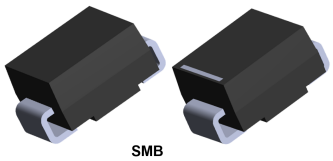
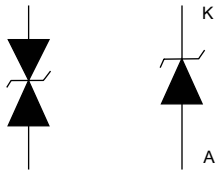
SMBJ

Datasheet

600 W TVS in SMB



SMB
(JEDEC DO-214AA)



Bidirectional Unidirectional

Product status link	
SMBJ	SMBJ5.0A, SMBJ5.0CA, SMBJ6.0A, SMBJ6.0CA, SMBJ6.5A, SMBJ6.5CA, SMBJ8.5A, SMBJ8.5CA, SMBJ10A, SMBJ10CA, SMBJ12A, SMBJ12CA, SMBJ13A, SMBJ13CA, SMBJ15A, SMBJ15CA, SMBJ16A, SMBJ16CA, SMBJ18A, SMBJ18CA, SMBJ20A, SMBJ20CA, SMBJ22A, SMBJ22CA, SMBJ24A, SMBJ24CA, SMBJ26A, SMBJ26CA, SMBJ28A, SMBJ28CA, SMBJ30A, SMBJ30CA, SMBJ33A, SMBJ33CA, SMBJ36A, SMBJ36CA, SMBJ40A, SMBJ40CA, SMBJ43A, SMBJ43CA, SMBJ48A, SMBJ48CA, SMBJ58A, SMBJ58CA, SMBJ64A, SMBJ64CA, SMBJ70A, SMBJ70CA, SMBJ85A, SMBJ85CA, SMBJ100A, SMBJ100CA, SMBJ130A, SMBJ130CA, SMBJ154A, SMBJ154CA, SMBJ170A, SMBJ170CA, SMBJ188A, SMBJ188CA

Features

- Peak pulse power: 600 W (10/1000 µs) and 4 kW (8/20 µs)
- Stand-off voltage range from 5 V to 188 V
- Unidirectional and bidirectional types
- Low leakage current: 0.2 µA at 25 °C and 1 µA at 85 °C
- Operating T_j max: 150 °C
- High power capability at T_j max.: up to 515 W (10/1000 µs)
- Lead finishing: matte tin plating

Complies with the following standards

- UL94, V0
- J-STD-020 MSL level 1
- J-STD-002, JESD 22-B102 E3 and MIL-STD-750, method 2026 solderable matte tin plated leads
- JESD-201 class 2 whisker test
- IPC7531 footprint
- JEDEC registered package outline
- IEC 61000-4-4 level 4:
  - 4 kV
- IEC 61000-4-2, C = 150 pF - R = 330 Ω exceeds level 4:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)

Description

The SMBJ 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. This device is 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.

The SMBJ series are packaged in SMB.

1 Characteristics

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

Symbol	Parameter		Value	Unit
V_{PP}	Peak pulse voltage	IEC 61000-4-2 (C = 150 pF, R = 330 Ω) Contact discharge Air discharge	 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

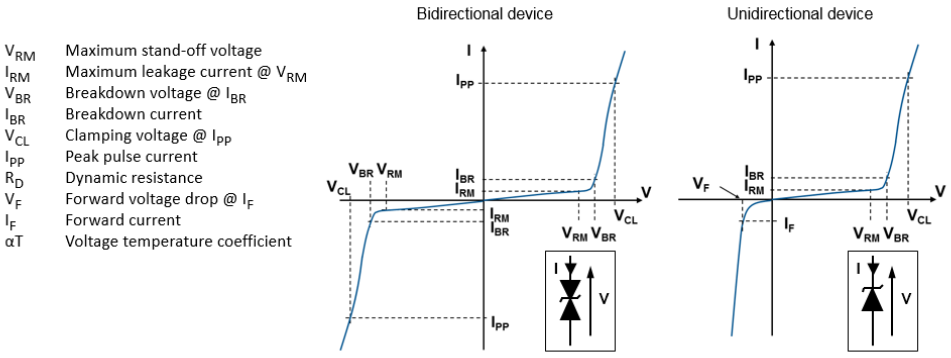


Figure 2. Pulse definition for electrical characteristics

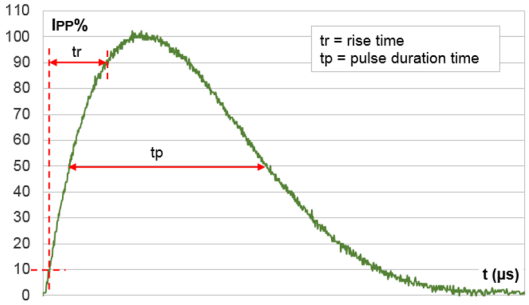


Table 2. Electrical characteristics - parameter values (T_{amb} = 25 °C, unless otherwise specified)

Type	I_{RM} max at V_{RM}			V_{BR} at I_{BR} (1)			10 / 1000 µs			8 / 20µs			αT
							V_{CL} (2)(3)	I_{PP} (4)	R_D	V_{CL} (2)(3)	I_{PP} (4)	R_D	
	25 °C	85 °C		Min.	Typ.		Max.		Max.	Max.		Max.	Max.
	µA		V	V		mA	V	A	Ω	V	A	Ω	10^{-4}/°C
SMBJ5.0A/CA	20	50	5.0	6.40	6.74	10	9.2	68	0.031	14.4	275	0.027	5.7
SMBJ6.0A/CA	20	50	6.0	6.70	7.05	10	10.3	61	0.048	14.8	270	0.027	5.9
SMBJ6.5A/CA	20	50	6.5	7.20	7.58	10	11.2	56	0.058	15.2	266	0.027	6.1
SMBJ8.5A/CA	20	50	8.5	9.40	9.90	1	14.4	41.7	0.096	19.5	205	0.044	7.3
SMBJ10A/CA	0.2	1	10	11.1	11.7	1	17	37	0.127	21.7	184	0.051	7.8
SMBJ12A/CA	0.2	1	12	13.3	14.0	1	19.9	31	0.168	25.3	157	0.068	8.3
SMBJ13A/CA	0.2	1	13	14.4	15.2	1	21.5	29	0.191	27.2	147	0.076	8.4
SMBJ15A/CA	0.2	1	15	16.7	17.6	1	24.4	25.1	0.236	32.5	123	0.114	8.8
SMBJ16A/CA	0.2	1	16	17.8	18.7	1	26	23.1	0.276	34.4	116	0.127	8.8
SMBJ18A/CA	0.2	1	18	20.0	21.1	1	29.2	21.5	0.328	39.3	102	0.168	9.2
SMBJ20A/CA	0.2	1	20	22.2	23.4	1	32.4	19.4	0.404	42.8	93	0.196	9.4
SMBJ22A/CA	0.2	1	22	24.4	25.7	1	35.5	17.7	0.481	48.3	83	0.257	9.6
SMBJ24A/CA	0.2	1	24	26.7	28.1	1	38.9	16	0.587	50	80	0.256	9.6
SMBJ26A/CA	0.2	1	26	28.9	30.4	1	42.1	14.9	0.683	53.5	75	0.288	9.7
SMBJ28A/CA	0.2	1	28	31.1	32.7	1	45.4	13.8	0.802	59	68	0.363	9.8
SMBJ30A/CA	0.2	1	30	33.3	35.1	1	48.4	13	0.888	64.3	62	0.443	9.9
SMBJ33A/CA	0.2	1	33	36.7	38.6	1	53.3	11.8	1.08	69.7	57	0.512	10.0
SMBJ36A/CA	0.2	1	36	40.0	42.1	1	58.1	10.3	1.35	76	52	0.611	10.0
SMBJ40A/CA	0.2	1	40	44.4	46.7	1	64.5	9.7	1.59	84	48	0.728	10.1
SMBJ48A/CA	0.2	1	48	53.3	56.1	1	77.4	8.1	2.28	100	40	1.03	10.3
SMBJ58A/CA	0.2	1	58	64.4	67.8	1	93.6	6.7	3.34	121	33	1.51	10.4
SMBJ64A/CA	0.2	1	64	71.3	75	1	103	5.8	4.17	134	30	1.84	10.5
SMBJ70A/CA	0.2	1	70	77.8	81.9	1	113	5.5	4.91	146	27	2.22	10.5
SMBJ85A/CA	0.2	1	85	94	99	1	137	4.6	7.18	178	22.5	3.29	10.6
SMBJ100A/CA	0.2	1	100	111	117	1	162	3.8	10.3	212	19	4.69	10.7
SMBJ130A/CA	0.2	1	130	144	152	1	209	3	16.5	265	15	7.03	10.8
SMBJ154A/CA	0.2	1	154	171	180	1	246	2.4	23.8	317	12.6	10.2	10.8
SMBJ170A/CA	0.2	1	170	189	199	1	275	2.2	30.0	353	11.3	12.7	10.8
SMBJ188A/CA	0.2	1	188	209	220	1	328	2	48.5	388	10.3	15.2	10.8

1. *To calculate V_{BR} versus T_j : V_{BR} at T_j = V_{BR} at 25 °C x (1 + αT x (T_j - 25))*
2. *To calculate V_{CL} versus T_j : V_{CL} at T_j = V_{CL} at 25 °C x (1 + αT x (T_j - 25))*
3. *To calculate V_{CL} max versus $I_{PPappli}$: V_{CLmax} = V_{CL} - RD x (I_{PP} - $I_{PPappli}$) where $I_{PP\ appli}$ is the surge current in the application*
4. *Surge capability given for both directions for unidirectional and bidirectional devices*

1.1 Characteristics (curves)

Figure 3. Maximum peak power dissipation versus initial junction temperature

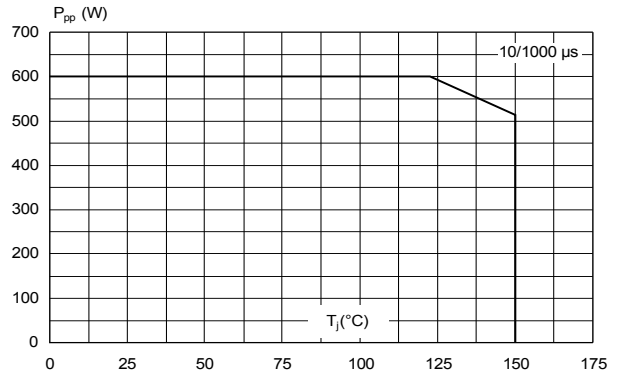


Figure 4. Maximum peak pulse power versus exponential pulse duration

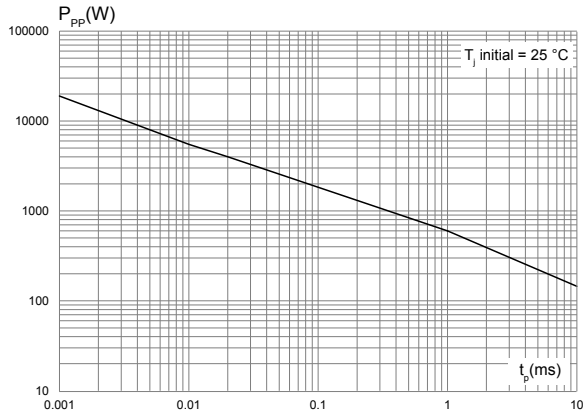


Figure 5. Maximum peak pulse current versus clamping voltage

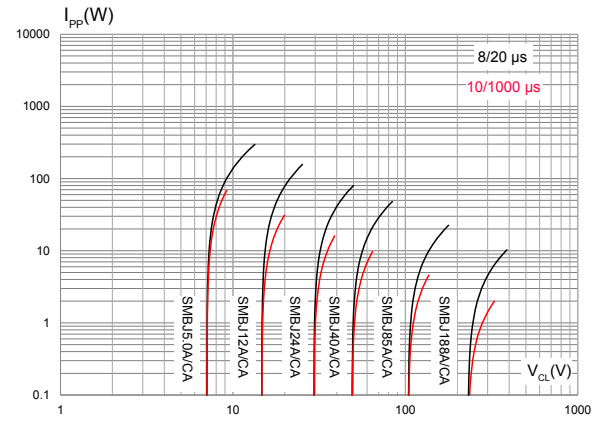


Figure 6. Dynamic resistance versus pulse duration

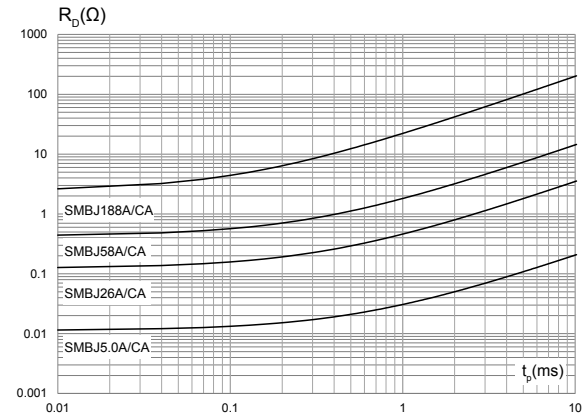


Figure 7. Junction capacitance versus reverse applied voltage (unidirectional types)

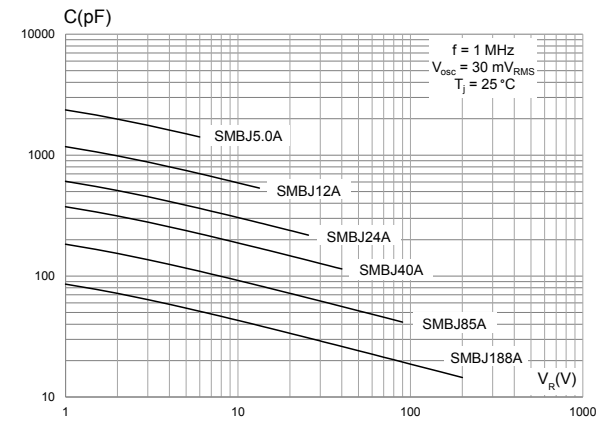


Figure 8. Junction capacitance versus applied voltage (bidirectional types)

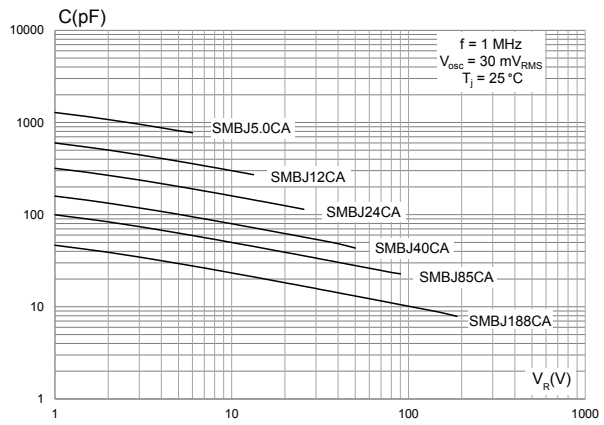


Figure 9. Leakage current versus junction temperature

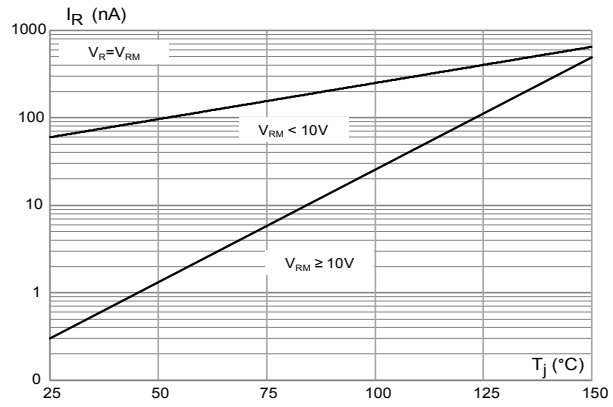


Figure 10. Peak forward voltage drop versus peak forward current

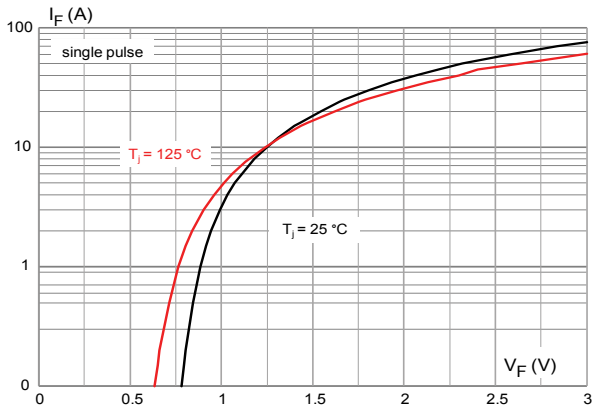


Figure 11. Thermal impedance junction to ambient versus pulse duration

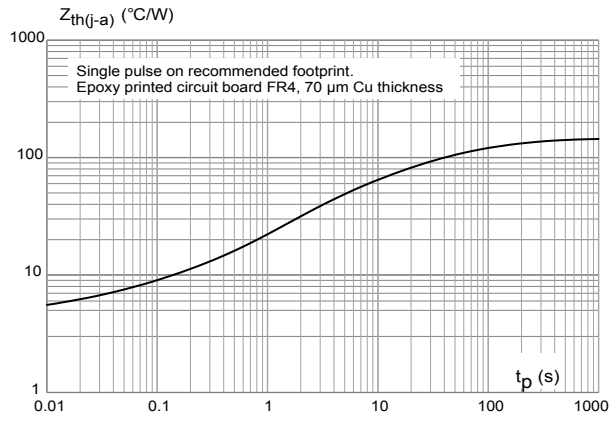
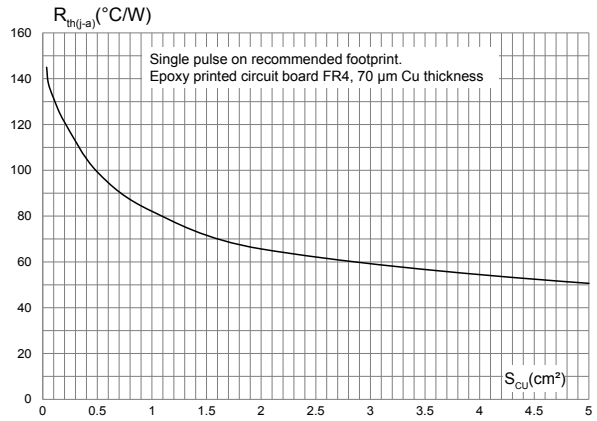


Figure 12. Thermal resistance junction to ambient versus copper area under each lead



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.

2.1 SMB package information

Figure 13. SMB package outline

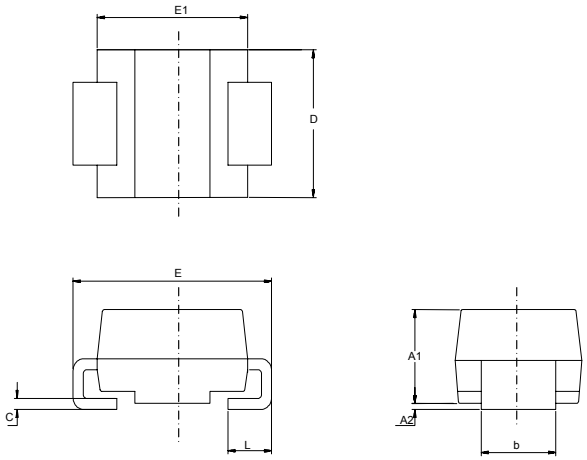


Table 3. SMB package mechanical data

Ref.	Dimensions			
	Millimeters		Inches[1]	
	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

1. *Values in inches are converted from mm*

Figure 14. SMB recommended footprint

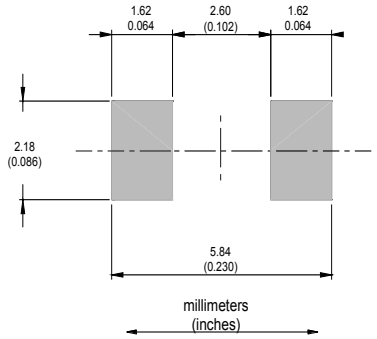
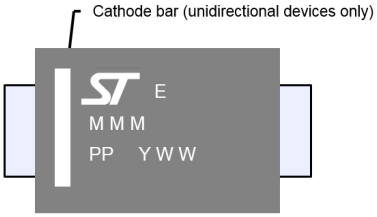
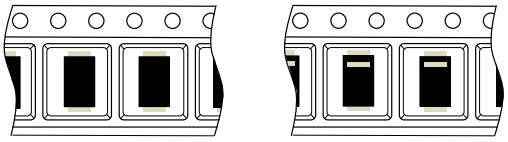


Figure 15. Marking layout



E : ECOPACK grade
MMM : Marking
PP : Assembly location
Y : Year
WW : week

Figure 16. Package orientation in reel



Taped according to EIA-481
Pocket dimensions are not on scale.
Pocket shape may vary depending on package
On bidirectional devices, marking and logo may not be always in the same direction.

Figure 17. Tape and reel orientation

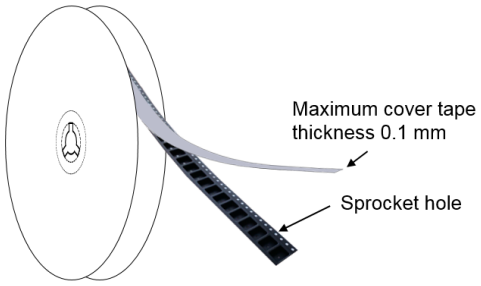


Figure 18. Reel dimensions (mm)

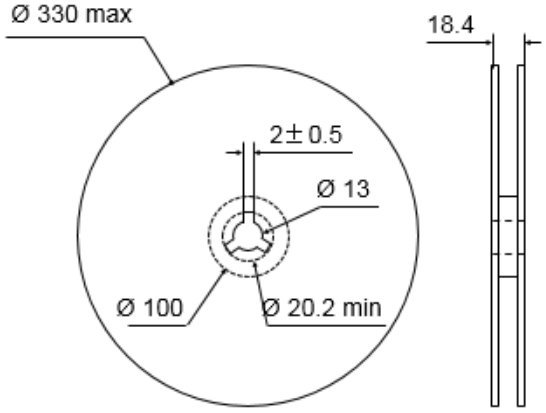


Figure 19. Inner box dimensions (mm)

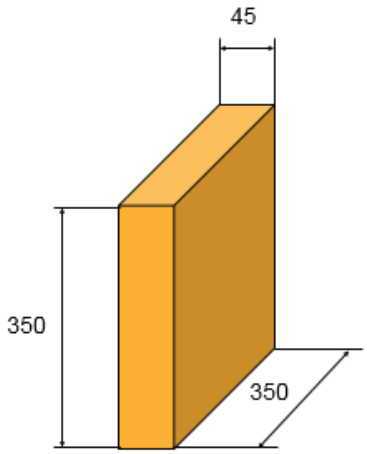
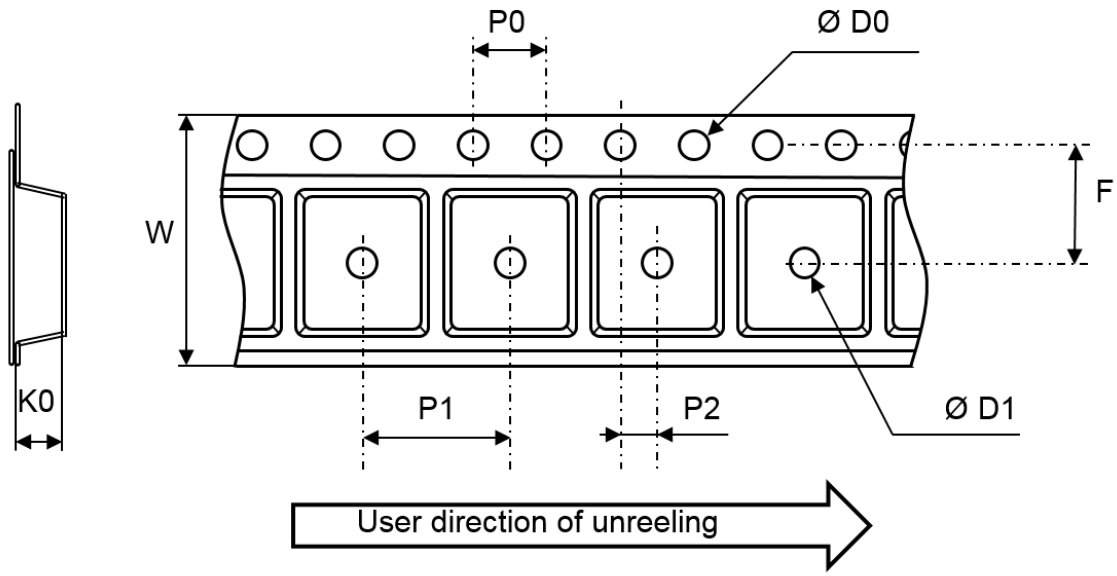


Figure 20. **Tape and reel outline**



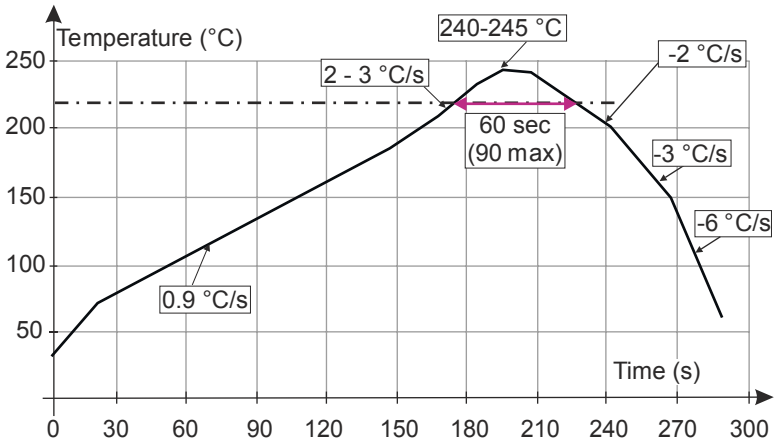
Note: Pocket dimensions are not on scale
Pocket shape may vary depending on package

Table 4. **Tape and reel mechanical data**

Ref.	Dimensions		
	Millimeters		
	Min.	Typ.	Max.
ØD0	1.5	1.55	1.6
ØD1	1.5		
F	5.4	5.5	5.6
K0	2.64	2.74	2.84
P0	3.9	4.0	4.1
P1	7.9	8.0	8.1
P2	1.9	2.0	2.1
W	11.7	12.0	12.3

2.2 Reflow profile

Figure 21. **ST ECOPACK recommended soldering reflow profile for PCB mounting**



Note: Minimize air convection currents in the reflow oven to avoid component movement. Maximum soldering profile corresponds to the latest IPC/JEDEC J-STD-020.

3 Ordering information

Figure 22. **Ordering information scheme**

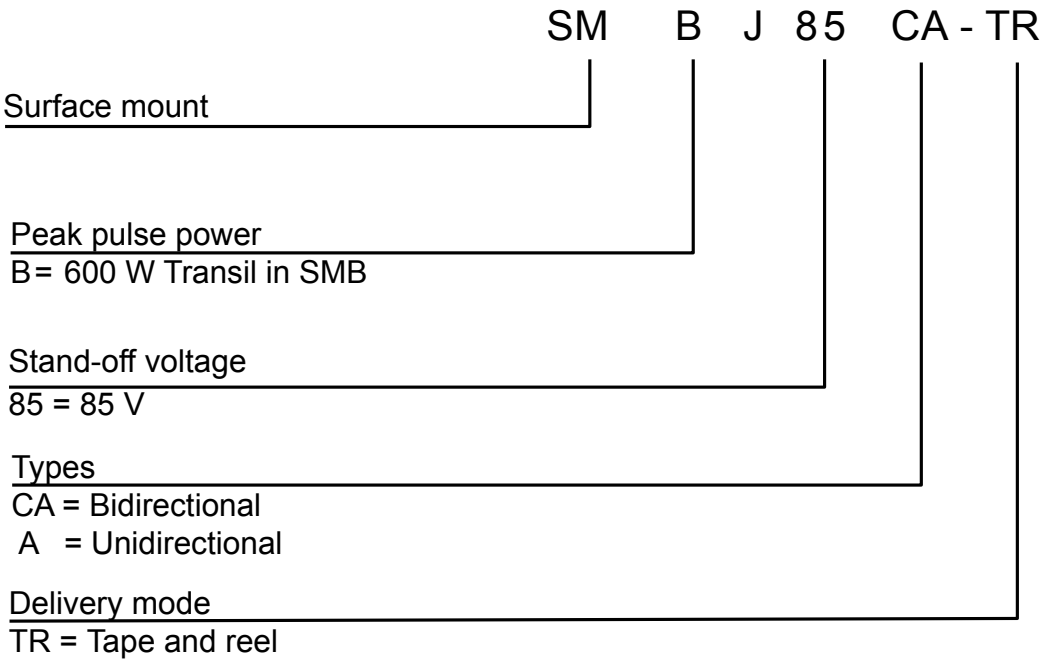


Table 5. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
SMBJxxxA / CA	See Table 6. Marking.	SMB	0.11 g	2500	Tape and reel

Table 6. **Marking**

Order code	Marking	Order code	Marking
SMBJ5.0A	BUZ	SMBJ5.0CA	BBZ
SMBJ6.0A	BUA	SMBJ6.0CA	BBA
SMBJ6.5A	BUB	SMBJ6.5CA	BBB
SMBJ8.5A	BUC	SMBJ8.5CA	BBC
SMBJ10A	BUD	SMBJ10CA	BBD
SMBJ12A	BUE	SMBJ12CA	BBE
SMBJ13A	BUF	SMBJ13CA	BBF
SMBJ15A	BUG	SMBJ15CA	BBG
SMBJ16A	CUG	SMBJ16CA	CBG
SMBJ18A	BUH	SMBJ18CA	BBH
SMBJ20A	BUI	SMBJ20CA	BBI
SMBJ22A	BVA	SMBJ22CA	CBH
SMBJ24A	BUJ	SMBJ24CA	BBJ
SMBJ26A	BUK	SMBJ26CA	BBK
SMBJ28A	BUL	SMBJ28CA	BBL
SMBJ30A	BUM	SMBJ30CA	BBM
SMBJ33A	BUN	SMBJ33CA	BBN
SMBJ36A	CUN	SMBJ36CA	CBN
SMBJ40A	CUJ	SMBJ40CA	CBJ
SMBJ48A	BUW	SMBJ48CA	BBW
SMBJ58A	BUO	SMBJ58CA	BBO
SMBJ64A	BUP	SMBJ64CA	BBP
SMBJ70A	CUM	SMBJ70CA	CBM
SMBJ85A	BUQ	SMBJ85CA	BBQ
SMBJ100A	CUQ	SMBJ100CA	CBQ
SMBJ130A	BUS	SMBJ130CA	BBS
SMBJ154A	BUT	SMBJ154CA	BBT
SMBJ170A	BUU	SMBJ170CA	BBU
SMBJ188A	BUV	SMBJ188CA	BBV

Revision history

Table 7. **Document revision history**

Date	Version	Changes
Oct-2001	4	Previous issue.
10-Feb-2005	5	Reformatted to current template. Added directional (uni and bi) indications to graphics. Added ECOPACK statement.
16-Nov-2006	6	Add part numbers SMBJ36A-TR and SMBJ36CA-TR in Table 3.
14-May-2009	7	Reformatted to current standards. Updated ECOPACK statement. Added part number SMBJ43CA/A.
17-Sep-2009	8	Document updated for low leakage current.
09-Jul-2010	9	Changed timescale in Figure 9.
20-Oct-2010	10	Updated Figure 13.
24-Jan-2018	11	Updated Table 3: "Electrical characteristics parameter values (Tamb = 25 °C, unless otherwise specified)".
26-Apr-2021	12	Updated Table 6. Minor text changes.