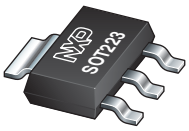


Z0109NN0

4Q Triac

Rev. 3 — 10 May 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 enhanced immunity to noise and direct interfacing to logic level ICs and low power gate drivers.

1.2 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

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; $T_{j(init)}$ = 25 °C; t_p = 20 ms; see Figure 4; see Figure 5	-	-	12.5	A
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{sp} \leq 105$ °C; see Figure 3; see Figure 1; see Figure 2	-	-	1	A

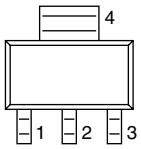
Table 1. Quick reference data *...continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 9	0.4	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 9	0.4	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; see Figure 9	0.4	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; see Figure 9	0.4	-	10	mA

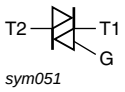
2. Pinning information

Table 2. Pinning information

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



SOT223 (SOT223)



sym051

3. Ordering information

Table 3. Ordering information

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

4. Marking

Table 4. Marking codes

Type number	Marking code[1]
Z0109NN0	109NN0

[1] % = placeholder for manufacturing site code

5. Limiting values

Table 5. 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; $T_{sp} \leq 105$ °C; see Figure 3; see Figure 1; see Figure 2	-	1	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; see Figure 4; see Figure 5	-	12.5	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms	-	13.8	A
I^2t	I^2t for fusing	$t_p = 10$ ms; sine-wave pulse	-	0.78	A^2s
dI_T/dt	rate of rise of on-state current	$I_T = 1$ A; $I_G = 20$ mA; $dI_G/dt = 100$ mA/µs; T2+ G+	-	50	A/µs
		$I_T = 1$ A; $I_G = 20$ mA; $dI_G/dt = 100$ mA/µs; T2+ G-	-	50	A/µs
		$I_T = 1$ A; $I_G = 20$ mA; $dI_G/dt = 100$ mA/µs; T2- G-	-	50	A/µs
		$I_T = 1$ A; $I_G = 20$ mA; $dI_G/dt = 100$ mA/µs; T2- G+	-	20	A/µs
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	°C
T_j	junction temperature		-	125	°C

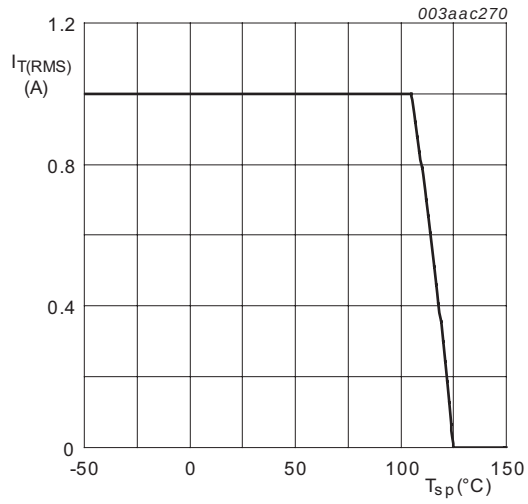


Fig 1. RMS on-state current as a function of solder point temperature; maximum values

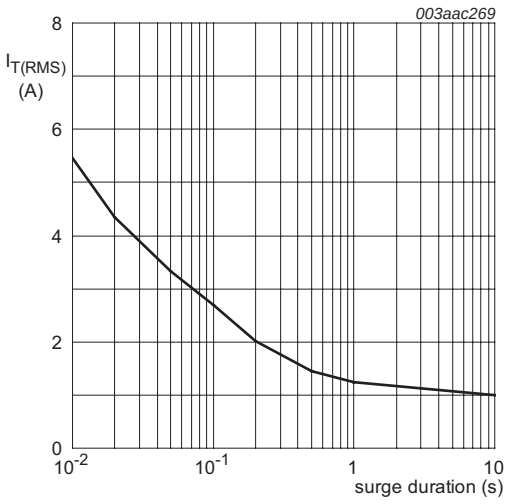
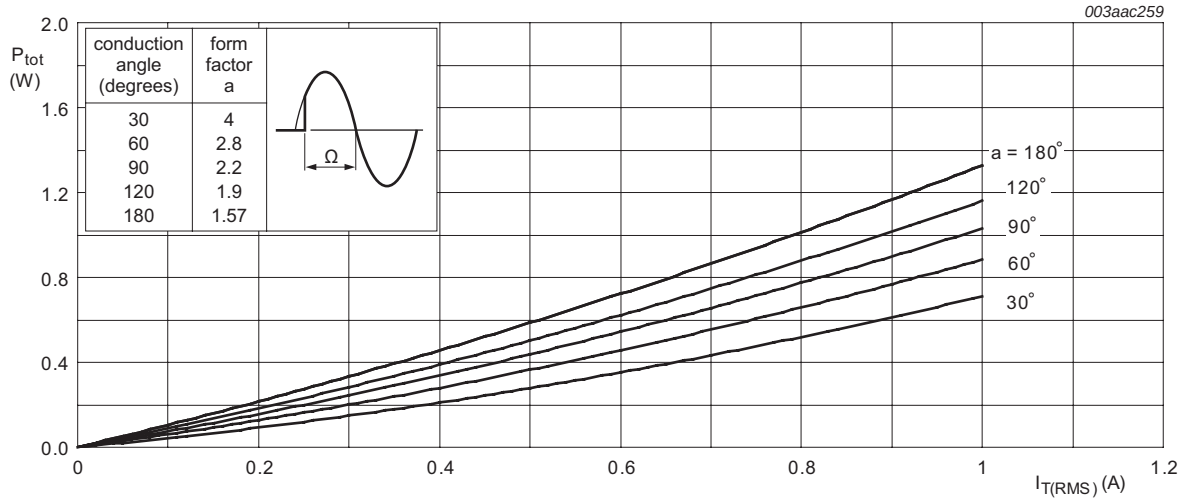
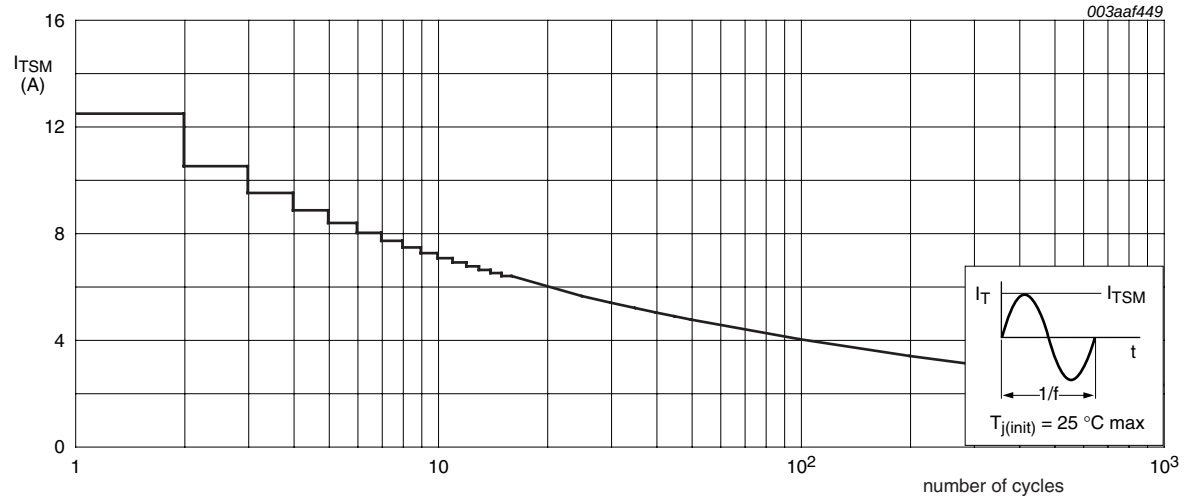


Fig 2. RMS on-state current as a function of surge duration; maximum values



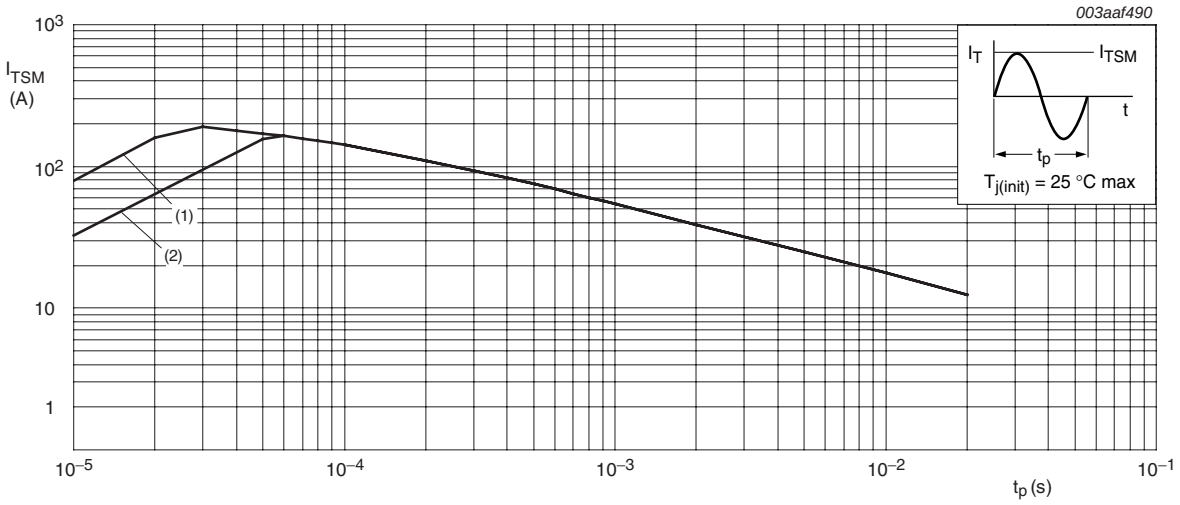
α = conduction angle

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



f = 50 Hz

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



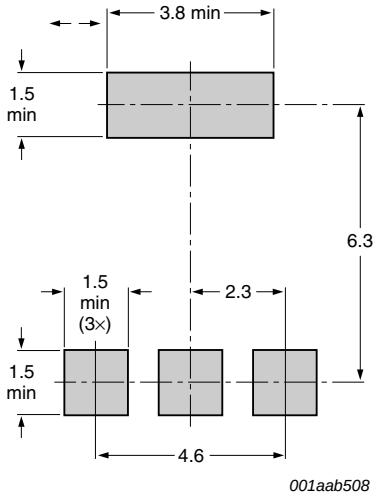
$t_p \leq 20\,ms$;
(1) dI_T/dt limit;
(2) T2 − G + quadrant limit

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

6. Thermal characteristics

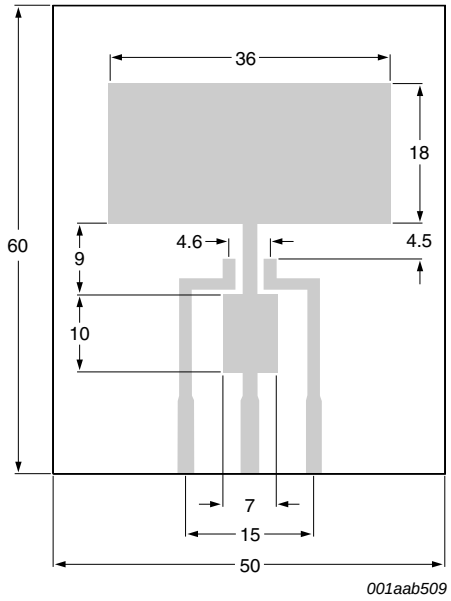
Table 6. Thermal characteristics

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	in free air; printed-circuit board mounted: minimum footprint; full cycle; see Figure 6	-	156	-	K/W
		in free air; printed-circuit board mounted: pad area; full cycle; see Figure 7	-	70	-	K/W



All dimensions are in mm

Fig 6. Minimum footprint SOT223



All dimensions are in mm

Printed circuit board:

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

Fig 7. Printed circuit board pad area: SOT223

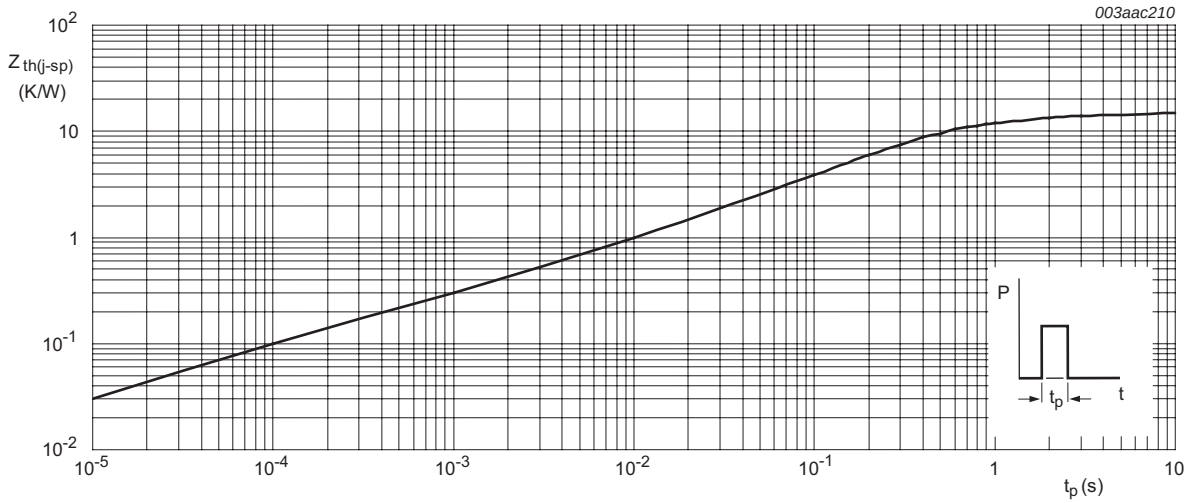
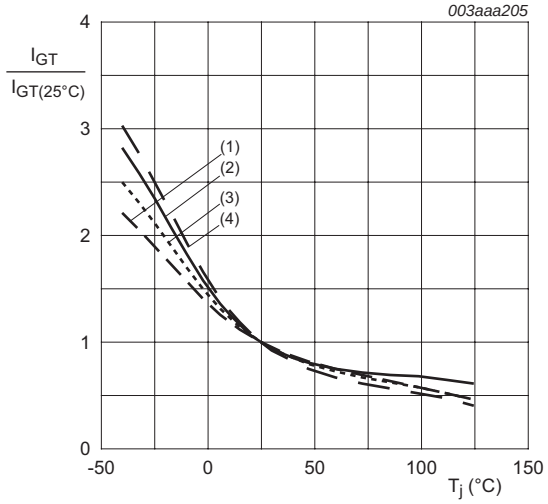


Fig 8. Transient thermal impedance from junction to solder point as a junction of pulse width

7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 9	0.4	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 9	0.4	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; see Figure 9	0.4	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; see Figure 9	0.4	-	10	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 10	-	-	15	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 10	-	-	30	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; see Figure 10	-	-	15	mA
		V_D = 12 V; I_G = 0.1 A; T2- G+; T_j = 25 °C; see Figure 10	-	-	15	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; see Figure 11	-	-	10	mA
V_T	on-state voltage	I_T = 1.4 A; T_j = 25 °C; see Figure 12	-	1.3	1.6	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; see Figure 13	-	-	1.3	V
		V_D = 800 V; I_T = 0.1 A; T_j = 125 °C; see Figure 13	0.2	-	-	V
I_D	off-state current	V_D = 800 V; T_j = 125 °C	-	-	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 536 V; T_j = 110 °C; gate open circuit; exponential waveform; see Figure 14	120	-	-	V/µs
dV_{com}/dt	rate of change of commutating voltage	V_D = 400 V; T_j = 110 °C; dI_{com}/dt = 0.44 A/ms; gate open circuit	2	-	-	V/µs



(1) T2- G+

(2) T2- G-

(3) T2+ G-

(4) T2+ G+

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

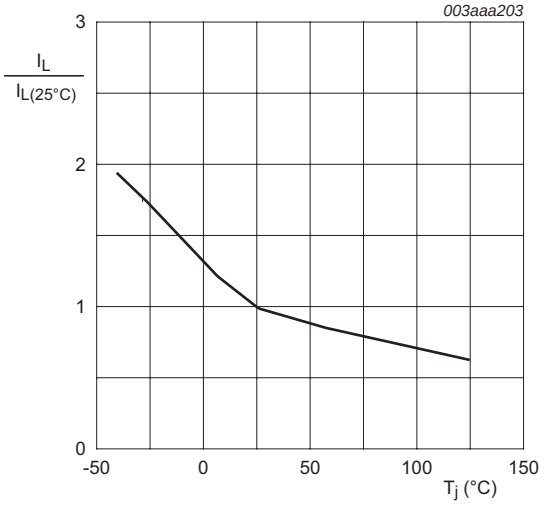


Fig 10. Normalized latching current as a function of junction temperature

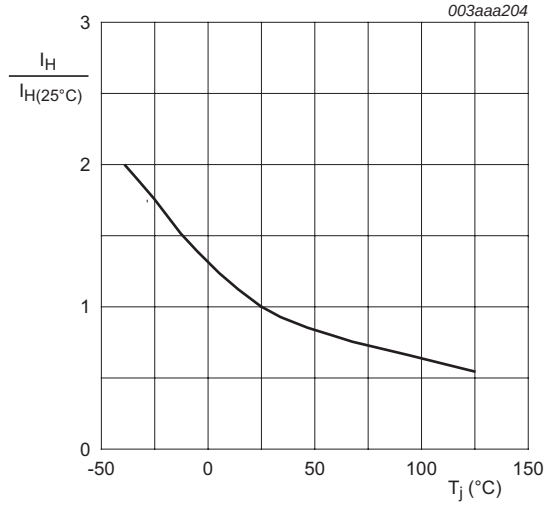
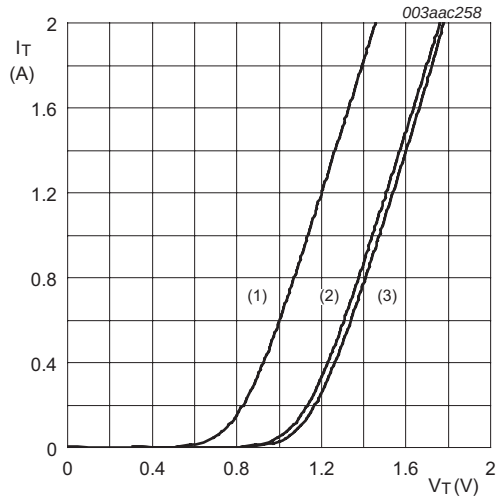


Fig 11. Normalized holding current as a function of junction temperature



V_o = 1.13 V

R_s = 0.31 Ω

(1) T_j = 125 °C; typical values

(2) T_j = 125 °C; maximum values

(3) T_j = 25 °C; maximum values

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

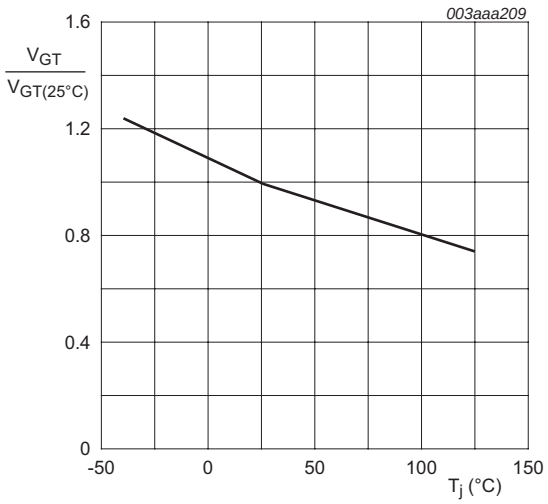
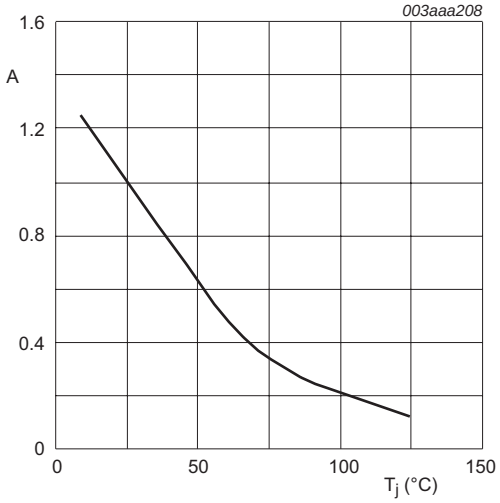


Fig 13. Normalized gate trigger voltage as a function of junction temperature

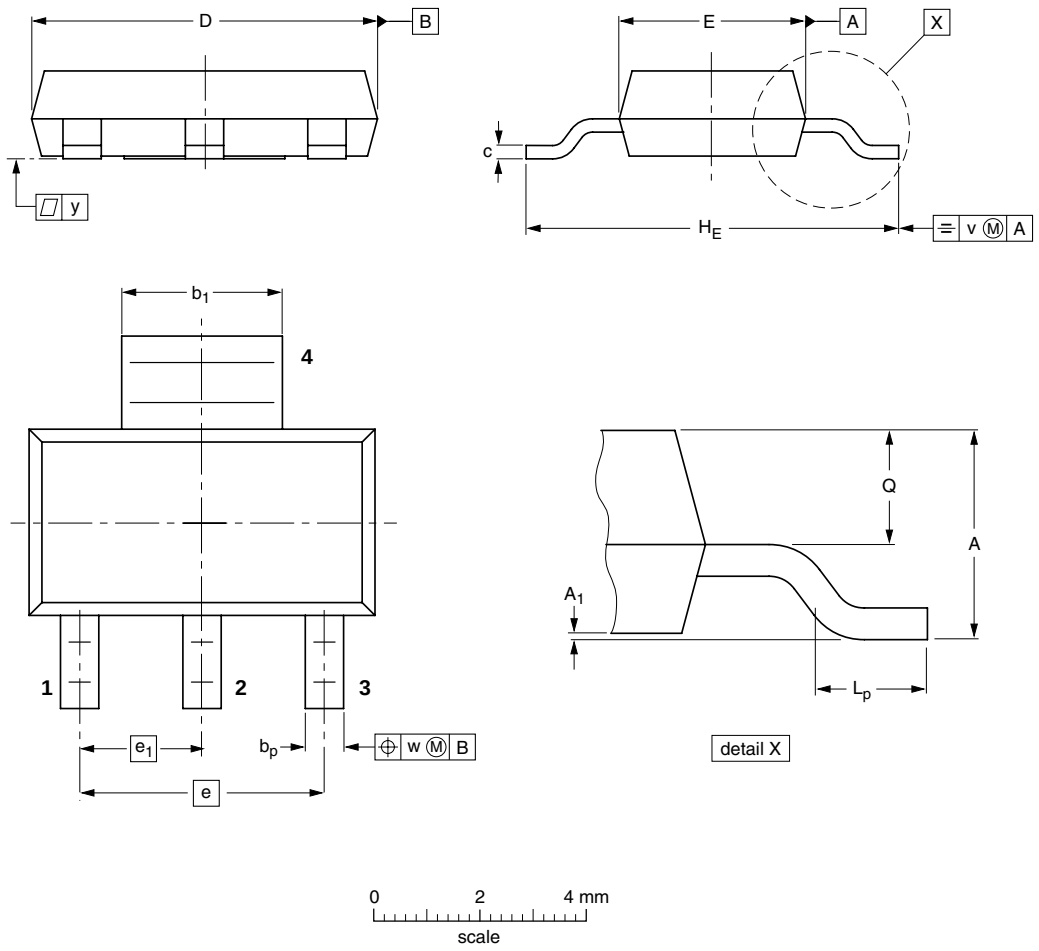


$$A = \frac{dV_D / dt}{dV_{D(25°C)} / dt}$$

Fig 14. Normalized critical rate of rise of off-state voltage as a function of junction temperature; typical values

8. Package outline

Plastic surface-mounted package with increased heatsink; 4 leads **SOT223**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	b_1	c	D	E	e	e_1	H_E	L_p	Q	v	w	y
mm	1.8 1.5	0.10 0.01	0.80 0.60	3.1 2.9	0.32 0.22	6.7 6.3	3.7 3.3	4.6	2.3	7.3 6.7	1.1 0.7	0.95 0.85	0.2	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT223			SC-73			~~04-11-10~~ 06-03-16

Fig 15. Package outline SOT223 (SOT223)

9. Package outline

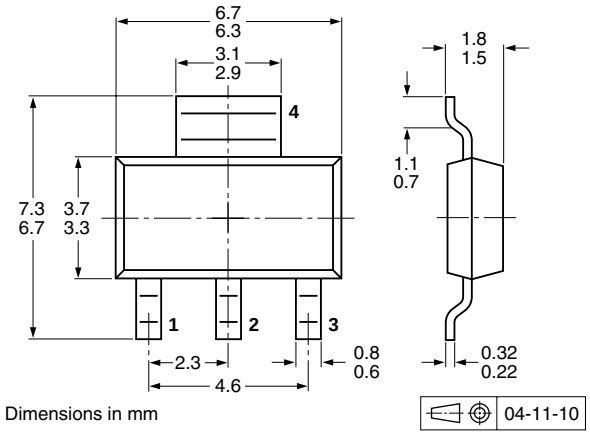


Fig 16. Package outline SOT223 (SOT223)

10. Soldering

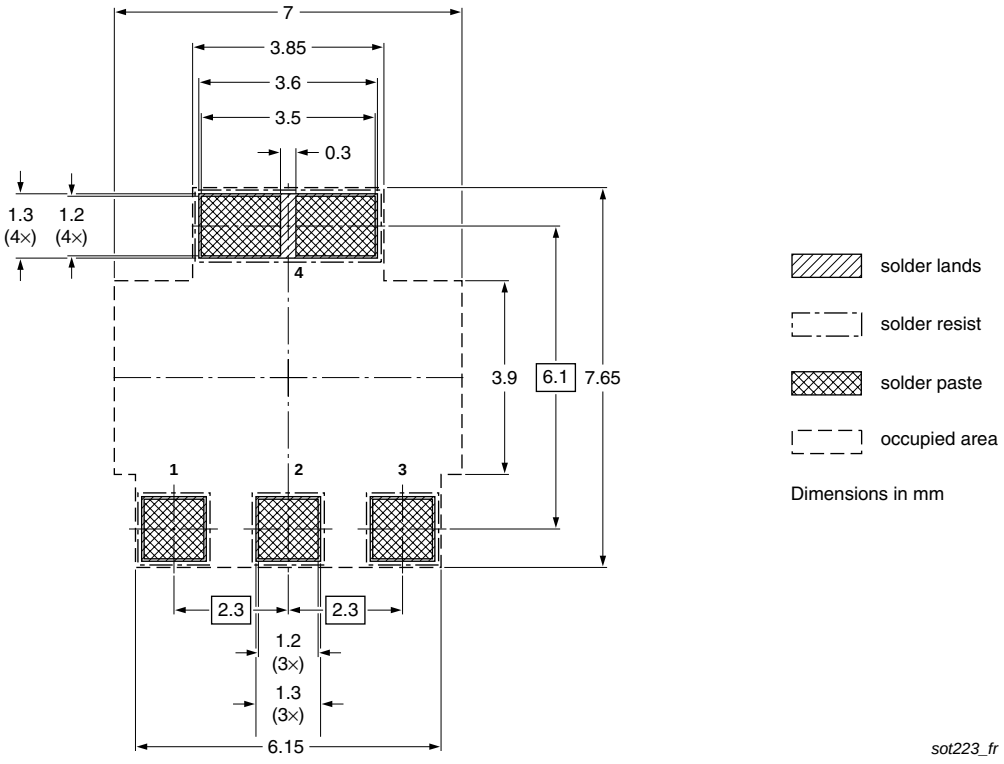


Fig 17. Reflow soldering footprint for SOT223 (SOT223)

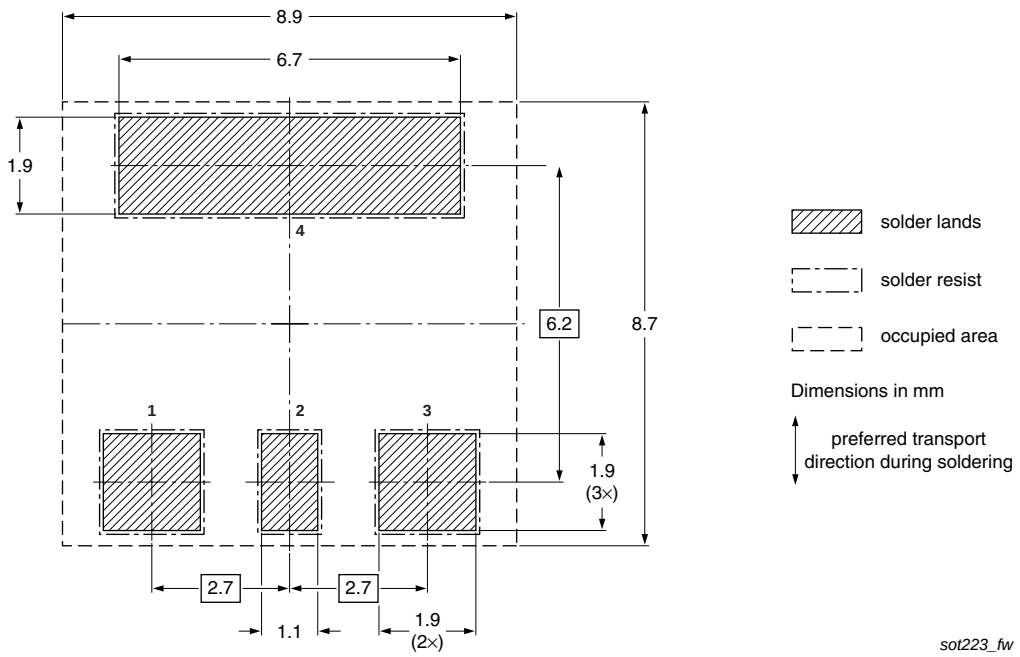


Fig 18. Wave soldering footprint for SOT223 (SOT223)

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
Z0109NN0 v.3	20110510	Product data sheet	-	Z0109NN0 v.2
Modifications:	• Various changes to content.			
Z0109NN0 v.2	20110318	Product data sheet	-	Z0109NN0 v.1

12. Legal information

12.1 Data sheet status

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.

[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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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14. Contents

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