

# Z0109NN

## 4Q Triac

Rev. 05 — 18 March 2011

Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.2 Features and benefits

- Direct interfacing to logic level ICs
- Direct interfacing to low power gate drive circuits
- High blocking voltage capability
- Planar passivated for voltage ruggedness and reliability
- Sensitive gate in four quadrants
- Surface-mountable package
- Triggering in all four quadrants

### 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 data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{\text{DRM}}$	repetitive peak off-state voltage		-	-	800	V
$I_{\text{TSM}}$	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$ ; $t_{\text{p}} = 20\text{ ms}$ ; see <a href="#">Figure 4</a> ; see <a href="#">Figure 5</a>	-	-	8	A
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{sp}} \leq 105\text{ °C}$ ; see <a href="#">Figure 3</a> ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a>	-	-	1	A

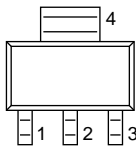
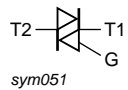


Table 1. Quick reference data ...continued

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+; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 9</a>	-	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 9</a>	-	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 9</a>	-	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 9</a>	-	-	10	mA

## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1		 sym051
2	T2	main terminal 2		
3	G	gate		
4	T2	main terminal 2		

**SOT223 (SOT223)**

## 3. Ordering information

Table 3. Ordering information

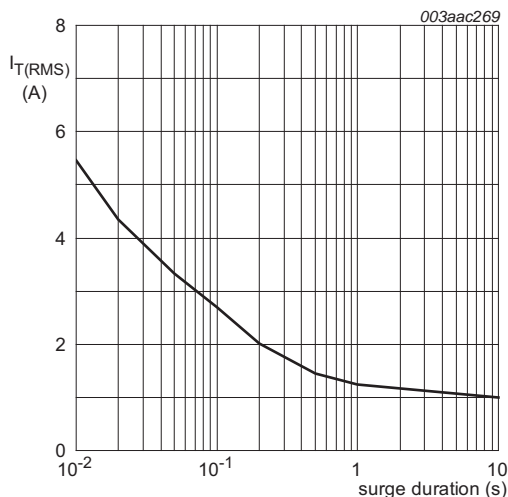
Type number	Package		Version
	Name	Description	
Z0109NN	SOT223	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

## 4. Limiting values

**Table 4. Limiting values**

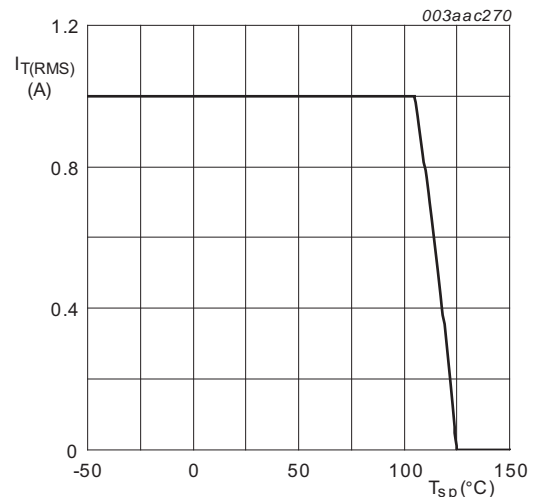
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{sp} \leq 105\text{ °C}$ ; see <a href="#">Figure 3</a> ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a>	-	1	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; see <a href="#">Figure 4</a> ; see <a href="#">Figure 5</a>	-	8	A
		full sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$	-	8.5	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; sine-wave pulse	-	0.32	$A^2s$
$di_T/dt$	rate of rise of on-state current	$I_T = 1\text{ A}$ ; $I_G = 20\text{ mA}$ ; $dI_G/dt = 0.1\text{ A}/\mu s$ ; T2+ G+	-	50	$A/\mu s$
		$I_T = 1\text{ A}$ ; $I_G = 20\text{ mA}$ ; $dI_G/dt = 0.1\text{ A}/\mu s$ ; T2+ G-	-	50	$A/\mu s$
		$I_T = 1\text{ A}$ ; $I_G = 20\text{ mA}$ ; $dI_G/dt = 0.1\text{ A}/\mu s$ ; T2- G-	-	50	$A/\mu s$
		$I_T = 1\text{ A}$ ; $I_G = 20\text{ mA}$ ; $dI_G/dt = 0.1\text{ A}/\mu s$ ; T2- G+	-	20	$A/\mu s$
$I_{GM}$	peak gate current		-	1	A
$P_{GM}$	peak gate power		-	2	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.1	W
$T_{stg}$	storage temperature		-40	150	$^{\circ}C$
$T_j$	junction temperature		-	125	$^{\circ}C$



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

**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**

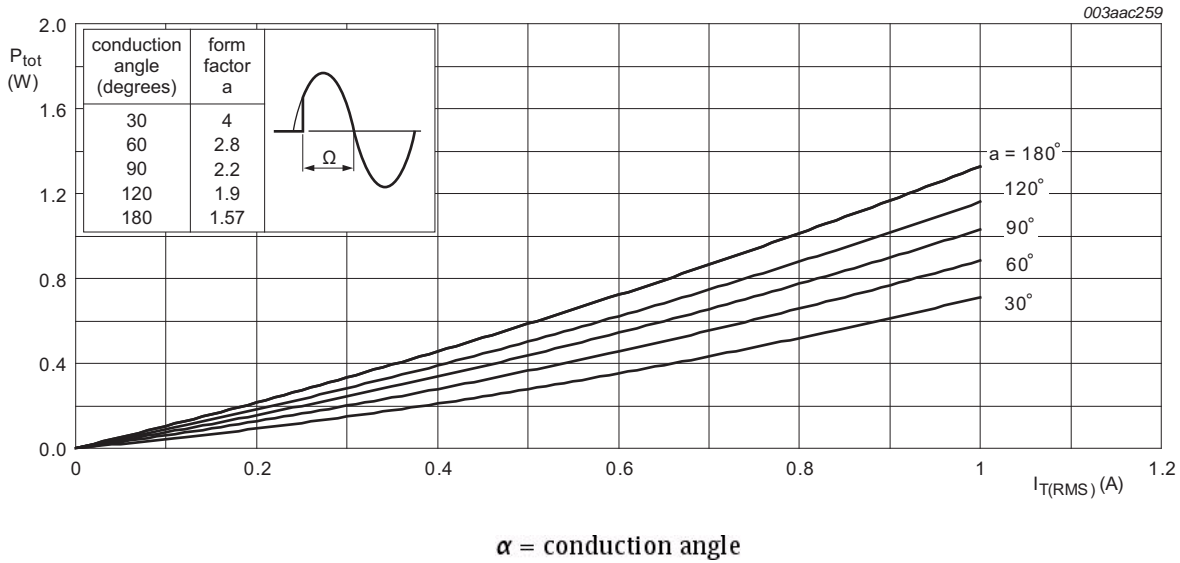


Fig 3. Total power dissipation as a function of RMS on-state current; maximum values

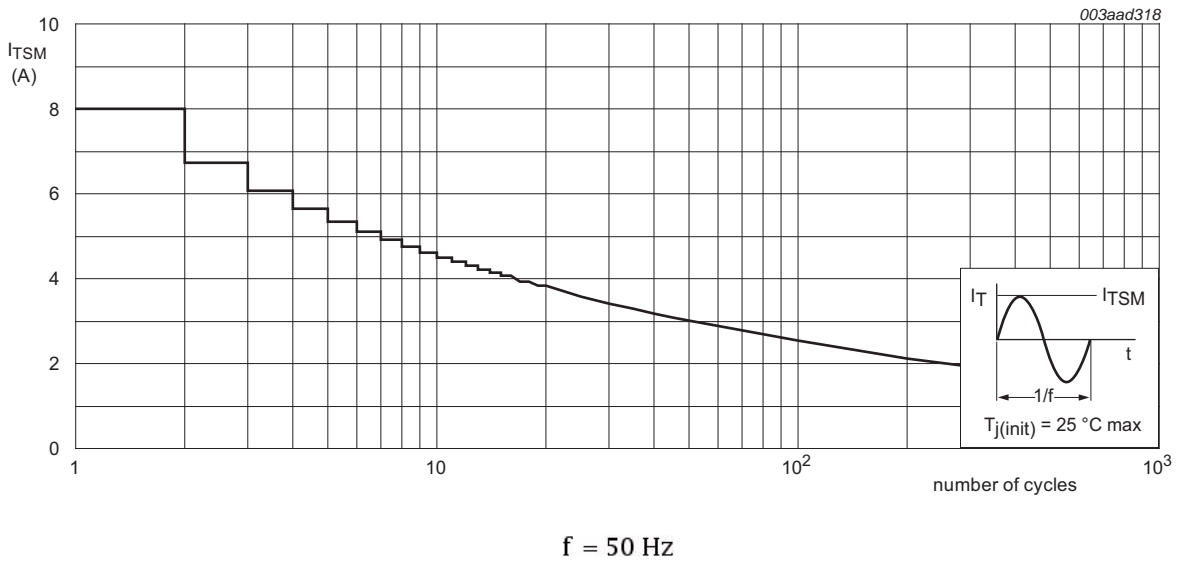
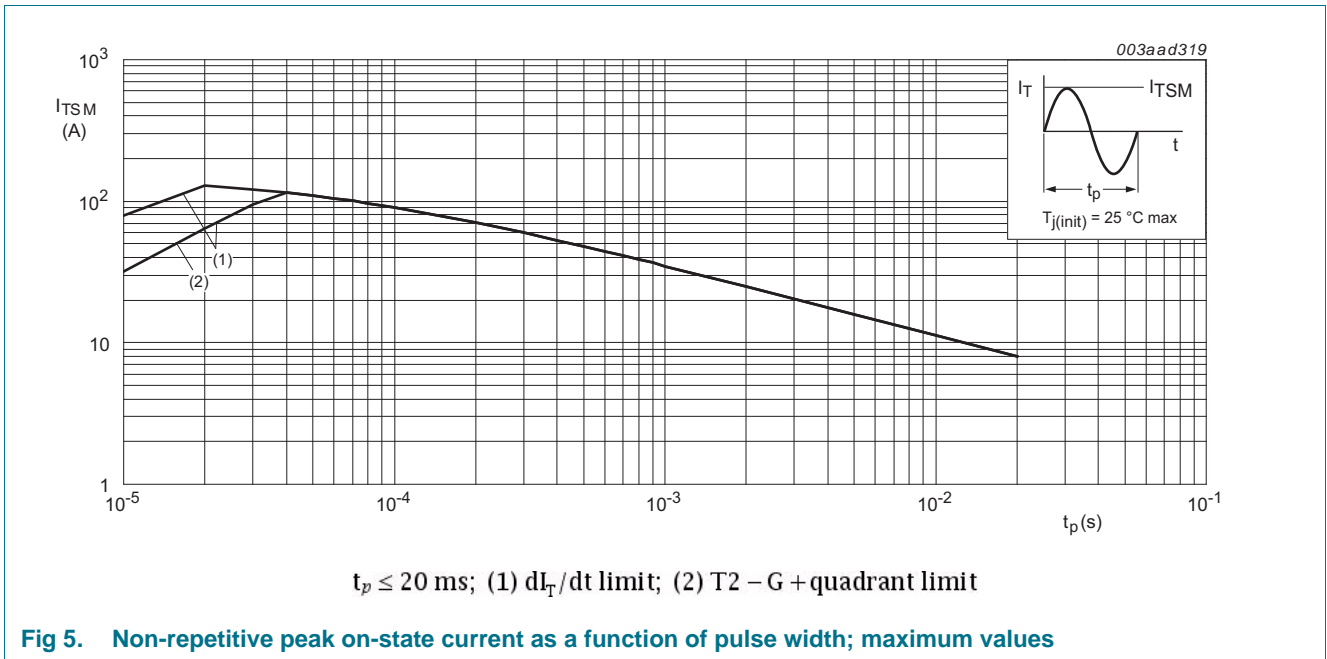


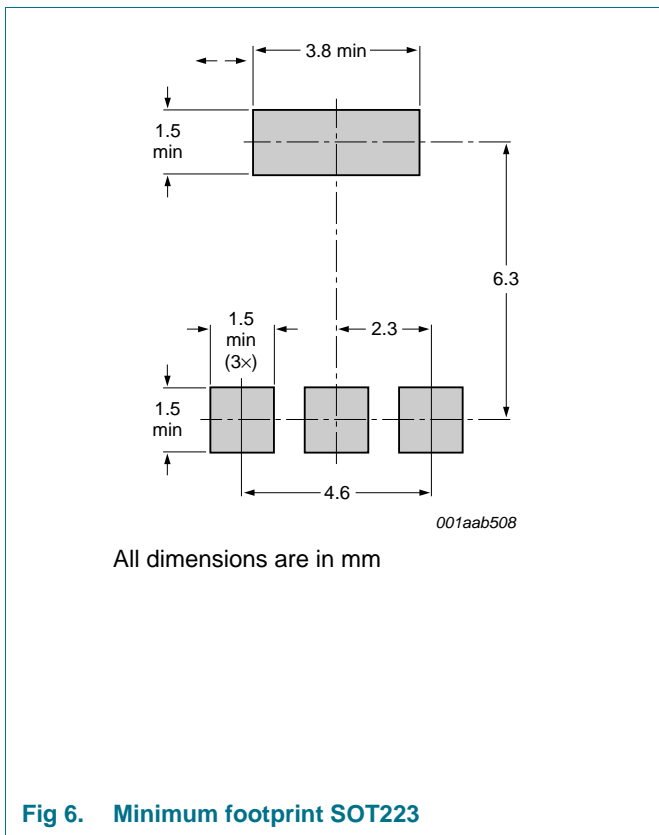
Fig 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



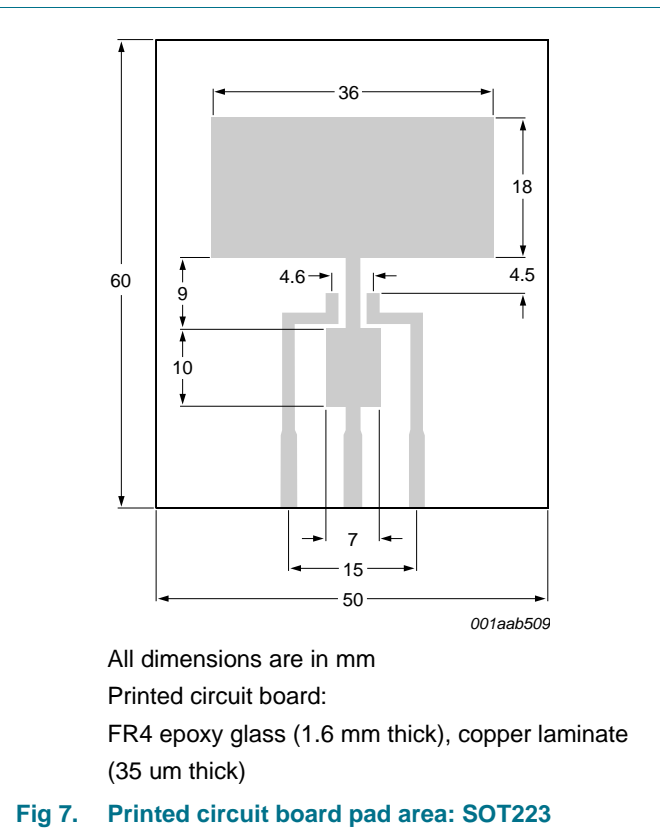
## 5. Thermal characteristics

**Table 5. Thermal characteristics**

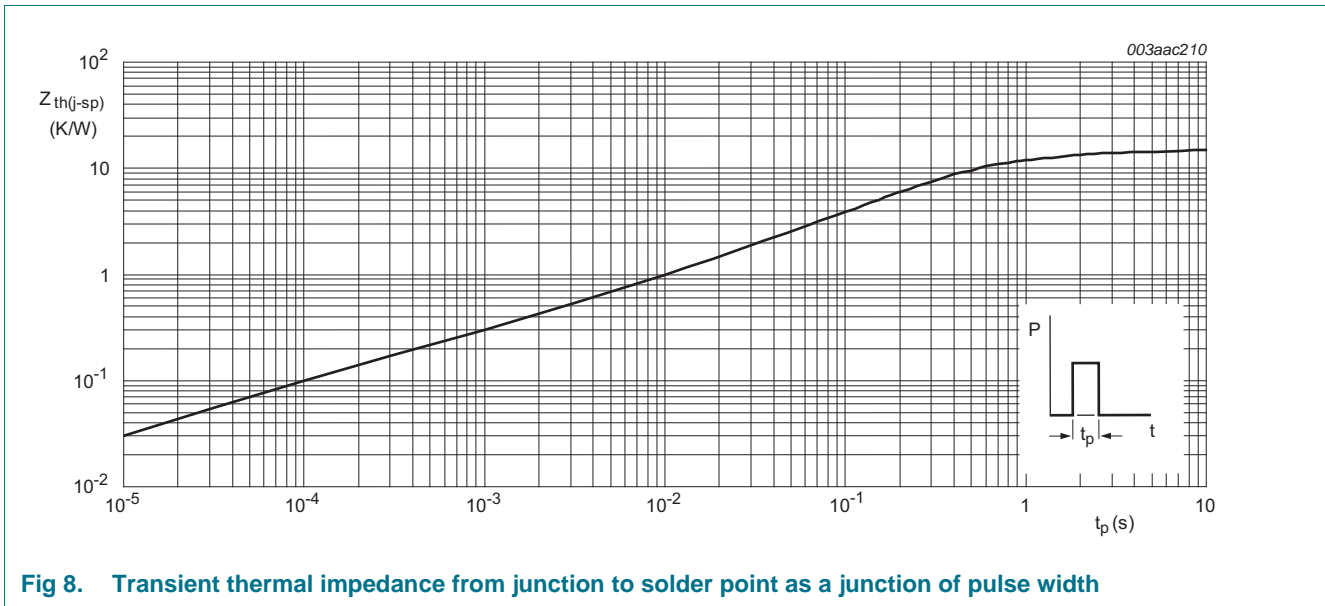
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	full cycle; see <a href="#">Figure 8</a>	-	-	15	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	full cycle; printed circuit board mounted; minimum footprint; see <a href="#">Figure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



**Fig 6. Minimum footprint SOT223**



**Fig 7. Printed circuit board pad area: SOT223**

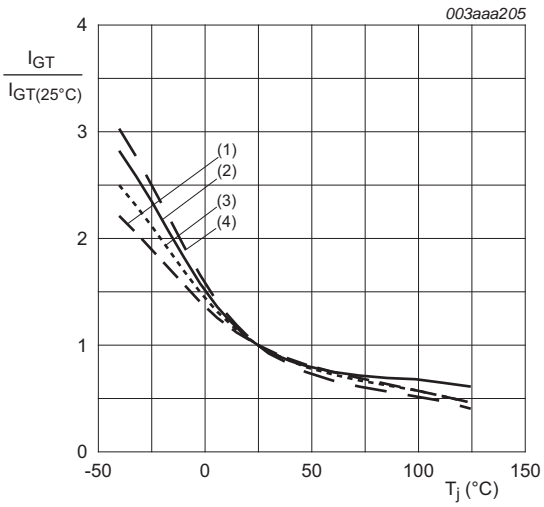


## 6. Characteristics

Table 6. Characteristics

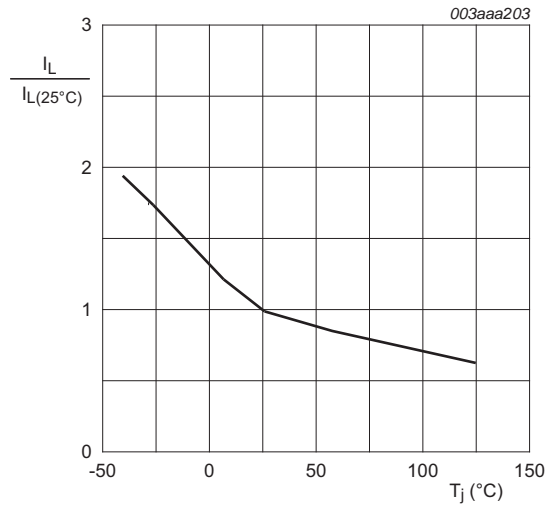
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 9</a>	-	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 9</a>	-	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 9</a>	-	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 9</a>	-	-	10	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 10</a>	-	-	15	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 10</a>	-	-	25	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 10</a>	-	-	15	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 10</a>	-	-	15	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 11</a>	-	-	10	mA
$V_T$	on-state voltage	$I_T = 1.4\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 12</a>	-	1.3	1.6	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 13</a>	-	-	1.3	V
		$V_D = 800\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ °C}$ ; see <a href="#">Figure 13</a>	0.2	-	-	V
$I_D$	off-state current	$V_D = 800\text{ V}$ ; $T_j = 125\text{ °C}$	-	-	0.5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$ ; $T_j = 110\text{ °C}$ ; gate open circuit; exponential waveform; see <a href="#">Figure 14</a>	50	-	-	V/ $\mu$ s
$dV_{com}/dt$	rate of change of commutating voltage	$V_D = 400\text{ V}$ ; $T_j = 110\text{ °C}$ ; $dI_{com}/dt = 0.44\text{ A/ms}$ ; gate open circuit	2	-	-	V/ $\mu$ s



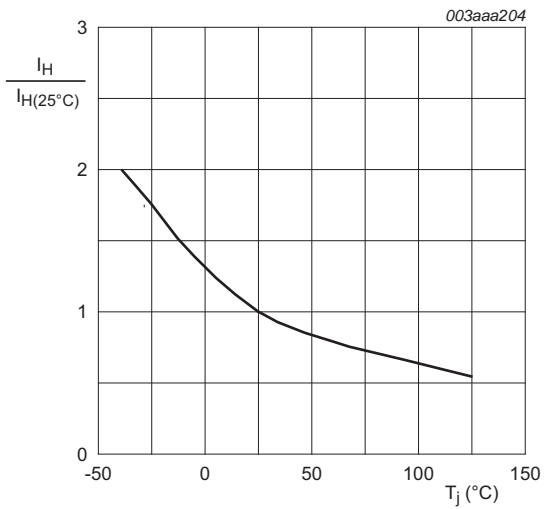


- (1) T2- G+
- (2) T2- G-
- (3) T2+ G-
- (4) T2+ G+

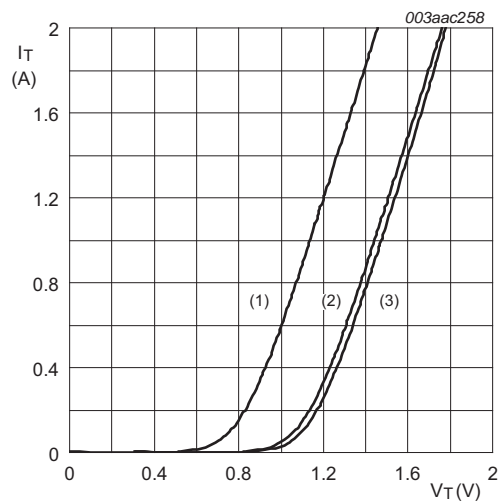
**Fig 9. Normalized gate trigger current as a function of junction temperature**



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



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



$V_o = 1.13 \text{ V}$   
 $R_s = 0.31 \text{ } \Omega$

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

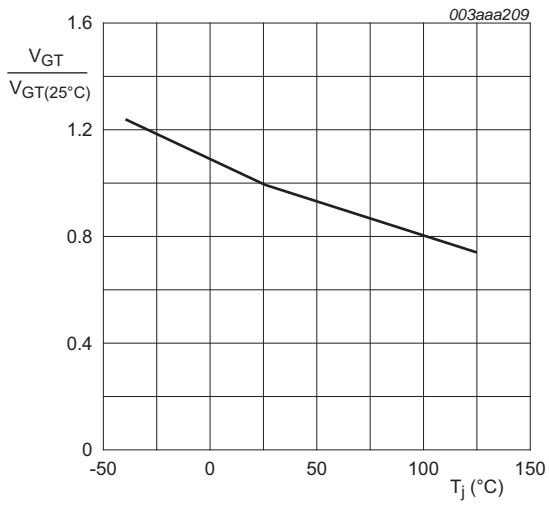
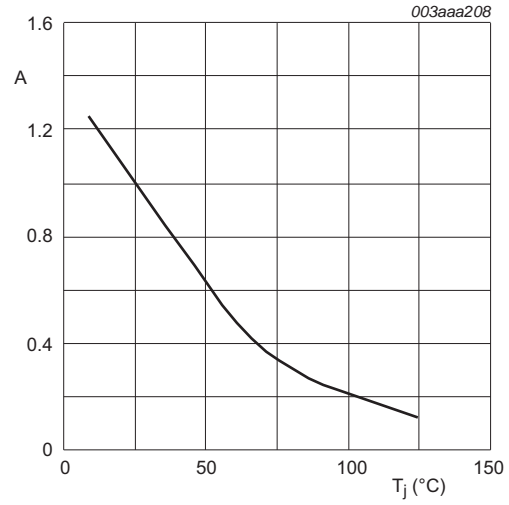


Fig 13. Normalized gate trigger voltage as a function of junction temperature



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

Fig 14. 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

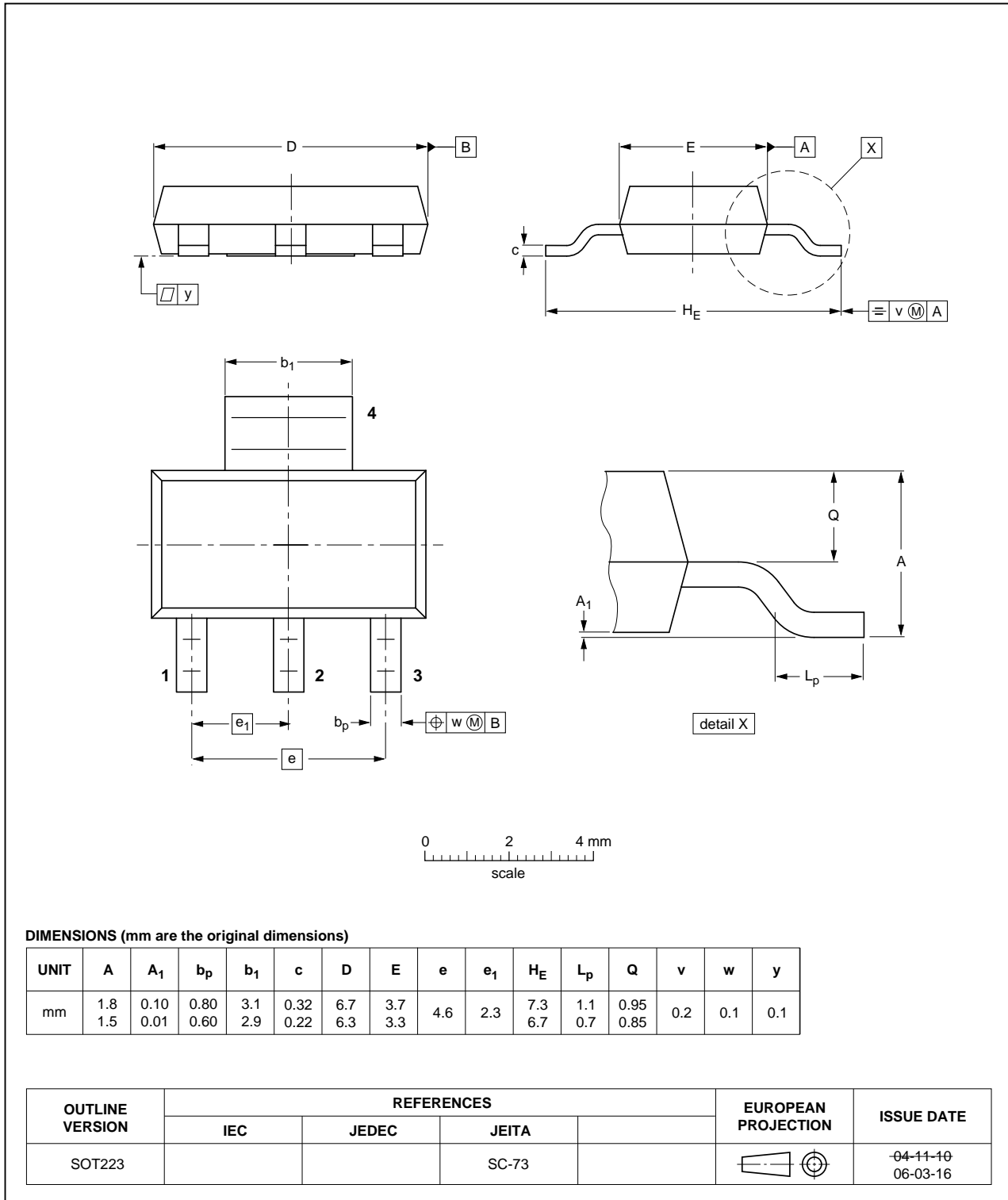


Fig 15. Package outline SOT223 (SOT223)

## 8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
Z0109NN v.5	20110318	Product data sheet	-	Z0109NN v.4
Modifications:	• Various changes to content.			
Z0109NN v.4	20100906	Product data sheet	-	Z0109NN v.3

## 9. Legal information

### 9.1 Data sheet status

Document status <sup>[1]</sup> <sup>[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.

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

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