

## 1. General description

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

## 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

## 3. Applications

- General purpose low power motor control
- Home appliances
- Industrial process control
- Low power AC Fan controllers

## 4. Quick reference data

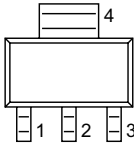
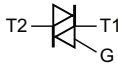
Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
<b>Absolute maximum rating</b>							
$V_{DRM}$	repetitive peak off-state voltage			800			V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{sp} \leq 130\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		1			A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>		11			A
		full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$		12.1			A
$T_j$	operating junction temperature			-40 to 150			°C
Symbol	Parameter	Conditions	Notes	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+; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>		-	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>		-	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>		-	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>		-	-	25	mA

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$I_H$	holding current	$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C};$ Fig. 11		-	-	20	mA
$V_T$	on-state voltage	$I_T = 1\text{ A}; T_j = 25\text{ }^\circ\text{C};$ Fig. 12		-	1.3	1.5	V
<b>Dynamic characteristics</b>							
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}; T_j = 110\text{ }^\circ\text{C};$ ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit		150	-	-	V/ $\mu\text{s}$
$dV_{com}/dt$	rate of change of commutating voltage	$V_D = 400\text{ V}; T_j = 110\text{ }^\circ\text{C};$ $dI_{com}/dt = 0.44\text{ A/ms};$ gate open circuit		0.5	-	-	V/ $\mu\text{s}$

## 5. 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		

## 6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BT231W-800ET	SOT223	BT231W-800ETF	Reel	4000	SOT223	16-Mar-2006

## 7. Marking

Table 4. Marking codes

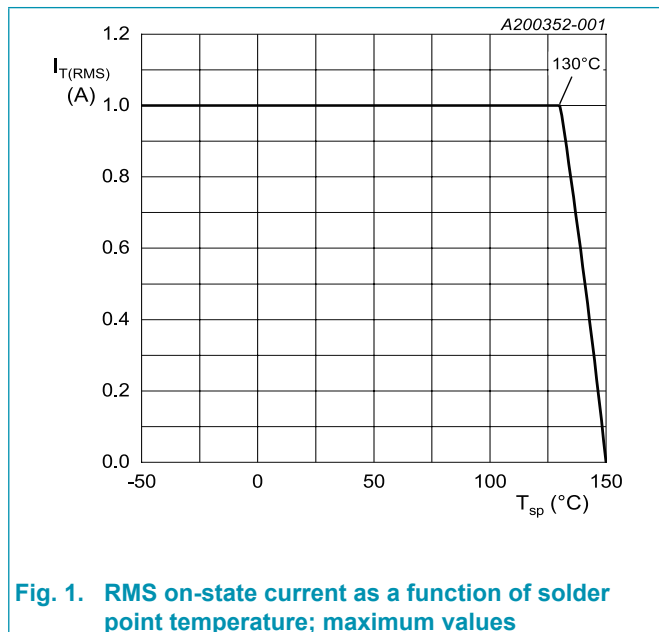
Type number	Marking codes	
	Assembly factory: d	Assembly factory: L
BT231W-800ET	Jdxxx 231W8E	JLxxx 231W8E

## 8. Limiting values

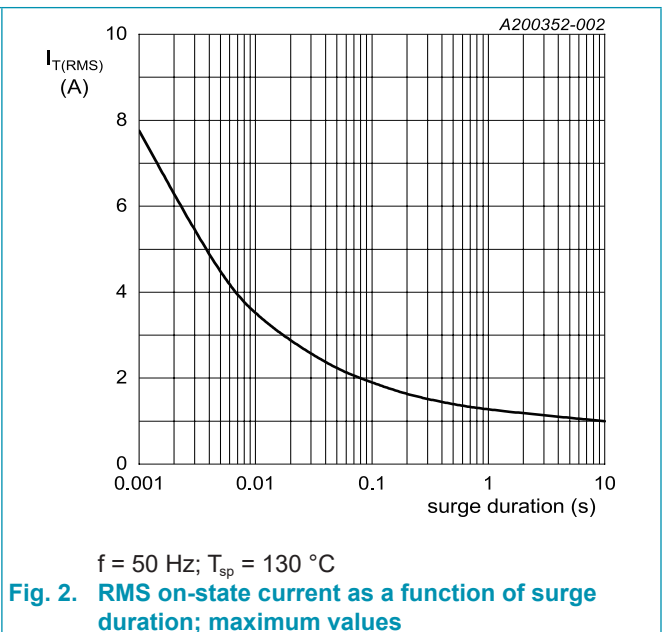
**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Notes	Values	Unit
$V_{DRM}$	repetitive peak off-state voltage			800	V
$V_{RRM}$	repetitive peak reverse voltage			800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{sp} \leq 130\text{ °C}$ ; <a href="#">Fig 1</a> ; <a href="#">Fig 2</a> ; <a href="#">Fig 3</a>		1	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig 4</a> ; <a href="#">Fig 5</a>		11	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$		12.1	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; SIN		0.61	A <sup>2</sup> s
$di_T/dt$	rate of rise of on-state current	$I_G = 20\text{ mA}$		50	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 to 150	°C
$T_j$	operating junction temperature			-40 to 150	°C



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



$f = 50\text{ Hz}$ ;  $T_{sp} = 130\text{ °C}$

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

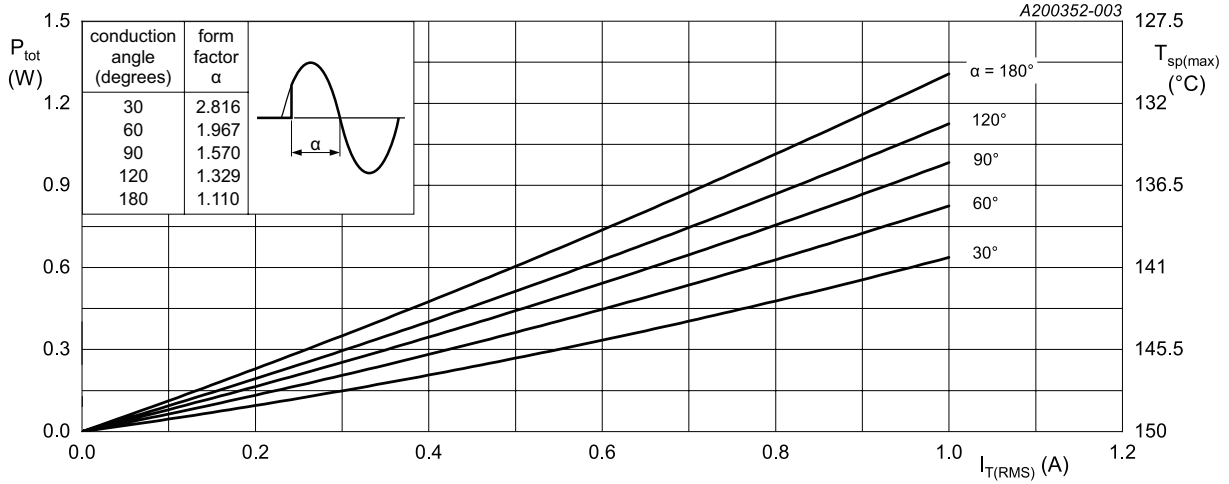
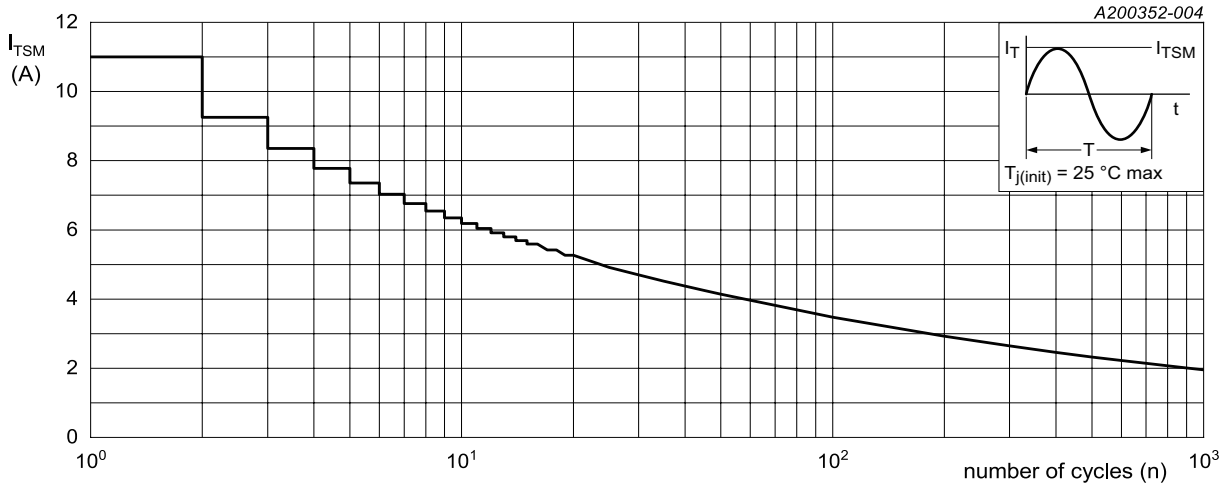
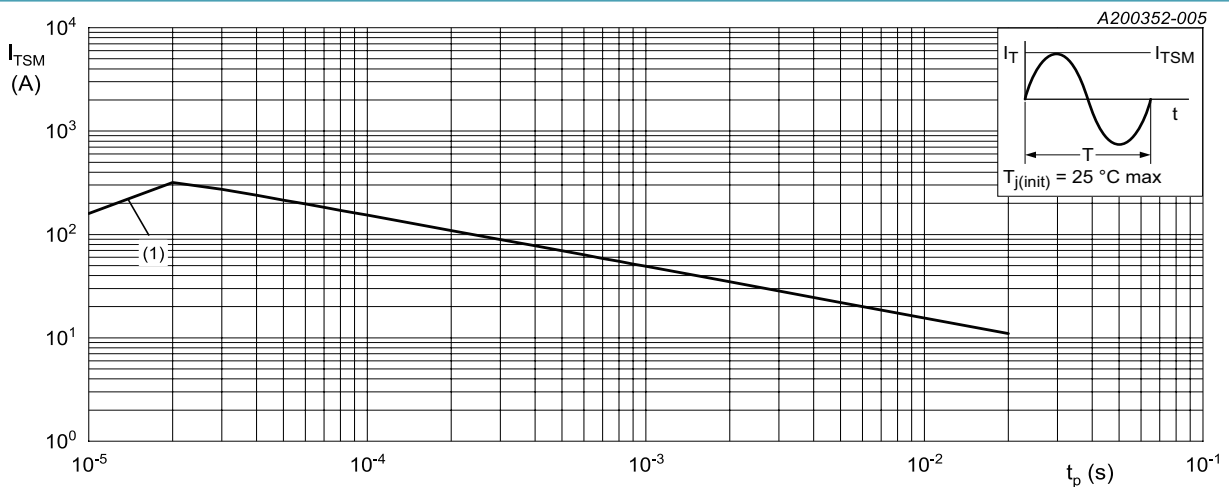


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values



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

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

### 9. Thermal characteristics

Table 6. Thermal characteristics

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

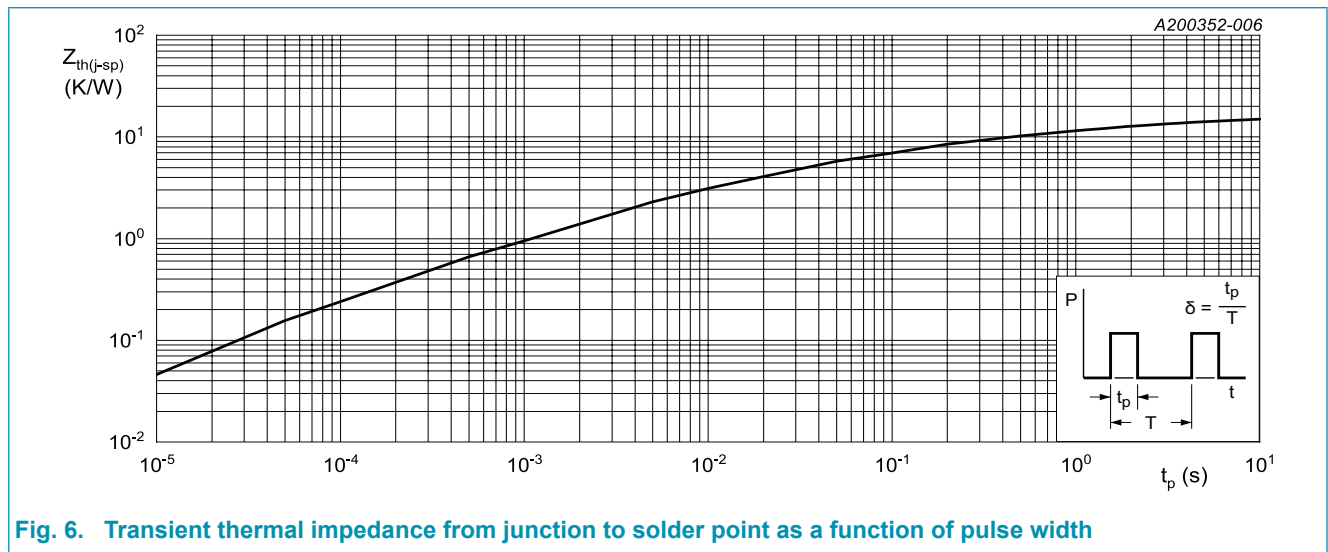


Fig. 6. Transient thermal impedance from junction to solder point as a function of pulse width

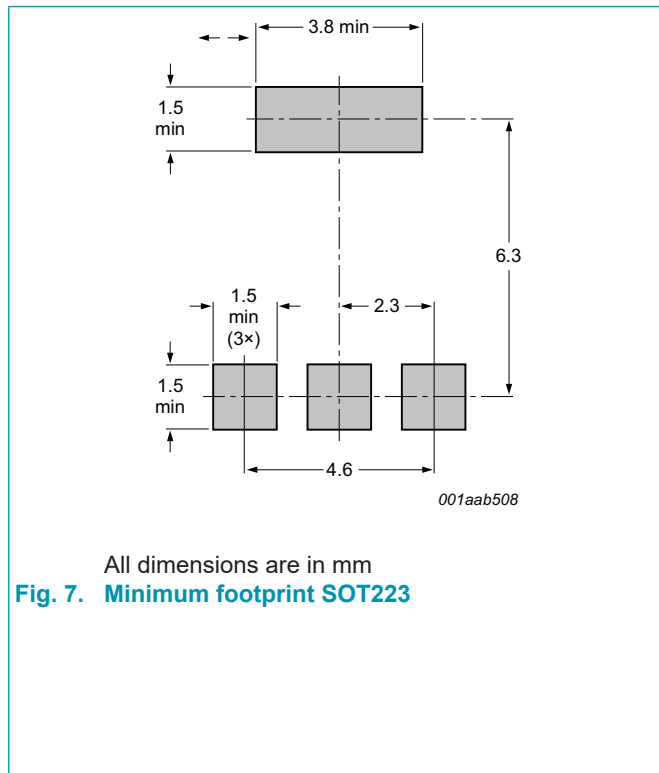


Fig. 7. Minimum footprint SOT223

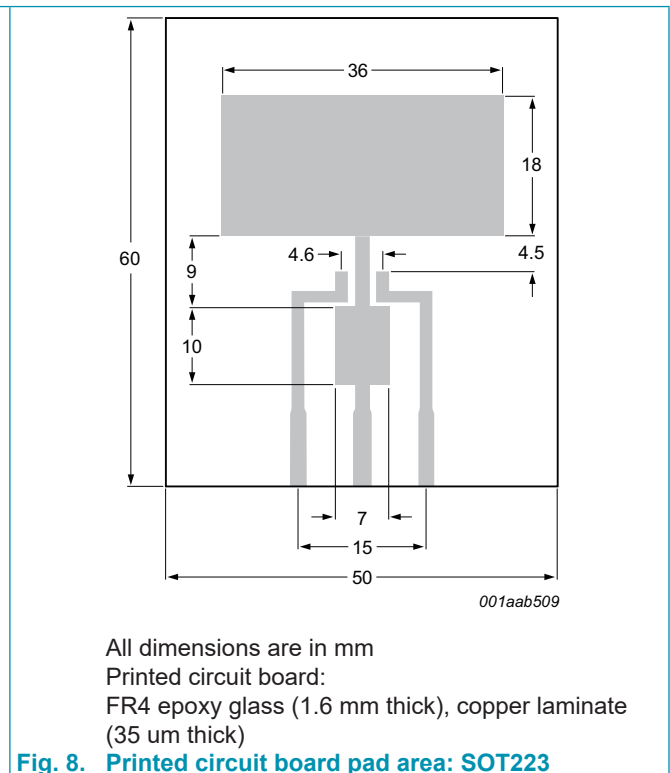
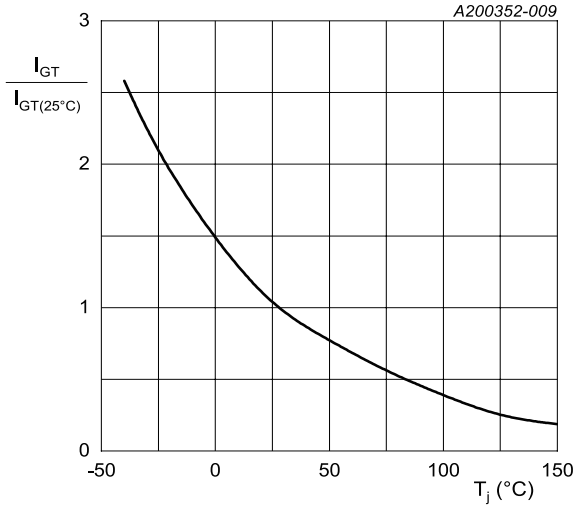


Fig. 8. Printed circuit board pad area: SOT223

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	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+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>		-	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>		-	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>		-	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>		-	-	25	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>		-	-	15	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>		-	-	15	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>		-	-	15	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>		-	-	25	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>		-	-	20	mA
$V_T$	on-state voltage	$I_T = 1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 12</a>		-	1.3	1.5	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 13</a>		-	-	1	V
		$V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 150\text{ }^\circ\text{C}$		0.2	-	-	V
$I_D$	off-state current	$V_D = 800\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$		-	-	10	$\mu\text{A}$
		$V_D = 800\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$		-	-	1	mA
$I_R$	reverse current	$V_R = 800\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$		-	-	10	$\mu\text{A}$
		$V_R = 800\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$		-	-	1	mA
<b>Dynamic characteristics</b>							
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$ ; $T_j = 110\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit		150	-	-	V/ $\mu\text{s}$
$dV_{com}/dt$	rate of change of commutating voltage	$V_D = 400\text{ V}$ ; $T_j = 110\text{ }^\circ\text{C}$ ; $dI_{com}/dt = 0.44\text{ A/ms}$ ; gate open circuit		0.5	-	-	V/ $\mu\text{s}$



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

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

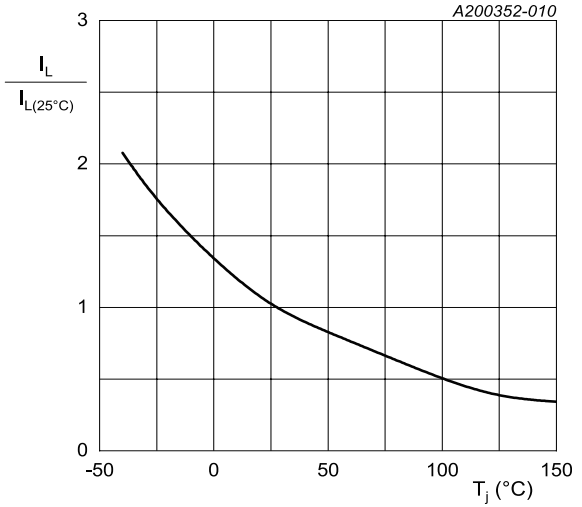


Fig. 10. Normalized latching current as a function of junction temperature

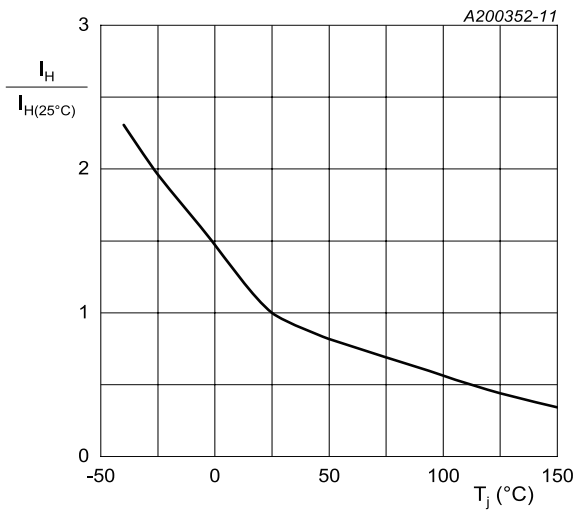
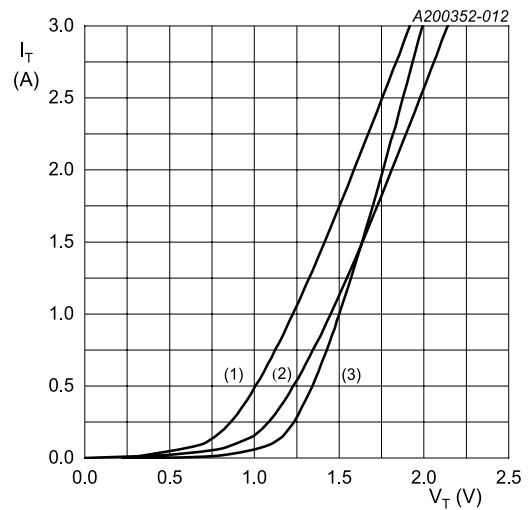


Fig. 11. Normalized holding current as a function of junction temperature



- $V_o = 1.230 \text{ V}; R_s = 0.2000 \Omega$
- (1)  $T_j = 150 \text{ }^\circ\text{C}$ ; typical values
  - (2)  $T_j = 150 \text{ }^\circ\text{C}$ ; maximum values
  - (3)  $T_j = 25 \text{ }^\circ\text{C}$ ; maximum values

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

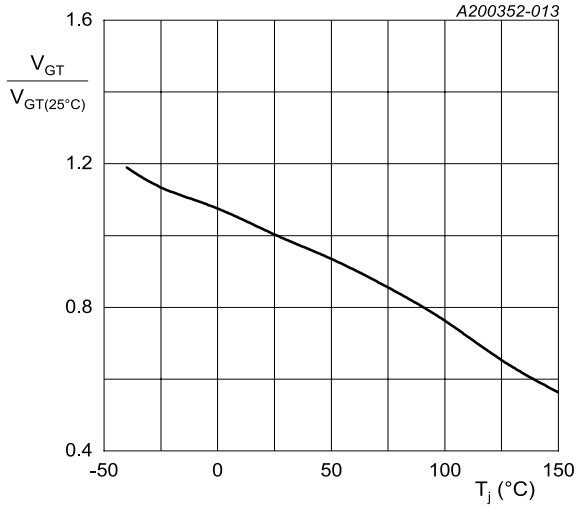
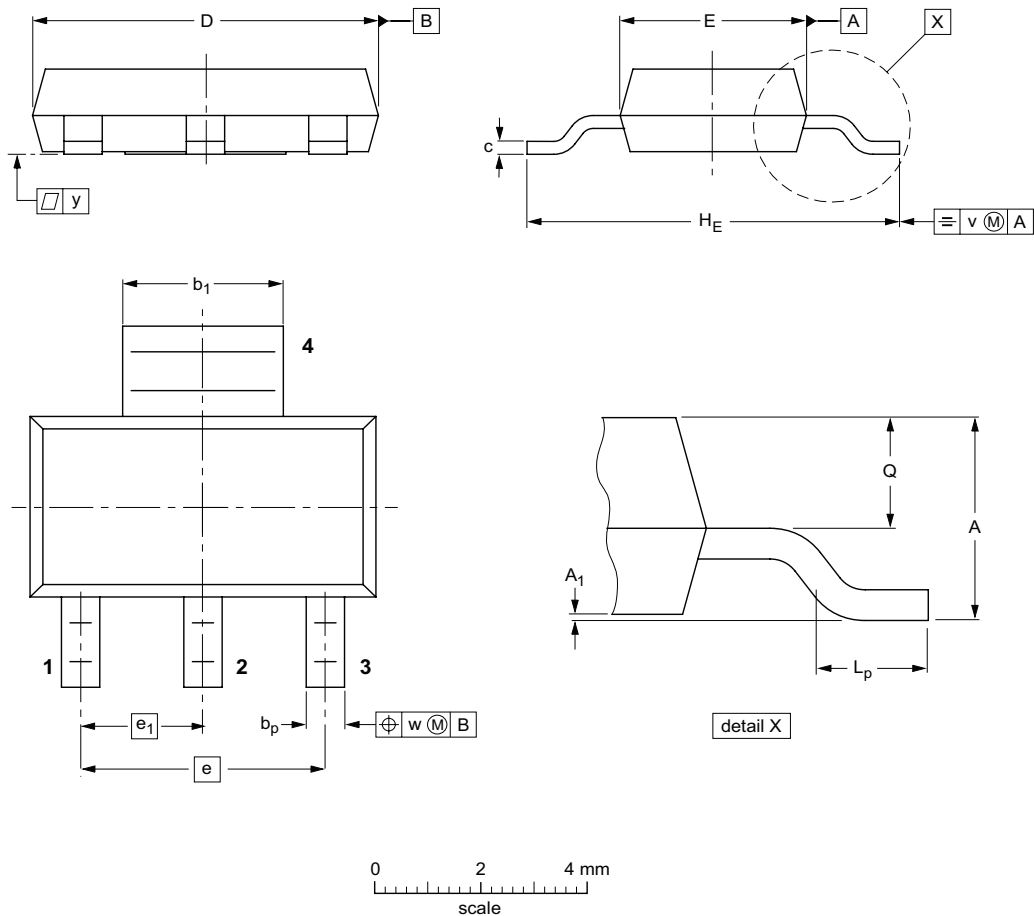


Fig. 13. Normalized gate trigger voltage as a function of junction temperature

### 11. Package outline

Plastic surface-mounted package with increased heatsink; 4 leads

SOT223



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub>	b <sub>p</sub>	b <sub>1</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	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

## 12. Legal information

### 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.

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

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1. General description.....	1
2. Features and benefits .....	1
3. Applications .....	1
4. Quick reference data .....	1
5. Pinning information.....	2
6. Ordering information.....	2
7. Marking.....	2
8. Limiting values .....	3
9. Thermal characteristics .....	5
10. Characteristics.....	6
11. Package outline .....	9
12. Legal information .....	10
13. Contents .....	12

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