



# PRODUCT/PROCESS CHANGE NOTIFICATION

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PCN IPG-DIS/14/8468  
Dated 06 May 2014

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## Power Rectifiers

**Additional Assembly and Test Location in China for DPAK package**

**Table 1. Change Implementation Schedule**

|  |             |
|--|-------------|
| Forecasted implementation date for change  | 29-Apr-2014 |
| Forecasted availability date of samples for customer   | 31-May-2014 |
| Forecasted date for <b>STMicroelectronics</b> change Qualification Plan results availability | 29-Apr-2014 |
| Estimated date of changed product first shipment   | 05-Aug-2014 |

**Table 2. Change Identification**

|   |  |
|---|--|
| Product Identification<br>(Product Family/Commercial Product) | Power Rectifiers in DPAK package             |
| Type of change  | Assembly additional location                 |
| Reason for change   | to increase the manufacturing capacity       |
| Description of the change                                     | see attached                                 |
| Change Product Identification                                 | marking, internal codification and QA number |
| Manufacturing Location(s)                                     |  |



## DOCUMENT APPROVAL

| Name           | Function          |
|----------------|-------------------|
| Paris, Eric    | Marketing Manager |
| Duclos, Franck | Product Manager   |
| Cazaubon, Guy  | Q.A. Manager      |

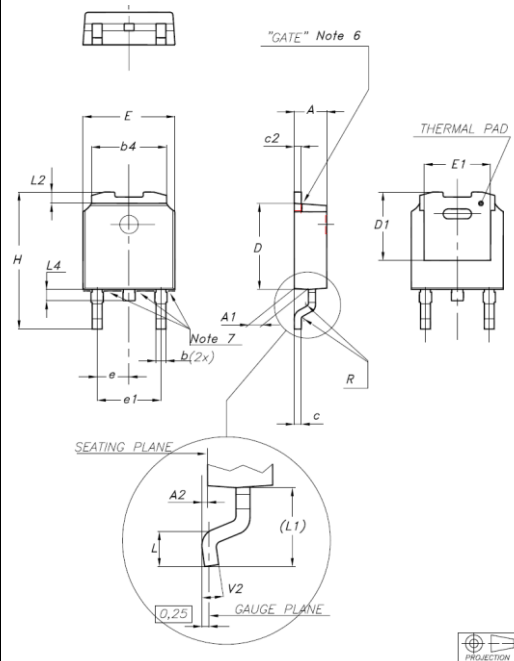
| <b>PCN</b><br><b>Product/Process Change Notification</b>  |                 |   |            |
|---|-----------------|---|------------|
| <b>Power Rectifiers</b><br><b>Additional Assembly and Test Location in China for DPAK package</b> |                 |   |            |
| <b>Notification number:</b>   | IPG-DIS/14/8468 | <b>Issue Date</b>   | 29/04/2014 |
| <b>Issued by</b>  | Aline AUGIS     |   |            |
| <b>Product series affected by the change</b>  |                 | <p><b><u>Power Schottky Diodes</u></b></p> <p>STPS10170CB-TR<br/>           STPS1045B<br/>           STPS1045B-TR<br/>           STPS10LCD200CBTR<br/>           STPS10LCD80CB-TR<br/>           STPS1545CB-TR<br/>           STPS15H100CB<br/>           STPS15L30CB<br/>           STPS15L30CB-TR<br/>           STPS15L45CB<br/>           STPS15L45CB-TR<br/>           STPS15L60CB<br/>           STPS15L60CB-TR<br/>           STPS16170CB-TR<br/>           STPS20120CB-TR<br/>           STPS20LCD200CBTR<br/>           STPS340B-TR<br/>           STPS4S200B-TR<br/>           STPS5H100B<br/>           STPS5L25B-TR<br/>           STPS640CB<br/>           STPS640CB-TR<br/>           STPS660CB-TR<br/>           STPS8L30B<br/>           STPS8L30B-TR</p> <p><b><u>Ultrafast Diodes</u></b></p> <p>STTH1002CB<br/>           STTH1002CB-TR<br/>           STTH1004SB-TR<br/>           STTH10P04SB-TR<br/>           STTH25MC065B-TR<br/>           STTH312B-TR<br/>           STTH4R02B-TR<br/>           STTH506B<br/>           STTH512B-TR<br/>           STTH5L06B-TR<br/>           STTH5MC065B<br/>           STTH5R06B<br/>           STTH802B-TR<br/>           STTH802CB-TR<br/>           STTH8S06B-TR</p> |            |

(1) IPG: Industrial & Power Group - ASD: Application Specific Device – IPAD™: Integrated Passive and Active Devices

|                |                                      |
|----------------|--------------------------------------|
| Type of change | Additional assembly package location |
|----------------|--------------------------------------|

**Description of the change**

STMicroelectronics decided to **expand the manufacturing capacity Power Rectifiers** (Power Schottky and Ultrafast Diodes) housed in **DBPAK package** with one **additional assembly and test plant** in China.  
 In order to cover both manufacturing locations DBPAK package outline dimensions, the package dimension table of the impacted products will be updated as below:



| NEW DBPAK dimensions | Column1         | Column2 |
|----------------------|-----------------|---------|
|                      | Dimensions (mm) |         |
|                      | Min.            | Max.    |
| <b>A</b>             | 2.18            | 2.4     |
| <b>A1</b>            | 0.9             | 1.1     |
| <b>A2</b>            | 0.03            | 0.23    |
| <b>b</b>             | 0.64            | 0.9     |
| <b>b4</b>            | 4.95            | 5.46    |
| <b>c</b>             | 0.46            | 0.61    |
| <b>c2</b>            | 0.46            | 0.6     |
| <b>D</b>             | 5.97            | 6.22    |
| <b>D1</b>            | 5.1             |         |
| <b>E</b>             | 6.35            | 6.73    |
| <b>E1</b>            | 4.32            |         |
| <b>e1</b>            | 4.4             | 4.7     |
| <b>H</b>             | 9.35            | 10.4    |
| <b>L</b>             | 1               | 1.78    |
| <b>L2</b>            |                 | 1.27    |
| <b>L4</b>            | 0.6             | 1.02    |
| <b>V2</b>            | 0°              | 8°      |

**Reason for change**

This additional multi-sourcing will increase our **manufacturing capacity** for a better service on the considered **Power Rectifier** devices.

**Former versus changed product:**

The changed products do not present modified electrical, 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.

**Disposition of former products**

As the purpose is to expand the manufacturing capacity, shipments of the products processed in the initial test and assembly site will continue.

(1) IPG: Industrial & Power Group - ASD: Application Specific Device – IPAD™: Integrated Passive and Active Devices

**Marking and traceability**

Parts produced in the new China location are differentiated by their **marking** as indicated below

| Assembly location                         | Assy plant code | Date code marking               |  |
|---|-----------------|---------------------------------|--|
|   |                 | Assy year                       | Assy week                                |
| China 1 (ST)                              | GK              | Y (1 digit indicating the year) | WW (2 digits indicating the week number) |
| <b>New location :<br/>China 2 (subco)</b> | <b>GE</b>       |                                 |  |

**Traceability** for the implemented change will be ensured by an **internal codification** and by the **Q.A. number**.

**Qualification complete date**

27-Nov-2012

**Forecasted sample availability**

| Product family      | Sub-family | Commercial part Number | Availability date                            |
|---------------------|------------|------------------------|--|
| Diodes & Rectifiers | All        | All                    | Upon request with from 4 to 8 weeks of delay |

**Change implementation schedule**

| Sales types | Estimated production start | Estimated first shipments |
|-------------|----------------------------|---------------------------|
| All         | Week 10 - 2014             | Week 31 - 2014            |

**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 90 days of receipt of this PCN will constitute acceptance of the change

**Qualification program and results**

QRP11259QRP

**Qualification of  
ECOPACK®2 resin for Rectifiers products  
in DPAK package**

| General Information        |  |
|----------------------------|--|
| <b>Product Line</b>        | Rectifiers                                     |
| <b>Product Description</b> | Rectifiers in DPAK package:<br>ECOPACK®2 resin |
| <b>Product Group</b>       | APM  |
| <b>Product division</b>    | ASD & IPAD                                     |
| <b>Package</b>             | DPAK   |
| <b>Maturity level step</b> | Qualified                                      |

| Locations              |  |
|------------------------|--|
| <b>Wafer fab</b>       | STM Tours (France)<br>STM Singapore            |
| <b>Assembly plant</b>  | STM Long Gang (China)<br>Subcontractor (China) |
| <b>Reliability Lab</b> | STM Tours (France)                             |

**DOCUMENT INFORMATION**

| Version | Date        | Pages | Prepared by | Comment  |
|---------|-------------|-------|-------------|--|
| 1.0     | 21-Nov-2011 | 8     | I. BALLON   | First issue<br>Qualification of Rectifiers products in DPAK package<br>at STM Long Gang: ECOPACK®2 resin |
| 2.0     | 03-Dec-2012 | 9     |             | Qualification of DPAK package at subcontractor in<br>China: ECOPACK®2 resin                              |

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  |
|--------------------|--|
| JESD47             | Stress-Test-Driven Qualification of Integrated Circuits            |
| FMEA               | 8315678 - 8320100  |
| RER                | 1126008 (ST Long Gang in China) – 1126011 (subcontractor in China) |

## 2 GLOSSARY

|      |                                     |
|------|-------------------------------------|
| DUT  | Device Under Test                   |
| PCB  | Printed Circuit Board               |
| SS   | Sample Size                         |
| HTRB | High Temperature Reverse Bias       |
| TC   | Temperature Cycling                 |
| PCT  | Pressure Cooker Test (Pressure Pot) |
| THB  | Temperature Humidity Bias           |
| SD   | Solderability                       |

## 3 RELIABILITY EVALUATION OVERVIEW

### 3.1 Objectives

The objective of this report is to qualify “Halogen-Free” encapsulation molding compound for Rectifiers housed in DPAK package at ST Long Gang (China) and subcontractor in China.

The product series are listed below.

| Product sub-Family           | DPAK series   |
|------------------------------|---|
| <b>Power Schottky Diodes</b> | STPSxxxB(-TR)<br>STPSxxxCB(-TR)<br>STPSxxHxxB(-TR)<br>STPSxxHxxCB(-TR)<br>STPSxxLxxB(-TR)<br>STPSxxLxxCB(-TR)                     |
| <b>Ultrafast Diodes</b>      | STTHxxxB(-TR)<br>STTHxxxCB(-TR)<br>STTHxxxSB(-TR)<br>STTHxxLCDxxSB(-TR)<br>STTHxxPxxSB(-TR)<br>STTHxxRxxB(-TR)<br>STTHxxSxxB(-TR) |

The reliability methodology used in this qualification follows the JESD47-G: «Stress Test Driven Qualification Methodology».

### 3.2 Conclusion

The perimeter addressed in this campaign qualifies the production of Rectifiers housed in DPAK package at ST Long Gang (China) and subcontractor in China with the “Halogen-Free” encapsulation molding compound. Reliability tests are positive.

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 Device description

- Rectifiers in DPAK package with ECOPACK®2 Molding compound assembled at ST Long Gang (China) plant and subcontractor plant in China.

### 4.2 Construction note

| <b>Rectifiers in DPAK package<br/>with new ECOPACK®2 Molding compound</b> |  |
|---|--|
| <b>Wafer/Die fab. information</b>   |  |
| Wafer fab manufacturing location  | STM Singapore<br>STM Tours (France)                |
| <b>Wafer Testing (EWS) information</b>                                    |  |
| Electrical testing manufacturing location                                 | STM Singapore<br>STM Tours (France)                |
| <b>Assembly information</b>   |  |
| Assembly site   | STM Long Gang (China)<br>Subcontractor in China    |
| Package description   | DPAK   |
| Molding compound  | <b>ECOPACK®2</b> (“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   | Aluminium  |
| Lead finishing process  | Plating  |
| Lead finishing material   | Tin (Sn 100%)                                      |
| <b>Final testing information</b>  |  |
| Testing location  | STM Long Gang (China)<br>Subcontractor in China    |

## 5 TESTS RESULTS SUMMARY

### 5.1 Test vehicles

| Lot #   | Process/ Package   | Assembly plant        | Product Family | Product      |
|---------|--------------------|-----------------------|----------------|--------------|
| 1       | DPAK               | ST China              | Power Schottky | STPS15H100CB |
| 2       |                    |                       | TurboSwitch    | STTH512B     |
| 3       |                    |                       | Power Schottky | STPS15H100CB |
| 4       |                    |                       | TurboSwitch    | STTH5R06B    |
| 5       | D <sup>2</sup> PAK |                       | Power Schottky | STPS3045CG   |
| 6       |                    |                       | Power Schottky | STPS30170CG  |
| 7       |                    |                       | Ultrafast      | STTH2004SG   |
| 8       |                    |                       | Power Schottky | STPS41H100CG |
| 9       | DPAK               |                       | TurboSwitch    | STTH512B     |
| 10      |                    |                       | Power Schottky | STPS15H100CB |
| 11 / 15 | DPAK               | Subcontractor (China) | Power Schottky | STPS15L45CB  |
| 12 / 16 |                    |                       |                | STPS15H100CB |
| 13 / 17 |                    |                       | Ultrafast      | STTH512B     |
| 14 / 18 |                    |                       |                | STTH5R06B    |

### 5.2 Test plan and results summary

#### Die Oriented Tests

| Test | PC | Std ref.     | Conditions   | SS  | Steps  | Failure/SS   |        |        |        | Note |
|------|----|--------------|--|-----|--------|--------------|--------|--------|--------|------|
|      |    |              |  |     |        | Lots 5 to 10 | Lot 12 | Lot 13 | Lot 14 |      |
| HTRB | N  | JESD22 A-108 | T <sub>j</sub> , V <sub>r</sub> = 0.8xV <sub>rrm</sub> | 691 | 168 H  | 0/77         | 0/76   | 0/76   | 0/77   |      |
|      |    |              |  |     | 500 H  | 0/77         | 0/76   | 0/76   | 0/77   |      |
|      |    |              |  |     | 1000 H | 0/77         | 0/76   | 0/76   | 0/77   |      |

#### Package Oriented Tests

| Test   | PC     | Std ref.     | Conditions   | SS   | Steps  | Failure/SS |            |        |        | Note   |      |
|--------|--------|--------------|--|------|--------|------------|------------|--------|--------|--------|------|
|        |        |              |  |      |        | Lot 1      | Lot 2      | Lot 11 | Lot 13 |        |      |
| THB    | Y      | JESD22 A-101 | T <sub>a</sub> = 85°C, RH = 85%, V <sub>r</sub> = 0.8xV <sub>rrm</sub> or 100V max | 198  | 168 H  | 0/25       | 0/77       | 0/24   | 0/24   |        |      |
|        |        |              |  |      | 500 H  | 0/25       | 0/77       | 0/24   | 0/24   |        |      |
|        |        |              |  |      | 1000 H | 0/25       | 0/77       | 0/24   | 0/24   |        |      |
| TC     | Y      | JESD22 A-104 | T <sub>a</sub> = -55°C to 150°C  | 227  | SS     | Steps      | Failure/SS |        |        |        | Note |
|        |        |              |  |      |        |            | Lot 3      | Lot 4  | Lot 11 | Lot 12 |      |
|        |        |              |  |      | 100 cy | 0/25       | 0/25       | 0/25   | 0/25   | 0/25   |      |
|        |        |              |  |      | 500 cy | 0/25       | 0/25       | 0/25   | 0/25   | 0/25   |      |
|        |        |              |  |      | Steps  | Failure/SS |            |        |        |        |      |
| Lot 15 | Lot 16 | Lot 17       | Lot 18   |      |        |            |            |        |        |        |      |
| 100 cy | 0/28   | 0/26         | 0/23   | 0/25 |        |            |            |        |        |        |      |
| 500 cy | 0/28   | 0/26         | 0/23   | 0/25 |        |            |            |        |        |        |      |



| Test | PC | Std ref.     | Conditions            | SS  | Steps | Failure/SS |        |        |        |        | Note |
|------|----|--------------|-----------------------|-----|-------|------------|--------|--------|--------|--------|------|
|      |    |              |                       |     |       | Lot 1      | Lot 2  | Lot 11 | Lot 12 | Lot 14 |      |
| PCT  | Y  | JESD22 A-102 | 121°C, 100% RH, 2bars | 276 | 96hrs | 0/24       | 0/77   | 0/25   | 0/25   | 0/25   |      |
|      |    |              |                       |     | Steps | Failure/SS |        |        |        |        |      |
|      |    |              |                       |     |       | Lot 15     | Lot 16 | Lot 17 | Lot 18 |        |      |
|      |    |              |                       |     | 96hrs | 0/25       | 0/25   | 0/25   | 0/25   |        |      |

| Test          | PC | Std ref.  | Conditions                  | SS | Steps | Failure/SS |       |        |        |        | Note |
|---------------|----|-----------|-----------------------------|----|-------|------------|-------|--------|--------|--------|------|
|               |    |           |                             |    |       | Lot 1      | Lot 2 | Lot 11 | Lot 12 | Lot 14 |      |
| Solderability | N  | J-STD-002 | 245°C SnAgCu bath Dry aging | 50 |       | 0/10       | 0/10  | 0/10   | 0/10   | 0/10   |      |
|               |    |           | 245°C SnAgCu bath Wet aging | 50 |       | 0/10       | 0/10  | 0/10   | 0/10   | 0/10   |      |
|               |    |           |                             | SS | Steps | Failure/SS |       |        |        |        |      |
|               |    |           |                             |    |       | Lot 1      | Lot 2 | Lot 11 | Lot 12 | Lot 14 |      |
|               |    |           | 220°C SnPb bath Dry aging   | 50 |       | 0/10       | 0/10  | 0/10   | 0/10   | 0/10   |      |
|               |    |           | 220°C SnPb bath Wet aging   | 50 |       | 0/10       | 0/10  | 0/10   | 0/10   |        |      |

## 6 ANNEXES

### 6.1 Device details

#### 6.1.1 Pin connection and bonding diagram

| Package | Pin connection   |  |   |
|---------|--|--|---|
|         | For Single diode configuration<br>STPSxxxxB<br>STTHxxxxB | For Single diode configuration<br>STPSxxxxSB<br>STTHxxxxSB | For Double diodes configuration<br>STPSxxxxCB<br>STTHxxxxCB |
| DPAK    |  |  |   |
|         |  |  |   |
|         |  |  |   |

## 6.2 Package outline/Mechanical data

### DPAK dimensions

| Ref. | Dimensions  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 2.18        | 2.39  | 0.085  | 0.94  |
| A1   | 0.90        | 1.10  | 0.035  | 0.043 |
| A2   | 0.03        | 0.23  | 0.001  | 0.009 |
| B    | 0.64        | 0.89  | 0.025  | 0.035 |
| B2   | 4.95        | 5.46  | 0.194  | 0.214 |
| C    | 0.46        | 0.61  | 0.018  | 0.024 |
| C2   | 0.46        | 0.60  | 0.018  | 0.023 |
| D    | 5.97        | 6.22  | 0.235  | 0.244 |
| D1   | 5.0         |       | 0.196  |       |
| E    | 6.35        | 6.73  | 0.25   | 0.264 |
| E1   | 4.32        |       | 0.170  |       |
| e1   | 4.40        | 4.7   | 0.173  | 0.185 |
| H    | 9.35        | 10.34 | 0.368  | 0.407 |
| L    | 1.0         | 1.78  | 0.039  | 0.070 |
| L2   |             | 1.27  |        | 0.05  |
| L4   |             | 1.01  |        | 0.039 |

### 6.3 Tests description

| Test name  | Description  | Purpose  |
|--|--|--|
| <b>Die Oriented</b>  |  |  |
| <b>HTRB</b><br>High Temperature Reverse Bias<br><br><b>HTFB / HTGB</b><br>High Temperature Forward (Gate) Bias | The device is stressed in static configuration, trying to satisfy as much as possible the following conditions:<br>low power dissipation;<br>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.<br>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. |
| <b>Package Oriented</b>  |  |  |
| <b>TC</b><br>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.  |
| <b>THB</b><br>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.   |
| <b>AC/PCT</b><br>Auto Clave (Pressure Pot)   | 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.  |



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