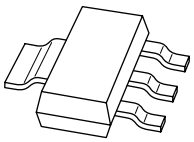


OT406

Four-quadrant triac, enhanced noise immunity

Rev. 01 — 19 May 2008 Product data sheet

1. Product profile

1.1 General description

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

1.2 Features

- Sensitive gate
- Direct interfacing to logic level ICs
- Enhanced immunity to voltage transients and noise
- Gate triggering in four quadrants
- Direct interfacing to low power gate drive circuits
- Blocking voltage to 600 V

1.3 Applications

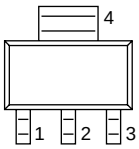
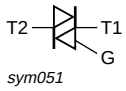
- Home appliances
- Low power AC fan speed controllers
- Low power motor control
- Low power loads in industrial process control

1.4 Quick reference data

- $V_{DRM} \leq 600$ V
- $I_{TSM} \leq 12.5$ A (t = 20 ms)
- $I_{T(RMS)} \leq 1$ A
- $I_{GT} \leq 3$ mA
- $I_{GT} \leq 5$ mA (T2– G+)

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	main terminal 1 (T1)	 SOT223	 sym051
2	main terminal 2 (T2)		
3	gate (G)		
4	mounting base; main terminal 2 (T2)		

3. Ordering information

Table 2. Ordering information

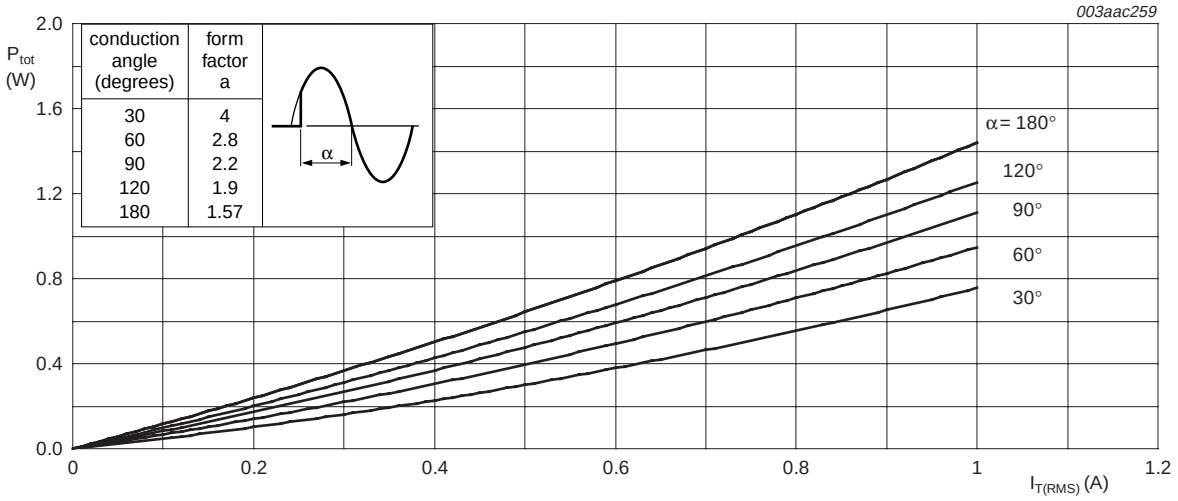
Type number	Package		
	Name	Description	Version
OT406	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

4. Limiting values

Table 3. Limiting values

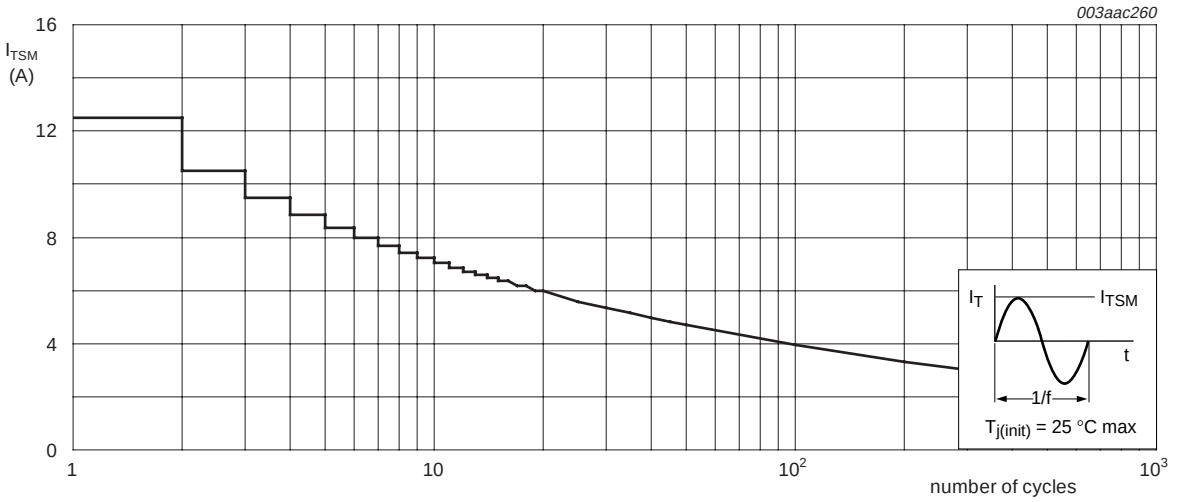
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	600	V
V_{RRM}	repetitive peak reverse voltage		-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{sp} \leq 103$ °C; see Figure 4 and 5	-	1	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_j = 25$ °C prior to surge; see Figure 2 and 3			
		t = 20 ms	-	12.5	A
		t = 16.7 ms	-	13.8	A
I^2t	I^2t for fusing	$t_p = 10$ ms	-	1.28	A^2s
dI_T/dt	rate of rise of on-state current	$I_{TM} = 1$ A; $I_G = 20$ mA; $dI_G/dt = 0.2$ A/µs			
		T2+ G+	-	50	A/µs
		T2+ G–	-	50	A/µs
		T2– G–	-	50	A/µs
		T2– G+	-	10	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



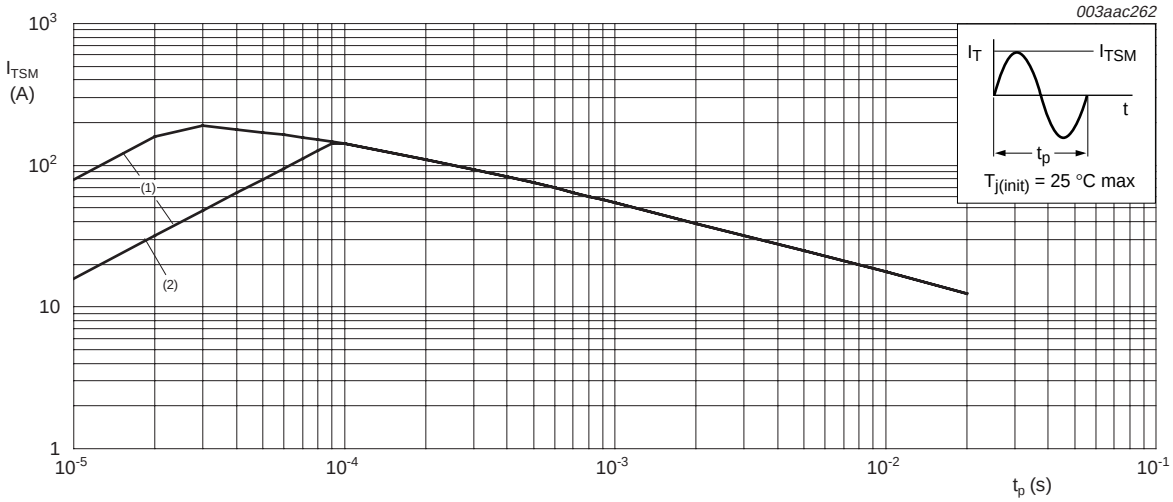
α = conduction angle

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



f = 50 Hz

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

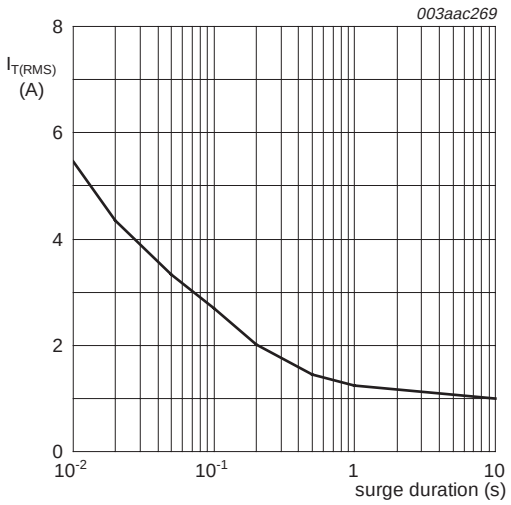


$t_p \leq 20$ ms

(1) dI_T/dt limit

(2) T2– G+ quadrant limit

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



f = 50 Hz

T_{sp} = 103 °C

Fig 4. RMS on-state current as a function of surge duration; maximum values

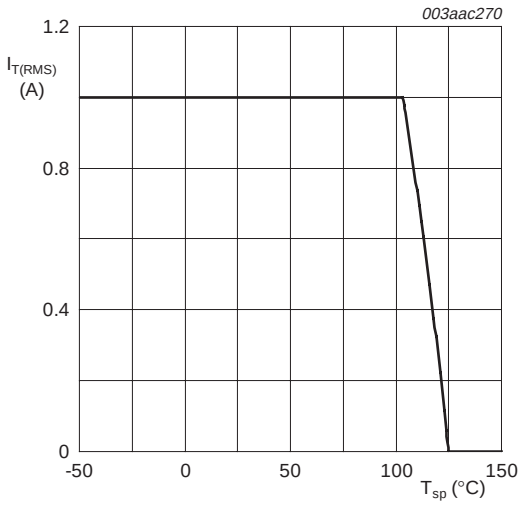


Fig 5. RMS on-state current as a function of solder point temperature; maximum values

5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	full cycle; see Figure 6	-	-	15	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	full cycle				
		for minimum footprint see Figure 13	-	156	-	K/W
		for pad area see Figure 14	-	70	-	K/W

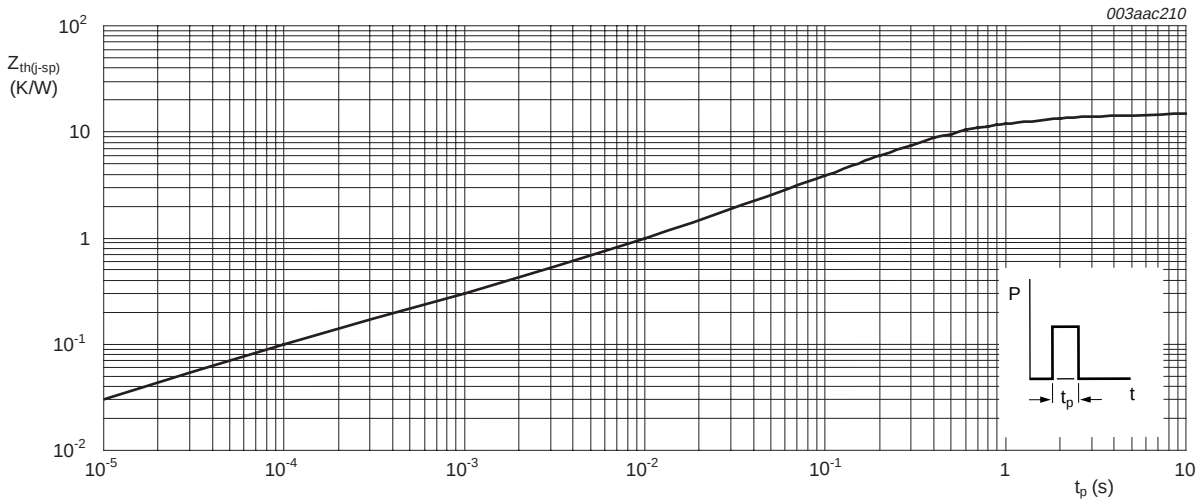


Fig 6. Transient thermal impedance from junction to solder point as a function of pulse width

6. Static characteristics

Table 5. Static characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; see Figure 8				
		T2+ G+	-	-	3	mA
		T2+ G–	-	-	3	mA
		T2– G–	-	-	3	mA
		T2– G+	-	-	5	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; see Figure 10				
		T2+ G+	-	-	7	mA
		T2+ G–	-	-	20	mA
		T2– G–	-	-	7	mA
		T2– G+	-	-	7	mA
I_H	holding current	V_D = 12 V; I_G = 0.1 A; see Figure 11	-	-	7	mA
V_T	on-state voltage	I_T = 1 A; see Figure 9	-	1.3	1.6	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; see Figure 7	-	-	1.3	V
		$V_D = V_{DRM}$; I_T = 0.1 A; T_j = 125 °C	0.2	-	-	V
I_D	off-state current	$V_D = V_{DRM(max)}$; T_j = 125 °C	-	-	0.5	mA

7. Dynamic characteristics

Table 6. Dynamic characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 0.67V_{DRM(max)}$; $T_j = 110$ °C; exponential waveform; gate open circuit	10	-	-	V/µs
dV_{com}/dt	rate of change of commutating voltage	$V_{DM} = 400$ V; $T_j = 110$ °C; $I_{TM} = 1$ A; $dI_{com}/dt = 0.44$ A/ms	0.5	-	-	V/µs

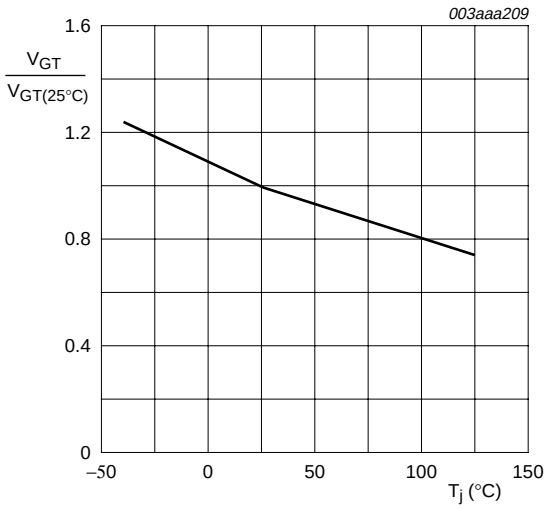
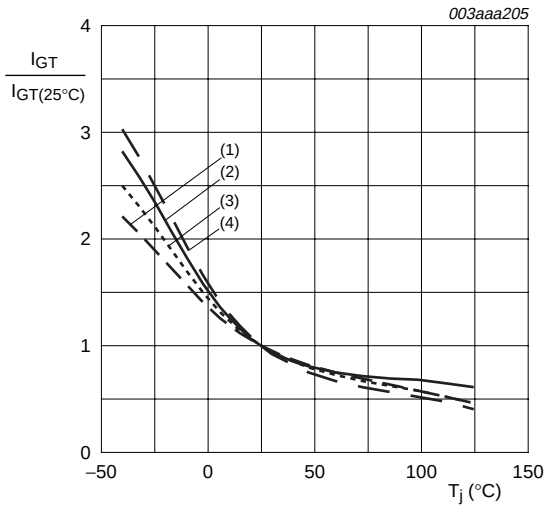
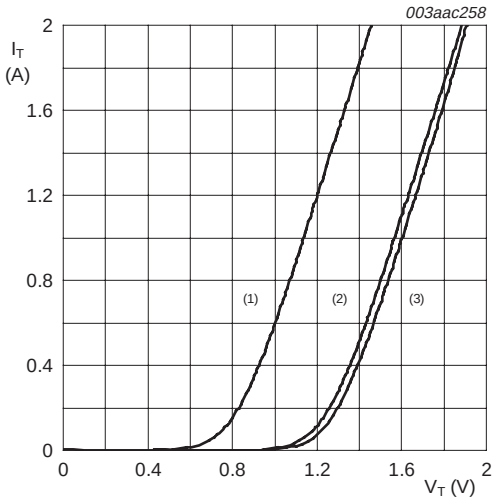


Fig 7. Normalized gate trigger voltage as a function of junction temperature



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

Fig 8. Normalized gate trigger 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 9. On-state current as a function of on-state voltage

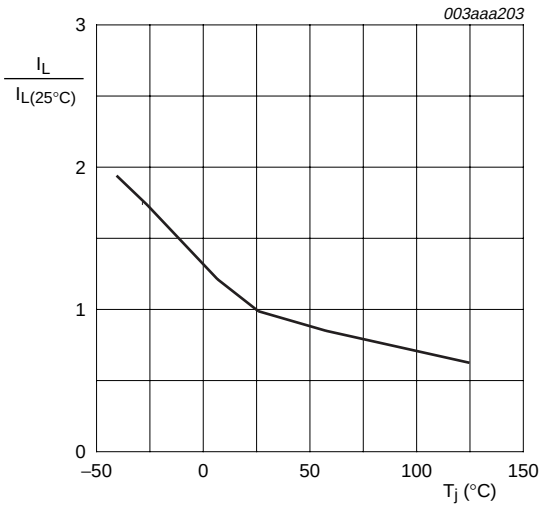


Fig 10. Normalized latching current as a function of junction temperature

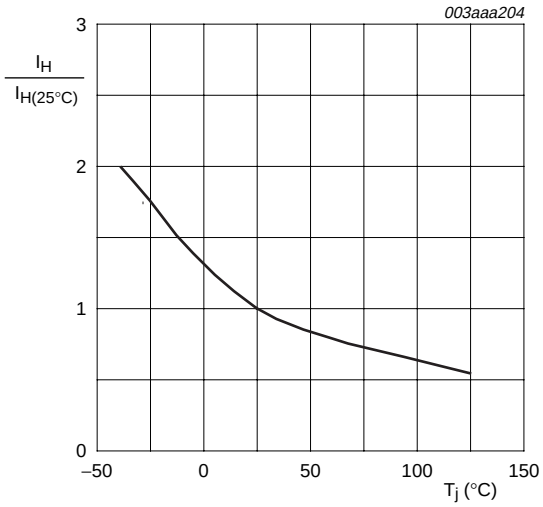
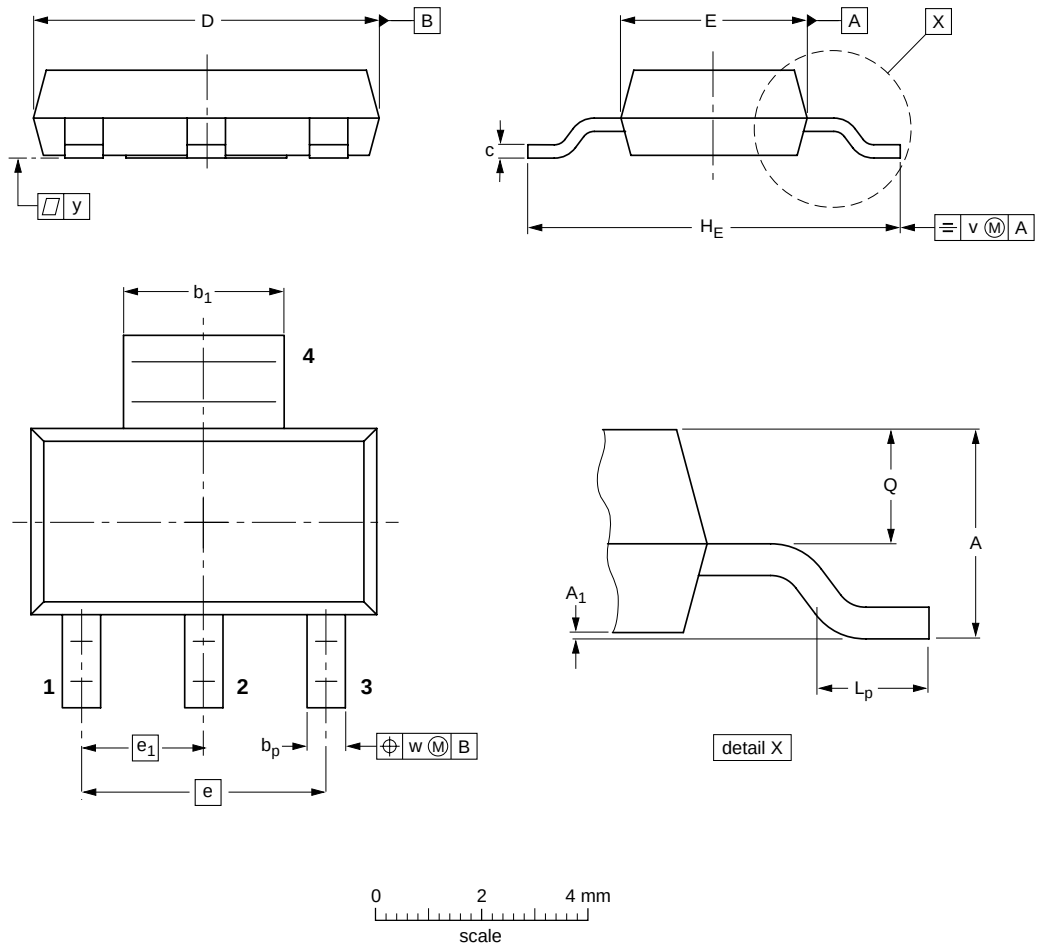


Fig 11. Normalized holding current as a function of junction temperature

8. Package outline

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



DIMENSIONS (mm are the original dimensions)

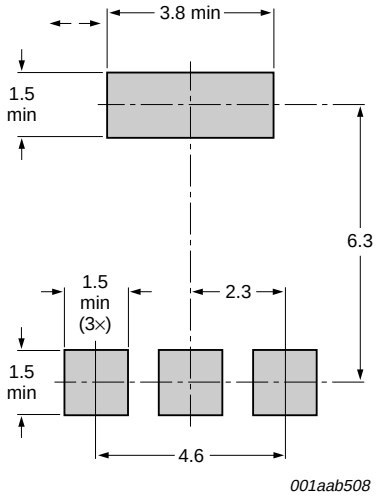
UNIT	A	A_1	b_p	b_1	c	D	E	e	e_1	H_E	L_p	Q	v	w	y
mm	1.8 1.5	0.10 0.01	0.80 0.60	3.1 2.9	0.32 0.22	6.7 6.3	3.7 3.3	4.6	2.3	7.3 6.7	1.1 0.7	0.95 0.85	0.2	0.1	0.1

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

Fig 12. Package outline SOT223 (SC-73)

9. Mounting

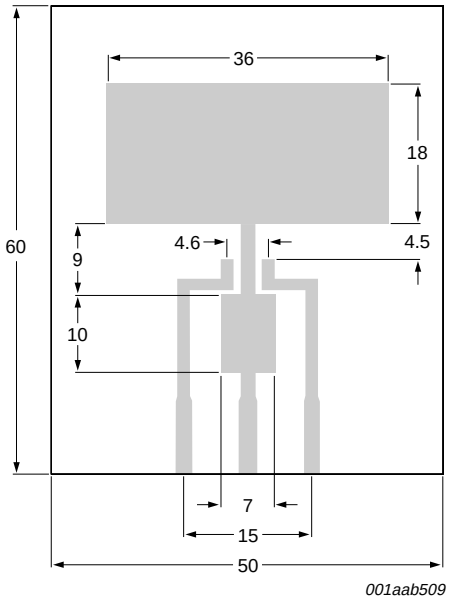
9.1 Mounting instructions



All dimensions are in mm

Fig 13. Minimum footprint SOT223

9.2 Printed-circuit board



All dimensions are in mm

Printed-circuit board: FR4 epoxy glass (1.6 mm thick), copper laminate (35 µm thick)

Fig 14. Printed-circuit board pad area SOT223

10. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
OT406_1	20080519	Product data sheet	-	-

11. Legal information

11.1 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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13. Contents

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Date of release: 19 May 2008
Document identifier: OT406_1