

## 1. Product profile

### 1.1 General description

Passivated sensitive gate 4-Q triac in a SOT223 surface-mountable plastic package

### 1.2 Features and benefits

- Direct interfacing to logic level ICs
- Direct interfacing to low power gate drive circuits
- High blocking voltage of 600V
- Sensitive gate in four quadrants
- Surface-mountable package

### 1.3 Applications

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

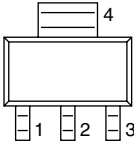
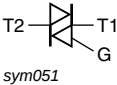
### 1.4 Quick reference data

Table 1. Quick reference

| Symbol                        | Parameter                         | Conditions                                                                                                           | Min | Typ | Max | Unit |
|-------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| $V_{\text{DRM}}$              | repetitive peak off-state voltage |                                                                                                                      | -   | -   | 600 | V    |
| $I_{\text{T(RMS)}}$           | RMS on-state current              | half sine wave; $T_{\text{sp}} \leq 89\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 1</a> and <a href="#">4</a> | -   | -   | 1   | A    |
| <b>Static characteristics</b> |                                   |                                                                                                                      |     |     |     |      |
| $I_{\text{GT}}$               | gate trigger current              | $V_{\text{D}} = 12\text{ V}$ ; $T_{\text{j}} = 25\text{ }^{\circ}\text{C}$ ; T2+ G-; see <a href="#">Figure 6</a>    | -   | -   | 3   | mA   |
|                               |                                   | $V_{\text{D}} = 12\text{ V}$ ; $T_{\text{j}} = 25\text{ }^{\circ}\text{C}$ ; T2- G-                                  | -   | -   | 3   | mA   |
|                               |                                   | $V_{\text{D}} = 12\text{ V}$ ; $T_{\text{j}} = 25\text{ }^{\circ}\text{C}$ ; T2+ G+                                  | -   | -   | 3   | mA   |
|                               |                                   | $V_{\text{D}} = 12\text{ V}$ ; $T_{\text{j}} = 25\text{ }^{\circ}\text{C}$ ; T2- G+                                  | -   | -   | 5   | mA   |

2. Pinning information

Table 2. Pinning information

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

3. Ordering information

Table 3. Ordering information

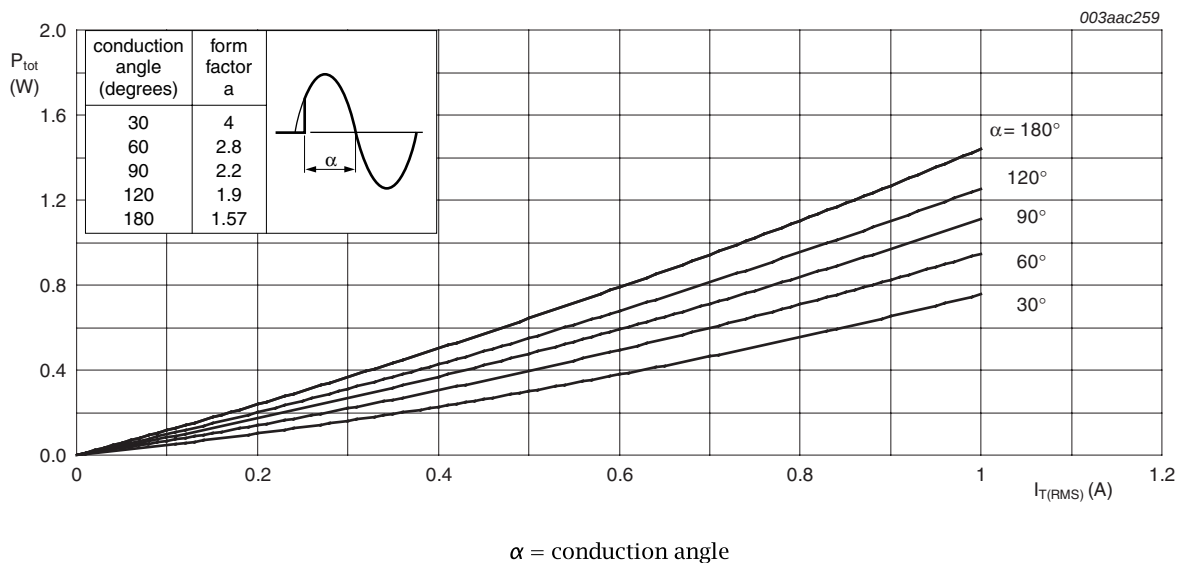
| Type number | Package |                                                                  | Version |
|-------------|---------|------------------------------------------------------------------|---------|
|             | Name    | Description                                                      |         |
| Z0103MN     | SC-73   | plastic surface-mounted package with increased heatsink; 4 leads | SOT223  |

## 4. Limiting values

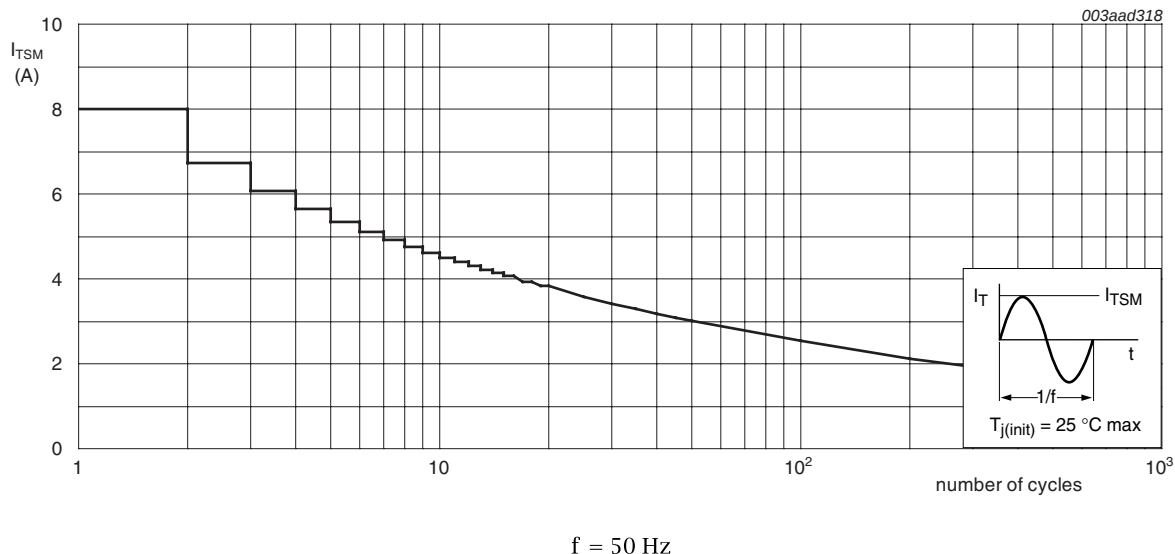
**Table 4. Limiting values**

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

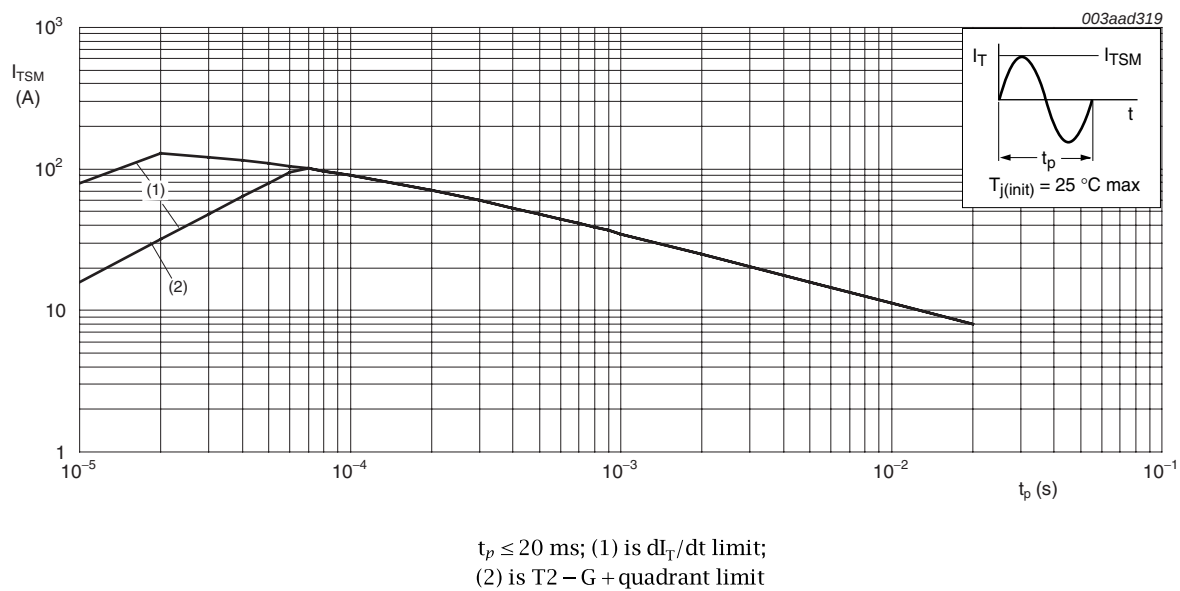
| Symbol              | Parameter                            | Conditions                                                                                                                                             | Min | Max  | Unit               |
|---------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|--------------------|
| $V_{\text{DRM}}$    | repetitive peak off-state voltage    |                                                                                                                                                        | -   | 600  | V                  |
| $I_{\text{T(RMS)}}$ | RMS on-state current                 | half sine wave; $T_{\text{sp}} \leq 89\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 1</a> and <a href="#">4</a>                                   | -   | 1    | A                  |
| $di_{\text{T}}/dt$  | rate of rise of on-state current     | $I_{\text{T}} = 1\text{ A}$ ; $I_{\text{G}} = 20\text{ mA}$ ; $di_{\text{G}}/dt = 100\text{ mA}/\mu\text{s}$ ; T2+ G-                                  | -   | 50   | A/ $\mu\text{s}$   |
|                     |                                      | $I_{\text{T}} = 1\text{ A}$ ; $I_{\text{G}} = 20\text{ mA}$ ; $di_{\text{G}}/dt = 100\text{ mA}/\mu\text{s}$ ; T2+ G+                                  | -   | 50   | A/ $\mu\text{s}$   |
|                     |                                      | $I_{\text{T}} = 1\text{ A}$ ; $I_{\text{G}} = 20\text{ mA}$ ; $di_{\text{G}}/dt = 100\text{ mA}/\mu\text{s}$ ; T2- G+                                  | -   | 20   | A/ $\mu\text{s}$   |
|                     |                                      | $I_{\text{T}} = 1\text{ A}$ ; $I_{\text{G}} = 20\text{ mA}$ ; $di_{\text{G}}/dt = 100\text{ mA}/\mu\text{s}$ ; T2- G-                                  | -   | 50   | A/ $\mu\text{s}$   |
| $I_{\text{GM}}$     | peak gate current                    |                                                                                                                                                        | -   | 1    | A                  |
| $P_{\text{GM}}$     | peak gate power                      |                                                                                                                                                        | -   | 2    | W                  |
| $T_{\text{stg}}$    | storage temperature                  |                                                                                                                                                        | -40 | 150  | $^{\circ}\text{C}$ |
| $T_{\text{j}}$      | junction temperature                 |                                                                                                                                                        | -   | 125  | $^{\circ}\text{C}$ |
| $I_{\text{TSM}}$    | non-repetitive peak on-state current | full sine wave; $t_{\text{p}} = 16.7\text{ ms}$ ; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$                                                    | -   | 8.5  | A                  |
|                     |                                      | full sine wave; $t_{\text{p}} = 20\text{ ms}$ ; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 2</a> and <a href="#">3</a> | -   | 8    | A                  |
| $I^2t$              | $I^2t$ for fusing                    | $t_{\text{p}} = 10\text{ ms}$ ; sine-wave pulse                                                                                                        | -   | 0.32 | A $^2\text{s}$     |
| $P_{\text{G(AV)}}$  | average gate power                   |                                                                                                                                                        | -   | 0.1  | W                  |



**Fig 1. Total power dissipation as a function of RMS on-state current; maximum values**



**Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values**



**Fig 3. Non-repetitive peak on-state current as a function of pulse width; maximum values**

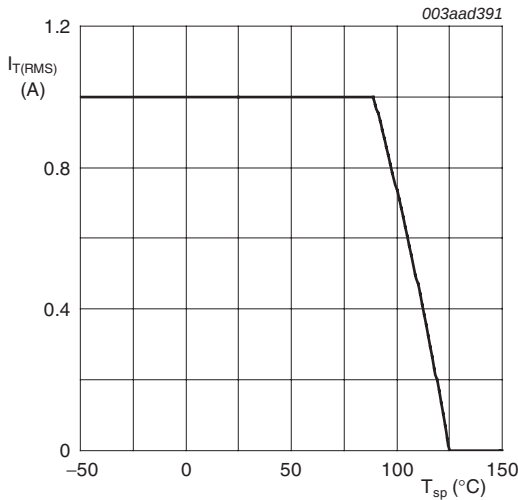


Fig 4. Maximum permissible RMS on-state current as a function of solder point temperature; typical values.

5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol         | Parameter                                        | Conditions                   | Min | Typ | Max | Unit |
|----------------|--------------------------------------------------|------------------------------|-----|-----|-----|------|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | see <a href="#">Figure 5</a> | -   | -   | 25  | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient      |                              | -   | 150 | -   | K/W  |
|                |                                                  |                              | -   | 60  | -   | K/W  |

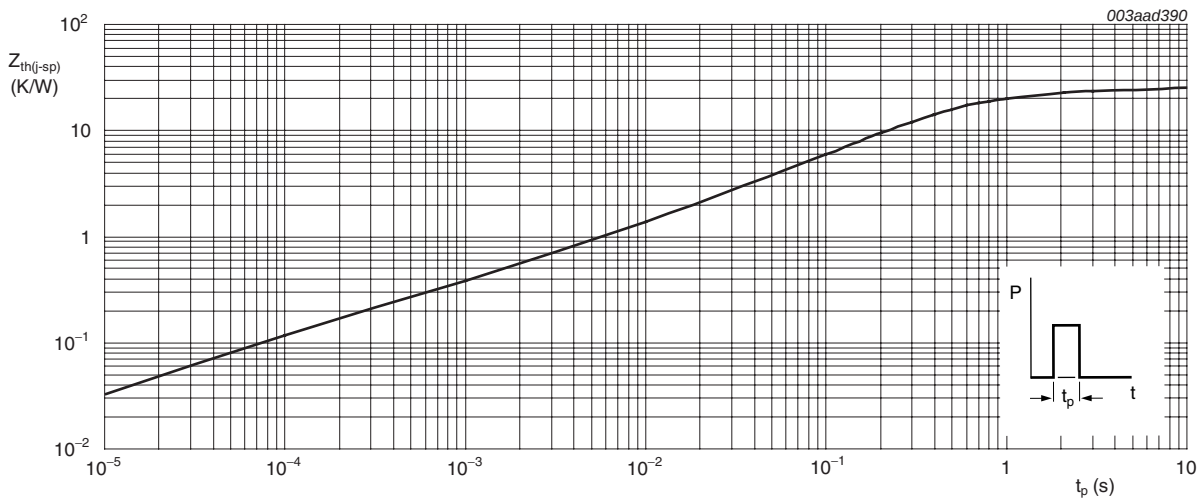
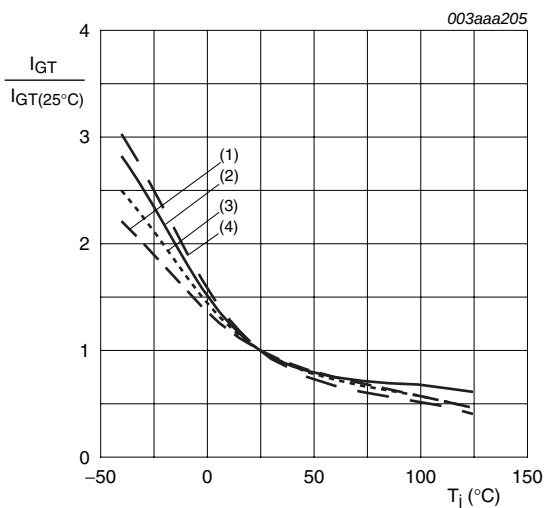


Fig 5. Transient thermal impedance from junction to solder point as a function of pulse duration

## 6. Characteristics

Table 6. Characteristics

| Symbol                         | Parameter                           | Conditions                                                                                                           | Min | Typ | Max | Unit             |
|--------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------------------|
| <b>Static characteristics</b>  |                                     |                                                                                                                      |     |     |     |                  |
| $I_{GT}$                       | gate trigger current                | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; T2+ G-; see <a href="#">Figure 6</a>                        | -   | -   | 3   | mA               |
|                                |                                     | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; T2- G-                                                      | -   | -   | 3   | mA               |
|                                |                                     | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; T2+ G+                                                      | -   | -   | 3   | mA               |
|                                |                                     | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; T2- G+                                                      | -   | -   | 5   | mA               |
| $I_L$                          | latching current                    | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-; see <a href="#">Figure 7</a> | -   | -   | 15  | mA               |
|                                |                                     | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+                               | -   | -   | 7   | mA               |
|                                |                                     | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; $I_G = 0.1\text{ A}$ ; T2- G+                               | -   | -   | 7   | mA               |
|                                |                                     | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; $I_G = 0.1\text{ A}$ ; T2- G-                               | -   | -   | 7   | mA               |
| $I_H$                          | holding current                     | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 10</a>                               | -   | -   | 7   | mA               |
| $V_T$                          | on-state voltage                    | $I_T = 1\text{ A}$ ; see <a href="#">Figure 8</a>                                                                    | -   | 1.3 | 1.6 | V                |
| $V_{GT}$                       | gate trigger voltage                | $I_T = 0.1\text{ A}$ ; $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 9</a>         | -   | -   | 1.3 | V                |
|                                |                                     | $I_T = 0.1\text{ A}$ ; $V_D = 600\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$                                      | 0.2 | -   | -   | V                |
| $I_D$                          | off-state current                   | $V_D = 600\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$                                                             | -   | -   | 0.5 | mA               |
| <b>Dynamic characteristics</b> |                                     |                                                                                                                      |     |     |     |                  |
| $dV_D/dt$                      | rate of rise of off-state voltage   | $V_{DM} = 402\text{ V}$ ; $T_j = 110\text{ }^\circ\text{C}$ ; gate open circuit; see <a href="#">Figure 11</a>       | 10  | -   | -   | V/ $\mu\text{s}$ |
| $dV_{com}/dt$                  | rate of rise 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      | 0.5 | -   | -   | V/ $\mu\text{s}$ |



(1) is T2+G+ quadrant; (2) is T2+G- quadrant;  
(3) is T2- G- quadrant; (4) is T2- G+ quadrant

Fig 6. Normalized gate trigger current as a function of junction temperature

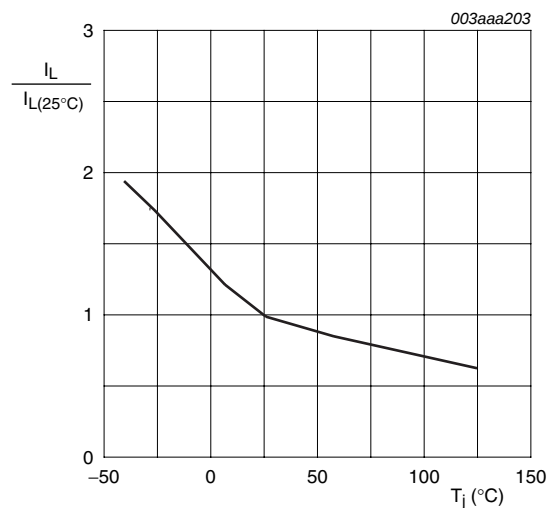
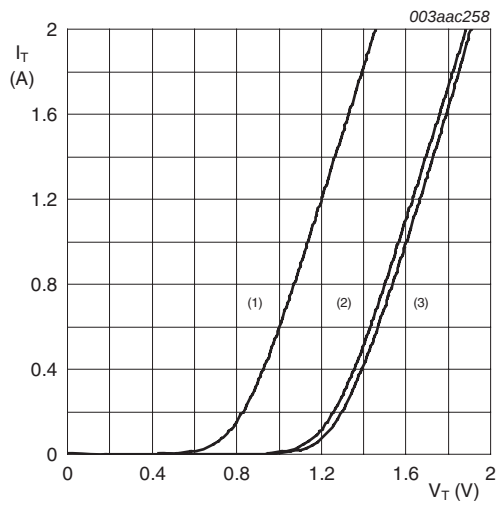


Fig 7. Normalized latching current as a function of junction temperature



$V_0 = 1.254 \text{ V}$ ;  $R_s = 0.31 \Omega$   
(1)  $T_j = 125 \text{ }^\circ\text{C}$ ; typical values  
(2)  $T_j = 125 \text{ }^\circ\text{C}$ ; maximum values  
(3)  $T_j = 25 \text{ }^\circ\text{C}$ ; maximum values

Fig 8. On-state current as a function of on-state voltage

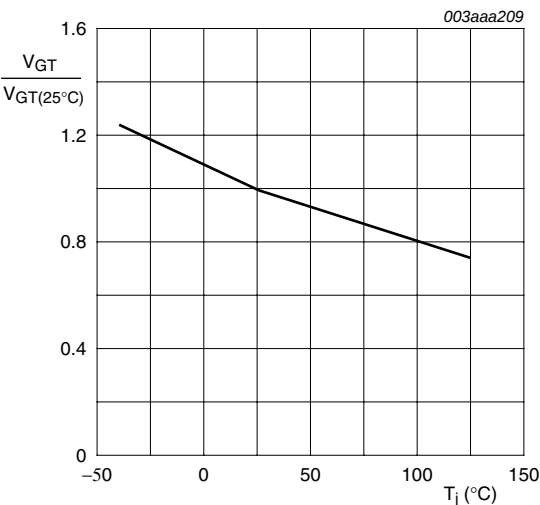


Fig 9. Normalized gate trigger voltage as a function of junction temperature

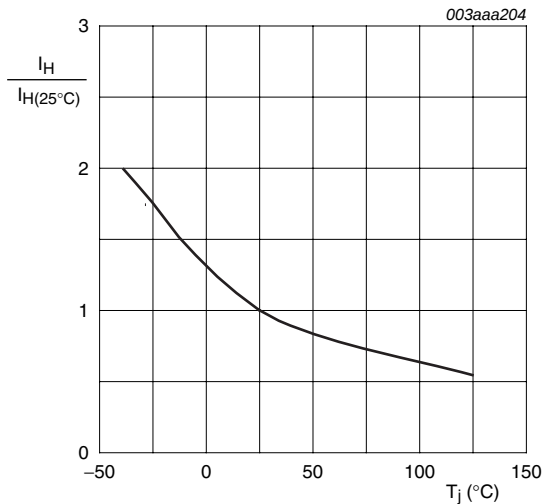
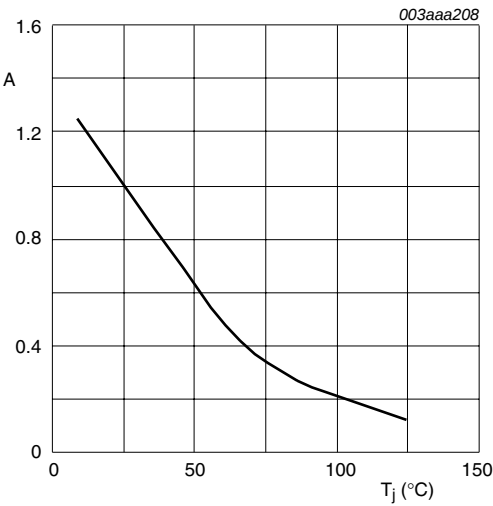


Fig 10. Normalized holding current as a function of junction temperature



$$A = \frac{dV_D/dt}{dV_{D(25^{\circ}\text{C})}/dt}$$

Fig 11. Normalized critical rate of rise of off-state voltage as a function of junction temperature;typical values

7. Package outline

Plastic surface-mounted package with increased heatsink; 4 leads

SOT223

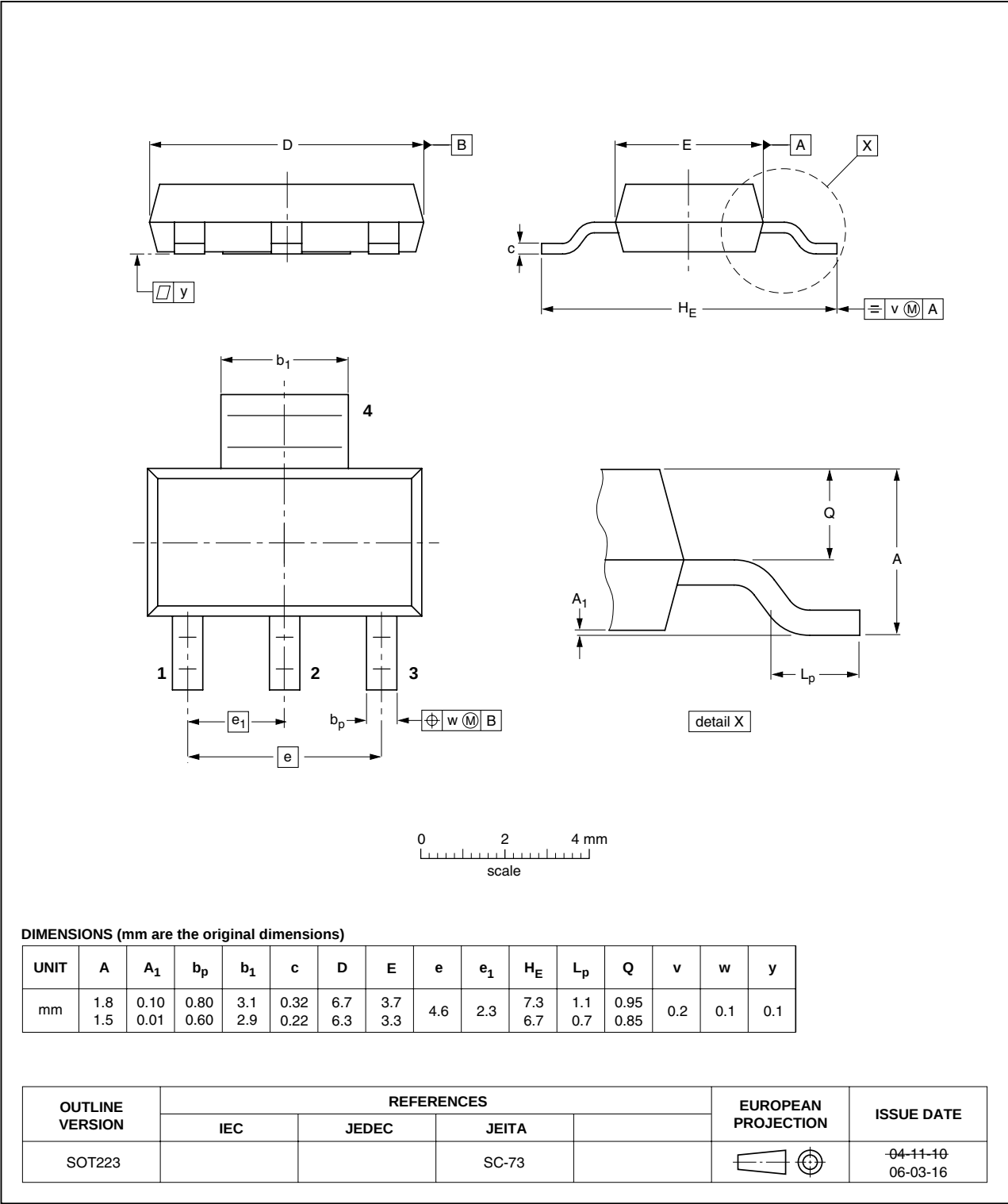


Fig 12. Package outline SOT223 (SC-73)

## 8. Revision history

Table 7. Revision history

| Document ID                               | Release date                                                                                                                                                                                                                                                                                                                            | Data sheet status  | Change notice | Supersedes            |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-----------------------|
| Z0103MN_3                                 | 20090805                                                                                                                                                                                                                                                                                                                                | Product data sheet | -             | Z0103_07_09_SERIES-02 |
| Modifications:                            | <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• Type number Z0103MN separated from data sheet Z0103_07_09_SERIES-02.</li></ul> |                    |               |                       |
| Z0103_07_09_SERIES-02<br>(9397 750 10102) | 20020912                                                                                                                                                                                                                                                                                                                                | Product data       | -             | Z0103_07_09_SERIES-01 |
| Z0103_07_09_SERIES-01<br>(9397 750 09419) | 20020411                                                                                                                                                                                                                                                                                                                                | Product data       | -             | -                     |

## 9. Legal information

### 9.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition                                                                            |
|-----------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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