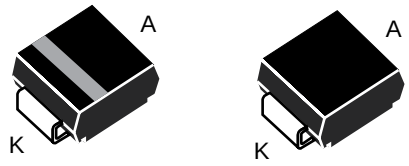
SM6TY

Automotive 600 W Transil™

Datasheet - production data



Unidirectional Bidirectional
SMB
(JEDEC DO-214AA)

Features

- AEC-Q101 qualified
- Peak pulse power:
  - 600 W (10/1000 µs)
  - 4 kW (8/20 µs)
- Stand-off voltage range: from 6 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_j max.:
  - 515 W (10/1000 µs)
- JEDEC registered package outline
- Resin meets UL 94, V0

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 = -150 V
  - Pulse 2a: V_S = +112 V
  - Pulse 3a: V_S = -220 V
  - Pulse3b: V_S = +150 V

Description

The SM6TY Transil series has been designed to protect sensitive automotive circuits against surges defined in ISO 7637-2 and against electrostatic discharges according ISO 10605.

The planar technology makes this device compatible with high-end circuits where low leakage current and high junction temperature are required to provide reliability and stability over time. SM6TY are packaged in SMB (SMB footprint in accordance with IPC 7531 standard).

Transil™ is a trademark of STMicroelectronics.

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

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 ISO10605 / IEC 61000-4-2 (C = 150 pF, R = 330 Ω) Contact discharge Air discharge	 30 30 30 30	kV
P_{PP}	Peak pulse power dissipation	10/1000 µs, T_j initial = T_{amb}	600	W
T_{stg}	Storage temperature range		-65 to +150	°C
T_j	Operating junction temperature range		-55 to +150	°C
T_L	Maximum lead temperature for soldering during 10 s		260	°C

Figure 1: Electrical characteristics - parameter definitions

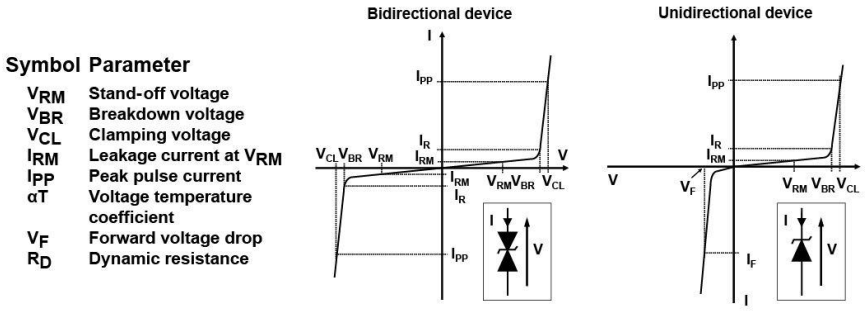


Figure 2: Pulse definition for electrical characteristics

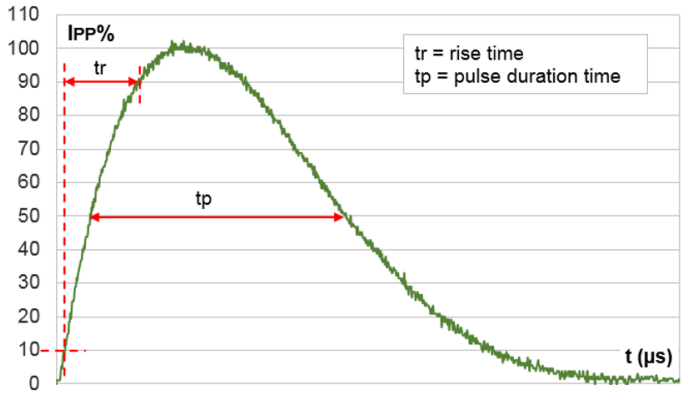


Table 2: Electrical characteristics parameter values (T_{amb} = 25 °C, unless otherwise specified)

Order code	I_{RM} max at V_{RM}			V_{BR} at I_R(1)				10 / 1000 µs			8 / 20µs			αT(2)
								V_{CL}	I_{PP}	R_D	V_{CL}	I_{PP}	R_D	
	25 °C	85 °C		Min.	Typ.	Max.		Max.		Max.	Max.			Max.
	µA		V	V			mA	V(3)	A(4)	Ω	V	A	Ω	10^{-4}/°C
SM6T6V8AY/CAY	20	50	5.80	6.45	6.8	7.14	10	10.5	57	0.059	14.4	275	0.027	5.7
SM6T7V5AY/CAY	20	50	6.40	7.13	7.5	7.88	10	11.3	53	0.065	15.2	266	0.027	6.1
SM6T10AY/CAY	20	50	8.55	9.5	10.0	10.5	1	14.5	41	0.098	18.6	215	0.038	7.3
SM6T12AY/CAY	0.2	1	10.2	11.4	12	12.6	1	16.7	36	0.114	21.7	184	0.049	7.8
SM6T15AY/CAY	0.2	1	12.8	14.3	15	15.8	1	21.2	28	0.193	27.2	147	0.078	8.4
SM6T16AY/CAY	0.2	1	14.1	15.7	16.5	17.3	1	23.1	26	0.254	29	136	0.092	8.6
SM6T18AY/CAY	0.2	1	15.3	17.1	18	18.9	1	25.2	24	0.263	32.5	123	0.111	8.8
SM6T22AY/CAY	0.2	1	18.8	20.9	22	23.1	1	30.6	20	0.375	39.3	102	0.159	9.2
SM6T24AY/CAY	0.2	1	20.5	22.8	24	25.2	1	33.2	18	0.444	42.8	93	0.189	9.4
SM6T27AY/CAY	0.2	1	23.1	25.7	27	28.4	1	37.5	16	0.569	48.3	83	0.240	9.6
SM6T30AY/CAY	0.2	1	25.6	28.5	30	31.5	1	41.5	14.5	0.690	53.5	75	0.293	9.7
SM6T33AY/CAY	0.2	1	28.2	31.4	33	34.7	1	45.7	13.1	0.840	59.0	68	0.357	9.8
SM6T36AY/CAY	0.2	1	30.8	34.2	36	37.8	1	49.9	12	1.01	64.3	62	0.427	9.9
SM6T39AY/CAY	0.2	1	33.3	37.1	39	41.0	1	53.9	11.1	1.16	69.7	57	0.504	10.0
SM6T42AY/CAY	0.2	1	36	40	42.1	44.2	1	58.1	10.3	1.35	76	52	0.611	10.0
SM6T47AY/CAY	0.2	1	40	44	46.7	49.0	1	64.5	9.7	1.59	84.0	48.0	0.728	10.1
SM6T56AY/CAY	0.2	1	47.6	53.2	56	58.8	1	76.6	7.8	2.28	100	40	1.030	10.0
SM6T68AY/CAY	0.2	1	58.1	64.6	68	71.4	1	92	6.5	3.17	121	33	1.503	10.4
SM6T75AY/CAY	0.2	1	64.1	71.3	75	78.8	1	103	5.8	4.17	134	30	1.84	10.5
SM6T82AY/CAY	0.2	1	70.0	77.8	81.9	86.0	1	113	5.5	4.91	146	27.0	2.22	10.5

Notes:

(1)Pulse test: t_p < 50 ms

(2)To calculate V_{BR} or V_{CL} versus junction temperature, use the following formulas: V_{BR} at T_J = V_{BR} at 25 °C x (1 + αT x (T_J - 25)) V_{CL} at T_J = V_{CL} at 25 °C x (1 + αT x (T_J-25))

(3)To calculate maximum clamping voltage at other surge level, use the following formula: V_{CLmax} = $V_{BR\ max}$ + R_D x $I_{PPappli}$ where $I_{PPappli}$ is the surge current in the application

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

1.1 Characteristics (curves)

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

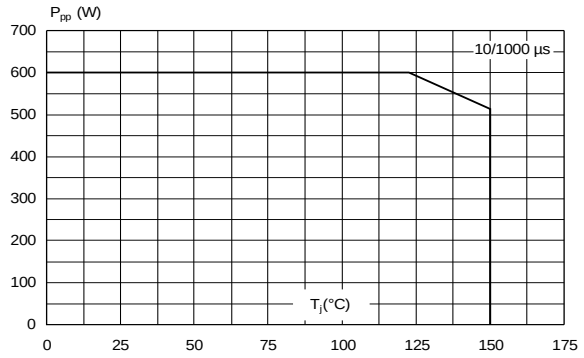


Figure 4: Peak pulse power versus exponential pulse duration

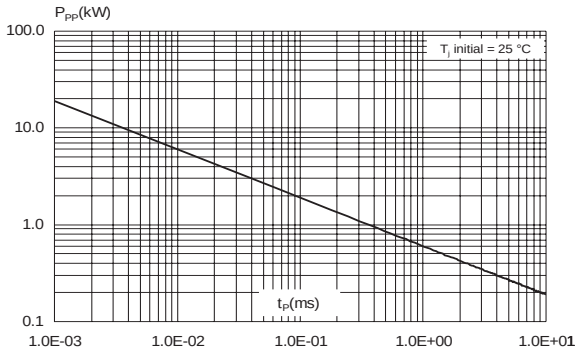


Figure 5: Clamping voltage versus peak pulse current exponential waveform (maximum values)

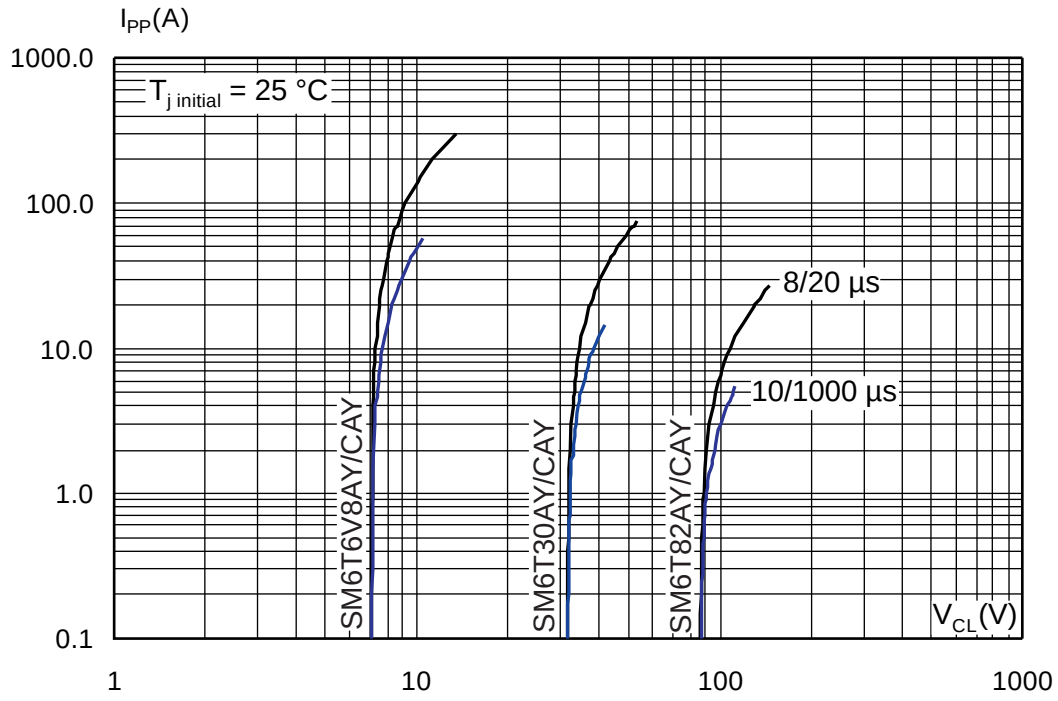


Figure 6: ISO 7637-2 pulse 1 response (V_S = -150 V)

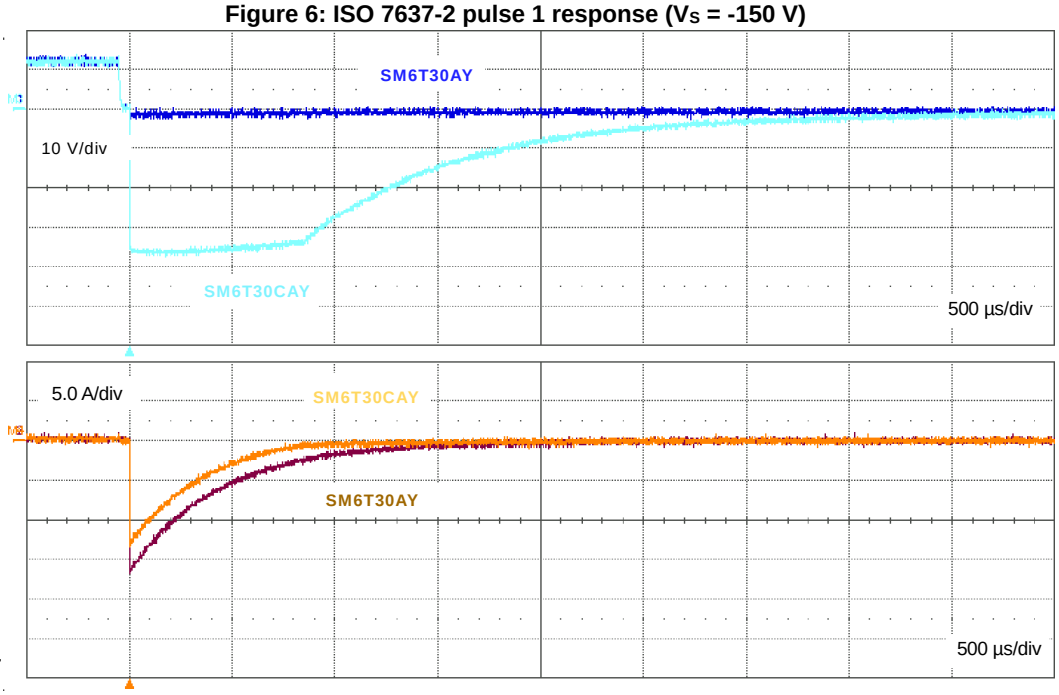


Figure 7: ISO 7637-2 pulse 2a response (V_S = 112 V)

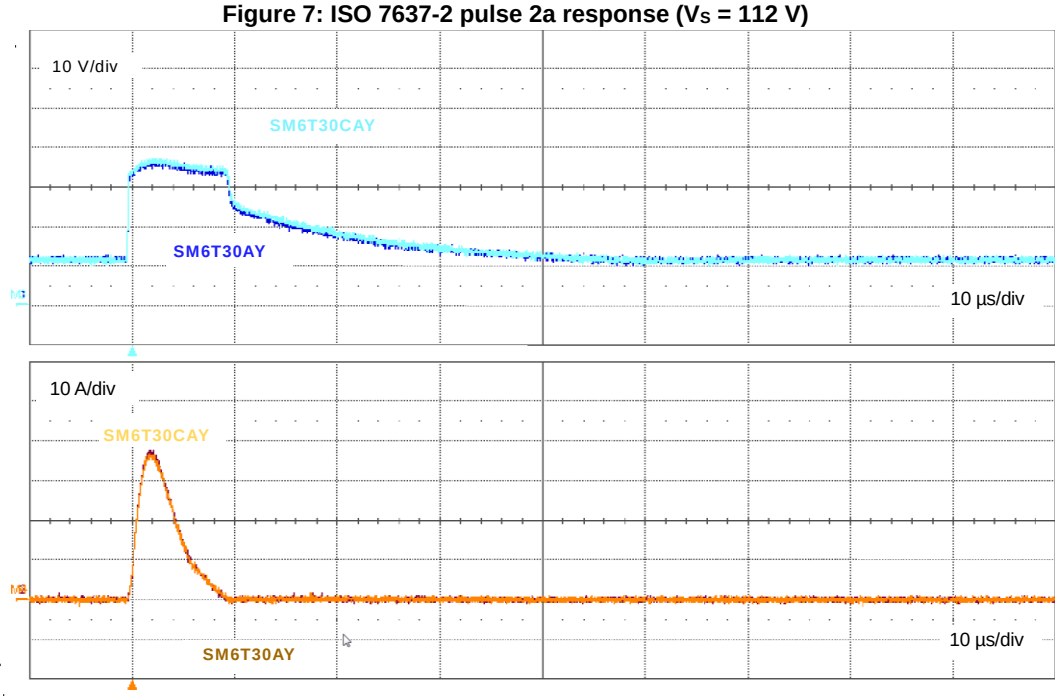


Figure 8: ISO 7637-2 pulse 3a response (V_S = -220 V)

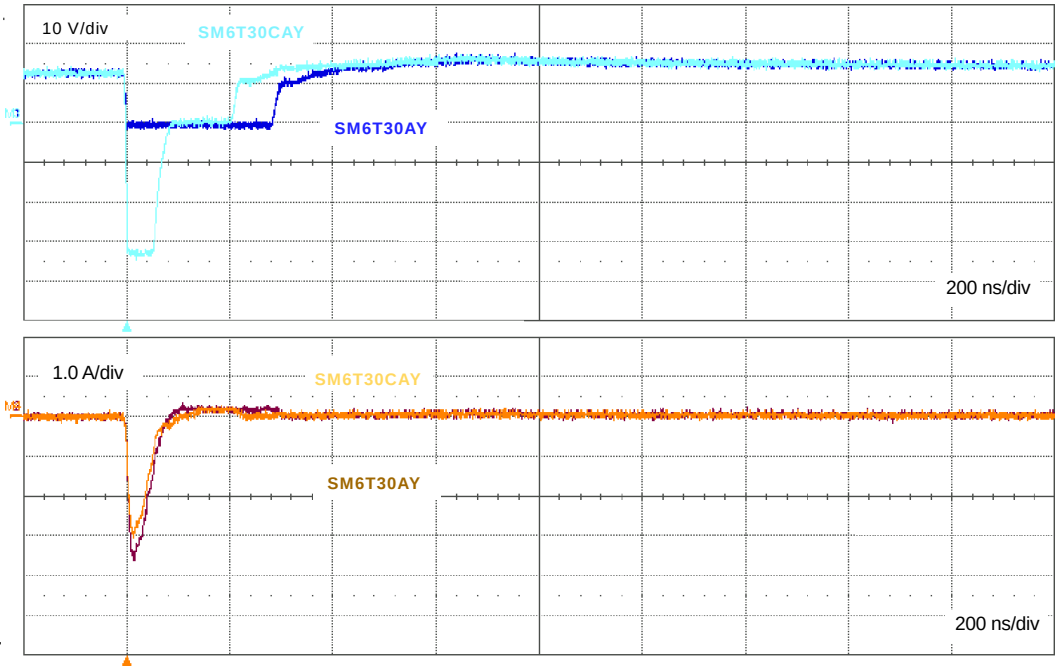
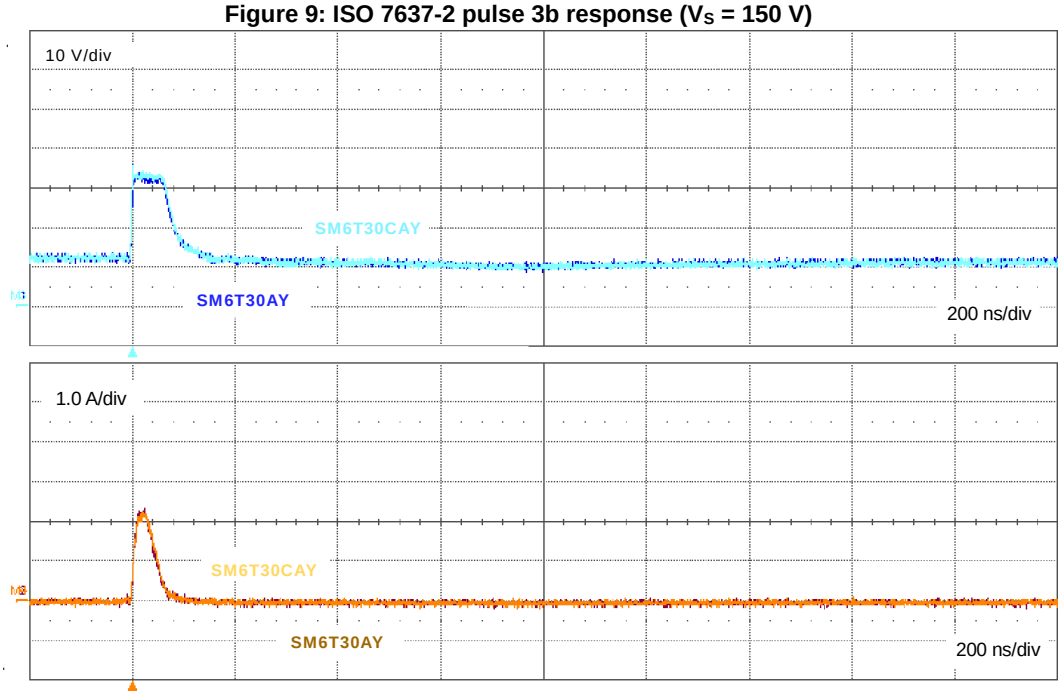


Figure 9: ISO 7637-2 pulse 3b response (V_S = 150 V)



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

Figure 10: Junction capacitance versus reverse applied voltage for unidirectional types (typical values)

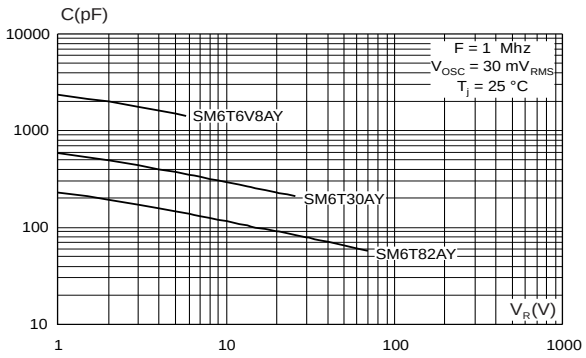


Figure 11: Junction capacitance versus reverse applied voltage for bidirectional types (typical values)

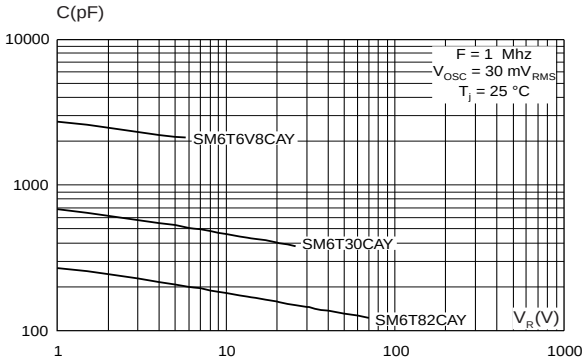


Figure 12: Relative variation of thermal impedance junction to ambient versus pulse duration

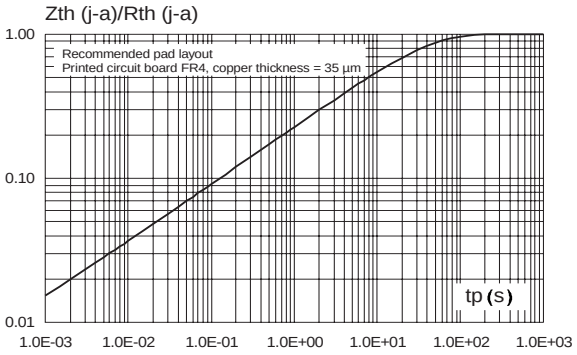


Figure 13: Thermal resistance junction to ambient versus copper surface under each lead

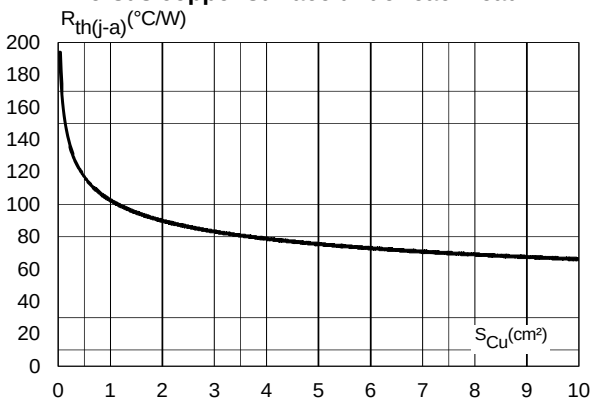


Figure 14: Leakage current versus junction temperature (typical values)

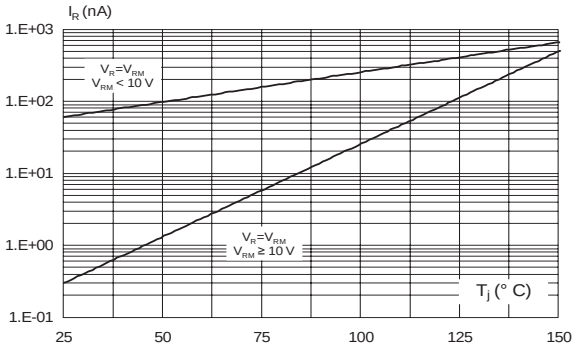
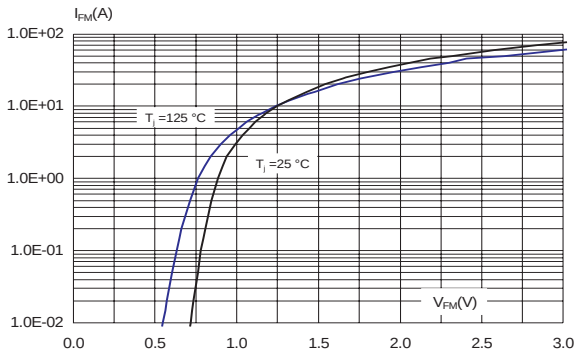


Figure 15: Peak forward voltage drop versus peak forward current (typical values)



2 Package information

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.

- Case: JEDEC DO214-AA molded plastic over planar junction
- Terminals: solder plated, solderable per MIL-STD-750, method 2026
- Polarity: for unidirectional types the band indicates cathode.
- Flammability: epoxy is rated UL94V-0
- Lead-free package

2.1 SMB package information

Figure 16: SMB package outline

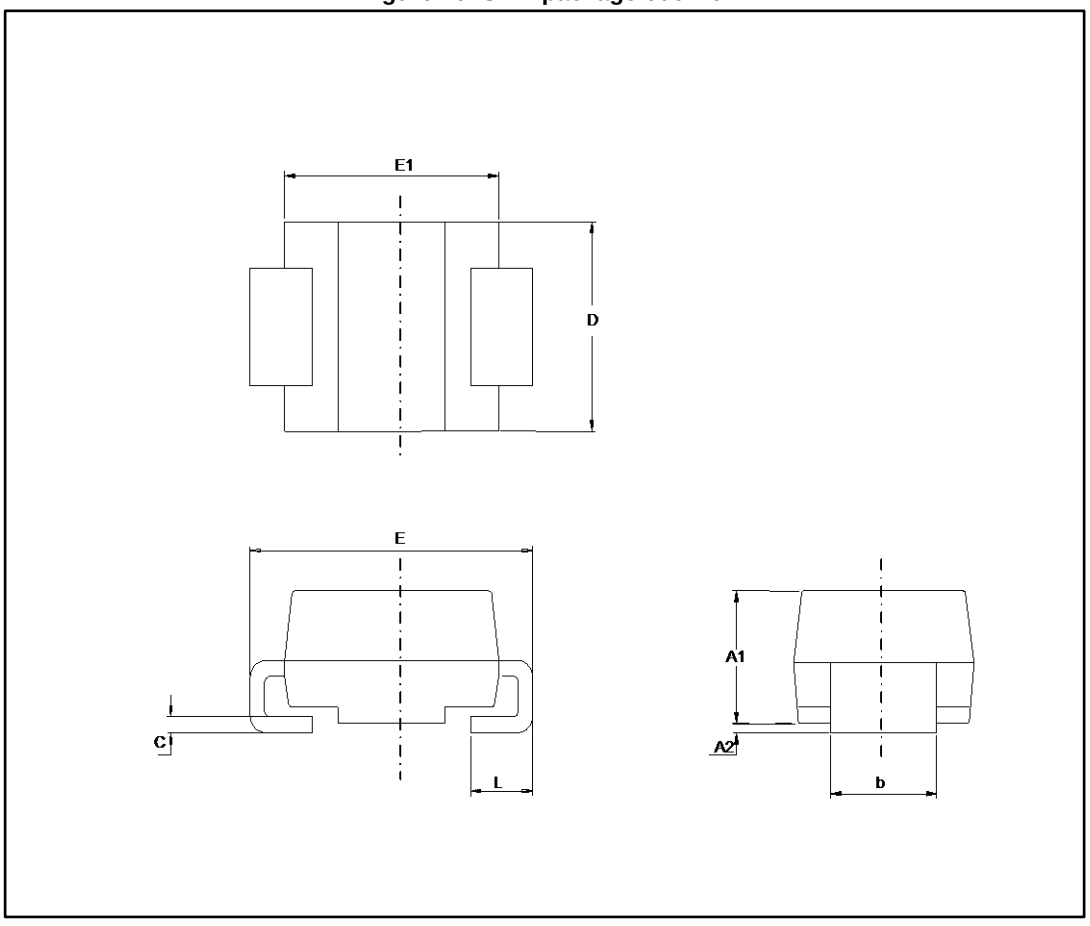
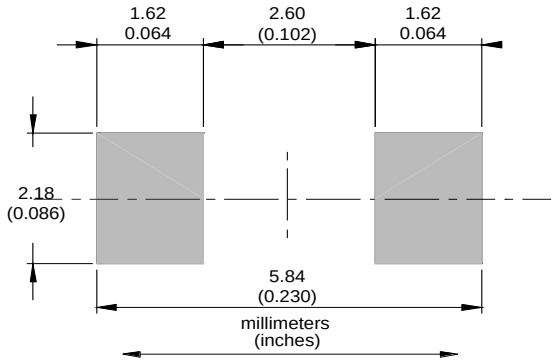


Table 3: SMB package mechanical data

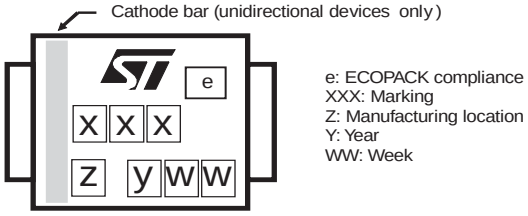
Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.0748	0.0965
A2	0.05	0.20	0.0020	0.0079
b	1.95	2.20	0.0768	0.0867
c	0.15	0.40	0.0059	0.0157
D	3.30	3.95	0.1299	0.1556
E	5.10	5.60	0.2008	0.2205
E1	4.05	4.60	0.1594	0.1811
L	0.75	1.50	0.0295	0.0591

Figure 17: SMB recommended footprint



Note: Marking layout can vary according to assembly location.

Figure 18: Marking layout



3 Ordering information

Figure 19: Ordering information scheme

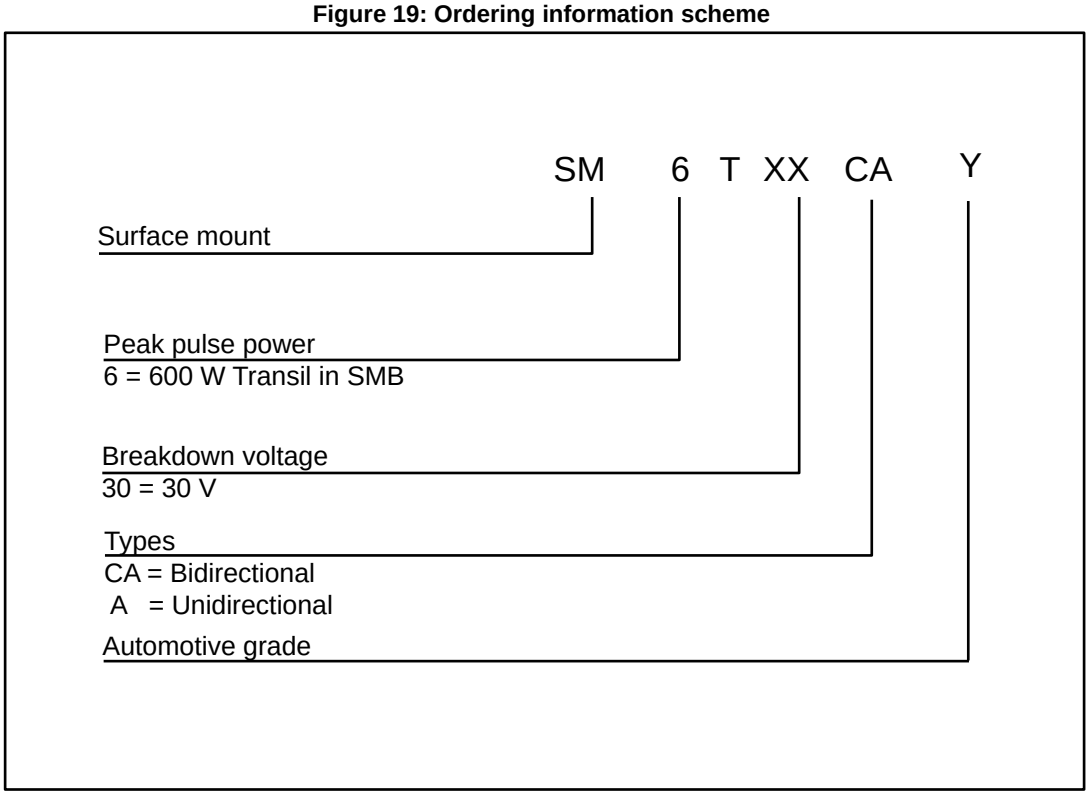


Table 4: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
SM6TxxxAy/CAy(1)	See *Table 5: "Marking"*.	SMB	0.11 g	2500	Tape and reel

Notes:

(1)Where xxx is nominal value of V_{BR} and A or CA indicates unidirectional or bidirectional version. See *Table 2: "Electrical characteristics parameter values (Tamb = 25 °C, unless otherwise specified)"* for list of available devices and their order codes

Table 5: Marking

Order code	Marking	Order code	Marking
SM6T6V8AY	DEY	SM6T6V8CAY	LEY
SM6T7V5AY	DGY	SM6T7V5CAY	LGY
SM6T10AY	DPY	SM6T10CAY	LPY
SM6T12AY	DTY	SM6T12CAY	LTY
SM6T15AY	DXY	SM6T15CAY	LXY
SM6T16AY	DZY	SM6T16CAY	LZY
SM6T18AY	EEY	SM6T18CAY	MYE
SM6T22AY	EKY	SM6T22CAY	MKY
SM6T24AY	EMY	SM6T24CAY	MMY
SM6T27AY	EPY	SM6T27CAY	MPY
SM6T30AY	ERY	SM6T30CAY	MRY
SM6T33AY	ETY	SM6T33CAY	MTY
SM6T36AY	EVY	SM6T36CAY	MVY
SM6T39AY	EXY	SM6T39CAY	MXY
SM6T42AY	FBY	SM6T42CAY	NAY
SM6T47AY	FAY	SM6T47CAY	NBY
SM6T56AY	FLY	SM6T56CAY	NLY
SM6T68AY	FQY	SM6T68CAY	NQY
SM6T75AY	FSY	SM6T75CAY	NSY
SM6T82AY	FWY	SM6T82CAY	NWY

4 Revision history

Table 6: Document revision history

Date	Revision	Changes
15-Sep-2010	1	Initial release.
18-Oct-2011	2	Deleted old Table 2. Thermal parameter. Updated Table 2 and added order codes in Table 4. Updated Figure 5, Figure 10 and Figure 11. Updated Complies with the following standards on page 1.
27-Mar-2012	3	Added footnote on page 1.
26-Sep-2014	4	Updated Table 2 and Table 4. Reformatted to current standard.
19-Nov-2014	5	Updated Figure 7 and Figure 8.
09-Jan-2018	6	Updated *Table 2: "Electrical characteristics parameter values (Tamb = 25 °C, unless otherwise specified)"*.

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