

## 1. General description

Planar passivated high commutation triac in a SOT223 surface mounted plastic package. This "series E" triac balances the requirements of commutation performance and gate sensitivity and is intended for interfacing with low power drivers and logic ICs including microcontrollers.

## 2. Features and benefits

- 3Q technology for improved noise immunity
- Direct triggering from low power drivers and logic ICs
- High commutation capability with sensitive gate
- High immunity to false turn-on by  $dV/dt$
- High voltage capability
- Planar passivated for voltage ruggedness and reliability
- Sensitive gate for easy logic level triggering
- Surface mountable package
- Triggering in three quadrants only

## 3. Applications

- General purpose motor control
- Small loads in washing machines
- Solenoid drivers

## 4. Quick reference data

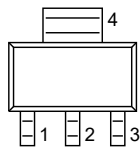
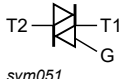
Table 1. Quick reference data

| Symbol                        | Parameter                            | Conditions   | Min | Typ | Max  | Unit             |
|-------------------------------|--------------------------------------|--|-----|-----|------|------------------|
| $V_{DRM}$                     | repetitive peak off-state voltage    |  | -   | -   | 800  | V                |
| $I_{T(RMS)}$                  | RMS on-state current                 | full sine wave; $T_{sp} \leq 106 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>        | -   | -   | 1    | A                |
| $I_{TSM}$                     | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$ ; $t_p = 16.7 \text{ ms}$   | -   | -   | 13.7 | A                |
|                               |                                      | full sine wave; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$ ; $t_p = 20 \text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a> | -   | -   | 12.5 | A                |
| $T_j$                         | junction temperature                 |  | -   | -   | 125  | $^\circ\text{C}$ |
| <b>Static characteristics</b> |                                      |  |     |     |      |                  |
| $I_{GT}$                      | gate trigger current                 | $V_D = 12 \text{ V}$ ; $I_T = 0.1 \text{ A}$ ; T2+ G+; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>                          | 1   | -   | 10   | mA               |

| Symbol                         | Parameter                             | Conditions  | Min | Typ | Max | Unit       |
|--------------------------------|---------------------------------------|---|-----|-----|-----|------------|
|                                |                                       | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2+ \text{ G-}; T_j = 25\text{ }^\circ\text{C};$ Fig. 9   | 1   | -   | 10  | mA         |
|                                |                                       | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2- \text{ G-}; T_j = 25\text{ }^\circ\text{C};$ Fig. 9   | 1   | -   | 10  | mA         |
| $I_H$                          | holding current                       | $V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C};$ Fig. 11  | -   | -   | 12  | mA         |
| $V_T$                          | on-state voltage                      | $I_T = 1.4\text{ A}; T_j = 25\text{ }^\circ\text{C};$ Fig. 12   | -   | 1.3 | 1.5 | V          |
| <b>Dynamic characteristics</b> |                                       |   |     |     |     |            |
| $dV_D/dt$                      | rate of rise of off-state voltage     | $V_{DM} = 536\text{ V}; T_j = 125\text{ }^\circ\text{C}; (V_{DM} = 67\% \text{ of } V_{DRM});$ exponential waveform; gate open circuit; Fig. 14           | 600 | -   | -   | V/ $\mu$ s |
| $dI_{com}/dt$                  | rate of change of commutating current | $V_D = 400\text{ V}; T_j = 125\text{ }^\circ\text{C}; I_{T(RMS)} = 1\text{ A};$ $dV_{com}/dt = 20\text{ V/s};$ (snubberless condition); gate open circuit | 2.5 | -   | -   | A/ms       |
|                                |                                       | $V_D = 400\text{ V}; T_j = 125\text{ }^\circ\text{C}; I_{T(RMS)} = 1\text{ A};$ $dV_{com}/dt = 10\text{ V/s};$ gate open circuit                          | 3.5 | -   | -   | A/ms       |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description     | Simplified outline  | Graphic symbol  |
|-----|--------|-----------------|---|---|
| 1   | T1     | main terminal 1 |  <p>SC-73 (SOT223)</p> |  <p>sym051</p> |
| 2   | T2     | main terminal 2 |   |   |
| 3   | G      | gate            |   |   |
| 4   | T2     | main terminal 2 |   |   |

## 6. Ordering information

Table 3. Ordering information

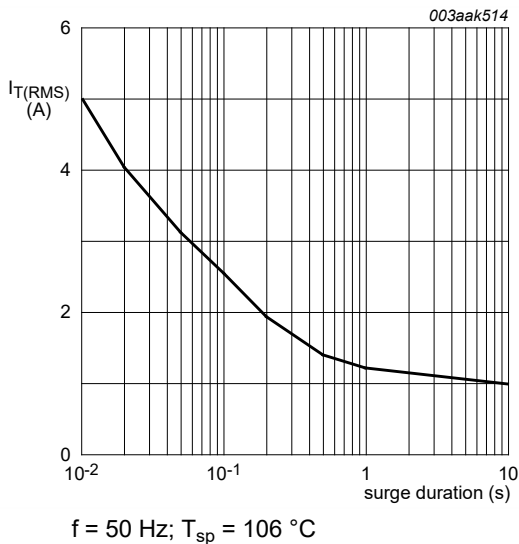
| Type number  | Package |  |         |
|--------------|---------|--|---------|
|              | Name    | Description  | Version |
| BTA201W-800E | SC-73   | plastic surface-mounted package with increased heatsink; 4 leads | SOT223  |

## 7. Limiting values

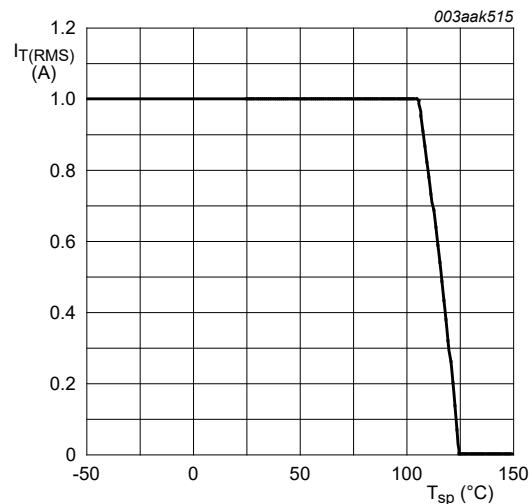
**Table 4. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol       | Parameter                            | Conditions   | Min | Max  | Unit                   |
|--------------|--------------------------------------|--|-----|------|------------------------|
| $V_{DRM}$    | repetitive peak off-state voltage    |  | -   | 800  | V                      |
| $I_{T(RMS)}$ | RMS on-state current                 | full sine wave; $T_{sp} \leq 106\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>       | -   | 1    | A                      |
| $I_{TSM}$    | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 16.7\text{ ms}$   | -   | 13.7 | A                      |
|              |                                      | full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a> | -   | 12.5 | A                      |
| $I^2t$       | $I^2t$ for fusing                    | $t_p = 10\text{ ms}$ ; SIN   | -   | 0.78 | $\text{A}^2\text{s}$   |
| $di_T/dt$    | rate of rise of on-state current     | $I_G = 0.2\text{ A}$   | -   | 100  | $\text{A}/\mu\text{s}$ |
| $I_{GM}$     | peak gate current                    |  | -   | 1    | A                      |
| $P_{GM}$     | peak gate power                      |  | -   | 2    | W                      |
| $P_{G(AV)}$  | average gate power                   | over any 20ms period   | -   | 0.1  | W                      |
| $T_{stg}$    | storage temperature                  |  | -40 | 150  | $^{\circ}\text{C}$     |
| $T_j$        | junction temperature                 |  | -   | 125  | $^{\circ}\text{C}$     |



**Fig. 1. RMS on-state current as a function of surge duration; maximum values**



**Fig. 2. RMS on-state current as a function of solder point temperature; maximum values**

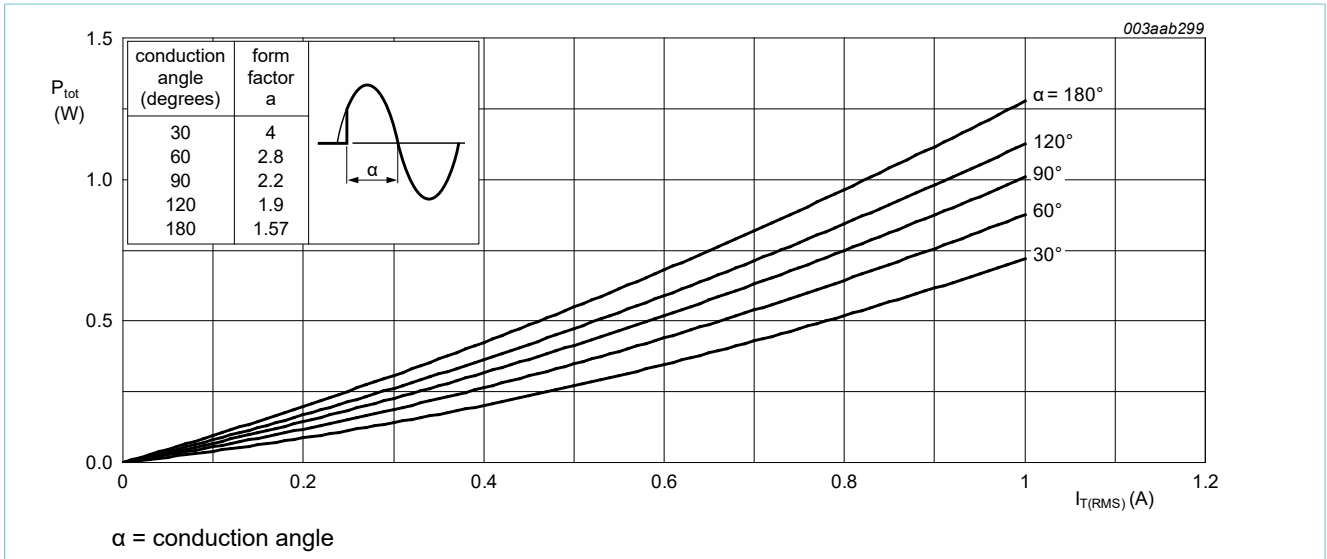


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

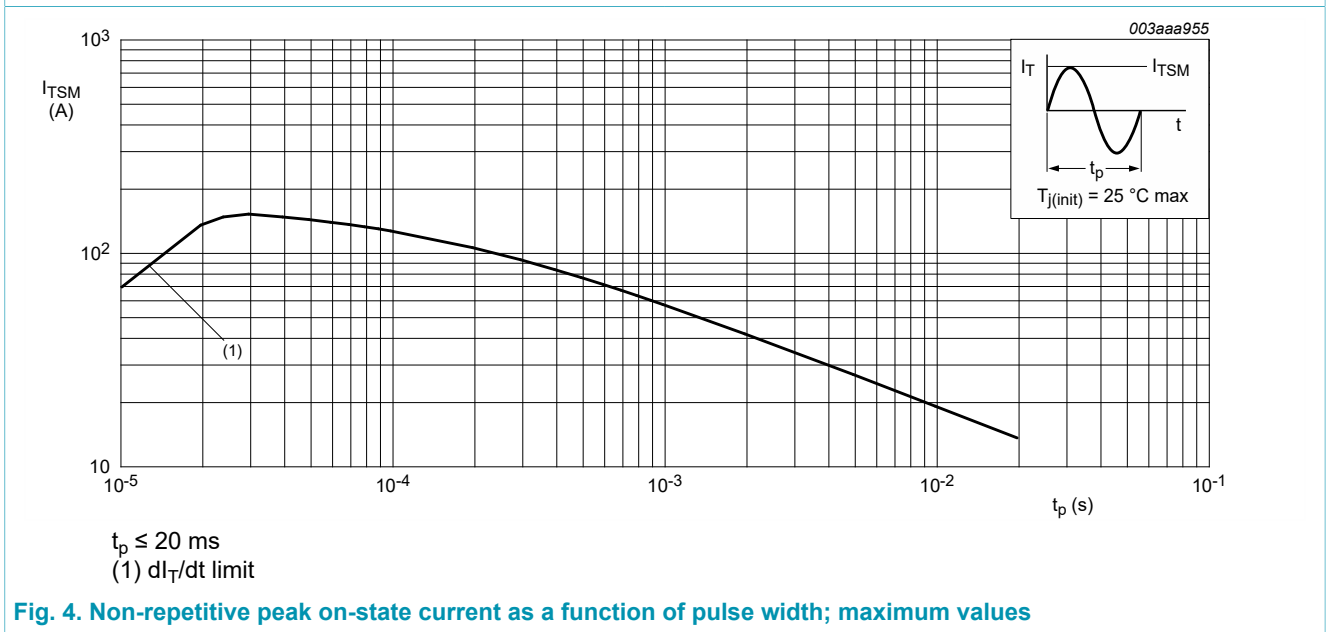
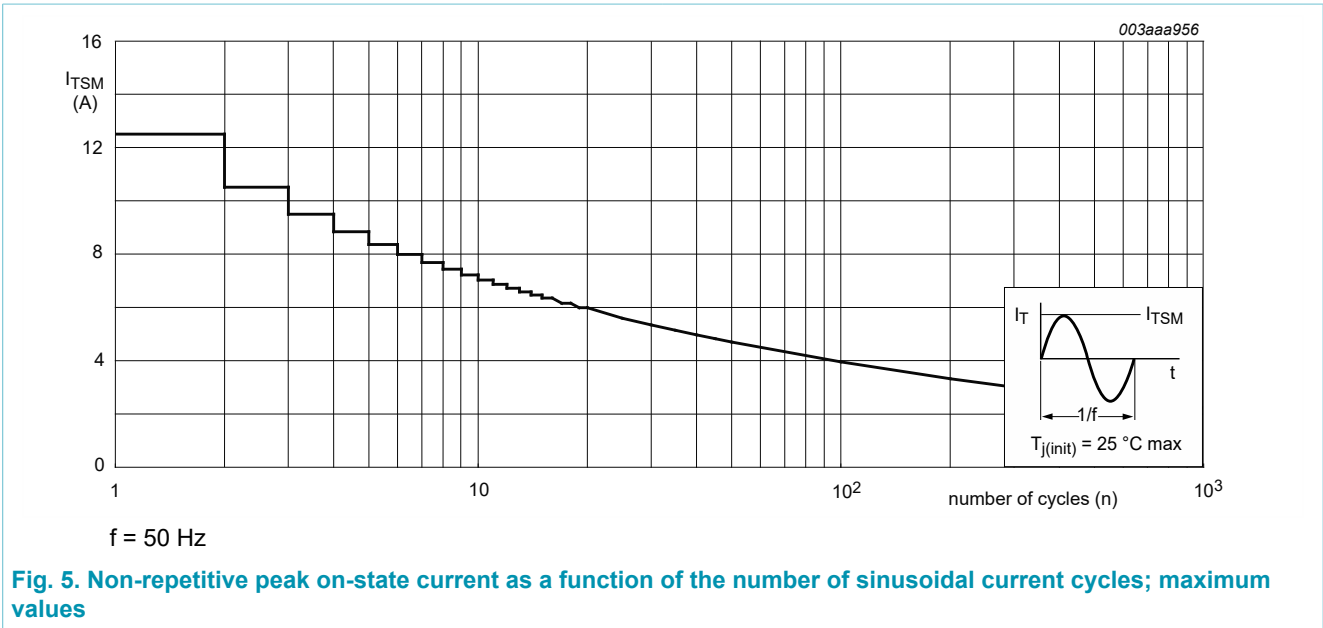


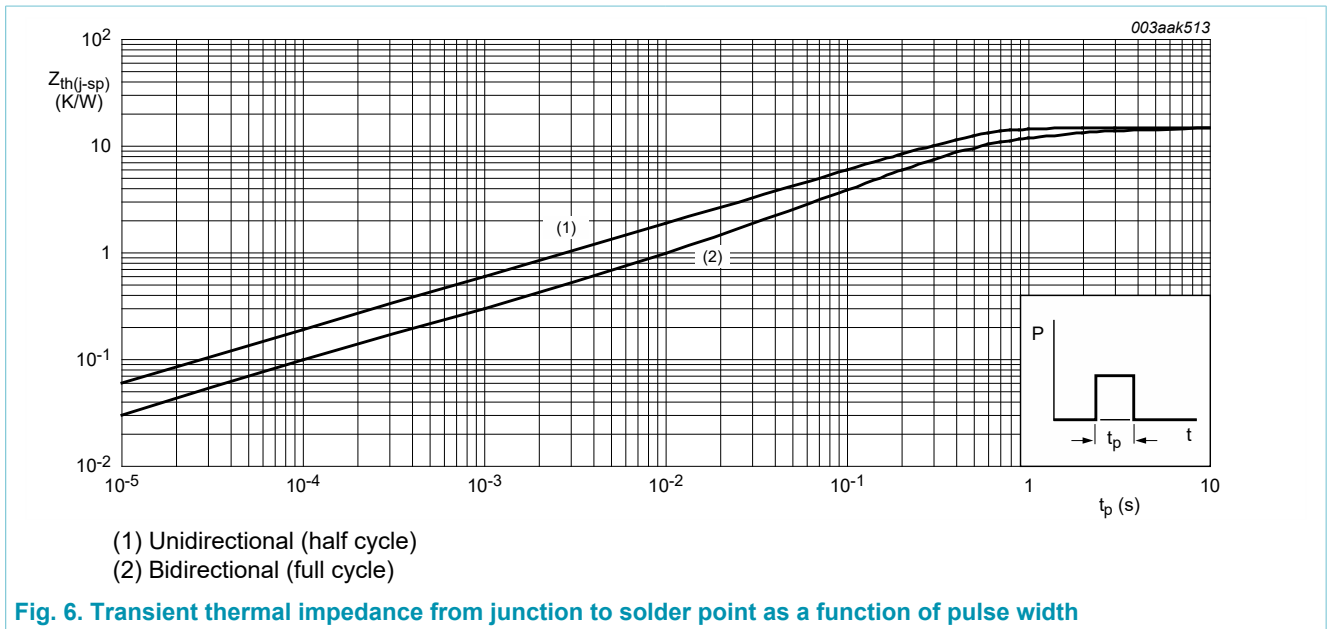
Fig. 4. Non-repetitive peak on-state current as a function of pulse width; maximum values

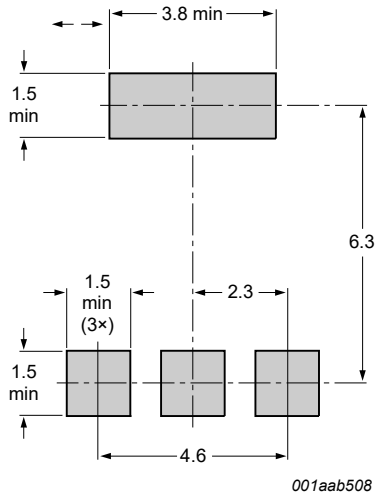


### 8. Thermal characteristics

Table 5. Thermal characteristics

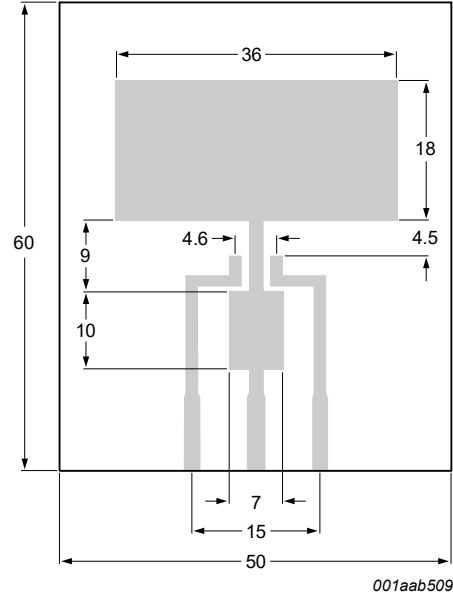
| Symbol         | Parameter  | Conditions  | Min | Typ | Max | Unit |
|----------------|--|---|-----|-----|-----|------|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point     | full and half cycle; <a href="#">Fig. 6</a>   | -   | -   | 15  | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient free air | in free air; printed circuit board mounted; minimum footprint; <a href="#">Fig. 7</a> | -   | 156 | -   | K/W  |
|                |  | in free air; printed circuit board mounted; pad area; <a href="#">Fig. 8</a>          | -   | 70  | -   | K/W  |





All dimensions are in mm

**Fig. 7. Minimum footprint SOT223**



All dimensions are in mm

Printed circuit board:

FR4 epoxy glass (1.6 mm thick), copper laminate (35 um thick)

**Fig. 8. Printed circuit board pad area: SOT223**

## 9. Characteristics

Table 6. Characteristics

| Symbol                         | Parameter                             | Conditions   | Min | Typ | Max | Unit       |
|--------------------------------|---------------------------------------|--|-----|-----|-----|------------|
| <b>Static characteristics</b>  |                                       |  |     |     |     |            |
| $I_{GT}$                       | gate trigger current                  | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G+;<br>$T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>  | 1   | -   | 10  | mA         |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-;<br>$T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>  | 1   | -   | 10  | mA         |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-;<br>$T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>  | 1   | -   | 10  | mA         |
| $I_L$                          | latching current                      | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+;<br>$T_j = 25\text{ °C}$ ; <a href="#">Fig. 10</a>   | -   | -   | 12  | mA         |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-;<br>$T_j = 25\text{ °C}$ ; <a href="#">Fig. 10</a>   | -   | -   | 20  | mA         |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-;<br>$T_j = 25\text{ °C}$ ; <a href="#">Fig. 10</a>   | -   | -   | 12  | mA         |
| $I_H$                          | holding current                       | $V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>   | -   | -   | 12  | mA         |
| $V_T$                          | on-state voltage                      | $I_T = 1.4\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 12</a>  | -   | 1.3 | 1.5 | V          |
| $V_{GT}$                       | gate trigger voltage                  | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ;<br><a href="#">Fig. 13</a>   | -   | 0.7 | 1   | V          |
|                                |                                       | $V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ °C}$ ;<br><a href="#">Fig. 13</a>   | 0.2 | 0.3 | -   | V          |
| $I_D$                          | off-state current                     | $V_D = 800\text{ V}$ ; $T_j = 125\text{ °C}$   | -   | 0.1 | 0.5 | mA         |
| <b>Dynamic characteristics</b> |                                       |  |     |     |     |            |
| $dV_D/dt$                      | rate of rise of off-state voltage     | $V_{DM} = 536\text{ V}$ ; $T_j = 125\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit; <a href="#">Fig. 14</a>     | 600 | -   | -   | V/ $\mu$ s |
| $dI_{com}/dt$                  | rate of change of commutating current | $V_D = 400\text{ V}$ ; $T_j = 125\text{ °C}$ ; $I_{T(RMS)} = 1\text{ A}$ ;<br>$dV_{com}/dt = 20\text{ V/s}$ ; (snubberless condition); gate open circuit | 2.5 | -   | -   | A/ms       |
|                                |                                       | $V_D = 400\text{ V}$ ; $T_j = 125\text{ °C}$ ; $I_{T(RMS)} = 1\text{ A}$ ;<br>$dV_{com}/dt = 10\text{ V/s}$ ; gate open circuit                          | 3.5 | -   | -   | A/ms       |



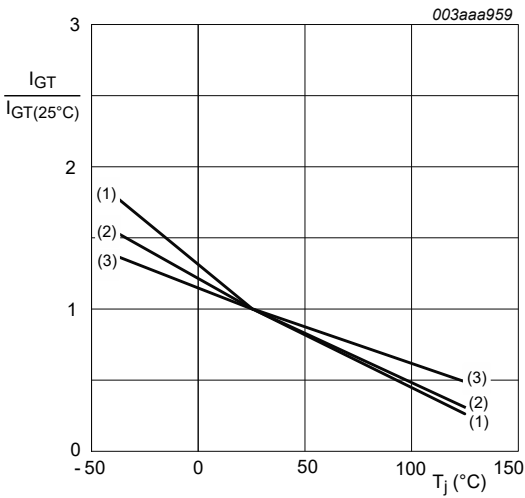


Fig. 9. Normalized gate trigger current as a function of junction temperature

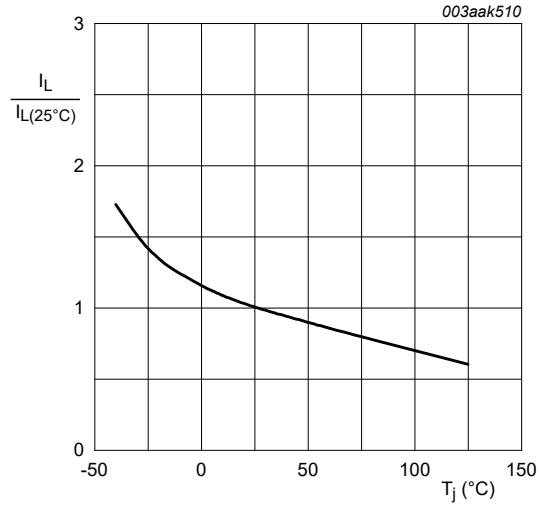


Fig. 10. Normalized latching current as a function of junction temperature

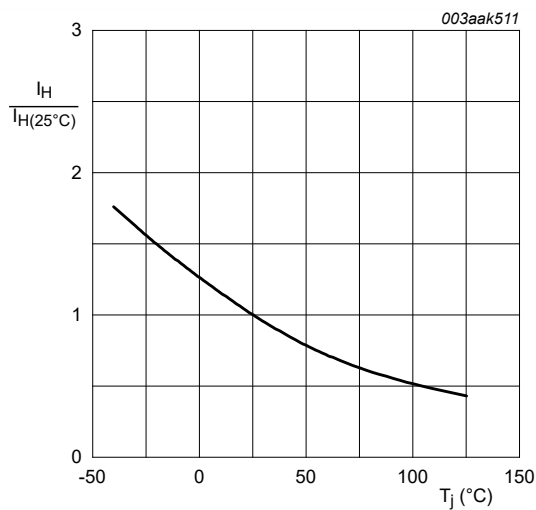


Fig. 11. Normalized holding current as a function of junction temperature

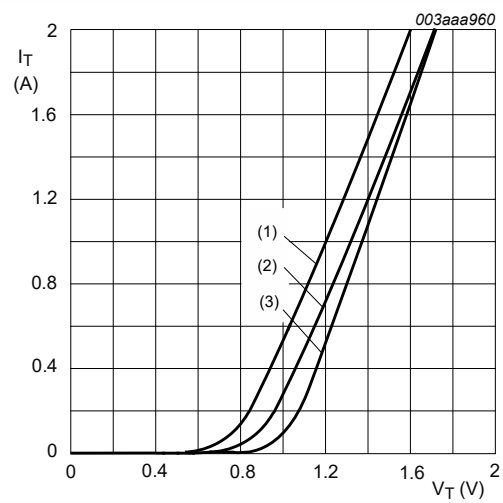
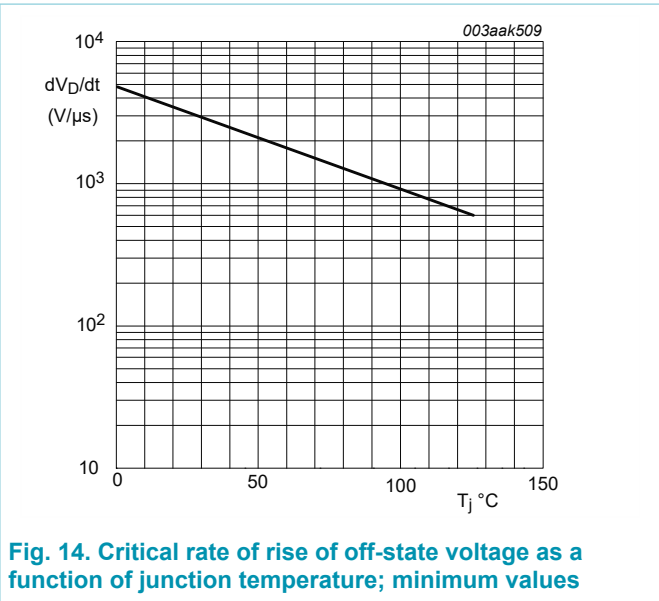
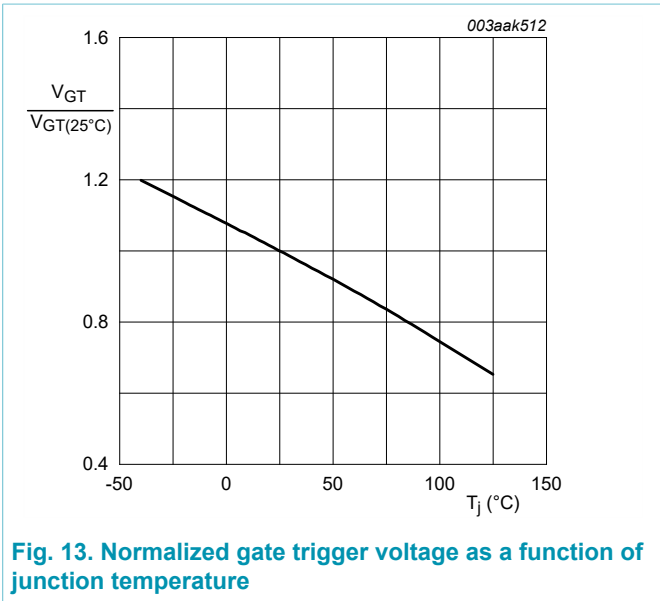


Fig. 12. On-state current as a function of on-state voltage



### 10. Package outline

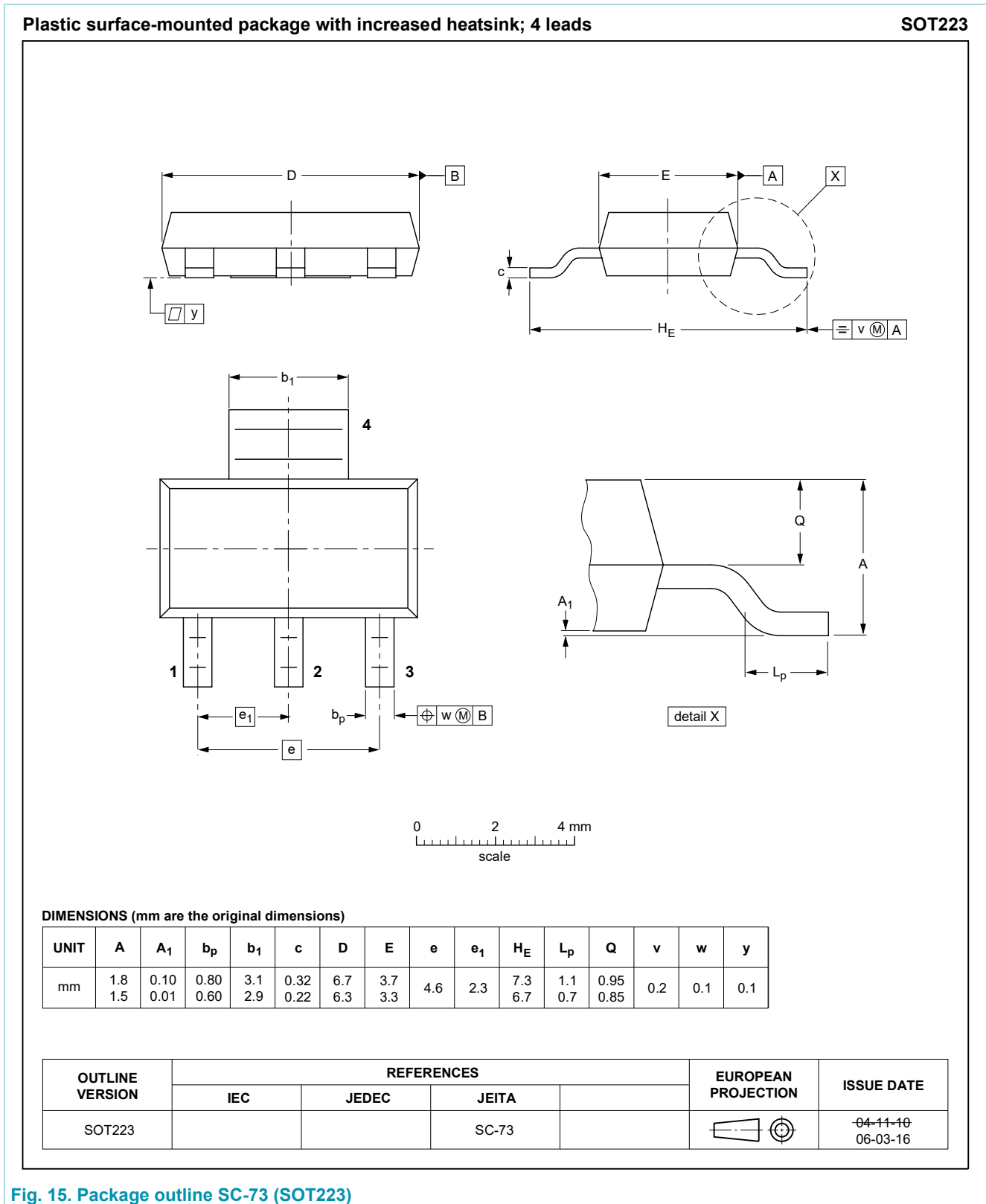


Fig. 15. Package outline SC-73 (SOT223)

### 11. Package outline (minimized)

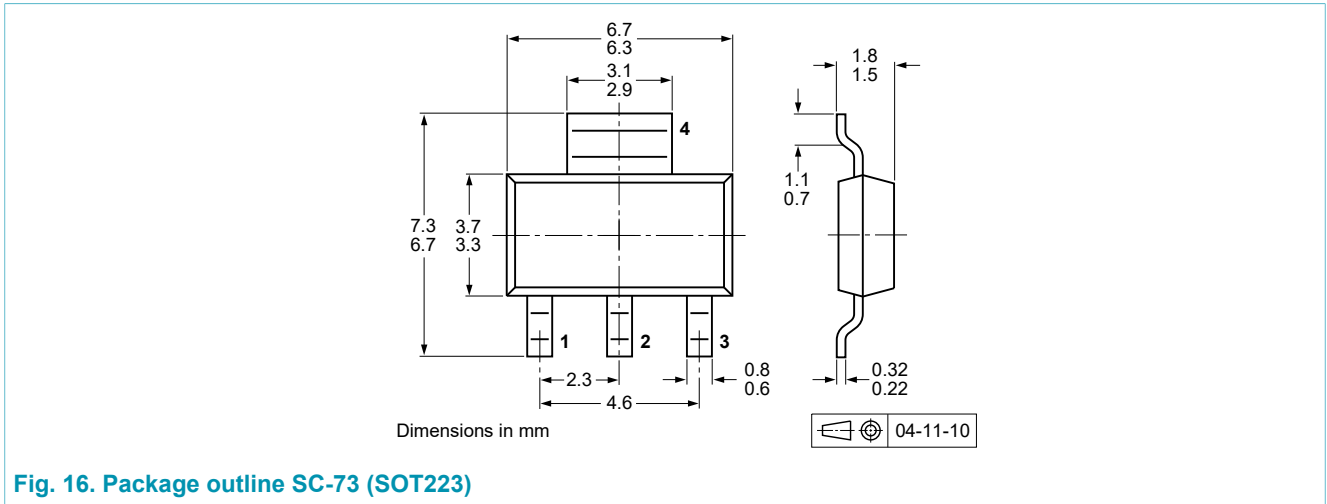


Fig. 16. Package outline SC-73 (SOT223)

### 12. Soldering

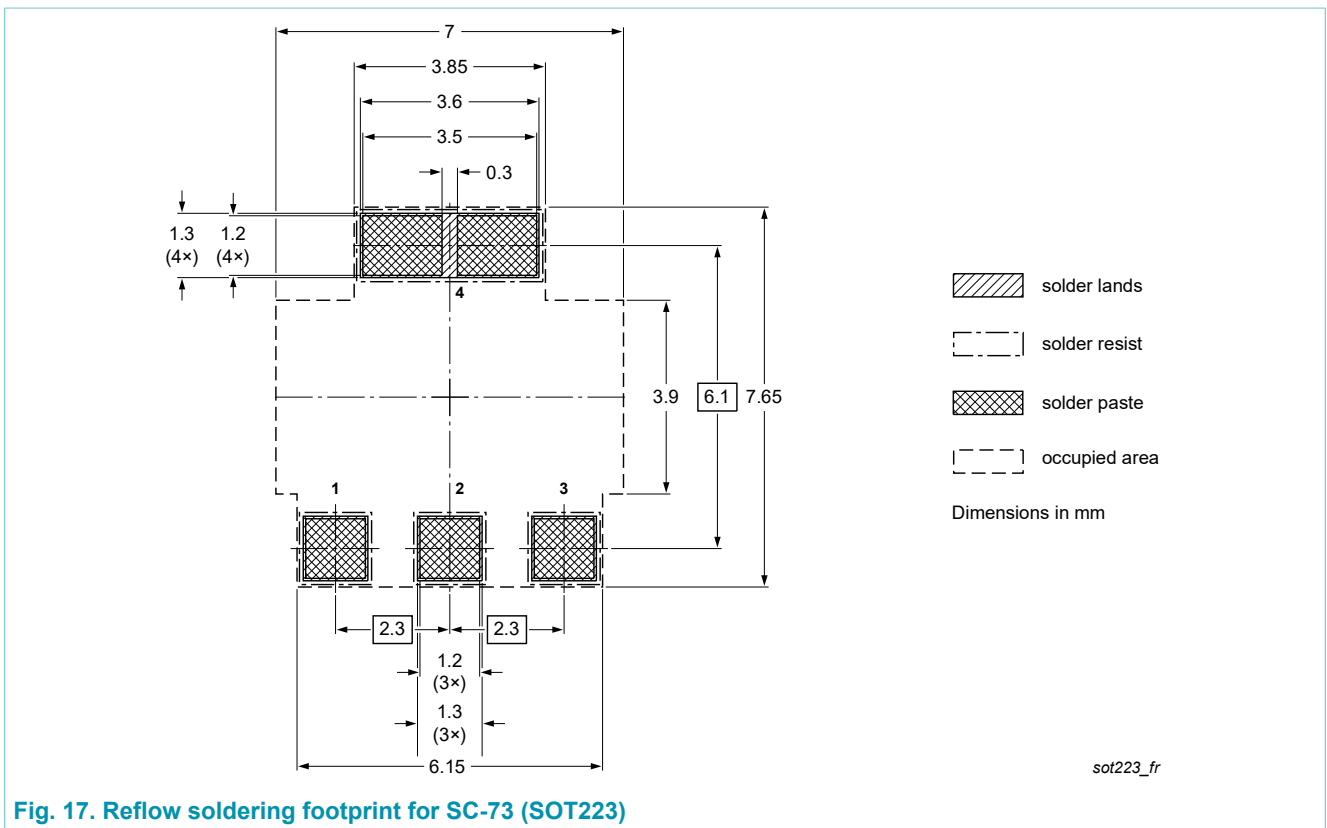
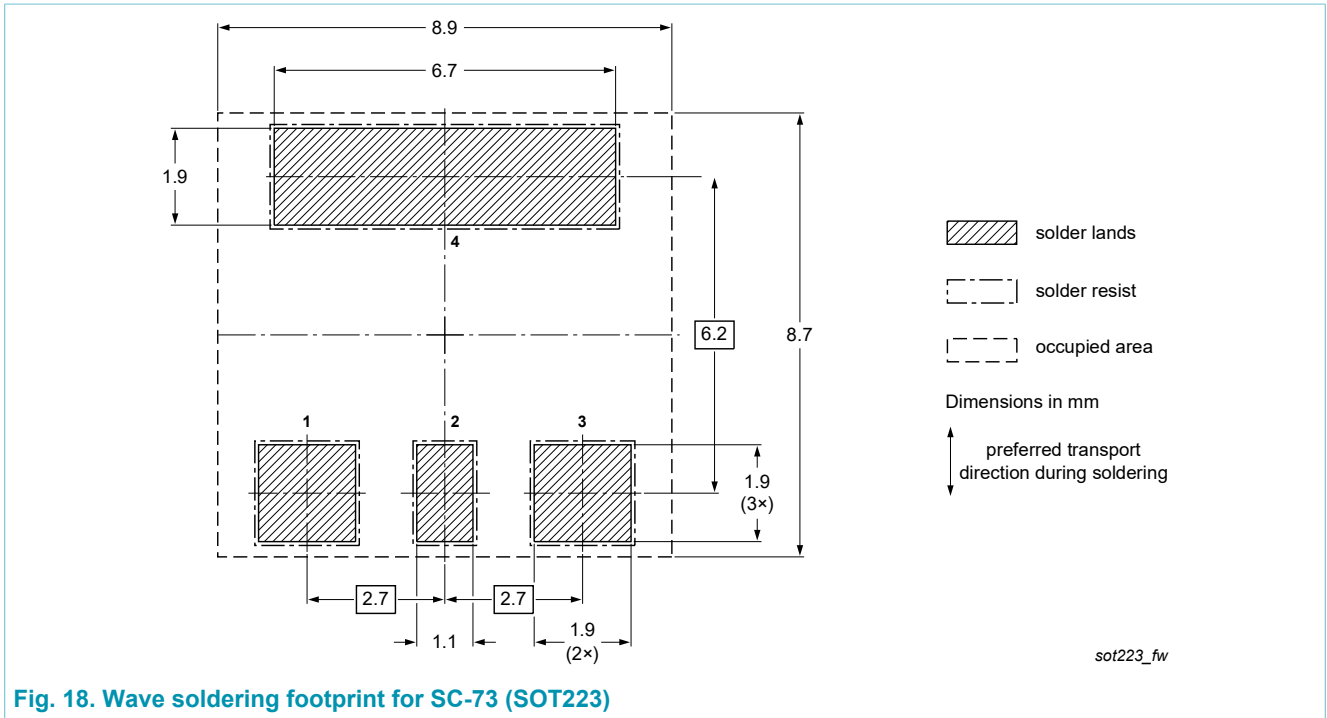


Fig. 17. Reflow soldering footprint for SC-73 (SOT223)



### 13. Legal information

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|--------------------------------|--------------------|---|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
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Date of release: 15 June 2016

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