

Description

The SMM4F Transil serie has been designed to protect sensitive equipment against electro-static discharges according to IEC 61000-4-2, MIL STD 883 Method 3015, and electrical over stress such as IEC 61000-4-4 and 5. They are generally for surges below 400 W 10/1000 μ s.

This planar technology makes it compatible with high-end equipment and SMPS where low leakage current and high junction temperature are required to provide reliability and stability over time. Their low clamping voltages provide a better safety margin to protect sensitive circuits with extended life time expectancy.

Packaged in STmite Flat, this minimizes PCB space consumption (footprint in accordance with IPC 7531 standard). Transil is a trademark of STMicroelectronics.

Features

- Typical peak pulse power:
 - 400 W (10/1000 μ s)
 - 2.4 kW (8/20 μ s)
- Stand-off voltage range: from 5 V to 33 V
- Unidirectional type
- Low leakage current:
 - 0.2 μ A at 25 °C
 - 1 μ A at 85 °C
- Operating T_j max: 175 °C
- JEDEC registered package outline
- RoHS package
- Halogen free molding compound

Complies with the following standards

- IEC 61000-4-2 level 4:
 - 15 kV (air discharge)
 - 8 kV (contact discharge)
- MIL STD 883G-Method 3015-7: class3
 - 25 kV (human body model)

1 Characteristics

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

| Symbol | Parameter | Value | Unit | |
|-----------|--|---|------|---|
| V_{PP} | Peak pulse voltage (IEC 61000-4-2 contact discharge) | 30 | kV | |
| P_{PP} | Peak pulse power dissipation | $T_j \text{ initial} = T_{amb}$ | 400 | W |
| P | Power dissipation on infinite heatsink | $T_{amb} = 125\text{ °C}$ | 2.5 | W |
| I_{FSM} | Non repetitive surge peak forward current for unidirectional types | $t_p = 10\text{ ms}$ $T_j \text{ initial} = T_{amb}$ | 30 | A |
| T_{stg} | Storage temperature range | -65 to +175 | °C | |
| T_j | Operating junction temperature range | -55 to +175 | °C | |
| T_L | Maximum lead temperature for soldering during 10 s | 260 | °C | |

Table 2: Thermal resistances

| Symbol | Parameter | Value | Unit |
|---------------|--|-------|------|
| $R_{th(j-l)}$ | Junction to leads | 20 | °C/W |
| $R_{th(j-a)}$ | Junction to ambient on PCB with recommended pad layout | 250 | |

Figure 1: Electrical characteristics - parameter definitions ($T_{amb} = 25\text{ °C}$)

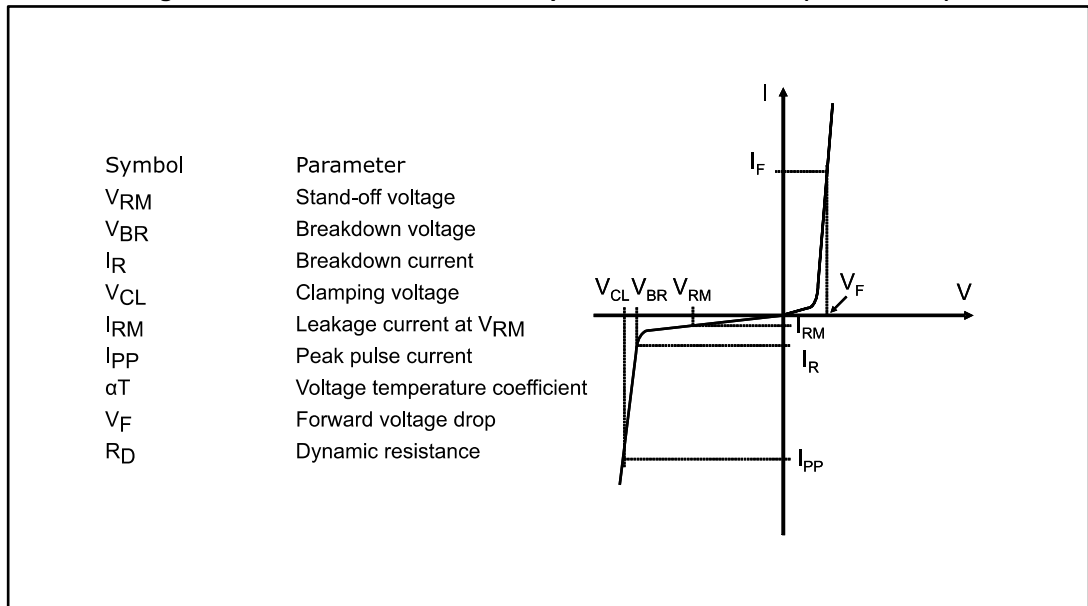


Table 3: Electrical characteristics - parameter values (T_{amb} = 25 °C)

| Type | I _{RM} max. at V _{RM} | | | V _{BR} at I _R ⁽¹⁾ | | | | V _{CL} at I _{PP} 10/1000 μs | | | R _D ⁽²⁾ 10/1000 μs | V _{CL} at I _{PP} 8/20 μs | | RD 8/20 μs ⁽²⁾ | αT ⁽³⁾ |
|-----------|---|-------|-----|--|-------|------|----|---|------|-------|--|--|-------|---------------------------|-------------------|
| | 25 °C | 85 °C | | Min. | Typ. | Max. | | Max. | | | Max. | | | | Max. |
| | μA | | V | V | | | mA | V | A | Ω | V | A | Ω | 10 ⁻⁴ /°C | |
| SMM4F5.0A | 10 | 50 | 5.0 | 6.46 | 6.80 | 7.14 | 10 | 9.2 | 43.5 | 0.047 | 13.4 | 179 | 0.035 | 5.7 | |
| SMM4F6.0A | 10 | 50 | 6.0 | 6.65 | 7.00 | 7.35 | 10 | 10.3 | 38.8 | 0.076 | 13.7 | 175 | 0.036 | 5.9 | |
| SMM4F6.5A | 10 | 50 | 6.5 | 7.13 | 7.50 | 7.88 | 10 | 11.2 | 37.5 | 0.093 | 14.5 | 166 | 0.039 | 6.1 | |
| SMM4F8.5A | 10 | 50 | 8.5 | 9.5 | 10.0 | 10.5 | 1 | 14.4 | 27.7 | 0.141 | 19.5 | 140 | 0.064 | 7.3 | |
| SMM4F10A | 0.2 | 1 | 10 | 11.4 | 12.0 | 12.6 | 1 | 17.0 | 23.5 | 0.187 | 21.7 | 127 | 0.071 | 7.8 | |
| SMM4F12A | 0.2 | 1 | 12 | 13.3 | 14.0 | 14.7 | 1 | 19.9 | 20.1 | 0.259 | 25.3 | 112 | 0.094 | 8.3 | |
| SMM4F13A | 0.2 | 1 | 13 | 14.3 | 15.0 | 15.8 | 1 | 21.5 | 18.6 | 0.309 | 27.2 | 106 | 0.108 | 8.4 | |
| SMM4F15A | 0.2 | 1 | 15 | 17.1 | 18.0 | 18.9 | 1 | 24.4 | 16.4 | 0.335 | 32.5 | 90 | 0.150 | 8.8 | |
| SMM4F18A | 0.2 | 1 | 18 | 20.9 | 22.0 | 23.1 | 1 | 29.2 | 14.0 | 0.436 | 39.3 | 76 | 0.214 | 9.2 | |
| SMM4F20A | 0.2 | 1 | 20 | 22.8 | 24.0 | 25.2 | 1 | 32.4 | 12.0 | 0.600 | 42.8 | 70 | 0.250 | 9.4 | |
| SMM4F24A | 0.2 | 1 | 24 | 26.6 | 28.01 | 29.4 | 1 | 38.9 | 9.5 | 1.00 | 50 | 61 | 0.338 | 9.6 | |
| SMM4F26A | 0.2 | 1 | 26 | 28.5 | 30.0 | 31.5 | 1 | 42.1 | 9.0 | 1.18 | 53.5 | 58 | 0.380 | 9.7 | |
| SMM4F28A | 0.2 | 1 | 28 | 31.4 | 33.0 | 34.7 | 1 | 45.4 | 8.0 | 1.34 | 59.0 | 53 | 0.456 | 9.8 | |
| SMM4F33A | 0.2 | 1 | 33 | 37.1 | 39.0 | 41.0 | 1 | 53.3 | 7.0 | 1.76 | 69.7 | 45 | 0.636 | 10.0 | |

Notes:

(1) Pulse test: t_p < 50 ms.

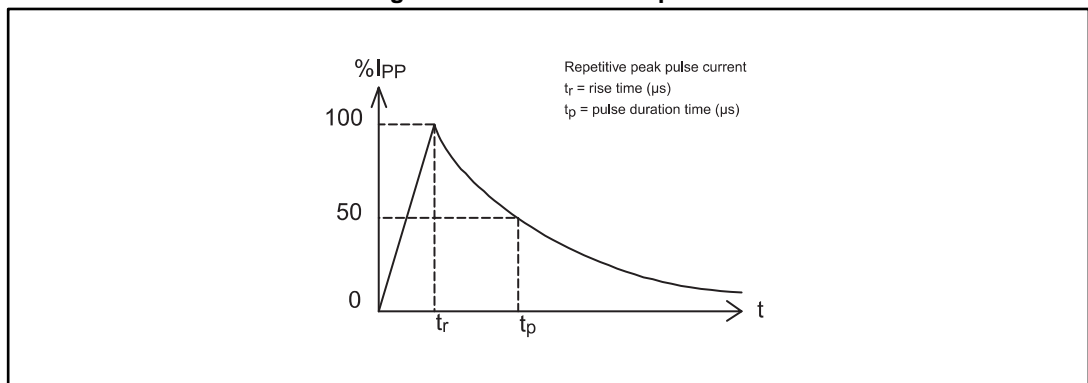
(2) To calculate maximum clamping voltage at other surge currents, use the following formula:

$$V_{CLmax} = R_D \times I_{PP} + V_{BRmax}$$

(3) To calculate V_{BR} versus junction temperature, use the following formula:

$$V_{BR} \text{ at } T_j = V_{BR} @ 25 \text{ °C} \times (1 + \alpha T \times (T_j - 25))$$

Figure 2: Definition of I_{PP} pulse



1.1 Characteristics (curves)

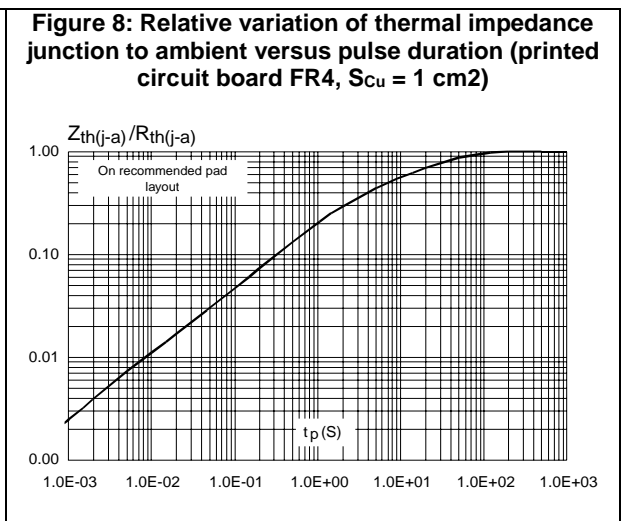
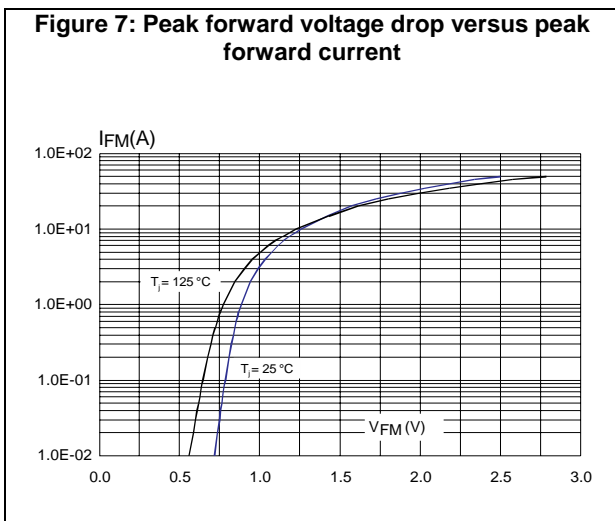
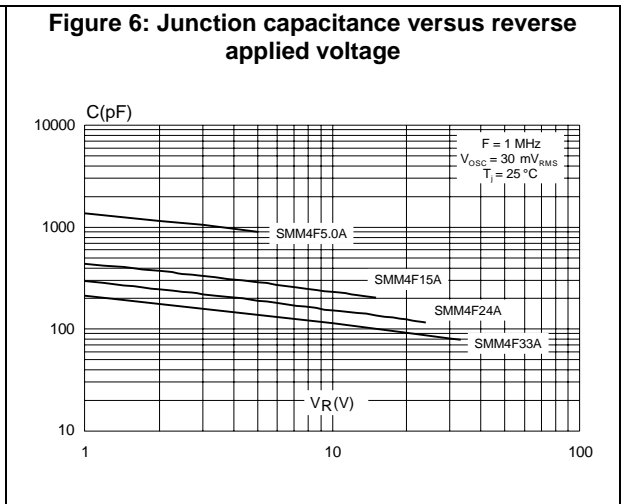
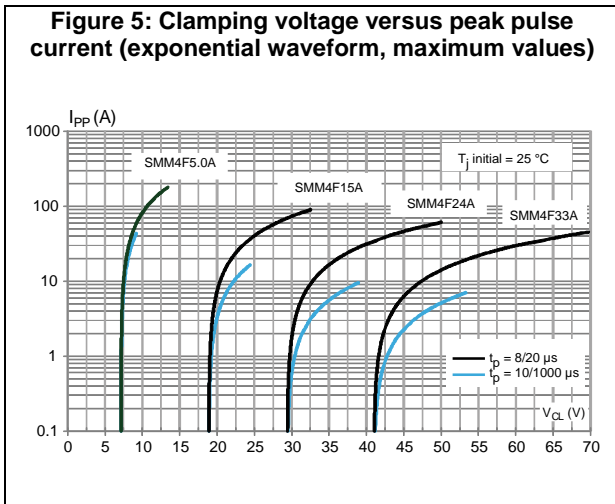
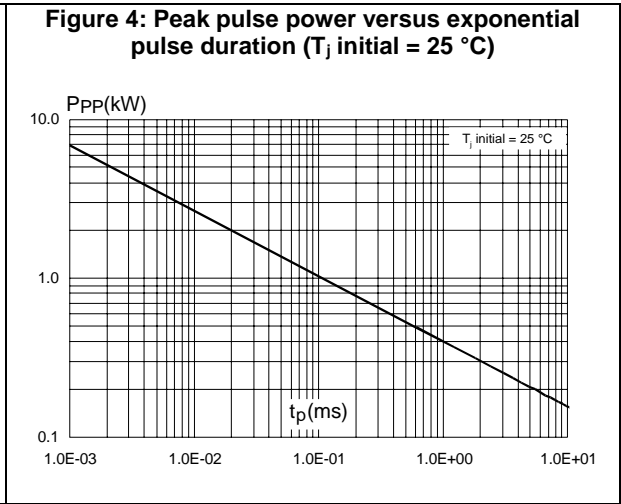
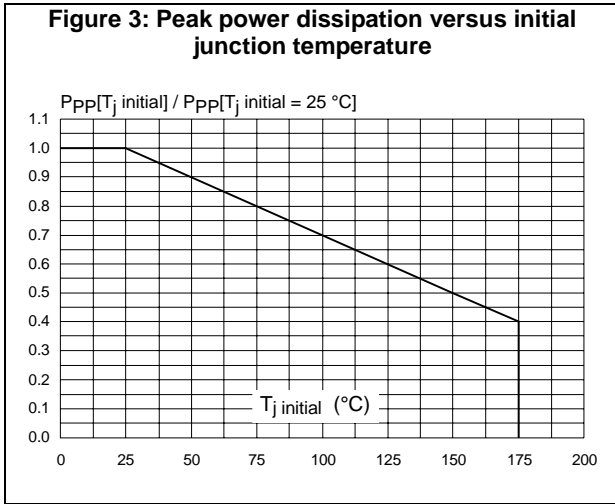


Figure 9: Thermal resistance junction to ambient versus copper surface under each lead (printed circuit board FR4, $e_{Cu} = 35 \mu m$)

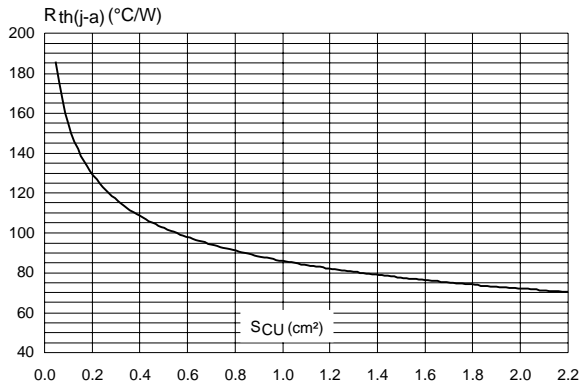
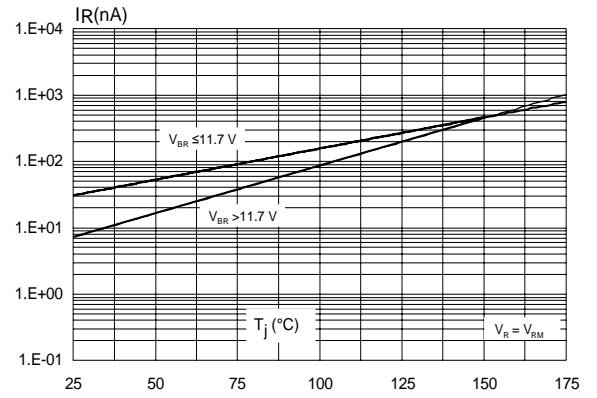


Figure 10: Leakage current versus junction temperature (typical values)



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 DO216-AA Flat 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 STmite Flat package information

Figure 11: STmite Flat package outline

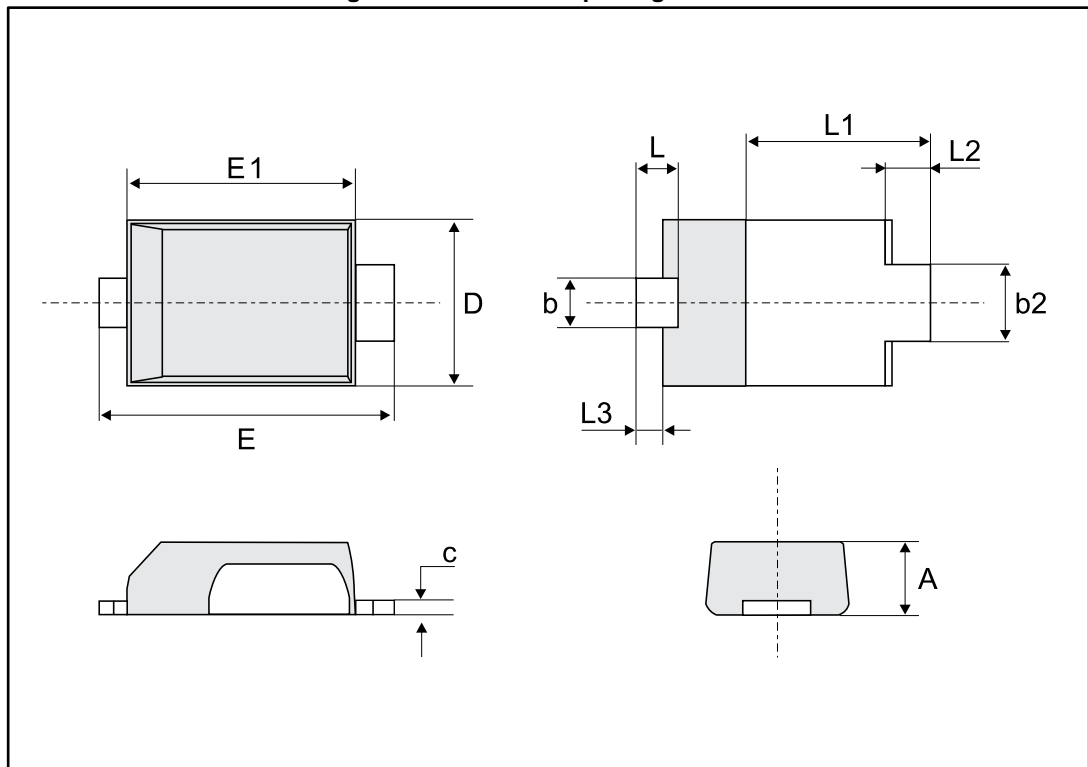


Table 4: STmite Flat mechanical data

| Ref. | Dimensions | | | | | |
|------|-------------|------|------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 0.80 | 0.85 | 0.95 | 0.031 | 0.033 | 0.037 |
| b | 0.40 | 0.55 | 0.65 | 0.016 | 0.022 | 0.026 |
| b2 | 0.70 | 0.85 | 1.00 | 0.027 | 0.033 | 0.039 |
| c | 0.10 | 0.15 | 0.25 | 0.004 | 0.006 | 0.009 |
| D | 1.75 | 1.90 | 2.05 | 0.069 | 0.075 | 0.081 |
| E | 3.60 | 3.80 | 3.90 | 0.142 | 0.150 | 0.154 |
| E1 | 2.80 | 2.95 | 3.10 | 0.110 | 0.116 | 0.122 |
| L | 0.50 | 0.55 | 0.80 | 0.020 | 0.022 | 0.031 |
| L1 | 2.10 | 2.40 | 2.60 | 0.083 | 0.094 | 0.102 |
| L2 | 0.45 | 0.60 | 0.75 | 0.018 | 0.024 | 0.030 |
| L3 | 0.20 | 0.35 | 0.50 | 0.008 | 0.014 | 0.020 |

Figure 12: Footprint recommendations, dimensions in mm (inches)

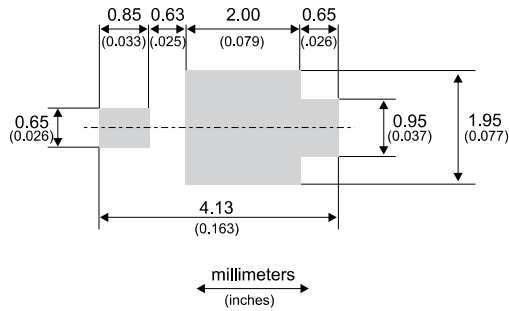


Figure 13: Marking layout (refer to ordering information table for marking)

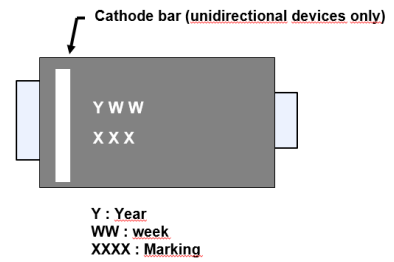
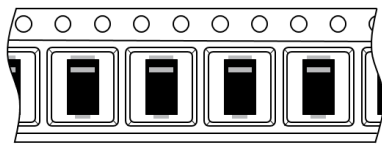


Figure 14: Package orientation in reel



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

Figure 15: Tape and reel orientation

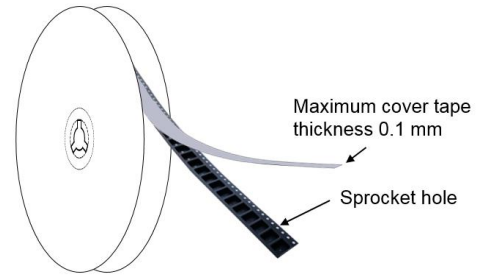


Figure 16: Reel dimensions (mm)

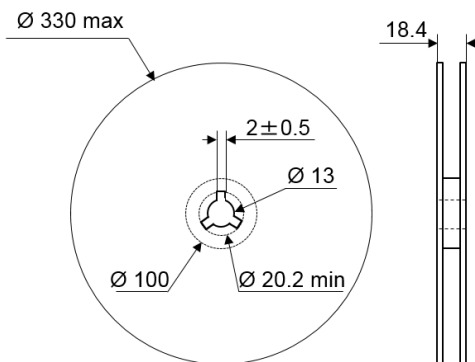


Figure 17: Inner box dimensions (mm)

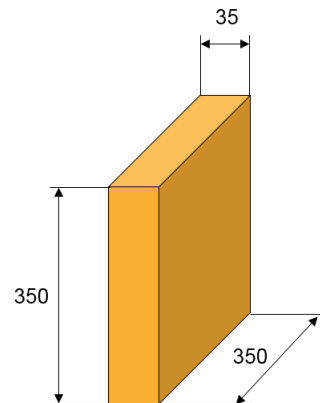


Figure 18: Tape and reel outline

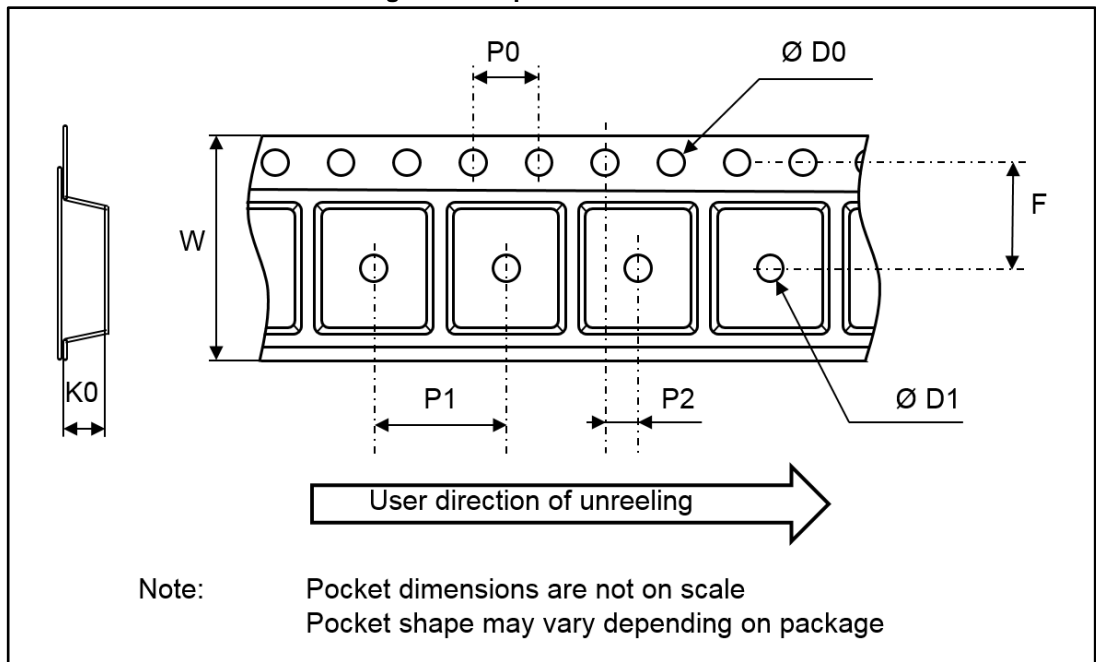


Table 5: Tape and reel mechanical data

| Ref. | Dimensions | | |
|------|-------------|------|------|
| | Millimeters | | |
| | Min. | Typ. | Max. |
| P0 | 3.9 | 4 | 4.1 |
| P1 | 3.9 | 4 | 4.1 |
| P2 | 1.9 | 2 | 2.1 |
| ØD0 | 1.5 | 1.55 | 1.6 |
| ØD1 | 1.5 | | |
| F | 5.2 | 5.25 | 5.3 |
| K0 | 1.2 | 1.3 | 1.4 |
| W | 11.7 | 12 | 12.3 |

3 Ordering information

Figure 19: Ordering information scheme

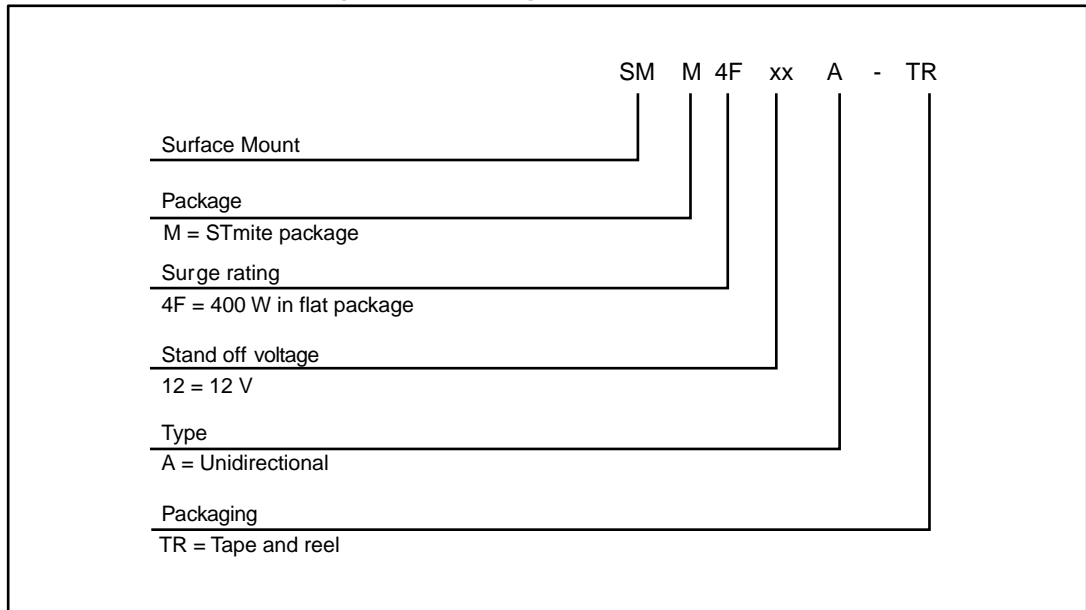


Table 6: Ordering information

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|-------------|-------------------------------|-------------|--------|-----------|---------------|
| SMM4FxxA-TR | See Table 6 . | STmite Flat | 16 mg | 12000 | Tape and reel |

Table 7: Marking

| Type | Marking |
|--------------|---------|
| SMM4F5.0A-TR | 4UA |
| SMM4F6.0A-TR | 4UB |
| SMM4F6.5A-TR | 4UC |
| SMM4F8.5A-TR | 4UD |
| SMM4F10A-TR | 4UE |
| SMM4F12A-TR | 4UF |
| SMM4F13A-TR | 4UG |
| SMM4F15A-TR | 4UH |
| SMM4F18A-TR | 4UJ |
| SMM4F20A-TR | 4UK |
| SMM4F24A-TR | 4UM |
| SMM4F26A-TR | 4UN |
| SMM4F28A-TR | 4UO |
| SMM4F33A-TR | 4UQ |

4 Revision history

Table 8: Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 29-Nov-2007 | 1 | First issue. |
| 19-Dec-2007 | 2 | Updated I_{PP} and R_D parameters in columns 10 and 11 of <i>Table 4</i> . |
| 19-Aug-2014 | 3 | Updated package name. |
| 19-Jan-2017 | 4 | Updated cover page and <i>Table 4</i> . |

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