# PRODUCT/PROCESS CHANGE NOTIFICATION

PCN IPD-DIS/12/7461
Dated 04 Sep 2012

**IPD - ASD & IPAD Division**

**Rectifiers in I2PAK & TO-220 packages**

**New ECOPACK2 molding compound & electroplating generalization**

**Table 1. Change Implementation Schedule**

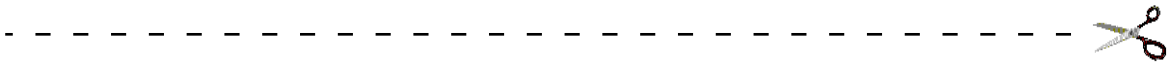
| | |
|---|---|
| Forecasted implementation date for change | 16-Nov-2012 |
| Forecasted availability date of samples for customer | 28-Aug-2012 |
| Forecasted date for **STMicroelectronics** change Qualification Plan results availability | 28-Aug-2012 |
| Estimated date of changed product first shipment | 04-Dec-2012 |

**Table 2. Change Identification**

| | |
|---|---|
| Product Identification (Product Family/Commercial Product) | See product series listed in PCN document |
| Type of change | Package assembly material change |
| Reason for change | Standardization of our assembly processes |
| Description of the change | The purpose of this document is to announce the qualification of the Cheil SG-8200DT molding compound and the generalization of the electroplating technique for all production sites of our Power Rectifiers in I2PAK and TO-220AB/AC (including narrow leads) packages. |
| Change Product Identification | Traceability is ensured by date code and QA number |
| Manufacturing Location(s) | |

**Table 3. List of Attachments**

| | |
|---|---|
| Customer Part numbers list | |
| Qualification Plan results | |



| Customer Acknowledgement of Receipt | **PCN IPD-DIS/12/7461** |
|---|---|
| Please sign and return to STMicroelectronics Sales Office | **Dated 04 Sep 2012** |

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

Remark

.....

.....

.....

.....

.....

.....

.....

.....

# DOCUMENT APPROVAL

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

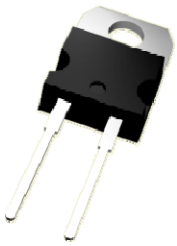
**PRODUCT/PROCESS**
CHANGE NOTIFICATION

PCN IPD-DIS/12/7461

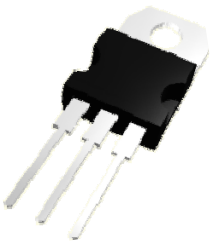
# IPD - ASD & IPAD Division[1]

## Rectifiers in I²PAK & TO-220 packages:

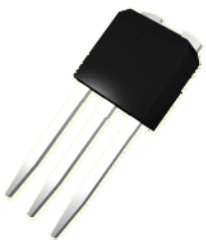
## New ECOPACK®2 molding compound & electroplating generalization



**TO-220AC**



**TO-220AB(NL)**



**I²PAK**

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

## WHY THIS CHANGE?

The purpose of this document is to announce the qualification of the Cheil SG-8200DT **molding compound** and the generalization of the **electroplating technique** for all production sites of our **Power Rectifiers** in **I²PAK** and **TO-220AB/AC** (including narrow leads) packages.

The SG-8200DT molding compound is **widely used** in several plants for **other power ST devices in TO-220AB/TO-247 packages** and with the **generalization of the electroplating** technique, these changes constitute one step forward towards the **standardization** of our assembly processes.

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

| Product Sub-Family | Product Series | Package |
|---|---|---|
| **Power Schottky Rectifiers** | STPSxxxCR | I²PAK |
| | STPSxxxSR | |
| | STPSxxxCT(N) | TO-220AB(NL) |
| | STPSxxxST(N) | |
| | STPSxxxD | TO-220AC |
| **SiC Rectifiers** | STPSCxxxD | TO-220AC |
| **Ultrafast Rectifiers** | STTHxxxCR | I²PAK |
| | STTHxxxSR | |
| | STTHxxxD | TO-220AC |
| | STPSxxxR | I²PAK |
| | STTHxxxCT | TO-220AB |
| | STTHxxxST | |

**Specific devices** not expressly listed in the above table are included in these changes. Devices intended for the **automotive market** are also affected by these changes.

## WHAT IS THE CHANGE?

The use of the SG-8200DT molding compound has **no impact** on the **electrical**, **dimensional** and **thermal** parameters, maintaining **unchanged** current information published on the relevant datasheets. The verification is included in the **qualification program**. The involved production sites are located in China, Morocco and Philippines.

While the **electroplating technique** is already implemented for all parts in I²PAK package and for parts in TO-220 packages produced in our Long Gang site, it will be fully extended to the TO-220 production in our Shenzhen site, consequently leading to the **generalization of the plating technique** and to the **discontinuation of the dipping process** for such packages.

The devices produced with the new molding compound comply with the **RoHS*** directive by their **ECOPACK®2** (“halogen-free”) grade and also comply with the **UL 94 V-0** standard.

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

*(*) Restriction of the use of certain Hazardous Substances according to European Directive 2002/95/CE.*

## HOW AND WHEN?

Qualification and test results:

The **reliability test plan** supporting the qualification program for the announced changes was defined according to the **AEC Q101 standard**. The **reliability test report** of the qualification program is annexed to the present document.

The production ramp-up will be monitored with a **pre-launch control plan** implemented on selected parameters.

Sampling:

**Samples** of selected devices, including the test vehicles, are available now for customer qualification if ordered within **30 days** from notification, while the availability of other samples will be granted from production start, upon request.

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 46-2012** | From **week 49-2012** |

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 assembled with the SG-8200DT molding compound have the **same marking** as parts produced with the current ECOPACK®2 molding compound. The **traceability** of the molding compound will be ensured by the **date code** and by the **Q.A. number**.

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.

Annex: reliability report for qualification program

- Reliability report **12162QRP-Rev1.0** for Power Rectifiers.

# *Qualification of*
# New ECOPACK®2 molding compound & electroplating generalization for Rectifiers products in I²PAK & TO-220 *packages*

| General Information | |
|---|---|
| **Product Line** | Rectifiers (BU78) |
| **Product Description** | Rectifiers in I²PAK & TO-220 packages: new ECOPACK®2 molding compound & electroplating generalization |
| **Product Group** | IPD |
| **Product division** | ASD & IPAD |
| **Package** | I²PAK<br>TO-220AB/TO-220AB(NL)<br>TO-220AC |
| **Maturity level step** | Qualified |

| Locations | |
|---|---|
| **Wafer fab** | STM Singapore<br>STM Tours (France)<br>STM Catania (Italy) |
| **Assembly plant** | ST Shenzhen (China)<br>ST Long Gang (China)<br>ST Bouskoura (Morocco)<br>Subcontractor in Philippines |
| **Reliability Lab** | STM Tours (France) |

## DOCUMENT INFORMATION

| Version | Date | Pages | Prepared by | Comment |
|---|---|---|---|---|
| 1.0 | 21-Aug-2012 | 12 | I. BALLON | First issue<br>Qualification of Rectifiers I²PAK & TO-220 packages: New ECOPACK®2 molding compound & electroplating generalization<br><br>(Reference document: Product Change Notification PCN IPD-DIS/12/7461) |

## TABLE OF CONTENTS

# 1 APPLICABLE AND REFERENCE DOCUMENTS

| Document reference | Short description |
|---|---|
| **JESD47** | Stress-Test-Driven Qualification of Integrated Circuits |
| **AEC-Q101** | Stress test qualification for automotive grade discrete semiconductors |
| **FMEA** | 8248329 |
| **RER** | 1141014 |

# 2 GLOSSARY

| | |
|---|---|
| **DUT** | Device Under Test |
| **PCB** | Printed Circuit Board |
| **SS** | Sample Size |
| **HTRB** | High Temperature Reverse Bias |
| **TC** | Temperature Cycling |
| **PCT** | Pressure Pot 2 bars |
| **THB** | Temperature Humidity Bias |
| **IOLT** | Intermittent Operational Life |
| **DPA** | Destructive Physical Analysis. Random sample of devices that have successfully completed THB and TC |
| **RSH** | Resistance to solder Heat |
| **SD** | Solderability |

# 3 RELIABILITY EVALUATION OVERVIEW

## 3.1 Objectives

The objective of this report is to qualify a new ECOPACK®2 **molding compound** (Cheil SG-8200DT) and the generalization of the **electroplating technique** for all production sites of our **Power Rectifiers** in **I²PAK** and **TO-220AB/AC** (including narrow leads) packages.

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

| Product Sub-Family | Product Series | Package |
|---|---|---|
| **Power Schottky Rectifiers** | STPSxxxCR | I²PAK |
| | STPSxxxSR | |
| | STPSxxxCT(N) | TO-220AB(NL) |
| | STPSxxxST(N) | |
| | STPSxxxD | TO-220AC |
| **SiC Rectifiers** | STPSCxxxD | TO-220AC |
| **Ultrafast Rectifiers** | STTHxxxCR | I²PAK |
| | STTHxxxSR | |
| | STTHxxxD | TO-220AC |
| | STPSxxxR | I²PAK |
| | STTHxxxCT | TO-220AB |
| | STTHxxxST | |

Specific devices not expressly listed in the above table are included in this change. Devices intended for the automotive market are included in this molding compound qualification.

According FMEA 8248329, tests vehicles have been chosen covering the full qualification perimeter.
The following reliability tests are:

- HTRB to evaluate the risk of contamination from the resin and the assembly process versus the die layout sensitivity.
- TC, IOLT, RSH to ensure the mechanical robustness of the products.
- THB, AC to check the robustness to corrosion and the good package hermeticity.
- Solderability to evaluate the risk of resin contamination on leads and to ensure electroplating robustness.

The reliability methodology used in this qualification follows the JESD47-H «Stress Test Driven Qualification Methodology» and AEC-Q101 rev.C for automotive products.

## 3.2 Conclusion

The perimeter addressed in this campaign qualifies the production of Rectifiers housed in I²PAK & TO-220 packages with the new “Halogen-Free” encapsulation molding compound and generalization of electroplating.
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 I²PAK & TO-220 packages with new ECOPACK®2 molding compound & electroplating.

## 4.2 Construction note

| | **Rectifiers in I²PAK & TO-220 packages with new ECOPACK®2 molding compound & electroplating** |
|---|---|
| **Wafer/Die fab. information** | |
| Wafer fab manufacturing location | STMicroelectronics Singapore<br>STMicroelectronics Tours (France)<br>STMicroelectronics Catania (Italy) |
| **Wafer Testing (EWS) information** | |
| Electrical testing manufacturing location | STMicroelectronics Singapore<br>STMicroelectronics Tours (France)<br>STMicroelectronics Catania (Italy) |
| **Assembly information** | |
| Assembly site | STMicroelectronics Shenzhen (China)<br>STMicroelectronics Long Gang (China)<br>STMicroelectronics Bouskoura (Morocco)<br>Subcontractor in Philippines |
| Package description | I²PAK / TO-220AB /T O-220AB(NL) / TO-220AC |
| Molding compound | **ECOPACK®2** ("Halogen-free") molding compound |
| Lead finishing process | Electroplating |
| Lead finishing material | Tin (Sn 100%) |
| **Final testing information** | |
| Testing location | STMicroelectronics Shenzhen (China)<br>STMicroelectronics Long Gang (China)<br>STMicroelectronics Bouskoura (Morocco)<br>Subcontractor in Philippines |

# 5 TESTS RESULTS SUMMARY

## 5.1 Test vehicles

| Lot # | Product | Back End | Package | Product Family |
|---|---|---|---|---|
| 1 | STTH3002CT | ST LGG | TO-220AB | Bipolar Rectifier 200V |
| 2 | STTH3012D | | TO-220AC | Turboswitch 1200V |
| 3 | STTH12R06D | | | Turboswitch 600V |
| 4 | STPS40M60CT | | TO-220AB | Power Schottky 60V |
| 5 | STPS30M120ST | | | Power Schottky 120V |
| 6 | STPS40SM100CT | | | Power Schottky 100V |
| 7 | STPS2545CTY | ST BSK | | Power Schottky 45V |
| 8 | STPSC1006D | ST SHZ | TO-220AC | SiC Power Schottky 600V |
| 9 | STPS1645D | | | Power Schottky 45V |
| 10 | STPS30M120ST | ST LGG | TO-220AB | Power Schottky 120V |
| 11 | STPS40SM100CT | ST SHZ | | Power Schottky 100V |
| 12 | STPS40SM100CT | ST LGG | | Power Schottky 100V |
| 13 | STTH1210DY | ST SHZ | TO-220AC | Turboswitch 1200V |
| 14 | STPS41L60CT | Subcontractor in Philippines | TO-220AB | Power Schottky 60V |

## 5.2 Test plan and results summary

**Die Oriented Tests**

| Test | PC | Std ref. | Conditions | SS | Steps | Failure/SS | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lot 1 | Lot 3 | Lot 6 | Lot 7 | Lot 8 | |
| HTRB | N | JESD22 A-108 | Tj, Vr = 0.8xVrrm | 539 | 168 H | 0/77 | 0/77 | 0/77 | 0/77 | 0/77 | |
| | | | | | 500 H | 0/77 | 0/77 | 0/77 | 0/77 | 0/77 | |
| | | | | | 1000 H | 0/77 | 0/77 | 0/77 | 0/77 | 0/77 | |
| | | | | | **Steps** | **Failure/SS** | | | | | **Note** |
| | | | | | | **Lot 9** | **Lot 13** | | | | |
| | | | | | 168 H | 0/77 | 0/77 | | | | |
| | | | | | 500 H | 0/77 | 0/77 | | | | |
| | | | | | 1000 H | 0/77 | 0/77 | | | | |

**Package Oriented Tests**

| Test | PC | Std ref. | Conditions | SS | Steps | Failure/SS | | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lot 2 | Lot 4 | Lot 6 | Lot 7 | Lot 9 | Lot 13 | |
| THB | N | JESD22 A-101 | Ta = 85°C, RH = 85%, Vr = 0.8xVrrm or 100V max | 306 | 168 H | 0/25 | 0/25 | 0/25 | 0/77 | 0/77 | 0/77 | |
| | | | | | 500 H | 0/25 | 0/25 | 0/25 | 0/77 | 0/77 | 0/77 | |
| | | | | | 1000 H | 0/25 | 0/25 | 0/25 | 0/77 | 0/77 | 0/77 | |

| TC | N | JESD22 A-104 | Ta = -55°C to 150°C 1cycle/hour | SS | Steps | Failure/SS | | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lot 4 | Lot 5 | Lot 10 | Lot 6 | Lot 12 | Lot 7 | |
| | | | | 381 | 100 cy | 0/25 | 0/25 | 0/25 | 0/25 | 0/25 | 0/77 | |
| | | | | | 500 cy | 0/25 | 0/25 | 0/25 | 0/25 | 0/25 | 0/77 | |
| | | | | | 1K cy | 0/25 | 0/25 | 0/25 | 0/25 | 0/25 | 0/77 | |
| | | | | | Steps | Failure/SS | | | | | | Note |
| | | | | | | Lot 9 | Lot 13 | Lot 14 | | | | |
| | | | | | 100 cy | 0/77 | 0/77 | 0/25 | | | | |
| | | | | | 500 cy | 0/77 | 0/77 | 0/25 | | | | |
| | | | | | 1K cy | 0/77 | 0/77 | 0/25 | | | | |

| | | | | SS | Steps | Failure/SS | | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lot 4 | Lot 5 | Lot 9 | | | | |
| IOLT | N | MIL-STD 750 Method 1037 | IF, delta TC=85°C Power ON=3.5min, Power OFF=3.5min. | 127 | 8572 cycles | 0/25 | 0/25 | 0/77 | | | | |

| | | | | SS | Steps | Failure/SS | | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lot 1 | Lot 7 | Lot 9 | Lot 11 | Lot 13 | Lot 14 | |
| PCT | N | JESD22 A-102 | 121°C, RH=100%, P=2 bars | 306 | 96hrs | 0/25 | 0/77 | 0/77 | 0/25 | 0/77 | 0/25 | |

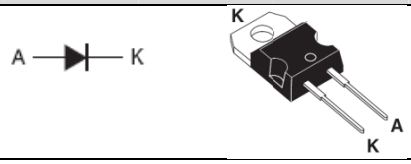
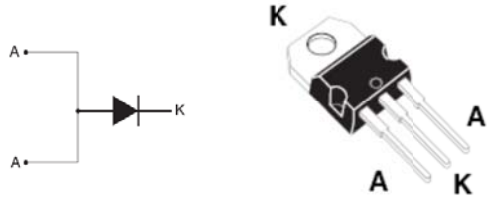
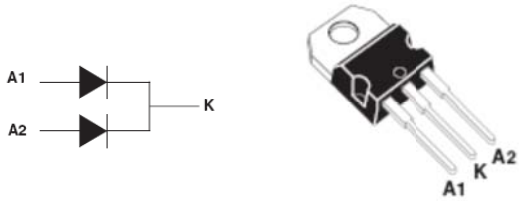
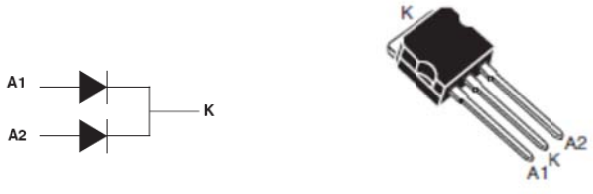
| | | | | SS | Steps | Failure/SS | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lot 6 | Lot 7 | Lot 9 | Lot 11 | Lot 14 | |
| RSH | N | JESD22 B-106 | 260°C 10s ON / 15s OFF | 60 | | 0/12 | 0/12 | 0/12 | 0/12 | 0/12 | |

| | | | | SS | Steps | Failure/SS | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lot 6 | Lot 7 | Lot 9 | Lot 11 | 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 | | | | | Note |
| | | | | | | Lot 6 | Lot 7 | Lot 9 | Lot 11 | 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 | 0/10 | |

# 6 ANNEXES

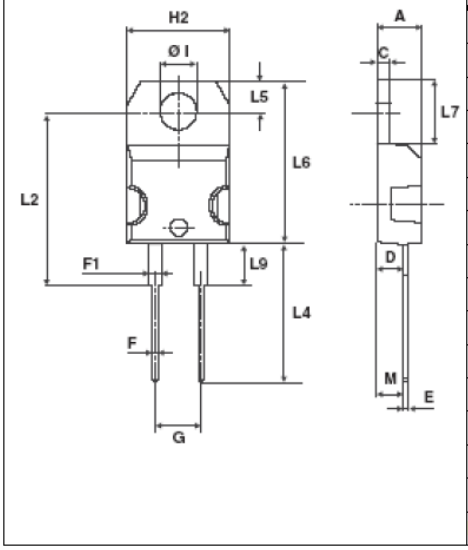
## 6.1 Device details

### 6.1.1 Pin connection

<table>
<tr><th>Package</th><th>Pin connection</th></tr>
<tr><td>TO-220AC</td><td> 
</td></tr>
<tr><td rowspan="2">TO-220AB (NL)</td><td>STPSxxST/STTHxxST: Single diode configuration<br> 
</td></tr>
<tr><td>STPSxxCT/STTHxxCT: Double diode configuration<br> 
</td></tr>
<tr><td rowspan="2">I²PAK</td><td>STPSxxSR/STTHxxSR: Single diode configuration<br> 
</td></tr>
<tr><td>STPSxxCR/STTHxxCR: Double diode configuration<br> 
</td></tr>
</table>

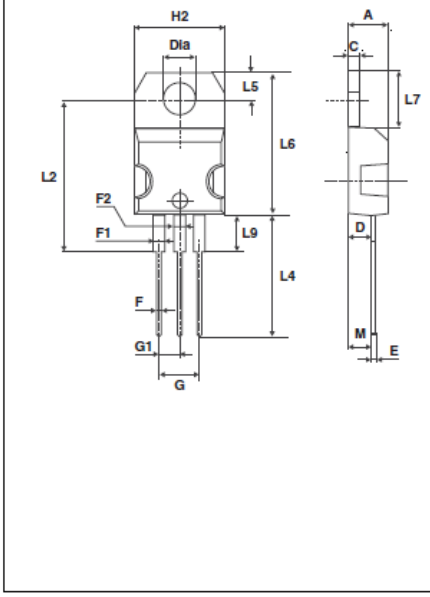
### 6.1.2 Package outline/Mechanical data

- **TO-220AC**



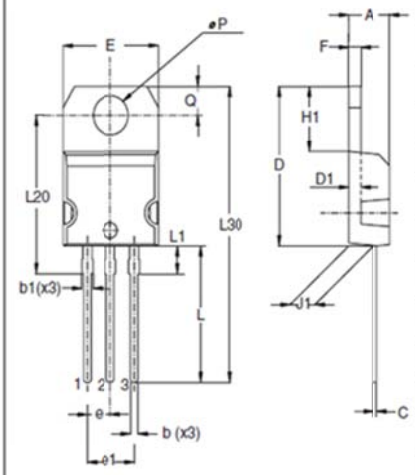

| Ref. | Dimensions | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.173 | 0.181 |
| C | 1.23 | 1.32 | 0.048 | 0.051 |
| D | 2.40 | 2.72 | 0.094 | 0.107 |
| E | 0.49 | 0.70 | 0.019 | 0.027 |
| F | 0.61 | 0.88 | 0.024 | 0.034 |
| F1 | 1.14 | 1.70 | 0.044 | 0.066 |
| G | 4.95 | 5.15 | 0.194 | 0.202 |
| H2 | 10.00 | 10.40 | 0.393 | 0.409 |
| L2 | 16.40 typ. | | 0.645 typ. | |
| L4 | 13.00 | 14.00 | 0.511 | 0.551 |
| L5 | 2.65 | 2.95 | 0.104 | 0.116 |
| L6 | 15.25 | 15.75 | 0.600 | 0.620 |
| L7 | 6.20 | 6.60 | 0.244 | 0.259 |
| L9 | 3.50 | 3.93 | 0.137 | 0.154 |
| M | 2.6 typ. | | 0.102 typ. | |
| Diam. I | 3.75 | 3.85 | 0.147 | 0.151 |

- **TO-220AB**



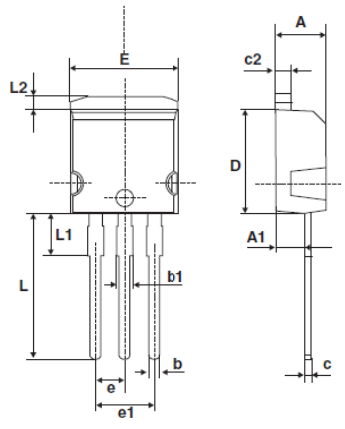

| Ref. | Dimensions | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.173 | 0.181 |
| C | 1.23 | 1.32 | 0.048 | 0.051 |
| D | 2.40 | 2.72 | 0.094 | 0.107 |
| E | 0.49 | 0.70 | 0.019 | 0.027 |
| F | 0.61 | 0.88 | 0.024 | 0.034 |
| F1 | 1.14 | 1.70 | 0.044 | 0.066 |
| F2 | 1.14 | 1.70 | 0.044 | 0.066 |
| G | 4.95 | 5.15 | 0.194 | 0.202 |
| G1 | 2.40 | 2.70 | 0.094 | 0.106 |
| H2 | 10 | 10.40 | 0.393 | 0.409 |
| L2 | 16.4 typ. | | 0.645 typ. | |
| L4 | 13 | 14 | 0.511 | 0.551 |
| L5 | 2.65 | 2.95 | 0.104 | 0.116 |
| L6 | 15.25 | 15.75 | 0.600 | 0.620 |
| L7 | 6.20 | 6.60 | 0.244 | 0.259 |
| L9 | 3.50 | 3.93 | 0.137 | 0.154 |
| M | 2.6 typ. | | 0.102 typ. | |
| Diam. | 3.75 | 3.85 | 0.147 | 0.151 |

- **TO-220AB (NL)**




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 | 0.17 | | 0.18 |
| b | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b1 | 0.95 | | 1.20 | 0.037 | | 0.047 |
| c | 0.48 | | 0.70 | 0.019 | | 0.027 |
| D | 15.25 | | 15.75 | 0.60 | | 0.62 |
| D1 | | 1.27 | | | 0.05 | |
| E | 10.00 | | 10.40 | 0.39 | | 0.41 |
| e | 2.40 | | 2.70 | 0.094 | | 0.106 |
| e1 | 4.95 | | 5.15 | 0.19 | | 0.20 |
| F | 1.23 | | 1.32 | 0.048 | | 0.052 |
| H1 | 6.20 | | 6.60 | 0.24 | | 0.26 |
| J1 | 2.40 | | 2.72 | 0.095 | | 0.107 |
| L | 13.00 | | 14.00 | 0.51 | | 0.55 |
| L1 | 2.60 | | 2.90 | 0.102 | | 0.114 |
| L20 | | 15.40 | | | 0.61 | |
| L30 | | 28.90 | | | 1.14 | |
| ØP | 3.75 | | 3.85 | 0.147 | | 0.151 |
| Q | 2.65 | | 2.95 | 0.104 | | 0.116 |

- **I²PAK**




| Ref. | Dimensions | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.173 | 0.181 |
| A1 | 2.40 | 2.72 | 0.094 | 0.107 |
| b | 0.61 | 0.88 | 0.024 | 0.035 |
| b1 | 1.14 | 1.70 | 0.044 | 0.067 |
| c | 0.49 | 0.70 | 0.019 | 0.028 |
| c2 | 1.23 | 1.32 | 0.048 | 0.052 |
| D | 8.95 | 9.35 | 0.352 | 0.368 |
| e | 2.40 | 2.70 | 0.094 | 0.106 |
| e1 | 4.95 | 5.15 | 0.195 | 0.203 |
| E | 10 | 10.40 | 0.394 | 0.409 |
| L | 13 | 14 | 0.512 | 0.551 |
| L1 | 3.50 | 3.93 | 0.138 | 0.155 |
| L2 | 1.27 | 1.40 | 0.050 | 0.055 |

## 6.2 Tests description

| Test name | Description | Purpose |
|---|---|---|
| **Die Oriented** | | |
| **HTRB**<br>High Temperature Reverse Bias<br><br>**HTFB / HTGB**<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. |
| **Package Oriented** | | |
| **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), followed by an off period, when the power is suddenly removed, for cooling the case through a similar delta temperature.<br>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**<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. |
| **THB**<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. |

| Test name | Description | Purpose |
|---|---|---|
| **Package Oriented** | | |
| **PCT**<br>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. |
| **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. |

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries(‘‘ST’’) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND / OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE ( AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION ), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS ‘‘AUTOMOTIVE GRADE’’ MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners



STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morroco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

**www.st.com**