

## Features

- Peak pulse power:
  - 600 W (10/1000  $\mu$ s)
  - 4 kW (8/20  $\mu$ s)
- Stand-off voltage 213 V
- Bidirectional type
- Low leakage current:
  - 200 nA at 25 °C
  - 1  $\mu$ A at 85 °C
- Operating  $T_{j\max}$ : 175 °C
- High power capability at  $T_{j\max}$
- JEDEC registered package outline
- Resin meets UL 94, V0
- AEC-Q101 qualified

## Complies with the following standards

- IEC 61000-4-2 exceeds level 4:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)
- ISO 10605, C = 330 pF, R = 330  $\Omega$  exceeds level 4:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)
- ISO 7637-2

## Description

The SM6T250CAY Transil series has been designed to protect sensitive automotive circuits against surges defined in ISO 7637-2 and against electrostatic discharges according to IEC 61000-4-2 and 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. SM6T250CAY is packaged in SMB (SMB footprint in accordance with IPC 7531 standard).

**TM:** Transil is a trademark of STMicroelectronics

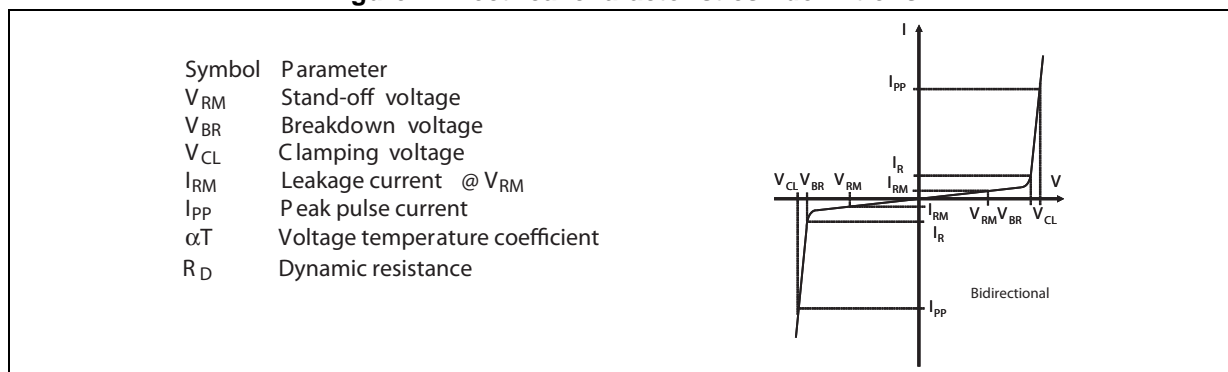
# 1 Characteristics

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

| Symbol            | Parameter   |  | Value      | Unit               |
|-------------------|---|--|------------|--------------------|
| $V_{PP}$          | Peak pulse voltage                                  | ISO 10605 (C = 330 pF, R = 330 $\Omega$ ): |            |                    |
|                   |   | Contact discharge                          | 30         | kV                 |
|                   |   | Air discharge                              | 30         |                    |
|                   |   | IEC61000-4-2:                              |            |                    |
| Contact discharge | 30  |  |            |                    |
|                   | Air discharge                                       | 30   |            |                    |
| $P_{PP}$          | Peak pulse power dissipation <sup>(1)</sup>         | $T_j$ initial = $T_{amb}$                  | 600        | W                  |
| $T_j$             | Operating junction temperature range                |  | -55 to 175 | $^{\circ}\text{C}$ |
| $T_{stg}$         | Storage temperature range                           |  | -65 to 175 | $^{\circ}\text{C}$ |
| $T_L$             | Maximum lead temperature for soldering during 10 s. |  | 260        | $^{\circ}\text{C}$ |

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

**Figure 1. Electrical characteristics - definitions**



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

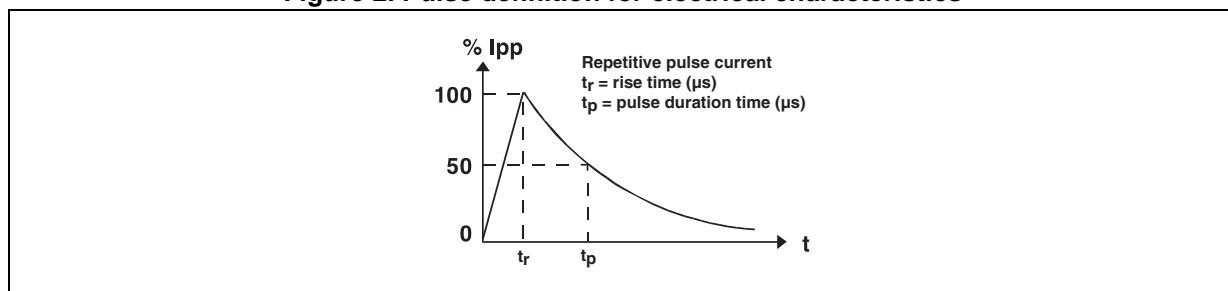


Table 2. Electrical characteristics, parameter values (T<sub>amb</sub> = 25 °C)

| Order code | I <sub>RM</sub> max at V <sub>RM</sub> |    |     | V <sub>BR</sub> at I <sub>R</sub> (1) |      |      | V <sub>CL</sub> at I <sub>PP</sub> 10/1000 μs |     | R <sub>D</sub> (2) 10/100 μs | V <sub>CL</sub> at I <sub>PP</sub> 8/20 μs |     | R <sub>D</sub> (2) 8/20 μs | αT      |    |
|------------|--|----|-----|---------------------------------------|------|------|---|-----|------------------------------|--|-----|----------------------------|---------|----|
|            | 25                                     | 85 |     | min.                                  | typ. | max. | max.  |     |                              | max.                                       |     |                            | max.    |    |
|            | °C                                     |    |     |                                       |      |      |   |     |                              |  |     |                            |         | V  |
|            | nA                                     | μA | V   | V                                     |      | mA   | V <sup>(3)</sup>                              | A   | Ω                            | V <sup>(3)</sup>                           | A   | Ω                          | 10-4/°C |    |
| SM6T250CAY | 200                                    | 1  | 213 | 237                                   | 250  | 263  | 1   | 344 | 1.75                         | 53.7                                       | 400 | 10                         | 15      | 11 |

1. Pulse test: t<sub>p</sub> < 50 ms
2. To calculate maximum clamping voltage at another surge level, use the following formula:  
 $V_{CLmax} = V_{CL} - R_D \times (I_{PP} - I_{PPappli})$  where I<sub>PPappli</sub> is the surge current in the application.
3. To calculate V<sub>BR</sub> or V<sub>CL</sub> versus junction temperature, use the following formulas:  
 $V_{BR} @ T_J = V_{BR} @ 25^\circ C \times (1 + \alpha T \times (T_J - 25))$   
 $V_{CL} @ T_J = V_{CL} @ 25^\circ C \times (1 + \alpha T \times (T_J - 25))$

Figure 3. Peak power dissipation versus initial junction temperature

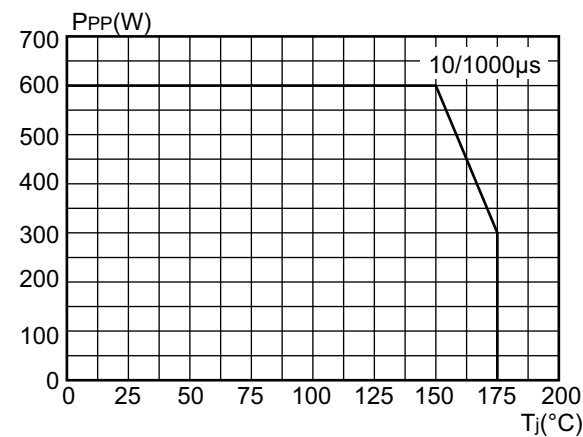


Figure 4. Peak pulse power versus exponential pulse duration (T<sub>J</sub> initial = 25 °C)

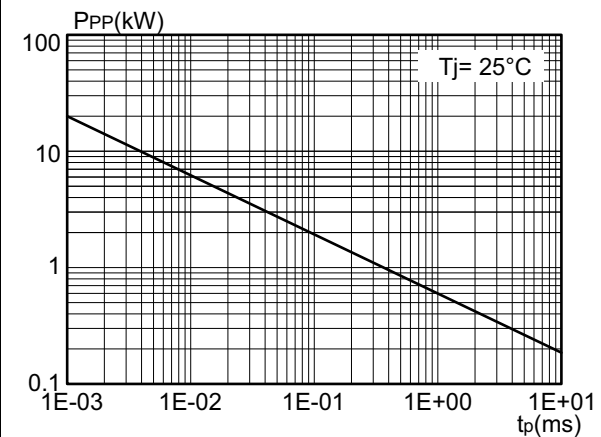


Figure 5. Clamping voltage versus peak pulse current exponential waveform (maximum values)

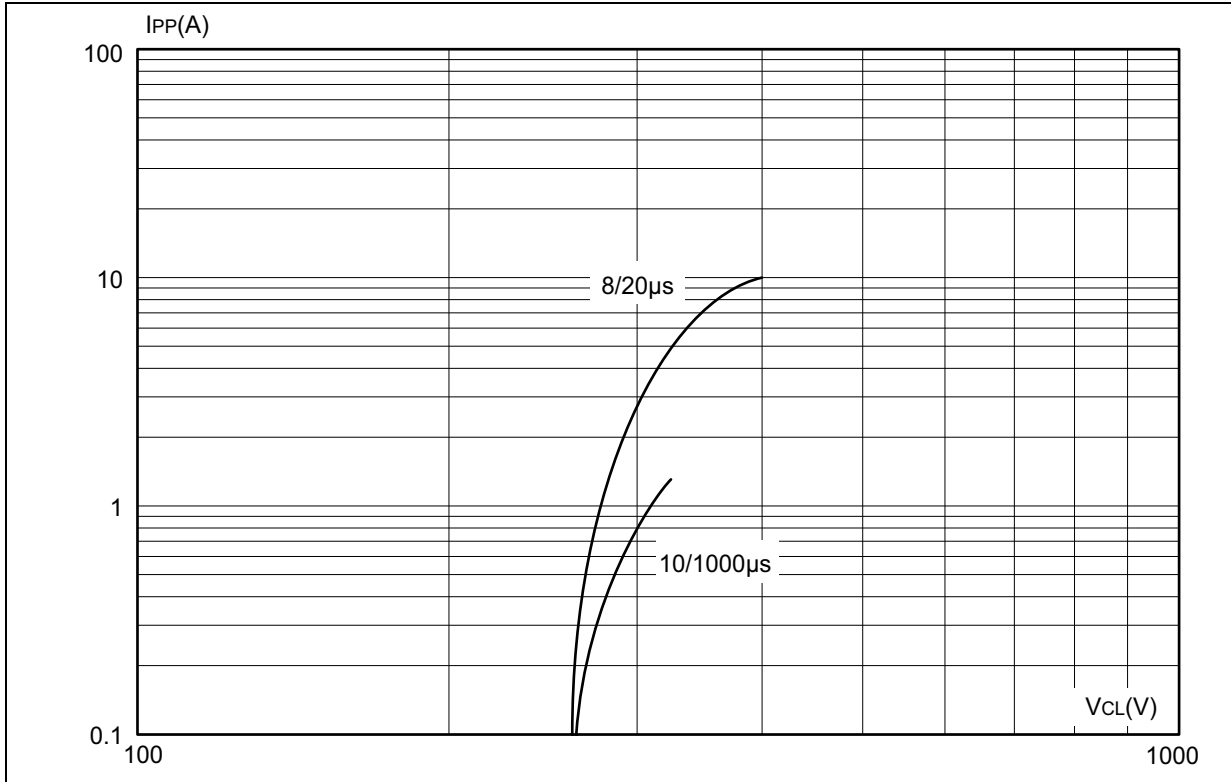
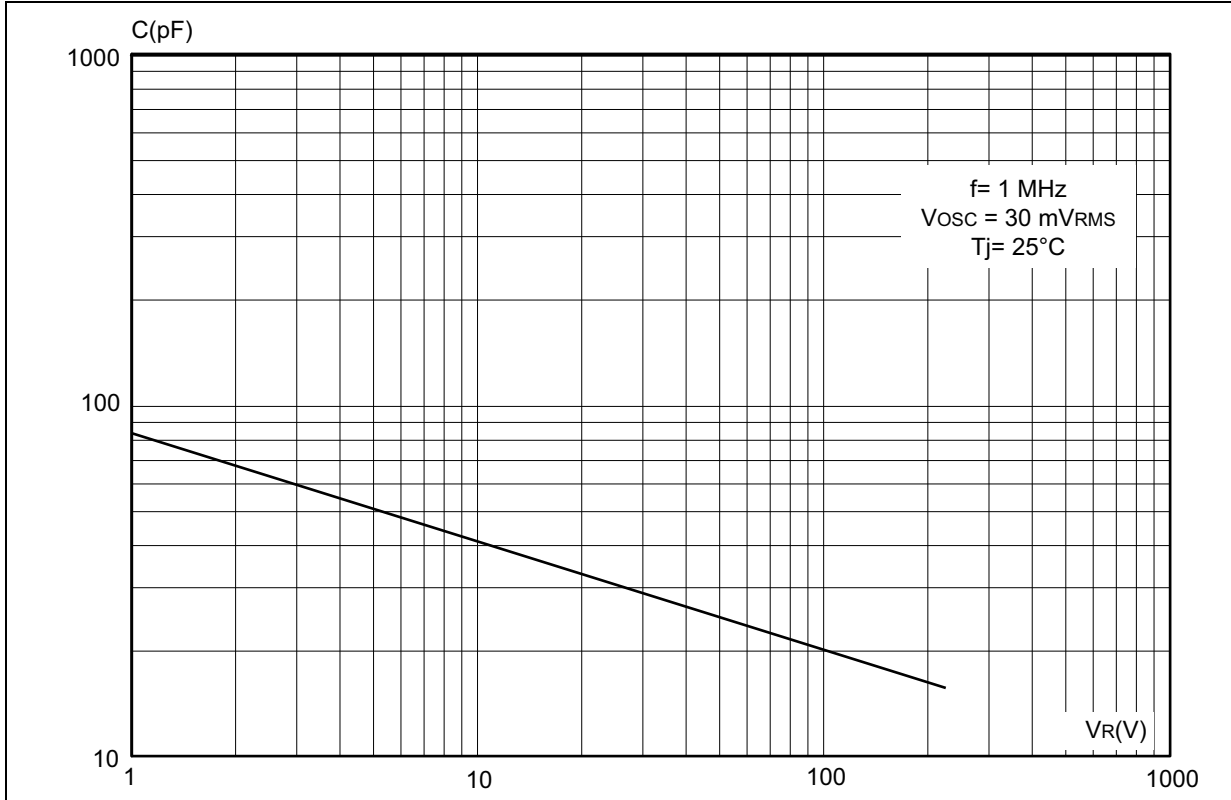
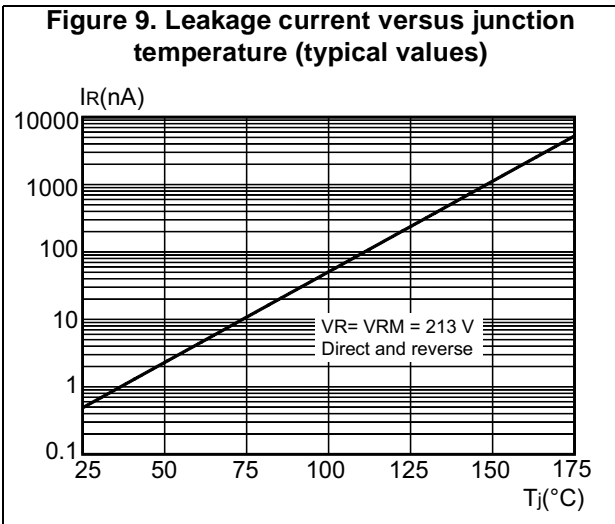
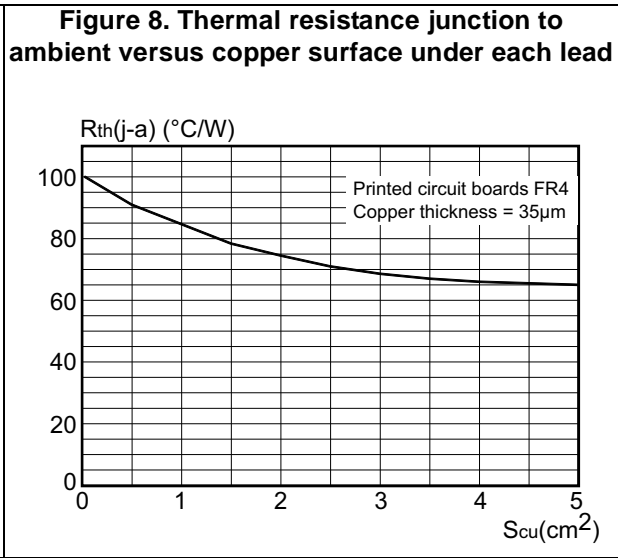
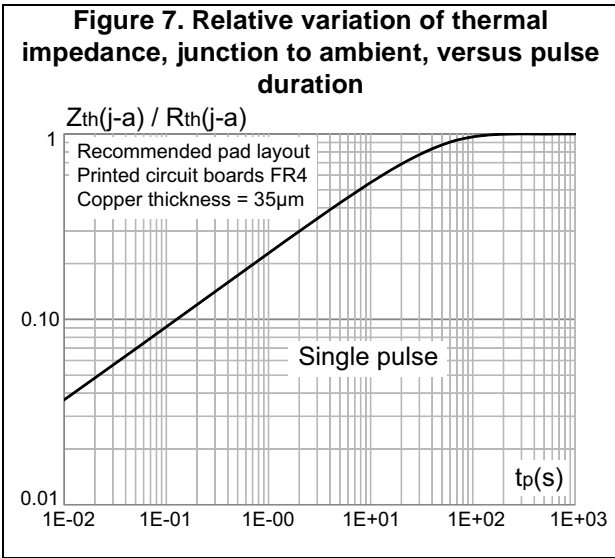


Figure 6. Junction capacitance versus reverse applied (typical values)





## 2 Application and design guidelines

More information is available in the ST Application note AN2689 "Protection of automotive electronics from electrical hazards, guidelines for design and component selection".

## 3 Packaging information

- Case: JEDEC DO-214AA molded plastic over planar junction
- Terminals: solder plated, solderable as per MIL-STD-750, Method 2026
- Polarity: for unidirectional types the band indicates cathode
- Epoxy meets UL94, V0
- Lead-free package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Figure 10. SMB outline (definitions)

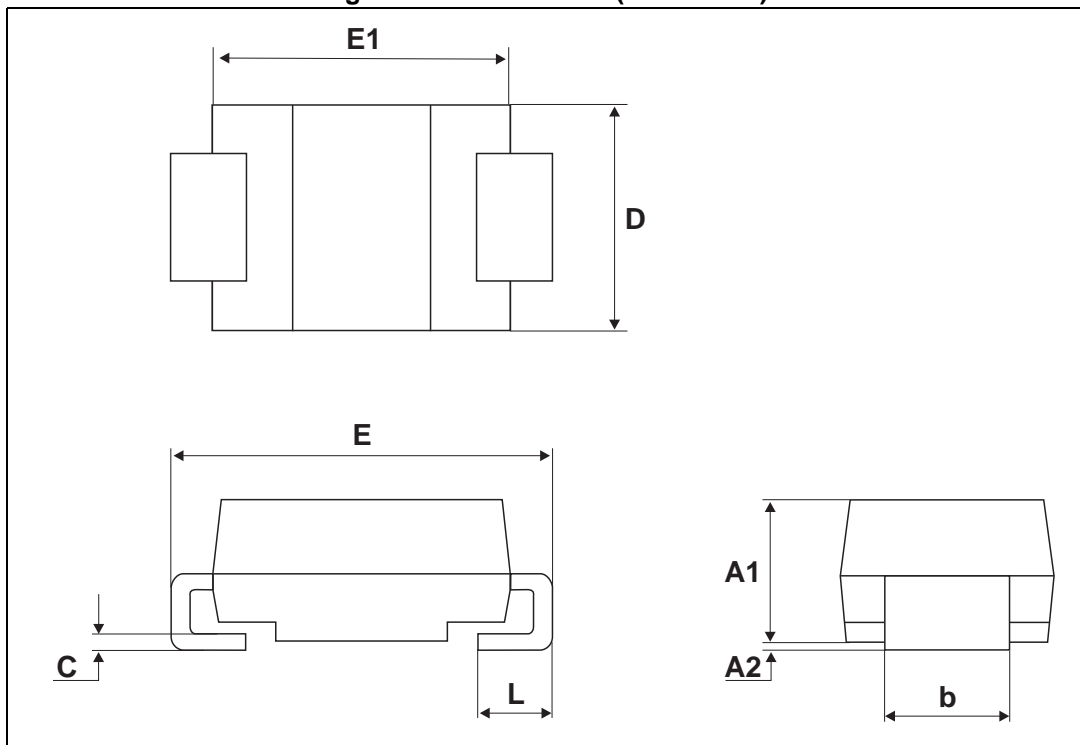


Table 3. SMB dimensions (values)

| 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    | 1.95        | 2.20 | 0.077  | 0.087 |
| c    | 0.15        | 0.40 | 0.006  | 0.016 |
| D    | 3.30        | 3.95 | 0.130  | 0.156 |
| E    | 5.10        | 5.60 | 0.201  | 0.220 |
| E1   | 4.05        | 4.60 | 0.159  | 0.181 |
| L    | 0.75        | 1.50 | 0.030  | 0.059 |

Figure 11. SMB footprint dimensions in mm (inches)

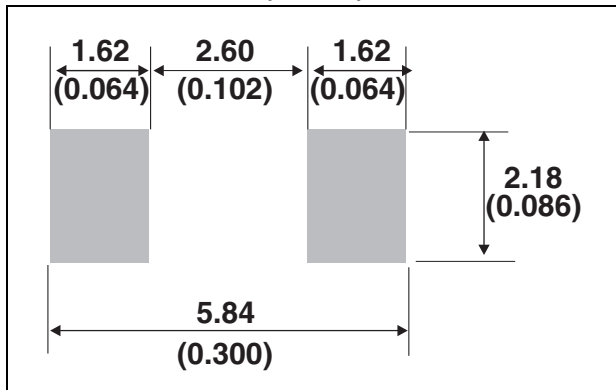
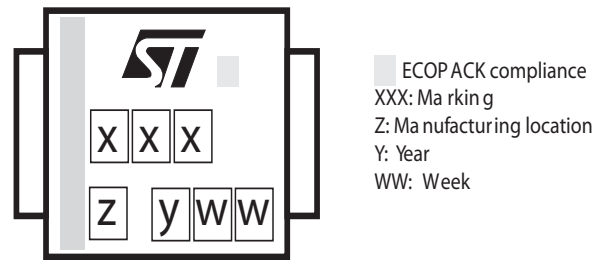


Figure 12. Marking layout<sup>(1)</sup>



1. Marking layout can vary according to assembly location.

## 4 Ordering information

Figure 13. Ordering information scheme

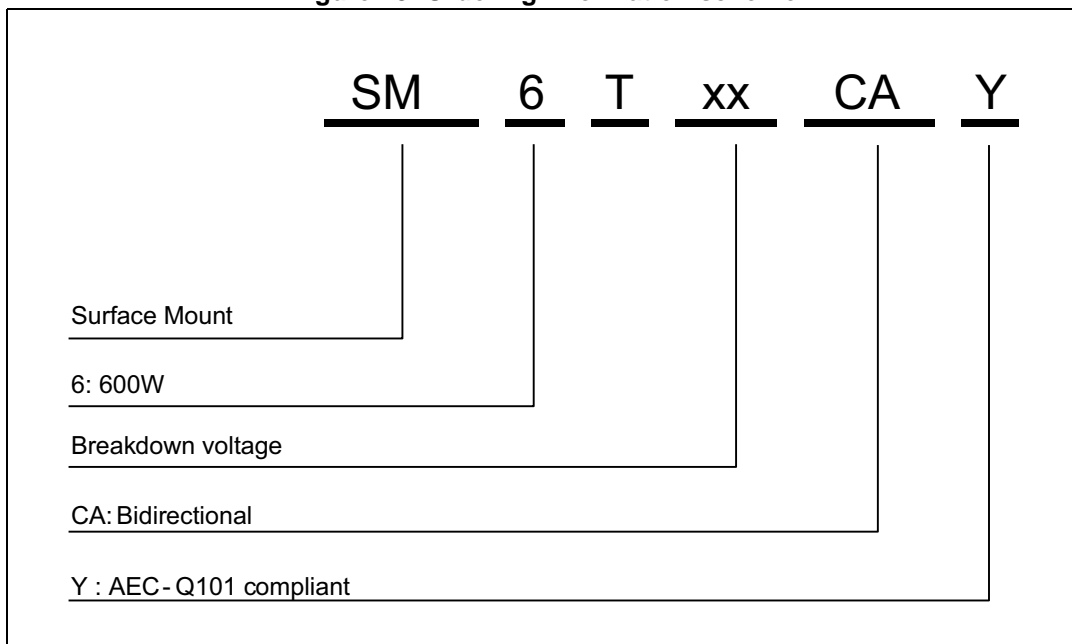


Table 4. Ordering information

| Order code | Marking | Weight | Base qty. | Delivery mode |
|------------|---------|--------|-----------|---------------|
| SM6T250CAY | PRY     | 0.11 g | 2500      | Tape and reel |

## 5 Revision history

Table 5. Document revision history

| Date        | Revision | Changes                            |
|-------------|----------|------------------------------------|
| 19-Mar-2015 | 1        | Initial release.                   |
| 09-Apr-2015 | 2        | Updated <a href="#">Figure 7</a> . |



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