

Z0103MN0

4Q Triac

Rev. 01 — 3 January 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
- Sensitive gate triggering in all 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 data

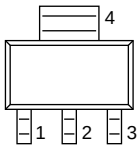
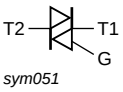
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	600	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)}$ = 25 °C; t_p = 20 ms; see Figure 4; see Figure 5	-	-	12.5	A
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{sp} \leq$ 103 °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	0.2	-	3	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 9	0.2	-	3	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; see Figure 9	0.2	-	3	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; see Figure 9	0.2	-	5	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
Z0103MN0	SOT223	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

4. Marking

Table 4. Marking codes

Type number	Marking code[1]
Z0103MN0	103MN0

[1] % = placeholder for manufacturing site code

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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		-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{sp} \leq 103$ °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; SIN	-	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

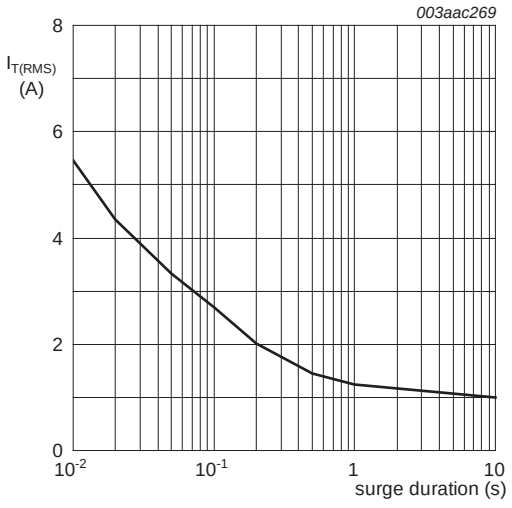


Fig 1. RMS on-state current as a function of surge duration; maximum values

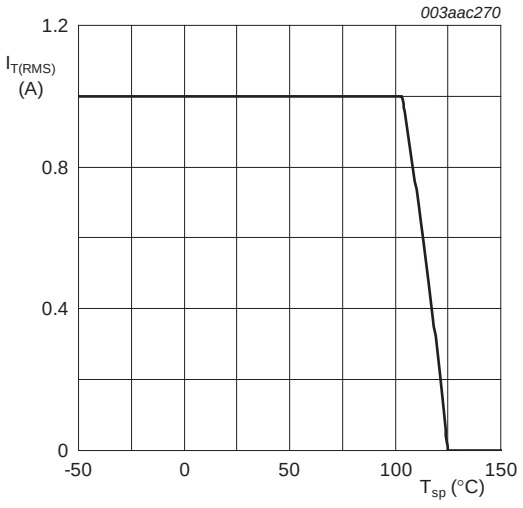
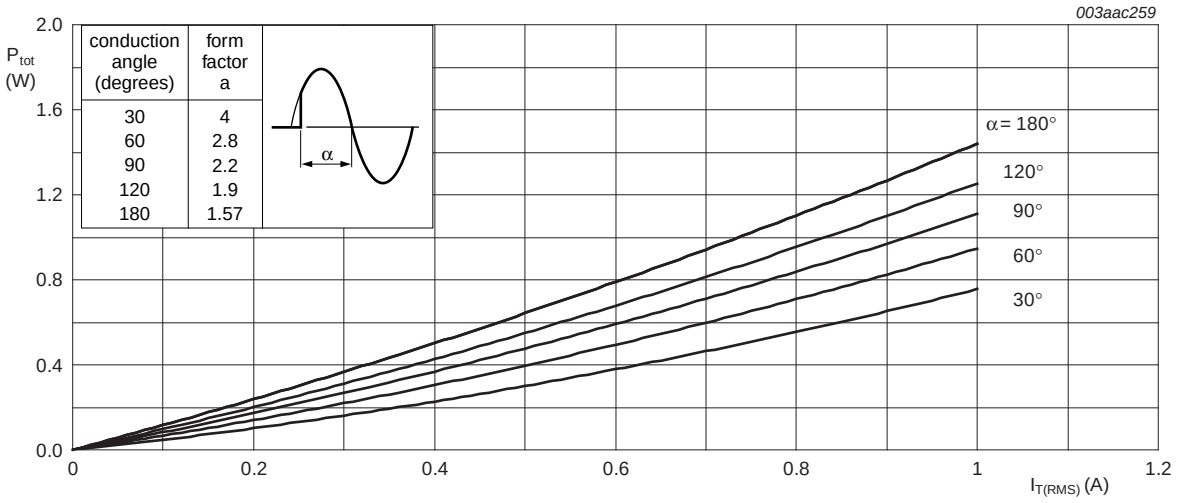


Fig 2. RMS on-state current as a function of solder point temperature; maximum values

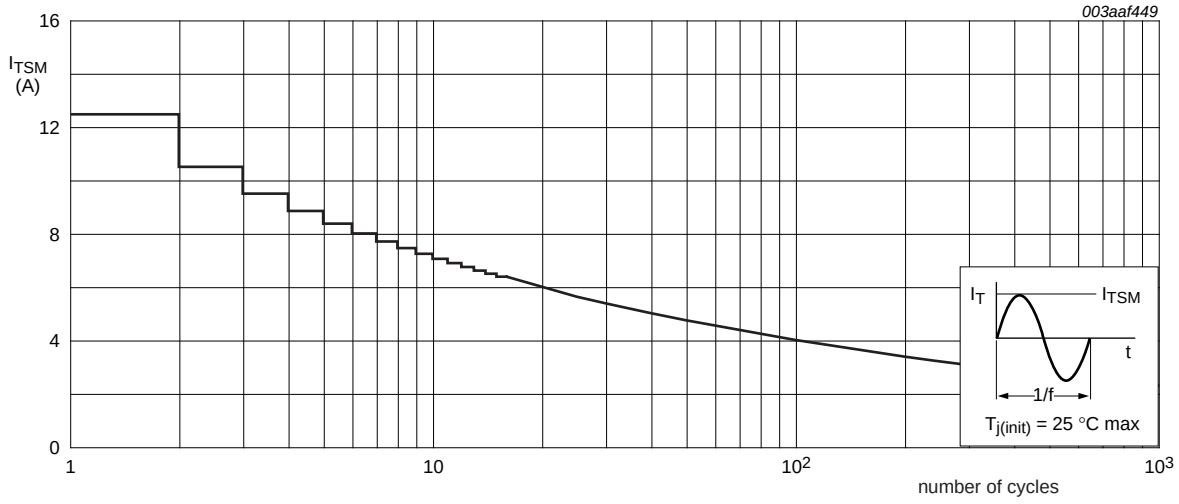
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α = conduction angle

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

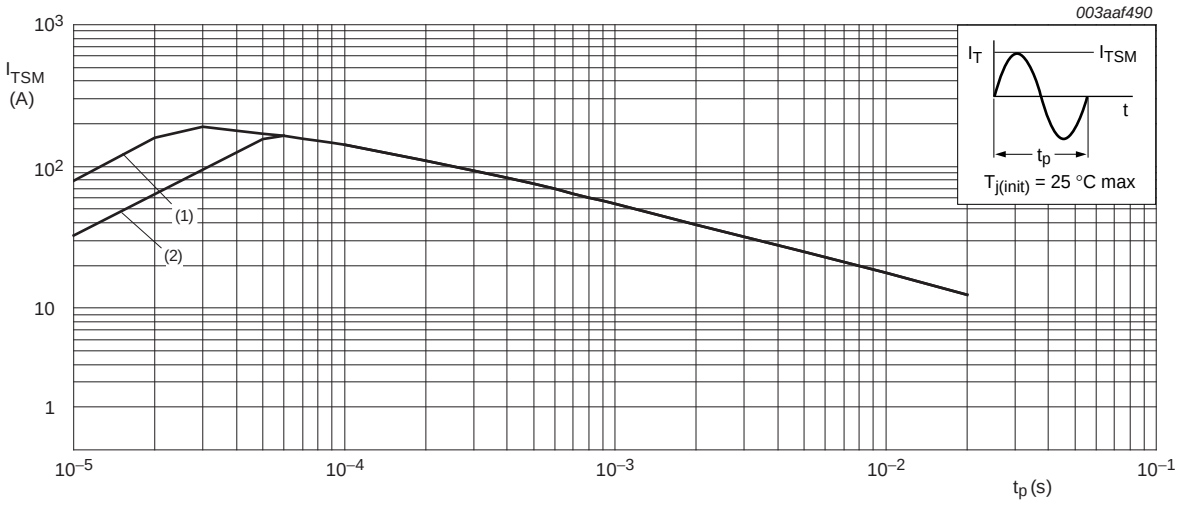


f = 50 Hz

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

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

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

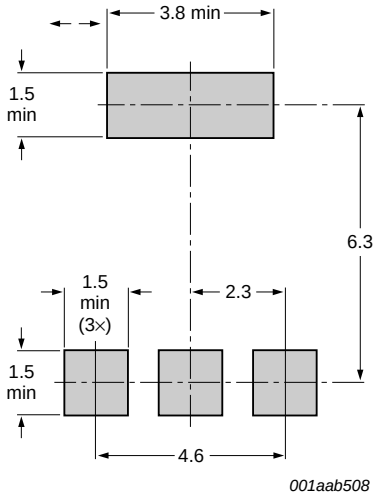
6. Thermal characteristics

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

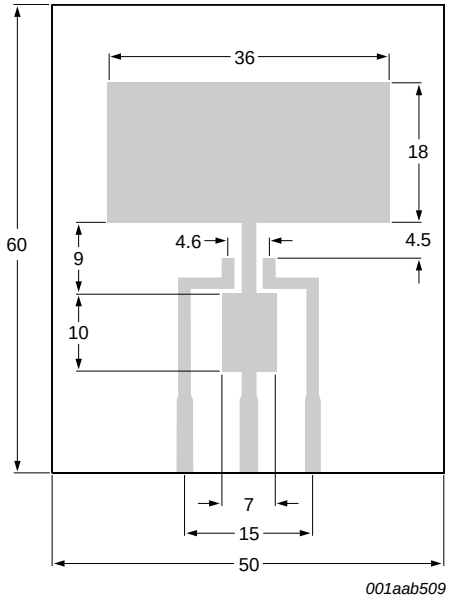
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All dimensions are in mm

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

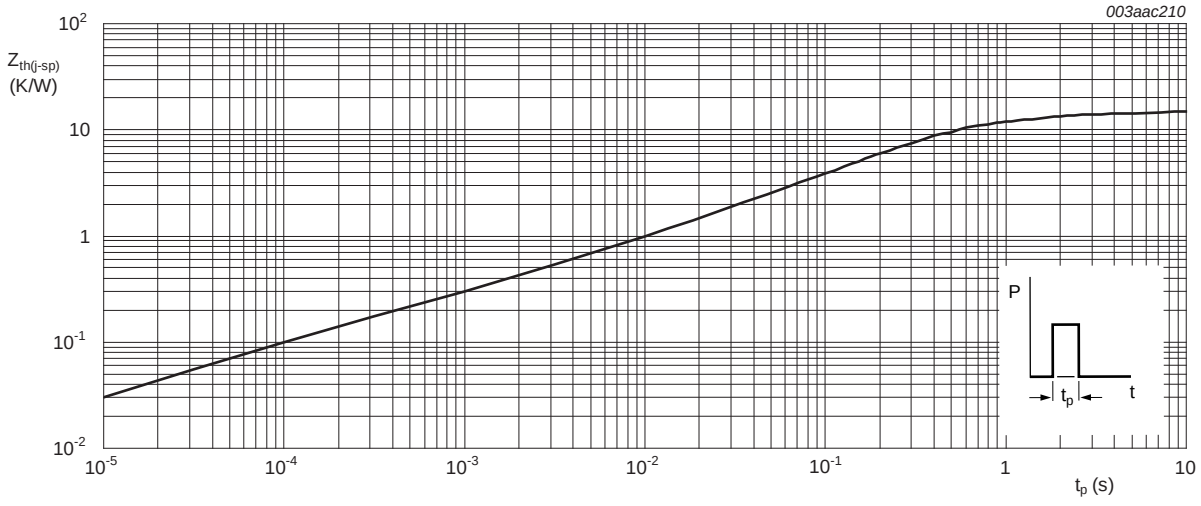


Fig 8. Transient thermal impedance from junction to solder point as a function of pulse width

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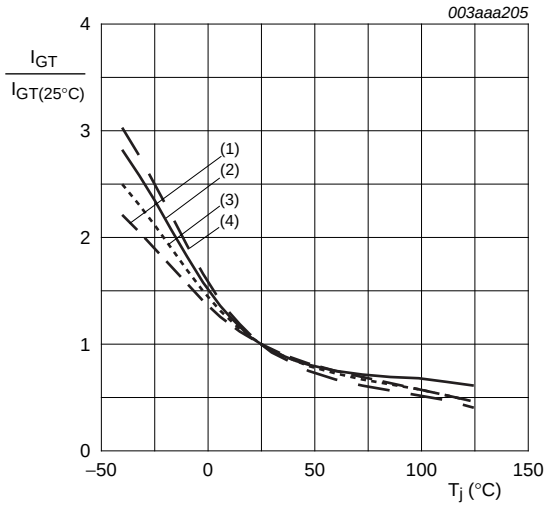
7. Characteristics

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	0.2	-	3	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 9	0.2	-	3	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; see Figure 9	0.2	-	3	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; see Figure 9	0.2	-	5	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 10	-	-	7	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 10	-	-	20	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; see Figure 10	-	-	7	mA
		V_D = 12 V; I_G = 0.1 A; T2- G+; T_j = 25 °C; see Figure 10	-	-	7	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; see Figure 14	-	-	7	mA
V_T	on-state voltage	I_T = 1 A; T_j = 25 °C; see Figure 11	-	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 12	-	-	1.3	V
		V_D = 600 V; I_T = 0.1 A; T_j = 125 °C	0.2	-	-	V
I_D	off-state current	V_D = 600 V; T_j = 125 °C	-	-	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 110 °C; gate open circuit; exponential waveform; see Figure 13	80	-	-	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	0.5	-	-	V/µs

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(1) T2- G+

(2) T2- G-

(3) T2+ G-

(4) T2+ G+

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

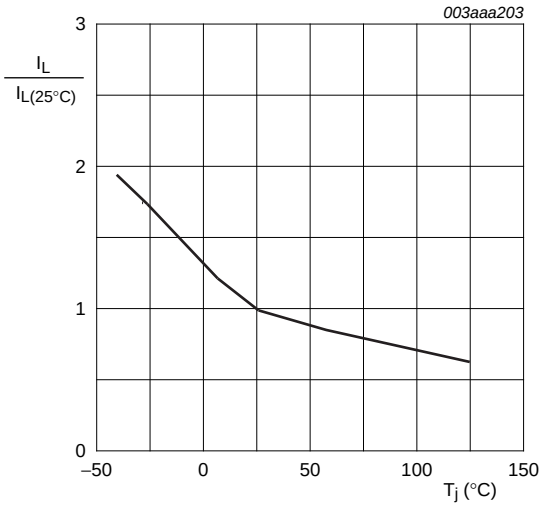
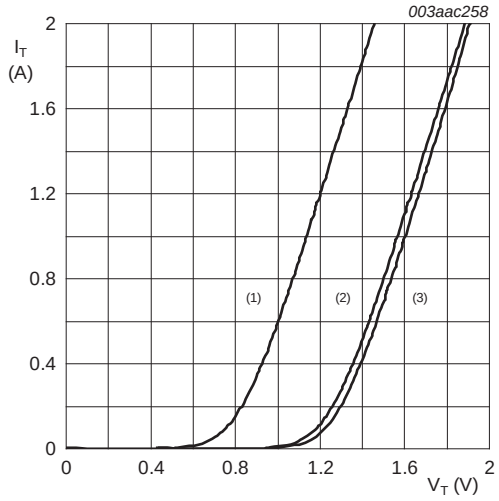


Fig 10. Normalized latching current as a function of junction temperature



V_o = 1.254 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 11. On-state current as a function of on-state voltage

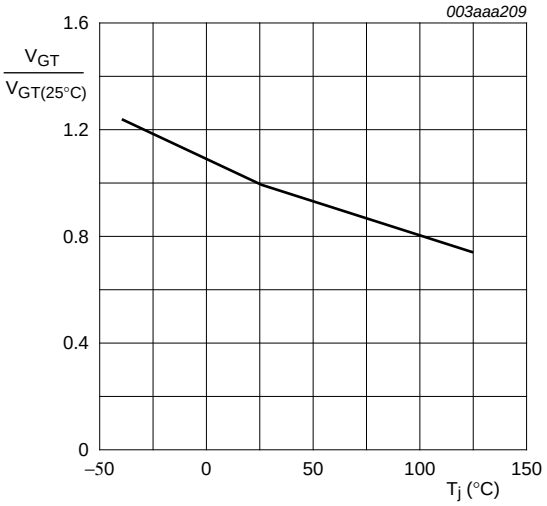
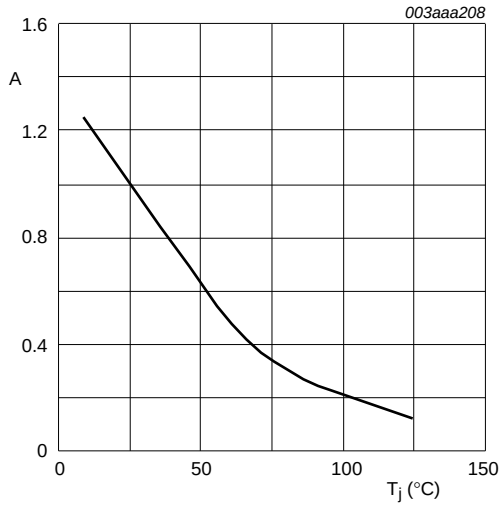


Fig 12. Normalized gate trigger voltage as a function of junction temperature

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

Fig 13. Normalized critical rate of rise of off-state voltage as a function of junction temperature; typical values

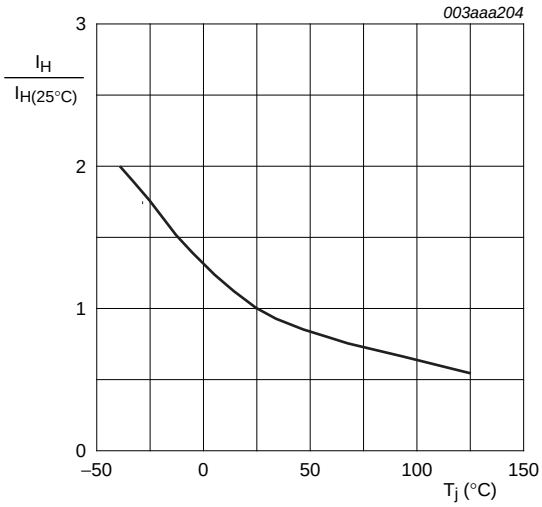


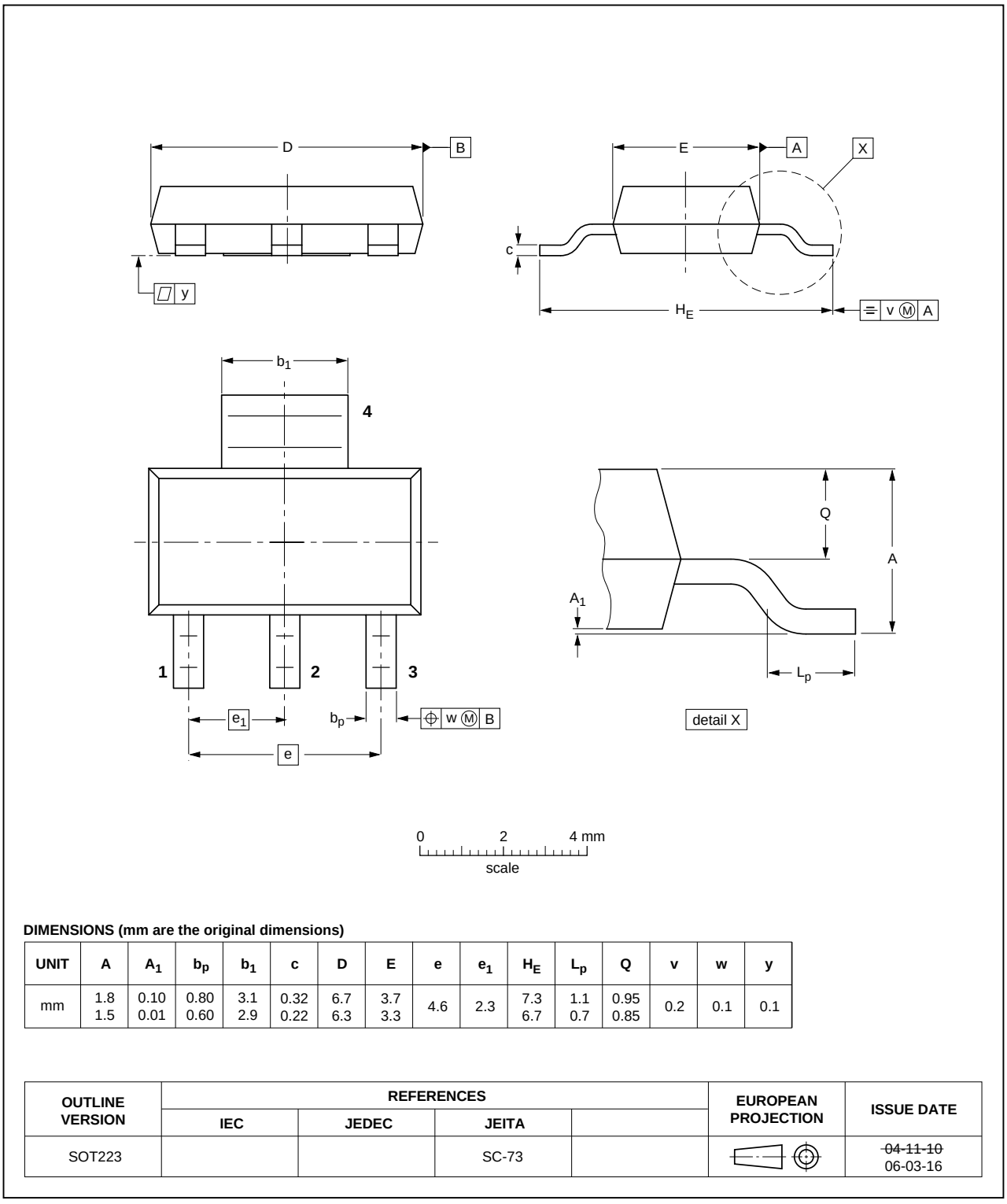
Fig 14. Normalized holding current as a function of junction temperature

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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)

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9. Soldering

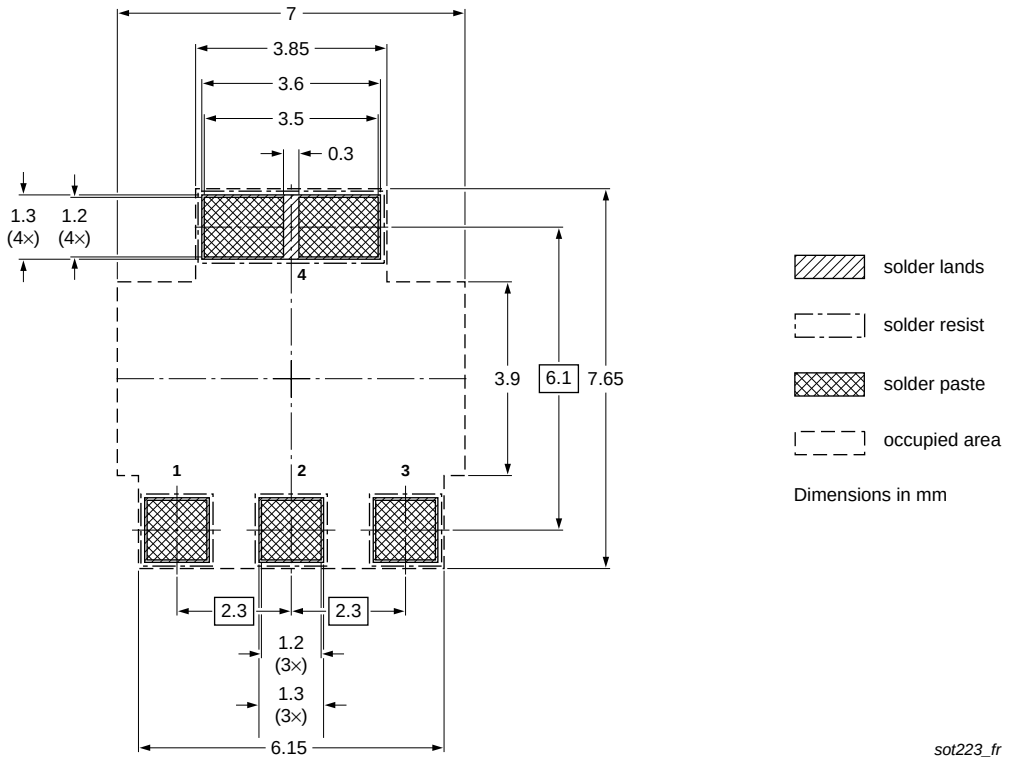


Fig 16. Reflow soldering footprint for SOT223 (SOT223)

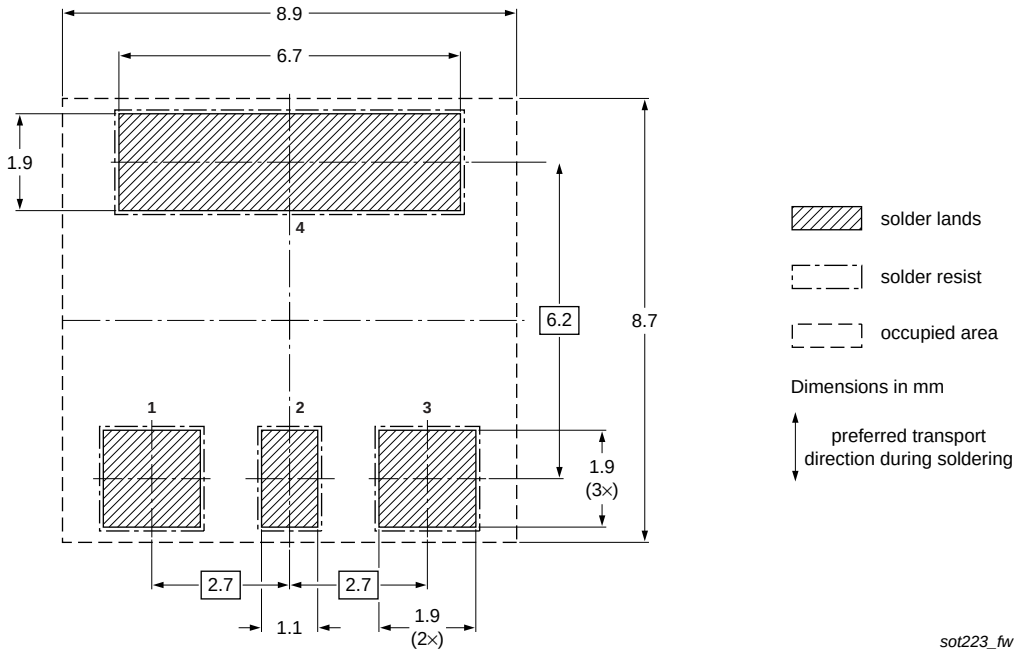


Fig 17. Wave soldering footprint for SOT223 (SOT223)

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10. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
Z0103MN0 v.1	20110103	Product data sheet	-	-

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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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Date of release: 3 January 2011
Document identifier: Z0103MN0