SM15TY

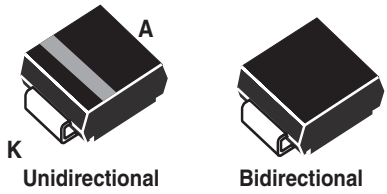
Automotive 1500 W Transil™

Features

- peak pulse power:
  - 1500 W (10/1000 µs)
  - 10 kW (8/20 µs)
- stand-off voltage range: from 15 V to 58 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 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



Unidirectional Bidirectional

SMC
(JEDEC DO-214AB)

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 °C)

Symbol	Parameter		Value	Unit
V_{PP}	Peak pulse voltage	ISO10605 (C = 330 pF, R = 330 Ω) contact discharge air discharge IEC61000-4-2 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.

Table 2. Thermal parameter

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

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

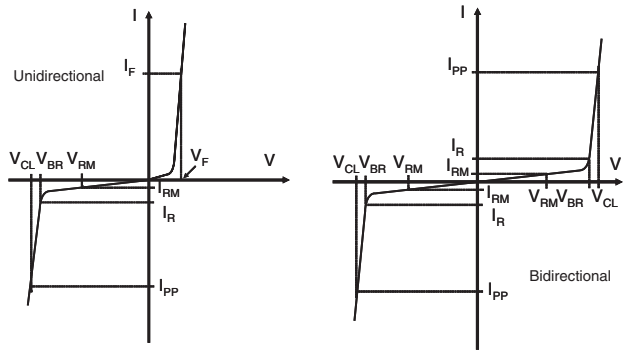


Figure 2. Pulse definition for electrical characteristics

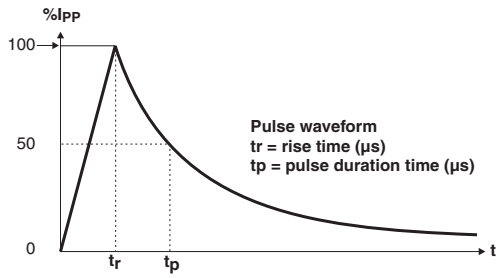


Table 3. Electrical characteristics, typical values unless otherwise stated (T_{amb} = 25 °C)

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.
	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 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)

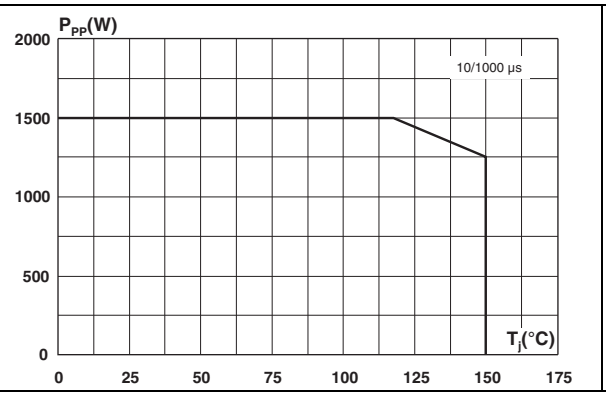


Figure 4. Peak pulse power versus exponential pulse duration (T_j initial = 25 °C)

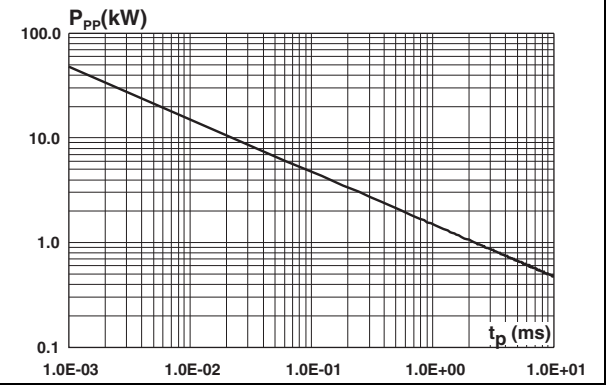


Figure 5. Clamping voltage versus peak pulse current (exponential waveform, maximum values)

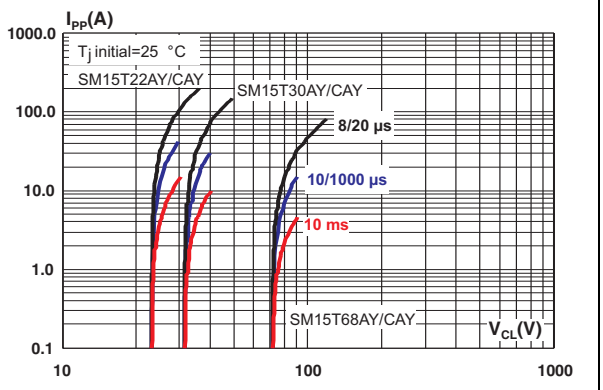


Figure 6. Junction capacitance versus reverse applied voltage for unidirectional types (typical values)

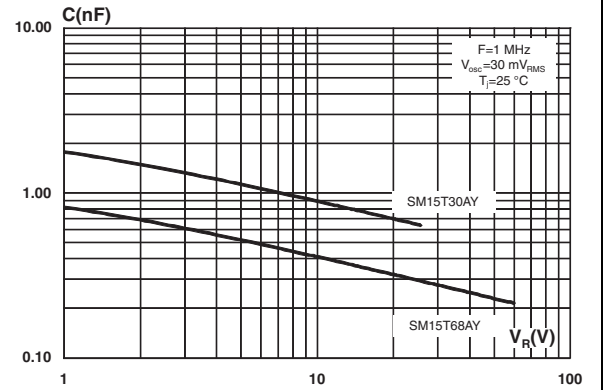


Figure 7. Junction capacitance versus reverse applied voltage for bidirectional types (typical values)

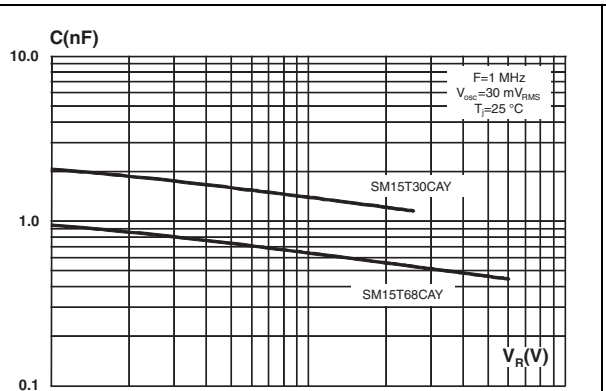


Figure 8. Thermal resistance junction to ambient versus copper surface under each lead

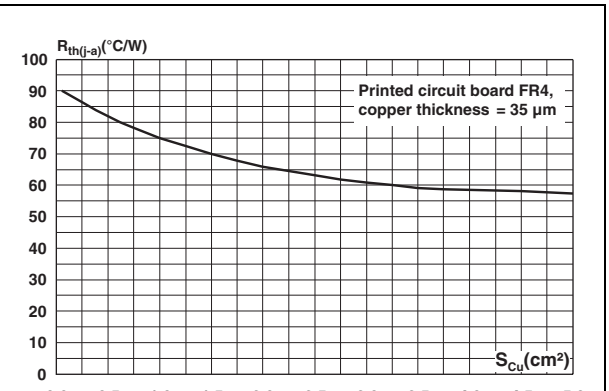


Figure 9. Leakage current versus junction temperature (typical values)

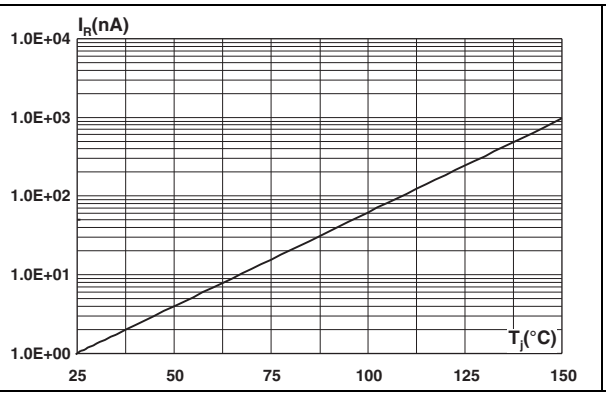


Figure 10. Peak forward voltage drop versus peak forward current (typical values)

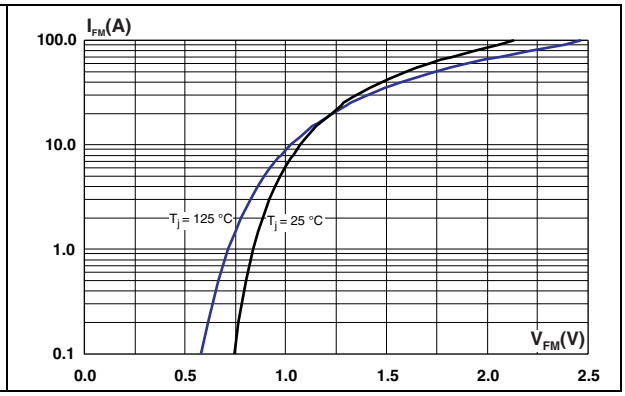


Figure 11. ISO7637-2 pulse 1 response (V_S = -100 V)

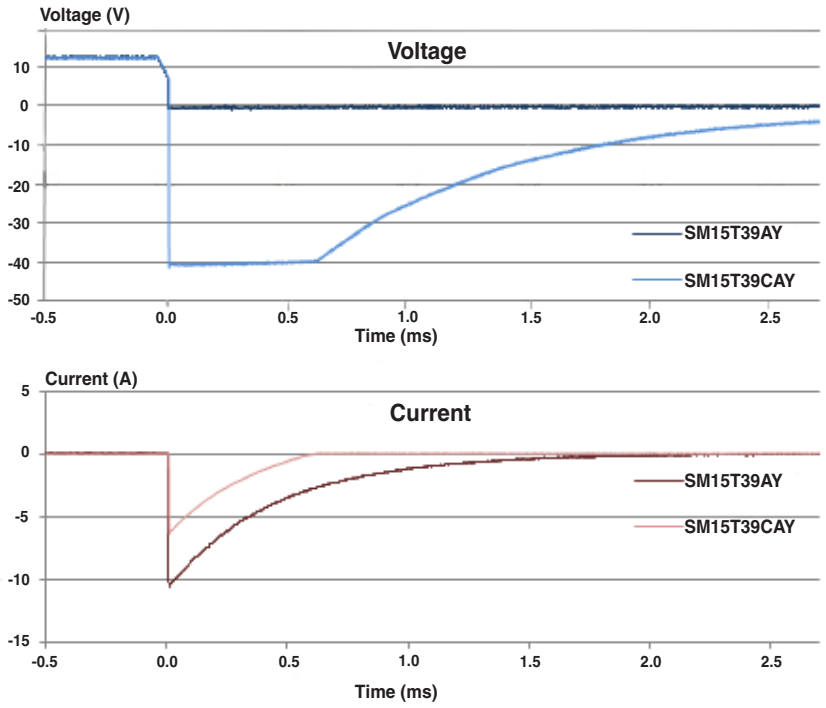


Figure 12. ISO7637-2 pulse 2 response (V_S = 50 V)

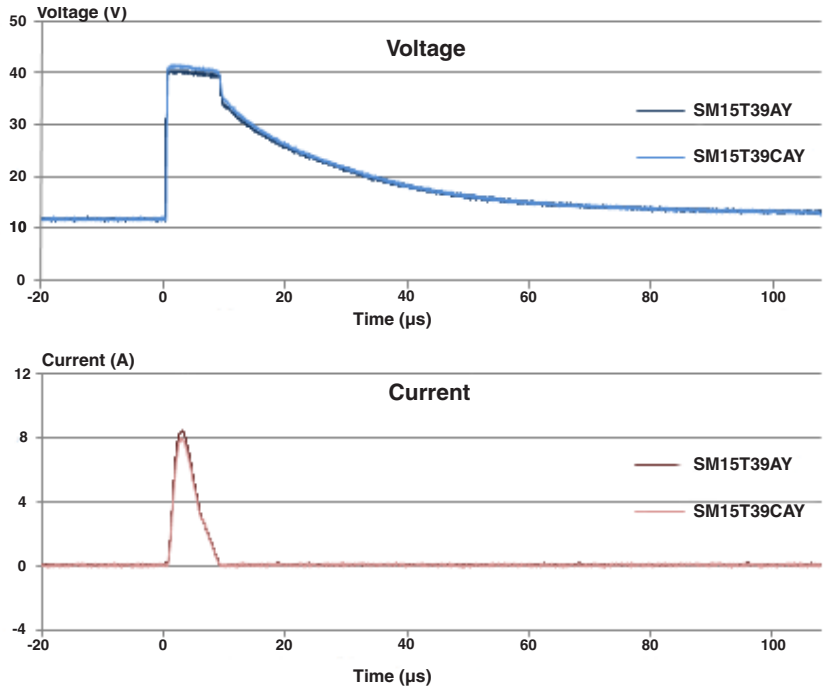


Figure 13. ISO7637-2 pulse 3a response (V_S = -150 V)

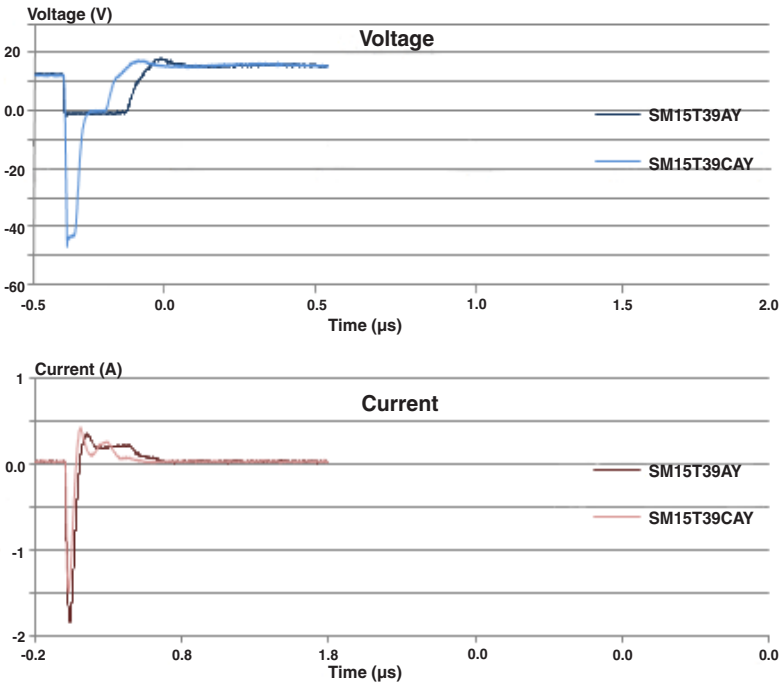
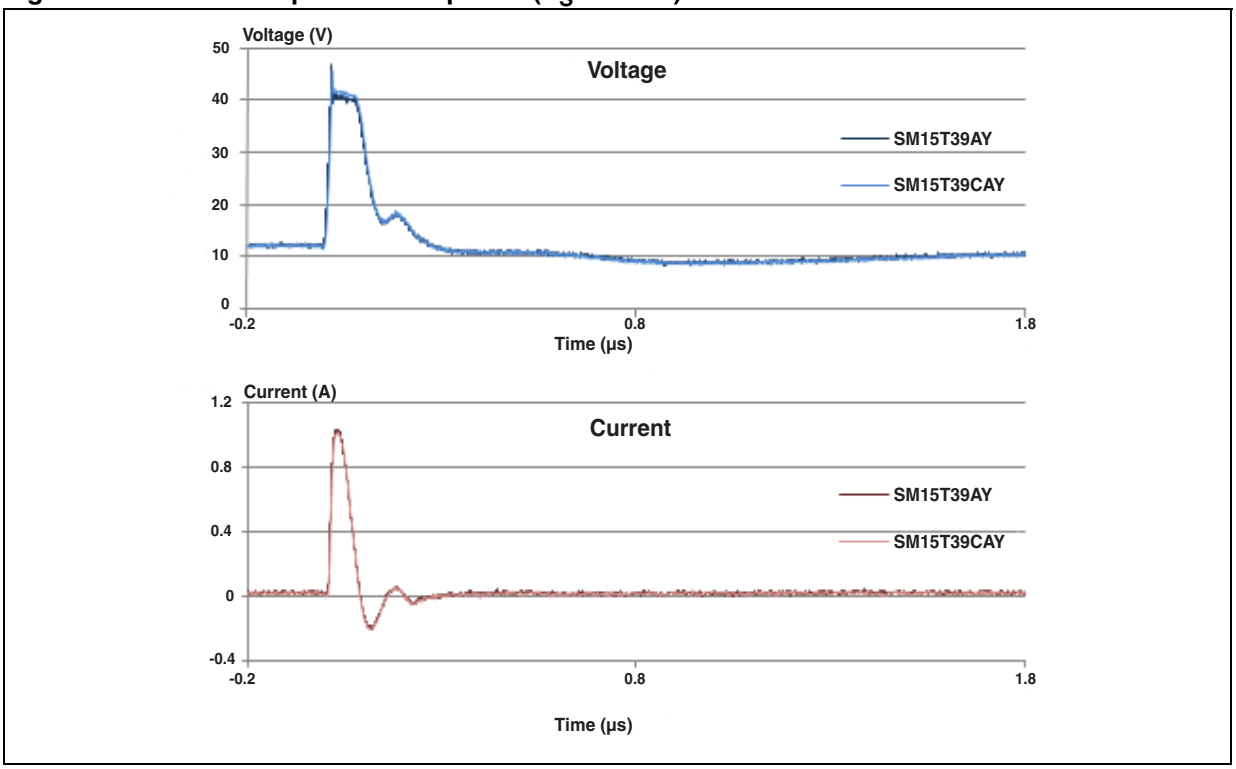


Figure 14. ISO7637-2 pulse 3b response (V_S = 100 V)

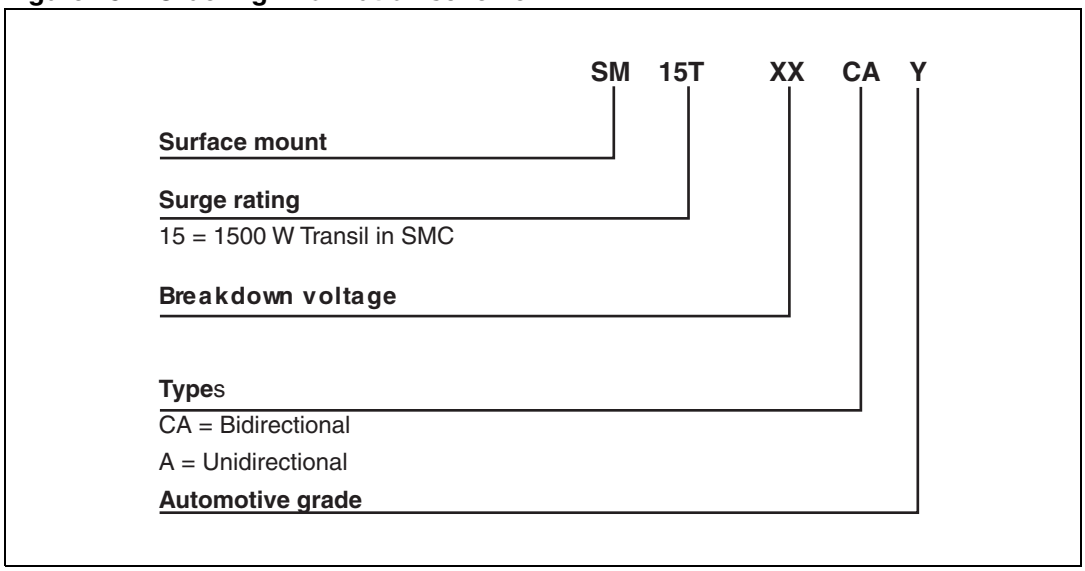


2 Application and design guidelines

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

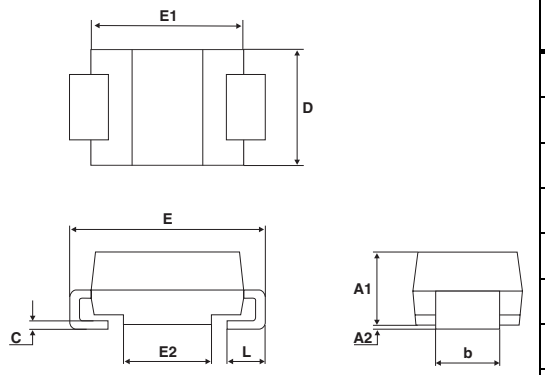


4 Package information

- 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)

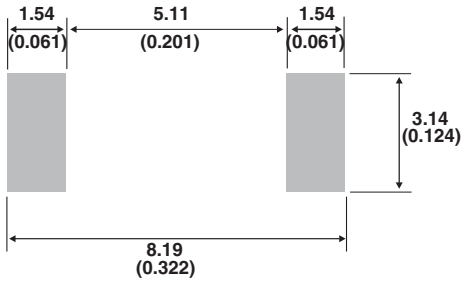
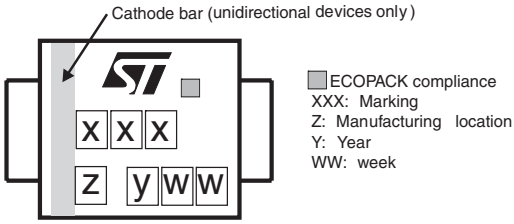


Figure 17. Marking layout(1)



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.

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