PRODUCT/PROCESS CHANGE NOTIFICATION

PCN IPD-DIS/12/7253
Notification Date 05/07/2012

IPD - ASD & IPAD Division

Power Rectifiers in TO-220FPAB packages

Additional Assembly and Test Location in China

Table 1. Change Implementation Schedule

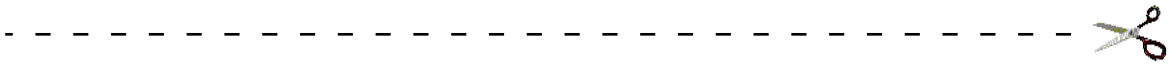
Forecasted implementation date for change	30-Apr-2012
Forecasted availabillity date of samples for customer	30-Apr-2012
Forecasted date for **STMicroelectronics** change Qualification Plan results availability	30-Apr-2012
Estimated date of changed product first shipment	06-Aug-2012

Table 2. Change Identification

Product Identification (Product Family/Commercial Product)	Power Rectifiers in TO-220FPAB package
Type of change	Assembly additional location
Reason for change	to better meet the market demand
Description of the change	Further to PCN APM-DIS/09/5170 announcing the qualification of an additional assembly and test location in China for selected Power Schottky Rectifiers, ST is announcing the extension of this additional assembly and test location to all its Power Rectifiers in TO-220FPAB.
Product Line(s) and/or Part Number(s)	See attached
Description of the Qualification Plan	See attached
Change Product Identification	marking, plant code, internal codification, QA number
Manufacturing Location(s)	

Table 3. List of Attachments

Customer Part numbers list	
Qualification Plan results	



Customer Acknowledgement of Receipt	**PCN IPD-DIS/12/7253**
Please sign and return to STMicroelectronics Sales Office	**Notification Date 05/07/2012**

☐ Qualification Plan Denied	Name:
☐ Qualification Plan Approved	Title:
	Company:
☐ Change Denied	Date:
☐ Change Approved	Signature:

Remark

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DOCUMENT APPROVAL

Name	Function
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Cazaubon, Guy	Division Q.A. Manager

PRODUCT/PROCESS
CHANGE NOTIFICATION

PCN IPD-DIS/12/7253

IPD - ASD & IPAD Division[1]

Power Rectifiers in TO-220FPAB packages:

Additional Assembly and Test Location in China

TO-220FPAB

(1) IPD: Industrial, Power & Discretes - ASD: Application Specific Device - IPAD: Integrated Passive and Active Devices

WHY THIS CHANGE?

Further to PCN APM-DIS/09/5170 announcing the qualification of an additional assembly and test location in China for selected Power Schottky Rectifiers, ST is announcing the extension of **this additional assembly and test location** to **all its Power Rectifiers** in **TO-220FPAB**.

This manufacturing extension was decided to better meet the market demand with an expansion of **our manufacturing capacities** for all **Power Rectifiers** housed in **TO-220FPAB packages** (3 leads).

Multi-sourcing	Current	New
Assembly & test location	CHINA (ST plants)	CHINA (ST plants) CHINA (subcontractor)

The **product series** involved in this production extension are listed below.

Product sub-Family	TO-220FPAB series
Power Schottky	STPSxxxCFP STPSxxHxxCFP STPSxxLxxCFP STPSxxMxxCFP STPSxxMxxSFP STPSxxSMxxCFP STPSxxSMxxSFP STPSxxSxxCFP
Ultrafast Rectifiers	STTHxxxCFP STTHxxxSFP STTHxxLCDxxCFP STTHxxLxxCFP STTHxxRxxCFP

Specific devices not expressly listed in the above table are included in this change. Devices intended for the automotive market are exempt of this capacity extension.

WHAT IS THE CHANGE?

The additional assembly and test plant is located in **China**. The assembly **Bill Of Material** status is summarized in the table below.

Material	TO-220FPAB series	
	Current (ST China plants)	New (China Subcontractor)
Lead Frame	Copper	
Die Attach	Soft solder	
Wire Bonding	Aluminum	
Moulding Compound	ECOPACK®2 grade	ECOPACK®2 grade
Lead Finish	Matte Sn	

There is no **impact** on the **electrical**, **thermal** and **dimensional** parameters, which results in **unchanged** current information published in the product datasheets. All verifications are included in the qualification program.

There is **no change** in the **packing mode** and in the standard **delivery quantities** either.

HOW AND WHEN?

Qualification and test results:

The **reliability test plan** supporting the qualification program for the implemented changes is **annexed** to the present document. The production ramp-up will be monitored with a **pre-launch control plan** implemented on selected parameters.

The **reliability test report** of the qualification program is annexed to the present document.

Sampling:

Samples of devices produced in the subcontractor plant will be available on request with approximate lead time of **30 days** depending on the die availability for each device.

Change implementation schedule:

The **production start** and **first shipments** will be implemented according to our work in progress and materials availability as indicated in the schedule below:

Salestypes	Production Start	1st Shipments
ALL	From **week 18-2012**	From **week 31-2012**

Absence of acknowledgement of this PCN within **30 days** of receipt will constitute acceptance of the change. After an acknowledgement, unless otherwise previously agreed to in writing for a specific process change requirement or for device specific requirements, absence of additional response within **90 days** of receipt of this PCN will constitute acceptance of the change. **Shipments** may in any case start earlier with the customer's **written agreement**.

Marking and Traceability:

Parts produced in China are differentiated by their **marking** as indicated below:

Assembly location	Date code marking			
	Diffusion plant code	Assy location code	Back end code	Date code
China (ST)	VU (France) VW (Singapore)	**CHN**	**GK**	y = 1 digit indicating the year ww = 2 digits indicating the week number
China (subco)			**GE**	

Please note that the marking of the ECOPACK®2 devices includes the **letter "G"** printed to the right of the "e3" symbol of the IPC-JEDEC J-STD 609 standard.

Traceability for the implemented change is ensured by the **plant code**, by an **internal codification** and by the **Q.A. number**.

Annex: Reliability Report **12093QRP-Rev1** for qualification program

Reliability Report

Qualification of additional Assembly & Test site in China for Power Rectifiers in TO-220FPAB package

General Information	
Product Line	*Rectifiers (BU78)*
Product Description	*Power Schottky and Ultrafast rectifiers*
Product Group	*APM*
Product division	*ASD & IPAD*
Package	*TO-220FPAB*
Maturity level step	*Qualified*

Locations	
Wafer fab	*ST Singapore* *ST Tours (France)*
Assembly plant	*Subcontractor China*
Reliability Lab	*ST Tours (France)*
Reliability assessment	*PASS*

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comment
Rev.1	23-Apr-2012	10	Isabelle Ballon	J.P. Rebrasse	PCN IPD-DIS/12/7253

TABLE OF CONTENTS

1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
JESD47	Stress-Test-Driven Qualification of Integrated Circuits
RER	1039009 / 0940005

2 GLOSSARY

SS	Sample Size
PC	Preconditioning
HTRB	High Temperature Reverse Bias
THB	Temperature Humidity Bias
TC	Temperature Cycling
IOLT	Intermittent Operating Life Test
RSH	Resistance to solder Heat
SD	Solderability
	Screwing

3 RELIABILITY EVALUATION OVERVIEW

3.1 Objectives

The objective of this report is to qualify additional assembly and test location in china for Power rectifiers housed in TO-220FPAB package.

The product series involved in this production extension and qualification are listed below.

Product sub-Family	TO-220FPAB series
Power Schottky	STPSxxxCFP STPSxxHxxCFP STPSxxLxxCFP STPSxxMxxCFP STPSxxMxxSFP STPSxxSMxxCFP STPSxxSMxxSFP STPSxxSxxCFP
Ultrafast Rectifiers	STTHxxxCFP STTHxxxSFP STTHxxLCDxxCFP STTHxxLxxCFP STTHxxRxxCFP

Specific devices not expressly listed in the above table are included in this change.

In order to guarantee the product perimeter reliability, corner test vehicles in the table below have been carefully selected following AEC-Q101 recommendation on generic data.

Test vehicles	Description	Package
Specific product STPS20H100CFP	Power Schottky	TO-220FPAB
STTH16R04CFP	Turboswitch	
STTH2002CFP STTH2003CFP	Ultrafast bipolar	

The reliability test methodology used follows the JESD47-F: « Stress Test Driven Qualification Methodology ».
The following reliability tests ensuing are:

- TC, RSH 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.
- THB to check the robustness to corrosion and the good package hermeticity.
- Solderability to check the ability of the component to be successfully soldered to the next level assembly using tin lead eutectic solder

3.2 Conclusion

ST ensures that the product has successfully completed the reliability plan. It is stressed that 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 ruggedness of the products and safe operation, which is consequently expected during their lifetime.

4 DEVICE CHARACTERISTICS

4.1 Device description

Power rectifiers housed in TO-220FPAB (3 leads) package.

4.2 Construction note

	Power Rectifiers
Wafer/Die fab. information	
Wafer fab manufacturing location	ST Singapore – ST Tours (France)
Technology	Power Rectifiers
Die finishing back side	Ti-Ni-Au
Bond pad metallization layers	Al
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST Singapore – ST Tours (France)
Assembly information	
Assembly site	Subcontractor China
Package description	TO-220FPAB
Molding compound	**ECOPACK®2** ("Halogen-free") molding compound
Frame material	Copper
Die attach process	Soft solder
Die attach material	Preform Pb/Sn/Ag
Wire bonding process	Ultra Sonic wire bonding
Wires bonding materials/diameters	Aluminum
Lead finishing process	Matte Tin (Sn)
Final testing information	
Testing location	Subcontractor China

5 TESTS RESULTS SUMMARY

5.1 Test vehicle

Lot #		Package	Product Line	Comments
L1	RER0940005L1	TO-220FPAB	STTH2002CFP	Bipolar 200V
L2	RER0940005L2		STTH16R04CFP	Bipolar 400V
L3	RER0940005L3		Specific product	Power Schottky 150V
L4	RER1039009L1		STTH2003CFP	Bipolar 300V
L5	RER1039009L2		STPS20H100CFP	Power Schottky 100V

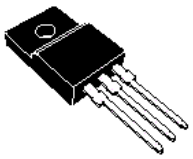
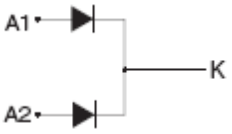
Detailed results in below chapter will refer to P/N and Lot #

5.2 Test plan and results summary

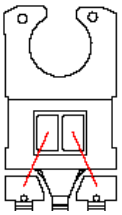
Test	PC	Std ref.	Conditions	SS	Steps	Failure/SS				
						Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
HTRB	N	JESD22A-108	Tj = 150°C, V = 0.8 VRRM	231	168 H	0/77	0/77	0/77		
					500 H	0/77	0/77	0/77		
					1000 H	0/77	0/77	0/77		
Screwing	N	ST 0019334	15 Kg cm	30	Electrical Measure after test	0/10	0/10	0/10		
RSH	N	JESD22B-106	260°C 10s ON 15s OFF	12	Electrical Measure after test			0/12		
TC	N	JESD22A-104	-65°C/+150°C	75	100cy	0/25	0/25	0/25	0/77	0/77
					500cy	0/25	0/25	0/25	0/77	0/77
IOLT	N	MIL-STD 750 Method 1037	IF for ΔT_C=85°C	75	4286cy	0/24	0/25	0/25		0/75
					8572cy	0/24	0/25	0/25		0/75
THB	N	JESD22A-101	Ta = 85°C, RH = 85%, BIAS	75	168 H	0/25	0/25	0/25		
					500 H	0/25	0/25	0/25		
					1000 H	0/25	0/25	0/25		
SD	N	J-STD-002	245°C SnAgCu 220°C SnPb	40 40	Electrical Measure after test	0/20 0/20	0/20 0/20	0/15 0/15		

6 ANNEXES

6.1 Pin connection

Package	Pin connection
TO220-FPAB	***TO-220FPAB***  

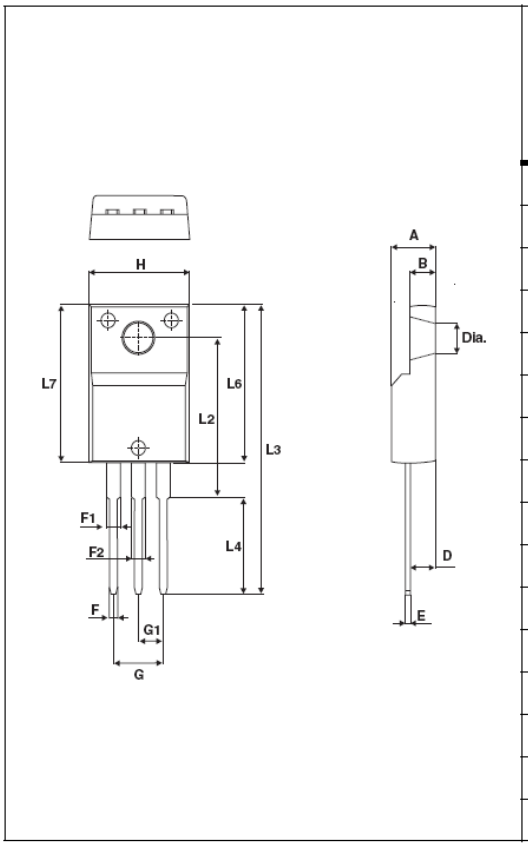
6.2 Bonding diagram

Package	Bonding diagrams
TO-220FPAB	

Note : Generic scheme (die / wire bonding sizes and die design given as example)

6.3 Package outline/Mechanical data

TO-220FPAB



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.4	4.9	0.173	0.192
B	2.5	2.9	0.098	0.114
D	2.45	2.75	0.096	0.108
E	0.4	0.7	0.016	0.028
F	0.6	1	0.024	0.039
F1	1.15	1.7	0.045	0.067
F2	1.15	1.7	0.045	0.067
G	4.95	5.2	0.195	0.205
G1	2.4	2.7	0.094	0.106
H	10	10.7	0.394	0.421
L2	16 Typ.		0.630 Typ.	
L3	28.6	30.6	1.126	1.205
L4	9.8	10.7	0.386	0.421
L6	15.8	16.4	0.622	0.646
L7	9	9.9	0.354	0.390
Dia.	2.9	3.5	0.114	0.138

6.4 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.
IOLT	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 (delta is the high minus the low mounting surface temperatures) of +85°C (+60°C for thyristors) +15°C, -5°C, followed by an off period, when the power is suddenly removed, for cooling the case through a similar delta temperature. Auxiliary (forced) cooling is permitted during the off period only. Heat sinks are not intended to be used in this test, however, small heat sinks may be used when it is otherwise difficult to control case temperature of test samples, such as with small package types (e.g., TO39).	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.
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.
RSH	The device is submitted to a dipping in a solder bath at 260°C with a dwell time of 10s. Only for through hole mounted devices.	This test is used to determine whether solid state devices can withstand the effects of the temperature to which they will be subjected during soldering of their leads. The heat is conducted through the leads into the device package from solder heat at the reverse side of the board. This procedure does not simulate wave soldering or reflow heat exposure on the same side of the board as the package body.

Test name	Description	Purpose
SD	The device is aged in a wet and dry bath of solder. A preconditioning test is included in this test method, which degrades the termination finish to provide a guard band against marginal finish. .	To 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

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