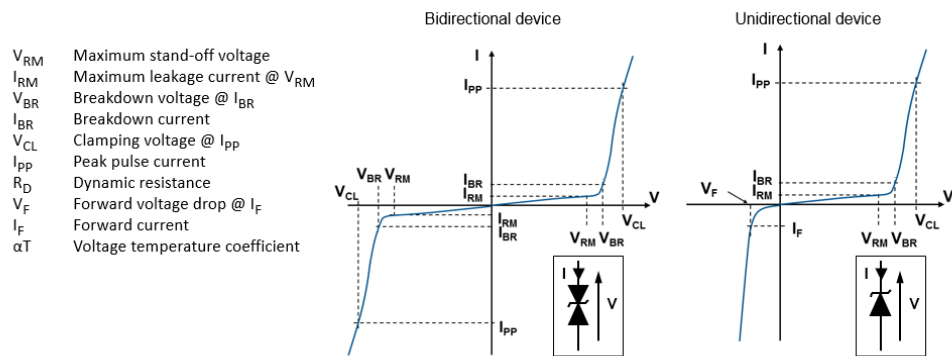


# 1 Characteristics

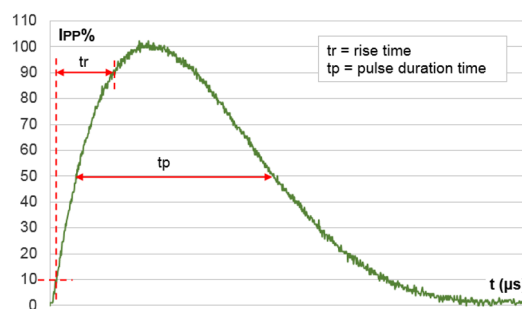
**Table 1. Absolute maximum ratings ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

| 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**



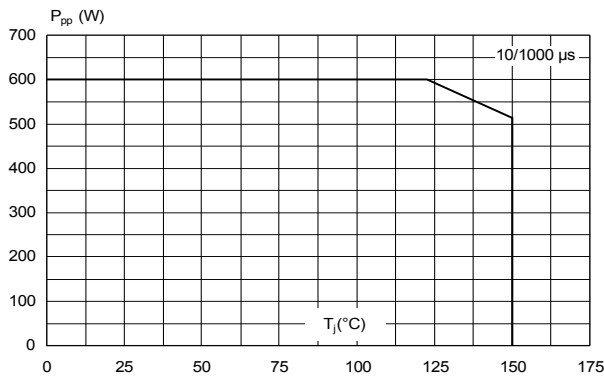
**Table 2. Electrical characteristics - parameter values ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)**

| 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.                       |
|             | $\mu\text{A}$            |                       | V   | V                          |      | mA | V                       | A              | $\Omega$ | V                    | A              | $\Omega$ | $10^{-4}/^{\circ}\text{C}$ |
| 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                       |

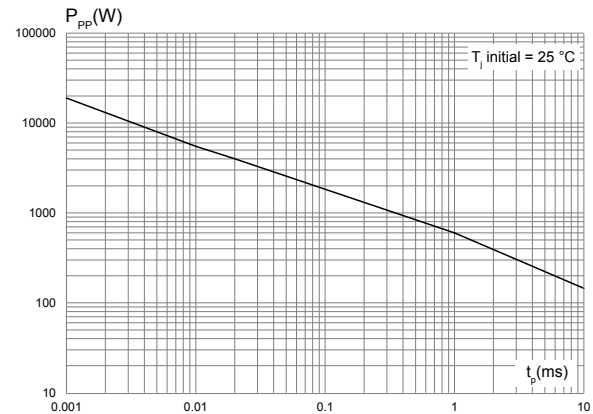
1. To calculate  $V_{BR}$  versus  $T_j$ :  $V_{BR}$  at  $T_j = V_{BR}$  at  $25\text{ }^{\circ}\text{C} \times (1 + \alpha T \times (T_j - 25))$
2. To calculate  $V_{CL}$  versus  $T_j$ :  $V_{CL}$  at  $T_j = V_{CL}$  at  $25\text{ }^{\circ}\text{C} \times (1 + \alpha T \times (T_j - 25))$
3. To calculate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

## 1.1 Characteristics (curves)

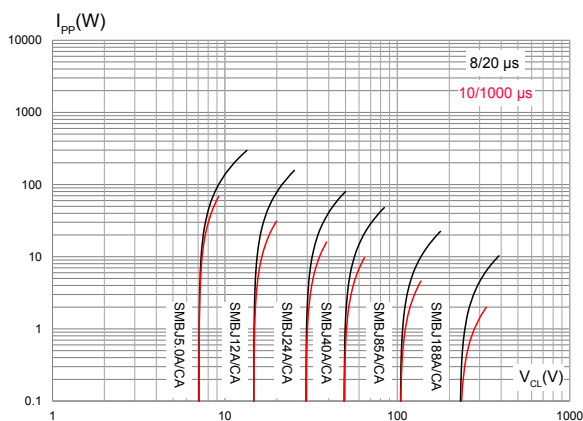
**Figure 3. Maximum peak power dissipation versus initial junction temperature**



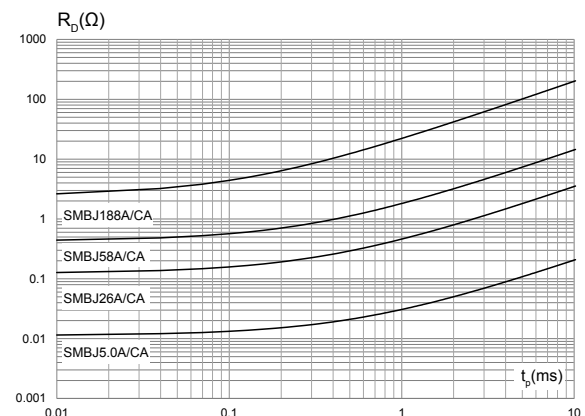
**Figure 4. Maximum peak pulse power versus exponential pulse duration**



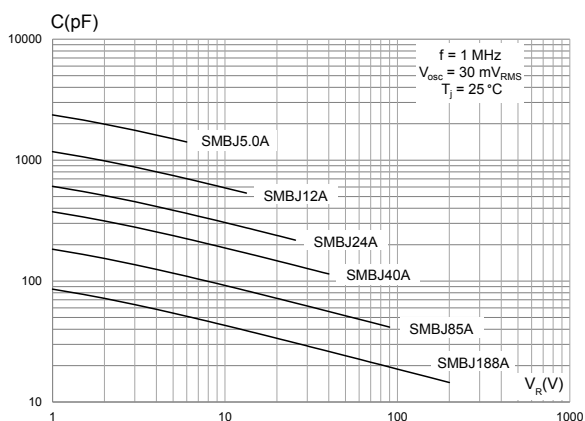
**Figure 5. Maximum peak pulse current versus clamping voltage**



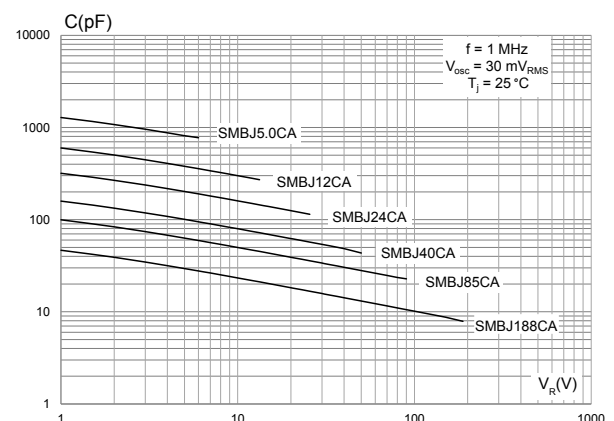
**Figure 6. Dynamic resistance versus pulse duration**

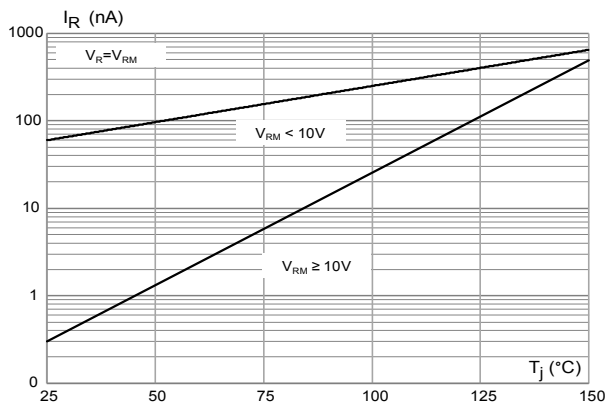
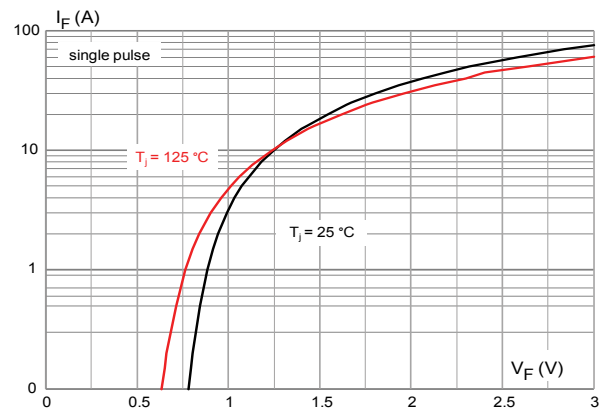
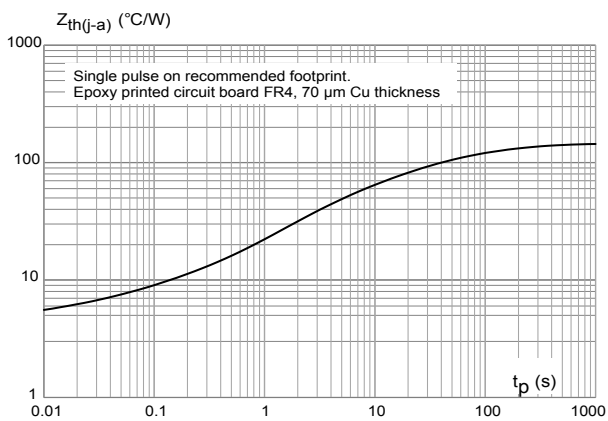
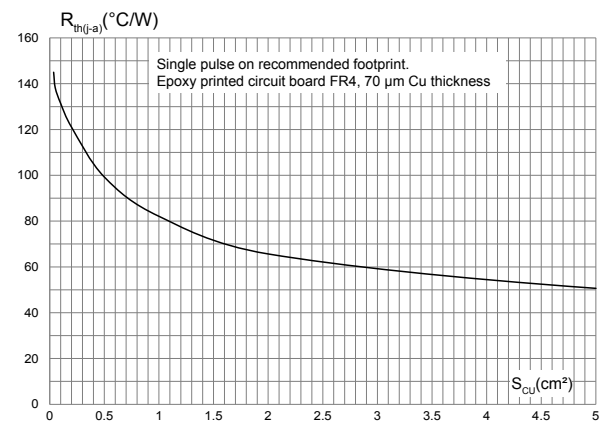


**Figure 7. Junction capacitance versus reverse applied voltage (unidirectional types)**



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



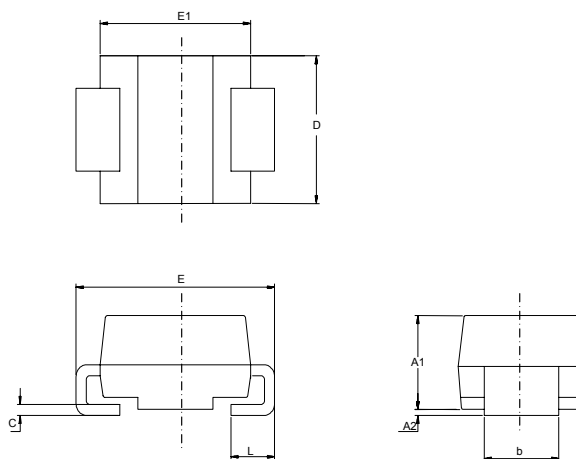
**Figure 9. Leakage current versus junction temperature**

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

### 2.1 SMB package information

**Figure 13. SMB package outline**

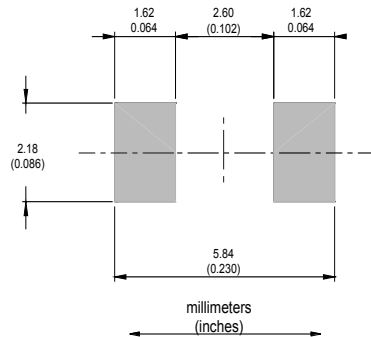


**Table 3. SMB package mechanical data**

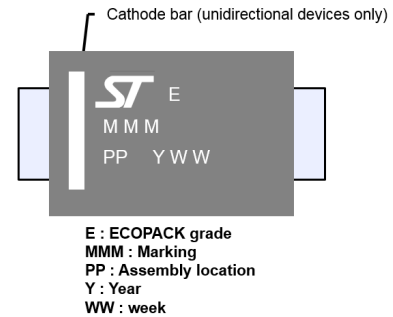
| Ref. | Dimensions  |      |                       |        |
|------|-------------|------|-----------------------|--------|
|      | Millimeters |      | Inches <sup>(1)</sup> |        |
|      | Min.        | Max. | Min.                  | Max.   |
| A1   | 1.90        | 2.45 | 0.0748            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

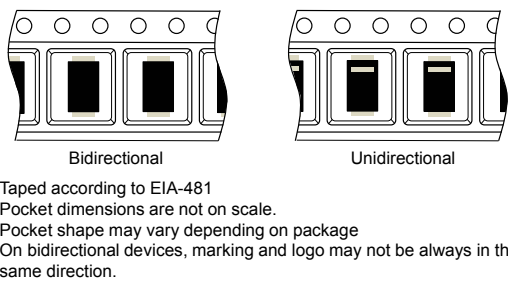
**Figure 14. SMB recommended footprint**



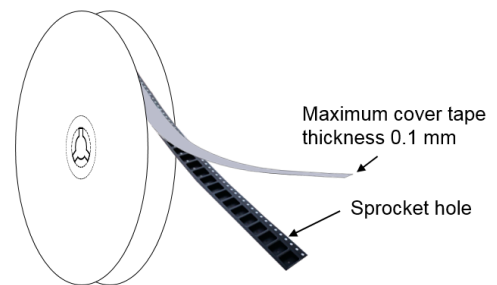
**Figure 15. Marking layout**



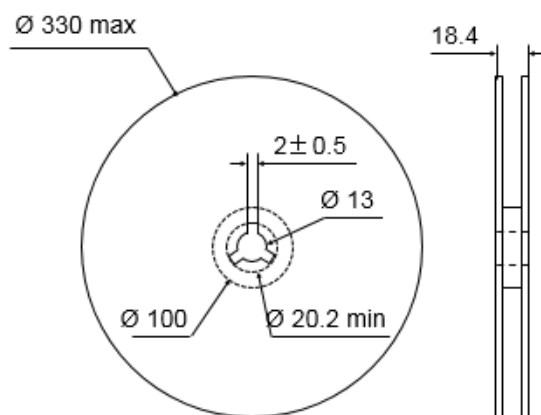
**Figure 16. Package orientation in reel**



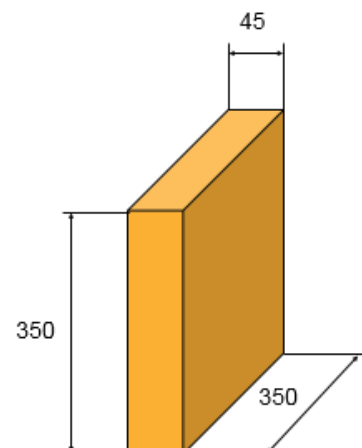
**Figure 17. Tape and reel orientation**

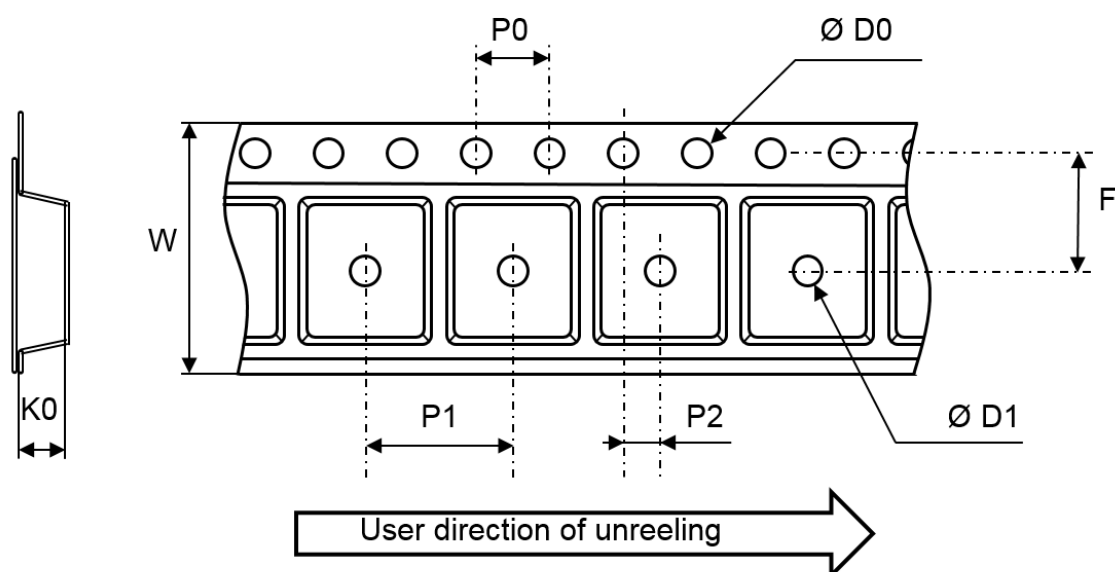


**Figure 18. Reel dimensions (mm)**



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



**Figure 20. Tape and reel outline**


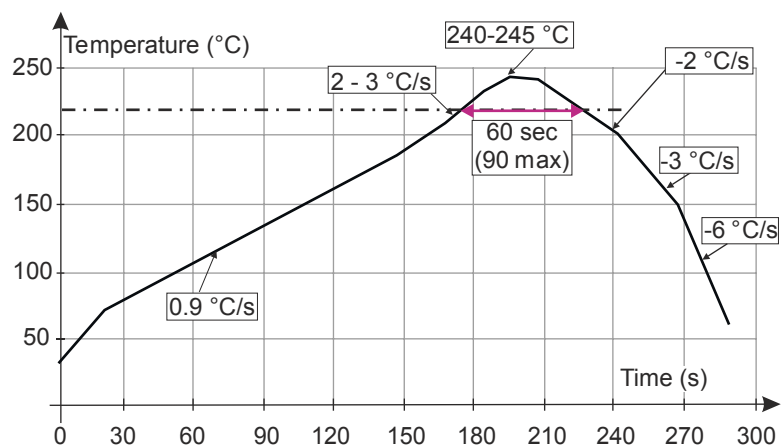
Note: Pocket dimensions are not on scale  
Pocket shape may vary depending on package

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

| Ref.             | Dimensions  |      |      |
|------------------|-------------|------|------|
|                  | Millimeters |      |      |
|                  | Min.        | Typ. | Max. |
| $\varnothing D0$ | 1.5         | 1.55 | 1.6  |
| $\varnothing D1$ | 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

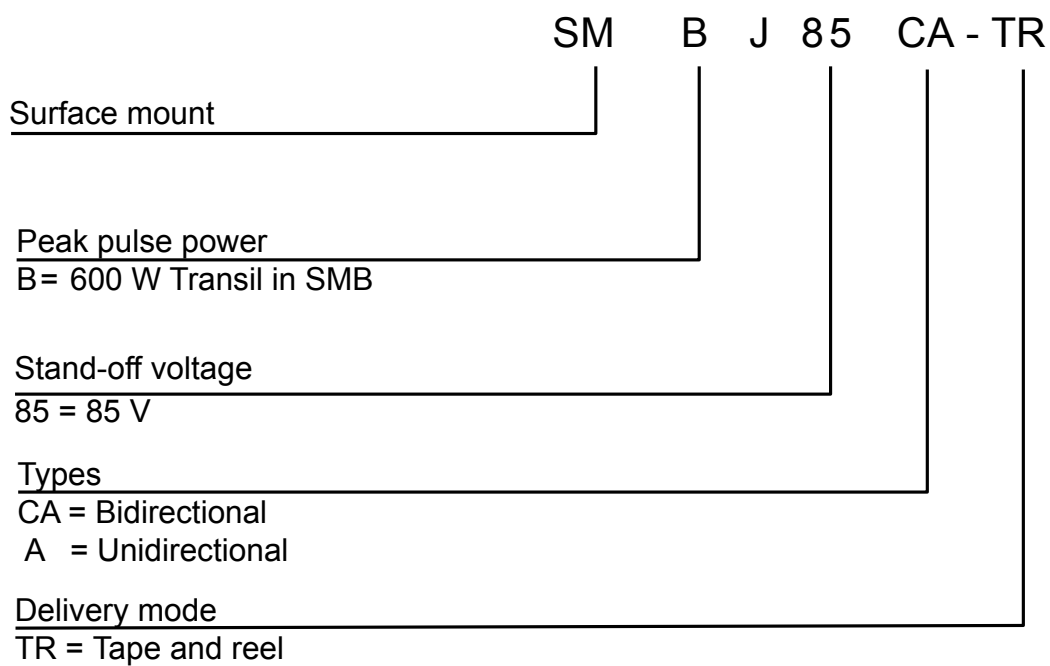


Table 5. Ordering information

| 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.<br>Minor text changes.                                                                           |

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