PRODUCT / PROCESS CHANGE NOTIFICATION

1. PCN basic data	
1.1 Company	STMicroelectronics International N.V
1.2 PCN No.	POWER AND DISCRETE PRODUCTS/24/14699
1.3 Title of PCN	Die manufacturing process homogenization in ST Tours (France) for TVS (Transient Voltage Suppressor) devices
1.4 Product Category	SM15Txxx SM6Txxx SMA6Jxxx SMAJxxx SMBJxxx SMCxJxxx SMCJxxx
1.5 Issue date	2024-04-15

2. PCN Team	
2.1 Contact supplier	
2.1.1 Name	PIKE EMMA
2.1.2 Phone	+44 1628896111
2.1.3 Email	emma.pike@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
Wafer Fab (Process)	Change of top layer on die	ST Microelectonics Tours - France

4. Description of change		
	Old	New
4.1 Description	Metallization AlNiAu	Metallization AlTiNiAu Secondary passivation (organic)
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	No	

5. Reason / motivation for change	
5.1 Motivation	In the frame of global production homogenization and continuous improvement, the latest metallization and passivation manufacturing processes developed on new products released will be applied to the whole TVS (Transient Voltage Suppressors) range.
5.2 Customer Benefit	SERVICE CONTINUITY

6. Marking of parts / traceability of change	
6.1 Description	New Finished Good/Type (ending by /NR or /HR) print on carton labels

7. Timing / schedule	
7.1 Date of qualification results	2024-04-12
7.2 Intended start of delivery	2024-07-19
7.3 Qualification sample available?	Upon Request

8. Qualification / Validation			
8.1 Description	14699 24013QRP.pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2024-04-15

9. Attachments (additional documentations)
14699 Public product.pdf 14699 PCN TVS FE Homogenization.pdf 14699 24013QRP.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
	SM15T200A	
	SM15T22A	
	SM15T33A	
	SM15T39CA	
	SM15T68A	
	SM15T6V8A	
	SM6T12A	
	SM6T15CA	
	SM6T18A	
	SM6T18CA	
	SM6T200A	
	SM6T220A	
	SM6T24CA	
	SM6T33A	
	SM6T33CA	
	SMA6J12CA-TR	
	SMA6J24CA-TR	
	SMA6J6.0CA-TR	
	SMA6J85A-TR	
	SMAJ15CA-TR	
	SMAJ24A-TR	
	SMAJ43CA-TR	
	SMAJ48A-TR	
	SMAJ6.0CA-TR	
	SMAJ85CA-TR	
	SMBJ15A-TR	
	SMBJ20CA-TR	
	SMBJ22A-TR	
	SMBJ28A-TR	
	SMBJ30A-TR	
	SMBJ30CA-TR	
	SMBJ33CA-TR	
	SMBJ48CA-TR	
	SMBJ5.0A-TR	
	SMBJ5.0CA-TR	
	SMBJ18A-TR	

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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 : Die manufacturing process homogenization in ST Tours (France)
for TVS (Transient Voltage Suppressor) devices
PCN Reference : POWER AND DISCRETE PRODUCTS/24/14699

Subject : Public Products List

Dear Customer,

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

SM15T22A	SMAJ26CA-TR	SMCJ24CA-TR
SMA6J85CA-TR	SMA6J8.5A-TR	SMCJ48CA-TR
SMBJ58A-TR	SMBJ18A-TR	SMBJ30A-TR
SMC50J30CA	SM6T10CA	SMAJ13A-TR
SMAJ28A-TR	SMC30J8.5A	SMC30J10A
SMC50J11A	SMBJ15A-TR	SMA6J13CA-TR
SM6T22CA	SMC30J154CA	SMAJ130CA-TR
SMBJ28CA-TR	SM6T18CA	SMC50J33CA
SMCJ20A-TR	SMC30J20CA	SMBJ70CA-TR
SM15T220CA	SMA6J6.5CA-TR	SMBJ5.0A-TR
SMBJ10CA-TR	SMC30J13A	SMC50J6.0CA
SMBJ22A-TR	SMAJ170A-TR	SMAJ15A-TR
SM15T12CA	SMAJ70CA-TR	SMC30J5.0A
SM6T6V8A	SMAJ30CA-TR	SM6T10A
SMA6J18A-TR	SMBJ10A-TR	SM15T68A
SMC50J70CA	SMCJ26A-TR	SM6T68CA
SMC50J16A	SMC50J26CA	SMC50J14CA
SMBJ26A-TR	SM6T22A	SMC30J70CA
SMA6J70A-TR	SMBJ170CA-TR	SMAJ20A-TR
SMA6J24A-TR	SMBJ24A-TR	SMC30J8.5CA
SMAJ33CA-TR	SMC30J28CA	SMCJ28A-TR
SMBJ6.5CA-TR	SM15T30CA	SMC30J16CA
SM6T68A	SMAJ6.5CA-TR	SMC30J188A
SMBJ12A-TR	SMAJ6.0A-TR	SMAJ24A-TR
SMA6J8.5CA-TR	SM15T200A	SMAJ33A-TR
SM6T200CA	SMAJ12A-TR	SM6T18A
SM6T200A	SMCJ30A-TR	SMA6J20A-TR
SMCJ5.0CA-TR	SMCJ130CA-TR	SMC50J23A
SMBJ13A-TR	SMAJ188CA-TR	SMC30J18A
SMBJ33A-TR	SMC30J58A	SM15T100CA
SMC30J85CA	SM6T56CA	SMC50J5.0A
SMC50J48CA	SMA6J15A-TR	SMC30J170A
SMC30J13CA	SM6T27CA	SMA6J33A-TR
SMA6J12A-TR	SMC30J15A	SM15T39A
SMBJ6.0CA-TR	SMC30J154A	SMC50J30A

Public Products List

SMA6J28A-TR	SMAJ5.0CA-TR	SM6T39CA
SMC50J15CA	SMBJ26CA-TR	SMC50J40CA
SMC50J64CA	SMC30J130A	SMCJ6.0A-TR
SMBJ28A-TR	SMAJ28CA-TR	SMBJ48A-TR
SMCJ170A-TR	SM6T15CA	SMBJ16A-TR
SMC50J8.5A	SMC30J100CA	SM6T7V5CA
SM15T15CA	SM15T36CA	SMA6J6.5A-TR
SMAJ43A-TR	SMCJ188CA-TR	SMC50J70A
SMC30J30CA	SM15T30A	SMA6J70CA-TR
SMAJ58A-TR	SMAJ26A-TR	SM6T39A
SMCJ70CA-TR	SMAJ10CA-TR	SMC30J20A
SM6T15A	SMC50J12CA	SM6T27A
SMA6J48CA-TR	SMC50J36CA	SMBJ170A-TR
SM6T12A	SMC50J28A	SMBJ130A-TR
SMAJ18A-TR	SM6T100CA	SMC50J6.0A
SMA6J10CA-TR	STIEC45-26AS	SM6T24A
SMAJ13CA-TR	SMC50J85CA	SMAJ188A-TR
SMC30J48A	SMC50J14A	SMAJ18CA-TR
SM6T36A	SMC30J170CA	SMC30J36A
SMCJ85CA-TR	SMBJ8.5CA-TR	SMC50J33A
SMBJ22CA-TR	SMC50J26A	SMBJ100CA-TR
SMC30J22A	SMC30J18CA	SMCJ40CA-TR
SMBJ18CA-TR	SMC50J6.5CA	SMC50J31CA
SM6T220A	SMCJ22A-TR	SMBJ58CA-TR
SM15T24CA	SM6T12CA	SMBJ20CA-TR
SMAJ40A-TR	SMC30J188CA	SM6T24CA
SMC30J6.5A	SMA6J40CA-TR	LNBTVS4-304S
SM15T33CA	SMA6J26CA-TR	SM6T36CA
SMC30J5.0CA	SMC50J24CA	SMBJ13CA-TR
SMC50J64A	SMBJ85CA-TR	SMC50J13CA
SMAJ15CA-TR	SM6T33A	SMCJ15A-TR
SMA6J6.0A-TR	SMBJ12CA-TR	SMAJ6.0CA-TR
SMA6J13A-TR	SMC50J40A	SM15T150CA
SMC50J100A	SMCJ5.0A-TR	STIEC45-24AS
SMA6J15CA-TR	SM15T200CA	SMBJ36CA-TR
SMBJ5.0CA-TR	SMAJ58CA-TR	SM6T7V5A
SMAJ170CA-TR	SM15T36A	SMBJ24CA-TR
SM15T15A	SM6T30CA	SMC30J40CA
SMC30J33A	SM15T6V8A	SMBJ48CA-TR
SM6T33CA	SMC50J12A	SMAJ6.5A-TR
SMCJ40A-TR	SMAJ70A-TR	SMAJ43CA-TR
SMC50J36A	SMBJ30CA-TR	SM15T24A
SM6T220CA	SMA6J85A-TR	SM6T30A
SMCJ12A-TR	SMC50J22CA	SMBJ15CA-TR
SMA6J20CA-TR	SMAJ154A-TR	SMC50J15A
SM15T39CA	SMC30J30A	SM5908
SMC30J6.0A	SMC30J70A	STIEC45-33AS
SMC30J48CA	SMC30J100A	SMC30J36CA
SM6T150A	SMAJ24CA-TR	SMC30J130CA
SMAJ30A-TR	SMC50J18A	SMC50J100CA

SMC50J28CA	SMC30J64A	SMC50J31A
SMC30J24A	SMAJ48CA-TR	SMC30J12A
SMC30J26A	SM15T220A	SMCJ13CA-TR
SMBJ64CA-TR	SMC30J85A	SMC50J20CA
SMC50J58A	SMC50J10A	SMA6J58A-TR
SMBJ40CA-TR	SMC30J64CA	SMBJ6.0A-TR
SMC50J24A	SMA6J18CA-TR	SMAJ85CA-TR
SMAJ12CA-TR	SMC30J22CA	SMC30J15CA
SMC30J6.0CA	SMC30J58CA	SMBJ33CA-TR
SM15T18CA	SM15T12A	SM15T68CA
SMAJ40CA-TR	SMC50J85A	SMA6J5.0CA-TR
SMBJ20A-TR	SMC30J40A	SM15T18A
SMA6J6.0CA-TR	SMC50J11CA	SMC50J23CA
SMCJ33A-TR	SMC30J33CA	SMA6J40A-TR
SM15T22CA	SMA6J58CA-TR	SMCJ18CA-TR
SMA6J26A-TR	SMCJ30CA-TR	SMC50J22A
SMBJ154A-TR	SM15T7V5A	SMA6J10A-TR
SMC30J6.5CA	SM6T100A	SMC50J6.5A
SMC30J10CA	SM15T27A	SMA6J12CA-TR
SMBJ70A-TR	SMC50J5.0CA	SMCJ188A-TR
SM15T6V8CA	SM15T33A	SMBJ6.5A-TR
LNBTVS6-304S	SMA6J5.0A-TR	SMAJ8.5CA-TR
SMC30J16A	SMC30J12CA	SMC30J24CA
STIEC45-30AS	SM6T150CA	SMA6J28CA-TR
SM15T10CA	SMC30J28A	SMC30J26CA
SMCJ15CA-TR	SMCJ33CA-TR	SMC50J16CA
SMC50J48A	SMC50J8.5CA	SMC50J18CA
SMAJ5.0A-TR	SMAJ48A-TR	SMA6J24CA-TR
SM15T100A	SMA6J48A-TR	LNBTVS4-222S
SMBJ64A-TR	SMA6J33CA-TR	SMC50J58CA
SM6T6V8CA	SMC50J13A	SMBJ40A-TR
SMC50J20A		

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Qualification Report

Qualification of passivation and metal stack homogenization on TVS (SMD packages)

General Information	
Product Line	*Protection*
Product Description	*Industrial TVS products*
Product Perimeter	SMAJxxx SMA6Jxxx SM6Txxx SMBJxxx SM15Txxx SMCxJxxx SMCJxxx LNBTVSx
Product Group	*APMS*
Product Division	*Discrete & Filter*
Packages	*SMA - SMB - SMC*
Maturity level step	*Qualified*

Locations	
Wafer Fab	*ST Tours (France)*
Assembly Plant	*Subcontractor (9941) – China* *Subcontractor (990C) – China*
Reliability Lab	*ST Tours (France)*
Reliability Assessment	*Pass*

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comments
1.0	April 11, 2024	26	A. KHEDIM	Timothée PINGAULT Digitally signed by Timothée PINGAULT Date: 2024.04.12 09:03:01 +02'00'	Document creation

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.
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1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
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

DPA	Destructive Physical Analysis
GD	Generic Data
H3TRB	High Humidity High Temperature Reverse Bias
HTRB	High Temperature Reverse Bias
PD	Physical Dimensions
PV	Parametric Verification
RS	Repetitive Surges
RSH	Resistance to solder heat
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 the change for homogenization and continuous improvement of the latest metallization and passivation manufacturing process developed on unidirectional and bidirectional TVS product range:

- 400W & 600W TVS embedded in SMA package,
- 600W TVS embedded in SMB package,
- 1500W, 3000W and 5000W TVS embedded in SMC package.

Commercial Product	Package	Comment (optional)
SMAJxxx	SMA	Industrial
SMA6Jxxx	SMA	
SM6Txxx	SMB	
SMBJxxx	SMB	
SM15Txxx	SMC	
SMCxJxxx	SMC	
SMCJxxx	SMC	
LNBTVSx	SMC	

Involved Commercial part numbers						
SMA package		SMB package		SMC package		
SMA6J10A	SMAJ130CA	SM6T100A	SMBJ130A	LNBTVS4-222S	SMC30J16CA	SMC50J30A
SMA6J10CA	SMAJ13A	SM6T100CA	SMBJ13A	LNBTVS4-304S	SMC30J170A	SMC50J30CA
SMA6J12A	SMAJ13CA	SM6T10A	SMBJ13CA	LNBTVS6-304S	SMC30J188A	SMC50J33A
SMA6J12CA	SMAJ154A	SM6T10CA	SMBJ154A	SM15T100A	SMC30J188CA	SMC50J33CA
SMA6J13A	SMAJ15A	SM6T12A	SMBJ15A	SM15T100CA	SMC30J18A	SMC50J36A
SMA6J13CA	SMAJ15CA	SM6T12CA	SMBJ15CA	SM15T10CA	SMC30J18CA	SMC50J36CA
SMA6J15A	SMAJ170A	SM6T150A	SMBJ16A	SM15T12A	SMC30J20A	SMC50J40A
SMA6J15CA	SMAJ170CA	SM6T150CA	SMBJ170A	SM15T12CA	SMC30J20CA	SMC50J40CA
SMA6J18A	SMAJ188A	SM6T15A	SMBJ170CA	SM15T150CA	SMC30J22A	SMC50J48A
SMA6J18CA	SMAJ188CA	SM6T15CA	SMBJ18A	SM15T15A	SMC30J22CA	SMC50J5.0A
SMA6J20A	SMAJ18A	SM6T18A	SMBJ18CA	SM15T15CA	SMC30J24A	SMC50J58A
SMA6J20CA	SMAJ18CA	SM6T18CA	SMBJ20A	SM15T18A	SMC30J24CA	SMC50J58CA
SMA6J24A	SMAJ20A	SM6T200A	SMBJ20CA	SM15T18CA	SMC30J26A	SMC50J64CA
SMA6J24CA	SMAJ24A	SM6T200CA	SMBJ22A	SM15T200A	SMC30J26CA	SMC50J6.5A
SMA6J26A	SMAJ24CA	SM6T220A	SMBJ22CA	SM15T200CA	SMC30J28A	SMC50J70A
SMA6J26CA	SMAJ26A	SM6T220CA	SMBJ24A	SM15T220A	SMC30J28CA	SMC50J85A
SMA6J28A	SMAJ26CA	SM6T22A	SMBJ24CA	SM15T220CA	SMC30J30A	SMCJ12A
SMA6J28CA	SMAJ28A	SM6T22CA	SMBJ26A	SM15T22A	SMC30J30CA	SMCJ130CA
SMA6J33A	SMAJ28CA	SM6T24A	SMBJ26CA	SM15T22CA	SMC30J33A	SMCJ13CA
SMA6J33CA	SMAJ30A	SM6T24CA	SMBJ28A	SM15T24A	SMC30J33CA	SMCJ15A
SMA6J40A	SMAJ30CA	SM6T27A	SMBJ28CA	SM15T24CA	SMC30J36A	SMCJ15CA
SMA6J40CA	SMAJ33A	SM6T27CA	SMBJ30A	SM15T27A	SMC30J36CA	SMCJ170A
SMA6J48A	SMAJ33CA	SM6T30A	SMBJ30CA	SM15T30A	SMC30J40CA	SMCJ188A
SMA6J48CA	SMAJ40A	SM6T30CA	SMBJ33A	SM15T30CA	SMC30J48A	SMCJ188CA
SMA6J5.0A	SMAJ40CA	SM6T33A	SMBJ33CA	SM15T33A	SMC30J48CA	SMCJ18CA
SMA6J5.0CA	SMAJ43A	SM6T33CA	SMBJ36CA	SM15T33CA	SMC30J5.0A	SMCJ20A
SMA6J58A	SMAJ43CA	SM6T36A	SMBJ40A	SM15T36A	SMC30J5.0CA	SMCJ22A
SMA6J58CA	SMAJ48A	SM6T36CA	SMBJ40CA	SM15T36CA	SMC30J58A	SMCJ24CA
SMA6J6.0A	SMAJ48CA	SM6T39A	SMBJ48A	SM15T39A	SMC30J58CA	SMCJ26A
SMA6J6.0CA	SMAJ5.0A	SM6T39CA	SMBJ48CA	SM15T39CA	SMC30J6.0A	SMCJ28A
SMA6J6.5A	SMAJ5.0CA	SM6T56CA	SMBJ5.0A	SM15T68A	SMC30J6.0CA	SMCJ30A
SMA6J6.5CA	SMAJ58A	SM6T68A	SMBJ5.0CA	SM15T68CA	SMC30J64A	SMCJ30CA
SMA6J70A	SMAJ58CA	SM6T68CA	SMBJ58A	SM15T6V8A	SMC30J64CA	SMCJ33A
SMA6J70CA	SMAJ6.0A	SM6T6V8A	SMBJ58CA	SM15T6V8CA	SMC30J6.5A	SMCJ33CA
SMA6J8.5A	SMAJ6.0CA	SM6T6V8CA	SMBJ6.0A	SM15T7V5A	SMC30J6.5CA	SMCJ40A
SMA6J85A	SMAJ6.5A	SM6T7V5A	SMBJ6.0CA	SM5908	SMC30J70A	SMCJ40CA
SMA6J8.5CA	SMAJ6.5CA	SM6T7V5CA	SMBJ6.5A	SMC30J100A	SMC30J70CA	SMCJ48CA
SMA6J85CA	SMAJ70A	SMBJ100CA	SMBJ6.5CA	SMC30J100CA	SMC30J8.5A	SMCJ5.0A
SMAJ10CA	SMAJ70CA	SMBJ10A	SMBJ70A	SMC30J10A	SMC30J8.5CA	SMCJ5.0CA
SMAJ12A	SMAJ8.5CA	SMBJ10CA	SMBJ70CA	SMC30J10CA	SMC50J100A	SMCJ6.0A
SMAJ12CA	SMAJ85CA	SMBJ12A	SMBJ8.5CA	SMC30J12A	SMC50J12CA	SMCJ70CA
		SMBJ12CA	SMBJ85CA	SMC30J12CA	SMC50J20CA	SMCJ85CA
				SMC30J13A	SMC50J24A	STIEC45-24AS
				SMC30J13CA	SMC50J24CA	STIEC45-26AS
				SMC30J15A	SMC50J28A	STIEC45-30AS
				SMC30J15CA	SMC50J28CA	STIEC45-33AS
				SMC30J16A		

The reliability test methodology used follows the JESD47: “Stress Test driven Qualification Methodology” .

The reliability tests ensuing are:

.

- TC 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.
- H3TRB, UHAST to check the robustness to corrosion and the good package hermeticity.
- RSH to check compatibility of package with customer assembly.
- Functional test: Repetitive IPP to verify robustness of device submitted to rated Ipp (as per data sheet)

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, TVS in SMD packages are compliant with JESD47.

4 DEVICE CHARACTERISTICS

4.1 Device description

Example datasheet of TVS SMA package (SMA6J12A)

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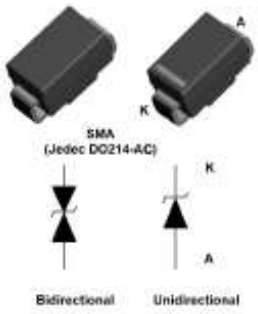
SMA6JxxA, SMA6JxxCA

Datasheet

600 W TVS in SMA



Product status link
SMA6J5.0A, SMA6J5.0CA,
SMA6J6.0A, SMA6J6.0CA,
SMA6J6.5A, SMA6J6.5CA,
SMA6J8.5A, SMA6J8.5CA,
SMA6J10A, SMA6J10CA,
SMA6J12A, SMA6J12CA,
SMA6J13A, SMA6J13CA,
SMA6J15A, SMA6J15CA,
SMA6J18A, SMA6J18CA,
SMA6J20A, SMA6J20CA,
SMA6J24A, SMA6J24CA,
SMA6J26A, SMA6J26CA,
SMA6J28A, SMA6J28CA,
SMA6J33A, SMA6J33CA,
SMA6J40A, SMA6J40CA,
SMA6J48A, SMA6J48CA,
SMA6J58A, SMA6J58CA,
SMA6J70A, SMA6J70CA,
SMA6J85A, SMA6J85CA

Features

- Peak pulse power:
  - 600 W (10/1000 µs)
  - 4 kW (8/20 µs)
- Stand-off voltage range from 5 V to 85 V
- Unidirectional and bidirectional types
- Low leakage current:
  - 0.2 µA at 25 °C
  - 1 µA at 85 °C
- Operating T_J max: 175 °C
- JEDEC registered package outline
- Resin meets UL94, V0

Complies with the following standards

- UL94, V0
- J-STD-020 MSL level 1
- J-STD-002, JESD 22-B102 E3 and MIL-STD-750, method 2026 solderable matte tin plated leads
- JESD-201 class 2 whisker test
- IPC7531 footprint
- JEDEC registered package outline
- IEC 61000-4-4 level 4:
  - 4 kV
- IEC 61000-4-2, C = 150 pF - R = 330 Ω exceeds level 4:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)

Description

The SMA6J series is designed to protect sensitive equipment against electrostatic discharges according to IEC 61000-4-2 and MIL STD 883, method 3015, and electrical overstress according to IEC 61000-4-4 and 5. This device is more generally used against surges below 600 W (10/1000 µs).

The Planar technology makes it compatible with high-end circuits where low leakage current and high junction temperature are required to provide long term reliability and stability. SMA6J devices are packaged in SMA (SMA footprint in accordance with IPC 7531 standard).

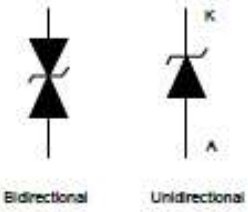
Example datasheet of TVS SMB package (SM6T22CA)

life.augmented

SM6T

Datasheet

600 W TVS in SMB



Features

- Peak pulse power: 600 W (10/1000 µs) and 4 kW (8/20 µs)
- Stand-off voltage range from 5 V to 188 V
- Unidirectional and bidirectional types
- Low leakage current: 0.2 µA at 25 °C and 1 µA at 85 °C
- Operating T_J max: 150 °C
- High power capability at T_J max.: up to 515 W (10/1000 µs)
- Lead finishing: matte tin plating

Complies with the following standards

- UL94, V0
- J-STD-020 MSL level 1
- J-STD-002, JESD 22-B102 E3 and MIL-STD-750, method 2026 solderable matte tin plated leads
- JESD-201 class 2 whisker test
- IPC7531 footprint
- JEDEC registered package outline
- IEC 61000-4-4 level 4:
  - 4 kV
- IEC 61000-4-2, C = 150 pF - R = 330 Ω exceeds level 4:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)

Product status link	
SM6T	SM6T6V8A, SM6T6V8CA, SM6T7V5A, SM6T7V5CA, SM6T10A, SM6T10CA, SM6T12A, SM6T12CA, SM6T15A, SM6T15CA, SM6T18A, SM6T18CA, SM6T22A, SM6T22CA, SM6T24A, SM6T24CA, SM6T27A, SM6T27CA, SM6T30A, SM6T30CA, SM6T33A, SM6T33CA, SM6T36A, SM6T36CA, SM6T39A, SM6T39CA, SM6T56A, SM6T56CA, SM6T68A, SM6T68CA, SM6T75A, SM6T75CA, SM6T100A, SM6T100CA, SM6T150A, SM6T150CA, SM6T200A, SM6T200CA, SM6T220A, SM6T220CA

Description

The SM6T series are designed to protect sensitive equipment against electrostatic discharges according to IEC 61000-4-2 and MIL STD 883, method 3015, and electrical overstress according to IEC 61000-4-4 and 5. This device is more generally used against surges below 600 W (10/1000 µs).

The Planar technology makes it suitable for high-end equipment and SMPS where low leakage current and high junction temperature are required to provide reliability and stability over time.

The SM6T series are packaged in SMB.

Example datasheet of TVS SMC package (SM30J30A)

life.augmented

SMC30JxxA, SMC30JxxCA

Datasheet

3000 W TVS in SMC

Product status link

SMC30J5.0A, SMC30J5.0CA,
SMC30J6.0A, SMC30J6.0CA,
SMC30J6.5A, SMC30J6.5CA,
SMC30J8.5A, SMC30J8.5CA,
SMC30J10A, SMC30J10CA,
SMC30J12A, SMC30J12CA,
SMC30J13A, SMC30J13CA,
SMC30J15A, SMC30J15CA,
SMC30J16A, SMC30J16CA,
SMC30J18A, SMC30J18CA,
SMC30J20A, SMC30J20CA,
SMC30J22A, SMC30J22CA,
SMC30J24A, SMC30J24CA,
SMC30J26A, SMC30J26CA,
SMC30J28A, SMC30J28CA,
SMC30J30A, SMC30J30CA,
SMC30J33A, SMC30J33CA,
SMC30J36A, SMC30J36CA,
SMC30J40A, SMC30J40CA,
SMC30J48A, SMC30J48CA,
SMC30J58A, SMC30J58CA,
SMC30J64A, SMC30J64CA,
SMC30J70A, SMC30J70CA,
SMC30J85A, SMC30J85CA,
SMC30J100A, SMC30J100CA,
SMC30J130A, SMC30J130CA,
SMC30J154A, SMC30J154CA,
SMC30J170A, SMC30J170CA,
SMC30J188A, SMC30J188CA

Features

- Peak pulse power:
  - 3000 W (10/1000 µs)
  - up to 40 kW (8/20 µs)
- Stand-off voltage range from 5 V to 188 V
- Unidirectional and bidirectional types
- Low leakage current: 0.2 µA at 25 °C
- Operating T_J max: 175 °C
- JEDEC registered package outline
- Lead finishing: matte tin plating

Complies with the following standards

- UL94, V0
- J-STD-020 MSL level 1
- J-STD-002, JESD 22-B102 E3 and MIL-STD-750, method 2026
- JESD-201 class 2 whisker test
- IPC7531 footprint and JEDEC registered package outline
- IEC 61000-4-4 level 4:
  - 4 k V
- IEC 61000-4-2, C = 150 pF, R = 330 Ω exceeds level 4:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)

Description

The SMC30J TVS series are designed to protect sensitive equipment against electrostatic discharges according to IEC 61000-4-2, MIL STD 883 Method 3015, and electrical overstress such as IEC 61000-4-4 and 5. They are used for surges below 3000 W 10/1000 µs.

This planar technology makes it compatible with high-end equipment and SMPS where low leakage current and high junction temperature are required to provide reliability and stability over time.

4.2 Construction Note

	400W, 600W TVS package SMA qualification
Wafer/Die fab. information	
Wafer fab manufacturing location	ST Tours - France
Technology / Process family	Discrete Transil
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST Tours - France
Assembly information	
Assembly site	Subcontractor (9941) – China
Package description	SMA
Molding compound	ECOPACK®2 molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	Subcontractor (9941) - China

	400W, 600W TVS package SMA qualification
Wafer/Die fab. information	
Wafer fab manufacturing location	ST Tours - France
Technology / Process family	Discrete Transil
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST Tours - France
Assembly information	
Assembly site	Subcontractor (990C) – China
Package description	SMA
Molding compound	ECOPACK®2 molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	Subcontractor (990C) - China

	600W TVS SMB qualification
Wafer/Die fab. information	
Wafer fab manufacturing location	ST Tours - France
Technology / Process family	Discrete Transil
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST Tours - France
Assembly information	
Assembly site	Subcontractor (9941) – China
Package description	SMB
Molding compound	ECOPACK®2 molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	Subcontractor (9941) - China

	600W TVS SMB qualification
Wafer/Die fab. information	
Wafer fab manufacturing location	ST Tours - France
Technology / Process family	Discrete Transil
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST Tours - France
Assembly information	
Assembly site	Subcontractor (990C) – China or Subcontractor (990C) - China
Package description	SMB
Molding compound	ECOPACK®2 molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	Subcontractor (990C) - China

	1500W, 3000W, 5000W TVS SMC qualification
Wafer/Die fab. information	
Wafer fab manufacturing location	ST Tours - France
Technology / Process family	Discrete Transil
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST Tours - France
Assembly information	
Assembly site	Subcontractor (9941) - China
Package description	SMC
Molding compound	ECOPACK®2 molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	Subcontractor (9941) - China

5 TESTS PLAN AND RESULTS SUMMARY

5.1 Test vehicles

Lot #	Finish Good	Package	Comments
Lot 1	SMAJ33CA	SMA	Qualification lot
Lot 2	SM6T39CA	SMB	Qualification lot
Lot 3	SM15T6V8CA	SMC	Qualification lot
Lot 4	SMC30J188CA	SMC	Qualification lot
Lot 5	SMC50J100A	SMC	Qualification lot
Lot 6	SMAJ5.0A	SMA	Qualification lot
Lot 7	SMA6J33A	SMA	Qualification lot
Lot 8	LNBTVS6	SMC	Qualification lot
Lot 9	SMAJ33A	SMA	Qualification lot
Lot 10	SMBJ70CA	SMB	Qualification lot
Lot 11	SMBJ33A	SMB	Qualification lot

Detailed results in the chapter below 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.			
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	
MSL research	MSL	J-STD-020			Not applicable for PTH and WLCSP without coating	
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				
High Temperature Reverse Bias	HTRB	MIL-STD-750-1 M1038 Method A (for diodes, rectifiers and Zeners) M1039 Method A (for transistors)	Lot 1 Lot 2 Lot 3 Lot 4 Lot 5 Lot 7 Lot 9 Lot 10 Lot 11 Lot 12	77 77 77 77 77 77 45 45 45 45		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 H3TRB	
Temperature Humidity Storage	THS	JESD22 A-118			Covered by H3TRB	
Temperature Cycling	TC	JESD22A-104	Lot 5 Lot 6 Lot 7 Lot 8 Lot 9 Lot 10 Lot 11	77 77 77 25 25 25 25		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	Lot 1 Lot 2	77 77		X

Stress	Abrv	Reference	Lot	SS	Comments	Test plan
			Lot 3 Lot 5 Lot 7 Lot 8 Lot 9 Lot 10 Lot 11	77 77 77 25 25 25 25		
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	Lot 1 Lot 2 Lot 5 Lot 8 Lot 9 Lot 10 Lot 11	77 77 77 25 25 25 25	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			For power devices. Not required for Transient Voltage Suppressor (TVS) parts	
Power and Temperature Cycle	PTC	JED22A-105			For power devices. Not required for Transient Voltage Suppressor (TVS) parts Perform PTC if $\Delta Tj>100°C$ cannot be achieved with IOL 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			After H3TRB and TC	
Physical Dimension	PD	JESD22B-100	Refer to annex 6.2			X
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 A-111 (SMD)	Lot 9 Lot 10	30 30		X
Solderability	SD	J-STD-002 JESD22B102				
Dead Bug Test	DBT	ST Internal specification			Mandatory for SMD package Data collection for PTH package	
Thermal Resistance	TR	JESD24-3, 24-4, 24-6 as appropriate			Required in case of process change. Not applicable to protection device as no limit specified in the datasheet	

Stress	Abrv	Reference	Lot	SS	Comments	Test plan
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 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	Lot 2 Lot 3 Lot 4 Lot 6 Lot 7 Lot 8 Lot 9 Lot 10 Lot 11	20 20 20 20 20 20 20 20 20	Required for protection devices only.	X

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	Total	Steps	Results / Lot Fail/s.s.										
						SMAJ33CA	SM6T39CA	SM15T6V8CA	SMC30J188CA	SMC50J100A	SMAJ5.0A	SMA6J33A	LNBTVS6	SMAJ33A	SMBJ70CA	SMBJ33A
						Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6	Lot 7	Lot 8	Lot 9	Lot 10	Lot 11
Pre-and Post Electrical Test	-	ST datasheet	IR, VBR, VF parameters according to product datasheet	2576	-	0/2576										
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 (note1)	Refer to paragraph 6.1 in Annexes												
HTRB	N	MIL-STD-750-1 M1038 Method A	Junction Temperature=150°C Temperature=150°C Tension=Vrm	642	1000h	0/77	0/77	0/77	0/77				0/45	0/45	0/45	0/45
			Junction Temperature=175°C Temperature=175°C Tension = Vrm		1000h					0/77		0/77				
TC	Y	JESD22-A104	Frequency (cy/h)=2cy/h Temperature (high)=150°C Temperature (low)=-55°C	231	500cy					0/77	0/77	0/77				
			Frequency (cy/h)=2cy/h Temperature (high)=150°C Temperature (low)=-65°C	257	500cy					W15-2024			0/25	0/25	0/25	0/25
RSH	N	JESD22A-111 (SMD) / JESD22B-106 (PTH)	Temperature=260°C Time (on)=10s	60	Measure after dipping									0/30	0/30	
H3TRB	Y	JESD22-A101	Humidity (HR)=85% Temperature=85°C Tension= Vrm (max 100V)	331	1000h	0/77	0/77			0/77			0/25	0/25	0/25	0/25
UHAST	Y	JESD22 A-118	Humidity (HR)=85% Pressure=2.3bar Temperature=130°C	875	96h	0/77	0/77	0/77		0/77		0/77	0/25	0/25	0/25	0/25
Functional test																
Repetitive Surge	Y	ADCS0060282	IPP=IPP datasheet Pulse delay=0.01ms Time between surge=60s	180	50 surges		0/20	0/20	0/20		0/20	0/20	0/20	0/20	0/20	0/20

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

SMAJ33A

Characterization SMAJ33A							
Date : 05/04/2024							
Ref : 23515A							
Lab : ST Tours Characterization Lab							
TEST	**VBR**	**IRM**	**IRM**	**VCL 10/1000 µs**	**RD**	**VCL 8/20 µs**	**RD**
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TEST CALCULES	TESEC	TESTS_CALCULES
Condition 1	25°C	25°C	85°C	25°C	25°C	25°C	25°C
Condition 2	IR=1mA	VRM=33V	VRM=33V	IPP=7.5A	IF1=3.75A	IPP=33A	IF1=16.5A
Condition 3					IF2=7.5A		IF2=33A
Condition 4					VR1= 1-VCL 10/1000 µs		VR1= 1-VCL 8/20 µs
Condition 5					VR2= 2-VCL 10/1000 µs		VR2= 2-VCL 8/20 µs
Min. Datasheet	*36.7*						
Typ. Datasheet	*38.6*						
Max. Datasheet		*0,2µA*	*1µA*	*53.3*	*1.70*	*69.7*	*0.884ohm*
Comments	Direct	Direct	Direct	Direct	Direct	Direct	Direct
UNIT	V	nA	nA	V	*Ohm*	V	*Ohm*
N	30	30	30	30	30	30	30
Min	37.83	1.27	3.34	45.9	0.96	48.69	0.324
Max	39.13	10.23	47.13	48.3	1.2	52.71	0.379
Avg.	38.49	4.48	20.11	46.8	1.04	50.5	0.341

(*)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

SMBJ33A

Characterization SMBJ33A							
Date : 05/04/2024							
Ref : 23534A							
Lab : ST Tours Characterization Lab							
TEST	**VBR**	**IRM**	**IRM**	**VCL 10/1000 µs**	**RD**	**VCL 8/20 µs**	**RD**
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TEST CALCULES	TESEC	TESTS_CALCULES
Condition 1	25°C	25°C	85°C	25°C	25°C	25°C	25°C
Condition 2	IR=1mA	VRM=33V	VRM=33V	IPP=11.8A	IF1=5.9A	IPP=57A	IF1=28.5A
Condition 3					IF2=11.8A		IF2=57A
Condition 4					VR1= 1-VCL 10/1000 µs		VR1= 1-VCL 8/20 µs
Condition 5					VR2= 2-VCL 10/1000 µs		VR2= 2-VCL 8/20 µs
Min. Datasheet	*36.7*						
Typ. Datasheet	*38.6*						
Max. Datasheet		*0,2µA*	*1µA*	*53.3*	*1.08*	*69.7*	*0.512ohm*
Comments	Direct	Direct	Direct	Direct	Direct	Direct	Direct
UNIT	V	nA	nA	V	*Ohm*	V	*Ohm*
N	30	30	30	30	30	30	30
Min	38.41	1.975	6.975	46.2	0.576	51.32	0.191
Max	40	7.863	11.93	48.3	0.83	54.08	0.225
Avg.	38.99	2.719	9.62	46.96	0.663	52.49	0.212

(*)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

SMBJ70CA

Characterization SMBJ70CA

Date : 05/04/2024
Ref : 23516A
Lab : ST Tours Characterization Lab

TEST	VBR	VBR	IRM	IRM	IRM	IRM
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TESEC	TESEC
Condition 1	25°C	25°C	25°C	25°C	85°C	85°C
Condition 2	IR=1mA	IR=1mA	VRM=70V	VRM=70V	VRM=70V	VRM=70V
Condition 3						
Condition 4						
Condition 5						
Min. Datasheet	*77.8*	*77.8*				
Typ. Datasheet	*81.9*	*81.9*				
Max. Datasheet			*0,2µA*	*0,2µA*	*1µA*	*1µA*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	nA	nA	nA	nA
N	30	30	30	30	30	30
Min	79.98	80.12	1.074	0.952	4.42	2.393
Max	83.17	82.25	26.86	27.91	46.83	40.78
Avg.	81.37	81.15	6.687	9.846	19.109	20.215

TEST	VCL 10/1000 µs	VCL 10/1000 µs	RD	RD	VCL 8/20 µs	VCL 8/20 µs	RD	RD
EQUIPMENT	TESEC	TESEC	TEST CALCULES	TEST CALCULES	TESEC	TESEC	TESTS_CALCULES	TESTS_CALCULES
Condition 1	25°C	25°C	25°C	25°C	25°C	25°C	25°C	25°C
Condition 2	IPP=5.5A	IPP=5.5A	IF1=2.75A	IF1=2.75A	IPP=27A	IPP=27A	IF1=13.5A	IF1=13.5A
Condition 3			IF2=5.5A	IF2=5.5A			IF2=27A	IF2=27A
Condition 4			VR1= 1-VCL 10/1000 µs	VR1= 1-VCL 10/1000 µs			VR1= 1-VCL 8/20 µs	VR1= 1-VCL 8/20 µs
Condition 5			VR2= 2-VCL 10/1000 µs	VR2= 2-VCL 10/1000 µs			VR2= 2-VCL 8/20 µs	VR2= 2-VCL 8/20 µs
Min. Datasheet								
Typ. Datasheet								
Max. Datasheet	*113*	*113*	*4.91*	*4.91*	*146*	*146*	*2.2ohm*	*2.2ohm*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	*Ohm*	*Ohm*	V	V	*ohm*	*ohm*
N	15	15	15	15	15	15	15	15
Min	95	94.9	2.109	2.472	98.08	98.08	0.611	0.603
Max	97.5	97.1	3.381	2.909	100.83	100.83	0.679	0.679
Avg.	96.04	95.9	2.766	2.71	99.48	99.48	0.642	0.6373

(*)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

LNBTVS6

Characterization LNBTVS6

Date : 05/04/2024
Ref : 23513A
Lab : ST Tours Characterization Lab

TEST	VBR	IRM	IRM	VCL 10/1000 µs	VCL 8/20 µs
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TESEC
Condition 1	25°C	25°C	85°C	25°C	25°C
Condition 2	IR=1mA	VRM=28V	VRM=28V	IPP=67A	IPP=500A
Condition 3					
Condition 4					
Condition 5					
Min. Datasheet	*30*				
Typ. Datasheet	*31.5*				
Max. Datasheet	*33*	*0,2µA*	*1µA*	*45*	*45*
Comments	Direct	Direct	Direct	Direct	Direct
UNIT	V	nA	nA	V	V
N	30	30	30	30	30
Min	30.99	2.39	13.67	37.6	41.61
Max	31.69	16.02	113.5	39.2	42.75
Moy.	31.25	8.33	50.998	38.21	42.04

(*)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

SMA6J33A

Characterization SMA6J33A

Date : 05/04/2024
Ref : 23511A
Lab : ST Tours Characterization Lab

TEST	VBR	IRM	IRM	VCL 10/1000 µs	RD	VCL 8/20 µs	RD
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TEST CALCULES	TESEC	TESTS_CALCULES
Condition 1	25°C	25°C	85°C	25°C	25°C	25°C	25°C
Condition 2	IR=1mA	VRM=33V	VRM=33V	IPP=11.8A	IF1=5.9A	IPP=57A	IF1=28.5A
Condition 3					IF2=11.8A		IF2=57A
Condition 4					VR1= 1-VCL 10/1000 µs		VR1= 1-VCL 8/20 µs
Condition 5					VR2= 2-VCL 10/1000 µs		VR2= 2-VCL 8/20 µs
Min. Datasheet	*36.7*						
Typ. Datasheet	*38.6*						
Max. Datasheet	*40.6*	*0,2µA*	*1µA*	*51.9*	*0.963*	*69*	*0.512*
Comments	Direct	Direct	Direct	Direct	Direct	Direct	Direct
UNIT	V	nA	nA	V	*Ohm*	V	*Ohm*
N	30	30	30	30	30	30	30
Min	38.13	0.952	1.05	46.6	0.559	51.37	0.172
Max	40.19	22.71	46.88	49.8	0.779	54.49	0.235
Avg.	38.86	10.485	21.13	47.23	0.655	52.3	0.218

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Please note that these electrical parameters are 100% tested at 25°C at Final stage of back-end manufacturing before deliveries to customers

SMAJ5.0A

Characterization SMAJ5.0AH-TR

Date : 05/04/2024
Ref : 23510A
Lab : ST Tours Characterization Lab

TEST	VBR	IRM	IRM	VCL 10/1000 µs	RD	VCL 8/20 µs	RD
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TEST CALCULES	TESEC	TESTS_CALCULES
Condition 1	25°C	25°C	85°C	25°C	25°C	25°C	25°C
Condition 2	IR=10mA	VRM=5V	VRM=5V	IPP=43.5A	IF1=21.75A	IPP=174A	IF1=87A
Condition 3					IF2=43.5A		IF2=174A
Condition 4					VR1= 1-VCL 10/1000 µs		VR1= 1-VCL 8/20 µs
Condition 5					VR2= 2-VCL 10/1000 µs		VR2= 2-VCL 8/20 µs
Min. Datasheet	*6.40*						
Typ. Datasheet	*6.74*						
Max. Datasheet		*20µA*	*50µA*	*9.2*	*0.049*	*13.4*	*0.036ohm*
Comments	Direct	Direct	Direct	Direct	Direct	Direct	Direct
UNIT	V	nA	nA	V	*Ohm*	V	*Ohm*
N	30	30	30	30	30	30	30
Min	6.686	25.5	82.13	8.41	0.021	12.04	0.0289
Max	6.819	220	397.2	8.68	0.04	12.6	0.0331
Avg.	6.731	48.33	122.76	8.53	0.0352	12.29	0.0308

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SMC50J100A

Characterization SMC50J100A-TR							
Date : 05/04/2024							
Ref : 23471A							
Lab : ST Tours Characterization Lab							
TEST	**VBR**	**IRM**	**IRM**	**VCL 10/1000 µs**	**RD**	**VCL 8/20 µs**	**RD**
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TEST CALCULES	TESEC	TESTS_CALCULES
Condition 1	25°C	25°C	85°C	25°C	25°C	25°C	25°C
Condition 2	IR=1mA	VRM=100V	VRM=100V	IPP=28A	IF1=14A	IPP=227A	IF1=114A
Condition 3					IF2=28A		IF2=227A
Condition 4					VR1= 1-VCL 10/1000 µs		VR1= 1-VCL 8/20 µs
Condition 5					VR2= 2-VCL 10/1000 µs		VR2= 2-VCL 8/20 µs
Min. Datasheet	*111*						
Typ. Datasheet	*117*						
Max. Datasheet	*123*	*0,2µA*	*1µA*	*179*	*2000mohm*	*212*	*392mohm*
Comments	Direct	Direct	Direct	Direct	Direct	Direct	Direct
UNIT	V	nA	nA	V	*mohm*	V	*mohm*
N	30	30	30	30	30	30	30
Min	114.8	7.301	10.01	142.5	892.85	159.82	0.181
Max	118.2	25.69	59.09	147.5	1130.71	164.83	0.196
Avg.	116.09	16.86	26.55	144.49	958.52	161.22	0.186

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SMC30J188CA

Characterization SMC30J188CA						
Date : 05/04/2024						
Ref : 23470A						
Lab : ST Tours Characterization Lab						
TEST	**VBR**	**VBR**	**IRM**	**IRM**	**IRM**	**IRM**
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TESEC	TESEC
Condition 1	25°C	25°C	25°C	25°C	85°C	85°C
Condition 2	IR=1mA	IR=1mA	VRM=188V	VRM=188V	VRM=188V	VRM=188V
Condition 3						
Condition 4						
Condition 5						
Min. Datasheet	*209*	*209*				
Typ. Datasheet	*220*	*220*				
Max. Datasheet	*231*	*231*	*0,2µA*	*0,2µA*	*1µA*	*1µA*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	nA	nA	nA	nA
N	30	30	30	30	30	30
Min	215.3	214.8	20.27	3.809	23.44	21.98
Max	224.4	221	51.57	36.82	86.44	100.8
Avg.	217.58	217.5	32.048	21.58	50.12	54.9

TEST	**VCL 10/1000 µs**	**VCL 10/1000 µs**	**RD**	**RD**	**VCL 8/20 µs**	**VCL 8/20 µs**	**RD**	**RD**
EQUIPMENT	TESEC	TESEC	TEST CALCULES	TEST CALCULES	TESEC	TESEC	TESTS_CALCULES	TESTS_CALCULES
Condition 1	25°C	25°C	25°C	25°C	25°C	25°C	25°C	25°C
Condition 2	IPP=9A	IPP=9A	IF1=4.5A	IF1=4.5A	IPP=80A	IPP=80A	IF1=40A	IF1=40A
Condition 3			IF2=9A	IF2=9A			IF2=80A	IF2=80A
Condition 4			VR1= 1-VCL 10/1000 µs	VR1= 1-VCL 10/1000 µs			VR1= 1-VCL 8/20 µs	VR1= 1-VCL 8/20 µs
Condition 5			VR2= 2-VCL 10/1000 µs	VR2= 2-VCL 10/1000 µs			VR2= 2-VCL 8/20 µs	VR2= 2-VCL 8/20 µs
Min. Datasheet								
Typ. Datasheet								
Max. Datasheet	*328*	*328*	*10778mohm*	*10778mohm*	*388*	*388*	*1963mohm*	*1963mohm*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	*Ohm*	*Ohm*	V	V	*Ohm*	*Ohm*
N	15	15	15	15	15	15	15	15
Min	247.8	261.6	0.333	3.755	272.2	273.8	0.418	0.4875
Max	270.8	267.1	4.333	4.444	278.6	279.8	0.548	0.52
Avg.	262.63	264.01	3.822	4.112	276.413	277.08	0.511	0.508

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SM15T6V8CA

Characterization SM15T6V8CA

Date : 05/04/2024
Ref : 23469A
Lab : ST Tours Characterization Lab

TEST	VBR	VBR	IRM	IRM	IRM	IRM
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TESEC	TESEC
Condition 1	25°C	25°C	25°C	25°C	85°C	85°C
Condition 2	IR=1mA	IR=1mA	VRM=5.8V	VRM=5.8V	VRM=5.8V	VRM=5.8V
Condition 3						
Condition 4						
Condition 5						
Min. Datasheet	*6.45*	*6.45*				
Typ. Datasheet	*6.8*	*6.8*				
Max. Datasheet	*7.14*	*7.14*	*500µA*	*500µA*	*2000µA*	*2000µA*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	µA	µA	µA	µA
N	30	30	30	30	30	30
Min	6.798	6.775	5.348	5.47	13.43	13.92
Max	6.899	6.901	10.45	10.35	24.17	24.42
Avg.	6.835	6.835	8.131	8.293	19.44	19.81

TEST	VCL 10/1000 µs	VCL 10/1000 µs	RD	RD	VCL 8/20 µs	VCL 8/20 µs	RD	RD
EQUIPMENT	TESEC	TESEC	TEST CALCULES	TEST CALCULES	TESEC	TESEC	TESTS_CALCULES	TESTS_CALCULES
Condition 1	25°C	25°C	25°C	25°C	25°C	25°C	25°C	25°C
Condition 2	IPP=143A	IPP=143A	IF1=72A	IF1=72A	IPP=746A	IPP=746A	IF1=370A	IF1=370A
Condition 3			IF2=143A	IF2=143A			IF2=746A	IF2=746A
Condition 4			VR1= 1-VCL 10/1000 µs	VR1= 1-VCL 10/1000 µs			VR1= 1-VCL 8/20 µs	VR1= 1-VCL 8/20 µs
Condition 5			VR2= 2-VCL 10/1000 µs	VR2= 2-VCL 10/1000 µs			VR2= 2-VCL 8/20 µs	VR2= 2-VCL 8/20 µs
Min. Datasheet								
Typ. Datasheet								
Max. Datasheet	*10.5*	*10.5*	*0.023*	*0.023*	*13.4*	*13.4*	*0.008ohm*	*0.008ohm*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	*Ohm*	*Ohm*	V	V	*ohm*	*ohm*
N	15	15	15	15	15	15	15	15
Min	8.25	8.21	0.00633	0.00647	11.73	11.8	0.00585	0.005851
Max	8.45	8.42	0.00845	0.00957	12.07	12.07	0.006382	0.006569
Avg.	8.31	8.26	0.00685	0.00729	11.85	11.91	0.00603	0.006184

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SM6T39CA

Characterization SM6T39CA							
Date : 05/04/2024							
Ref : 23467A							
Lab : ST Tours Characterization Lab							
TEST	**VBR**	**VBR**	**IRM**	**IRM**	**IRM**	**IRM**	
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TESEC	TESEC	
Condition 1	25°C	25°C	25°C	25°C	85°C	85°C	
Condition 2	IR=1mA	IR=1mA	VRM=33.3V	VRM=33.3V	VRM=33.3V	VRM=33.3V	
Condition 3							
Condition 4							
Condition 5							
Min. Datasheet	*37.1*	*37.1*					
Typ. Datasheet	*39*	*39*					
Max. Datasheet	*41*	*41*	*0,2µA*	*0,2µA*	*1µA*	*1µA*	
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse	
UNIT	V	V	nA	nA	nA	nA	
N	30	30	30	30	30	30	
Min	38.56	38.56	1.444	1.807	8.314	9.649	
Max	39.75	39.95	2.42	2.45	14.35	13.03	
Avg.	39.013	39	1.8317	2.069	11.568	11.21	

VCL 10/1000 µs	**VCL 10/1000 µs**	**RD**	**RD**	**VCL 8/20 µs**	**VCL 8/20 µs**	**RD**	**RD**
TESEC	TESEC	TEST CALCULES	TEST CALCULES	TESEC	TESEC	TESTS_CALCULES	TESTS_CALCULES
25°C	25°C	25°C	25°C	25°C	25°C	25°C	25°C
IPP=11.1A	IPP=11.1A	IF1=5.55A	IF1=5.55A	IPP=57A	IPP=57A	IF1=28.5A	IF1=28.5A
		IF2=11A	IF2=11A			IF2=57A	IF2=57A
		VR1= 1-VCL 10/1000 µs	VR1= 1-VCL 10/1000 µs			VR1= 1-VCL 8/20 µs	VR1= 1-VCL 8/20 µs
		VR2= 2-VCL 10/1000 µs	VR2= 2-VCL 10/1000 µs			VR2= 2-VCL 8/20 µs	VR2= 2-VCL 8/20 µs
53.9	*53.9*	*1.16*	*1.16*	*69.7*	*69.7*	*0.504*	*0.504*
Direct	Reverse	Direct	Reverse	Direct	Reverse	Direct	Reverse
V	V	*Ohm*	*Ohm*	V	V	*Ohm*	*Ohm*
15	15	15	15	15	15	15	15
45.9	45.9	0.5714	0.5893	49	49	0.1754	0.1754
47.3	48.7	0.6964	0.6786	50.33	51.67	0.1870	0.1989
46.586	46.693	0.6262	0.6345	49.55	49.75	0.1762	0.1817

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SMAJ33CA

Characterization SMAJ33CA

Date : 05/04/2024
Ref : 23466A
Lab : ST Tours Characterization Lab

TEST	VBR	VBR	IRM	IRM	IRM	IRM
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TESEC	TESEC
Condition 1	25°C	25°C	25°C	25°C	85°C	85°C
Condition 2	IR=1mA	IR=1mA	VRM=33V	VRM=33V	VRM=33V	VRM=33V
Condition 3						
Condition 4						
Condition 5						
Min. Datasheet	*36.7*	*36.7*				
Typ. Datasheet	*38.6*	*38.6*				
Max. Datasheet			*0,2µA*	*0,2µA*	*1µA*	*1µA*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	nA	nA	nA	nA
N	30	30	30	30	30	30
Min	37,39	37,23	1,27	0,90	0,98	1,22
Max	39,24	38,80	14,50	11,94	30,28	50,30
Avg.	38,12	38,07	7,43	5,21	15,28	20,31

TEST	VCL 10/1000 µs	VCL 10/1000 µs	RD	RD	VCL 8/20 µs	VCL 8/20 µs	RD	RD
EQUIPMENT	TESEC	TESEC	TEST CALCULES	TEST CALCULES	TESEC	TESEC	TESTS_CALCULES	TESTS_CALCULES
Condition 1	25°C	25°C	25°C	25°C	25°C	25°C	25°C	25°C
Condition 2	IPP=7.5A	IPP=7.5A	IF1=3.7A	IF1=3.7A	IPP=33A	IPP=33A	IF1=17A	IF1=17A
Condition 3			IF2=7.5A	IF2=7.5A			IF2=33A	IF2=33A
Condition 4			VR1= 1-VCL 10/1000 µs	VR1= 1-VCL 10/1000 µs			VR1= 1-VCL 8/20 µs	VR1= 1-VCL 8/20 µs
Condition 5			VR2= 2-VCL 10/1000 µs	VR2= 2-VCL 10/1000 µs			VR2= 2-VCL 8/20 µs	VR2= 2-VCL 8/20 µs
Min. Datasheet								
Typ. Datasheet								
Max. Datasheet	*53.3*	*53.3*	*1.70*	*1.70*	*69.7*	*69.7*	*0.884ohm*	*0.884ohm*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	*Ohm*	*Ohm*	V	V	*Ohm*	*Ohm*
N	15	15	15	15	15	15	15	15
Min	44.60	44.50	0.7895	0.8421	46.81	46.81	0.2520	0.2519
Max	48.10	47.00	1.0789	1.0263	48.36	48.05	0.4650	0.2713
Avg.	45.78	45,63	0,9281	0,9228	47,31	47,41	0,2800	0,2661

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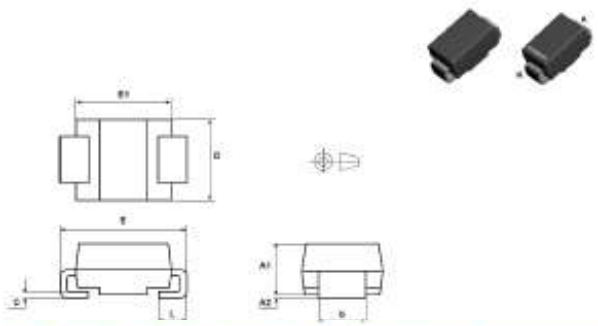
6.2 **Physical Dimensions**

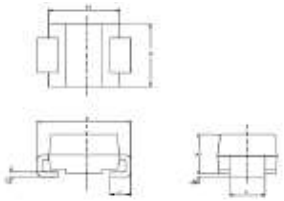
SMA package dimensions

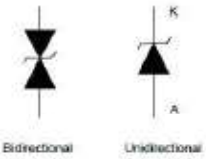


Ref.	Millimeters	
	Min.	Max.
A1	1.90	2.45
A2	0.05	0.20
b	1.25	1.65
c	0.15	0.40
D	2.25	2.90
E	4.80	5.35
E1	3.95	4.60
L	0.75	1.50

Spec	A1	A2	b	c	D	E	E1	L
MIN:	1.90	0.05	1.25	0.15	2.25	4.80	3.95	0.75
MAX:	2.45	0.20	1.65	0.40	2.90	5.35	4.60	1.50
1	2.134	0.142	1.549	0.280	2.818	5.069	4.380	1.066
2	2.107	0.150	1.536	0.250	2.825	5.065	4.379	1.055
3	2.138	0.133	1.539	0.268	2.800	5.080	4.383	1.040
4	2.129	0.113	1.551	0.277	2.806	5.128	4.371	1.037
5	2.124	0.124	1.537	0.271	2.810	5.115	4.364	1.051
6	2.093	0.137	1.528	0.261	2.817	5.062	4.371	1.055
7	2.116	0.144	1.551	0.275	2.802	5.117	4.375	1.039
8	2.087	0.104	1.539	0.266	2.810	5.131	4.379	1.023
9	2.132	0.118	1.543	0.273	2.804	5.080	4.382	1.041
10	2.132	0.122	1.541	0.280	2.814	5.133	4.375	1.021
11	2.137	0.142	1.535	0.271	2.801	5.088	4.379	1.021
12	2.089	0.132	1.528	0.261	2.806	5.109	4.371	1.016
13	2.146	0.137	1.533	0.267	2.820	5.123	4.380	1.072
14	2.136	0.112	1.544	0.270	2.818	5.096	4.366	1.045
15	2.115	0.132	1.533	0.271	2.813	5.092	4.368	1.042
16	2.107	0.119	1.532	0.276	2.837	5.097	4.382	1.039
17	2.125	0.130	1.541	0.269	2.819	5.104	4.375	1.020
18	2.132	0.134	1.532	0.265	2.803	5.112	4.376	1.045
19	2.139	0.142	1.528	0.268	2.827	5.113	4.379	1.029
20	2.121	0.118	1.529	0.263	2.804	5.127	4.383	1.016
21	2.130	0.140	1.543	0.271	2.823	5.127	4.368	1.040
22	2.146	0.136	1.555	0.273	2.814	5.079	4.362	1.020
23	2.114	0.130	1.536	0.263	2.799	5.102	4.376	1.036
24	2.126	0.140	1.549	0.272	2.820	5.133	4.380	1.037
25	2.133	0.137	1.537	0.272	2.820	5.088	4.375	1.052
26	2.099	0.116	1.530	0.268	2.809	5.177	4.389	1.030
27	2.089	0.107	1.524	0.256	2.820	5.075	4.383	1.063
28	2.108	0.111	1.547	0.274	2.825	5.079	4.376	1.074
29	2.100	0.105	1.531	0.274	2.814	5.110	4.370	1.058
30	2.140	0.134	1.540	0.268	2.816	5.110	4.385	1.042
MIN	2.087	0.104	1.524	0.250	2.799	5.062	4.362	1.016
MAX	2.146	0.150	1.555	0.280	2.837	5.177	4.389	1.074
AVG	2.121	0.128	1.538	0.269	2.814	5.104	4.376	1.041

SMB package dimensions

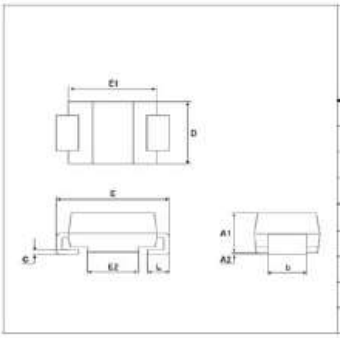




Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.0748	0.0965
A2	0.05	0.20	0.0020	0.0079
b	1.95	2.20	0.0768	0.0867
c	0.15	0.40	0.0059	0.0157
D	3.30	3.95	0.1299	0.1555
E	5.10	5.60	0.2008	0.2205
E1	4.05	4.60	0.1594	0.1811
L	0.75	1.50	0.0295	0.0591

Cote	A1	A2	b	c	D	E	E1	L
1	2.18	0.16	2.04	0.28	3.52	5.34	4.55	1.09
2	2.14	0.17	2.03	0.29	3.51	5.38	4.51	1.11
3	2.18	0.17	2.03	0.28	3.51	5.35	4.55	1.08
4	2.17	0.16	2.01	0.29	3.52	5.38	4.53	1.10
5	2.11	0.16	2.03	0.29	3.51	5.35	4.51	1.12
6	2.14	0.14	2.02	0.29	3.53	5.34	4.55	1.10
7	2.16	0.15	2.02	0.28	3.47	5.33	4.51	1.09
8	2.17	0.16	2.02	0.28	3.50	5.35	4.53	1.06
9	2.17	0.16	2.02	0.27	3.51	5.36	4.51	1.09
10	2.17	0.15	2.01	0.28	3.49	5.34	4.51	1.11
11	2.17	0.16	2.03	0.28	3.50	5.36	4.52	1.07
12	2.17	0.16	2.03	0.28	3.51	5.37	4.54	1.07
13	2.16	0.15	2.04	0.28	3.52	5.36	4.51	1.08
14	2.18	0.16	2.02	0.29	3.51	5.39	4.54	1.07
15	2.17	0.14	2.02	0.28	3.50	5.38	4.53	1.09
16	2.17	0.16	2.02	0.29	3.53	5.36	4.52	1.10
17	2.17	0.16	2.05	0.27	3.52	5.38	4.51	1.10
18	2.18	0.15	2.03	0.28	3.53	5.37	4.50	1.11
19	2.15	0.15	2.02	0.27	3.50	5.37	4.52	1.11
20	2.17	0.16	2.02	0.28	3.53	5.37	4.53	1.11
21	2.16	0.16	2.01	0.28	3.56	5.34	4.50	1.10
22	2.17	0.16	2.03	0.28	3.56	5.41	4.52	1.07
23	2.16	0.15	2.02	0.28	3.55	5.37	4.50	1.11
24	2.18	0.16	2.03	0.29	3.52	5.33	4.53	1.11
25	2.17	0.14	2.03	0.29	3.55	5.35	4.52	1.11
26	2.17	0.15	2.02	0.28	3.50	5.37	4.52	1.09
27	2.18	0.15	2.02	0.29	3.55	5.36	4.51	1.08
28	2.17	0.16	2.02	0.28	3.56	5.34	4.51	1.09
29	2.17	0.16	2.02	0.28	3.56	5.38	4.49	1.08
30	2.17	0.15	2.04	0.28	3.54	5.33	4.50	1.10
LSL	1.90	0.05	1.95	0.15	3.30	5.10	4.05	0.75
USL	2.45	0.20	2.20	0.40	3.95	5.60	4.60	1.50
MIN	2.11	0.14	2.01	0.27	3.47	5.33	4.49	1.06
MAX	2.18	0.17	2.05	0.29	3.56	5.41	4.55	1.12
AVG	2.17	0.16	2.02	0.28	3.52	5.36	4.52	1.09

SMC package dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.075	0.096
A2	0.05	0.20	0.002	0.008
b(1)	2.90	3.20	0.114	0.126
c(1)	0.15	0.40	0.006	0.016
D	5.55	6.25	0.218	0.246
E	7.75	8.15	0.305	0.321
E1	6.60	7.15	0.260	0.281
E2	4.40	4.70	0.173	0.185
L	0.75	1.50	0.030	0.059

DIMENSION	A1	A2	b	c	D	E	E1	E2	L
Min (mm)	1.900	0.050	2.900	0.150	5.550	7.750	6.600	4.400	0.750
Max (mm)	2.450	0.200	3.200	0.400	6.250	8.150	7.150	4.700	1.500
1	2.047	0.144	2.952	0.267	5.796	7.839	6.909	4.508	1.108
2	2.096	0.158	3.004	0.263	5.692	7.804	6.910	4.553	1.102
3	2.038	0.146	2.976	0.274	5.758	7.782	6.922	4.537	1.111
4	2.097	0.151	2.960	0.262	5.687	7.793	6.927	4.543	1.102
5	2.086	0.152	2.984	0.269	5.765	7.806	6.895	4.557	1.093
6	2.071	0.146	2.996	0.275	5.762	7.790	6.933	4.561	1.091
7	2.061	0.141	3.005	0.286	5.755	7.783	6.917	4.565	1.064
8	2.101	0.137	3.007	0.285	5.744	7.791	6.878	4.556	1.078
9	2.099	0.129	2.976	0.276	5.788	7.794	6.925	4.568	1.112
10	2.096	0.137	2.955	0.261	5.767	7.822	6.911	4.564	1.15
11	2.122	0.161	2.983	0.271	5.765	7.783	6.918	4.569	1.08
12	2.100	0.155	3.000	0.267	5.779	7.775	6.899	4.539	1.106
13	2.123	0.153	2.990	0.262	5.789	7.808	6.875	4.570	1.118
14	2.104	0.149	3.003	0.271	5.800	7.801	6.869	4.564	1.084
15	2.053	0.144	2.988	0.271	5.770	7.782	6.887	4.554	1.092
16	2.110	0.146	3.012	0.267	5.752	7.780	6.907	4.558	1.104
17	2.067	0.155	2.981	0.257	5.770	7.790	6.861	4.590	1.11
18	2.095	0.147	2.996	0.262	5.780	7.785	6.883	4.567	1.103
19	2.100	0.146	2.994	0.260	5.793	7.783	6.861	4.572	1.104
20	2.097	0.152	3.005	0.260	5.784	7.793	6.680	4.555	1.097
21	2.097	0.148	2.992	0.253	5.768	7.803	6.863	4.561	1.107
22	2.094	0.159	2.971	0.270	5.770	7.788	6.904	4.556	1.091
23	2.095	0.152	2.983	0.288	5.766	7.804	6.933	4.573	1.075
24	2.109	0.137	3.008	0.279	5.779	7.786	6.925	4.584	1.093
25	2.077	0.142	2.970	0.265	5.768	7.781	6.892	4.587	1.085
26	2.085	0.158	2.963	0.263	5.756	7.769	6.915	4.559	1.076
27	2.069	0.140	3.005	0.265	5.801	7.796	6.875	4.571	1.092
28	2.104	0.146	2.981	0.270	5.765	7.761	6.906	4.589	1.105
29	2.096	0.142	2.975	0.269	5.768	7.801	6.895	4.563	1.068
30	2.067	0.136	2.989	0.260	5.761	7.784	6.875	4.578	1.094
MOY	2.089	0.147	2.987	0.268	5.767	7.792	6.892	4.562	1.097
MIN	2.038	0.129	2.952	0.253	5.687	7.761	6.680	4.508	1.064
MAX	2.123	0.161	3.012	0.288	5.801	7.839	6.933	4.590	1.150

6.3 Tests description

Test name	Description	Purpose
Die Oriented		
HTRB High Temperature Reverse Bias	The device is stressed in static configuration, trying to satisfy as much as possible the following conditions: - Low power dissipation - Max. supply voltage compatible with diffusion process and internal circuitry limitations. 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. 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. To assess active area and contacts integrity
Package Oriented		
PC Preconditioning	The device is submitted to a typical temperature profile used for surface mounting devices, after a controlled moisture absorption.	As stand-alone test: to investigate the moisture sensitivity level. As preconditioning before other reliability tests: to verify that the surface mounting stress does not impact on the subsequent reliability performance. The typical failure modes are "pop-corn" effect and delamination.
H3TRB 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 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 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.
DPA Destructive Physical Analysis	Specific construction analysis on random parts that have successfully completed THB or TC.	To investigate on reliability stresses impact on delamination, corrosion and product construction integrity.
RSH 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.
Functional Tests		
RS Repetitive Surges	The device is submitted to a reverse current peak: Ipp, which depends of the current holding of the product.	To evaluate the holding of the component to a high electrical field. Short circuit or hot point is expected as failure mechanism.

(1) ADG: Automotive and Discrete Group

PCN
Product/Process Change Notification

Die manufacturing process homogenization in ST Tours (France) for TVS (Transient Voltage Suppressor) devices

Notification number:	PDP/24/14699	**Issue Date**	12-Apr-2024
Issued by	Sophie da Silva		
Product series affected by the change		SM15Txxx SM6Txxx SMA6Jxxx SMAJxxx SMBJxxx SMCxJxxx SMCJxxx Refer to attached table for involved Commercial Products	
Type of change		Front-End realization	

Description of the change

Die manufacturing process homogenization for metallization and passivation at ST Tours on TVS devices.

Reason for change

In the frame of global production homogenization and continuous improvement, the latest metallization and passivation manufacturing processes developed on new products released will be applied to the whole TVS (Transient Voltage Suppressors) range.

Former versus changed product:	The changed products do not present modified electrical, dimensional or thermal parameters, leaving unchanged the current information published in the product datasheet. The Moisture Sensitivity Level of the part (according to the IPC/JEDEC JSTD-020D standard) remains unchanged. There is no change in the packing modes and the standard delivery quantities either.

Disposition of former products

Delivery of current products will be done until stock depletion.

(1) ADG: Automotive and Discrete Group

Marking and traceability

Traceability of the change will be ensured by Finished Good/Type print on carton labels.

Commercial part number/Order code (examples)	Former Finished Good/Type (examples)	New Finished Good/Type (examples)
		Ending with /NR or /HR
SM6T33CA SMAJ70CA-TR	SM6T33CAH/NH SMAJ70CAH-TR/YS	SM6T33CAH/NR SMAJ70CAH-TR/HR

Qualification completion date	12-Apr-2024

Forecasted sample availability

Product family	Sub-family	Commercial part Number	Availability date
Protection	TVS	LNBTVS6-304S	Week18-2024
Protection	TVS	SM15T12A	Week18-2024
Protection	TVS	SM15T33CA	Week16-2024
Protection	TVS	SM15T36CA	Week18-2024
Protection	TVS	SM15T39A	Week18-2024
Protection	TVS	SM15T39CA	Week16-2024
Protection	TVS	SM6T33CA	Week16-2024
Protection	TVS	SM6T36CA	Week18-2024
Protection	TVS	SM6T39CA	Week18-2024
Protection	TVS	SM6T6V8A	Week18-2024
Protection	TVS	SMA6J33A-TR	Week18-2024
Protection	TVS	SMAJ30CA-TR	Week18-2024
Protection	TVS	SMAJ33CA-TR	Week16-2024
Protection	TVS	SMAJ5.0A-TR	Week18-2024
Protection	TVS	SMBJ33CA-TR	Week18-2024
Protection	TVS	SMCJ33CA-TR	Week18-2024

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.

Other samples are available on demand.

(1) ADG: Automotive and Discrete Group

Change implementation schedule

Sales-types	Estimated production start	Estimated first shipments
Finished Good	Week16-2024	Week29-2024

Comments:	With early PCN acceptance, shipments could be anticipated

Customer's feedback

Please contact your local ST sales representative or quality contact for requests concerning this change notification.
Absence of acknowledgement of this PCN within 30 days of receipt will constitute acceptance of the change
Absence of additional response within 90 days of receipt of this PCN will constitute acceptance of the change

Qualification program and results	24013QRP Attached

(1) ADG: Automotive and Discrete Group

Involved Commercial part numbers						
SMA package		**SMB package**		**SMC package**		
SMA6J10A-TR	SMAJ130CA-TR	SM6T100A	SMBJ13A-TR	LNBTVS4-222S	SMC30J22CA	SMC50J28A
SMA6J10CA-TR	SMAJ13A-TR	SM6T100CA	SMBJ13CA-TR	LNBTVS4-304S	SMC30J24A	SMC50J28CA
SMA6J12A-TR	SMAJ13CA-TR	SM6T10A	SMBJ154A-TR	LNBTVS6-304S	SMC30J24CA	SMC50J31A
SMA6J12CA-TR	SMAJ154A-TR	SM6T10CA	SMBJ15A-TR	SM15T100A	SMC30J26A	SMC50J31CA
SMA6J13A-TR	SMAJ15A-TR	SM6T12A	SMBJ15CA-TR	SM15T100CA	SMC30J26CA	SMC50J30A
SMA6J13CA-TR	SMAJ15CA-TR	SM6T12CA	SMBJ16A-TR	SM15T10CA	SMC30J28A	SMC50J30CA
SMA6J15A-TR	SMAJ170A-TR	SM6T150A	SMBJ170A-TR	SM15T12A	SMC30J28CA	SMC50J33A
SMA6J15CA-TR	SMAJ170CA-TR	SM6T150CA	SMBJ170CA-TR	SM15T12CA	SMC30J30A	SMC50J33CA
SMA6J18A-TR	SMAJ188A-TR	SM6T15A	SMBJ18A-TR	SM15T150CA	SMC30J30CA	SMC50J36A
SMA6J18CA-TR	SMAJ188CA-TR	SM6T15CA	SMBJ18CA-TR	SM15T15A	SMC30J33A	SMC50J36CA
SMA6J20A-TR	SMAJ18A-TR	SM6T18A	SMBJ20A-TR	SM15T15CA	SMC30J33CA	SMC50J40A
SMA6J20CA-TR	SMAJ18CA-TR	SM6T18CA	SMBJ20CA-TR	SM15T18A	SMC30J36A	SMC50J40CA
SMA6J24A-TR	SMAJ20A-TR	SM6T200A	SMBJ22A-TR	SM15T18CA	SMC30J36CA	SMC50J48A
SMA6J24CA-TR	SMAJ24A-TR	SM6T200CA	SMBJ22CA-TR	SM15T200A	SMC30J40A	SMC50J48CA
SMA6J26A-TR	SMAJ24CA-TR	SM6T220A	SMBJ24A-TR	SM15T200CA	SMC30J40CA	SMC50J5.0A
SMA6J26CA-TR	SMAJ26A-TR	SM6T220CA	SMBJ24CA-TR	SM15T220A	SMC30J48A	SMC50J5.0CA
SMA6J28A-TR	SMAJ26CA-TR	SM6T22A	SMBJ26A-TR	SM15T220CA	SMC30J48CA	SMC50J58A
SMA6J28CA-TR	SMAJ28A-TR	SM6T22CA	SMBJ26CA-TR	SM15T22A	SMC30J5.0A	SMC50J58CA
SMA6J33A-TR	SMAJ28CA-TR	SM6T24A	SMBJ28A-TR	SM15T22CA	SMC30J5.0CA	SMC50J6.0A
SMA6J33CA-TR	SMAJ30A-TR	SM6T24CA	SMBJ28CA-TR	SM15T24A	SMC30J58A	SMC50J6.0CA
SMA6J40A-TR	SMAJ30CA-TR	SM6T27A	SMBJ30A-TR	SM15T24CA	SMC30J58CA	SMC50J6.5A
SMA6J40CA-TR	SMAJ33A-TR	SM6T27CA	SMBJ30CA-TR	SM15T27A	SMC30J6.0A	SMC50J6.5CA
SMA6J48A-TR	SMAJ33CA-TR	SM6T30A	SMBJ33A-TR	SM15T30A	SMC30J6.0CA	SMC50J64A
SMA6J48CA-TR	SMAJ40A-TR	SM6T30CA	SMBJ33CA-TR	SM15T30CA	SMC30J64A	SMC50J64CA
SMA6J5.0A-TR	SMAJ40CA-TR	SM6T33A	SMBJ36CA-TR	SM15T33A	SMC30J64CA	SMC50J70A
SMA6J5.0CA-TR	SMAJ43A-TR	SM6T33CA	SMBJ40A-TR	SM15T33CA	SMC30J6.5A	SMC50J70CA
SMA6J58A-TR	SMAJ43CA-TR	SM6T36A	SMBJ40CA-TR	SM15T36A	SMC30J6.5CA	SMC50J8.5A
SMA6J58CA-TR	SMAJ48A-TR	SM6T36CA	SMBJ48A-TR	SM15T36CA	SMC30J70A	SMC50J8.5CA
SMA6J6.0A-TR	SMAJ48CA-TR	SM6T39A	SMBJ48CA-TR	SM15T39A	SMC30J70CA	SMC50J85A
SMA6J6.0CA-TR	SMAJ5.0A-TR	SM6T39CA	SMBJ5.0A-TR	SM15T39CA	SMC30J8.5A	SMC50J85CA
SMA6J6.5A-TR	SMAJ5.0CA-TR	SM6T56CA	SMBJ5.0CA-TR	SM15T68A	SMC30J8.5CA	SMCJ12A-TR
SMA6J6.5CA-TR	SMAJ58A-TR	SM6T68A	SMBJ58A-TR	SM15T68CA	SMC30J85A	SMCJ130CA-TR
SMA6J70A-TR	SMAJ58CA-TR	SM6T68CA	SMBJ58CA-TR	SM15T6V8A	SMC30J85CA	SMCJ13CA-TR
SMA6J70CA-TR	SMAJ6.0A-TR	SM6T6V8A	SMBJ6.0A-TR	SM15T6V8CA	SMC50J100A	SMCJ15A-TR
SMA6J8.5A-TR	SMAJ6.0CA-TR	SM6T6V8CA	SMBJ6.0CA-TR	SM15T7V5A	SMC50J100CA	SMCJ15CA-TR
SMA6J85A-TR	SMAJ6.5A-TR	SM6T7V5A	SMBJ6.5A-TR	SM5908	SMC50J10A	SMCJ170A-TR
SMA6J8.5CA-TR	SMAJ6.5CA-TR	SM6T7V5CA	SMBJ6.5CA-TR	SMC30J100A	SMC50J10CA	SMCJ188A-TR
SMA6J85CA-TR	SMAJ70A-TR	SMBJ100CA-TR	SMBJ64A-TR	SMC30J100CA	SMC50J11A	SMCJ188CA-TR
SMAJ10CA-TR	SMAJ70CA-TR	SMBJ10A-TR	SMBJ64CA-TR	SMC30J10A	SMC50J11CA	SMCJ18CA-TR
SMAJ12A-TR	SMAJ8.5CA-TR	SMBJ10CA-TR	SMBJ70A-TR	SMC30J10CA	SMC50J12A	SMCJ20A-TR
SMAJ12CA-TR	SMAJ85CA-TR	SMBJ12A-TR	SMBJ70CA-TR	SMC30J12A	SMC50J12CA	SMCJ22A-TR
		SMBJ12CA-TR	SMBJ8.5CA-TR	SMC30J12CA	SMC50J13A	SMCJ24CA-TR
		SMBJ130A-TR	SMBJ85CA-TR	SMC30J130A	SMC50J13CA	SMCJ26A-TR
				SMC30J130CA	SMC50J14A	SMCJ28A-TR
				SMC30J13A	SMC50J14CA	SMCJ30A-TR
				SMC30J13CA	SMC50J15A	SMCJ30CA-TR
				SMC30J154A	SMC50J15CA	SMCJ33A-TR
				SMC30J154CA	SMC50J16A	SMCJ33CA-TR
				SMC30J15A	SMC50J16CA	SMCJ40A-TR
				SMC30J15CA	SMC50J18A	SMCJ40CA-TR
				SMC30J16A	SMC50J18CA	SMCJ48CA-TR
				SMC30J16CA	SMC50J20A	SMCJ5.0A-TR
				SMC30J170A	SMC50J20CA	SMCJ5.0CA-TR
				SMC30J170CA	SMC50J22A	SMCJ6.0A-TR
				SMC30J188A	SMC50J22CA	SMCJ70CA-TR
				SMC30J188CA	SMC50J23A	SMCJ85CA-TR
				SMC30J18A	SMC50J23CA	STIEC45-24AS
				SMC30J18CA	SMC50J24A	STIEC45-26AS
				SMC30J20A	SMC50J24CA	STIEC45-30AS
				SMC30J20CA	SMC50J26A	STIEC45-33AS
				SMC30J22A	SMC50J26CA	

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

Qualification Report

Qualification of passivation and metal stack homogenization on TVS (SMD packages)

General Information	
Product Line	*Protection*
Product Description	*Industrial TVS products*
Product Perimeter	SMAJxxx SMA6Jxxx SM6Txxx SMBJxxx SM15Txxx SMCxJxxx SMCJxxx LNBTVSx
Product Group	*APMS*
Product Division	*Discrete & Filter*
Packages	*SMA - SMB - SMC*
Maturity level step	*Qualified*

Locations	
Wafer Fab	*ST Tours (France)*
Assembly Plant	*Subcontractor (9941) – China* *Subcontractor (990C) – China*
Reliability Lab	*ST Tours (France)*
Reliability Assessment	*Pass*

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comments
1.0	April 11, 2024	26	A. KHEDIM	Timothée PINGAULT Digitally signed by Timothée PINGAULT Date: 2024.04.12 09:03:01 +02'00'	Document creation

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.
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1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
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

DPA	Destructive Physical Analysis
GD	Generic Data
H3TRB	High Humidity High Temperature Reverse Bias
HTRB	High Temperature Reverse Bias
PD	Physical Dimensions
PV	Parametric Verification
RS	Repetitive Surges
RSH	Resistance to solder heat
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 the change for homogenization and continuous improvement of the latest metallization and passivation manufacturing process developed on unidirectional and bidirectional TVS product range:

- 400W & 600W TVS embedded in SMA package,
- 600W TVS embedded in SMB package,
- 1500W, 3000W and 5000W TVS embedded in SMC package.

Commercial Product	Package	Comment (optional)
SMAJxxx	SMA	Industrial
SMA6Jxxx	SMA	
SM6Txxx	SMB	
SMBJxxx	SMB	
SM15Txxx	SMC	
SMCxJxxx	SMC	
SMCJxxx	SMC	
LNBTVSx	SMC	

Involved Commercial part numbers						
SMA package		SMB package		SMC package		
SMA6J10A	SMAJ130CA	SM6T100A	SMBJ130A	LNBTVS4-222S	SMC30J16CA	SMC50J30A
SMA6J10CA	SMAJ13A	SM6T100CA	SMBJ13A	LNBTVS4-304S	SMC30J170A	SMC50J30CA
SMA6J12A	SMAJ13CA	SM6T10A	SMBJ13CA	LNBTVS6-304S	SMC30J188A	SMC50J33A
SMA6J12CA	SMAJ154A	SM6T10CA	SMBJ154A	SM15T100A	SMC30J188CA	SMC50J33CA
SMA6J13A	SMAJ15A	SM6T12A	SMBJ15A	SM15T100CA	SMC30J18A	SMC50J36A
SMA6J13CA	SMAJ15CA	SM6T12CA	SMBJ15CA	SM15T10CA	SMC30J18CA	SMC50J36CA
SMA6J15A	SMAJ170A	SM6T150A	SMBJ16A	SM15T12A	SMC30J20A	SMC50J40A
SMA6J15CA	SMAJ170CA	SM6T150CA	SMBJ170A	SM15T12CA	SMC30J20CA	SMC50J40CA
SMA6J18A	SMAJ188A	SM6T15A	SMBJ170CA	SM15T150CA	SMC30J22A	SMC50J48A
SMA6J18CA	SMAJ188CA	SM6T15CA	SMBJ18A	SM15T15A	SMC30J22CA	SMC50J5.0A
SMA6J20A	SMAJ18A	SM6T18A	SMBJ18CA	SM15T15CA	SMC30J24A	SMC50J58A
SMA6J20CA	SMAJ18CA	SM6T18CA	SMBJ20A	SM15T18A	SMC30J24CA	SMC50J58CA
SMA6J24A	SMAJ20A	SM6T200A	SMBJ20CA	SM15T18CA	SMC30J26A	SMC50J64CA
SMA6J24CA	SMAJ24A	SM6T200CA	SMBJ22A	SM15T200A	SMC30J26CA	SMC50J6.5A
SMA6J26A	SMAJ24CA	SM6T220A	SMBJ22CA	SM15T200CA	SMC30J28A	SMC50J70A
SMA6J26CA	SMAJ26A	SM6T220CA	SMBJ24A	SM15T220A	SMC30J28CA	SMC50J85A
SMA6J28A	SMAJ26CA	SM6T22A	SMBJ24CA	SM15T220CA	SMC30J30A	SMCJ12A
SMA6J28CA	SMAJ28A	SM6T22CA	SMBJ26A	SM15T22A	SMC30J30CA	SMCJ130CA
SMA6J33A	SMAJ28CA	SM6T24A	SMBJ26CA	SM15T22CA	SMC30J33A	SMCJ13CA
SMA6J33CA	SMAJ30A	SM6T24CA	SMBJ28A	SM15T24A	SMC30J33CA	SMCJ15A
SMA6J40A	SMAJ30CA	SM6T27A	SMBJ28CA	SM15T24CA	SMC30J36A	SMCJ15CA
SMA6J40CA	SMAJ33A	SM6T27CA	SMBJ30A	SM15T27A	SMC30J36CA	SMCJ170A
SMA6J48A	SMAJ33CA	SM6T30A	SMBJ30CA	SM15T30A	SMC30J40CA	SMCJ188A
SMA6J48CA	SMAJ40A	SM6T30CA	SMBJ33A	SM15T30CA	SMC30J48A	SMCJ188CA
SMA6J5.0A	SMAJ40CA	SM6T33A	SMBJ33CA	SM15T33A	SMC30J48CA	SMCJ18CA
SMA6J5.0CA	SMAJ43A	SM6T33CA	SMBJ36CA	SM15T33CA	SMC30J5.0A	SMCJ20A
SMA6J58A	SMAJ43CA	SM6T36A	SMBJ40A	SM15T36A	SMC30J5.0CA	SMCJ22A
SMA6J58CA	SMAJ48A	SM6T36CA	SMBJ40CA	SM15T36CA	SMC30J58A	SMCJ24CA
SMA6J6.0A	SMAJ48CA	SM6T39A	SMBJ48A	SM15T39A	SMC30J58CA	SMCJ26A
SMA6J6.0CA	SMAJ5.0A	SM6T39CA	SMBJ48CA	SM15T39CA	SMC30J6.0A	SMCJ28A
SMA6J6.5A	SMAJ5.0CA	SM6T56CA	SMBJ5.0A	SM15T68A	SMC30J6.0CA	SMCJ30A
SMA6J6.5CA	SMAJ58A	SM6T68A	SMBJ5.0CA	SM15T68CA	SMC30J64A	SMCJ30CA
SMA6J70A	SMAJ58CA	SM6T68CA	SMBJ58A	SM15T6V8A	SMC30J64CA	SMCJ33A
SMA6J70CA	SMAJ6.0A	SM6T6V8A	SMBJ58CA	SM15T6V8CA	SMC30J6.5A	SMCJ33CA
SMA6J8.5A	SMAJ6.0CA	SM6T6V8CA	SMBJ6.0A	SM15T7V5A	SMC30J6.5CA	SMCJ40A
SMA6J85A	SMAJ6.5A	SM6T7V5A	SMBJ6.0CA	SM5908	SMC30J70A	SMCJ40CA
SMA6J8.5CA	SMAJ6.5CA	SM6T7V5CA	SMBJ6.5A	SMC30J100A	SMC30J70CA	SMCJ48CA
SMA6J85CA	SMAJ70A	SMBJ100CA	SMBJ6.5CA	SMC30J100CA	SMC30J8.5A	SMCJ5.0A
SMAJ10CA	SMAJ70CA	SMBJ10A	SMBJ70A	SMC30J10A	SMC30J8.5CA	SMCJ5.0CA
SMAJ12A	SMAJ8.5CA	SMBJ10CA	SMBJ70CA	SMC30J10CA	SMC50J100A	SMCJ6.0A
SMAJ12CA	SMAJ85CA	SMBJ12A	SMBJ8.5CA	SMC30J12A	SMC50J12CA	SMCJ70CA
		SMBJ12CA	SMBJ85CA	SMC30J12CA	SMC50J20CA	SMCJ85CA
				SMC30J13A	SMC50J24A	STIEC45-24AS
				SMC30J13CA	SMC50J24CA	STIEC45-26AS
				SMC30J15A	SMC50J28A	STIEC45-30AS
				SMC30J15CA	SMC50J28CA	STIEC45-33AS
				SMC30J16A		

The reliability test methodology used follows the JESD47: “Stress Test driven Qualification Methodology” .

The reliability tests ensuing are:

.

- TC 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.
- H3TRB, UHAST to check the robustness to corrosion and the good package hermeticity.
- RSH to check compatibility of package with customer assembly.
- Functional test: Repetitive IPP to verify robustness of device submitted to rated Ipp (as per data sheet)

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, TVS in SMD packages are compliant with JESD47.

4 DEVICE CHARACTERISTICS

4.1 Device description

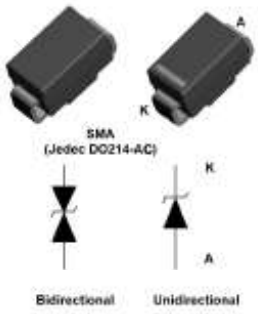
Example datasheet of TVS SMA package (SMA6J12A)

life.augmented

SMA6JxxA, SMA6JxxCA

Datasheet

600 W TVS in SMA



Product status link
SMA6J5.0A, SMA6J5.0CA,
SMA6J6.0A, SMA6J6.0CA,
SMA6J6.5A, SMA6J6.5CA,
SMA6J8.5A, SMA6J8.5CA,
SMA6J10A, SMA6J10CA,
SMA6J12A, SMA6J12CA,
SMA6J13A, SMA6J13CA,
SMA6J15A, SMA6J15CA,
SMA6J18A, SMA6J18CA,
SMA6J20A, SMA6J20CA,
SMA6J24A, SMA6J24CA,
SMA6J26A, SMA6J26CA,
SMA6J28A, SMA6J28CA,
SMA6J33A, SMA6J33CA,
SMA6J40A, SMA6J40CA,
SMA6J48A, SMA6J48CA,
SMA6J58A, SMA6J58CA,
SMA6J70A, SMA6J70CA,
SMA6J85A, SMA6J85CA

Features

- Peak pulse power:
  - 600 W (10/1000 µs)
  - 4 kW (8/20 µs)
- Stand-off voltage range from 5 V to 85 V
- Unidirectional and bidirectional types
- Low leakage current:
  - 0.2 µA at 25 °C
  - 1 µA at 85 °C
- Operating T_J max: 175 °C
- JEDEC registered package outline
- Resin meets UL94, V0

Complies with the following standards

- UL94, V0
- J-STD-020 MSL level 1
- J-STD-002, JESD 22-B102 E3 and MIL-STD-750, method 2026 solderable matte tin plated leads
- JESD-201 class 2 whisker test
- IPC7531 footprint
- JEDEC registered package outline
- IEC 61000-4-4 level 4:
  - 4 kV
- IEC 61000-4-2, C = 150 pF - R = 330 Ω exceeds level 4:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)

Description

The SMA6J series is designed to protect sensitive equipment against electrostatic discharges according to IEC 61000-4-2 and MIL STD 883, method 3015, and electrical overstress according to IEC 61000-4-4 and 5. This device is more generally used against surges below 600 W (10/1000 µs).

The Planar technology makes it compatible with high-end circuits where low leakage current and high junction temperature are required to provide long term reliability and stability. SMA6J devices are packaged in SMA (SMA footprint in accordance with IPC 7531 standard).

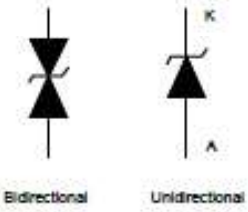
Example datasheet of TVS SMB package (SM6T22CA)

life.augmented

SM6T

Datasheet

600 W TVS in SMB



Features

- Peak pulse power: 600 W (10/1000 µs) and 4 kW (8/20 µs)
- Stand-off voltage range from 5 V to 188 V
- Unidirectional and bidirectional types
- Low leakage current: 0.2 µA at 25 °C and 1 µA at 85 °C
- Operating T_J max: 150 °C
- High power capability at T_J max.: up to 515 W (10/1000 µs)
- Lead finishing: matte tin plating

Complies with the following standards

- UL94, V0
- J-STD-020 MSL level 1
- J-STD-002, JESD 22-B102 E3 and MIL-STD-750, method 2026 solderable matte tin plated leads
- JESD-201 class 2 whisker test
- IPC7531 footprint
- JEDEC registered package outline
- IEC 61000-4-4 level 4:
  - 4 kV
- IEC 61000-4-2, C = 150 pF - R = 330 Ω exceeds level 4:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)

Product status link	
SM6T	SM6T6V8A, SM6T6V8CA, SM6T7V5A, SM6T7V5CA, SM6T10A, SM6T10CA, SM6T12A, SM6T12CA, SM6T15A, SM6T15CA, SM6T18A, SM6T18CA, SM6T22A, SM6T22CA, SM6T24A, SM6T24CA, SM6T27A, SM6T27CA, SM6T30A, SM6T30CA, SM6T33A, SM6T33CA, SM6T36A, SM6T36CA, SM6T39A, SM6T39CA, SM6T56A, SM6T56CA, SM6T68A, SM6T68CA, SM6T75A, SM6T75CA, SM6T100A, SM6T100CA, SM6T150A, SM6T150CA, SM6T200A, SM6T200CA, SM6T220A, SM6T220CA

Description

The SM6T series are designed to protect sensitive equipment against electrostatic discharges according to IEC 61000-4-2 and MIL STD 883, method 3015, and electrical overstress according to IEC 61000-4-4 and 5. This device is more generally used against surges below 600 W (10/1000 µs).

The Planar technology makes it suitable for high-end equipment and SMPS where low leakage current and high junction temperature are required to provide reliability and stability over time.

The SM6T series are packaged in SMB.

Example datasheet of TVS SMC package (SM30J30A)

life.augmented

SMC30JxxA, SMC30JxxCA

Datasheet

3000 W TVS in SMC

Product status link

SMC30J5.0A, SMC30J5.0CA,
SMC30J6.0A, SMC30J6.0CA,
SMC30J6.5A, SMC30J6.5CA,
SMC30J8.5A, SMC30J8.5CA,
SMC30J10A, SMC30J10CA,
SMC30J12A, SMC30J12CA,
SMC30J13A, SMC30J13CA,
SMC30J15A, SMC30J15CA,
SMC30J16A, SMC30J16CA,
SMC30J18A, SMC30J18CA,
SMC30J20A, SMC30J20CA,
SMC30J22A, SMC30J22CA,
SMC30J24A, SMC30J24CA,
SMC30J26A, SMC30J26CA,
SMC30J28A, SMC30J28CA,
SMC30J30A, SMC30J30CA,
SMC30J33A, SMC30J33CA,
SMC30J36A, SMC30J36CA,
SMC30J40A, SMC30J40CA,
SMC30J48A, SMC30J48CA,
SMC30J58A, SMC30J58CA,
SMC30J64A, SMC30J64CA,
SMC30J70A, SMC30J70CA,
SMC30J85A, SMC30J85CA,
SMC30J100A, SMC30J100CA,
SMC30J130A, SMC30J130CA,
SMC30J154A, SMC30J154CA,
SMC30J170A, SMC30J170CA,
SMC30J188A, SMC30J188CA

Features

- Peak pulse power:
  - 3000 W (10/1000 µs)
  - up to 40 kW (8/20 µs)
- Stand-off voltage range from 5 V to 188 V
- Unidirectional and bidirectional types
- Low leakage current: 0.2 µA at 25 °C
- Operating T_J max: 175 °C
- JEDEC registered package outline
- Lead finishing: matte tin plating

Complies with the following standards

- UL94, V0
- J-STD-020 MSL level 1
- J-STD-002, JESD 22-B102 E3 and MIL-STD-750, method 2026
- JESD-201 class 2 whisker test
- IPC7531 footprint and JEDEC registered package outline
- IEC 61000-4-4 level 4:
  - 4 k V
- IEC 61000-4-2, C = 150 pF, R = 330 Ω exceeds level 4:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)

Description

The SMC30J TVS series are designed to protect sensitive equipment against electrostatic discharges according to IEC 61000-4-2, MIL STD 883 Method 3015, and electrical overstress such as IEC 61000-4-4 and 5. They are used for surges below 3000 W 10/1000 µs.

This planar technology makes it compatible with high-end equipment and SMPS where low leakage current and high junction temperature are required to provide reliability and stability over time.

4.2 Construction Note

	400W, 600W TVS package SMA qualification
Wafer/Die fab. information	
Wafer fab manufacturing location	ST Tours - France
Technology / Process family	Discrete Transil
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST Tours - France
Assembly information	
Assembly site	Subcontractor (9941) – China
Package description	SMA
Molding compound	ECOPACK®2 molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	Subcontractor (9941) - China

	400W, 600W TVS package SMA qualification
Wafer/Die fab. information	
Wafer fab manufacturing location	ST Tours - France
Technology / Process family	Discrete Transil
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST Tours - France
Assembly information	
Assembly site	Subcontractor (990C) – China
Package description	SMA
Molding compound	ECOPACK®2 molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	Subcontractor (990C) - China

	600W TVS SMB qualification
Wafer/Die fab. information	
Wafer fab manufacturing location	ST Tours - France
Technology / Process family	Discrete Transil
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST Tours - France
Assembly information	
Assembly site	Subcontractor (9941) – China
Package description	SMB
Molding compound	ECOPACK®2 molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	Subcontractor (9941) - China

	600W TVS SMB qualification
Wafer/Die fab. information	
Wafer fab manufacturing location	ST Tours - France
Technology / Process family	Discrete Transil
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST Tours - France
Assembly information	
Assembly site	Subcontractor (990C) – China or Subcontractor (990C) - China
Package description	SMB
Molding compound	ECOPACK®2 molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	Subcontractor (990C) - China

	1500W, 3000W, 5000W TVS SMC qualification
Wafer/Die fab. information	
Wafer fab manufacturing location	ST Tours - France
Technology / Process family	Discrete Transil
Wafer Testing (EWS) information	
Electrical testing manufacturing location	ST Tours - France
Assembly information	
Assembly site	Subcontractor (9941) - China
Package description	SMC
Molding compound	ECOPACK®2 molding compound
Lead finishing material	Lead free (pure Tin)
Final testing information	
Testing location	Subcontractor (9941) - China

5 TESTS PLAN AND RESULTS SUMMARY

5.1 Test vehicles

Lot #	Finish Good	Package	Comments
Lot 1	SMAJ33CA	SMA	Qualification lot
Lot 2	SM6T39CA	SMB	Qualification lot
Lot 3	SM15T6V8CA	SMC	Qualification lot
Lot 4	SMC30J188CA	SMC	Qualification lot
Lot 5	SMC50J100A	SMC	Qualification lot
Lot 6	SMAJ5.0A	SMA	Qualification lot
Lot 7	SMA6J33A	SMA	Qualification lot
Lot 8	LNBTVS6	SMC	Qualification lot
Lot 9	SMAJ33A	SMA	Qualification lot
Lot 10	SMBJ70CA	SMB	Qualification lot
Lot 11	SMBJ33A	SMB	Qualification lot

Detailed results in the chapter below 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.			
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	
MSL research	MSL	J-STD-020			Not applicable for PTH and WLCSP without coating	
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				
High Temperature Reverse Bias	HTRB	MIL-STD-750-1 M1038 Method A (for diodes, rectifiers and Zeners) M1039 Method A (for transistors)	Lot 1 Lot 2 Lot 3 Lot 4 Lot 5 Lot 7 Lot 9 Lot 10 Lot 11 Lot 12	77 77 77 77 77 77 45 45 45 45		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 H3TRB	
Temperature Humidity Storage	THS	JESD22 A-118			Covered by H3TRB	
Temperature Cycling	TC	JESD22A-104	Lot 5 Lot 6 Lot 7 Lot 8 Lot 9 Lot 10 Lot 11	77 77 77 25 25 25 25		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	Lot 1 Lot 2	77 77		X

Stress	Abrv	Reference	Lot	SS	Comments	Test plan
			Lot 3 Lot 5 Lot 7 Lot 8 Lot 9 Lot 10 Lot 11	77 77 77 25 25 25 25		
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	Lot 1 Lot 2 Lot 5 Lot 8 Lot 9 Lot 10 Lot 11	77 77 77 25 25 25 25	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			For power devices. Not required for Transient Voltage Suppressor (TVS) parts	
Power and Temperature Cycle	PTC	JED22A-105			For power devices. Not required for Transient Voltage Suppressor (TVS) parts Perform PTC if $\Delta Tj>100°C$ cannot be achieved with IOL 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			After H3TRB and TC	
Physical Dimension	PD	JESD22B-100	Refer to annex 6.2			X
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 A-111 (SMD)	Lot 9 Lot 10	30 30		X
Solderability	SD	J-STD-002 JESD22B102				
Dead Bug Test	DBT	ST Internal specification			Mandatory for SMD package Data collection for PTH package	
Thermal Resistance	TR	JESD24-3, 24-4, 24-6 as appropriate			Required in case of process change. Not applicable to protection device as no limit specified in the datasheet	

Stress	Abrv	Reference	Lot	SS	Comments	Test plan
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 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	Lot 2 Lot 3 Lot 4 Lot 6 Lot 7 Lot 8 Lot 9 Lot 10 Lot 11	20 20 20 20 20 20 20 20 20	Required for protection devices only.	X

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	Total	Steps	Results / Lot Fail/s.s.										
						SMAJ33CA	SM6T39CA	SM15T6V8CA	SMC30J188CA	SMC50J100A	SMAJ5.0A	SMA6J33A	LNBTVS6	SMAJ33A	SMBJ70CA	SMBJ33A
						Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6	Lot 7	Lot 8	Lot 9	Lot 10	Lot 11
Pre-and Post Electrical Test	-	ST datasheet	IR, VBR, VF parameters according to product datasheet	2576	-	0/2576										
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 (note1)	Refer to paragraph 6.1 in Annexes												
HTRB	N	MIL-STD-750-1 M1038 Method A	Junction Temperature=150°C Temperature=150°C Tension=Vrm	642	1000h	0/77	0/77	0/77	0/77				0/45	0/45	0/45	0/45
			Junction Temperature=175°C Temperature=175°C Tension = Vrm		1000h					0/77		0/77				
TC	Y	JESD22-A104	Frequency (cy/h)=2cy/h Temperature (high)=150°C Temperature (low)=-55°C	231	500cy					0/77	0/77	0/77				
			Frequency (cy/h)=2cy/h Temperature (high)=150°C Temperature (low)=-65°C	257	500cy					W15-2024			0/25	0/25	0/25	0/25
RSH	N	JESD22A-111 (SMD) / JESD22B-106 (PTH)	Temperature=260°C Time (on)=10s	60	Measure after dipping									0/30	0/30	
H3TRB	Y	JESD22-A101	Humidity (HR)=85% Temperature=85°C Tension= Vrm (max 100V)	331	1000h	0/77	0/77			0/77			0/25	0/25	0/25	0/25
UHAST	Y	JESD22 A-118	Humidity (HR)=85% Pressure=2.3bar Temperature=130°C	875	96h	0/77	0/77	0/77		0/77		0/77	0/25	0/25	0/25	0/25
Functional test																
Repetitive Surge	Y	ADCS0060282	IPP=IPP datasheet Pulse delay=0.01ms Time between surge=60s	180	50 surges		0/20	0/20	0/20		0/20	0/20	0/20	0/20	0/20	0/20

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

SMAJ33A

Characterization SMAJ33A							
Date : 05/04/2024							
Ref : 23515A							
Lab : ST Tours Characterization Lab							
TEST	**VBR**	**IRM**	**IRM**	**VCL 10/1000 µs**	**RD**	**VCL 8/20 µs**	**RD**
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TEST CALCULES	TESEC	TESTS_CALCULES
Condition 1	25°C	25°C	85°C	25°C	25°C	25°C	25°C
Condition 2	IR=1mA	VRM=33V	VRM=33V	IPP=7.5A	IF1=3.75A	IPP=33A	IF1=16.5A
Condition 3					IF2=7.5A		IF2=33A
Condition 4					VR1= 1-VCL 10/1000 µs		VR1= 1-VCL 8/20 µs
Condition 5					VR2= 2-VCL 10/1000 µs		VR2= 2-VCL 8/20 µs
Min. Datasheet	*36.7*						
Typ. Datasheet	*38.6*						
Max. Datasheet		*0,2µA*	*1µA*	*53.3*	*1.70*	*69.7*	*0.884ohm*
Comments	Direct	Direct	Direct	Direct	Direct	Direct	Direct
UNIT	V	nA	nA	V	*Ohm*	V	*Ohm*
N	30	30	30	30	30	30	30
Min	37.83	1.27	3.34	45.9	0.96	48.69	0.324
Max	39.13	10.23	47.13	48.3	1.2	52.71	0.379
Avg.	38.49	4.48	20.11	46.8	1.04	50.5	0.341

(*)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

SMBJ33A

Characterization SMBJ33A							
Date : 05/04/2024							
Ref : 23534A							
Lab : ST Tours Characterization Lab							
TEST	**VBR**	**IRM**	**IRM**	**VCL 10/1000 µs**	**RD**	**VCL 8/20 µs**	**RD**
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TEST CALCULES	TESEC	TESTS_CALCULES
Condition 1	25°C	25°C	85°C	25°C	25°C	25°C	25°C
Condition 2	IR=1mA	VRM=33V	VRM=33V	IPP=11.8A	IF1=5.9A	IPP=57A	IF1=28.5A
Condition 3					IF2=11.8A		IF2=57A
Condition 4					VR1= 1-VCL 10/1000 µs		VR1= 1-VCL 8/20 µs
Condition 5					VR2= 2-VCL 10/1000 µs		VR2= 2-VCL 8/20 µs
Min. Datasheet	*36.7*						
Typ. Datasheet	*38.6*						
Max. Datasheet		*0,2µA*	*1µA*	*53.3*	*1.08*	*69.7*	*0.512ohm*
Comments	Direct	Direct	Direct	Direct	Direct	Direct	Direct
UNIT	V	nA	nA	V	*Ohm*	V	*Ohm*
N	30	30	30	30	30	30	30
Min	38.41	1.975	6.975	46.2	0.576	51.32	0.191
Max	40	7.863	11.93	48.3	0.83	54.08	0.225
Avg.	38.99	2.719	9.62	46.96	0.663	52.49	0.212

(*)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

SMBJ70CA

Characterization SMBJ70CA

Date : 05/04/2024
Ref : 23516A
Lab : ST Tours Characterization Lab

TEST	VBR	VBR	IRM	IRM	IRM	IRM
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TESEC	TESEC
Condition 1	25°C	25°C	25°C	25°C	85°C	85°C
Condition 2	IR=1mA	IR=1mA	VRM=70V	VRM=70V	VRM=70V	VRM=70V
Condition 3						
Condition 4						
Condition 5						
Min. Datasheet	*77.8*	*77.8*				
Typ. Datasheet	*81.9*	*81.9*				
Max. Datasheet			*0,2µA*	*0,2µA*	*1µA*	*1µA*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	nA	nA	nA	nA
N	30	30	30	30	30	30
Min	79.98	80.12	1.074	0.952	4.42	2.393
Max	83.17	82.25	26.86	27.91	46.83	40.78
Avg.	81.37	81.15	6.687	9.846	19.109	20.215

TEST	VCL 10/1000 µs	VCL 10/1000 µs	RD	RD	VCL 8/20 µs	VCL 8/20 µs	RD	RD
EQUIPMENT	TESEC	TESEC	TEST CALCULES	TEST CALCULES	TESEC	TESEC	TESTS_CALCULES	TESTS_CALCULES
Condition 1	25°C	25°C	25°C	25°C	25°C	25°C	25°C	25°C
Condition 2	IPP=5.5A	IPP=5.5A	IF1=2.75A	IF1=2.75A	IPP=27A	IPP=27A	IF1=13.5A	IF1=13.5A
Condition 3			IF2=5.5A	IF2=5.5A			IF2=27A	IF2=27A
Condition 4			VR1= 1-VCL 10/1000 µs	VR1= 1-VCL 10/1000 µs			VR1= 1-VCL 8/20 µs	VR1= 1-VCL 8/20 µs
Condition 5			VR2= 2-VCL 10/1000 µs	VR2= 2-VCL 10/1000 µs			VR2= 2-VCL 8/20 µs	VR2= 2-VCL 8/20 µs
Min. Datasheet								
Typ. Datasheet								
Max. Datasheet	*113*	*113*	*4.91*	*4.91*	*146*	*146*	*2.2ohm*	*2.2ohm*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	*Ohm*	*Ohm*	V	V	*ohm*	*ohm*
N	15	15	15	15	15	15	15	15
Min	95	94.9	2.109	2.472	98.08	98.08	0.611	0.603
Max	97.5	97.1	3.381	2.909	100.83	100.83	0.679	0.679
Avg.	96.04	95.9	2.766	2.71	99.48	99.48	0.642	0.6373

(*)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.
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LNBTVS6

Characterization LNBTVS6

Date : 05/04/2024
Ref : 23513A
Lab : ST Tours Characterization Lab

TEST	VBR	IRM	IRM	VCL 10/1000 µs	VCL 8/20 µs
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TESEC
Condition 1	25°C	25°C	85°C	25°C	25°C
Condition 2	IR=1mA	VRM=28V	VRM=28V	IPP=67A	IPP=500A
Condition 3					
Condition 4					
Condition 5					
Min. Datasheet	*30*				
Typ. Datasheet	*31.5*				
Max. Datasheet	*33*	*0,2µA*	*1µA*	*45*	*45*
Comments	Direct	Direct	Direct	Direct	Direct
UNIT	V	nA	nA	V	V
N	30	30	30	30	30
Min	30.99	2.39	13.67	37.6	41.61
Max	31.69	16.02	113.5	39.2	42.75
Moy.	31.25	8.33	50.998	38.21	42.04

(*)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.
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SMA6J33A

Characterization SMA6J33A

Date : 05/04/2024
Ref : 23511A
Lab : ST Tours Characterization Lab

TEST	VBR	IRM	IRM	VCL 10/1000 µs	RD	VCL 8/20 µs	RD
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TEST CALCULES	TESEC	TESTS_CALCULES
Condition 1	25°C	25°C	85°C	25°C	25°C	25°C	25°C
Condition 2	IR=1mA	VRM=33V	VRM=33V	IPP=11.8A	IF1=5.9A	IPP=57A	IF1=28.5A
Condition 3					IF2=11.8A		IF2=57A
Condition 4					VR1= 1-VCL 10/1000 µs		VR1= 1-VCL 8/20 µs
Condition 5					VR2= 2-VCL 10/1000 µs		VR2= 2-VCL 8/20 µs
Min. Datasheet	*36.7*						
Typ. Datasheet	*38.6*						
Max. Datasheet	*40.6*	*0,2µA*	*1µA*	*51.9*	*0.963*	*69*	*0.512*
Comments	Direct	Direct	Direct	Direct	Direct	Direct	Direct
UNIT	V	nA	nA	V	*Ohm*	V	*Ohm*
N	30	30	30	30	30	30	30
Min	38.13	0.952	1.05	46.6	0.559	51.37	0.172
Max	40.19	22.71	46.88	49.8	0.779	54.49	0.235
Avg.	38.86	10.485	21.13	47.23	0.655	52.3	0.218

(*)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

SMAJ5.0A

Characterization SMAJ5.0AH-TR

Date : 05/04/2024
Ref : 23510A
Lab : ST Tours Characterization Lab

TEST	VBR	IRM	IRM	VCL 10/1000 µs	RD	VCL 8/20 µs	RD
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TEST CALCULES	TESEC	TESTS_CALCULES
Condition 1	25°C	25°C	85°C	25°C	25°C	25°C	25°C
Condition 2	IR=10mA	VRM=5V	VRM=5V	IPP=43.5A	IF1=21.75A	IPP=174A	IF1=87A
Condition 3					IF2=43.5A		IF2=174A
Condition 4					VR1= 1-VCL 10/1000 µs		VR1= 1-VCL 8/20 µs
Condition 5					VR2= 2-VCL 10/1000 µs		VR2= 2-VCL 8/20 µs
Min. Datasheet	*6.40*						
Typ. Datasheet	*6.74*						
Max. Datasheet		*20µA*	*50µA*	*9.2*	*0.049*	*13.4*	*0.036ohm*
Comments	Direct	Direct	Direct	Direct	Direct	Direct	Direct
UNIT	V	nA	nA	V	*Ohm*	V	*Ohm*
N	30	30	30	30	30	30	30
Min	6.686	25.5	82.13	8.41	0.021	12.04	0.0289
Max	6.819	220	397.2	8.68	0.04	12.6	0.0331
Avg.	6.731	48.33	122.76	8.53	0.0352	12.29	0.0308

(*)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

SMC50J100A

Characterization SMC50J100A-TR							
Date : 05/04/2024							
Ref : 23471A							
Lab : ST Tours Characterization Lab							
TEST	**VBR**	**IRM**	**IRM**	**VCL 10/1000 µs**	**RD**	**VCL 8/20 µs**	**RD**
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TEST CALCULES	TESEC	TESTS_CALCULES
Condition 1	25°C	25°C	85°C	25°C	25°C	25°C	25°C
Condition 2	IR=1mA	VRM=100V	VRM=100V	IPP=28A	IF1=14A	IPP=227A	IF1=114A
Condition 3					IF2=28A		IF2=227A
Condition 4					VR1= 1-VCL 10/1000 µs		VR1= 1-VCL 8/20 µs
Condition 5					VR2= 2-VCL 10/1000 µs		VR2= 2-VCL 8/20 µs
Min. Datasheet	*111*						
Typ. Datasheet	*117*						
Max. Datasheet	*123*	*0,2µA*	*1µA*	*179*	*2000mohm*	*212*	*392mohm*
Comments	Direct	Direct	Direct	Direct	Direct	Direct	Direct
UNIT	V	nA	nA	V	*mohm*	V	*mohm*
N	30	30	30	30	30	30	30
Min	114.8	7.301	10.01	142.5	892.85	159.82	0.181
Max	118.2	25.69	59.09	147.5	1130.71	164.83	0.196
Avg.	116.09	16.86	26.55	144.49	958.52	161.22	0.186

(*)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.
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SMC30J188CA

Characterization SMC30J188CA						
Date : 05/04/2024						
Ref : 23470A						
Lab : ST Tours Characterization Lab						
TEST	**VBR**	**VBR**	**IRM**	**IRM**	**IRM**	**IRM**
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TESEC	TESEC
Condition 1	25°C	25°C	25°C	25°C	85°C	85°C
Condition 2	IR=1mA	IR=1mA	VRM=188V	VRM=188V	VRM=188V	VRM=188V
Condition 3						
Condition 4						
Condition 5						
Min. Datasheet	*209*	*209*				
Typ. Datasheet	*220*	*220*				
Max. Datasheet	*231*	*231*	*0,2µA*	*0,2µA*	*1µA*	*1µA*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	nA	nA	nA	nA
N	30	30	30	30	30	30
Min	215.3	214.8	20.27	3.809	23.44	21.98
Max	224.4	221	51.57	36.82	86.44	100.8
Avg.	217.58	217.5	32.048	21.58	50.12	54.9

TEST	**VCL 10/1000 µs**	**VCL 10/1000 µs**	**RD**	**RD**	**VCL 8/20 µs**	**VCL 8/20 µs**	**RD**	**RD**
EQUIPMENT	TESEC	TESEC	TEST CALCULES	TEST CALCULES	TESEC	TESEC	TESTS_CALCULES	TESTS_CALCULES
Condition 1	25°C	25°C	25°C	25°C	25°C	25°C	25°C	25°C
Condition 2	IPP=9A	IPP=9A	IF1=4.5A	IF1=4.5A	IPP=80A	IPP=80A	IF1=40A	IF1=40A
Condition 3			IF2=9A	IF2=9A			IF2=80A	IF2=80A
Condition 4			VR1= 1-VCL 10/1000 µs	VR1= 1-VCL 10/1000 µs			VR1= 1-VCL 8/20 µs	VR1= 1-VCL 8/20 µs
Condition 5			VR2= 2-VCL 10/1000 µs	VR2= 2-VCL 10/1000 µs			VR2= 2-VCL 8/20 µs	VR2= 2-VCL 8/20 µs
Min. Datasheet								
Typ. Datasheet								
Max. Datasheet	*328*	*328*	*10778mohm*	*10778mohm*	*388*	*388*	*1963mohm*	*1963mohm*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	*Ohm*	*Ohm*	V	V	*Ohm*	*Ohm*
N	15	15	15	15	15	15	15	15
Min	247.8	261.6	0.333	3.755	272.2	273.8	0.418	0.4875
Max	270.8	267.1	4.333	4.444	278.6	279.8	0.548	0.52
Avg.	262.63	264.01	3.822	4.112	276.413	277.08	0.511	0.508

(*)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.
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SM15T6V8CA

Characterization SM15T6V8CA

Date : 05/04/2024
Ref : 23469A
Lab : ST Tours Characterization Lab

TEST	VBR	VBR	IRM	IRM	IRM	IRM
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TESEC	TESEC
Condition 1	25°C	25°C	25°C	25°C	85°C	85°C
Condition 2	IR=1mA	IR=1mA	VRM=5.8V	VRM=5.8V	VRM=5.8V	VRM=5.8V
Condition 3						
Condition 4						
Condition 5						
Min. Datasheet	*6.45*	*6.45*				
Typ. Datasheet	*6.8*	*6.8*				
Max. Datasheet	*7.14*	*7.14*	*500µA*	*500µA*	*2000µA*	*2000µA*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	µA	µA	µA	µA
N	30	30	30	30	30	30
Min	6.798	6.775	5.348	5.47	13.43	13.92
Max	6.899	6.901	10.45	10.35	24.17	24.42
Avg.	6.835	6.835	8.131	8.293	19.44	19.81

TEST	VCL 10/1000 µs	VCL 10/1000 µs	RD	RD	VCL 8/20 µs	VCL 8/20 µs	RD	RD
EQUIPMENT	TESEC	TESEC	TEST CALCULES	TEST CALCULES	TESEC	TESEC	TESTS_CALCULES	TESTS_CALCULES
Condition 1	25°C	25°C	25°C	25°C	25°C	25°C	25°C	25°C
Condition 2	IPP=143A	IPP=143A	IF1=72A	IF1=72A	IPP=746A	IPP=746A	IF1=370A	IF1=370A
Condition 3			IF2=143A	IF2=143A			IF2=746A	IF2=746A
Condition 4			VR1= 1-VCL 10/1000 µs	VR1= 1-VCL 10/1000 µs			VR1= 1-VCL 8/20 µs	VR1= 1-VCL 8/20 µs
Condition 5			VR2= 2-VCL 10/1000 µs	VR2= 2-VCL 10/1000 µs			VR2= 2-VCL 8/20 µs	VR2= 2-VCL 8/20 µs
Min. Datasheet								
Typ. Datasheet								
Max. Datasheet	*10.5*	*10.5*	*0.023*	*0.023*	*13.4*	*13.4*	*0.008ohm*	*0.008ohm*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	*Ohm*	*Ohm*	V	V	*ohm*	*ohm*
N	15	15	15	15	15	15	15	15
Min	8.25	8.21	0.00633	0.00647	11.73	11.8	0.00585	0.005851
Max	8.45	8.42	0.00845	0.00957	12.07	12.07	0.006382	0.006569
Avg.	8.31	8.26	0.00685	0.00729	11.85	11.91	0.00603	0.006184

(*)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

SM6T39CA

Characterization SM6T39CA							
Date : 05/04/2024							
Ref : 23467A							
Lab : ST Tours Characterization Lab							
TEST	**VBR**	**VBR**	**IRM**	**IRM**	**IRM**	**IRM**	
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TESEC	TESEC	
Condition 1	25°C	25°C	25°C	25°C	85°C	85°C	
Condition 2	IR=1mA	IR=1mA	VRM=33.3V	VRM=33.3V	VRM=33.3V	VRM=33.3V	
Condition 3							
Condition 4							
Condition 5							
Min. Datasheet	*37.1*	*37.1*					
Typ. Datasheet	*39*	*39*					
Max. Datasheet	*41*	*41*	*0,2µA*	*0,2µA*	*1µA*	*1µA*	
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse	
UNIT	V	V	nA	nA	nA	nA	
N	30	30	30	30	30	30	
Min	38.56	38.56	1.444	1.807	8.314	9.649	
Max	39.75	39.95	2.42	2.45	14.35	13.03	
Avg.	39.013	39	1.8317	2.069	11.568	11.21	

VCL 10/1000 µs	**VCL 10/1000 µs**	**RD**	**RD**	**VCL 8/20 µs**	**VCL 8/20 µs**	**RD**	**RD**
TESEC	TESEC	TEST CALCULES	TEST CALCULES	TESEC	TESEC	TESTS_CALCULES	TESTS_CALCULES
25°C	25°C	25°C	25°C	25°C	25°C	25°C	25°C
IPP=11.1A	IPP=11.1A	IF1=5.55A	IF1=5.55A	IPP=57A	IPP=57A	IF1=28.5A	IF1=28.5A
		IF2=11A	IF2=11A			IF2=57A	IF2=57A
		VR1= 1-VCL 10/1000 µs	VR1= 1-VCL 10/1000 µs			VR1= 1-VCL 8/20 µs	VR1= 1-VCL 8/20 µs
		VR2= 2-VCL 10/1000 µs	VR2= 2-VCL 10/1000 µs			VR2= 2-VCL 8/20 µs	VR2= 2-VCL 8/20 µs
53.9	*53.9*	*1.16*	*1.16*	*69.7*	*69.7*	*0.504*	*0.504*
Direct	Reverse	Direct	Reverse	Direct	Reverse	Direct	Reverse
V	V	*Ohm*	*Ohm*	V	V	*Ohm*	*Ohm*
15	15	15	15	15	15	15	15
45.9	45.9	0.5714	0.5893	49	49	0.1754	0.1754
47.3	48.7	0.6964	0.6786	50.33	51.67	0.1870	0.1989
46.586	46.693	0.6262	0.6345	49.55	49.75	0.1762	0.1817

(*)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

SMAJ33CA

Characterization SMAJ33CA

Date : 05/04/2024
Ref : 23466A
Lab : ST Tours Characterization Lab

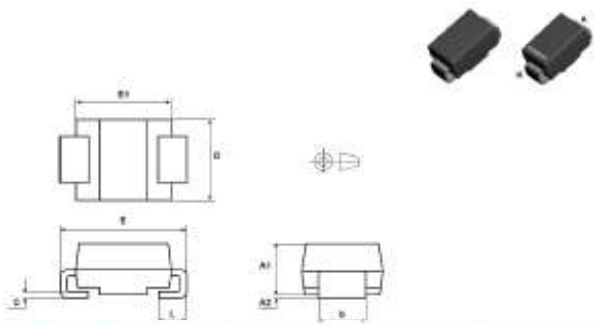
TEST	VBR	VBR	IRM	IRM	IRM	IRM
EQUIPMENT	TESEC	TESEC	TESEC	TESEC	TESEC	TESEC
Condition 1	25°C	25°C	25°C	25°C	85°C	85°C
Condition 2	IR=1mA	IR=1mA	VRM=33V	VRM=33V	VRM=33V	VRM=33V
Condition 3						
Condition 4						
Condition 5						
Min. Datasheet	*36.7*	*36.7*				
Typ. Datasheet	*38.6*	*38.6*				
Max. Datasheet			*0,2µA*	*0,2µA*	*1µA*	*1µA*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	nA	nA	nA	nA
N	30	30	30	30	30	30
Min	37,39	37,23	1,27	0,90	0,98	1,22
Max	39,24	38,80	14,50	11,94	30,28	50,30
Avg.	38,12	38,07	7,43	5,21	15,28	20,31

TEST	VCL 10/1000 µs	VCL 10/1000 µs	RD	RD	VCL 8/20 µs	VCL 8/20 µs	RD	RD
EQUIPMENT	TESEC	TESEC	TEST CALCULES	TEST CALCULES	TESEC	TESEC	TESTS_CALCULES	TESTS_CALCULES
Condition 1	25°C	25°C	25°C	25°C	25°C	25°C	25°C	25°C
Condition 2	IPP=7.5A	IPP=7.5A	IF1=3.7A	IF1=3.7A	IPP=33A	IPP=33A	IF1=17A	IF1=17A
Condition 3			IF2=7.5A	IF2=7.5A			IF2=33A	IF2=33A
Condition 4			VR1= 1-VCL 10/1000 µs	VR1= 1-VCL 10/1000 µs			VR1= 1-VCL 8/20 µs	VR1= 1-VCL 8/20 µs
Condition 5			VR2= 2-VCL 10/1000 µs	VR2= 2-VCL 10/1000 µs			VR2= 2-VCL 8/20 µs	VR2= 2-VCL 8/20 µs
Min. Datasheet								
Typ. Datasheet								
Max. Datasheet	*53.3*	*53.3*	*1.70*	*1.70*	*69.7*	*69.7*	*0.884ohm*	*0.884ohm*
Comments	Direct	Reverse	Direct	Reverse	Direct	Reverse	Direct	Reverse
UNIT	V	V	*Ohm*	*Ohm*	V	V	*Ohm*	*Ohm*
N	15	15	15	15	15	15	15	15
Min	44.60	44.50	0.7895	0.8421	46.81	46.81	0.2520	0.2519
Max	48.10	47.00	1.0789	1.0263	48.36	48.05	0.4650	0.2713
Avg.	45.78	45,63	0,9281	0,9228	47,31	47,41	0,2800	0,2661

(*)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

6.2 **Physical Dimensions**

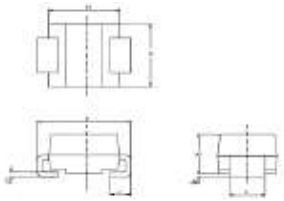
SMA package dimensions

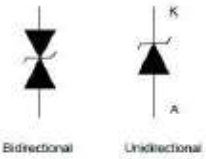


Ref.	Millimeters	
	Min.	Max.
A1	1.90	2.45
A2	0.05	0.20
b	1.25	1.65
c	0.15	0.40
D	2.25	2.90
E	4.80	5.35
E1	3.95	4.60
L	0.75	1.50

Spec	A1	A2	b	c	D	E	E1	L
MIN:	1.90	0.05	1.25	0.15	2.25	4.80	3.95	0.75
MAX:	2.45	0.20	1.65	0.40	2.90	5.35	4.60	1.50
1	2.134	0.142	1.549	0.280	2.818	5.069	4.380	1.066
2	2.107	0.150	1.536	0.250	2.825	5.065	4.379	1.055
3	2.138	0.133	1.539	0.268	2.800	5.080	4.383	1.040
4	2.129	0.113	1.551	0.277	2.806	5.128	4.371	1.037
5	2.124	0.124	1.537	0.271	2.810	5.115	4.364	1.051
6	2.093	0.137	1.528	0.261	2.817	5.062	4.371	1.055
7	2.116	0.144	1.551	0.275	2.802	5.117	4.375	1.039
8	2.087	0.104	1.539	0.266	2.810	5.131	4.379	1.023
9	2.132	0.118	1.543	0.273	2.804	5.080	4.382	1.041
10	2.132	0.122	1.541	0.280	2.814	5.133	4.375	1.021
11	2.137	0.142	1.535	0.271	2.801	5.088	4.379	1.021
12	2.089	0.132	1.528	0.261	2.806	5.109	4.371	1.016
13	2.146	0.137	1.533	0.267	2.820	5.123	4.380	1.072
14	2.136	0.112	1.544	0.270	2.818	5.096	4.366	1.045
15	2.115	0.132	1.533	0.271	2.813	5.092	4.368	1.042
16	2.107	0.119	1.532	0.276	2.837	5.097	4.382	1.039
17	2.125	0.130	1.541	0.269	2.819	5.104	4.375	1.020
18	2.132	0.134	1.532	0.265	2.803	5.112	4.376	1.045
19	2.139	0.142	1.528	0.268	2.827	5.113	4.379	1.029
20	2.121	0.118	1.529	0.263	2.804	5.127	4.383	1.016
21	2.130	0.140	1.543	0.271	2.823	5.127	4.368	1.040
22	2.146	0.136	1.555	0.273	2.814	5.079	4.362	1.020
23	2.114	0.130	1.536	0.263	2.799	5.102	4.376	1.036
24	2.126	0.140	1.549	0.272	2.820	5.133	4.380	1.037
25	2.133	0.137	1.537	0.272	2.820	5.088	4.375	1.052
26	2.099	0.116	1.530	0.268	2.809	5.177	4.389	1.030
27	2.089	0.107	1.524	0.256	2.820	5.075	4.383	1.063
28	2.108	0.111	1.547	0.274	2.825	5.079	4.376	1.074
29	2.100	0.105	1.531	0.274	2.814	5.110	4.370	1.058
30	2.140	0.134	1.540	0.268	2.816	5.110	4.385	1.042
MIN	2.087	0.104	1.524	0.250	2.799	5.062	4.362	1.016
MAX	2.146	0.150	1.555	0.280	2.837	5.177	4.389	1.074
AVG	2.121	0.128	1.538	0.269	2.814	5.104	4.376	1.041

SMB package dimensions

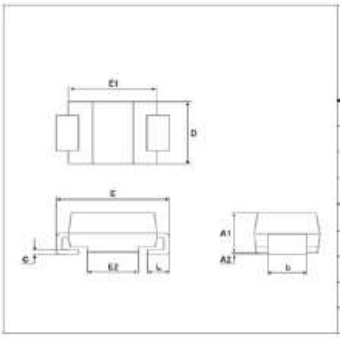




Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.0748	0.0965
A2	0.05	0.20	0.0020	0.0079
b	1.95	2.20	0.0768	0.0867
c	0.15	0.40	0.0059	0.0157
D	3.30	3.95	0.1299	0.1555
E	5.10	5.60	0.2008	0.2205
E1	4.05	4.60	0.1594	0.1811
L	0.75	1.50	0.0295	0.0591

Cote	A1	A2	b	c	D	E	E1	L
1	2.18	0.16	2.04	0.28	3.52	5.34	4.55	1.09
2	2.14	0.17	2.03	0.29	3.51	5.38	4.51	1.11
3	2.18	0.17	2.03	0.28	3.51	5.35	4.55	1.08
4	2.17	0.16	2.01	0.29	3.52	5.38	4.53	1.10
5	2.11	0.16	2.03	0.29	3.51	5.35	4.51	1.12
6	2.14	0.14	2.02	0.29	3.53	5.34	4.55	1.10
7	2.16	0.15	2.02	0.28	3.47	5.33	4.51	1.09
8	2.17	0.16	2.02	0.28	3.50	5.35	4.53	1.06
9	2.17	0.16	2.02	0.27	3.51	5.36	4.51	1.09
10	2.17	0.15	2.01	0.28	3.49	5.34	4.51	1.11
11	2.17	0.16	2.03	0.28	3.50	5.36	4.52	1.07
12	2.17	0.16	2.03	0.28	3.51	5.37	4.54	1.07
13	2.16	0.15	2.04	0.28	3.52	5.36	4.51	1.08
14	2.18	0.16	2.02	0.29	3.51	5.39	4.54	1.07
15	2.17	0.14	2.02	0.28	3.50	5.38	4.53	1.09
16	2.17	0.16	2.02	0.29	3.53	5.36	4.52	1.10
17	2.17	0.16	2.05	0.27	3.52	5.38	4.51	1.10
18	2.18	0.15	2.03	0.28	3.53	5.37	4.50	1.11
19	2.15	0.15	2.02	0.27	3.50	5.37	4.52	1.11
20	2.17	0.16	2.02	0.28	3.53	5.37	4.53	1.11
21	2.16	0.16	2.01	0.28	3.56	5.34	4.50	1.10
22	2.17	0.16	2.03	0.28	3.56	5.41	4.52	1.07
23	2.16	0.15	2.02	0.28	3.55	5.37	4.50	1.11
24	2.18	0.16	2.03	0.29	3.52	5.33	4.53	1.11
25	2.17	0.14	2.03	0.29	3.55	5.35	4.52	1.11
26	2.17	0.15	2.02	0.28	3.50	5.37	4.52	1.09
27	2.18	0.15	2.02	0.29	3.55	5.36	4.51	1.08
28	2.17	0.16	2.02	0.28	3.56	5.34	4.51	1.09
29	2.17	0.16	2.02	0.28	3.56	5.38	4.49	1.08
30	2.17	0.15	2.04	0.28	3.54	5.33	4.50	1.10
LSL	1.90	0.05	1.95	0.15	3.30	5.10	4.05	0.75
USL	2.45	0.20	2.20	0.40	3.95	5.60	4.60	1.50
MIN	2.11	0.14	2.01	0.27	3.47	5.33	4.49	1.06
MAX	2.18	0.17	2.05	0.29	3.56	5.41	4.55	1.12
AVG	2.17	0.16	2.02	0.28	3.52	5.36	4.52	1.09

SMC package dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.075	0.096
A2	0.05	0.20	0.002	0.008
b(1)	2.90	3.20	0.114	0.126
c(1)	0.15	0.40	0.006	0.016
D	5.55	6.25	0.218	0.246
E	7.75	8.15	0.305	0.321
E1	6.60	7.15	0.260	0.281
E2	4.40	4.70	0.173	0.185
L	0.75	1.50	0.030	0.059

DIMENSION	A1	A2	b	c	D	E	E1	E2	L
Min (mm)	1.900	0.050	2.900	0.150	5.550	7.750	6.600	4.400	0.750
Max (mm)	2.450	0.200	3.200	0.400	6.250	8.150	7.150	4.700	1.500
1	2.047	0.144	2.952	0.267	5.796	7.839	6.909	4.508	1.108
2	2.096	0.158	3.004	0.263	5.692	7.804	6.910	4.553	1.102
3	2.038	0.146	2.976	0.274	5.758	7.782	6.922	4.537	1.111
4	2.097	0.151	2.960	0.262	5.687	7.793	6.927	4.543	1.102
5	2.086	0.152	2.984	0.269	5.765	7.806	6.895	4.557	1.093
6	2.071	0.146	2.996	0.275	5.762	7.790	6.933	4.561	1.091
7	2.061	0.141	3.005	0.286	5.755	7.783	6.917	4.565	1.064
8	2.101	0.137	3.007	0.285	5.744	7.791	6.878	4.556	1.078
9	2.099	0.129	2.976	0.276	5.788	7.794	6.925	4.568	1.112
10	2.096	0.137	2.955	0.261	5.767	7.822	6.911	4.564	1.15
11	2.122	0.161	2.983	0.271	5.765	7.783	6.918	4.569	1.08
12	2.100	0.155	3.000	0.267	5.779	7.775	6.899	4.539	1.106
13	2.123	0.153	2.990	0.262	5.789	7.808	6.875	4.570	1.118
14	2.104	0.149	3.003	0.271	5.800	7.801	6.869	4.564	1.084
15	2.053	0.144	2.988	0.271	5.770	7.782	6.887	4.554	1.092
16	2.110	0.146	3.012	0.267	5.752	7.780	6.907	4.558	1.104
17	2.067	0.155	2.981	0.257	5.770	7.790	6.861	4.590	1.11
18	2.095	0.147	2.996	0.262	5.780	7.785	6.883	4.567	1.103
19	2.100	0.146	2.994	0.260	5.793	7.783	6.861	4.572	1.104
20	2.097	0.152	3.005	0.260	5.784	7.793	6.680	4.555	1.097
21	2.097	0.148	2.992	0.253	5.768	7.803	6.863	4.561	1.107
22	2.094	0.159	2.971	0.270	5.770	7.788	6.904	4.556	1.091
23	2.095	0.152	2.983	0.288	5.766	7.804	6.933	4.573	1.075
24	2.109	0.137	3.008	0.279	5.779	7.786	6.925	4.584	1.093
25	2.077	0.142	2.970	0.265	5.768	7.781	6.892	4.587	1.085
26	2.085	0.158	2.963	0.263	5.756	7.769	6.915	4.559	1.076
27	2.069	0.140	3.005	0.265	5.801	7.796	6.875	4.571	1.092
28	2.104	0.146	2.981	0.270	5.765	7.761	6.906	4.589	1.105
29	2.096	0.142	2.975	0.269	5.768	7.801	6.895	4.563	1.068
30	2.067	0.136	2.989	0.260	5.761	7.784	6.875	4.578	1.094
MOY	2.089	0.147	2.987	0.268	5.767	7.792	6.892	4.562	1.097
MIN	2.038	0.129	2.952	0.253	5.687	7.761	6.680	4.508	1.064
MAX	2.123	0.161	3.012	0.288	5.801	7.839	6.933	4.590	1.150

6.3 Tests description

Test name	Description	Purpose
Die Oriented		
HTRB High Temperature Reverse Bias	The device is stressed in static configuration, trying to satisfy as much as possible the following conditions: - Low power dissipation - Max. supply voltage compatible with diffusion process and internal circuitry limitations. 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. 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. To assess active area and contacts integrity
Package Oriented		
PC Preconditioning	The device is submitted to a typical temperature profile used for surface mounting devices, after a controlled moisture absorption.	As stand-alone test: to investigate the moisture sensitivity level. As preconditioning before other reliability tests: to verify that the surface mounting stress does not impact on the subsequent reliability performance. The typical failure modes are "pop-corn" effect and delamination.
H3TRB 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 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 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.
DPA Destructive Physical Analysis	Specific construction analysis on random parts that have successfully completed THB or TC.	To investigate on reliability stresses impact on delamination, corrosion and product construction integrity.
RSH 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.
Functional Tests		
RS Repetitive Surges	The device is submitted to a reverse current peak: Ipp, which depends of the current holding of the product.	To evaluate the holding of the component to a high electrical field. Short circuit or hot point is expected as failure mechanism.