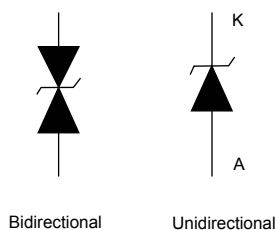
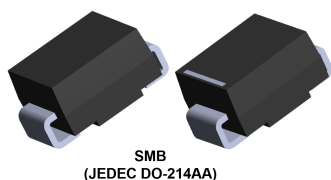


## 600 W TVS in SMB



### Features

- Peak pulse power: 600 W (10/1000  $\mu$ s) and 4 kW (8/20  $\mu$ s)
- Stand-off voltage range from 5 V to 188 V
- Unidirectional and bidirectional types
- Low leakage current: 0.2  $\mu$ A at 25 °C and 1  $\mu$ A at 85 °C
- Operating  $T_j$  max: 150 °C
- High power capability at  $T_j$  max.: up to 515 W (10/1000  $\mu$ s)
- 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  $\Omega$  exceeds level 4:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)

### Description

The SM6T 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  $\mu$ s).

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.

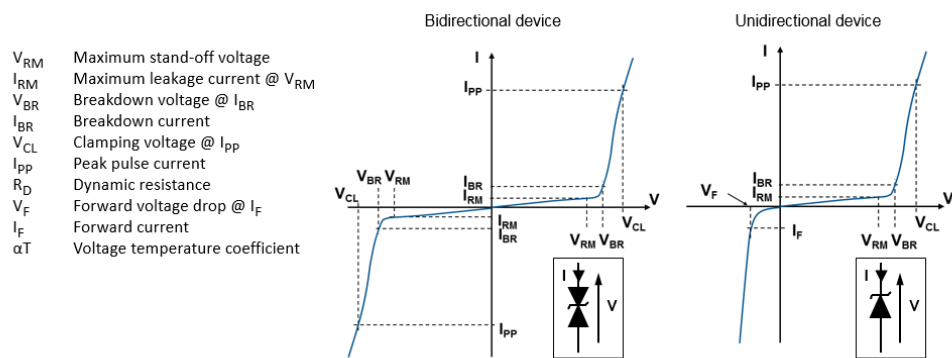
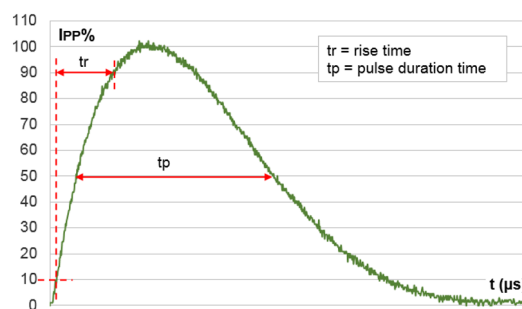
The SM6T series are packaged in SMB.

| Product status link |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SM6T                | SM6T6V8A, SM6T6V8CA,<br>SM6T7V5A, SM6T7V5CA,<br>SM6T10A, SM6T10CA,<br>SM6T12A, SM6T12CA,<br>SM6T15A, SM6T15CA,<br>SM6T18A, SM6T18CA,<br>SM6T22A, SM6T22CA,<br>SM6T24A, SM6T24CA,<br>SM6T27A, SM6T27CA,<br>SM6T30A, SM6T30CA,<br>SM6T33A, SM6T33CA,<br>SM6T36A, SM6T36CA,<br>SM6T39A, SM6T39CA,<br>SM6T56A, SM6T56CA,<br>SM6T68A, SM6T68CA,<br>SM6T75A, SM6T75CA,<br>SM6T100A, SM6T100CA,<br>SM6T150A, SM6T150CA,<br>SM6T200A, SM6T200CA,<br>SM6T220A, SM6T220CA |

# 1 Characteristics

**Table 1. Absolute maximum ratings ( $T_{amb} = 25^{\circ}\text{C}$ )**

| Symbol    | Parameter                                          | Value                                             | Unit               |
|-----------|----------------------------------------------------|---------------------------------------------------|--------------------|
| $V_{PP}$  | Peak pulse voltage                                 | IEC 61000-4-2 (C = 150 pF, R = 330 $\Omega$ )     |                    |
|           | Contact discharge                                  | 30                                                | kV                 |
|           | Air discharge                                      | 30                                                |                    |
| $P_{PP}$  | Peak pulse power dissipation                       | 10/1000 $\mu\text{s}$ , $T_j$ initial = $T_{amb}$ | W                  |
| $T_{stg}$ | Storage temperature range                          | -65 to +150                                       | $^{\circ}\text{C}$ |
| $T_j$     | Operating junction temperature range               | -55 to +150                                       | $^{\circ}\text{C}$ |
| $T_L$     | Maximum lead temperature for soldering during 10 s | 260                                               | $^{\circ}\text{C}$ |

**Figure 1. Electrical characteristics - parameter definitions**

**Figure 2. Pulse definition for electrical characteristics**


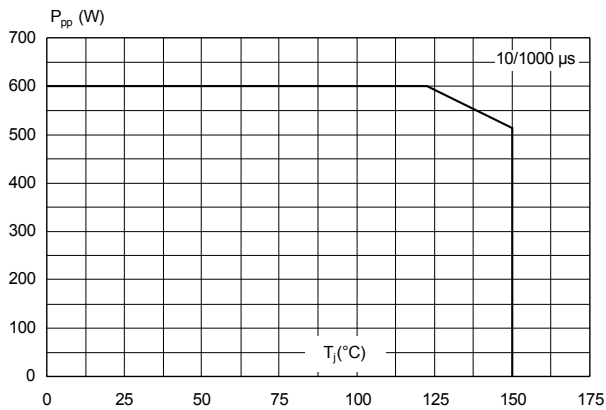
**Table 2. Electrical characteristics - parameter values ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)**

| Type        | $I_{RM}$ max at $V_{RM}$ |                       |      | $V_{BR}$ at $I_{BR}^{(1)}$ |      |      |    | 10 / 1000 $\mu\text{s}$ |                |          | 8 / 20 $\mu\text{s}$ |                |          | $\alpha T$                 |
|-------------|--------------------------|-----------------------|------|----------------------------|------|------|----|-------------------------|----------------|----------|----------------------|----------------|----------|----------------------------|
|             |                          |                       |      |                            |      |      |    | $V_{CL}^{(2)(3)}$       | $I_{PP}^{(4)}$ | $R_D$    | $V_{CL}^{(2)(3)}$    | $I_{PP}^{(4)}$ | $R_D$    |                            |
|             | 25 $^{\circ}\text{C}$    | 85 $^{\circ}\text{C}$ |      | Min.                       | Typ. | Max. |    | Max.                    |                | Max.     | Max.                 |                | Max.     | Max.                       |
|             | $\mu\text{A}$            |                       | V    | V                          |      |      | mA | V                       | A              | $\Omega$ | V                    | A              | $\Omega$ | $10^{-4}/^{\circ}\text{C}$ |
| SM6T6V8A/CA | 20                       | 50                    | 5.80 | 6.45                       | 6.8  | 7.14 | 10 | 10.5                    | 57             | 0.059    | 14.4                 | 275            | 0.027    | 5.7                        |
| SM6T7V5A/CA | 20                       | 50                    | 6.40 | 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                       |

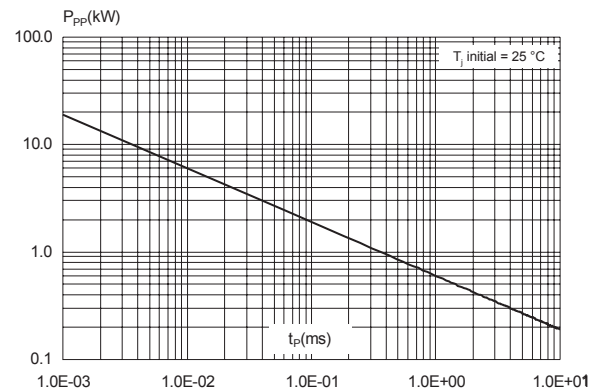
1. To calculate  $V_{BR}$  versus  $T_j$ :  $V_{BR}$  at  $T_j = V_{BR}$  at  $25\text{ }^{\circ}\text{C} \times (1 + \alpha T \times (T_j - 25))$
2. To calculate  $V_{CL}$  versus  $T_j$ :  $V_{CL}$  at  $T_j = V_{CL}$  at  $25\text{ }^{\circ}\text{C} \times (1 + \alpha T \times (T_j - 25))$
3. To calculate  $V_{CL}$  max versus  $I_{PP\text{appli}}$ :  $V_{CL\text{max}} = V_{BR\text{max}} + R_D \times I_{PP\text{appli}}$
4. Surge capability given for both directions for unidirectional and bidirectional devices

## 1.1 Characteristics (curves)

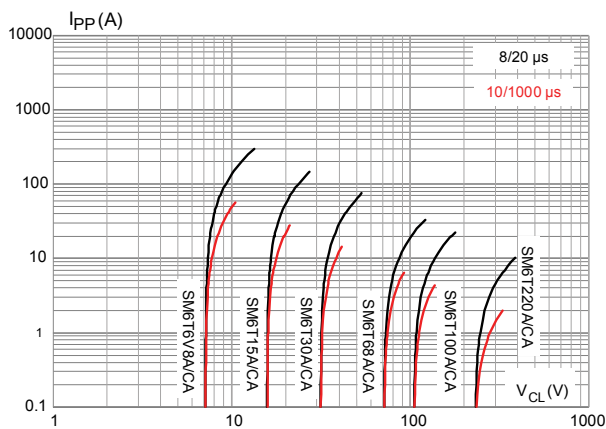
**Figure 3. Maximum peak power dissipation versus initial junction temperature**



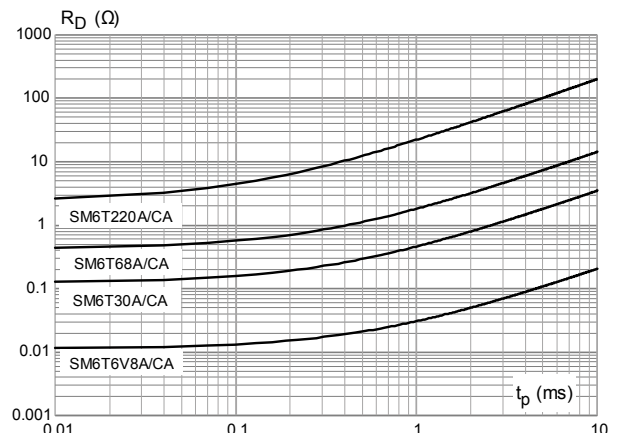
**Figure 4. Maximum peak pulse power versus exponential pulse duration**

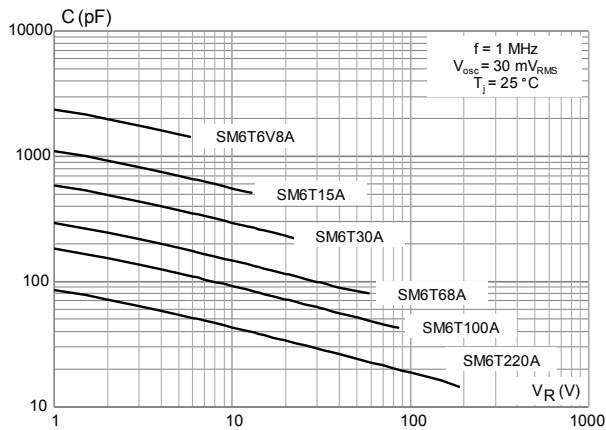
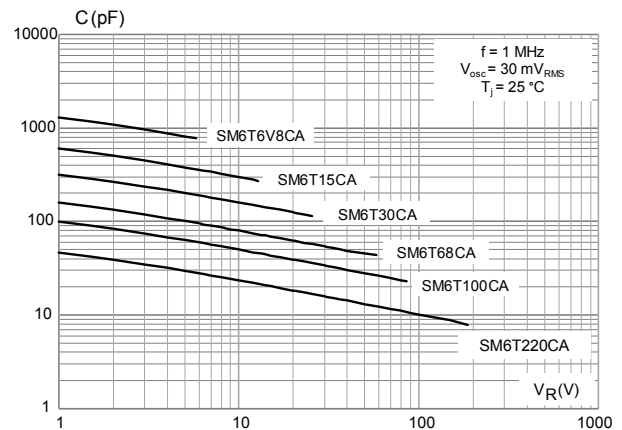
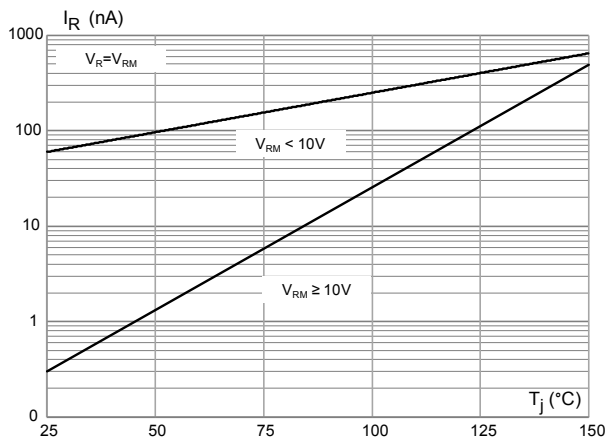
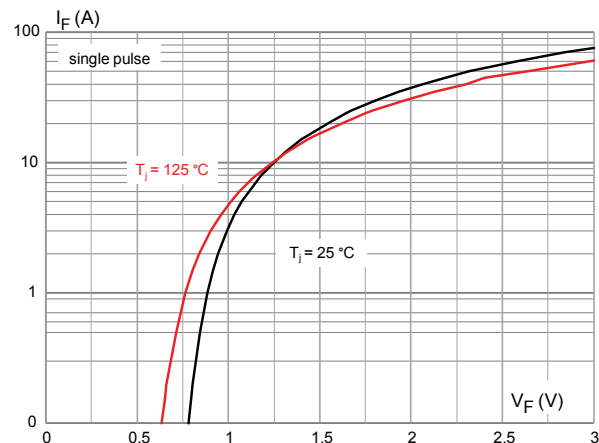
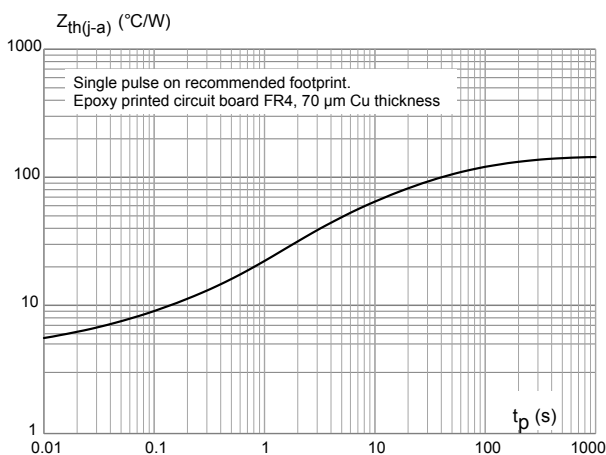
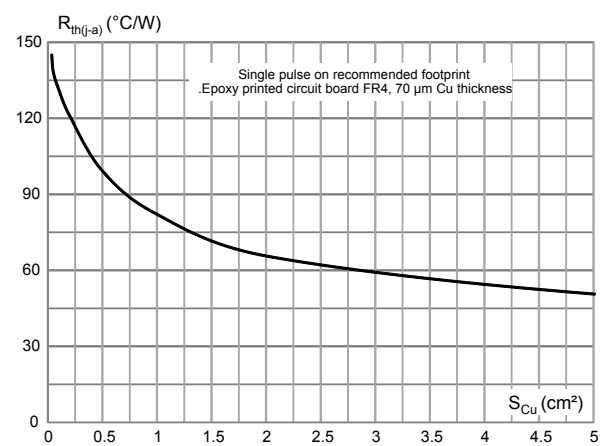


**Figure 5. Maximum peak pulse current versus clamping voltage**



**Figure 6. Dynamic resistance versus pulse duration (typical values)**



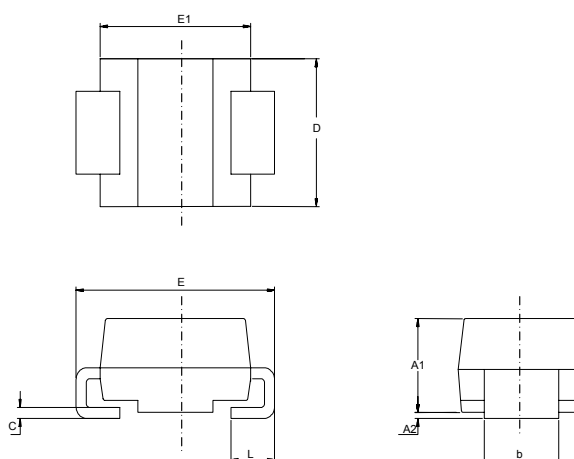
**Figure 7. Junction capacitance versus reverse applied voltage (unidirectional types)**

**Figure 8. Junction capacitance versus applied voltage (bidirectional type)**

**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](http://www.st.com). ECOPACK is an ST trademark.

### 2.1 SMB package information

**Figure 13. SMB package outline**

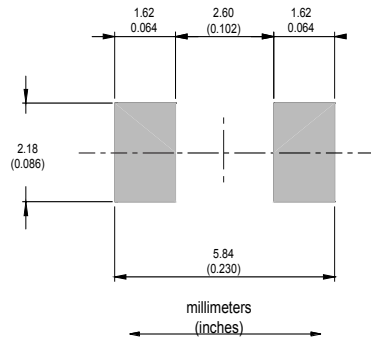


**Table 3. SMB package mechanical data**

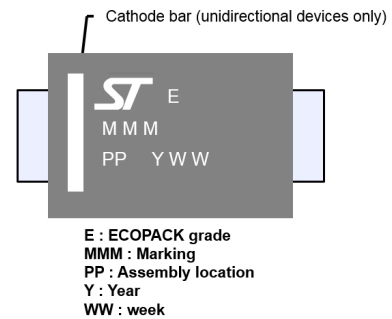
| Ref. | Dimensions  |      |                       |        |
|------|-------------|------|-----------------------|--------|
|      | Millimeters |      | Inches <sup>(1)</sup> |        |
|      | Min.        | Max. | Min.                  | Max.   |
| A1   | 1.90        | 2.45 | 0.0748                | 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

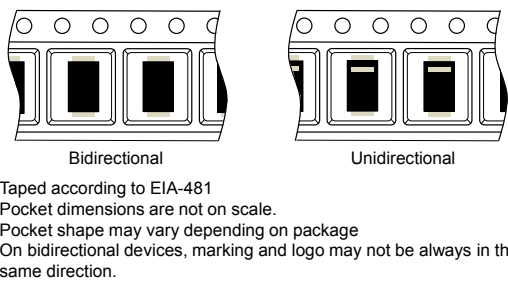
**Figure 14. SMB recommended footprint**



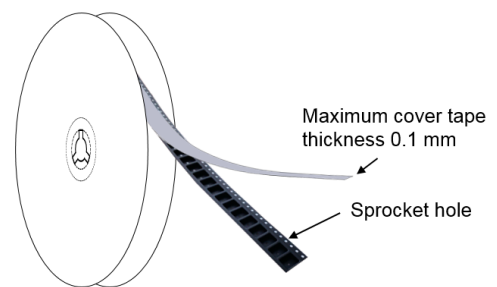
**Figure 15. Marking layout**



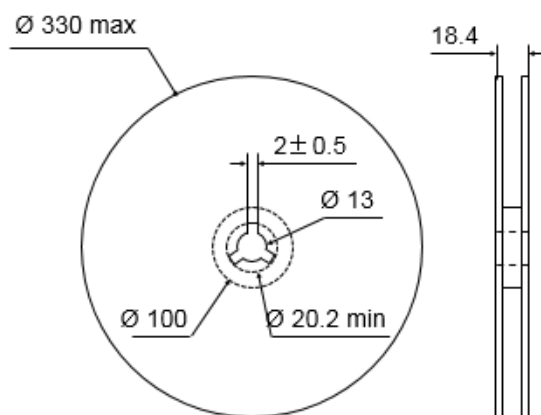
**Figure 16. Package orientation in reel**



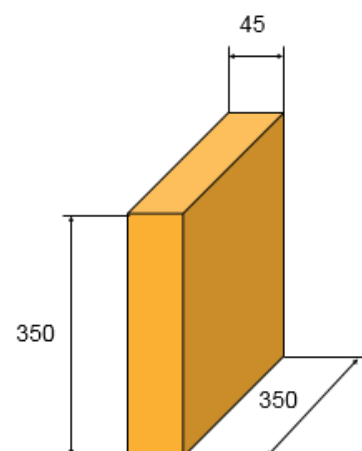
**Figure 17. Tape and reel orientation**

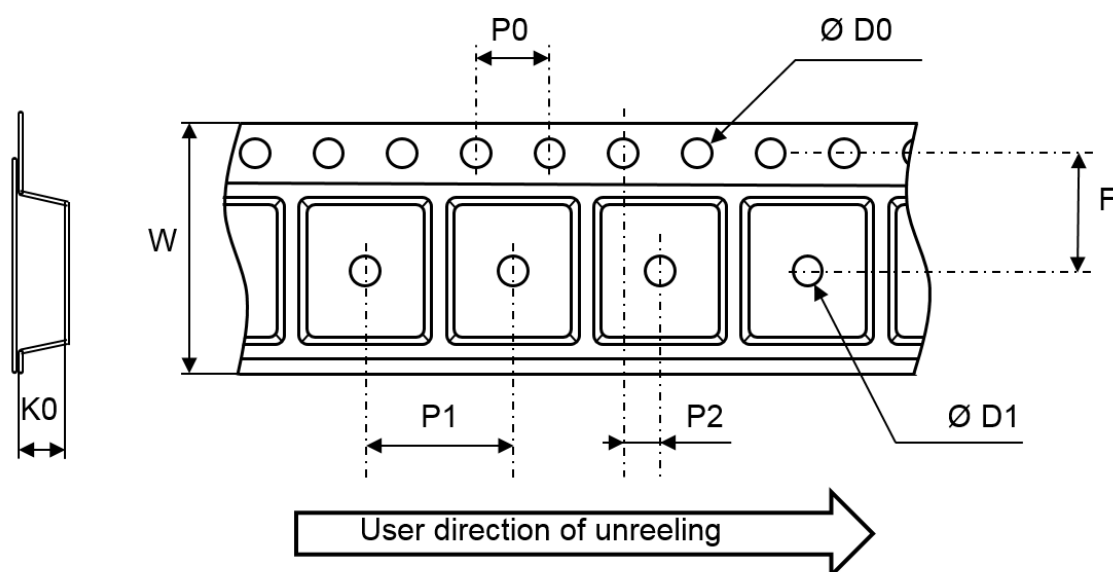


**Figure 18. Reel dimensions (mm)**



**Figure 19. Inner box dimensions (mm)**



**Figure 20. Tape and reel outline**


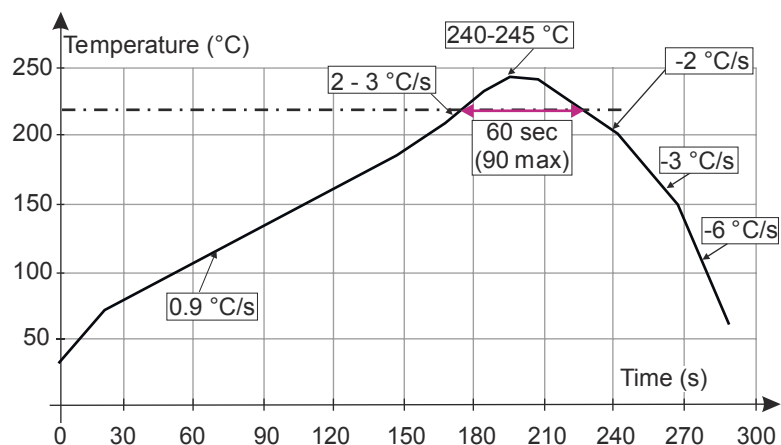
Note: Pocket dimensions are not on scale  
Pocket shape may vary depending on package

**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

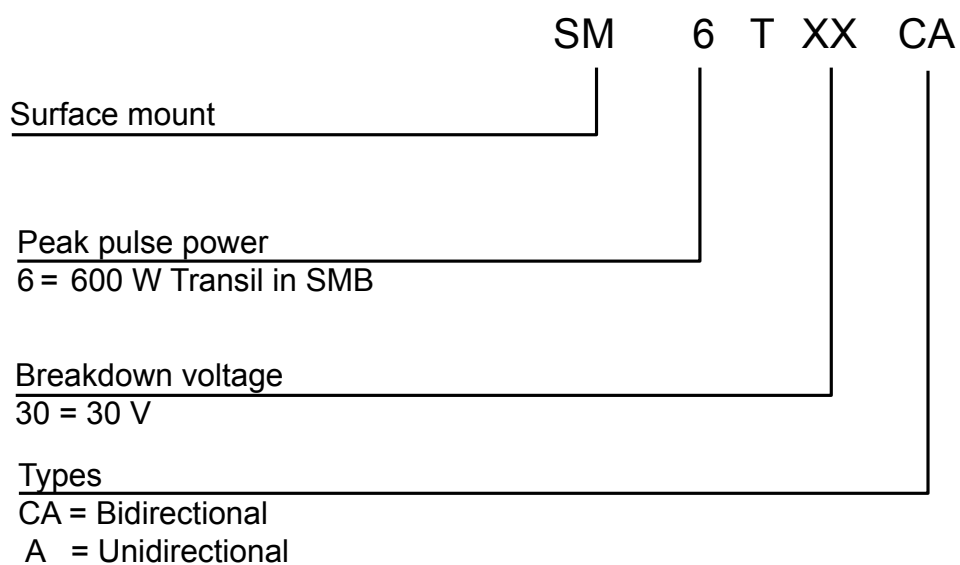


Table 5. Ordering information

| Order code    | Marking              | Package | Weight | Base qty. | Delivery mode |
|---------------|----------------------|---------|--------|-----------|---------------|
| SM6TxxxA / CA | See Table 6. Marking | SMB     | 0.11 g | 2500      | Tape and reel |

**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      |

## Revision history

**Table 7. Document revision history**

| Date        | Version | Changes                                                                                                                                                            |
|-------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Aug-2001    | 4       | Previous update.                                                                                                                                                   |
| 15-Sep-2004 | 5       | 1. Types table parameters on page 2: IRM @ T <sub>j</sub> = 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 (T <sub>amb</sub> = 25 °C, unless otherwise specified)".                                             |
| 03-Sep-2020 | 11      | Updated Section 1.1 Characteristics (curves).                                                                                                                      |
| 11-Sep-2020 | 12      | Minor text change.                                                                                                                                                 |
| 02-Jun-2021 | 13      | Updated Figure 12.                                                                                                                                                 |

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