SM15TY

Automotive 1500 W Transil™

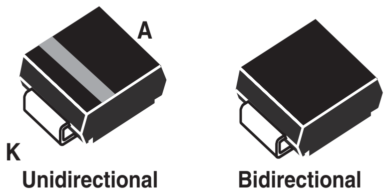
Datasheet — production data

Features

- Peak pulse power:
  - 1500 W (10/1000 µs)
  - 10 kW (8/20 µs)
- Stand-off voltage range: from 5.8 V to 70 V
- Unidirectional and bidirectional types
- Low leakage current:
  - 0.2 µA at 25 °C
  - 1 µA at 85 °C
- Operating $T_{j\ max}$: 150 °C
- High power capability at T_{jmax}:
  - 1250 W (10/1000 µs)
- JEDEC registered package outline
- Resin meets UL 94, V0
- AEC-Q101 qualified

Complies with the following standards

- ISO 10605, C = 150 pF - R = 330 Ω:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)
- ISO 10605 - C = 330 pF, R = 330 Ω:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)
- ISO 7637-2[(a)]
  - Pulse 1: V_S = -100 V
  - Pulse 2a: V_S = +50 V
  - Pulse 3a: V_S = -150 V
  - Pulse 3b: V_S = +100 V



SMC
(JEDEC DO-214AB)

Description

The SM15TY Transil series has been designed to protect sensitive automotive circuits against surges defined in ISO 7637-2 and against electrostatic discharges according to ISO 10605.

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).

a. Not applicable to parts with stand-off voltage lower than the average battery voltage (13.5 V)

TM: Transil is a trademark of STMicroelectronics

This is information on a product in full production. www.st.com

1 Characteristics

Table 1. Absolute maximum ratings (T_{amb} = 25 °C)

Symbol	Parameter		Value	Unit
V_{PP}	Peak pulse voltage	ISO 10605 (C = 330 pF, R = 330 Ω): Contact discharge Air discharge ISO 10605 (C = 150 pF, R = 330 Ω): Contact discharge Air discharge	 30 30 30 30	kV
P_{PP}	Peak pulse power dissipation(1)	$T_{j\ initial} = T_{amb}$	1500	W
T_{stg}	Storage temperature range		-65 to + 150	°C
T_j	Operating junction temperature range		-40 to + 150	°C
T_L	Maximum lead temperature for soldering during 10 s.		260	°C

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

Figure 1. Electrical characteristics - definitions

Symbol	Parameter
V_{RM}	Stand-off voltage
V_{BR}	Breakdown voltage
V_{CL}	Clamping voltage
I_{RM}	Leakage current @ V_{RM}
I_{PP}	Peak pulse current
αT	Voltage temperature coefficient
V_F	Forward voltage drop
R_D	Dynamic resistance

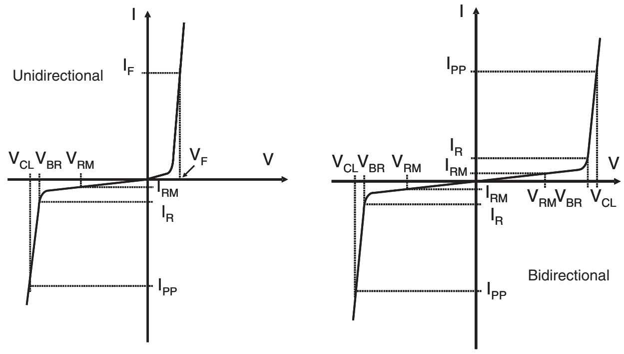


Figure 2. Pulse definition for electrical characteristics

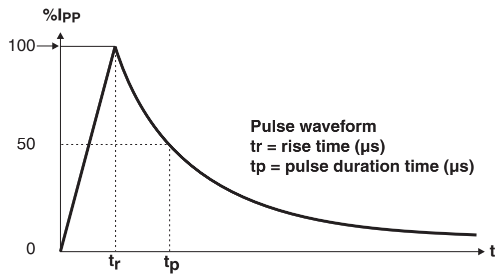


Table 2. Electrical characteristics, typical values unless otherwise stated (T_{amb} = 25 °C)

Order code	I_{RM} 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	αT (2)
	25 °C	85 °C		min	typ	max		max			max			max
	µA		V	V			mA	V(3)	A(4)	Ω	V(3)	A(4)	Ω	10-4/ °C
SM15T6V8AY/CAY	500	2000	5.8	6.45	6.8	7.14	10	10.5	143	0.023	13.4	746	0.008	5.7
SM15T7V5AY/CAY	250	1000	6.4	7.13	7.5	7.88	10	11.3	132	0.026	14.5	690	0.01	6.1
SM15T10AY/CAY	10	50	8.55	9.5	10	10.5	1	14.5	103	0.039	18.6	538	0.015	7.3
SM15T12AY/CAY	0.2	1	10.2	11.4	12	12.6	1	16.7	90	0.046	21.7	461	0.02	7.8
SM15T15AY/CAY	0.2	1	12.8	14.3	15	15.8	1	21.2	71	0.076	27.2	368	0.031	8.4
SM15T18AY/CAY	0.2	1	15.3	17.1	18	18.9	1	25.2	59.5	0.106	32.5	308	0.044	8.8
SM15T22AY/CAY	0.2	1	18.8	20.9	22	23.1	1	30.6	49	0.153	39.3	254	0.064	9.2
SM15T24AY/CAY	0.2	1	20.5	22.8	24	25.2	1	33.2	45	0.178	42.8	234	0.075	9.4
SM15T27AY/CAY	0.2	1	23.1	25.7	27	28.4	1	37.5	40	0.228	48.3	207	0.096	9.6
SM15T30AY/CAY	0.2	1	25.6	28.5	30	31.5	1	41.5	36	0.278	53.5	187	0.12	9.7
SM15T33AY/CAY	0.2	1	28.2	31.4	33	34.7	1	45.7	33	0.333	59	169	0.14	9.8
SM15T36AY/CAY	0.2	1	30.8	34.2	36	37.8	1	49.9	30	0.403	64.3	156	0.17	9.9
SM15T39AY/CAY	0.2	1	33.3	37.1	39	41.0	1	53.9	28	0.461	69.7	143	0.2	10
SM15T47AY/CAY	0.2	1	40.2	44.7	47	49.4	1	64.5	23.2	0.653	84	119	0.291	10.1
SM15T56AY/CAY	0.2	1	48	53.3	56	58.9	1	77.4	20	0.925	100	100	0.411	10.3
SM15T68AY/CAY	0.2	1	58.1	64.6	68	71.4	1	92	16.3	1.26	121	83	0.6	10.4
SM15T75AY/CAY	0.2	1	64.1	71.3	75	78.8	1	103	14.6	1.66	134	75	0.74	10.5
SM15T82AY/CAY	0.2	1	70	77.8	82	86.0	1	113	13.9	1.94	146	69	0.87	10.5

1. Pulse test: t_p < 50 ms
2. To calculate maximum clamping voltage at other surge level, use the following formula: $V_{CL}max = V_{CL} - R_D \times (I_{PP} - I_{PPappli})$ where IPP_{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 °C x (1 + αT x (T_J - 25))
   V_{CL} @ T_J = V_{CL} @ 25 °C x (1 + αT x (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)

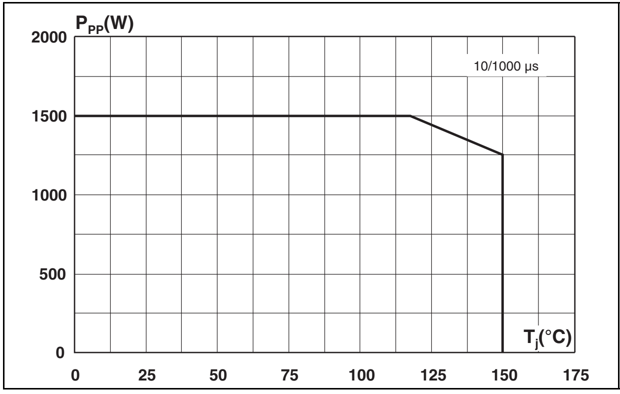


Figure 4. Peak pulse power versus exponential pulse duration (T_j initial = 25 °C)

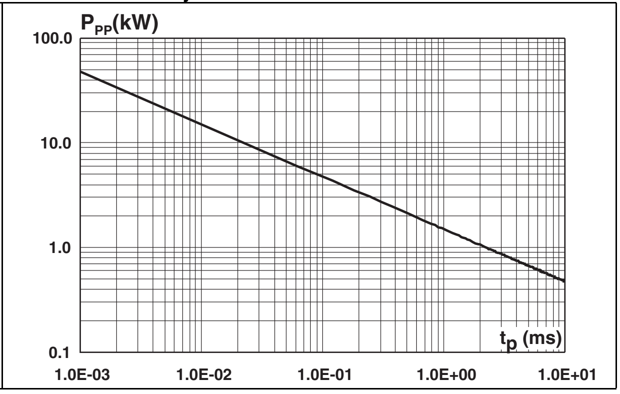


Figure 5. Clamping voltage versus peak pulse current (exponential waveform, maximum values)

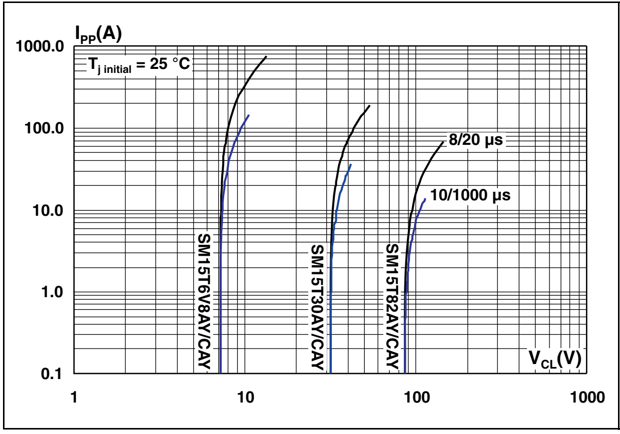


Figure 6. Junction capacitance versus reverse applied voltage for unidirectional types (typical values)

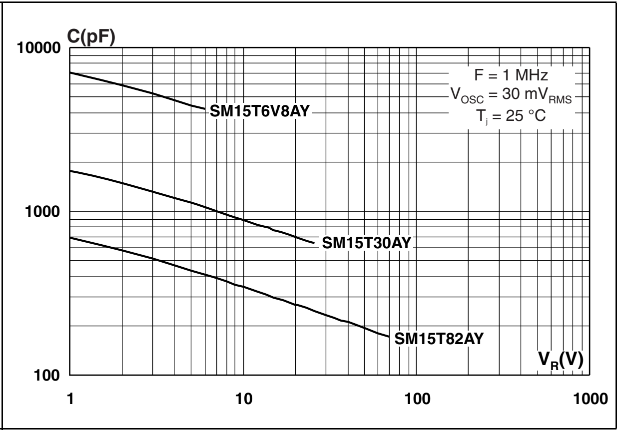


Figure 7. Junction capacitance versus reverse applied voltage for bidirectional types (typical values)

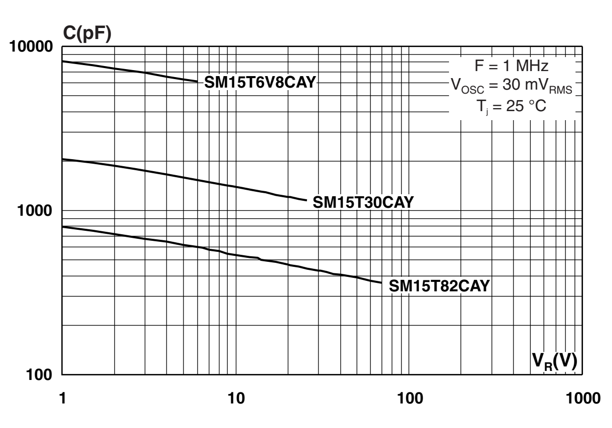


Figure 8. Thermal resistance junction to ambient versus copper surface under each lead

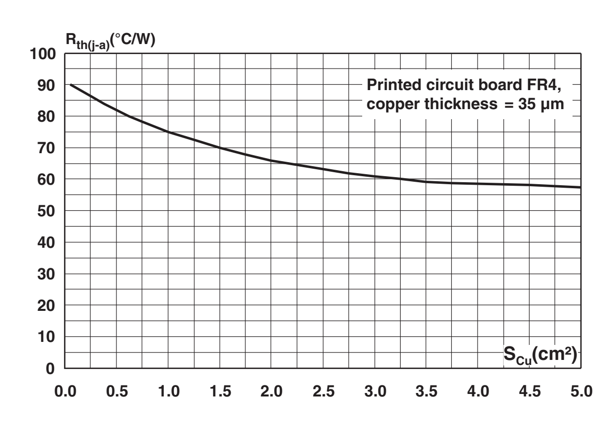


Figure 9. Leakage current versus junction temperature (typical values)

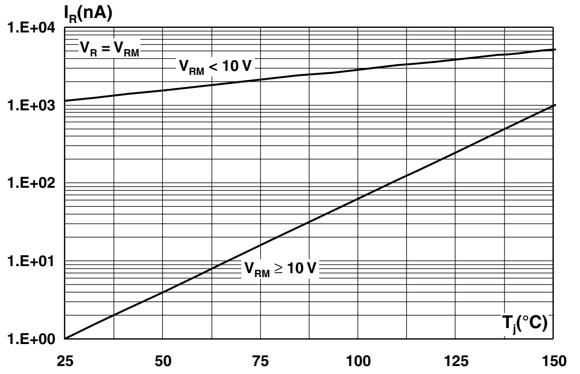


Figure 10. Peak forward voltage drop versus peak forward current (typical values)

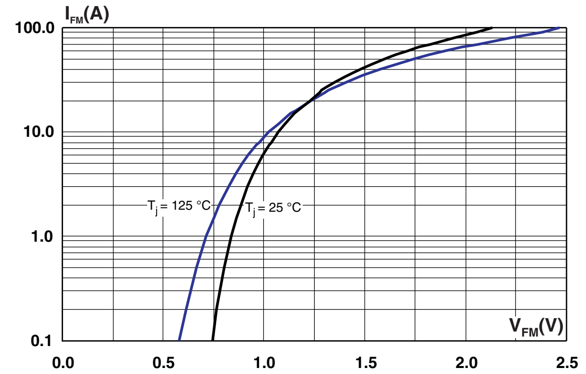


Figure 11. Relative variation of thermal impedance junction to ambient versus pulse duration

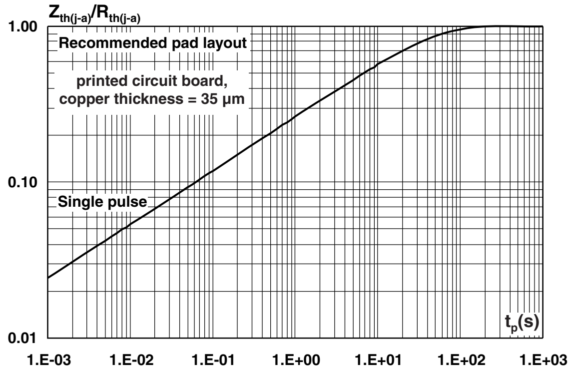


Figure 12. ISO7637-2 pulse 1 response (V_S = -100 V)

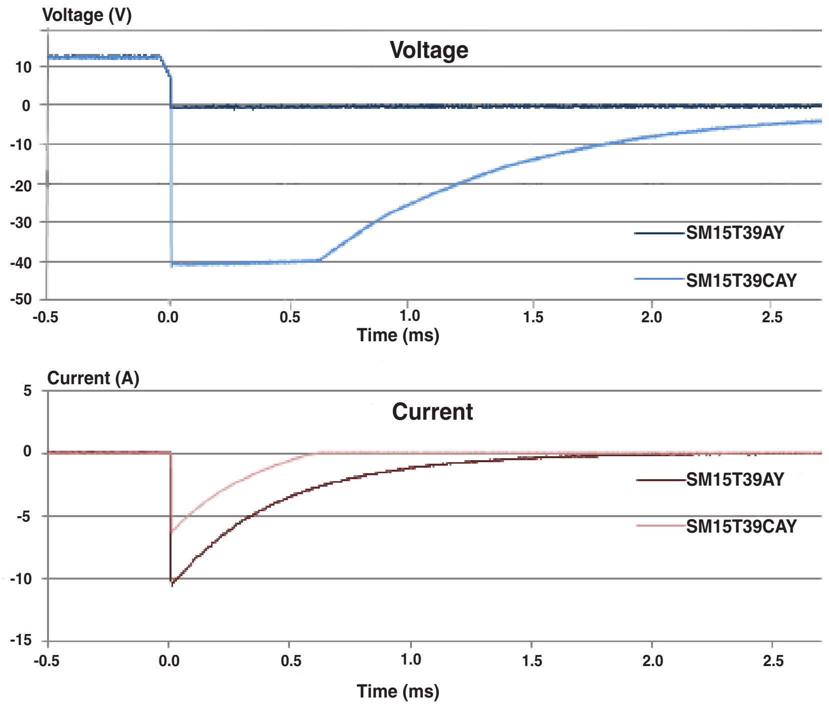


Figure 13. ISO7637-2 pulse 2 response (V_S = 50 V)

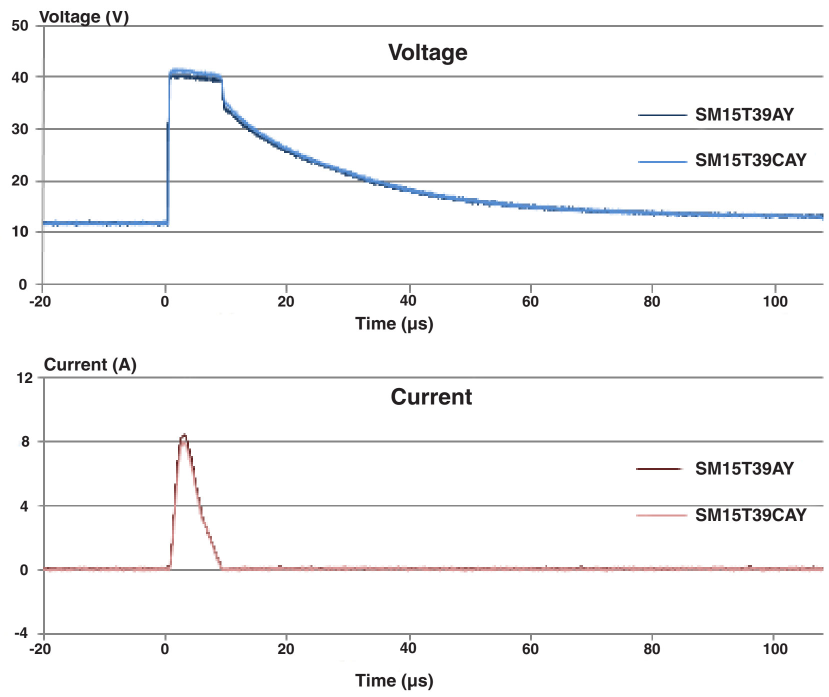


Figure 14. ISO7637-2 pulse 3a response (V_S = -150 V)

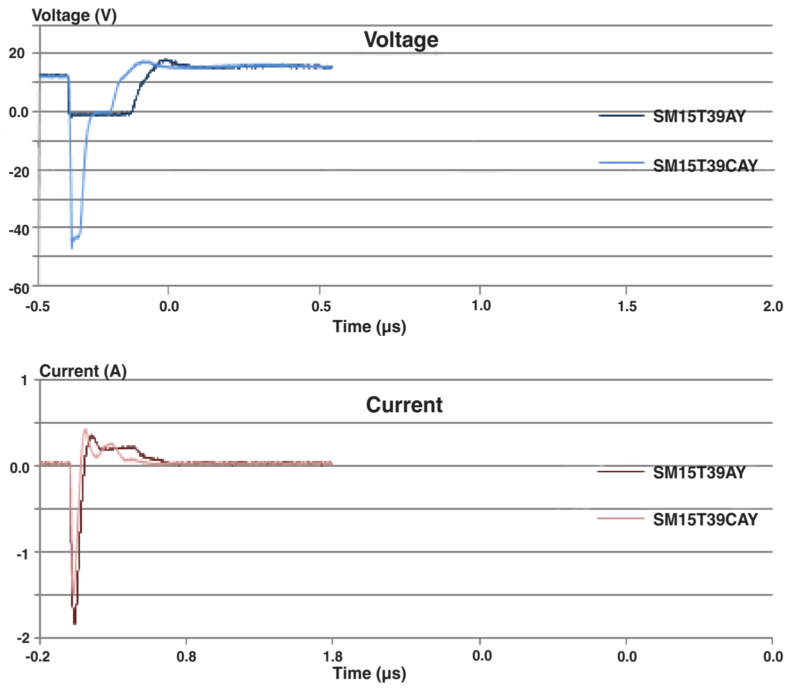
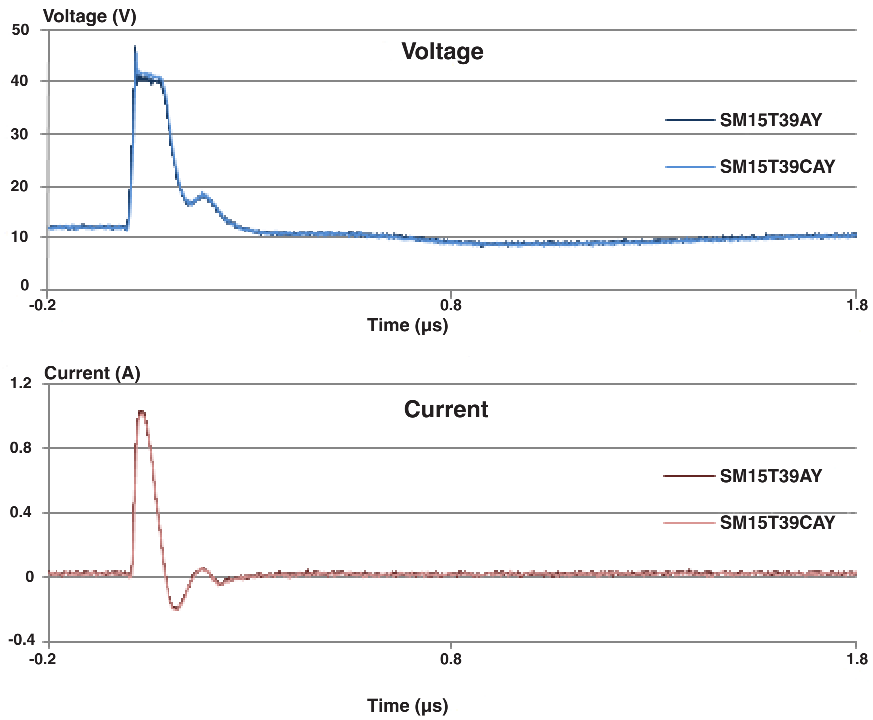


Figure 15. ISO7637-2 pulse 3b response (V_S = 100 V)



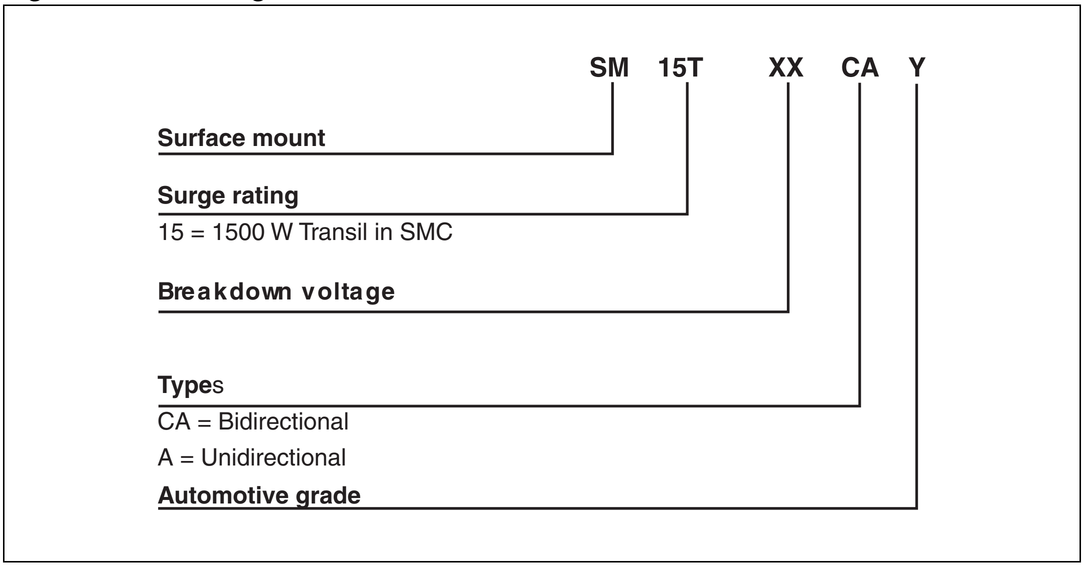
Note: ISO7637-2 pulses responses are not applicable for product with a stand off voltage lower than the average battery voltage (13.5 V).

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 16. Ordering information scheme

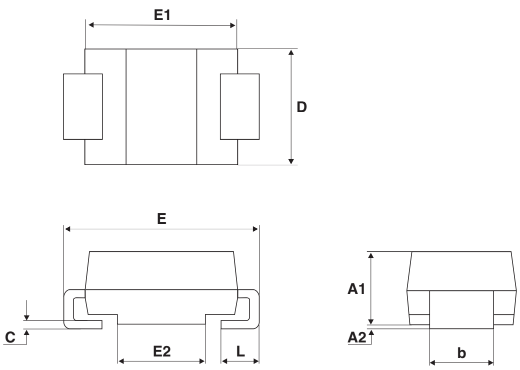


4 Package information

- 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 3. 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 17. SMC footprint dimensions in mm (inches)

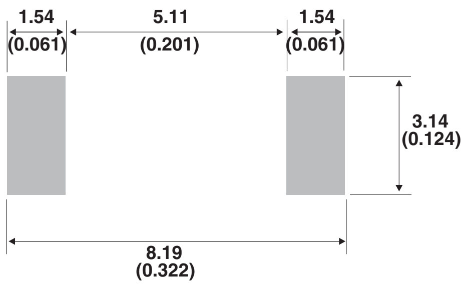
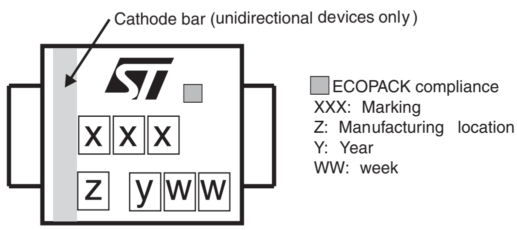


Figure 18. Marking layout(1)



1. Marking layout can vary according to assembly location.

Table 4. Marking

Order code	Marking	Order code	Marking
SM15T6V8AY	MDEY	SM15T6V8CAY	BDEY
SM15T7V5AY	MDGY	SM15T7V5CAY	BDGY
SM15T10AY	MDPY	SM15T10CAY	BDPY
SM15T12AY	MDTY	SM15T12CAY	BDTY
SM15T15AY	MDXY	SM15T15CAY	BDXY
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
SM15T56AY	MFBY	SM15T56CAY	BFBY
SM15T68AY	MFPY	SM15T68CAY	BFPY
SM15T75AY	MFOY	SM15T75CAY	BFOY
SM15T82AY	MFRY	SM15T82CAY	BFRY

5 Ordering information

Table 5. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
SM15TxxxAY/CAY(1)	See *Table 4 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 2* for list of available devices and their order codes

6 Revision history

Table 6. Document revision history

Date	Revision	Changes
15-Sep-2010	1	Initial release.
09-Nov-2011	2	Added order codes in *Table 2* and *Table 4*. Updated *Figure 5*, *6*, *7*, and *Table 1.* Added *Figure 11*. Deleted old Table 2. Thermal parameter. Updated *ISO 10605, C = 150 pF - R = 330 Ω: on page 1*
27-Mar-2012	3	Added footnote on page 1.