temperature Humidity 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.
DPA Destructive Physical Analysis	Specific construction analysis on random parts that have successfully completed THB or TC.	To investigate on reliability stresses impact on delamination, corrosion and product construction integrity.
PCT Pressure Cooker Test (Autoclave)	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 of +85°C (+15°C, -5°C), 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.