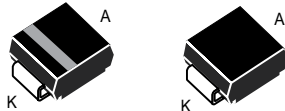


High junction temperature Transil™



Unidirectional Bidirectional
SMA
(JEDEC DO-214AA)

Features

- Peak pulse power:
 - 600 W (10/1000 μ s)
 - 4 kW (8/20 μ s)
- Stand-off voltage range: from 5 V to 188 V
- Unidirectional and bidirectional types
- 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
- Complies with the following standard: IEC 61000-4-2 level 4:
 - \pm 15 kV (air discharge)
 - \pm 8 kV (contact discharge)
- Complies with the following standard: MIL STD 883G, method 3015-7, class 3B:
 - \pm 25 kV HBM (human body model)

Description

The SMA6J Transil series has been designed to protect sensitive equipment against electro-static discharges according to IEC 61000-4-2, MIL STD 883 Method 3015, and electrical overstress such as IEC 61000-4-4 and 5. They are generally for surges below 600 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 SMA, which minimizes PCB space consumption (SMA footprint in accordance with IPC 7531 standard).

Transil™ is a trademark of STMicroelectronics.

Product status link

[SMA6J](#)

1 Characteristics

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

| Symbol | Parameter | | Value | Unit |
|-----------|----------------------------------------------------|----------------------------------------|-------------|--------------------|
| P_{PP} | Peak pulse power dissipation | $T_j \text{ initial} = T_{amb}$ | 600 | W |
| P | Power dissipation on infinite heatsink | $T_{amb} = 55\text{ }^{\circ}\text{C}$ | 4 | W |
| T_{stg} | Storage temperature range | | -65 to +175 | $^{\circ}\text{C}$ |
| T_j | Operating junction temperature range | | -55 to +175 | $^{\circ}\text{C}$ |
| T_L | Maximum lead temperature for soldering during 10 s | | 260 | $^{\circ}\text{C}$ |

Table 2. Thermal resistance

| Symbol | Parameter | Value | Unit |
|---------------|------------------------------------------------------------------|-------|-----------------------------|
| $R_{th(j-l)}$ | Junction to leads | 30 | $^{\circ}\text{C}/\text{W}$ |
| $R_{th(j-a)}$ | Junction to ambient on printed circuit on recommended pad layout | 120 | $^{\circ}\text{C}/\text{W}$ |

Figure 1. Electrical characteristics - parameter definitions

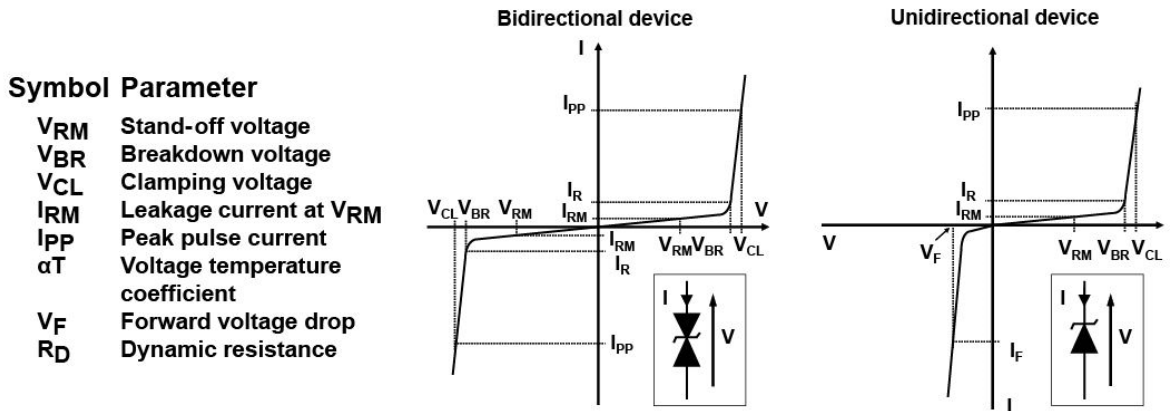


Figure 2. Pulse definition for electrical characteristics

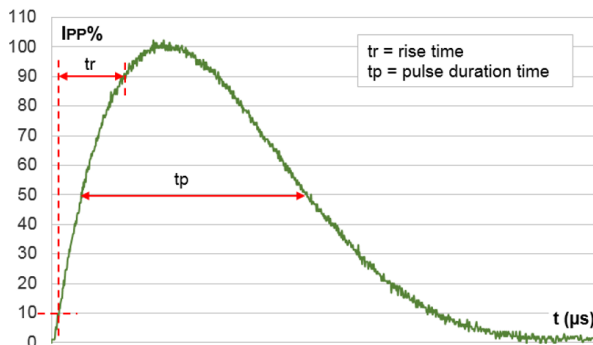


Table 3. Electrical characteristics parameter values ($T_{amb} = 25\text{ °C}$, unless otherwise specified)

| Order code | I_{RM} max at V_{RM} | | | V_{BR} at $I_R^{(1)}$ | | | | 10 / 1000 μ s | | | 8 / 20 μ s | | | $\alpha T^{(2)}$ |
|--------------|--------------------------|-------|-----|-------------------------|------|------|----|-------------------|------------------|----------|----------------|----------|----------|---------------------|
| | 25 °C | 85 °C | | Min. | Typ. | Max. | | V_{CL} | I_{PP} | R_D | V_{CL} | I_{PP} | R_D | |
| | | | | | | | | Max. | | Max. | Max. | | | Max. |
| | μ A | | V | V | | | mA | V ⁽³⁾ | A ⁽⁴⁾ | Ω | V | A | Ω | $10^{-4}/\text{°C}$ |
| SMA6J5.0A/CA | 20 | 50 | 5.0 | 6.40 | 6.74 | 7.07 | 10 | 9.1 | 68 | 0.029 | 14.4 | 275 | 0.027 | 5.7 |
| SMA6J6.0A/CA | 20 | 50 | 6.0 | 6.70 | 7.05 | 7.41 | 10 | 9.5 | 61 | 0.034 | 14.8 | 270 | 0.027 | 5.9 |
| SMA6J6.5A/CA | 20 | 50 | 6.5 | 7.20 | 7.58 | 7.96 | 10 | 10.2 | 56 | 0.040 | 15.2 | 266 | 0.027 | 6.1 |
| SMA6J8.5A/CA | 20 | 50 | 8.5 | 9.4 | 9.9 | 10.4 | 1 | 13.3 | 41.7 | 0.070 | 19.5 | 205 | 0.044 | 7.3 |
| SMA6J10A/CA | 0.2 | 1 | 10 | 11.1 | 11.7 | 12.3 | 1 | 15.7 | 37 | 0.093 | 21.7 | 184 | 0.051 | 7.8 |
| SMA6J12A/CA | 0.2 | 1 | 12 | 13.3 | 14.0 | 14.7 | 1 | 18.8 | 31 | 0.133 | 25.3 | 157 | 0.068 | 8.3 |
| SMA6J13A/CA | 0.2 | 1 | 13 | 14.4 | 15.2 | 15.9 | 1 | 20.4 | 29 | 0.154 | 27.2 | 147 | 0.076 | 8.4 |
| SMA6J15A/CA | 0.2 | 1 | 15 | 16.7 | 17.6 | 18.5 | 1 | 23.6 | 25.1 | 0.206 | 32.5 | 123 | 0.114 | 8.8 |
| SMA6J18A/CA | 0.2 | 1 | 18 | 20.0 | 21.1 | 22.1 | 1 | 28.3 | 21.5 | 0.288 | 39.3 | 102 | 0.168 | 9.2 |
| SMA6J20A/CA | 0.2 | 1 | 20 | 22.2 | 23.4 | 24.5 | 1 | 31.4 | 19.4 | 0.354 | 42.8 | 93 | 0.196 | 9.4 |
| SMA6J24A/CA | 0.2 | 1 | 24 | 26.7 | 28.1 | 29.5 | 1 | 37.8 | 16 | 0.516 | 50 | 80 | 0.256 | 9.6 |
| SMA6J26A/CA | 0.2 | 1 | 26 | 28.9 | 30.4 | 31.9 | 1 | 40.9 | 14.9 | 0.600 | 53.5 | 75 | 0.288 | 9.7 |
| SMA6J28A/CA | 0.2 | 1 | 28 | 31.1 | 32.7 | 34.4 | 1 | 44.0 | 13.8 | 0.697 | 59 | 68 | 0.363 | 9.8 |
| SMA6J33A/CA | 0.2 | 1 | 33 | 36.7 | 38.6 | 40.6 | 1 | 51.9 | 11.8 | 0.963 | 69 | 57 | 0.512 | 10.0 |
| SMA6J40A/CA | 0.2 | 1 | 40 | 44.4 | 46.7 | 49.1 | 1 | 62.8 | 9.7 | 1.42 | 84 | 48 | 0.728 | 10.1 |
| SMA6J48A/CA | 0.2 | 1 | 48 | 53.3 | 56.1 | 58.9 | 1 | 75.4 | 8.1 | 2.04 | 100 | 40 | 1.03 | 10.3 |
| SMA6J58A/CA | 0.2 | 1 | 58 | 64.4 | 67.8 | 71.2 | 1 | 91.1 | 6.7 | 2.97 | 121 | 33 | 1.51 | 10.4 |
| SMA6J70A/CA | 0.2 | 1 | 70 | 77.8 | 81.9 | 86.0 | 1 | 110 | 5.5 | 4.38 | 146 | 27 | 2.22 | 10.5 |
| SMA6J85A/CA | 0.2 | 1 | 85 | 94 | 99 | 104 | 1 | 134 | 4.6 | 6.45 | 178 | 22.5 | 3.29 | 10.6 |
| SMA6J100A/CA | 0.2 | 1 | 100 | 111 | 117 | 123 | 1 | 157 | 3.8 | 9.03 | 212 | 19 | 4.69 | 10.7 |
| SMA6J130A/CA | 0.2 | 1 | 130 | 144 | 152 | 159 | 1 | 204 | 3 | 14.9 | 265 | 15 | 7.03 | 10.8 |
| SMA6J154A/CA | 0.2 | 1 | 154 | 171 | 180 | 189 | 1 | 242 | 2.4 | 22.1 | 317 | 12.6 | 10.2 | 10.8 |
| SMA6J170A/CA | 0.2 | 1 | 170 | 189 | 199 | 209 | 1 | 275 | 2.2 | 30.0 | 353 | 11.3 | 12.7 | 10.8 |
| SMA6J188A/CA | 0.2 | 1 | 188 | 209 | 220 | 231 | 1 | 328 | 2 | 48.5 | 388 | 10.3 | 15.2 | 10.8 |

1. Pulse test: $t_p < 50\text{ ms}$

2. To calculate V_{BR} or V_{CL} versus junction temperature, use the following formulas:

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

3. To calculate maximum clamping voltage at other surge level, use the following formula:

- $V_{CLmax} = V_{BRmax} + R_D \times I_{PPappli}$ where $I_{PPappli}$ is the surge current in the application

4. Surge capability given for both directions for unidirectional and bidirectional types.

1.1 Characteristics (curves)

Figure 3. Peak power dissipation versus initial junction temperature

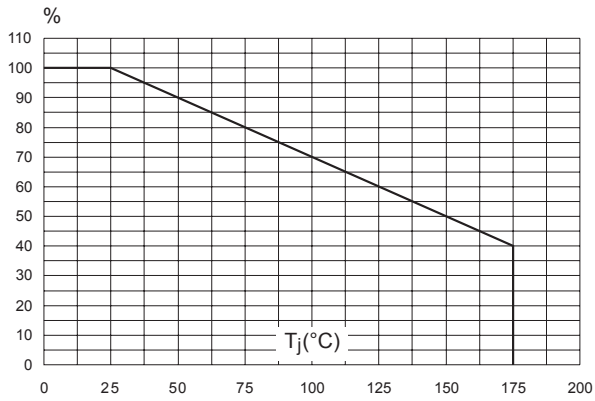


Figure 4. Peak pulse power versus exponential pulse duration ($T_{amb} = 25\text{ °C}$)

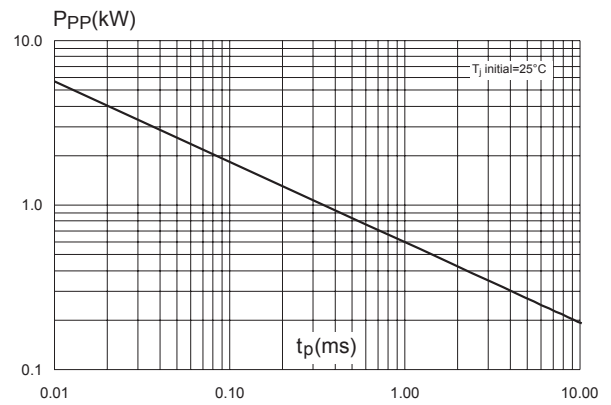


Figure 5. Clamping voltage versus peak pulse current (exponential waveform, maximum values)

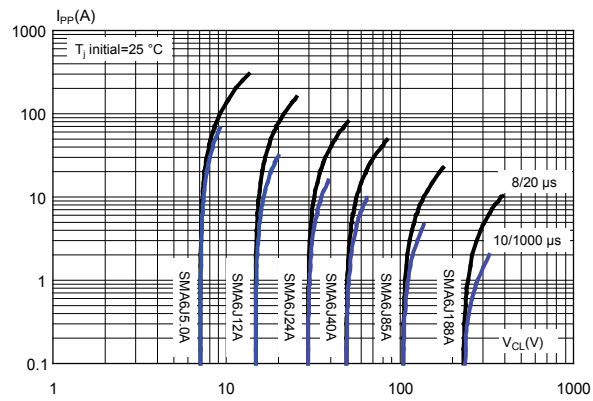


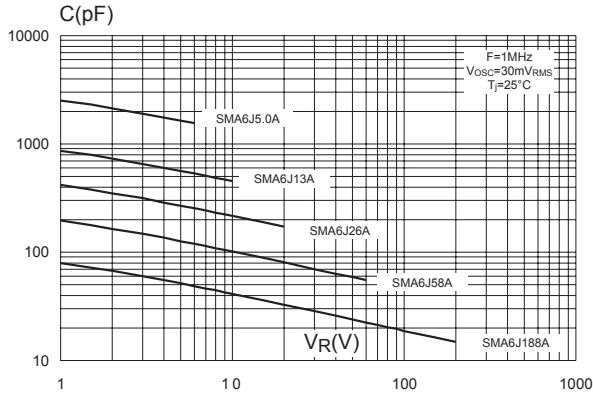
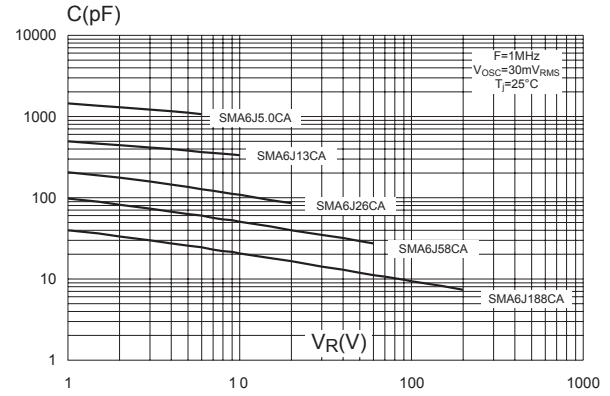
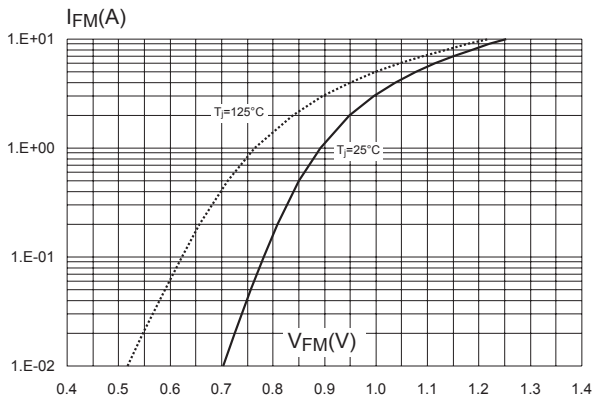
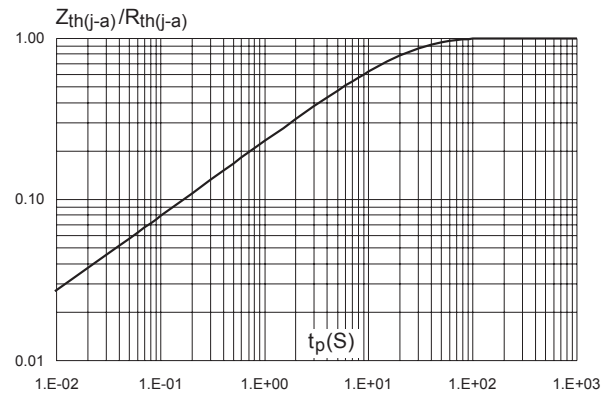
Figure 6. Junction capacitance versus reverse applied voltage (typical values) (SMA6JxxA)

Figure 7. Junction capacitance versus reverse applied voltage (typical values) (SMA6JxxCA)

Figure 8. Peak forward voltage drop versus peak forward current (typical values)

Figure 9. Relative variation of thermal impedance junction to ambient versus pulse duration (printed circuit board FR4, $S_{Cu} = 1 \text{ cm}^2$)


Figure 10. Thermal resistance junction to ambient versus copper surface under each lead (printed circuit board FR4, $\epsilon_{Cu} = 35 \mu\text{m}$)

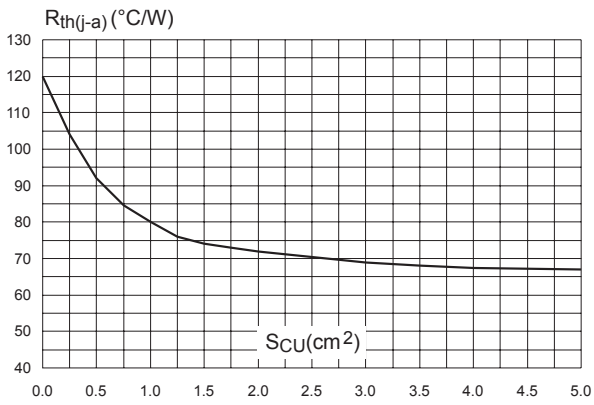
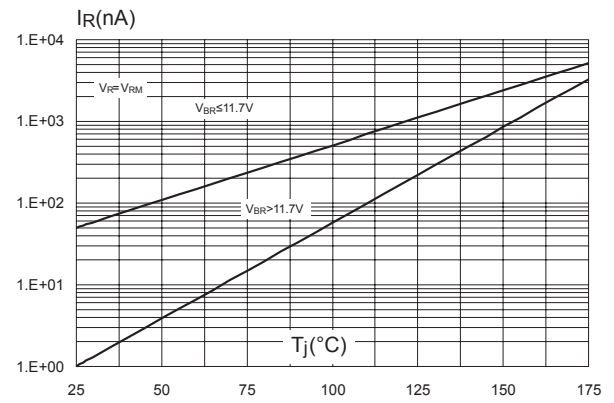


Figure 11. Leakage current versus junction temperature (typical values)



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.

2.1 SMA package information

- Case: JEDEC DO214-AA 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

Figure 12. SMA package outline

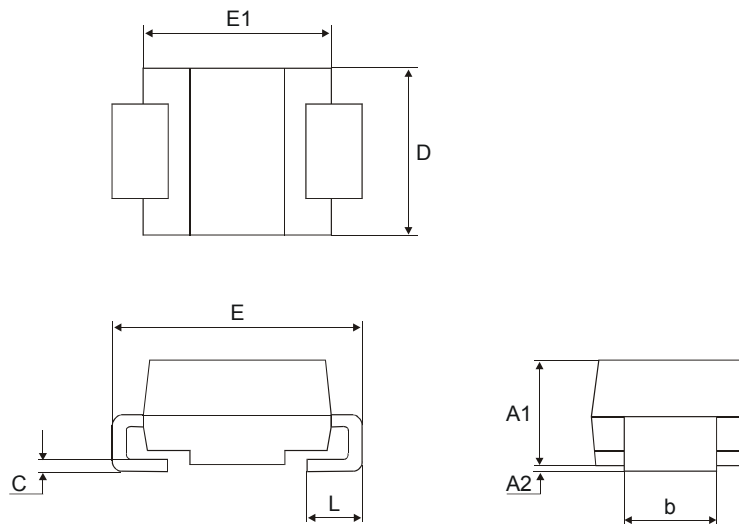
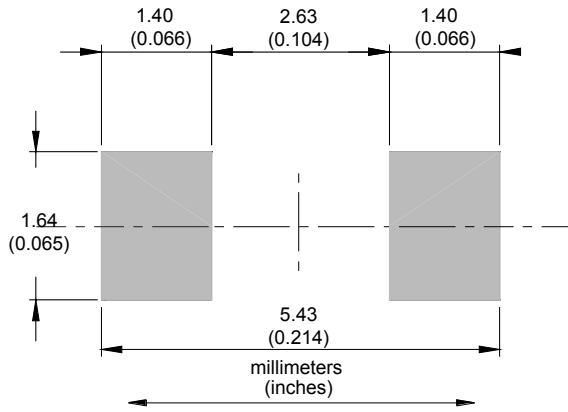
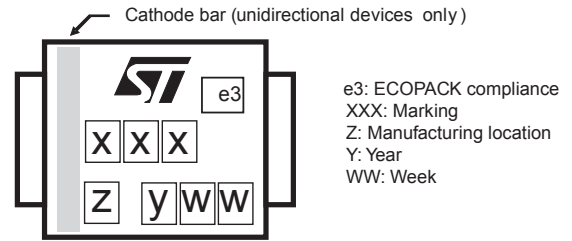


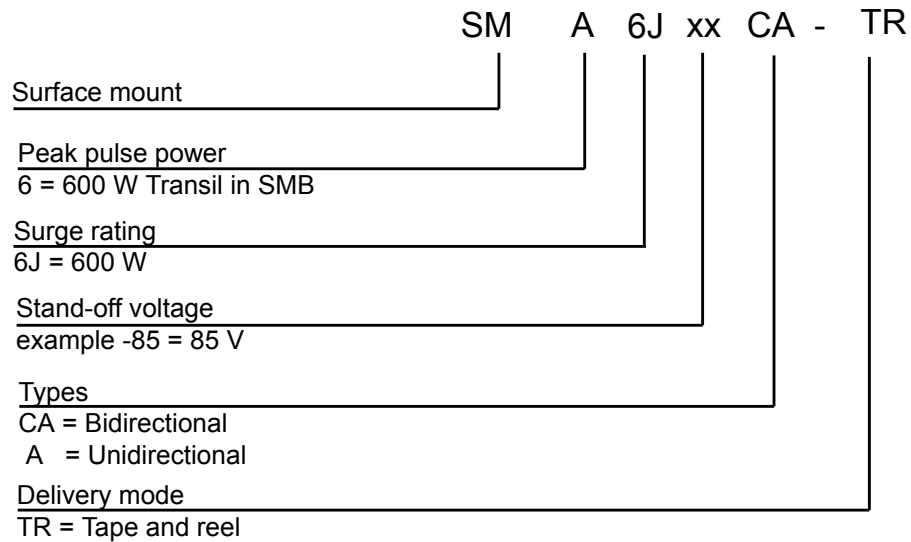
Table 4. SMA package mechanical data

| Ref. | Dimensions | | | |
|------|-------------|------|--------|--------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A1 | 1.90 | 2.45 | 0.0748 | 0.0964 |
| A2 | 0.05 | 0.20 | 0.0020 | 0.0079 |
| b | 1.25 | 1.65 | 0.0492 | 0.0649 |
| c | 0.15 | 0.40 | 0.0059 | 0.0157 |
| D | 2.25 | 2.90 | 0.0885 | 0.1141 |
| E | 4.80 | 5.35 | 0.1889 | 0.2106 |
| E1 | 3.95 | 4.60 | 0.1555 | 0.1811 |
| L | 0.75 | 1.50 | 0.0295 | 0.0591 |

Figure 13. SMA recommended footprint

Figure 14. Marking layout


Note: Marking layout can vary according to assembly location.

3 Ordering information

Figure 15. Ordering information scheme

Table 5. Ordering information

| Order code ⁽¹⁾ | Marking | Package | Weight | Base qty. | Delivery mode |
|---------------------------|------------------------|---------|---------|-----------|---------------|
| SMA6JxxA-TR | See Table 6. Marking . | SMA | 0.072 g | 5000 | Tape and reel |
| SMA6JxxCA-TR | | | | | |

1. xx indicates stand-off voltage

Table 6. Marking

| Type | Marking | Type | Marking |
|--------------|---------|---------------|---------|
| SMA6J5.0A-TR | 6UA | SMA6J5.0CA-TR | 6BA |
| SMA6J6.0A-TR | 6UB | SMA6J6.0CA-TR | 6BB |
| SMA6J6.5A-TR | 6UC | SMA6J6.5CA-TR | 6BC |
| SMA6J8.5A-TR | 6UD | SMA6J8.5CA-TR | 6BD |
| SMA6J10A-TR | 6UE | SMA6J10CA-TR | 6BE |
| SMA6J12A-TR | 6UF | SMA6J12CA-TR | 6BF |
| SMA6J13A-TR | 6UG | SMA6J13CA-TR | 6BG |
| SMA6J15A-TR | 6UH | SMA6J15CA-TR | 6BH |
| SMA6J18A-TR | 6UJ | SMA6J18CA-TR | 6BJ |
| SMA6J20A-TR | 6UK | SMA6J20CA-TR | 6BK |

| Type | Marking | Type | Marking |
|--------------|---------|---------------|---------|
| SMA6J24A-TR | 6UM | SMA6J24CA-TR | 6BM |
| SMA6J26A-TR | 6UN | SMA6J26CA-TR | 6BN |
| SMA6J28A-TR | 6UO | SMA6J28CA-TR | 6BO |
| SMA6J33A-TR | 6UQ | SMA6J33CA-TR | 6BQ |
| SMA6J40A-TR | 6UR | SMA6J40CA-TR | 6BR |
| SMA6J48A-TR | 6US | SMA6J48CA-TR | 6BS |
| SMA6J58A-TR | 6UT | SMA6J58CA-TR | 6BT |
| SMA6J70A-TR | 6UU | SMA6J70CA-TR | 6BU |
| SMA6J85A-TR | 6UV | SMA6J85CA-TR | 6BV |
| SMA6J100A-TR | 6UW | SMA6J100CA-TR | 6BW |
| SMA6J130A-TR | 6UX | SMA6J130CA-TR | 6BX |
| SMA6J154A-TR | 6UY | SMA6J154CA-TR | 6BY |
| SMA6J170A-TR | 6UZ | SMA6J170CA-TR | 6BZ |
| SMA6J188A-TR | 6UAA | SMA6J188CA-TR | 6BAA |

Revision history

Table 7. Document revision history

| Date | Revision | Changes |
|-------------|----------|-------------------------------------------------------------------------------------------------------------|
| 21-Feb-2007 | 1 | First issue. |
| 7-Nov-2007 | 2 | Updated Description. Improved readability of Ordering information scheme. Reformatted to current standards. |
| 04-Aug-2014 | 3 | Updated weight in Table 7. |
| 28-Oct-2015 | 4 | Updated Table 4 and Figure 3. |
| 04-Jul-2017 | 5 | Updated Table 4. |
| 22-Jan-2018 | 6 | Updated Table3. |
| 30-Aug-2018 | 7 | Updated Table 6. Marking . |

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