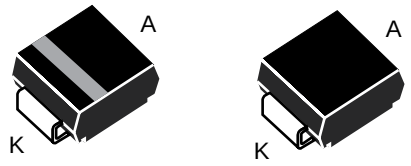
SM6T

Transil™

Datasheet - production data



Unidirectional Bidirectional
SMB
(JEDEC DO-214AA)

Features

- Peak pulse power:
  - 600 W (10/1000 µs)
  - 4 kW (8/20 µs)
- Stand-off voltage range: from 6.8 V to 220 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

Complies with the following standards

- IEC 61000-4-2 level 4:
  - 15 kV (air discharge)
  - 8 kV (contact discharge)
- IEC 61000-4-5
- MIL STD 883G, method 3015-7: class 3B:
  - 25 kV HBM (human body model)
- UL 497B, file number: QVGQ2.E136224
- Resin meets UL 94, V0
- MIL-STD-750, method 2026 solderability
- EIA STD RS-481 and IEC 60286-3 packing
- IPC 7531 footprint

Description

The SM6T Transil 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. These devices are 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.

SM6T are packaged in SMB (SMB footprint in accordance with IPC 7531 standard).

1 Characteristics

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

Symbol	Parameter		Value	Unit
P_{PP}	Peak pulse power dissipation(1)	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

Notes:

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

Table 2: Thermal resistance

Symbol	Parameter	Value	Unit
$R_{th(j-l)}$	Junction to leads	20	°C/W
$R_{th(j-a)}$	Junction to ambient on printed circuit on recommended pad layout	100	°C/W

Figure 1: Electrical characteristics - parameter definitions

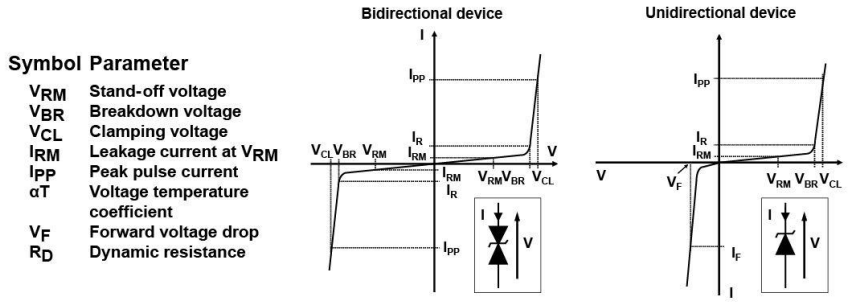


Figure 2: Pulse definition for electrical characteristics

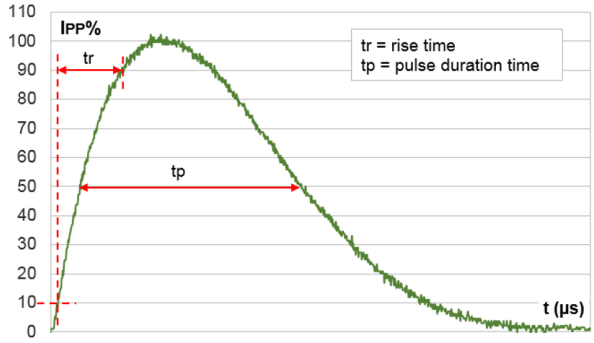


Table 3: Electrical characteristics parameter values (T_{amb} = 25 °C, unless otherwise specified)

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
SM6T6V8A/CA	20	50	5.8	6.45	6.8	7.14	10	10.5	57	0.059	14.4	275	0.027	5.7
SM6T7V5A/CA	20	50	6.4	7.13	7.5	7.88	10	11.3	53	0.065	15.2	266	0.027	6.1
SM6T10A/CA	20	50	8.55	9.5	10.0	10.5	1	14.5	41	0.098	18.6	215	0.038	7.3
SM6T12A/CA	0.2	1	10.2	11.4	12	12.6	1	16.7	36	0.114	21.7	184	0.049	7.8
SM6T15A/CA	0.2	1	12.8	14.3	15	15.8	1	21.2	28	0.193	27.2	147	0.078	8.4
SM6T18A/CA	0.2	1	15.3	17.1	18	18.9	1	25.2	24	0.263	32.5	123	0.111	8.8
SM6T22A/CA	0.2	1	18.8	20.9	22	23.1	1	30.6	20	0.375	39.3	102	0.159	9.2
SM6T24A/CA	0.2	1	20.5	22.8	24	25.2	1	33.2	18	0.444	42.8	93	0.189	9.4
SM6T27A/CA	0.2	1	23.1	25.7	27	28.4	1	37.5	16	0.569	48.3	83	0.240	9.6
SM6T30A/CA	0.2	1	25.6	28.5	30	31.5	1	41.5	14.5	0.690	53.5	75	0.293	9.7
SM6T33A/CA	0.2	1	28.2	31.4	33	34.7	1	45.7	13.1	0.840	59.0	68	0.357	9.8
SM6T36A/CA	0.2	1	30.8	34.2	36	37.8	1	49.9	12	1.01	64.3	62	0.427	9.9
SM6T39A/CA	0.2	1	33.3	37.1	39	41.0	1	53.9	11.1	1.16	69.7	57	0.504	10.0
SM6T56A/CA	0.2	1	47.6	53.2	56	58.8	1	76.6	7.8	2.28	100	40	1.030	10.0
SM6T68A/CA	0.2	1	58.1	64.6	68	71.4	1	92	6.5	3.17	121	33	1.503	10.4
SM6T75A/CA	0.2	1	64.1	71.3	75	78.8	1	103	5.8	4.17	134	30	1.84	10.5
SM6T100A/CA	0.2	1	85.5	95.0	100	105	1	137	4.4	7.27	178	22.5	3.24	10.6
SM6T150A/CA	0.2	1	128	143	150	158	1	207	2.9	16.9	265	15	7.13	10.8
SM6T200A/CA	0.2	1	171	190	200	210	1	274	2.2	29.1	353	11.3	12.7	10.8
SM6T220A/CA	0.2	1	188	209	220	231	1	328	2	48.5	388	10.3	15.2	10.8

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

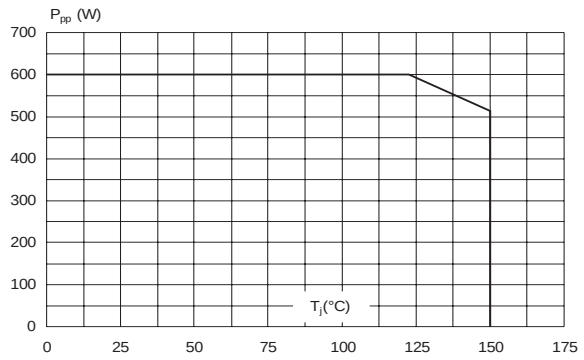


Figure 4: Peak pulse power versus exponential pulse duration

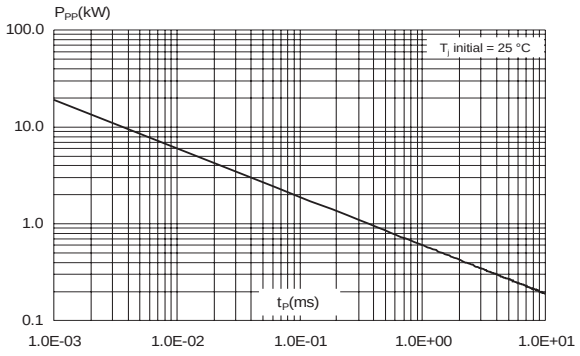


Figure 5: Clamping voltage versus peak pulse current (maximum values)

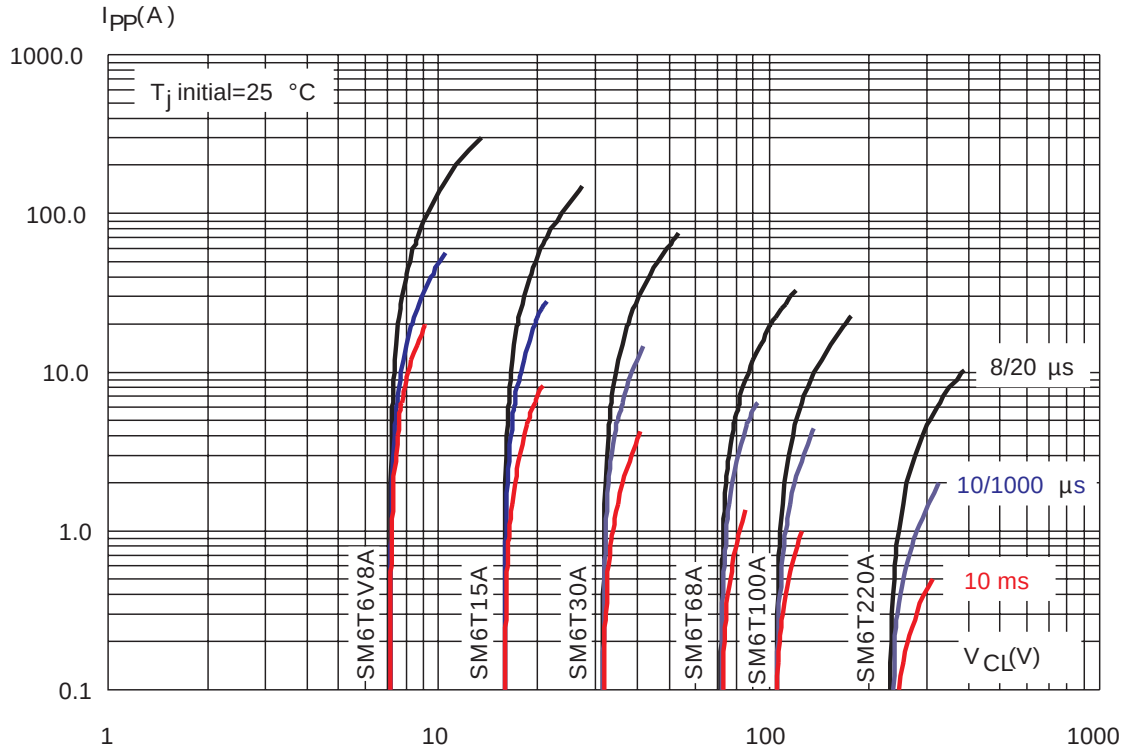


Figure 6: Capacitance versus reverse applied voltage for unidirectional types (typical values)

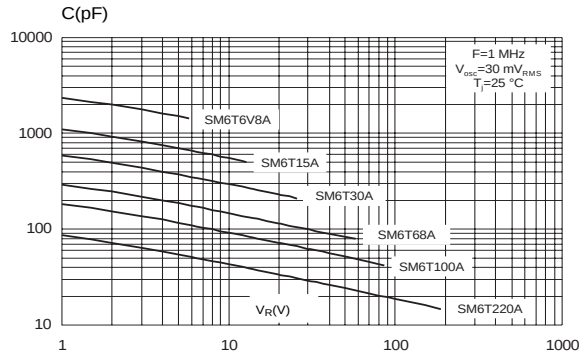


Figure 7: Capacitance versus reverse applied voltage for bidirectional types (typical values)

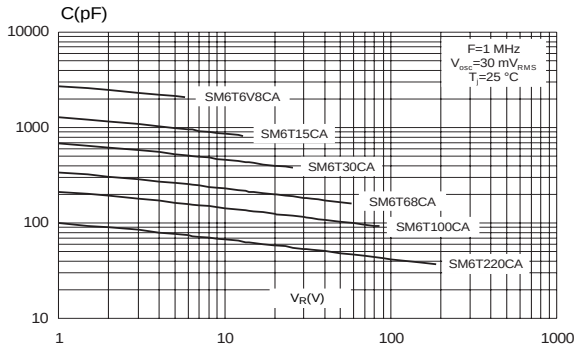


Figure 8: Peak forward voltage drop versus peak forward current (typical values)

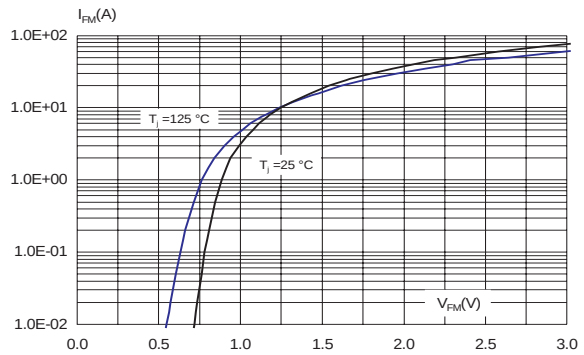


Figure 9: Relative variation of thermal impedance junction to ambient versus pulse duration

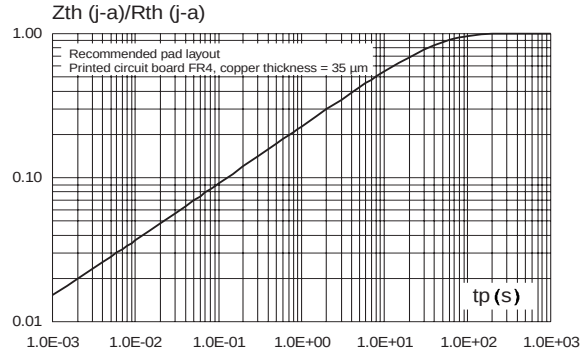


Figure 10: Thermal resistance junction to ambient versus copper surface under each lead

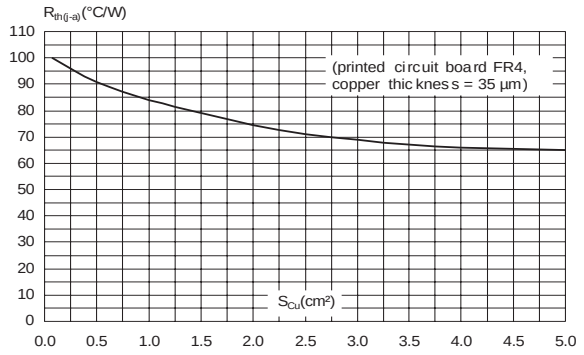
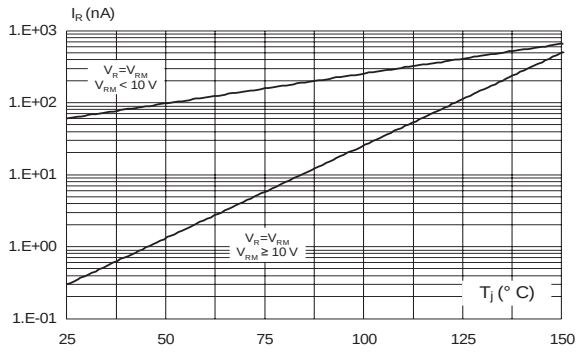


Figure 11: Leakage current versus junction temperature (typical values)



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
- RoHS package

2.1 SMB package information

Figure 12: SMB package outline

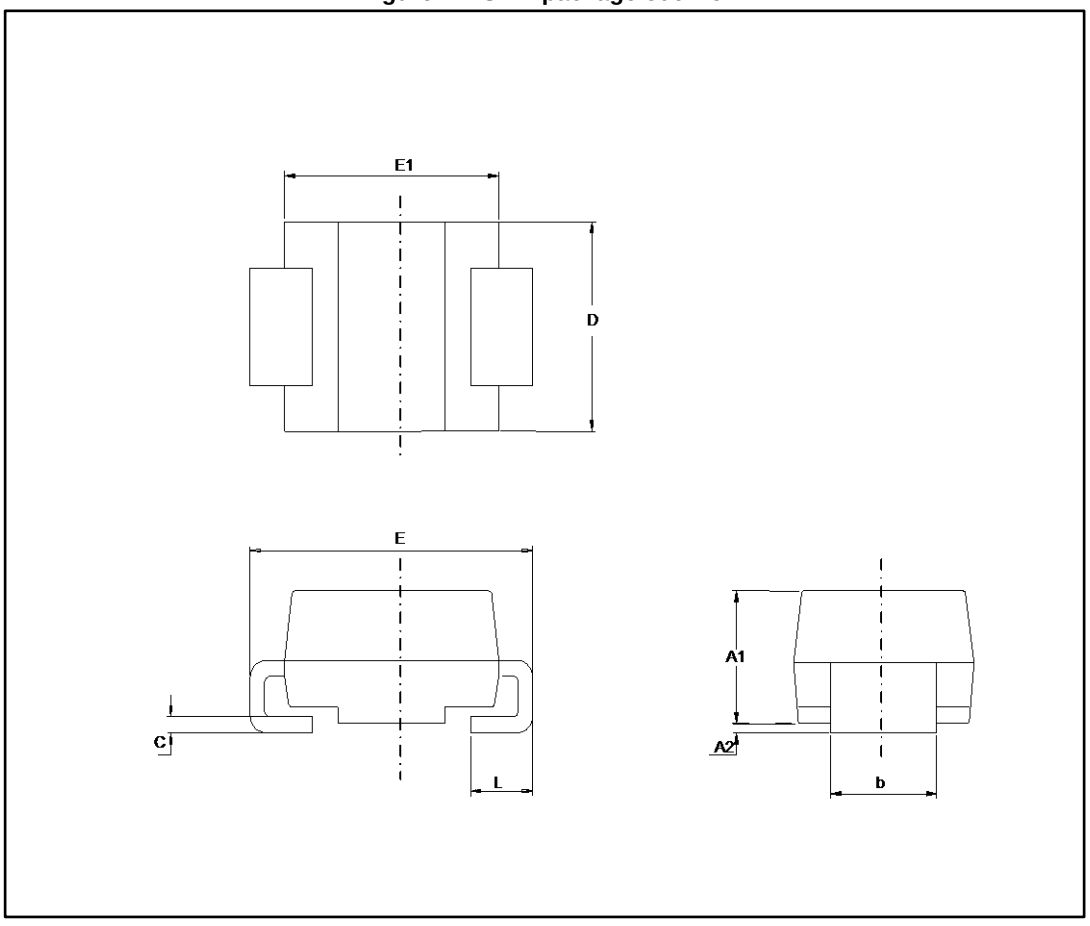
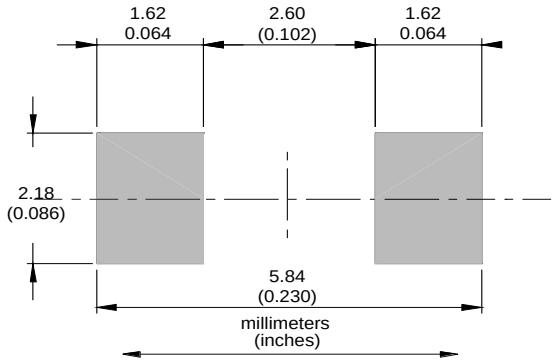


Table 4: SMB package mechanical data

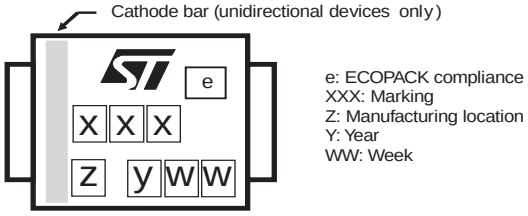
Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.0748	0.0965
A2	0.05	0.20	0.0020	0.0079
b	1.95	2.20	0.0768	0.0867
c	0.15	0.40	0.0059	0.0157
D	3.30	3.95	0.1299	0.1556
E	5.10	5.60	0.2008	0.2205
E1	4.05	4.60	0.1594	0.1811
L	0.75	1.50	0.0295	0.0591

Figure 13: SMB recommended footprint



Note: Marking layout can vary according to assembly location.

Figure 14: Marking layout



3 Ordering information

Figure 15: Ordering information scheme

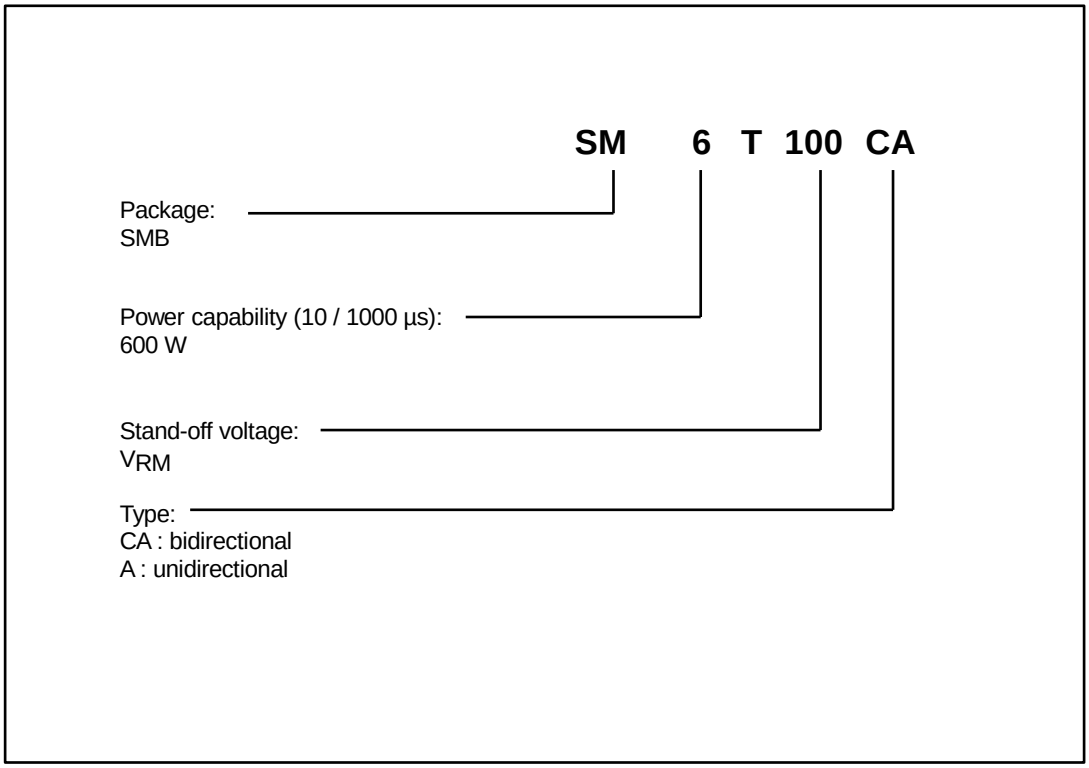


Table 5: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
SM6TxxxA/CA(1)	See *Table 6: "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 3: "Electrical characteristics parameter values (Tamb = 25 °C, unless otherwise specified)"* for list of available devices and their order codes.

Table 6: Marking

Order code	Marking	Order code	Marking
SM6T6V8A	DE	SM6T6V8CA	LE
SM6T7V5A	DG	SM6T7V5CA	LG
SM6T10A	DP	SM6T10CA	LP
SM6T12A	DT	SM6T12CA	LT
SM6T15A	DX	SM6T15CA	LX
SM6T18A	EE	SM6T18CA	ME
SM6T22A	EK	SM6T22CA	MK
SM6T24A	EM	SM6T24CA	MM
SM6T27A	EP	SM6T27CA	MP
SM6T30A	ER	SM6T30CA	MR
SM6T33A	ET	SM6T33CA	MT
SM6T36A	EV	SM6T36CA	MV
SM6T39A	EX	SM6T39CA	MX
SM6T56A	FL	SM6T56CA	NL
SM6T68A	FQ	SM6T68CA	NQ
SM6T75A	FS	SM6T75CA	NS
SM6T100A	FY	SM6T100CA	NY
SM6T150A	GL	SM6T150CA	OL
SM6T200A	GU	SM6T200CA	OU
SM6T220A	GW	SM6T220CA	OW

4 Revision history

Table 7: Document revision history

Date	Revision	Changes
Aug-2001	4A	Previous update.
15-Sep-2004	5	1. Types table parameters on page 2: I_{RM} @ Tj = 85 °C condition added 2. IRM max values changed
26-Mar-2009	6	Reformatted to current standard. SMB dimensions and footprint updated. Maximum junction temperature replaced with operating junction temperature range in Table 1.
25-May-2009	7	Reformatted to current standard. Added standards compliance information on page 1. Added device SM6T56 to Table 3. Updated all characteristic curves.
17-Sep-2009	8	Document updated for low leakage current.
20-Oct-2009	9	Updated Figure 13.
10-Jan-2018	10	Updated *Table 3: "Electrical characteristics parameter values (Tamb = 25 °C, unless otherwise specified)"*.

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