

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_{DRM}	repetitive peak off-state voltage		-	-	800	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$; $t_{\text{p}} = 20\text{ ms}$; see Figure 4 ; see Figure 5	-	-	8	A
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{sp}} \leq 105\text{ °C}$; see Figure 3 ; see Figure 1 ; see Figure 2	-	-	1	A

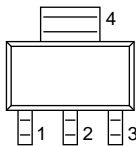
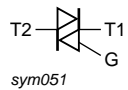


Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
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 Figure 9	-	-	10	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2+ G-;$ $T_j = 25\text{ }^\circ\text{C};$ see Figure 9	-	-	10	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2- G-;$ $T_j = 25\text{ }^\circ\text{C};$ see Figure 9	-	-	10	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2- G+;$ $T_j = 25\text{ }^\circ\text{C};$ see Figure 9	-	-	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

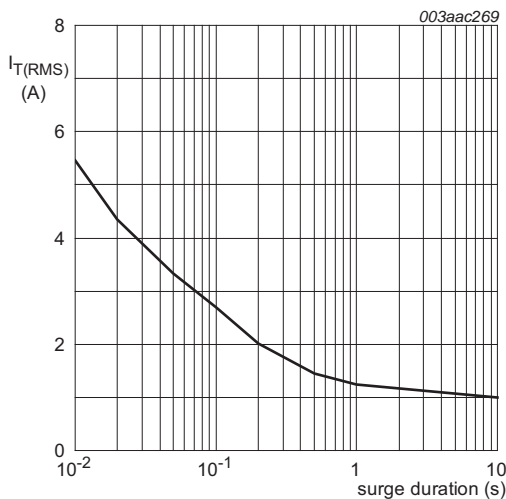
Type number	Package		Version
	Name	Description	
Z0109NN	SOT223	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

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; $T_{sp} \leq 105\text{ }^{\circ}\text{C}$; see Figure 3 ; see Figure 1 ; see Figure 2	-	1	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 20\text{ ms}$; see Figure 4 ; see Figure 5	-	8	A
		full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 16.7\text{ ms}$	-	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	$I_T = 1\text{ A}$; $I_G = 20\text{ mA}$; $di_G/dt = 0.1\text{ A}/\mu\text{s}$; T2+ G+	-	50	$\text{A}/\mu\text{s}$
		$I_T = 1\text{ A}$; $I_G = 20\text{ mA}$; $di_G/dt = 0.1\text{ A}/\mu\text{s}$; T2+ G-	-	50	$\text{A}/\mu\text{s}$
		$I_T = 1\text{ A}$; $I_G = 20\text{ mA}$; $di_G/dt = 0.1\text{ A}/\mu\text{s}$; T2- G-	-	50	$\text{A}/\mu\text{s}$
		$I_T = 1\text{ A}$; $I_G = 20\text{ mA}$; $di_G/dt = 0.1\text{ A}/\mu\text{s}$; T2- G+	-	20	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current		-	1	A
P_{GM}	peak gate power		-	2	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.1	W
T_{stg}	storage temperature		-40	150	$^{\circ}\text{C}$
T_j	junction temperature		-	125	$^{\circ}\text{C}$



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

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

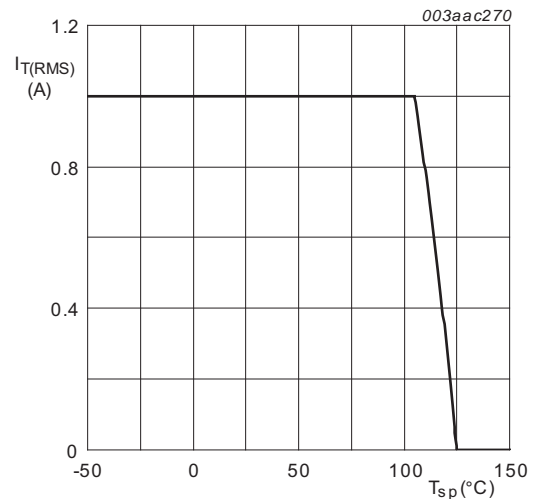


Fig 2. RMS on-state current as a function of solder point temperature; maximum values

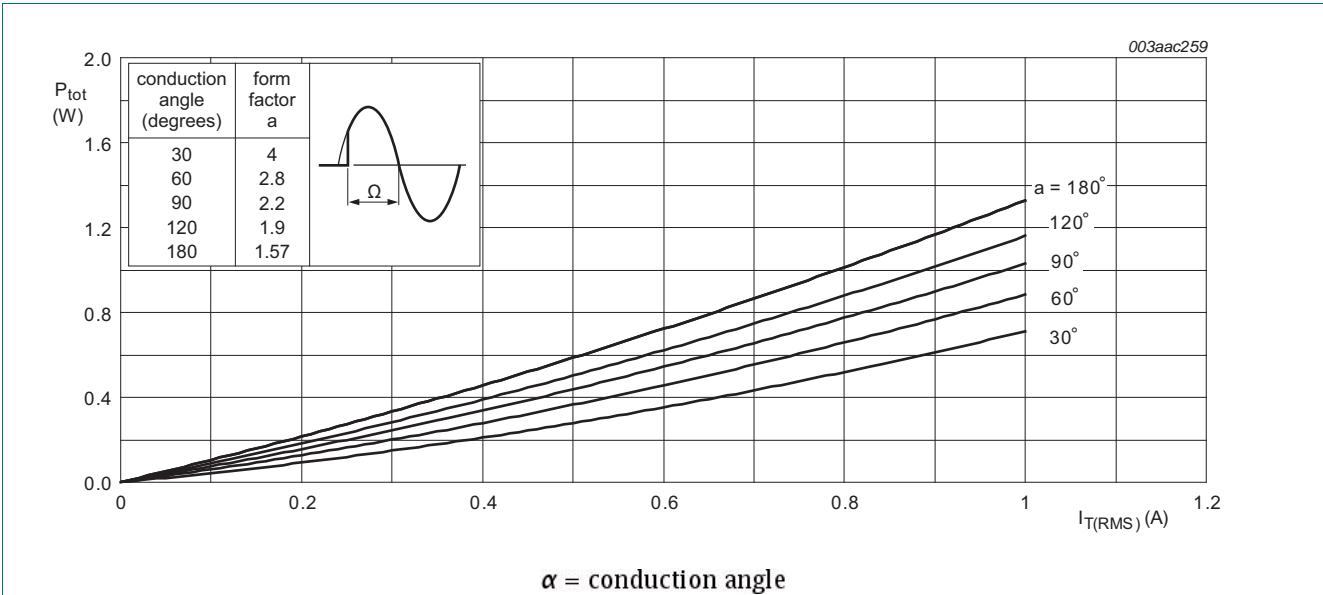


Fig 3. Total power dissipation as a function of RMS on-state current; maximum values

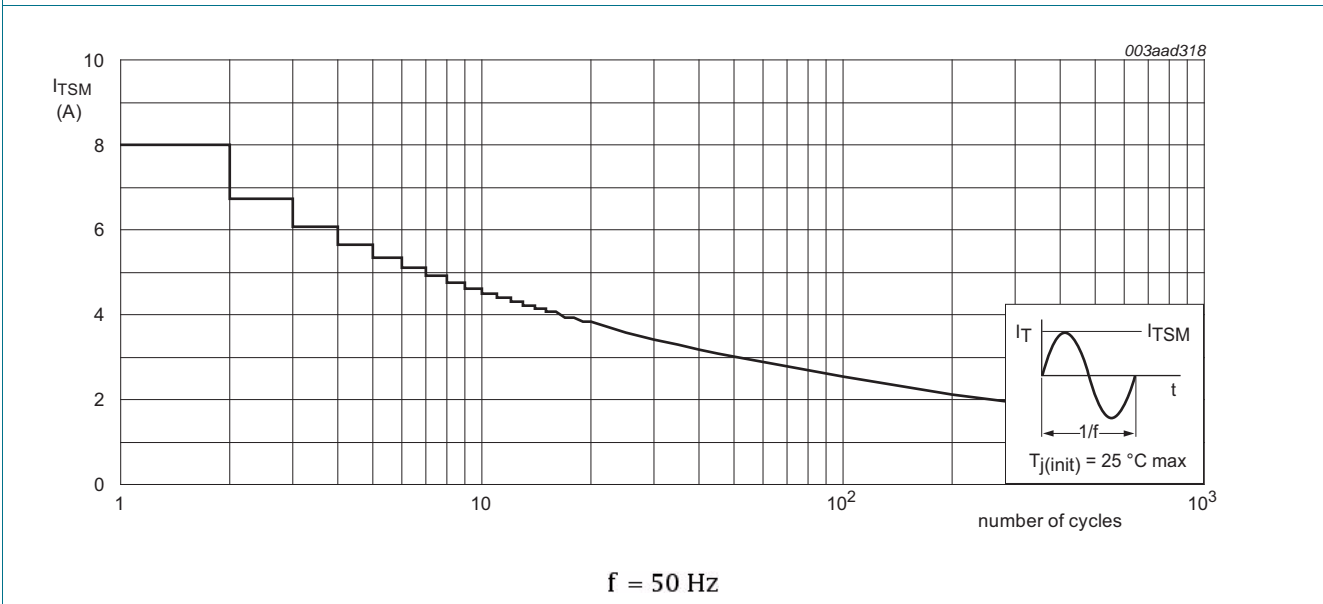


Fig 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

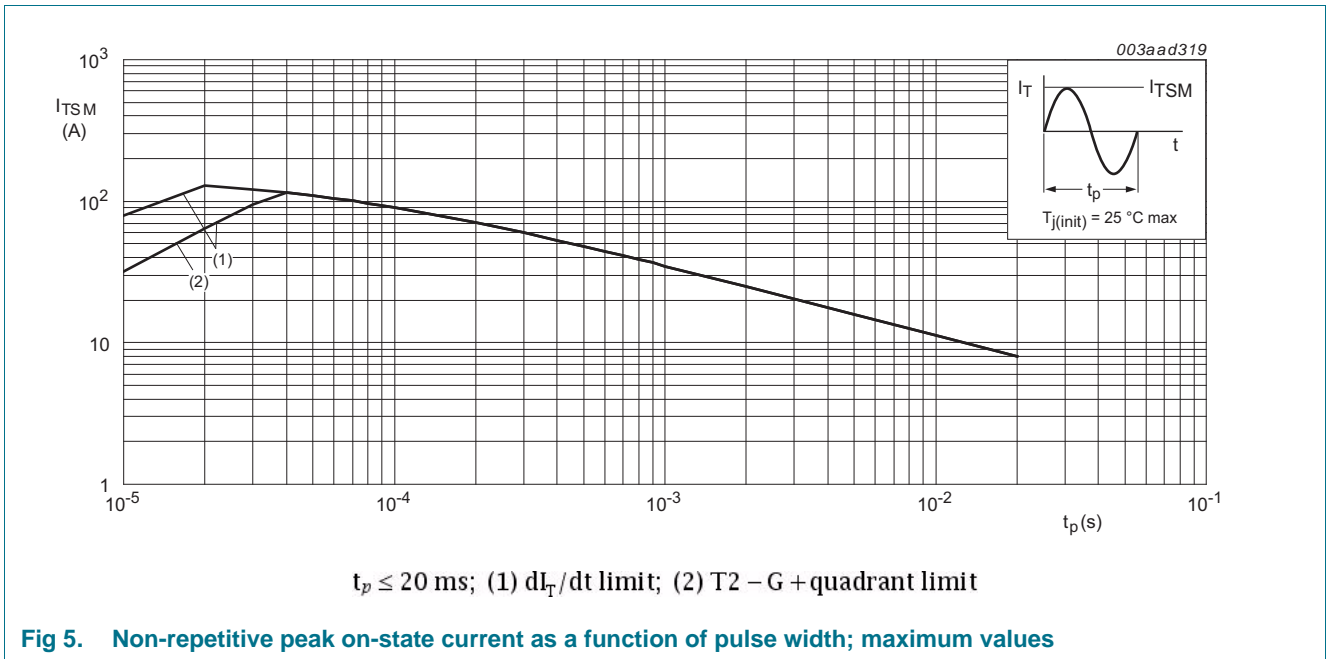


Fig 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

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 Figure 8	-	-	15	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	full cycle; printed circuit board mounted; minimum footprint; see Figure 6	-	156	-	K/W
		full cycle; printed circuit board mounted; pad area; see Figure 7	-	70	-	K/W

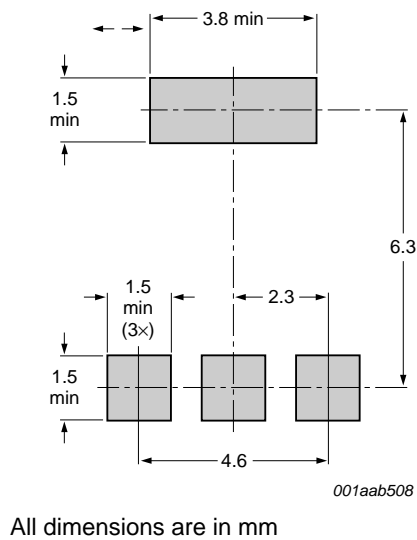


Fig 6. Minimum footprint SOT223

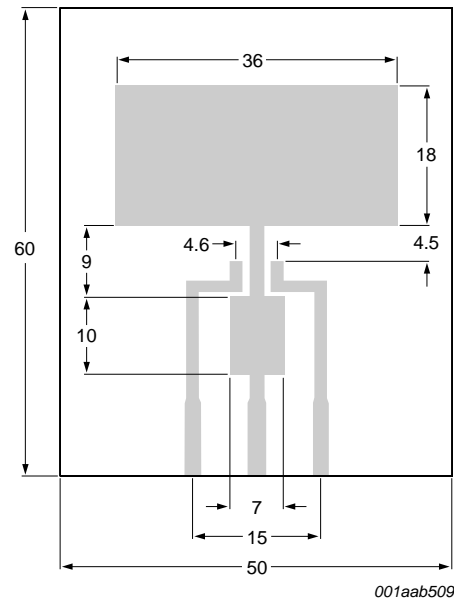


Fig 7. Printed circuit board pad area: SOT223

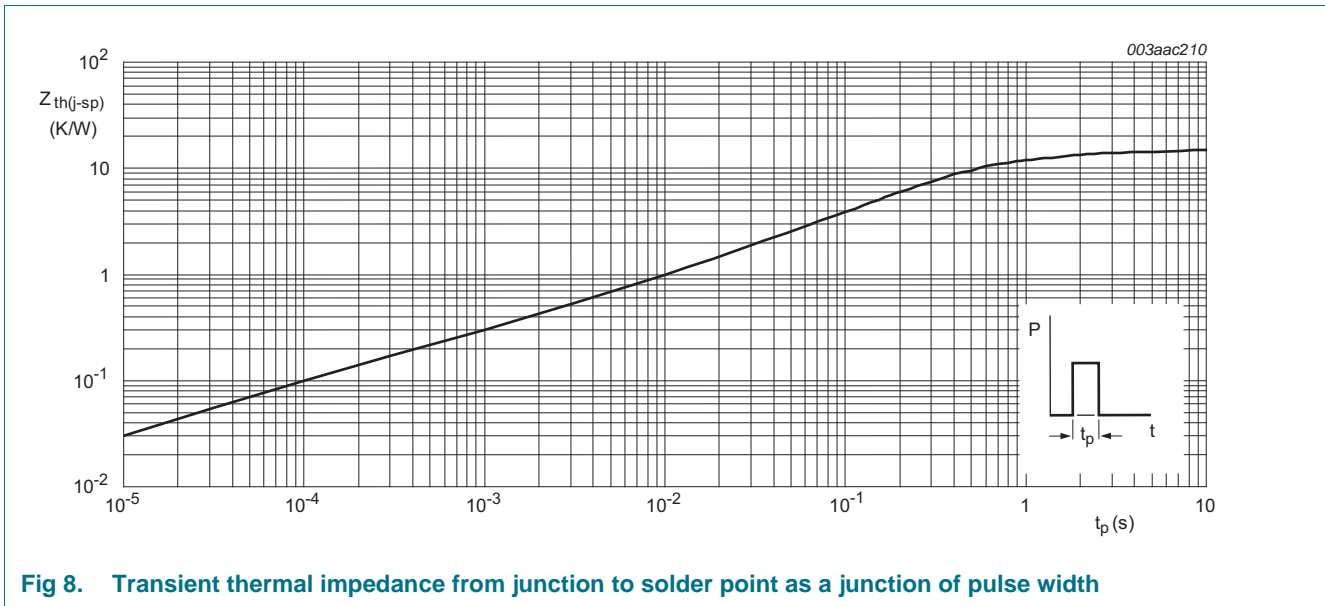
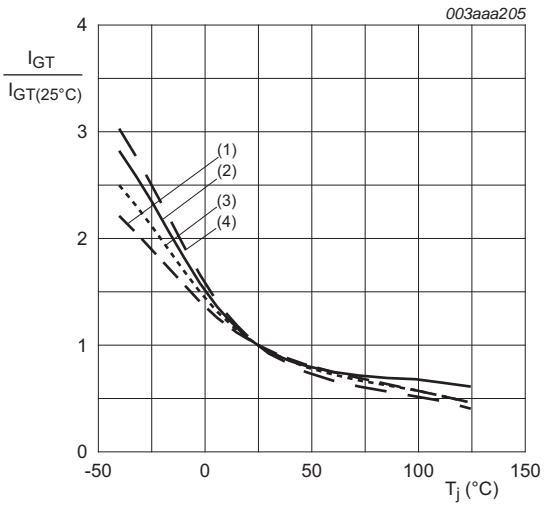


Fig 8. Transient thermal impedance from junction to solder point as a junction of pulse width

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; see Figure 9	-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; see Figure 9	-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; see Figure 9	-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ °C}$; see Figure 9	-	-	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 Figure 10	-	-	15	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; see Figure 10	-	-	25	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; see Figure 10	-	-	15	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ °C}$; see Figure 10	-	-	15	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; see Figure 11	-	-	10	mA
V_T	on-state voltage	$I_T = 1.4\text{ A}$; $T_j = 25\text{ °C}$; see Figure 12	-	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 Figure 13	-	-	1.3	V
		$V_D = 800\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125\text{ °C}$; see Figure 13	0.2	-	-	V
I_D	off-state current	$V_D = 800\text{ V}$; $T_j = 125\text{ °C}$	-	-	0.5	mA
Dynamic characteristics						
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 Figure 14	50	-	-	V/ μ 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/ μ 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

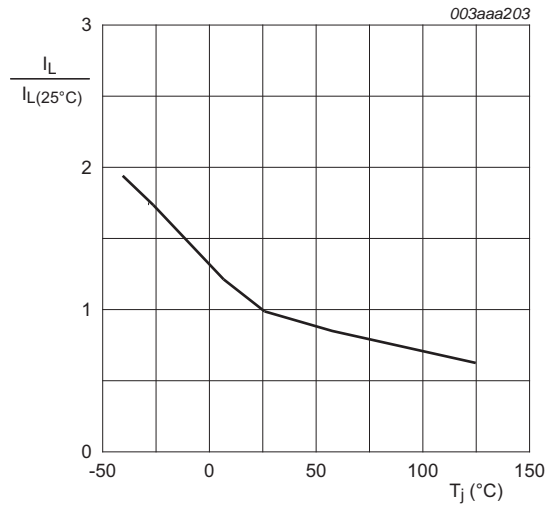


Fig 10. Normalized latching current as a function of junction temperature

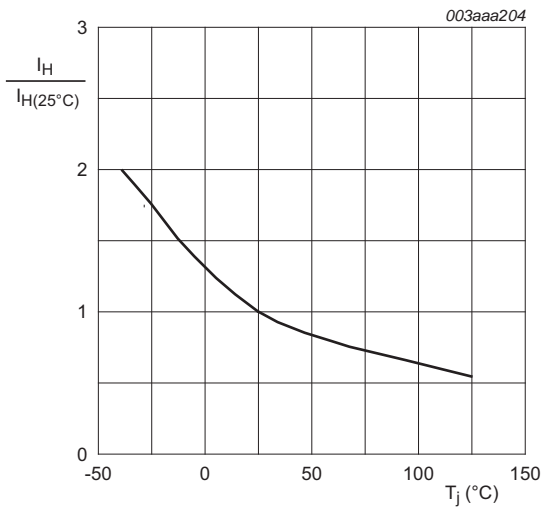
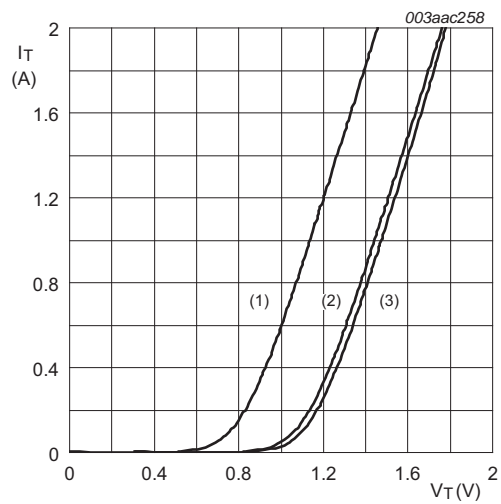


Fig 11. Normalized holding current as a function of junction temperature



$V_o = 1.13 \text{ V}$

$R_s = 0.31 \text{ } \Omega$

(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

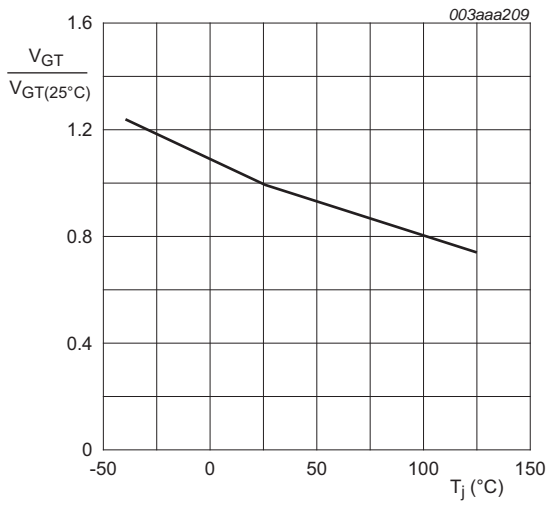
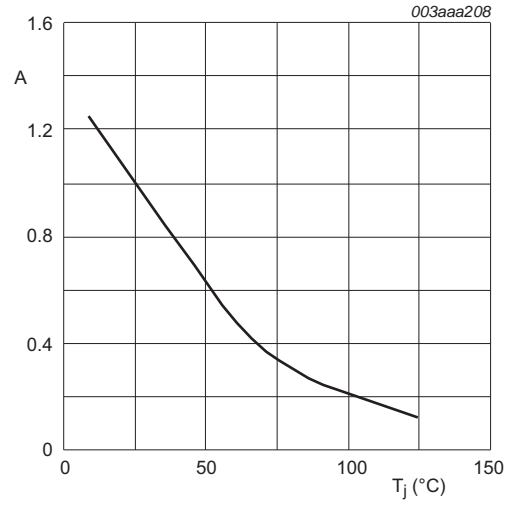


Fig 13. Normalized gate trigger voltage as a function of junction temperature



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

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

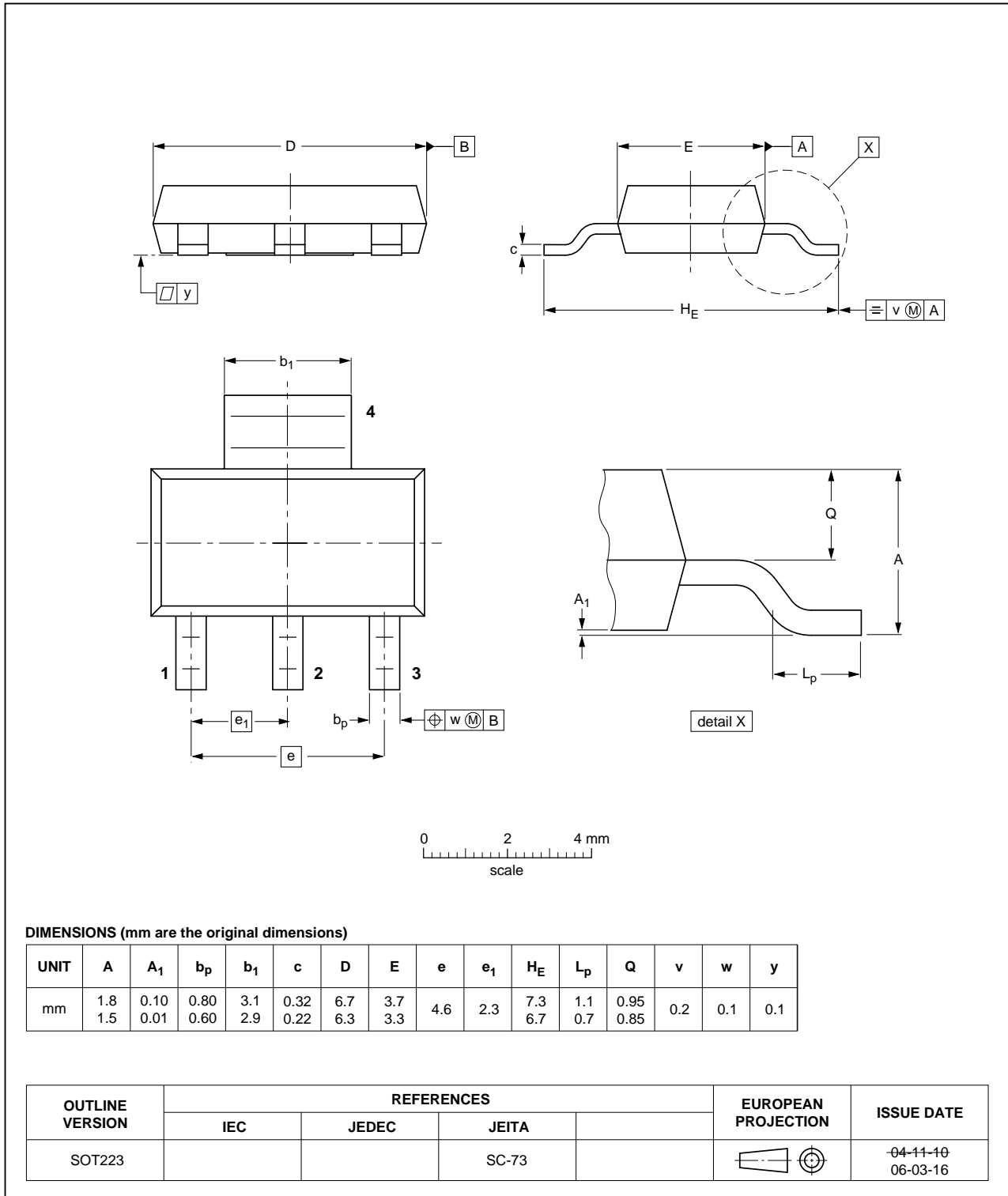


Fig 15. Package outline SOT223 (SOT223)

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

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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.
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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