

## 1. General description

Planar passivated sensitive gate four quadrant triac in a SOT223 (SC-73) surface-mountable plastic package intended for applications requiring enhanced immunity to noise and direct interfacing to logic level ICs and low power gate drivers.

## 2. Features and benefits

- Direct interfacing to logic level ICs
- Enhanced current surge capability
- Enhanced noise immunity
- High blocking voltage capability
- Planar passivated for voltage ruggedness and reliability
- Sensitive gate in four quadrants
- Surface-mountable package
- Triggering in all four quadrants

## 3. Applications

- General purpose low power motor control
- Home appliances
- Industrial process control
- Low power AC Fan controllers

## 4. Quick reference data

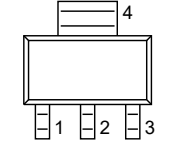
Table 1. Quick reference data

| Symbol                        | Parameter                            | Conditions                                                                                                                            | Min | Typ | Max  | Unit |
|-------------------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|------|
| $V_{\text{DRM}}$              | repetitive peak off-state voltage    |                                                                                                                                       | -   | -   | 800  | V    |
| $I_{\text{T(RMS)}}$           | RMS on-state current                 | full sine wave; $T_{\text{sp}} \leq 105\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>         | -   | -   | 1    | A    |
| $I_{\text{TSM}}$              | non-repetitive peak on-state current | full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$ ; $t_{\text{p}} = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a> | -   | -   | 12.5 | A    |
|                               |                                      | full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$ ; $t_{\text{p}} = 16.7\text{ ms}$                                                 | -   | -   | 13.8 | A    |
| $T_{\text{j}}$                | junction temperature                 |                                                                                                                                       | -   | -   | 125  | °C   |
| <b>Static characteristics</b> |                                      |                                                                                                                                       |     |     |      |      |
| $I_{\text{GT}}$               | gate trigger current                 | $V_{\text{D}} = 12\text{ V}$ ; $I_{\text{T}} = 0.1\text{ A}$ ; $T_2 + G+$ ; $T_{\text{j}} = 25\text{ °C}$ ; <a href="#">Fig. 9</a>    | 0.4 | -   | 10   | mA   |

| Symbol                         | Parameter                             | Conditions                                                                                                                                                       | Min | Typ | Max | Unit             |
|--------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------------------|
|                                |                                       | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>                                                | 0.4 | -   | 10  | mA               |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>                                                | 0.4 | -   | 10  | mA               |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>                                                | 0.4 | -   | 10  | mA               |
| $I_H$                          | holding current                       | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>                                                                                 | -   | -   | 10  | mA               |
| $V_T$                          | on-state voltage                      | $I_T = 1.4\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 12</a>                                                                                | -   | 1.3 | 1.6 | V                |
| <b>Dynamic characteristics</b> |                                       |                                                                                                                                                                  |     |     |     |                  |
| $dV_D/dt$                      | rate of rise of off-state voltage     | $V_{DM} = 536\text{ V}$ ; $T_j = 110\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit; <a href="#">Fig. 14</a> | 120 | -   | -   | V/ $\mu\text{s}$ |
| $dV_{com}/dt$                  | rate of change of commutating voltage | $V_D = 400\text{ V}$ ; $T_j = 110\text{ }^\circ\text{C}$ ; $dI_{com}/dt = 0.44\text{ A/ms}$ ; gate open circuit                                                  | 2   | -   | -   | V/ $\mu\text{s}$ |

## 5. Pinning information

Table 2. Pinning information

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

## 6. Ordering information

Table 3. Ordering information

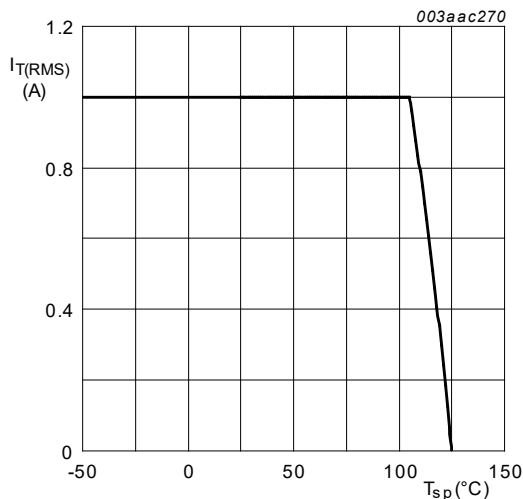
| Type number | Package |                                                                  |         |
|-------------|---------|------------------------------------------------------------------|---------|
|             | Name    | Description                                                      | Version |
| Z0109NN0    | SC-73   | plastic surface-mounted package with increased heatsink; 4 leads | SOT223  |

## 7. Limiting values

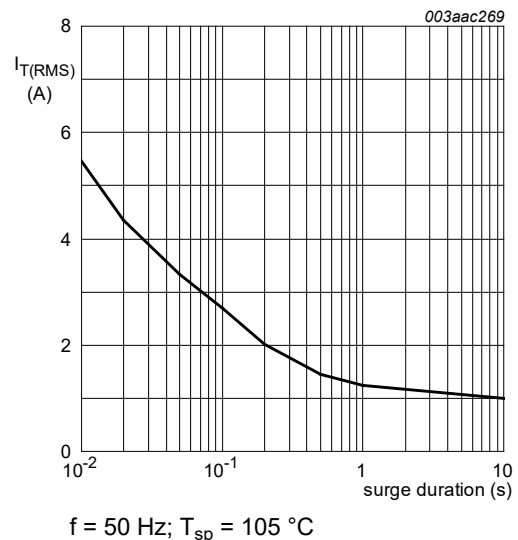
**Table 4. Limiting values**

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

| Symbol              | Parameter                            | Conditions                                                                                                                            | Min | Max  | Unit             |
|---------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----|------|------------------|
| $V_{\text{DRM}}$    | repetitive peak off-state voltage    |                                                                                                                                       | -   | 800  | V                |
| $I_{\text{T(RMS)}}$ | RMS on-state current                 | full sine wave; $T_{\text{sp}} \leq 105\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>         | -   | 1    | A                |
| $I_{\text{TSM}}$    | non-repetitive peak on-state current | full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$ ; $t_{\text{p}} = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a> | -   | 12.5 | A                |
|                     |                                      | full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$ ; $t_{\text{p}} = 16.7\text{ ms}$                                                 | -   | 13.8 | A                |
| $I^2t$              | $I^2t$ for fusing                    | $t_{\text{p}} = 10\text{ ms}$ ; SIN                                                                                                   | -   | 0.78 | A <sup>2</sup> s |
| $di_{\text{T}}/dt$  | rate of rise of on-state current     | $I_{\text{G}} = 20\text{ mA}$ ; T2+ G+                                                                                                | -   | 50   | A/ $\mu\text{s}$ |
|                     |                                      | $I_{\text{G}} = 20\text{ mA}$ ; T2+ G-                                                                                                | -   | 50   | A/ $\mu\text{s}$ |
|                     |                                      | $I_{\text{G}} = 20\text{ mA}$ ; T2- G-                                                                                                | -   | 50   | A/ $\mu\text{s}$ |
|                     |                                      | $I_{\text{G}} = 20\text{ mA}$ ; T2- G+                                                                                                | -   | 20   | A/ $\mu\text{s}$ |
| $I_{\text{GM}}$     | peak gate current                    |                                                                                                                                       | -   | 1    | A                |
| $P_{\text{GM}}$     | peak gate power                      |                                                                                                                                       | -   | 2    | W                |
| $P_{\text{G(AV)}}$  | average gate power                   | over any 20 ms period                                                                                                                 | -   | 0.1  | W                |
| $T_{\text{stg}}$    | storage temperature                  |                                                                                                                                       | -40 | 150  | °C               |
| $T_{\text{j}}$      | junction temperature                 |                                                                                                                                       | -   | 125  | °C               |



**Fig. 1. RMS on-state current as a function of solder point temperature; maximum values**



$f = 50\text{ Hz}$ ;  $T_{\text{sp}} = 105\text{ °C}$

**Fig. 2. RMS on-state current as a function of surge duration; maximum values**

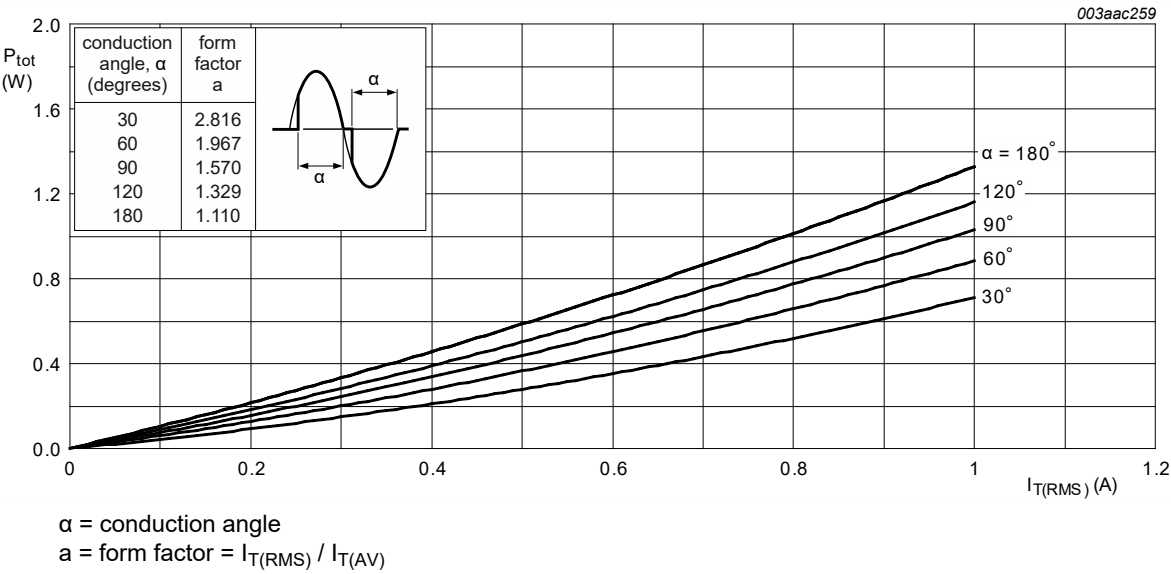


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

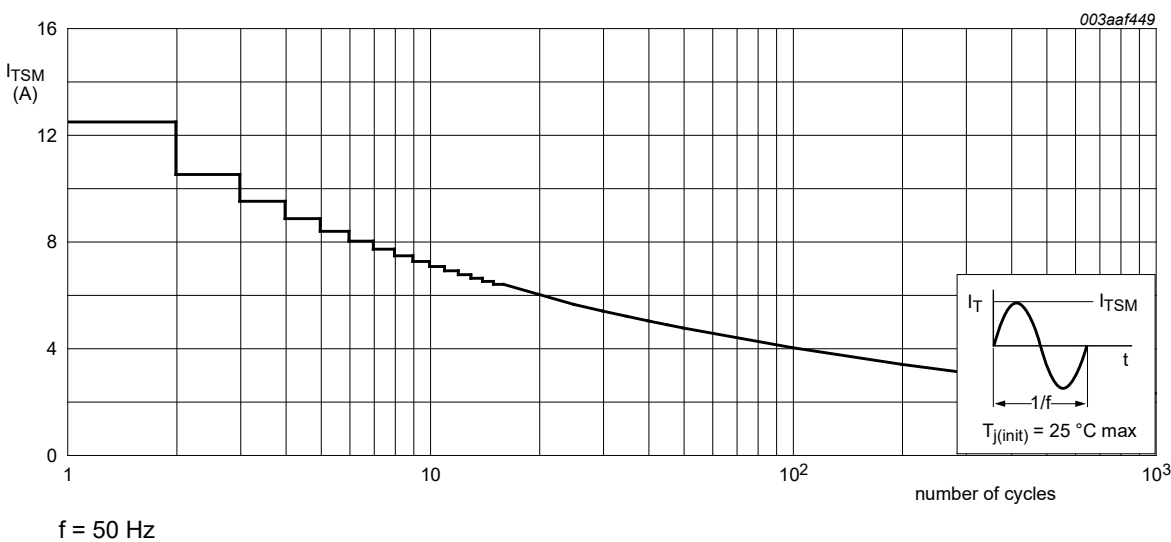
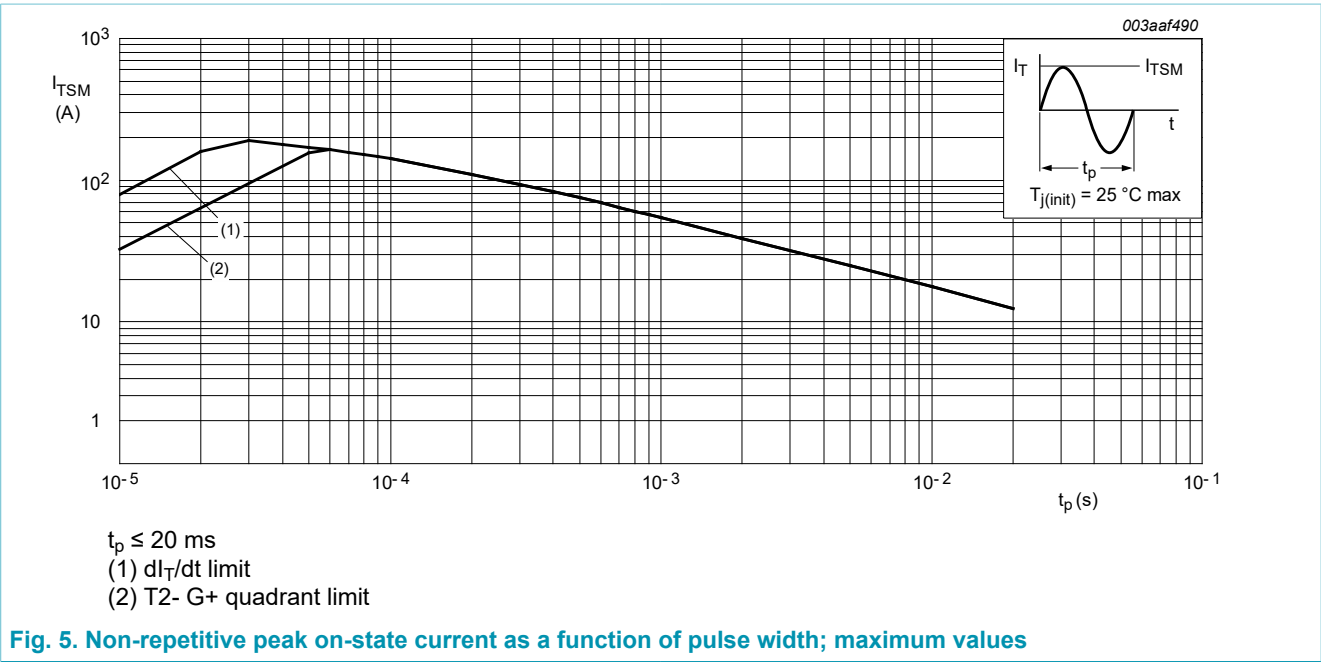


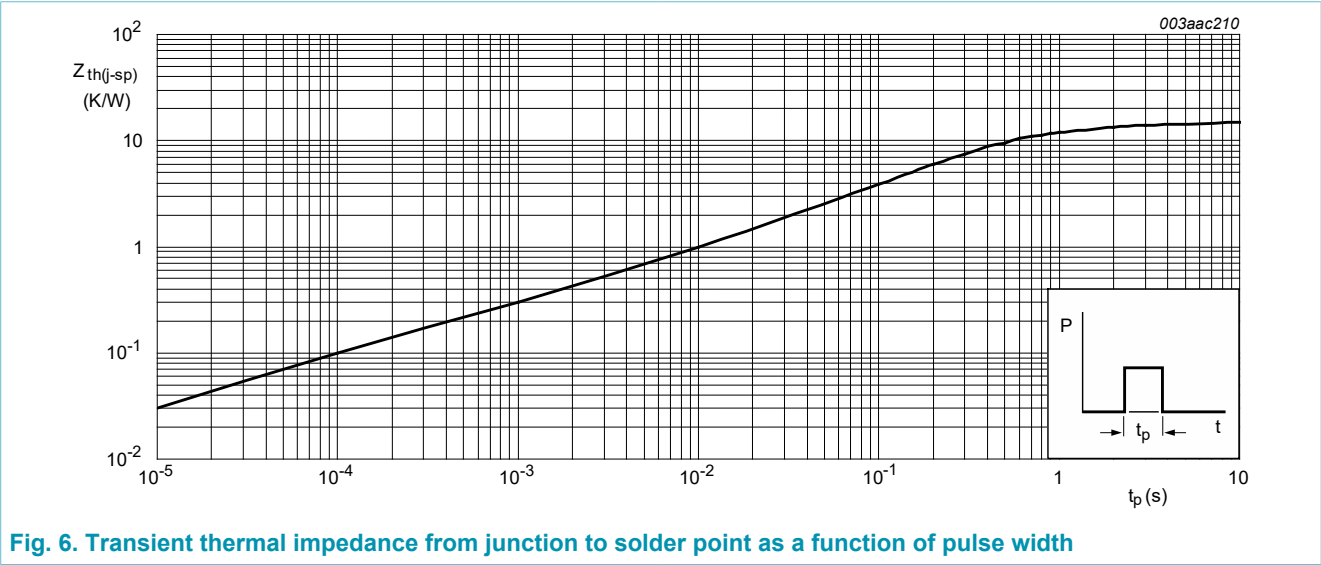
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

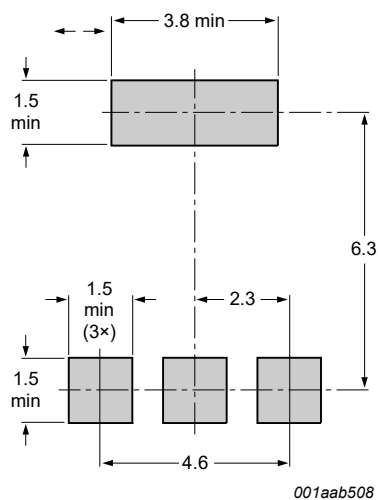


8. Thermal characteristics

Table 5. Thermal characteristics

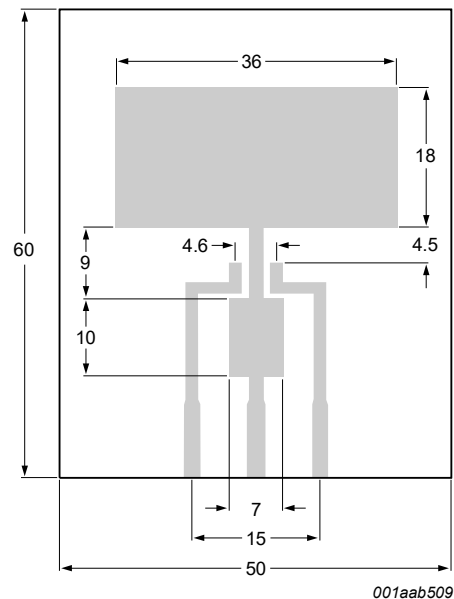
| Symbol         | Parameter                                            | Conditions                                                                        | Min | Typ | Max | Unit |
|----------------|------------------------------------------------------|-----------------------------------------------------------------------------------|-----|-----|-----|------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





All dimensions are in mm

**Fig. 7. Minimum footprint SOT223**



All dimensions are in mm

Printed circuit board:

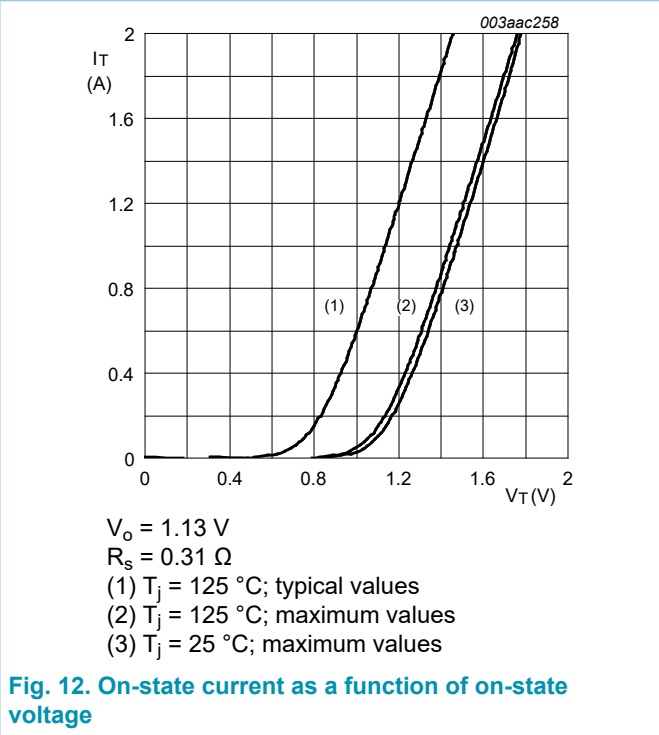
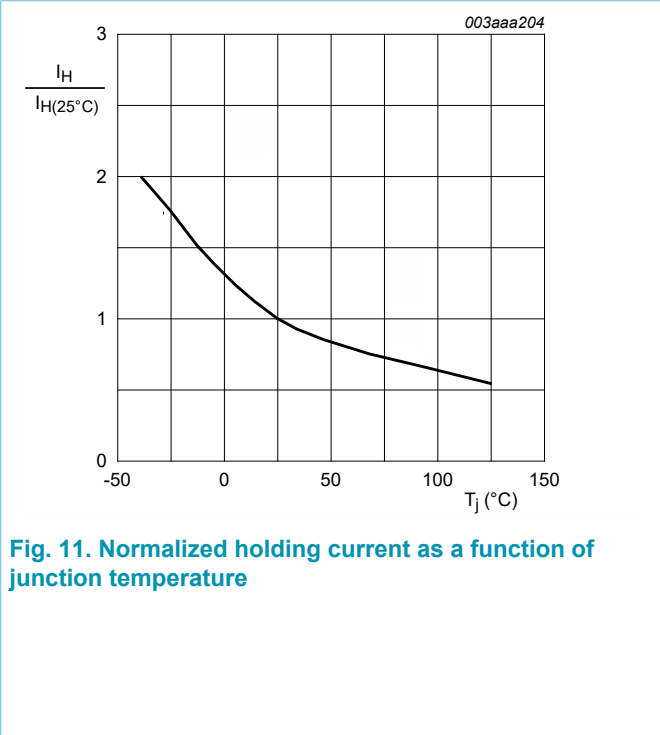
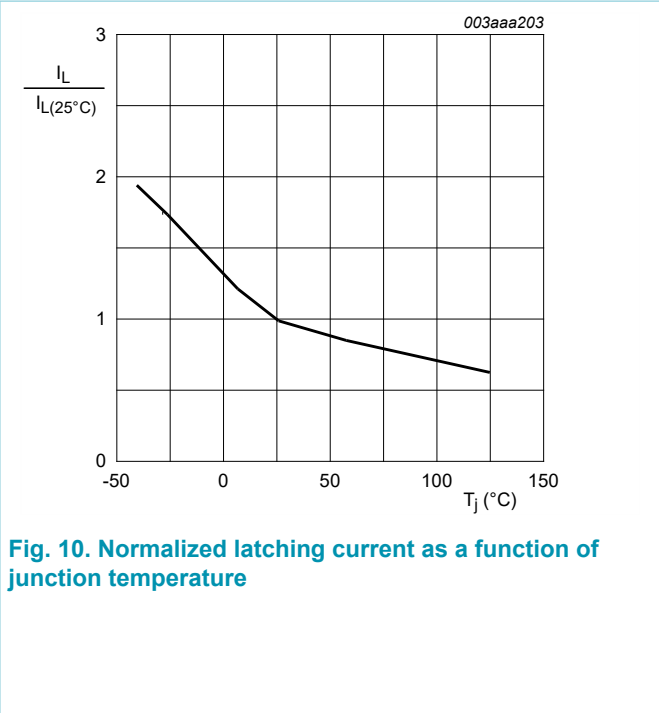
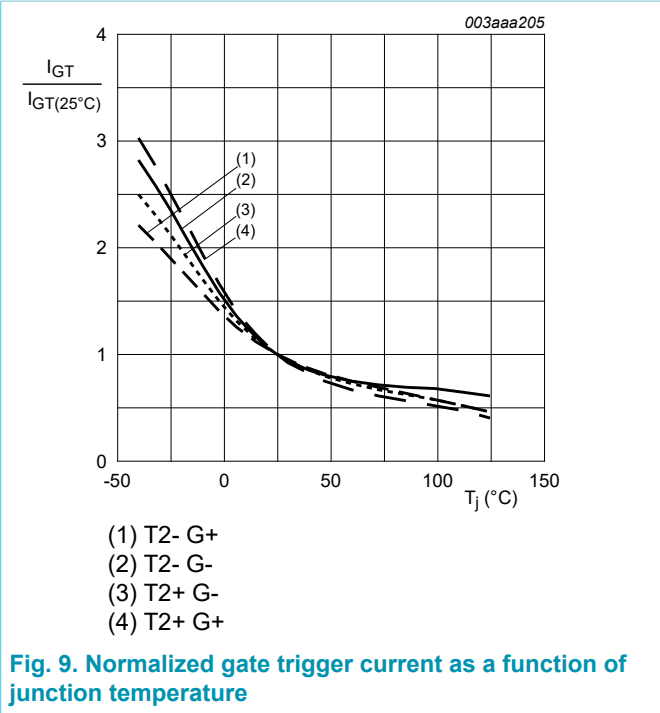
FR4 epoxy glass (1.6 mm thick), copper laminate  
(35  $\mu$ m thick)

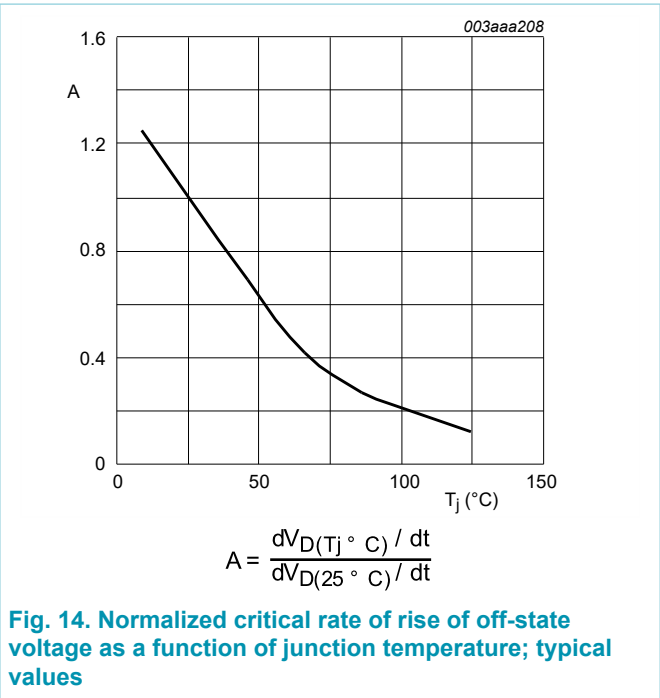
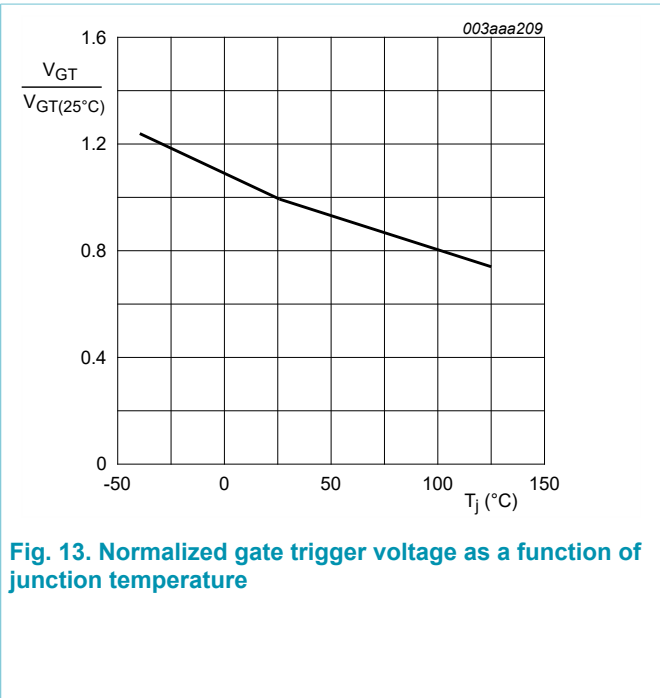
**Fig. 8. Printed circuit board pad area: SOT223**

## 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>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>                                                | 0.4 | -   | 10  | mA               |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>                                                | 0.4 | -   | 10  | mA               |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>                                                | 0.4 | -   | 10  | mA               |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>                                                | 0.4 | -   | 10  | mA               |
| $I_L$                          | latching current                      | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>                                               | -   | -   | 15  | mA               |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>                                               | -   | -   | 30  | mA               |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>                                               | -   | -   | 15  | mA               |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G+;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>                                               | -   | -   | 15  | mA               |
| $I_H$                          | holding current                       | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>                                                                                 | -   | -   | 10  | mA               |
| $V_T$                          | on-state voltage                      | $I_T = 1.4\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 12</a>                                                                                | -   | 1.3 | 1.6 | V                |
| $V_{GT}$                       | gate trigger voltage                  | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ;<br><a href="#">Fig. 13</a>                                                       | -   | -   | 1   | V                |
|                                |                                       | $V_D = 800\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ }^\circ\text{C}$ ;<br><a href="#">Fig. 13</a>                                                     | 0.2 | -   | -   | V                |
| $I_D$                          | off-state current                     | $V_D = 800\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$                                                                                                         | -   | -   | 0.5 | mA               |
| <b>Dynamic characteristics</b> |                                       |                                                                                                                                                                  |     |     |     |                  |
| $dV_D/dt$                      | rate of rise of off-state voltage     | $V_{DM} = 536\text{ V}$ ; $T_j = 110\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit; <a href="#">Fig. 14</a> | 120 | -   | -   | V/ $\mu\text{s}$ |
| $dV_{com}/dt$                  | rate of change of commutating voltage | $V_D = 400\text{ V}$ ; $T_j = 110\text{ }^\circ\text{C}$ ; $dI_{com}/dt = 0.44\text{ A/ms}$ ; gate open circuit                                                  | 2   | -   | -   | V/ $\mu\text{s}$ |





10. Package outline

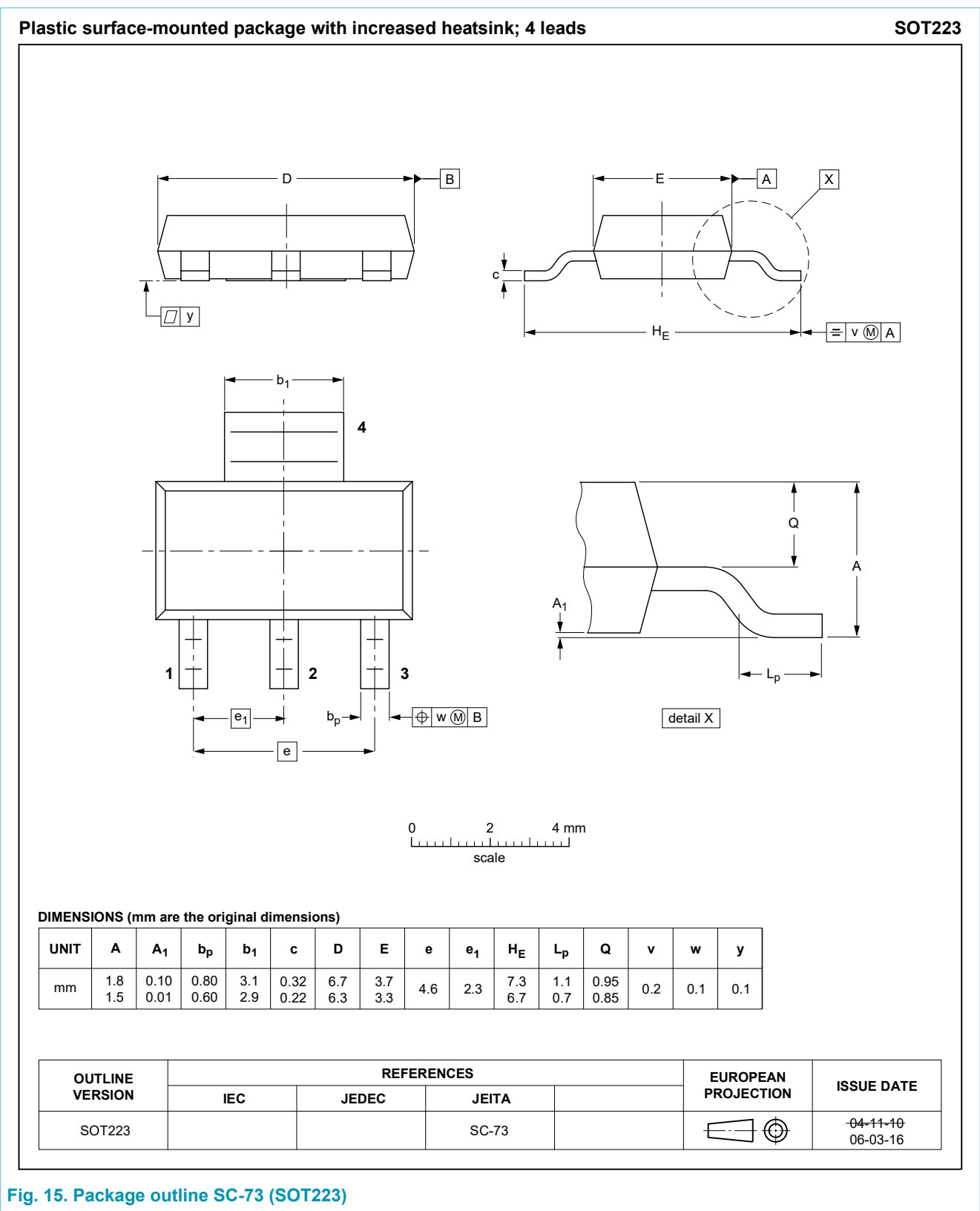


Fig. 15. Package outline SC-73 (SOT223)

## 11. Legal information

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| Document status [1][2]         | Product status [3] | Definition                                                                            |
|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 15 September 2018

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