# PRODUCT / PROCESS CHANGE NOTIFICATION

| 1. PCN basic data | |
|---|---|
| 1.1 Company | STMicroelectronics International N.V |
| 1.2 PCN No. | ADG/23/14215 |
| 1.3 Title of PCN | New molding compound for STPSC10H12G2Y-TR and STPSC20H12G2Y-TR |
| 1.4 Product Category | STPSC10H12G2Y-TR<br>STPSC20H12G2Y-TR |
| 1.5 Issue date | 2023-07-17 |

| 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 | Molding compound MG2 | Molding compound MG1 |
| 4.2 Anticipated Impact on form,fit, function, quality, reliability or processability? | No | |

| 5. Reason / motivation for change | |
|---|---|
| 5.1 Motivation | Molding compound upgrade to MG1 for these two products. |
| 5.2 Customer Benefit | QUALITY IMPROVEMENT |

| 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 | 2023-07-11 |
| 7.2 Intended start of delivery | 2024-01-26 |
| 7.3 Qualification sample available? | Upon Request |

| 8. Qualification / Validation | | | |
|---|---|---|---|
| 8.1 Description | 14215 23016QRP Rev1.pdf | | |
| 8.2 Qualification report and qualification results | Available (see attachment) | Issue Date | 2023-07-17 |

| 9. Attachments (additional documentations) |
|---|
| 14215 Public product.pdf<br>14215 PCN new molding compound for STPSCx0H12G2Y-TR.pdf<br>14215 23016QRP 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 |
| | STPSC10H12G2Y-TR | |
| | STPSC20H12G2Y-TR | |

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# Qualification Report

## *Qualification STPSC20H12G2Y-TR and STPSC10H12G2Y-TR with New resin Material Group 1*

| General Information | |
|---|---|
| **Product Line** | *Rectifiers* |
| **Product Description** | *Automotive 1200 V, 10 A, 20A, silicon carbide power Schottky diode* |
| **Product Perimeter** | *STPSC20H12G2Y-TR*<br>*STPSC10H12G2Y-TR* |
| **Product Group** | *ADG* |
| **Product Division** | *Discrete & Filter* |
| **Packages** | *D²PAK HV* |
| **Maturity level step** | *QUALIFIED* |

| Locations | |
|---|---|
| **Wafer Fab** | *ST Catania – Italy* |
| **Assembly Plant** | *ST Shenzhen – China* |
| **Reliability Lab** | *ST Tours – France* |
| **Reliability Assessment** | *PASS* |

## DOCUMENT INFORMATION

| Version | Date | Pages | Prepared by | Approved by | Comments |
|---|---|---|---|---|---|
| 1.0 | June 30, 2023 | 16 | Elisabeth PREVOST | Julien Michelon Digitally signed by Julien Michelon Date: 2023.07.07 17:49:57 +02'00' | Qualification of STPSC20H12G2Y-TR and STPSC10H12G2Y-T |

Note: This report is a summary of the qualification trials performed in good faith by STMicroelectronics in order to evaluate the potential risks during the product life using a set of defined test methods.
This report does not imply for STMicroelectronics expressly or implicitly any contractual obligations other than as set forth in STMicroelectronics general terms and conditions of Sale. This report and its contents shall not be disclosed to a third party without previous written agreement from STMicroelectronics.

# TABLE OF CONTENTS

# 1 APPLICABLE AND REFERENCE DOCUMENTS

| Document reference | Short description |
|---|---|
| **AEC-Q101 Rev. E** | Failure Mechanism Based Stress Test Qualification for Discrete Semiconductors in Automotive Applications |
| **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

| | |
|---|---|
| **DBT** | Dead Bug Test |
| **DPA** | Destructive Physical Analysis |
| **EV** | External Visual |
| **H3TRB** | High Humidity High Temperature Reverse Bias |
| **HTRB** | High Temperature Reverse Bias |
| **IOLT** | Intermittent Operating Life Test |
| **MSL** | Moisture Sensitivity Level |
| **PC** | Preconditioning |
| **PD** | Physical Dimensions |
| **PV** | Parametric Verification |
| **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 STPSC20H12G2Y-TR and STPSC10H12G2Y-TR with New resin Material Group 1, Automotive 1200 V, 10 A, 20A, silicon carbide power Schottky diode embedded in D²PAK HV package.

Table of involved products

| Commercial Product | Description | Package | Comment |
|---|---|---|---|
| STPSC20H12G2Y-TR | Power Schottky Diode | D²PAK HV | Automotive Grade |
| STPSC10H12G2Y-TR | | | |

The reliability test methodology used follows the JESD47: « Stress Test driven Qualification Methodology » and AEC-Q101 rev E guidelines.

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.
- UHAST to check the robustness to corrosion and the good package hermeticity.
- RSH, Solderability and DBT 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 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.

Based on these results, STPS20H12G2Y-TR and STPS10H12G2Y-TR are compliant with AEC-Q101 Rev E.

# 4 DEVICE CHARACTERISTICS

## 4.1 Device description

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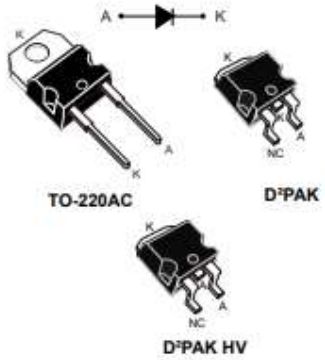
**STPSC20H12-Y**

Datasheet

Automotive 1200 V, 20 A, silicon carbide power Schottky diode




**Product label**

SUSTAINABLE TECHNOLOGY

**Product status link**

STPSC20H12-Y

**Product summary**

| | |
|---|---|
| $I_{F(AV)}$ | 20 A |
| $V_{RRM}$ | 1200 V |
| $T_j$ (max.) | 175 °C |
| $V_F$ (typ.) | 1.35 V |

### Features

- AEC-Q101 qualified
- No or negligible reverse recovery
- Switching behavior independent of temperature
- Robust high voltage periphery
- PPAP capable
- Operating $T_j$ from -40 °C to 175 °C
- D²PAK HV creepage distance (anode to cathode) = 5.38 mm min.
- ECOPACK compliant

### Applications

- On board charger

### Description

The SiC diode is an ultra high performance power Schottky diode. It is manufactured using a silicon carbide substrate. The wide band gap material allows the design of a Schottky diode structure with a 1200 V rating. Due to the Schottky construction, no recovery is shown at turn-off and ringing patterns are negligible. The minimal capacitive turn-off behavior is independent of temperature.

Especially suited for use in PFC applications, the STPSC20H12-Y will boost performance in hard switching conditions. Its high forward surge capability ensures good robustness during transient phases.

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# STPSC10H12G2Y-TR

Datasheet

## Automotive 1200 V, 10 A, silicon carbide power Schottky diode


**D²PAK HV**

**Product label**

SUSTAINABLE TECHNOLOGY

**Product status link**

STPSC10H12G2Y-TR

**Product summary**

| | |
|---|---|
| $I_{F(AV)}$ | 10 A |
| $V_{RRM}$ | 1200 V |
| $T_j$ (max.) | 175 °C |
| $V_F$ (typ.) | 1.35 V |

### Features

- AEC-Q101 qualified
- No or negligible reverse recovery
- Switching behavior independent of temperature
- Robust high voltage periphery
- PPAP capable
- Operating $T_j$ from -40 °C to 175 °C
- Low $V_F$
- D²PAK HV creepage distance (anode to cathode) = 5.38 mm min.
- ECOPACK2 compliant

### Applications

- On board charger (OBC)
- DC/DC
- PFC

### Description

This 10 A, 1200 V SiC diode is an ultra-high performance power Schottky diode. It is manufactured using a silicon carbide substrate. The wide band gap material allows the design of a Schottky diode structure with a 1200 V rating. Due to the Schottky construction, no recovery is shown at turn-off and ringing patterns are negligible. The minimal capacitive turn-off behavior is independent of temperature.

Housed in D²PAK HV, this diode is perfectly suited for a usage in PFC applications, in OBC, DC/DC for EV, easing the compliance to IEC-60664-1.

The STPSC10H12G2Y-TR will boost performances in hard switching conditions. Its high forward surge capability ensures good robustness during transient phases.

## 4.2 Construction Note

| | STPSC20H12G2Y-TR and STPSC10H12G2Y-TR |
|---|---|
| **Wafer/Die fab. information** | |
| Wafer fab manufacturing location | ST Catania - Italy |
| Technology / Process family | *Silicon Carbide Power Schottky Diode* |
| **Wafer Testing (EWS) information** | |
| Electrical testing manufacturing location | ST Catania - Italy |
| **Assembly information** | |
| Assembly site | ST Shenzhen- China |
| Package description | D²PK HV |
| Molding compound | ECOPACK®2 molding compound |
| **Final testing information** | |
| Testing location | ST Shenzhen- China |

# 5 TESTS PLAN AND RESULTS SUMMARY

## 5.1 Test vehicles

| Lot # | Part Number | Package | Wafer fab location | Assy plant Location | Comments |
|---|---|---|---|---|---|
| L1 | STPSC10H12G2Y-TR | D²PAK HV | ST Catania - Italy | ST Shenzhen - China | 1st Qualification lot |
| L2 | STPSC20H12G2Y-TR | D²PAK HV | ST Catania - Italy | ST Shenzhen - China | 2nd Qualification lot |
| L3 | STPSC20H12G2Y-TR | D²PAK HV | ST Catania - Italy | ST Shenzhen - China | 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. | | | X |
| 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 | X |
| MSL research | MSL | J-STD-020 | L2 | 30 | Not applicable for PTH and WLCSP without coating | X |
| External Visual | EV | JESD22B-101 | All qualification parts tested per the requirements of the appropriate device specification. | | Done during Assembly → Test & Finish inspection | |
| Parametric Verification | PV | User specification | L1<br>L2 | 30<br>30 | | X |
| High Temperature Reverse Bias | HTRB | MIL-STD-750-1 M1038 Method A (for diodes, rectifiers and Zeners) M1039 Method A (for transistors) | L1<br>L2<br>L3 | 77<br>77<br>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 | |
| 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<br>L2<br>L3 | 77<br>77<br>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<br>L2<br>L3 | 77<br>77<br>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<br>L2<br>L3 | 77<br>77<br>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<br>L2<br>L3 | 77<br>77<br>77 | For power devices. Not required for Transient Voltage Suppressor (TVS) parts | X |

| Stress | Abrv | Reference | Lot | SS | Comments | Test plan |
|---|---|---|---|---|---|---|
| Power and Temperature Cycle | PTC | JED22A-105 | | | For power devices. Not required for Transient Voltage Suppressor (TVS) parts<br>Perform PTC if ΔTj>100°C cannot be achieved with IOL<br>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 | L1<br>L2 | 4<br>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<br>A-111 (SMD)<br>B-106 (PTH) | L2 | 30 | Not applicable for SMD pitch < 0.5mm, package size > 5.5*12.5mm and die paddle > 2.5*3.5mm | X |
| Solderability | SD | J-STD-002<br>JESD22B102 | L2 | 40 | | X |
| Dead Bug Test | DBT | ST Internal specification | L2 | 30 | Mandatory for SMD package<br>Data collection for PTH package | X |
| Thermal Resistance | TR | JESD24-3, 24-4, 24-6 as appropriate | | | Required in case of process change.<br>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<br>JESD201 | | | | |
| 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) | PCsec | MIL-STD750-1 Method1037 | | | AQG324 test for Modules | |
| Power Cycling (minutes) | PCmin | 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 | 0/1298 | | | | |
| **External Visual** | - | JESD22B-101 | All qualification parts submitted for testing passed External & Visual inspection. during manufacturing process | | | | | |
| **Parametric Verification** | - | ST datasheet | Over part temperature range (note 1) | - | Refer to paragraph 6.1 in Annexes | | | |
| **PD** | - | JESD22 B-100 | | - | Refer to paragraph 6.3 in Annexes | | | |
| **ESD** | - | AEC-Q101-001 AEC-Q101-005 | HBM CDM | - | Refer to paragraph 6.2 in Annexes | | | |
| **HTRB** | N | MIL-STD-750-1 M1038 Method A | Junction Temperature=175°C Temperature= 170°C Voltage= 1200V | 1Khrs | 231 | 0/77 | 0/77 | 0/77 |
| **TC** | Y | JESD22A-104 | -55/+150°C 2cy/h | 1Kcys | 231 | 0/77 | 0/77 | 0/77 |
| **RSH** | N | JESD22A-111 | Temperature=260°C Time (on)=10s | - | 30 | - | 0/30 | - |
| **H3TRB** | Y | JESD22A-101 | 85°C; 85% RH Voltage=100V | 1Khrs | 231 | 0/77 | 0/77 | 0/77 |
| **DBT** | N | DM00112629 (ST internal) | IR reflow after flux deposition | - | 30 | - | 0/30 | - |
| **DPA** | Y | AEC-Q101-004 | After TC 1Kcy | - | 4 | 0/2 | 0/2 | - |
| | | | After H3TRB 1Khrs | - | 4 | 0/2 | 0/2 | - |
| **UHAST** | Y | JESD22A-118 | 130°C; 85% RH 2.3bar | 96hrs | 231 | 0/77 | 0/77 | 0/77 |
| **IOLT** | Y | MIL-STD 750 Method 1037 | ΔTj=100°C Ton=Toff=210s | 1Khrs | 231 | 0/77 | 0/77 | 0/77 |
| **SD** | N | J-STD-002 JESD22B-102 | Wet ageing SnPb bath 220°C | - | 15 | - | 0/15 | - |
| | | | Dry ageing SnPb bath 220°C | - | 15 | - | 0/15 | - |
| | | | Wet ageing SnAgCu bath 245°C | - | 15 | - | 0/15 | - |
| | | | Dry ageing SnAgCu bath 245°C | - | 15 | - | 0/15 | - |
| **MSL** | Y | JESD22-A113 | Humidity (HR)=85% MSL=1 Reflow=3 Temperature=85°C | - | 30 | - | 0/30 | - |

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."

# 6 ANNEXES

## 6.1 Parametric Verification

### STPSC10H12G2Y-TR product

| TEST | IR | IR | VF | VF | VR | VR | VR |
|---|---|---|---|---|---|---|---|
| EQUIPMENT | TESEC | TESEC | TESEC | TESEC | TESEC | TESEC | TESEC |
| Condition 1 | 25°C | 150°C | 25°C | 150°C | -40°C | 25°C | 150°C |
| Condition 2 | VR=1.2kV | VR=1.2kV | IF=10A | IF=10A | IR=5mA | IR=5mA | IR=5mA |
| Condition 3 | | | | | | | |
| Min. Datasheet | | | | | *1200V* | *1200V* | *1200V* |
| Typ. Datasheet | *5uA* | *30uA* | *1.35V* | *1.75V* | | | |
| Max. Datasheet | *60uA* | *400uA* | *1.50V* | *2.25V* | | | |
| Comments | | | | | | | |
| UNIT | nA | uA | V | V | V | V | V |
| N | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Min | 4,000 | 0,468 | 1,380 | 1,791 | 1399,000 | 1416,000 | 1456,000 |
| Max | 4955,000 | 10,870 | 1,482 | 2,040 | 1505,000 | 1522,000 | 1562,000 |
| Avg. | 245,057 | 1,155 | 1,411 | 1,891 | 1473,533 | 1500,467 | 1542,333 |

### STPSC20H12G2Y-TR product

| TEST | IR | IR | VF | VF | VR | VR | VR |
|---|---|---|---|---|---|---|---|
| EQUIPMENT | TESEC | TESEC | TESEC | TESEC | TESEC | TESEC | TESEC |
| Condition 1 | 25°C | 150°C | 25°C | 150°C | -40°C | 25°C | 150°C |
| Condition 2 | VR=1.2kV | VR=1.2kV | IF=20A | IF=20A | IR=1mA | IR=1mA | IR=1mA |
| Condition 3 | | | | | | | |
| Min. Datasheet | | | | | *1200V* | *1200V* | *1200V* |
| Typ. Datasheet | *10uA* | *60uA* | *1.35V* | *1.75V* | | | |
| Max. Datasheet | *120uA* | *800uA* | *1.50V* | *2.25V* | | | |
| Comments | | | | | | | |
| UNIT | nA | uA | V | V | V | V | V |
| N | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Min | 136,900 | 1,499 | 1,337 | 1,695 | 1449,000 | 1462,000 | 1517,000 |
| Max | 2357,000 | 5,045 | 1,384 | 1,806 | 1480,000 | 1497,000 | 1532,000 |
| Avg. | 342,577 | 2,093 | 1,360 | 1,758 | 1468,067 | 1484,533 | 1527,167 |

## 6.2 ESD

**STPSC10H12G2Y-TR product**

| TEST | ESD_CDM* | ESD_HBM* |
|---|---|---|
| EQUIPMENT | ESD-CDM TEST SYSTEM | ESS6008 |
| Condition 1 | 23°C | 24°C |
| Condition 2 | | |
| Condition 3 | | |
| Min. Datasheet | | |
| Typ. Datasheet | | |
| Max. Datasheet | | |
| Comments | AEC-Q101 | AEC-Q101 |
| UNIT | KV | KV |
| N | 30 | 30 |
| Min | >1.0 | >8.0 |
| Max | >1.0 | >8.0 |
| Avg. | | |

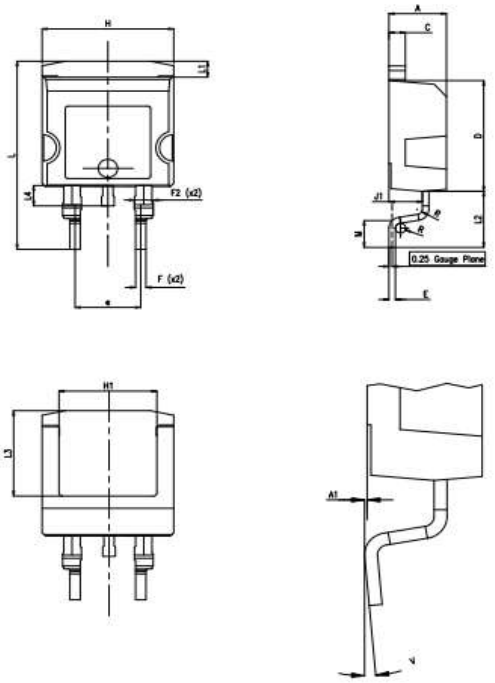
** Data retrieved from the characterization report 22027A for STPSC10H12DY as same die*

**STPSC20H12G2Y-TR product**

| TEST | ESD_CDM* | ESD_HBM* |
|---|---|---|
| EQUIPMENT | ESD-CDM TEST SYSTEM | ESS6008 |
| Condition 1 | 25°C | 25°C |
| Condition 2 | | |
| Condition 3 | | |
| Min. Datasheet | | |
| Typ. Datasheet | | |
| Max. Datasheet | | |
| Comments | AEC-Q101 | AEC-Q101 |
| UNIT | KV | KV |
| N | 30 | 30 |
| Min | >1.0 | >8.0 |
| Max | >1.0 | >8.0 |
| Avg. | | |

** Data retrieved from the characterization report 21869A for STPSC20H12G2Y-TR*

## 6.3 Physical Dimensions




| Results in mm | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DIMENSION** | **A** | **A1** | **C** | **D** | **e** | **E** | **F** | **F2** | **H** | **H1** | **J1** | **L** | **L1** | **L2** | **L3** | **L4** | **M** | **R** | **V** |
| Data book **Min** (mm) | 4.30 | 0.03 | 1.17 | 8.95 | 4.98 | 0.50 | 0.78 | 1.14 | 10.00 | 7.40 | 2.49 | 15.30 | 1.27 | 4.93 | 6.85 | 1.50 | 2.60 | 0.20 | 0° |
| Data book **Typ** (mm) | | | | | | | | | | | | | | | | | | | |
| Data book **Max** (mm) | 4.70 | 0.20 | 1.37 | 9.35 | 5.18 | 0.90 | 0.85 | 1.70 | 10.40 | 7.80 | 2.69 | 15.80 | 1.40 | 5.23 | 7.25 | 1.70 | 2.90 | 0.60 | 8° |
| 1 | 4.479 | 0.122 | 1.295 | 9.144 | 5.062 | 0.525 | 0.824 | 1.417 | 10.233 | 7.540 | 2.505 | 15.503 | 1.321 | 4.960 | 7.101 | 1.554 | 2.725 | 0.534 | 2.310 |
| 2 | 4.466 | 0.123 | 1.291 | 9.128 | 5.084 | 0.525 | 0.813 | 1.417 | 10.257 | 7.540 | 2.526 | 15.484 | 1.272 | 4.970 | 7.131 | 1.514 | 2.725 | 0.533 | 2.310 |
| 3 | 4.455 | 0.103 | 1.287 | 9.170 | 5.088 | 0.519 | 0.843 | 1.427 | 10.222 | 7.527 | 2.595 | 15.576 | 1.280 | 5.044 | 7.099 | 1.538 | 2.771 | 0.560 | 2.650 |
| 4 | 4.485 | 0.105 | 1.291 | 9.146 | 5.077 | 0.521 | 0.782 | 1.383 | 10.222 | 7.478 | 2.559 | 15.544 | 1.293 | 5.010 | 6.999 | 1.563 | 2.776 | 0.546 | 2.740 |
| 5 | 4.466 | 0.097 | 1.288 | 9.159 | 5.092 | 0.521 | 0.795 | 1.419 | 10.245 | 7.529 | 2.566 | 15.468 | 1.300 | 5.026 | 7.064 | 1.534 | 2.737 | 0.562 | 2.470 |
| 6 | 4.467 | 0.104 | 1.286 | 9.151 | 5.110 | 0.527 | 0.809 | 1.413 | 10.278 | 7.509 | 2.518 | 15.584 | 1.384 | 5.004 | 7.095 | 1.540 | 2.754 | 0.513 | 2.850 |
| 7 | 4.460 | 0.133 | 1.300 | 9.156 | 5.071 | 0.521 | 0.807 | 1.421 | 10.265 | 7.514 | 2.546 | 15.546 | 1.382 | 5.008 | 7.089 | 1.552 | 2.723 | 0.569 | 2.260 |
| 8 | 4.459 | 0.112 | 1.289 | 9.155 | 5.117 | 0.513 | 0.798 | 1.404 | 10.272 | 7.540 | 2.595 | 15.494 | 1.274 | 4.965 | 7.098 | 1.557 | 2.762 | 0.561 | 1.570 |
| 9 | 4.493 | 0.156 | 1.307 | 9.171 | 5.098 | 0.518 | 0.815 | 1.392 | 10.228 | 7.539 | 2.521 | 15.561 | 1.278 | 4.953 | 7.100 | 1.550 | 2.744 | 0.575 | 2.020 |
| 10 | 4.467 | 0.106 | 1.291 | 9.167 | 5.079 | 0.535 | 0.829 | 1.339 | 10.210 | 7.524 | 2.630 | 15.573 | 1.368 | 4.940 | 7.022 | 1.535 | 2.714 | 0.561 | 1.800 |
| 11 | 4.451 | 0.132 | 1.282 | 9.150 | 5.094 | 0.518 | 0.845 | 1.353 | 10.226 | 7.528 | 2.588 | 15.499 | 1.297 | 4.998 | 7.090 | 1.536 | 2.719 | 0.557 | 1.740 |
| 12 | 4.476 | 0.135 | 1.293 | 9.123 | 5.116 | 0.515 | 0.792 | 1.337 | 10.231 | 7.523 | 2.596 | 15.523 | 1.286 | 4.950 | 7.001 | 1.582 | 2.735 | 0.509 | 2.570 |
| 13 | 4.485 | 0.131 | 1.295 | 9.148 | 5.100 | 0.514 | 0.846 | 1.397 | 10.215 | 7.527 | 2.526 | 15.476 | 1.336 | 5.066 | 7.108 | 1.592 | 2.743 | 0.560 | 2.400 |
| 14 | 4.471 | 0.146 | 1.283 | 9.159 | 5.094 | 0.528 | 0.846 | 1.339 | 10.247 | 7.536 | 2.509 | 15.527 | 1.339 | 4.973 | 7.136 | 1.589 | 2.770 | 0.558 | 2.720 |
| 15 | 4.507 | 0.116 | 1.290 | 9.128 | 5.125 | 0.508 | 0.837 | 1.371 | 10.207 | 7.537 | 2.641 | 15.515 | 1.316 | 4.973 | 7.098 | 1.155 | 2.771 | 0.572 | 1.830 |
| 16 | 4.491 | 0.108 | 1.289 | 9.194 | 5.101 | 0.523 | 0.822 | 1.440 | 10.242 | 7.506 | 2.585 | 15.507 | 1.359 | 4.989 | 7.100 | 1.591 | 2.739 | 0.559 | 2.450 |
| 17 | 4.470 | 0.133 | 1.293 | 9.145 | 5.112 | 0.533 | 0.780 | 1.386 | 10.208 | 7.517 | 2.603 | 15.551 | 1.367 | 4.999 | 7.101 | 1.538 | 2.744 | 0.559 | 3.540 |
| 18 | 4.493 | 0.173 | 1.295 | 9.197 | 5.108 | 0.526 | 0.821 | 1.415 | 10.209 | 7.517 | 2.587 | 15.517 | 1.282 | 4.972 | 7.094 | 1.541 | 2.745 | 0.552 | 2.180 |
| 19 | 4.482 | 0.139 | 1.288 | 9.199 | 5.094 | 0.529 | 0.789 | 1.423 | 10.214 | 7.527 | 2.565 | 15.435 | 1.381 | 4.950 | 6.974 | 1.538 | 2.715 | 0.568 | 2.060 |
| 20 | 4.458 | 0.121 | 1.283 | 9.135 | 5.100 | 0.525 | 0.829 | 1.419 | 10.224 | 7.528 | 2.534 | 15.522 | 1.310 | 4.984 | 7.073 | 1.515 | 2.731 | 0.542 | 1.620 |
| 21 | 4.444 | 0.164 | 1.278 | 9.149 | 5.066 | 0.515 | 0.817 | 1.421 | 10.212 | 7.509 | 2.585 | 15.573 | 1.372 | 4.983 | 7.092 | 1.525 | 2.722 | 0.549 | 2.920 |
| 22 | 4.481 | 0.141 | 1.235 | 9.162 | 5.063 | 0.524 | 0.845 | 1.357 | 10.232 | 7.524 | 2.541 | 15.530 | 1.270 | 4.959 | 7.012 | 1.530 | 2.709 | 0.537 | 2.830 |
| 23 | 4.478 | 0.111 | 1.285 | 9.157 | 5.097 | 0.521 | 0.834 | 1.365 | 10.231 | 7.528 | 2.542 | 15.526 | 1.272 | 4.985 | 7.091 | 1.591 | 2.756 | 0.573 | 1.380 |
| 24 | 4.486 | 0.106 | 1.283 | 9.171 | 5.082 | 0.530 | 0.813 | 1.356 | 10.207 | 7.525 | 2.551 | 15.559 | 1.393 | 4.936 | 7.103 | 1.518 | 2.741 | 0.584 | 1.130 |
| 25 | 4.458 | 0.162 | 1.292 | 9.161 | 5.154 | 0.531 | 0.831 | 1.383 | 10.236 | 7.528 | 2.569 | 15.469 | 1.352 | 5.026 | 6.995 | 1.614 | 2.765 | 0.582 | 2.830 |
| 26 | 4.475 | 0.155 | 1.289 | 9.157 | 5.119 | 0.520 | 0.834 | 1.399 | 10.213 | 7.538 | 2.602 | 15.594 | 1.283 | 5.058 | 7.157 | 1.530 | 2.776 | 0.586 | 2.400 |
| 27 | 4.482 | 0.155 | 1.288 | 9.162 | 5.084 | 0.525 | 0.845 | 1.439 | 10.252 | 7.521 | 2.568 | 15.489 | 1.307 | 4.964 | 7.105 | 1.584 | 2.735 | 0.548 | 2.040 |
| 28 | 4.487 | 0.133 | 1.297 | 9.151 | 5.065 | 0.521 | 0.833 | 1.380 | 10.236 | 7.519 | 2.544 | 15.455 | 1.323 | 5.005 | 7.113 | 1.552 | 2.774 | 0.519 | 1.430 |
| 29 | 4.473 | 0.109 | 1.354 | 9.156 | 5.095 | 0.526 | 0.791 | 1.406 | 10.240 | 7.537 | 2.585 | 15.488 | 1.309 | 4.989 | 7.145 | 1.675 | 2.746 | 0.554 | 2.030 |
| 30 | 4.485 | 0.111 | 1.289 | 9.149 | 5.127 | 0.532 | 0.840 | 1.345 | 10.210 | 7.532 | 2.564 | 15.620 | 1.349 | 4.964 | 7.119 | 1.542 | 2.765 | 0.571 | 1.980 |
| **MOY** | **4.474** | **0.128** | **1.290** | **9.157** | **5.096** | **0.523** | **0.820** | **1.392** | **10.231** | **7.525** | **2.565** | **15.524** | **1.322** | **4.987** | **7.084** | **1.543** | **2.744** | **0.555** | **2.235** |
| **MIN** | **4.444** | **0.097** | **1.235** | **9.123** | **5.062** | **0.508** | **0.780** | **1.337** | **10.207** | **7.478** | **2.505** | **15.435** | **1.270** | **4.936** | **6.974** | **1.155** | **2.709** | **0.509** | **1.130** |
| **MAX** | **4.507** | **0.173** | **1.354** | **9.199** | **5.154** | **0.535** | **0.846** | **1.440** | **10.278** | **7.540** | **2.641** | **15.620** | **1.393** | **5.066** | **7.157** | **1.675** | **2.776** | **0.586** | **3.540** |

## 6.1 Thermal Resistance

| STPSC10H12G2Y-TR product | | STPSC20H12G2Y-TR product | |
|---|---|---|---|
| **TEST** | **RTH(J-C) DC** | **TEST** | **RTH(J-C)DC** |
| EQUIPMENT | RTH(PHASE12)_TEST417 | EQUIPMENT | RTH(PHASE12)_TEST417 |
| Min. Datasheet | - | Min. Datasheet | - |
| Typ. Datasheet | *0.65°C/W* | Typ. Datasheet | *0.30°C/W* |
| Max. Datasheet | *0.9°C/W* | Max. Datasheet | *0.45°C/W* |
| Comments | - | Comments | - |
| UNIT | °C/W | UNIT | °C/W |
| N | 10 | N | 10 |
| Min | 0,564 | Min | 0,247 |
| Max | 0,615 | Max | 0,308 |
| Avg. | 0,594 | Avg. | 0,274 |

## 6.2 Tests description

| Test name | Description | Purpose |
|---|---|---|
| **Die Oriented** | | |
| **HTRB**<br>High Temperature Reverse Bias<br>/<br>**HTFB**<br>High Temperature Forward 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.<br><br>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.<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.<br>To assess active area and contacts integrity |
| **Package Oriented** | | |
| **H3TRB**<br>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**<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. |
| **UHAST**<br>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**<br>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. |
| **DPA**<br>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. |
| **RSH**<br>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**<br>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. |
| **DBT**<br>Dead Bug Test | To evaluate the wettability of the package leads. Good indicator to determine the bad solderability behavior | Components are glued up-side down on a substrate. Pins are wetted with a moderately activated flux. Then run once through the reflow oven with leadfree temperature profile. Visual inspection is performed with suitable tool. |

# *PCN*
# *Product/Process Change Notification*

## New molding compound for STPSC10H12G2Y-TR and STPSC20H12G2Y-TR

| | | | |
|---|---|---|---|
| **Notification number:** | ADG/23/14215 | **Issue Date** | 11-Jul-2023 |
| **Issued by** | Sophie da Silva | | |
| **Product series affected by the change** | | STPSC10H12G2Y-TR<br>STPSC20H12G2Y-TR | |
| **Type of change** | | Backend realization | |

**Description of the change**

ST Microelectronics is qualifying new molding compound MG1 to replace current molding compound MG2.

**Reason for change**

Molding compound upgrade to MG1 for these two products.

| | |
|---|---|
| **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<br><br>The Moisture Sensitivity Level of the part (according to the IPC/JEDEC JSTD-020D standard) remains unchanged.<br><br>The footprint recommended by ST remains the same.<br><br>There is no change in the packing modes and the standard delivery quantities either.<br><br>The products remain in full compliance with the ST ECOPACK®2 grade (so called “halogen-free”). |

**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 | Former Finished Good/Type | New Finished Good/Type |
|---|---|---|
| STPSC10H12G2Y-TR<br>STPSC20H12G2Y-TR | YPSC10H12G2P/7<br>YPSC20H12G2P/7 | YPSC10H12G2P4/7<br>YPSC20H12G2P4/7 |

| | |
|---|---|
| **Qualification completion date** | 11-Jul-2023 |

**Forecasted sample availability**

| Product family | Sub-family | Commercial part Number | Availability date |
|---|---|---|---|
| RECTIFIERS | SiC | STPSC10H12G2Y-TR | Upon request |
| RECTIFIERS | SiC | STPSC20H12G2Y-TR | Upon request |

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-2024** | **Jan-2024** |

| | |
|---|---|
| **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** | 23016QRP Attached |

# Qualification Report

## *Qualification STPSC20H12G2Y-TR and STPSC10H12G2Y-TR with New resin Material Group 1*

| General Information | |
|---|---|
| **Product Line** | *Rectifiers* |
| **Product Description** | *Automotive 1200 V, 10 A, 20A, silicon carbide power Schottky diode* |
| **Product Perimeter** | *STPSC20H12G2Y-TR*<br>*STPSC10H12G2Y-TR* |
| **Product Group** | *ADG* |
| **Product Division** | *Discrete & Filter* |
| **Packages** | *D²PAK HV* |
| **Maturity level step** | *QUALIFIED* |

| Locations | |
|---|---|
| **Wafer Fab** | *ST Catania – Italy* |
| **Assembly Plant** | *ST Shenzhen – China* |
| **Reliability Lab** | *ST Tours – France* |
| **Reliability Assessment** | *PASS* |

## DOCUMENT INFORMATION

| Version | Date | Pages | Prepared by | Approved by | Comments |
|---|---|---|---|---|---|
| 1.0 | June 30, 2023 | 16 | Elisabeth PREVOST | Julien Michelon Digitally signed by Julien Michelon Date: 2023.07.07 17:49:57 +02'00' | Qualification of STPSC20H12G2Y-TR and STPSC10H12G2Y-T |

Note: This report is a summary of the qualification trials performed in good faith by STMicroelectronics in order to evaluate the potential risks during the product life using a set of defined test methods.
This report does not imply for STMicroelectronics expressly or implicitly any contractual obligations other than as set forth in STMicroelectronics general terms and conditions of Sale. This report and its contents shall not be disclosed to a third party without previous written agreement from STMicroelectronics.

# TABLE OF CONTENTS

# 1 APPLICABLE AND REFERENCE DOCUMENTS

| Document reference | Short description |
|---|---|
| **AEC-Q101 Rev. E** | Failure Mechanism Based Stress Test Qualification for Discrete Semiconductors in Automotive Applications |
| **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

| | |
|---|---|
| **DBT** | Dead Bug Test |
| **DPA** | Destructive Physical Analysis |
| **EV** | External Visual |
| **H3TRB** | High Humidity High Temperature Reverse Bias |
| **HTRB** | High Temperature Reverse Bias |
| **IOLT** | Intermittent Operating Life Test |
| **MSL** | Moisture Sensitivity Level |
| **PC** | Preconditioning |
| **PD** | Physical Dimensions |
| **PV** | Parametric Verification |
| **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 STPSC20H12G2Y-TR and STPSC10H12G2Y-TR with New resin Material Group 1, Automotive 1200 V, 10 A, 20A, silicon carbide power Schottky diode embedded in D²PAK HV package.

Table of involved products

| Commercial Product | Description | Package | Comment |
|---|---|---|---|
| STPSC20H12G2Y-TR | Power Schottky Diode | D²PAK HV | Automotive Grade |
| STPSC10H12G2Y-TR | | | |

The reliability test methodology used follows the JESD47: « Stress Test driven Qualification Methodology » and AEC-Q101 rev E guidelines.

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.
- UHAST to check the robustness to corrosion and the good package hermeticity.
- RSH, Solderability and DBT 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 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.

Based on these results, STPS20H12G2Y-TR and STPS10H12G2Y-TR are compliant with AEC-Q101 Rev E.

# 4 DEVICE CHARACTERISTICS

## 4.1 Device description

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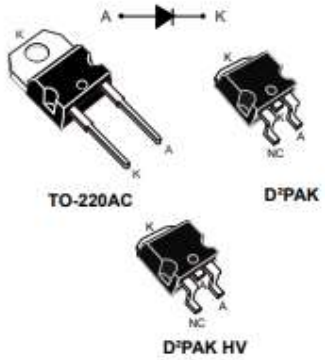
**STPSC20H12-Y**

Datasheet

Automotive 1200 V, 20 A, silicon carbide power Schottky diode




**Product label**

SUSTAINABLE TECHNOLOGY

**Product status link**

STPSC20H12-Y

**Product summary**

| | |
|---|---|
| $I_{F(AV)}$ | 20 A |
| $V_{RRM}$ | 1200 V |
| $T_j$ (max.) | 175 °C |
| $V_F$ (typ.) | 1.35 V |

### Features

- AEC-Q101 qualified
- No or negligible reverse recovery
- Switching behavior independent of temperature
- Robust high voltage periphery
- PPAP capable
- Operating $T_j$ from -40 °C to 175 °C
- D²PAK HV creepage distance (anode to cathode) = 5.38 mm min.
- ECOPACK compliant

### Applications

- On board charger

### Description

The SiC diode is an ultra high performance power Schottky diode. It is manufactured using a silicon carbide substrate. The wide band gap material allows the design of a Schottky diode structure with a 1200 V rating. Due to the Schottky construction, no recovery is shown at turn-off and ringing patterns are negligible. The minimal capacitive turn-off behavior is independent of temperature.

Especially suited for use in PFC applications, the STPSC20H12-Y will boost performance in hard switching conditions. Its high forward surge capability ensures good robustness during transient phases.

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# STPSC10H12G2Y-TR

Datasheet

## Automotive 1200 V, 10 A, silicon carbide power Schottky diode


**D²PAK HV**

**Product label**

SUSTAINABLE TECHNOLOGY

**Product status link**

STPSC10H12G2Y-TR

**Product summary**

| | |
|---|---|
| $I_{F(AV)}$ | 10 A |
| $V_{RRM}$ | 1200 V |
| $T_j$ (max.) | 175 °C |
| $V_F$ (typ.) | 1.35 V |

### Features

- AEC-Q101 qualified
- No or negligible reverse recovery
- Switching behavior independent of temperature
- Robust high voltage periphery
- PPAP capable
- Operating $T_j$ from -40 °C to 175 °C
- Low $V_F$
- D²PAK HV creepage distance (anode to cathode) = 5.38 mm min.
- ECOPACK2 compliant

### Applications

- On board charger (OBC)
- DC/DC
- PFC

### Description

This 10 A, 1200 V SiC diode is an ultra-high performance power Schottky diode. It is manufactured using a silicon carbide substrate. The wide band gap material allows the design of a Schottky diode structure with a 1200 V rating. Due to the Schottky construction, no recovery is shown at turn-off and ringing patterns are negligible. The minimal capacitive turn-off behavior is independent of temperature.

Housed in D²PAK HV, this diode is perfectly suited for a usage in PFC applications, in OBC, DC/DC for EV, easing the compliance to IEC-60664-1.

The STPSC10H12G2Y-TR will boost performances in hard switching conditions. Its high forward surge capability ensures good robustness during transient phases.

## 4.2 Construction Note

| | STPSC20H12G2Y-TR and STPSC10H12G2Y-TR |
|---|---|
| **Wafer/Die fab. information** | |
| Wafer fab manufacturing location | ST Catania - Italy |
| Technology / Process family | *Silicon Carbide Power Schottky Diode* |
| **Wafer Testing (EWS) information** | |
| Electrical testing manufacturing location | ST Catania - Italy |
| **Assembly information** | |
| Assembly site | ST Shenzhen- China |
| Package description | D²PK HV |
| Molding compound | ECOPACK®2 molding compound |
| **Final testing information** | |
| Testing location | ST Shenzhen- China |

# 5 TESTS PLAN AND RESULTS SUMMARY

## 5.1 Test vehicles

| Lot # | Part Number | Package | Wafer fab location | Assy plant Location | Comments |
|---|---|---|---|---|---|
| L1 | STPSC10H12G2Y-TR | D²PAK HV | ST Catania - Italy | ST Shenzhen - China | 1st Qualification lot |
| L2 | STPSC20H12G2Y-TR | D²PAK HV | ST Catania - Italy | ST Shenzhen - China | 2nd Qualification lot |
| L3 | STPSC20H12G2Y-TR | D²PAK HV | ST Catania - Italy | ST Shenzhen - China | 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. | | | X |
| 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 | X |
| MSL research | MSL | J-STD-020 | L2 | 30 | Not applicable for PTH and WLCSP without coating | X |
| External Visual | EV | JESD22B-101 | All qualification parts tested per the requirements of the appropriate device specification. | | Done during Assembly → Test & Finish inspection | |
| Parametric Verification | PV | User specification | L1<br>L2 | 30<br>30 | | X |
| High Temperature Reverse Bias | HTRB | MIL-STD-750-1 M1038 Method A (for diodes, rectifiers and Zeners) M1039 Method A (for transistors) | L1<br>L2<br>L3 | 77<br>77<br>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 | |
| 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<br>L2<br>L3 | 77<br>77<br>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<br>L2<br>L3 | 77<br>77<br>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<br>L2<br>L3 | 77<br>77<br>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<br>L2<br>L3 | 77<br>77<br>77 | For power devices. Not required for Transient Voltage Suppressor (TVS) parts | X |

| Stress | Abrv | Reference | Lot | SS | Comments | Test plan |
|---|---|---|---|---|---|---|
| Power and Temperature Cycle | PTC | JED22A-105 | | | For power devices. Not required for Transient Voltage Suppressor (TVS) parts<br>Perform PTC if ΔTj>100°C cannot be achieved with IOL<br>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 | L1<br>L2 | 4<br>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<br>A-111 (SMD)<br>B-106 (PTH) | L2 | 30 | Not applicable for SMD pitch < 0.5mm, package size > 5.5*12.5mm and die paddle > 2.5*3.5mm | X |
| Solderability | SD | J-STD-002<br>JESD22B102 | L2 | 40 | | X |
| Dead Bug Test | DBT | ST Internal specification | L2 | 30 | Mandatory for SMD package<br>Data collection for PTH package | X |
| Thermal Resistance | TR | JESD24-3, 24-4, 24-6 as appropriate | | | Required in case of process change.<br>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<br>JESD201 | | | | |
| 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) | PCsec | MIL-STD750-1 Method1037 | | | AQG324 test for Modules | |
| Power Cycling (minutes) | PCmin | 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 | 0/1298 | | | | |
| **External Visual** | - | JESD22B-101 | All qualification parts submitted for testing passed External & Visual inspection. during manufacturing process | | | | | |
| **Parametric Verification** | - | ST datasheet | Over part temperature range (note 1) | - | Refer to paragraph 6.1 in Annexes | | | |
| **PD** | - | JESD22 B-100 | | - | Refer to paragraph 6.3 in Annexes | | | |
| **ESD** | - | AEC-Q101-001 AEC-Q101-005 | HBM CDM | - | Refer to paragraph 6.2 in Annexes | | | |
| **HTRB** | N | MIL-STD-750-1 M1038 Method A | Junction Temperature=175°C Temperature= 170°C Voltage= 1200V | 1Khrs | 231 | 0/77 | 0/77 | 0/77 |
| **TC** | Y | JESD22A-104 | -55/+150°C 2cy/h | 1Kcys | 231 | 0/77 | 0/77 | 0/77 |
| **RSH** | N | JESD22A-111 | Temperature=260°C Time (on)=10s | - | 30 | - | 0/30 | - |
| **H3TRB** | Y | JESD22A-101 | 85°C; 85% RH Voltage=100V | 1Khrs | 231 | 0/77 | 0/77 | 0/77 |
| **DBT** | N | DM00112629 (ST internal) | IR reflow after flux deposition | - | 30 | - | 0/30 | - |
| **DPA** | Y | AEC-Q101-004 | After TC 1Kcy | - | 4 | 0/2 | 0/2 | - |
| | | | After H3TRB 1Khrs | - | 4 | 0/2 | 0/2 | - |
| **UHAST** | Y | JESD22A-118 | 130°C; 85% RH 2.3bar | 96hrs | 231 | 0/77 | 0/77 | 0/77 |
| **IOLT** | Y | MIL-STD 750 Method 1037 | ΔTj=100°C Ton=Toff=210s | 1Khrs | 231 | 0/77 | 0/77 | 0/77 |
| **SD** | N | J-STD-002 JESD22B-102 | Wet ageing SnPb bath 220°C | - | 15 | - | 0/15 | - |
| | | | Dry ageing SnPb bath 220°C | - | 15 | - | 0/15 | - |
| | | | Wet ageing SnAgCu bath 245°C | - | 15 | - | 0/15 | - |
| | | | Dry ageing SnAgCu bath 245°C | - | 15 | - | 0/15 | - |
| **MSL** | Y | JESD22-A113 | Humidity (HR)=85% MSL=1 Reflow=3 Temperature=85°C | - | 30 | - | 0/30 | - |

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."

# 6 ANNEXES

## 6.1 Parametric Verification

### STPSC10H12G2Y-TR product

| TEST | IR | IR | VF | VF | VR | VR | VR |
|---|---|---|---|---|---|---|---|
| EQUIPMENT | TESEC | TESEC | TESEC | TESEC | TESEC | TESEC | TESEC |
| Condition 1 | 25°C | 150°C | 25°C | 150°C | -40°C | 25°C | 150°C |
| Condition 2 | VR=1.2kV | VR=1.2kV | IF=10A | IF=10A | IR=5mA | IR=5mA | IR=5mA |
| Condition 3 | | | | | | | |
| Min. Datasheet | | | | | *1200V* | *1200V* | *1200V* |
| Typ. Datasheet | *5uA* | *30uA* | *1.35V* | *1.75V* | | | |
| Max. Datasheet | *60uA* | *400uA* | *1.50V* | *2.25V* | | | |
| Comments | | | | | | | |
| UNIT | nA | uA | V | V | V | V | V |
| N | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Min | 4,000 | 0,468 | 1,380 | 1,791 | 1399,000 | 1416,000 | 1456,000 |
| Max | 4955,000 | 10,870 | 1,482 | 2,040 | 1505,000 | 1522,000 | 1562,000 |
| Avg. | 245,057 | 1,155 | 1,411 | 1,891 | 1473,533 | 1500,467 | 1542,333 |

### STPSC20H12G2Y-TR product

| TEST | IR | IR | VF | VF | VR | VR | VR |
|---|---|---|---|---|---|---|---|
| EQUIPMENT | TESEC | TESEC | TESEC | TESEC | TESEC | TESEC | TESEC |
| Condition 1 | 25°C | 150°C | 25°C | 150°C | -40°C | 25°C | 150°C |
| Condition 2 | VR=1.2kV | VR=1.2kV | IF=20A | IF=20A | IR=1mA | IR=1mA | IR=1mA |
| Condition 3 | | | | | | | |
| Min. Datasheet | | | | | *1200V* | *1200V* | *1200V* |
| Typ. Datasheet | *10uA* | *60uA* | *1.35V* | *1.75V* | | | |
| Max. Datasheet | *120uA* | *800uA* | *1.50V* | *2.25V* | | | |
| Comments | | | | | | | |
| UNIT | nA | uA | V | V | V | V | V |
| N | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Min | 136,900 | 1,499 | 1,337 | 1,695 | 1449,000 | 1462,000 | 1517,000 |
| Max | 2357,000 | 5,045 | 1,384 | 1,806 | 1480,000 | 1497,000 | 1532,000 |
| Avg. | 342,577 | 2,093 | 1,360 | 1,758 | 1468,067 | 1484,533 | 1527,167 |

## 6.2 ESD

**STPSC10H12G2Y-TR product**

| TEST | ESD_CDM* | ESD_HBM* |
|---|---|---|
| EQUIPMENT | ESD-CDM TEST SYSTEM | ESS6008 |
| Condition 1 | 23°C | 24°C |
| Condition 2 | | |
| Condition 3 | | |
| Min. Datasheet | | |
| Typ. Datasheet | | |
| Max. Datasheet | | |
| Comments | AEC-Q101 | AEC-Q101 |
| UNIT | KV | KV |
| N | 30 | 30 |
| Min | >1.0 | >8.0 |
| Max | >1.0 | >8.0 |
| Avg. | | |

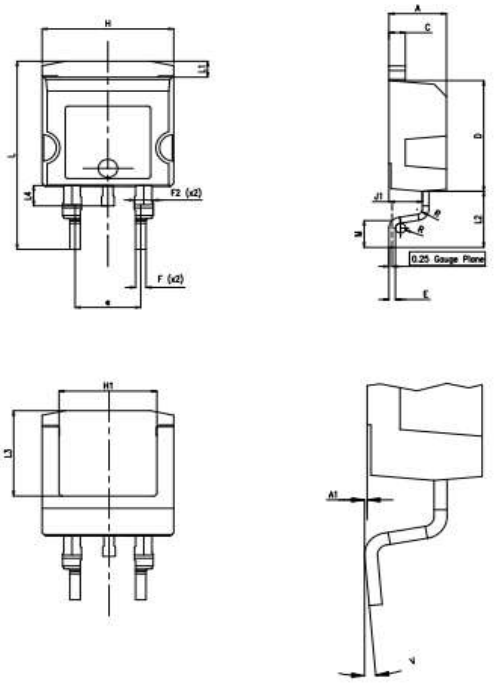
** Data retrieved from the characterization report 22027A for STPSC10H12DY as same die*

**STPSC20H12G2Y-TR product**

| TEST | ESD_CDM* | ESD_HBM* |
|---|---|---|
| EQUIPMENT | ESD-CDM TEST SYSTEM | ESS6008 |
| Condition 1 | 25°C | 25°C |
| Condition 2 | | |
| Condition 3 | | |
| Min. Datasheet | | |
| Typ. Datasheet | | |
| Max. Datasheet | | |
| Comments | AEC-Q101 | AEC-Q101 |
| UNIT | KV | KV |
| N | 30 | 30 |
| Min | >1.0 | >8.0 |
| Max | >1.0 | >8.0 |
| Avg. | | |

** Data retrieved from the characterization report 21869A for STPSC20H12G2Y-TR*

## 6.3 Physical Dimensions




| Results in mm | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DIMENSION** | **A** | **A1** | **C** | **D** | **e** | **E** | **F** | **F2** | **H** | **H1** | **J1** | **L** | **L1** | **L2** | **L3** | **L4** | **M** | **R** | **V** |
| Data book **Min** (mm) | 4.30 | 0.03 | 1.17 | 8.95 | 4.98 | 0.50 | 0.78 | 1.14 | 10.00 | 7.40 | 2.49 | 15.30 | 1.27 | 4.93 | 6.85 | 1.50 | 2.60 | 0.20 | 0° |
| Data book **Typ** (mm) | | | | | | | | | | | | | | | | | | | |
| Data book **Max** (mm) | 4.70 | 0.20 | 1.37 | 9.35 | 5.18 | 0.90 | 0.85 | 1.70 | 10.40 | 7.80 | 2.69 | 15.80 | 1.40 | 5.23 | 7.25 | 1.70 | 2.90 | 0.60 | 8° |
| 1 | 4.479 | 0.122 | 1.295 | 9.144 | 5.062 | 0.525 | 0.824 | 1.417 | 10.233 | 7.540 | 2.505 | 15.503 | 1.321 | 4.960 | 7.101 | 1.554 | 2.725 | 0.534 | 2.310 |
| 2 | 4.466 | 0.123 | 1.291 | 9.128 | 5.084 | 0.525 | 0.813 | 1.417 | 10.257 | 7.540 | 2.526 | 15.484 | 1.272 | 4.970 | 7.131 | 1.514 | 2.725 | 0.533 | 2.310 |
| 3 | 4.455 | 0.103 | 1.287 | 9.170 | 5.088 | 0.519 | 0.843 | 1.427 | 10.222 | 7.527 | 2.595 | 15.576 | 1.280 | 5.044 | 7.099 | 1.538 | 2.771 | 0.560 | 2.650 |
| 4 | 4.485 | 0.105 | 1.291 | 9.146 | 5.077 | 0.521 | 0.782 | 1.383 | 10.222 | 7.478 | 2.559 | 15.544 | 1.293 | 5.010 | 6.999 | 1.563 | 2.776 | 0.546 | 2.740 |
| 5 | 4.466 | 0.097 | 1.288 | 9.159 | 5.092 | 0.521 | 0.795 | 1.419 | 10.245 | 7.529 | 2.566 | 15.468 | 1.300 | 5.026 | 7.064 | 1.534 | 2.737 | 0.562 | 2.470 |
| 6 | 4.467 | 0.104 | 1.286 | 9.151 | 5.110 | 0.527 | 0.809 | 1.413 | 10.278 | 7.509 | 2.518 | 15.584 | 1.384 | 5.004 | 7.095 | 1.540 | 2.754 | 0.513 | 2.850 |
| 7 | 4.460 | 0.133 | 1.300 | 9.156 | 5.071 | 0.521 | 0.807 | 1.421 | 10.265 | 7.514 | 2.546 | 15.546 | 1.382 | 5.008 | 7.089 | 1.552 | 2.723 | 0.569 | 2.260 |
| 8 | 4.459 | 0.112 | 1.289 | 9.155 | 5.117 | 0.513 | 0.798 | 1.404 | 10.272 | 7.540 | 2.595 | 15.494 | 1.274 | 4.965 | 7.098 | 1.557 | 2.762 | 0.561 | 1.570 |
| 9 | 4.493 | 0.156 | 1.307 | 9.171 | 5.098 | 0.518 | 0.815 | 1.392 | 10.228 | 7.539 | 2.521 | 15.561 | 1.278 | 4.953 | 7.100 | 1.550 | 2.744 | 0.575 | 2.020 |
| 10 | 4.467 | 0.106 | 1.291 | 9.167 | 5.079 | 0.535 | 0.829 | 1.339 | 10.210 | 7.524 | 2.630 | 15.573 | 1.368 | 4.940 | 7.022 | 1.535 | 2.714 | 0.561 | 1.800 |
| 11 | 4.451 | 0.132 | 1.282 | 9.150 | 5.094 | 0.518 | 0.845 | 1.353 | 10.226 | 7.528 | 2.588 | 15.499 | 1.297 | 4.998 | 7.090 | 1.536 | 2.719 | 0.557 | 1.740 |
| 12 | 4.476 | 0.135 | 1.293 | 9.123 | 5.116 | 0.515 | 0.792 | 1.337 | 10.231 | 7.523 | 2.596 | 15.523 | 1.286 | 4.950 | 7.001 | 1.582 | 2.735 | 0.509 | 2.570 |
| 13 | 4.485 | 0.131 | 1.295 | 9.148 | 5.100 | 0.514 | 0.846 | 1.397 | 10.215 | 7.527 | 2.526 | 15.476 | 1.336 | 5.066 | 7.108 | 1.592 | 2.743 | 0.560 | 2.400 |
| 14 | 4.471 | 0.146 | 1.283 | 9.159 | 5.094 | 0.528 | 0.846 | 1.339 | 10.247 | 7.536 | 2.509 | 15.527 | 1.339 | 4.973 | 7.136 | 1.589 | 2.770 | 0.558 | 2.720 |
| 15 | 4.507 | 0.116 | 1.290 | 9.128 | 5.125 | 0.508 | 0.837 | 1.371 | 10.207 | 7.537 | 2.641 | 15.515 | 1.316 | 4.973 | 7.098 | 1.155 | 2.771 | 0.572 | 1.830 |
| 16 | 4.491 | 0.108 | 1.289 | 9.194 | 5.101 | 0.523 | 0.822 | 1.440 | 10.242 | 7.506 | 2.585 | 15.507 | 1.359 | 4.989 | 7.100 | 1.591 | 2.739 | 0.559 | 2.450 |
| 17 | 4.470 | 0.133 | 1.293 | 9.145 | 5.112 | 0.533 | 0.780 | 1.386 | 10.208 | 7.517 | 2.603 | 15.551 | 1.367 | 4.999 | 7.101 | 1.538 | 2.744 | 0.559 | 3.540 |
| 18 | 4.493 | 0.173 | 1.295 | 9.197 | 5.108 | 0.526 | 0.821 | 1.415 | 10.209 | 7.517 | 2.587 | 15.517 | 1.282 | 4.972 | 7.094 | 1.541 | 2.745 | 0.552 | 2.180 |
| 19 | 4.482 | 0.139 | 1.288 | 9.199 | 5.094 | 0.529 | 0.789 | 1.423 | 10.214 | 7.527 | 2.565 | 15.435 | 1.381 | 4.950 | 6.974 | 1.538 | 2.715 | 0.568 | 2.060 |
| 20 | 4.458 | 0.121 | 1.283 | 9.135 | 5.100 | 0.525 | 0.829 | 1.419 | 10.224 | 7.528 | 2.534 | 15.522 | 1.310 | 4.984 | 7.073 | 1.515 | 2.731 | 0.542 | 1.620 |
| 21 | 4.444 | 0.164 | 1.278 | 9.149 | 5.066 | 0.515 | 0.817 | 1.421 | 10.212 | 7.509 | 2.585 | 15.573 | 1.372 | 4.983 | 7.092 | 1.525 | 2.722 | 0.549 | 2.920 |
| 22 | 4.481 | 0.141 | 1.235 | 9.162 | 5.063 | 0.524 | 0.845 | 1.357 | 10.232 | 7.524 | 2.541 | 15.530 | 1.270 | 4.959 | 7.012 | 1.530 | 2.709 | 0.537 | 2.830 |
| 23 | 4.478 | 0.111 | 1.285 | 9.157 | 5.097 | 0.521 | 0.834 | 1.365 | 10.231 | 7.528 | 2.542 | 15.526 | 1.272 | 4.985 | 7.091 | 1.591 | 2.756 | 0.573 | 1.380 |
| 24 | 4.486 | 0.106 | 1.283 | 9.171 | 5.082 | 0.530 | 0.813 | 1.356 | 10.207 | 7.525 | 2.551 | 15.559 | 1.393 | 4.936 | 7.103 | 1.518 | 2.741 | 0.584 | 1.130 |
| 25 | 4.458 | 0.162 | 1.292 | 9.161 | 5.154 | 0.531 | 0.831 | 1.383 | 10.236 | 7.528 | 2.569 | 15.469 | 1.352 | 5.026 | 6.995 | 1.614 | 2.765 | 0.582 | 2.830 |
| 26 | 4.475 | 0.155 | 1.289 | 9.157 | 5.119 | 0.520 | 0.834 | 1.399 | 10.213 | 7.538 | 2.602 | 15.594 | 1.283 | 5.058 | 7.157 | 1.530 | 2.776 | 0.586 | 2.400 |
| 27 | 4.482 | 0.155 | 1.288 | 9.162 | 5.084 | 0.525 | 0.845 | 1.439 | 10.252 | 7.521 | 2.568 | 15.489 | 1.307 | 4.964 | 7.105 | 1.584 | 2.735 | 0.548 | 2.040 |
| 28 | 4.487 | 0.133 | 1.297 | 9.151 | 5.065 | 0.521 | 0.833 | 1.380 | 10.236 | 7.519 | 2.544 | 15.455 | 1.323 | 5.005 | 7.113 | 1.552 | 2.774 | 0.519 | 1.430 |
| 29 | 4.473 | 0.109 | 1.354 | 9.156 | 5.095 | 0.526 | 0.791 | 1.406 | 10.240 | 7.537 | 2.585 | 15.488 | 1.309 | 4.989 | 7.145 | 1.675 | 2.746 | 0.554 | 2.030 |
| 30 | 4.485 | 0.111 | 1.289 | 9.149 | 5.127 | 0.532 | 0.840 | 1.345 | 10.210 | 7.532 | 2.564 | 15.620 | 1.349 | 4.964 | 7.119 | 1.542 | 2.765 | 0.571 | 1.980 |
| **MOY** | **4.474** | **0.128** | **1.290** | **9.157** | **5.096** | **0.523** | **0.820** | **1.392** | **10.231** | **7.525** | **2.565** | **15.524** | **1.322** | **4.987** | **7.084** | **1.543** | **2.744** | **0.555** | **2.235** |
| **MIN** | **4.444** | **0.097** | **1.235** | **9.123** | **5.062** | **0.508** | **0.780** | **1.337** | **10.207** | **7.478** | **2.505** | **15.435** | **1.270** | **4.936** | **6.974** | **1.155** | **2.709** | **0.509** | **1.130** |
| **MAX** | **4.507** | **0.173** | **1.354** | **9.199** | **5.154** | **0.535** | **0.846** | **1.440** | **10.278** | **7.540** | **2.641** | **15.620** | **1.393** | **5.066** | **7.157** | **1.675** | **2.776** | **0.586** | **3.540** |

## 6.1 Thermal Resistance

| STPSC10H12G2Y-TR product | | STPSC20H12G2Y-TR product | |
|---|---|---|---|
| **TEST** | **RTH(J-C) DC** | **TEST** | **RTH(J-C)DC** |
| EQUIPMENT | RTH(PHASE12)_TEST417 | EQUIPMENT | RTH(PHASE12)_TEST417 |
| Min. Datasheet | - | Min. Datasheet | - |
| Typ. Datasheet | *0.65°C/W* | Typ. Datasheet | *0.30°C/W* |
| Max. Datasheet | *0.9°C/W* | Max. Datasheet | *0.45°C/W* |
| Comments | - | Comments | - |
| UNIT | °C/W | UNIT | °C/W |
| N | 10 | N | 10 |
| Min | 0,564 | Min | 0,247 |
| Max | 0,615 | Max | 0,308 |
| Avg. | 0,594 | Avg. | 0,274 |

## 6.2 Tests description

| Test name | Description | Purpose |
|---|---|---|
| **Die Oriented** | | |
| **HTRB**<br>High Temperature Reverse Bias<br>/<br>**HTFB**<br>High Temperature Forward 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.<br><br>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.<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.<br>To assess active area and contacts integrity |
| **Package Oriented** | | |
| **H3TRB**<br>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**<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. |
| **UHAST**<br>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**<br>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. |
| **DPA**<br>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. |
| **RSH**<br>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**<br>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. |
| **DBT**<br>Dead Bug Test | To evaluate the wettability of the package leads. Good indicator to determine the bad solderability behavior | Components are glued up-side down on a substrate. Pins are wetted with a moderately activated flux. Then run once through the reflow oven with leadfree temperature profile. Visual inspection is performed with suitable tool. |

# 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 :*** New molding compound for STPSC10H12G2Y-TR and STPSC20H12G2Y-TR

***PCN Reference :*** ADG/23/14215

***Subject :*** Public Products List

Dear Customer,

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

| | | |
|---|---|---|
| STPSC10H12G2Y-TR | STPSC20H12G2Y-TR | |

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