

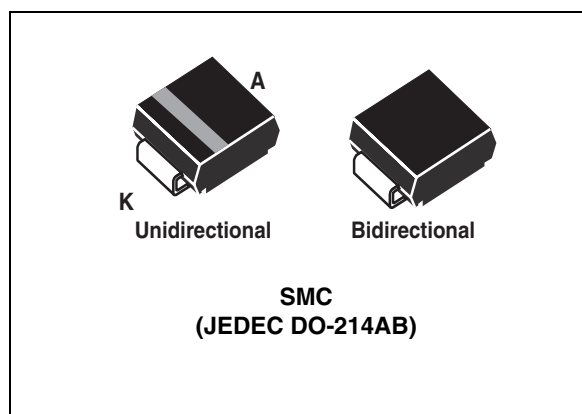
Automotive 1500 W Transil™

Features

- peak pulse power:
 - 1500 W (10/1000 μ s)
 - 10 kW (8/20 μ s)
- stand-off voltage range: from 15 V to 58 V
- unidirectional and bidirectional types
- low leakage current:
 - 0.2 μ A at 25 °C
 - 1 μ A at 85 °C
- operating $T_{j\max}$: 150 °C
- high power capability at $T_{j\max}$:
 - 1250 W (10/1000 μ s)
- JEDEC registered package outline
- resin meets UL 94, V0
- AEC qualified

Complies with the following standards

- IEC 61000-4-2 level 4:
 - 15 kV (air discharge)
 - 8 kV (contact discharge)
- ISO10605 - C = 330 pF, R = 330 Ω :
 - 15 kV (air discharge)
 - 8 kV (contact discharge)
- ISO 7637-2 (for pulse 1 and 2a, applicable only to parts with stand-off voltage (V_{RM}) lower than the average battery voltage: 13.5 V):
 - Pulse 1: $V_S = -100$ V
 - Pulse 2a: $V_S = +50$ V
 - Pulse 3a: $V_S = -150$ V
 - Pulse 3b: $V_S = +100$ V



Description

The SM15TY Transil series has been designed to protect sensitive automotive circuits against surges defined in ISO7637-2 and against electrostatic discharges according to IEC 61000-4-2 and ISO10605.

The Planar technology makes it compatible with high-end circuits where low leakage current and high junction temperature are required to provide reliability and stability over time. SM15TY are packaged in SMC (SMC footprint in accordance with IPC 7531 standard).

TM: Transil is a trademark of STMicroelectronics

1 Characteristics

Table 1. Absolute maximum ratings ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Symbol	Parameter		Value	Unit
V_{PP}	Peak pulse voltage	ISO10605 (C = 330 pF, R = 330 Ω) contact discharge	30	kV
		air discharge	30	
		IEC61000-4-2 contact discharge	30	
		air discharge	30	
P_{PP}	Peak pulse power dissipation ⁽¹⁾	$T_j \text{ initial} = T_{amb}$	1500	W
T_{stg}	Storage temperature range		-65 to + 150	$^{\circ}\text{C}$
T_j	Operating junction temperature range		-40 to + 150	$^{\circ}\text{C}$
T_L	Maximum lead temperature for soldering during 10 s.		260	$^{\circ}\text{C}$

1. For a surge greater than the maximum values, the diode will fail in short-circuit.

Table 2. Thermal parameter

Symbol	Parameter	Value	Unit
$R_{th(j-l)}$	Junction to leads	15	$^{\circ}\text{C/W}$
$R_{th(j-a)}$	Junction to ambient on printed circuit on recommended pad layout	90	$^{\circ}\text{C/W}$

Figure 1. Electrical characteristics - definitions

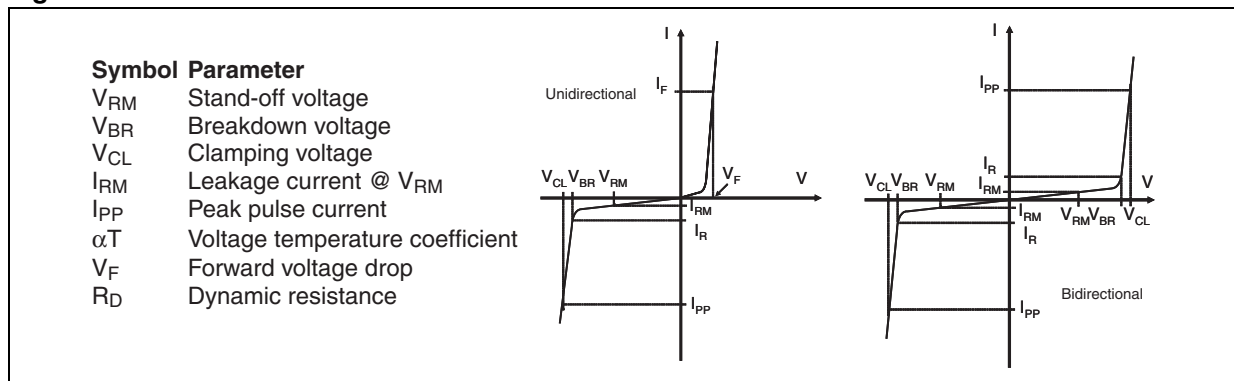


Figure 2. Pulse definition for electrical characteristics

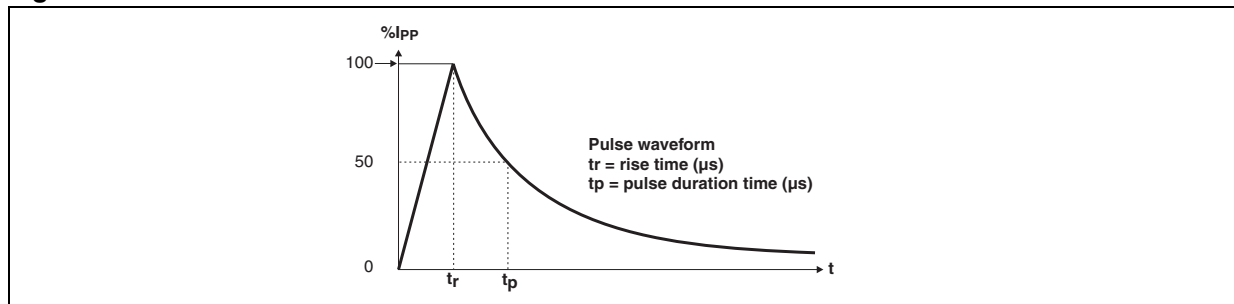


Table 3. Electrical characteristics, typical values unless otherwise stated ($T_{amb} = 25\text{ °C}$)

Order code	$I_{RM} \text{ max}@V_{RM}$		$V_{BR} @I_R^{(1)}$				$V_{CL} @I_{PP}$ 10/1000 μs		R_D 10/1000 μs	$V_{CL} @I_{PP}$ 8/20 μs		R_D 8/20 μs	$\alpha T^{(2)}$
	25 °C	85 °C	min.	typ.		max.			max.			max.	
	μA		V	V		mA	V ⁽³⁾	A ⁽⁴⁾	Ω	V ⁽³⁾	A ⁽⁴⁾	Ω	10-4/ °C
SM15T18AY/CAY	0.2	1	15.3	17.1	18	1	25.2	59.5	0.106	32.5	308	0.044	8.8
SM15T22AY/CAY	0.2	1	18.8	20.9	22	1	30.6	49	0.153	39.3	254	0.064	9.2
SM15T24AY/CAY	0.2	1	20.5	22.8	24	1	33.2	45	0.178	42.8	234	0.075	9.4
SM15T27AY/CAY	0.2	1	23.1	25.7	27	1	37.5	40	0.228	48.3	207	0.096	9.6
SM15T30AY/CAY	0.2	1	25.6	28.5	30	1	41.5	36	0.278	53.5	187	0.12	9.7
SM15T33AY/CAY	0.2	1	28.2	31.4	33	1	45.7	33	0.333	59	169	0.14	9.8
SM15T36AY/CAY	0.2	1	30.8	34.2	36	1	49.9	30	0.403	64.3	156	0.17	9.9
SM15T39AY/CAY	0.2	1	33.3	37.1	39	1	53.9	28	0.461	69.7	143	0.2	10
SM15T47AY/CAY	0.2	1	40.2	44.7	47	1	64.5	23.2	0.653	84	119	0.291	10.1
SM15T68AY/CAY	0.2	1	58.1	64.6	68	1	92	16.3	1.26	121	83	0.6	10.4

1. Pulse test: $t_p < 50\text{ ms}$

2. To calculate maximum clamping voltage at other surge level, use the following formula: $V_{CL,max} = V_{CL} - R_D \times (I_{PP} - I_{PP,appli})$
where $I_{PP,appli}$ is the surge current in the application

3. To calculate V_{BR} or V_{CL} versus junction temperature, use the following formulas:

$$V_{BR} @ T_J = V_{BR} @ 25\text{ °C} \times (1 + \alpha_T \times (T_J - 25))$$

$$V_{CL} @ T_J = V_{CL} @ 25\text{ °C} \times (1 + \alpha_T \times (T_J - 25))$$

4. Surge capability given for both directions for unidirectional and bidirectional types.

Figure 3. Peak pulse power dissipation versus initial junction temperature (typical values)

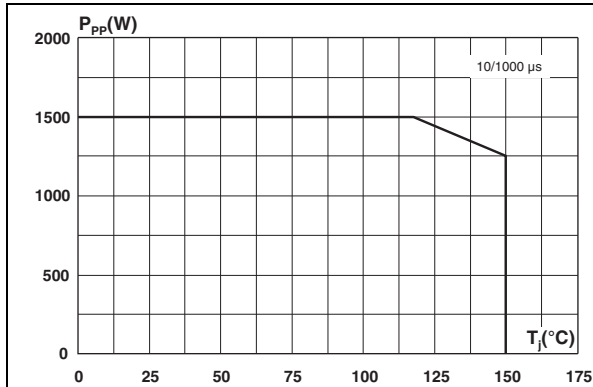


Figure 4. Peak pulse power versus exponential pulse duration (T_j initial = 25 °C)

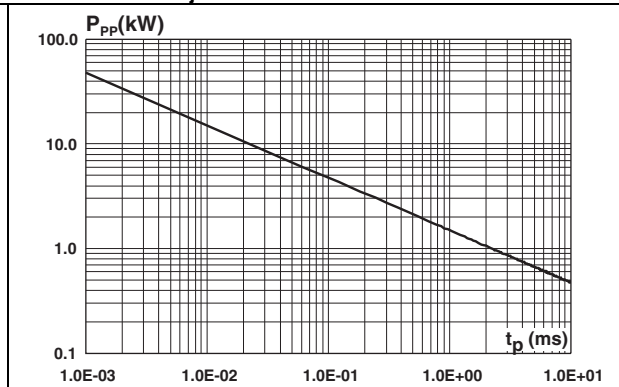


Figure 5. Clamping voltage versus peak pulse current (exponential waveform, maximum values)

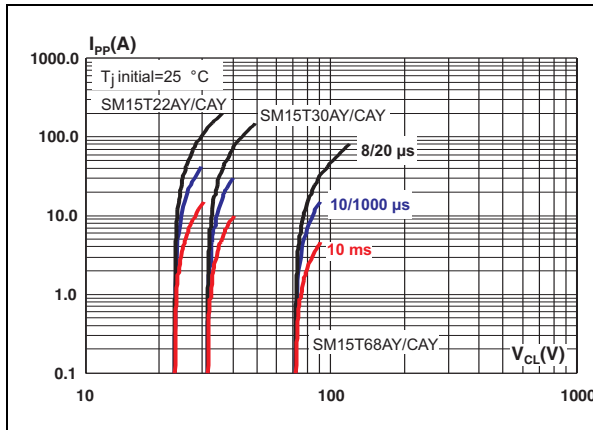


Figure 6. Junction capacitance versus reverse applied voltage for unidirectional types (typical values)

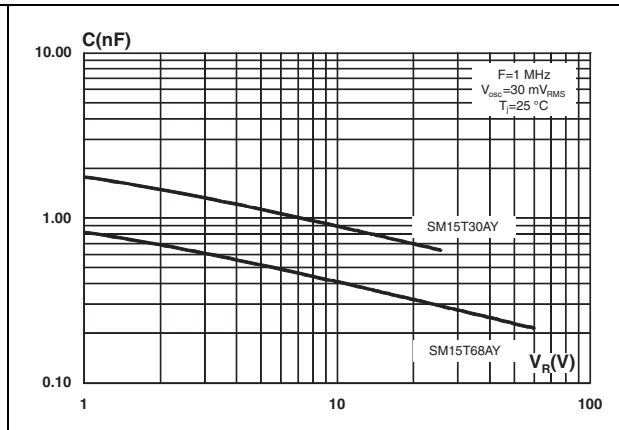


Figure 7. Junction capacitance versus reverse applied voltage for bidirectional types (typical values)

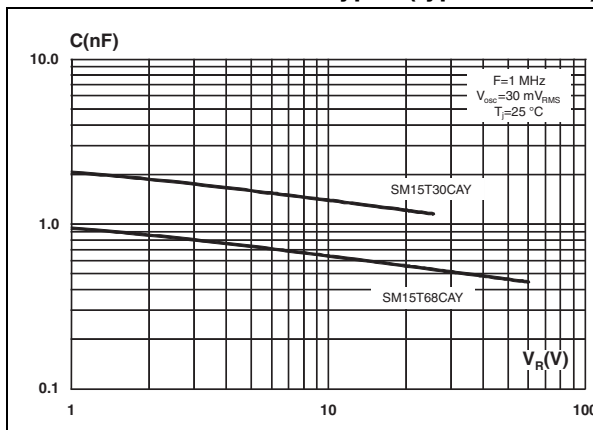


Figure 8. Thermal resistance junction to ambient versus copper surface under each lead

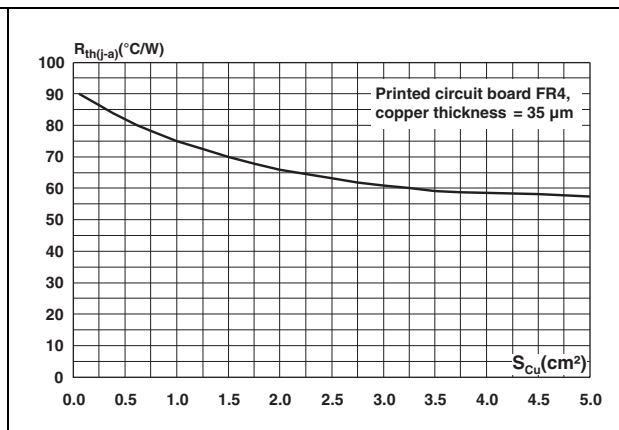


Figure 9. Leakage current versus junction temperature (typical values)

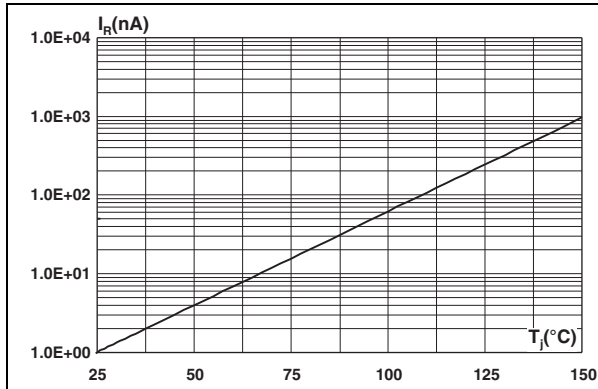


Figure 10. Peak forward voltage drop versus peak forward current (typical values)

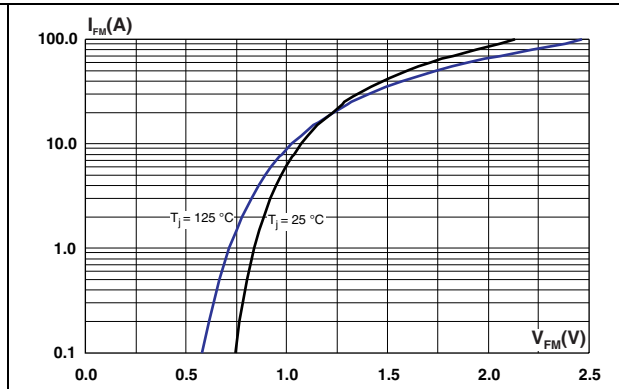


Figure 11. ISO7637-2 pulse 1 response ($V_S = -100\text{ V}$)

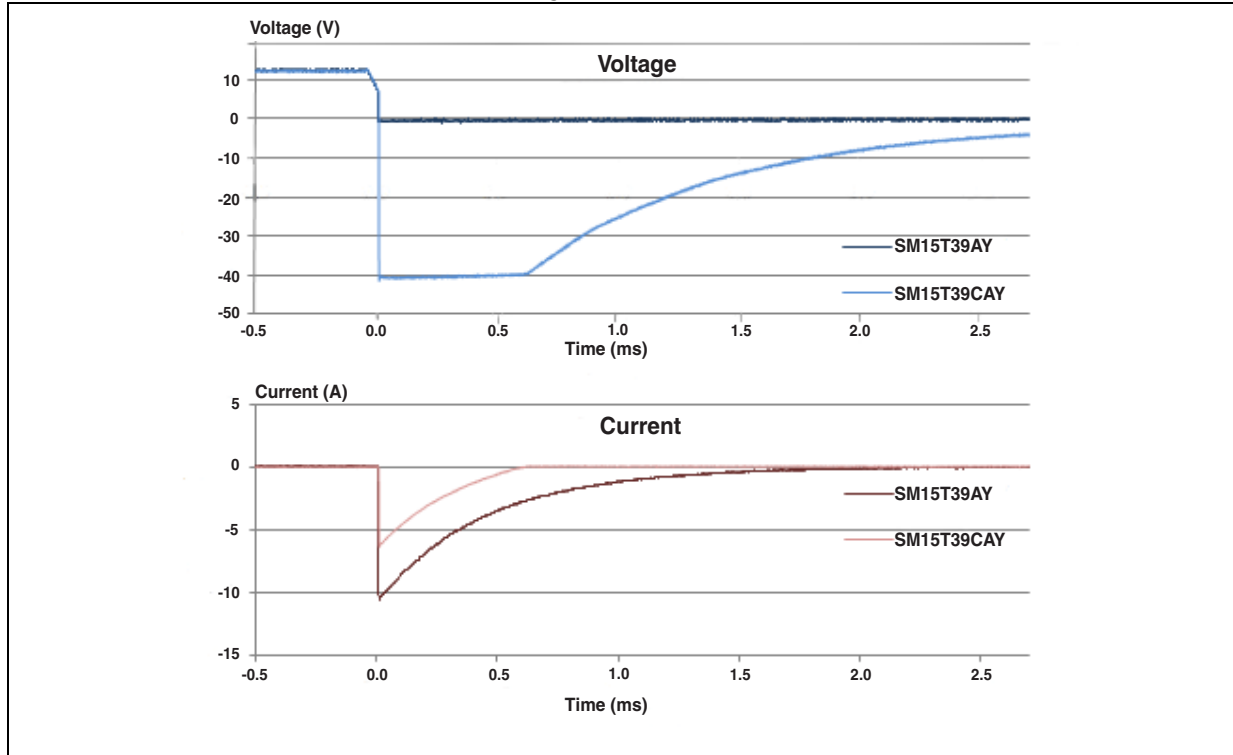


Figure 12. ISO7637-2 pulse 2 response ($V_S = 50\text{ V}$)

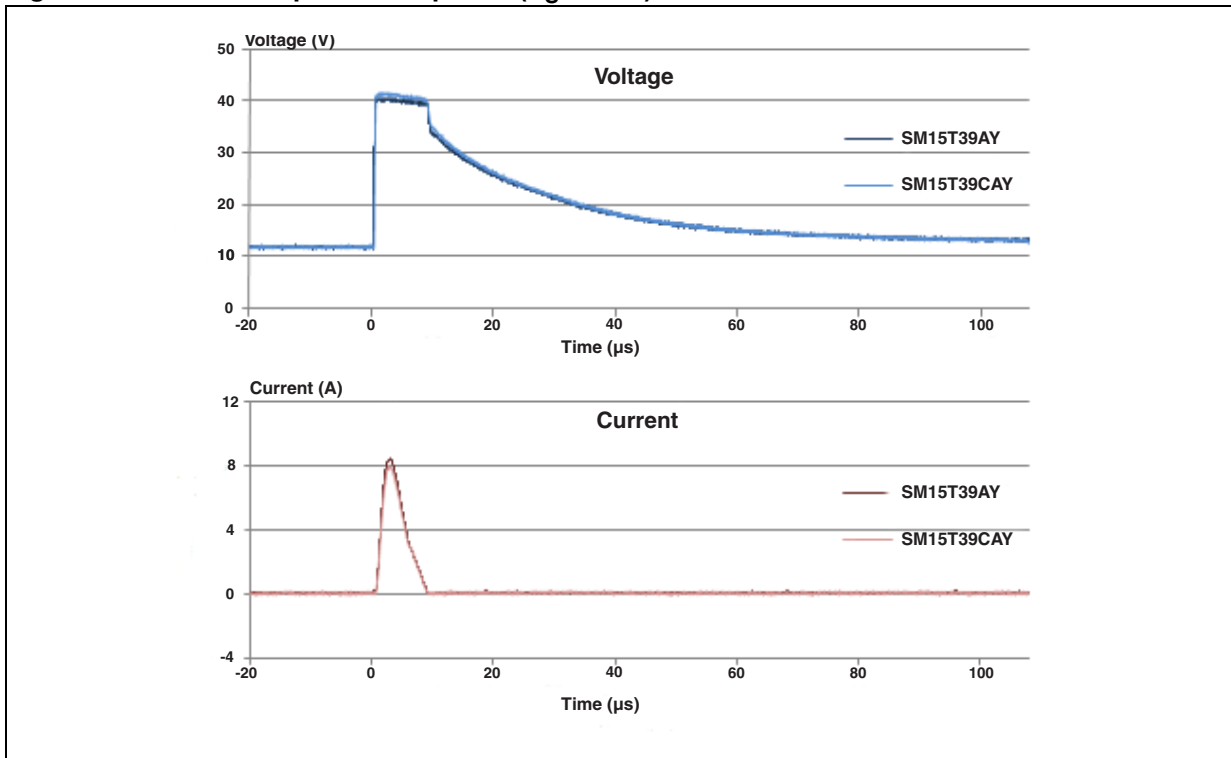


Figure 13. ISO7637-2 pulse 3a response ($V_S = -150\text{ V}$)

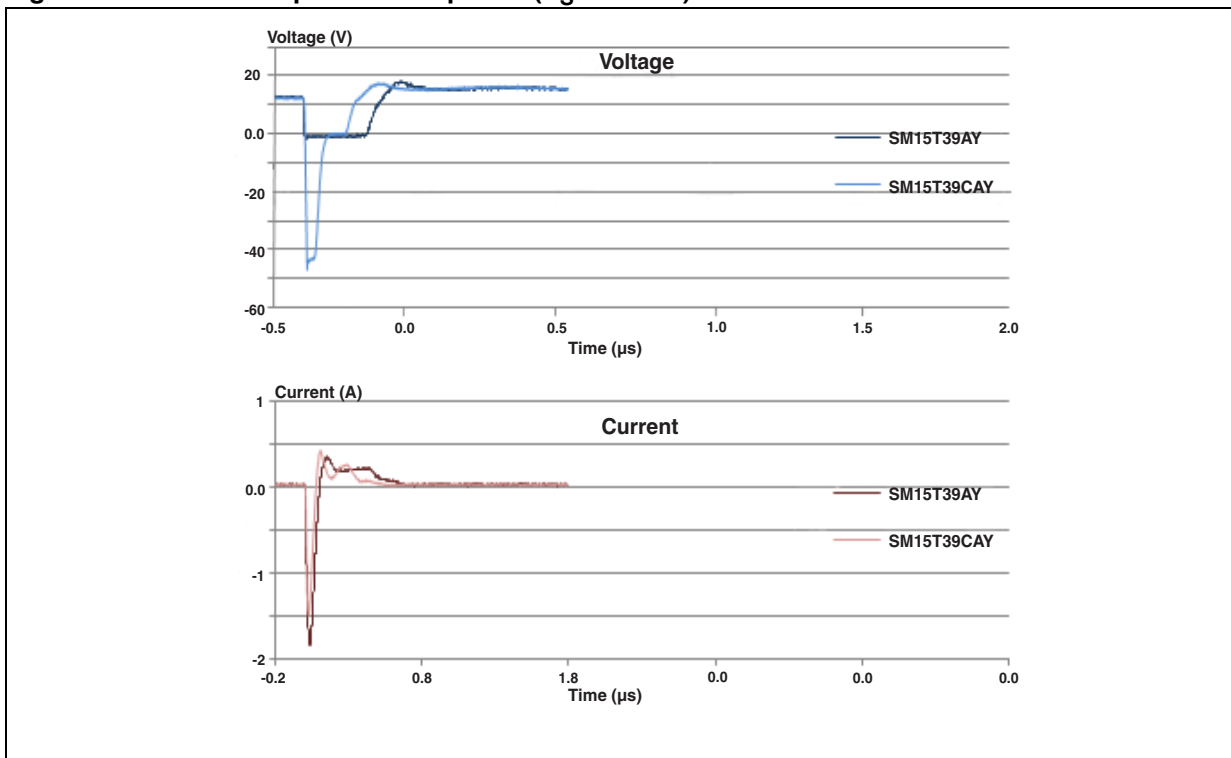
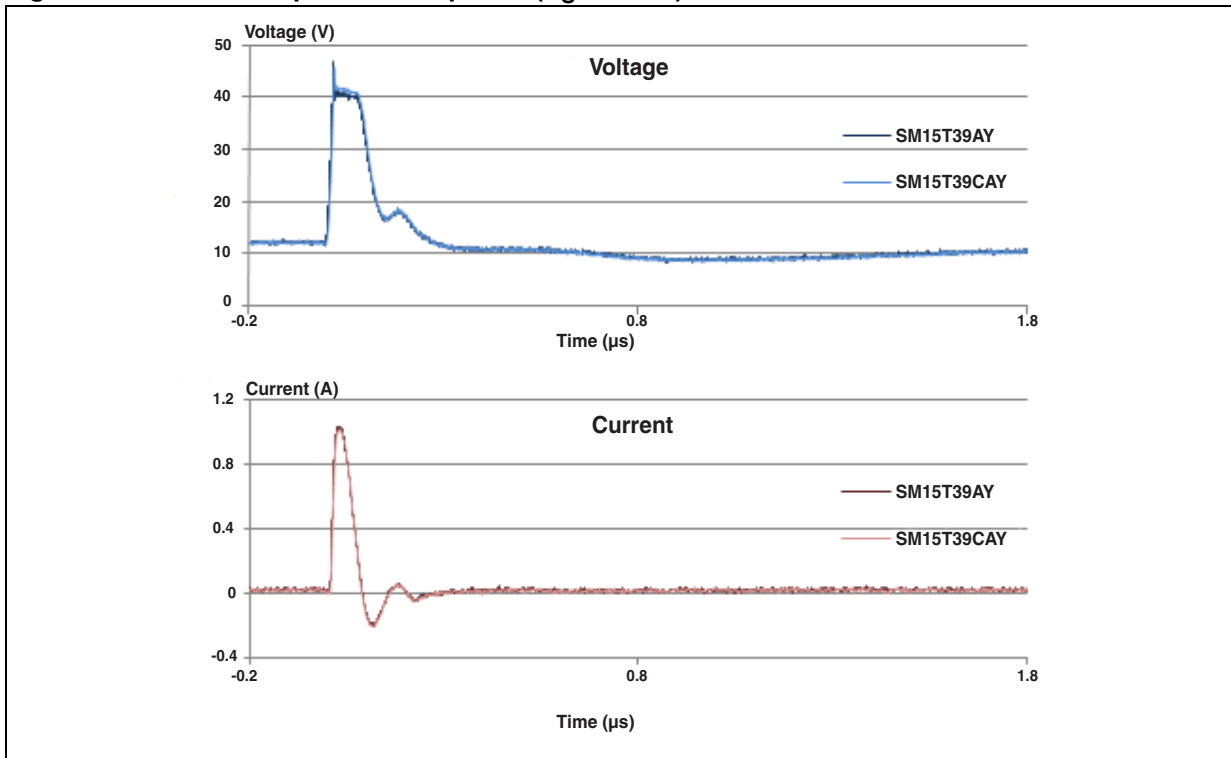


Figure 14. ISO7637-2 pulse 3b response ($V_S = 100\text{ V}$)

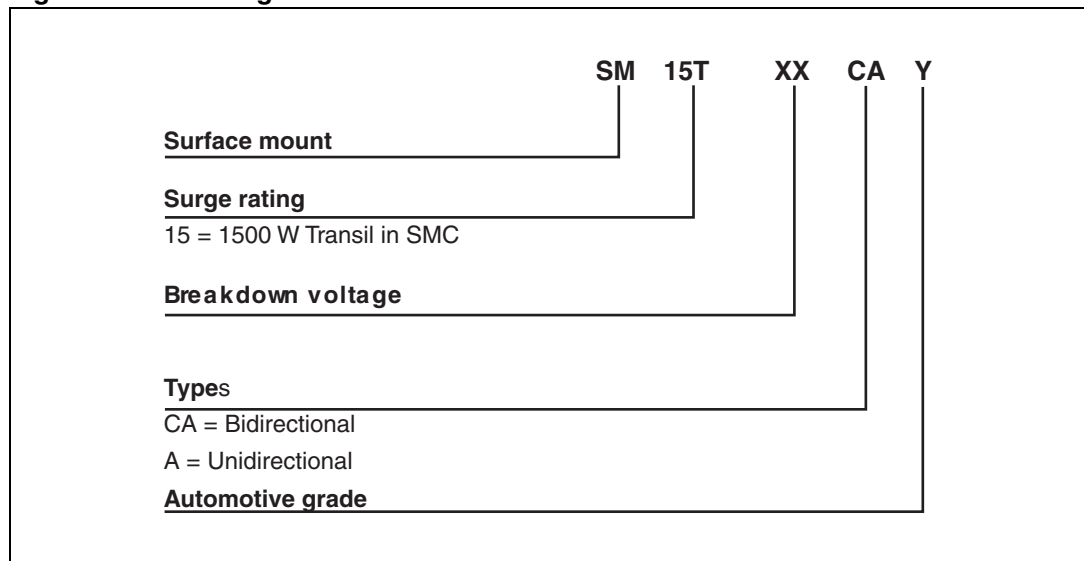


2 Application and design guidelines

More information is available in the Application note AN2689 “Protection of automotive electronics from electrical hazards, guidelines for design and component selection”.

3 Ordering information scheme

Figure 15. Ordering information scheme



4 Package information

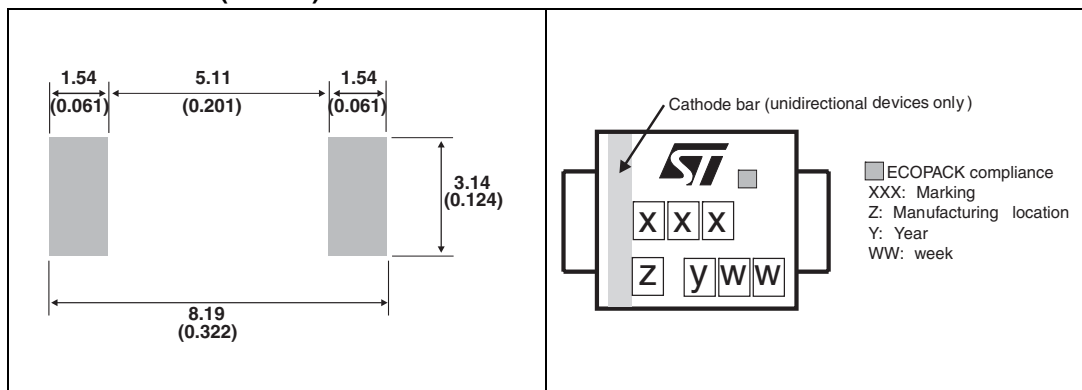
- Case: JEDEC DO-214AB molded plastic over planar junction
- Terminals: solder plated, solderable as per MIL-STD-750, Method 2026
- Polarity: for unidirectional types the band indicates cathode
- Flammability: epoxy is rated UL 94, V0
- RoHS package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

Table 4. SMC 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	2.90	3.20	0.114	0.126
c	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

Figure 16. SMC footprint dimensions in mm (inches) **Figure 17. Marking layout⁽¹⁾**



1. Marking layout can vary according to assembly location.

Table 5. Marking

Order code	Marking	Order code	Marking
SM15T18AY	MEEY	SM15T18CAY	BEEY
SM15T22AY	MEKY	SM15T22CAY	BEKY
SM15T24AY	MEMY	SM15T24CAY	BEMY
SM15T27AY	MEPY	SM15T27CAY	BEPY
SM15T30AY	MERY	SM15T30CAY	BERY
SM15T33AY	METY	SM15T33CAY	BETY
SM15T36AY	MEVY	SM15T36CAY	BEVY
SM15T39AY	MEXY	SM15T39CAY	BEXY
SM15T47AY	MFAY	SM15T47CAY	BFAY
SM15T68AY	MFPY	SM15T68CAY	BFPY

5 Ordering information

Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
SM15TxxxAY/CAY ⁽¹⁾	See Table 5 on page 10	SMC	0.25 g	2500	Tape and reel

1. Where xxx is nominal value of V_{BR} and A or CA indicates unidirectional or bidirectional version. See [Table 3](#) for list of available devices and their order codes

6 Revision history

Table 7. Document revision history

Date	Revision	Description of changes
15-Sep-2010	1	Initial release.

Please Read Carefully:

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

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

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

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

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

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

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

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

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

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

© 2010 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

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

www.st.com