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# BTA204W-600C

3Q Hi-Com Triac

15 August 2014

Product data sheet

## 1. General description

Planar passivated high commutation three quadrant triac in a SOT223 surface mountable plastic package intended for use in circuits where high static and dynamic  $dV/dt$  and high  $dI/dt$  can occur. This triac will commute the full rated RMS current at the maximum rated junction temperature without the aid of a snubber.

## 2. Features and benefits

3Q technology for improved noise immunity

High commutation capability with maximum false trigger immunity

High immunity to false turn-on by  $dV/dt$

Less sensitive gate for very high noise immunity

Planar passivated for voltage ruggedness and reliability

Surface mountable package

## 3. Applications

- General purpose motor controls
- Home appliances
- Rectifier-fed DC inductive loads e.g. DC motors and solenoids

## 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; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	10	A



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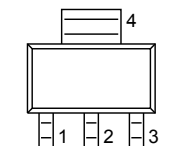
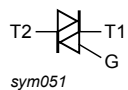
## BTA204W-600C

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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{sp} \leq 108\text{ }^{\circ}\text{C}$ ; Fig. 1; Fig. 2; Fig. 3	-	-	1	A
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ }^{\circ}\text{C}$ ; Fig. 9	-	-	35	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ }^{\circ}\text{C}$ ; Fig. 9	-	-	35	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ }^{\circ}\text{C}$ ; Fig. 9	-	-	35	mA

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	 <p>SC-73 (SOT223)</p>	 <p>sym051</p>
2	T2	main terminal 2		
3	G	gate		
4	mb	mounting base; connected to main terminal 2		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BTA204W-600C	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

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## BTA204W-600C

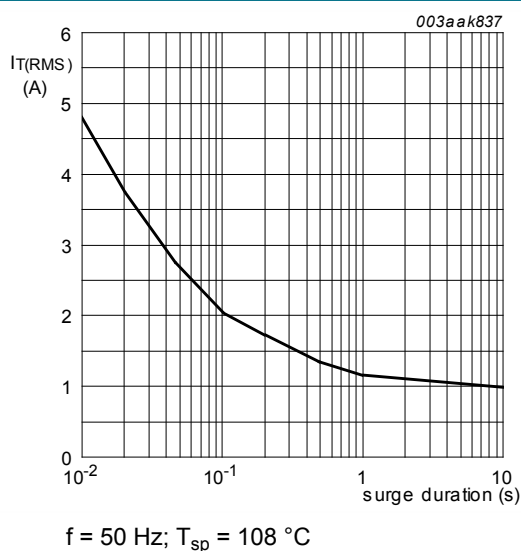
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## 7. Limiting values

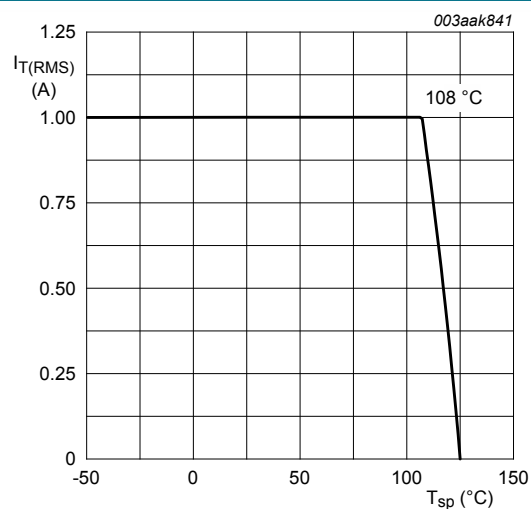
**Table 4. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{\text{DRM}}$	repetitive peak off-state voltage		-	600	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{sp}} \leq 108\text{ }^{\circ}\text{C}$ ; Fig. 1; Fig. 2; Fig. 3	-	1	A
$I_{\text{TSM}}$	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$ ; $t_{\text{p}} 16.7\text{ ms}$	-	11	A
		full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$ ; $t_{\text{p}} = 20\text{ ms}$ ; Fig. 4; Fig. 5	-	10	A
$I^2t$	$I^2t$ for fusing	$t_{\text{p}} = 10\text{ ms}$ ; SIN	-	0.5	$\text{A}^2\text{s}$
$di_{\text{T}}/dt$	rate of rise of on-state current	$I_{\text{T}} = 1.5\text{ A}$ ; $I_{\text{G}} = 0.2\text{ A}$ ; $di_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$	-	100	$\text{A}/\mu\text{s}$
$I_{\text{GM}}$	peak gate current		-	2	A
$P_{\text{GM}}$	peak gate power		-	5	W
$P_{\text{G(AV)}}$	average gate power	over any 20ms period	-	0.5	W
$T_{\text{stg}}$	storage temperature		-40	150	$^{\circ}\text{C}$
$T_{\text{j}}$	junction temperature		-	125	$^{\circ}\text{C}$



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

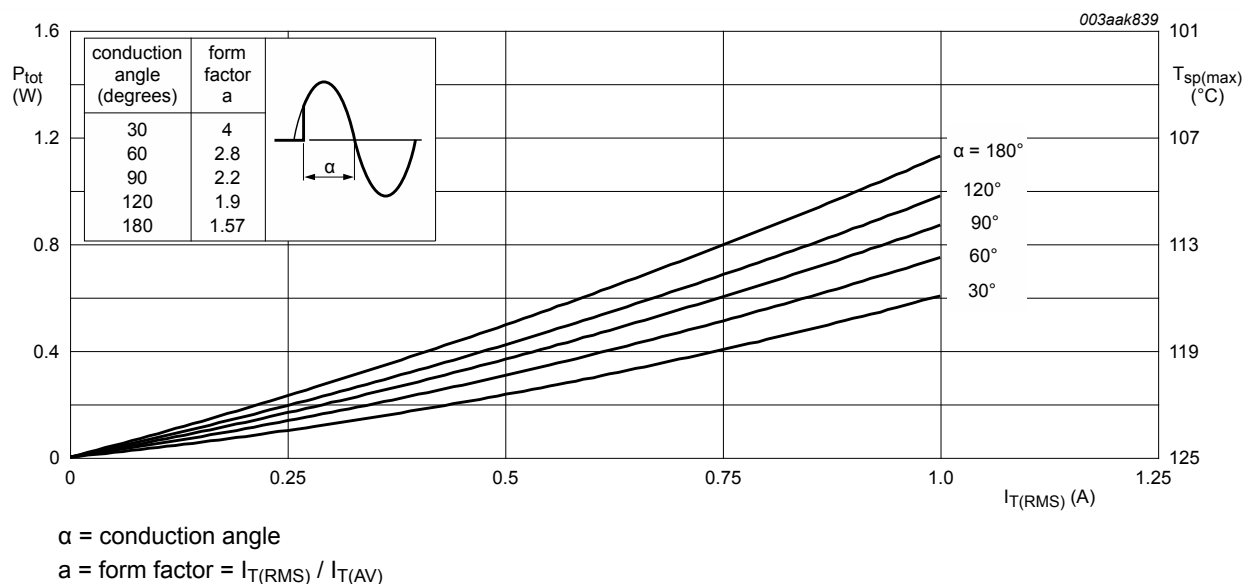


**Fig. 2. RMS on-state current as a function of solder point temperature; maximum values**

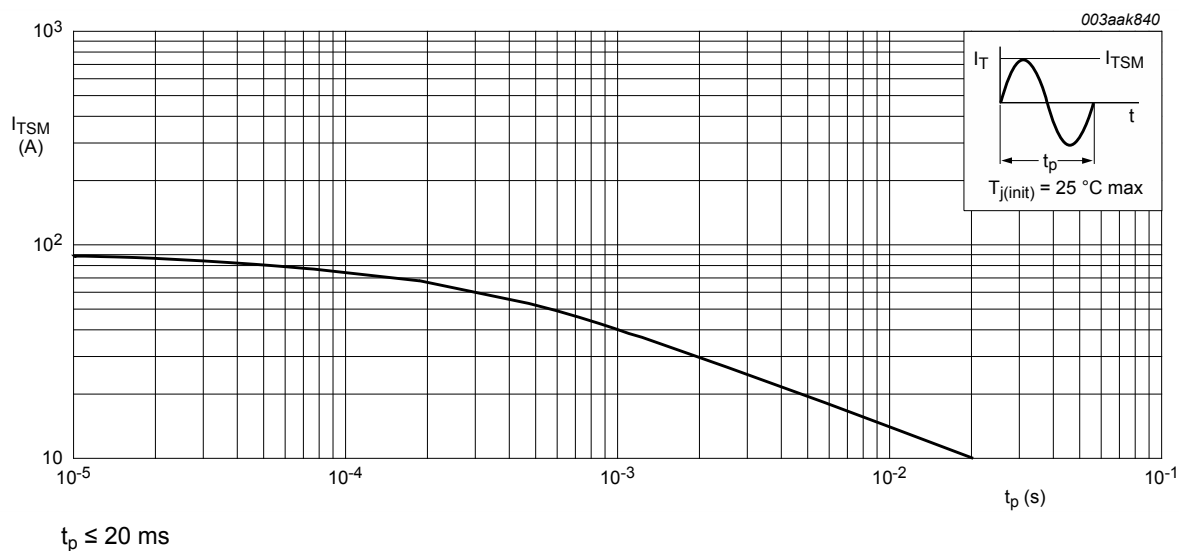
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**Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values**

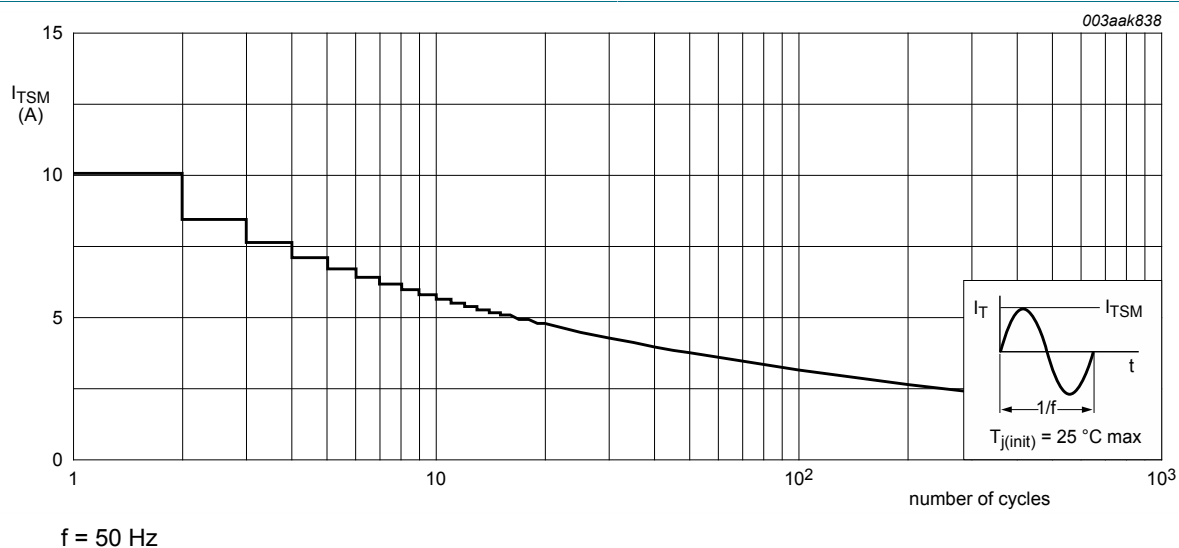


**Fig. 4. Non-repetitive peak on-state current as a function of pulse width; maximum values**

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**Fig. 5. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values**

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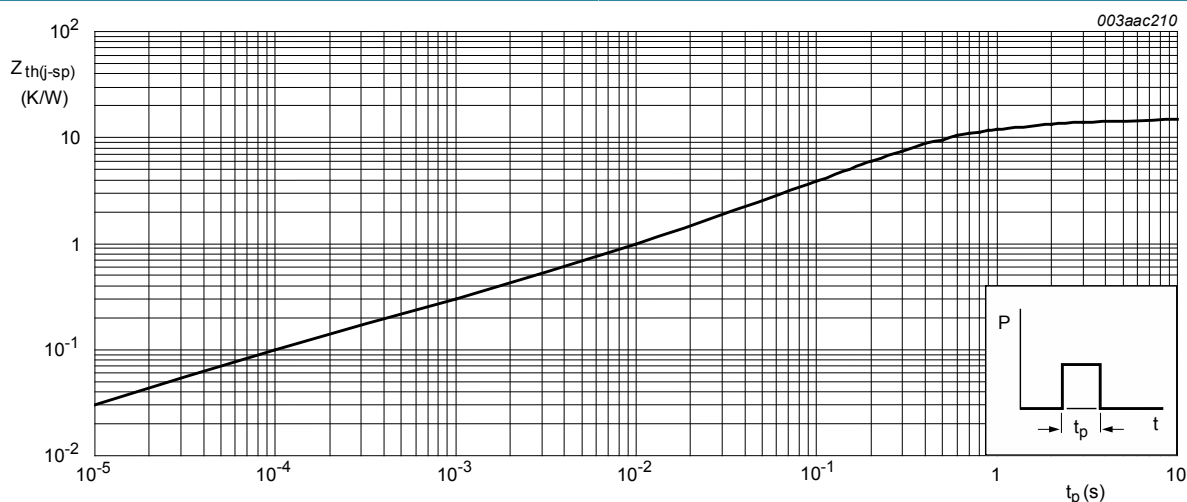
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### 8. Thermal characteristics

**Table 5. Thermal characteristics**

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

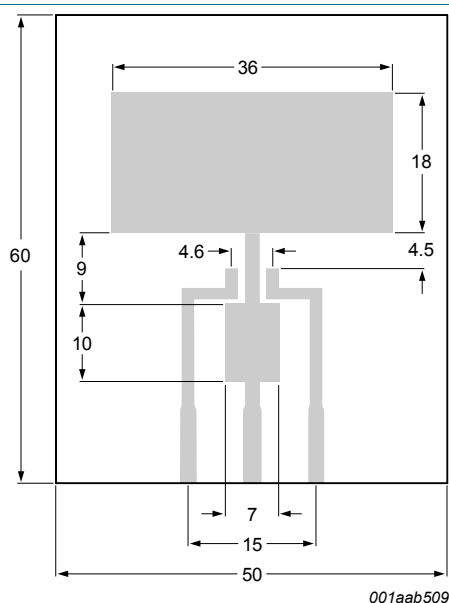


**Fig. 6. Transient thermal impedance from junction to solder point as a function of pulse width**

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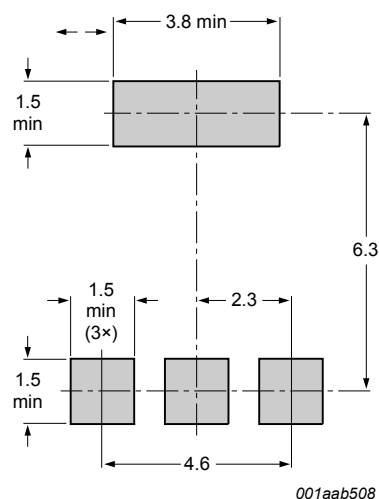


All dimensions are in mm

Printed circuit board:

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

**Fig. 7. Printed circuit board pad area: SOT223**



All dimensions are in mm

**Fig. 8. Minimum footprint SOT223**



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### 9. Characteristics

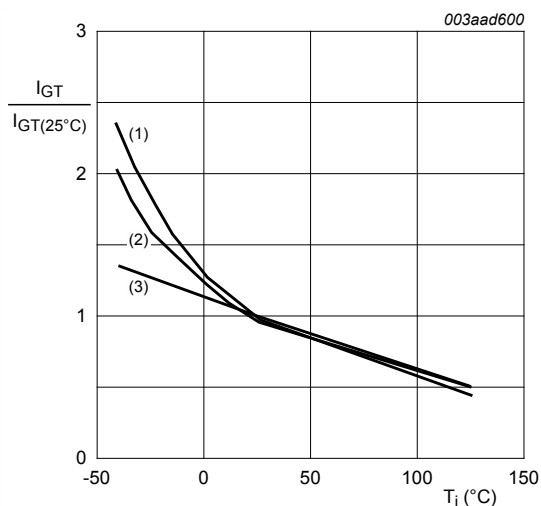
Table 6. Characteristics

Symbol	Parameter	Conditions	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>	-	-	35	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>	-	-	35	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>	-	-	35	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>	-	-	30	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>	-	-	20	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>	-	-	20	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	$I_T = 2\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 12</a>	-	1.2	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>	-	0.7	1	V
		$V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; <a href="#">Fig. 13</a>	0.25	0.4	-	V
$I_D$	off-state current	$V_D = 600\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$	-	0.1	0.5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; (67% of $V_{DRM}$ ); exponential waveform; gate open circuit	1000	-	-	V/ $\mu\text{s}$
$dI_{com}/dt$	rate of change of commutating current	$V_D = 400\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 1\text{ A}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; (snubberless condition); gate open circuit	3	-	-	A/ms

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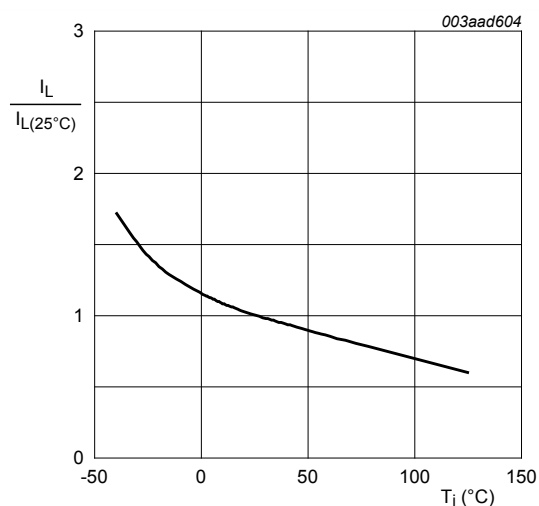
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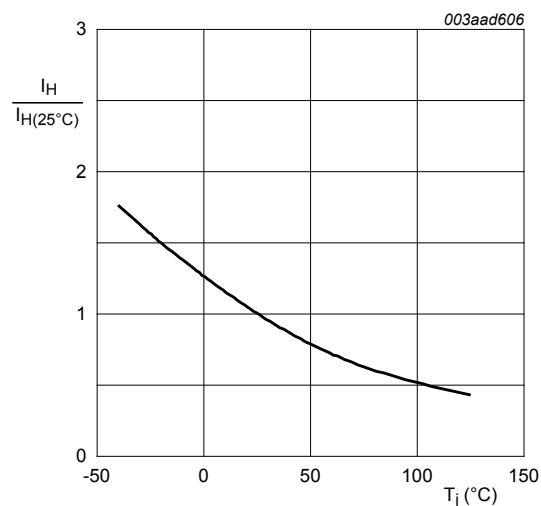


- (1) T2- G-  
(2) T2+ G-  
(3) T2+ G+

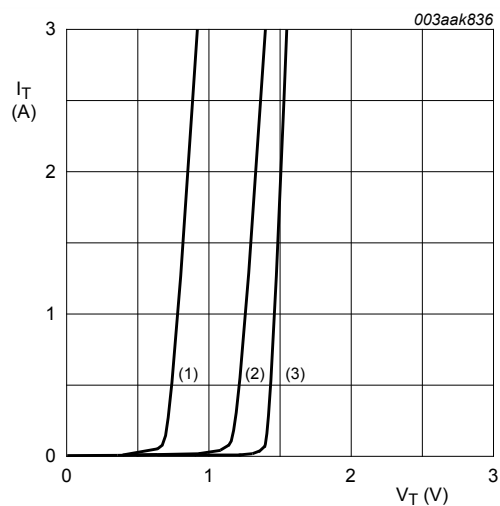
**Fig. 9. Normalized gate trigger current as a function of junction temperature**



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



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



$V_o = 1.27 \text{ V}; R_s = 0.091 \Omega$

- (1)  $T_j = 125^{\circ}\text{C}$ ; typical values  
(2)  $T_j = 125^{\circ}\text{C}$ ; maximum values  
(3)  $T_j = 25^{\circ}\text{C}$ ; maximum values

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

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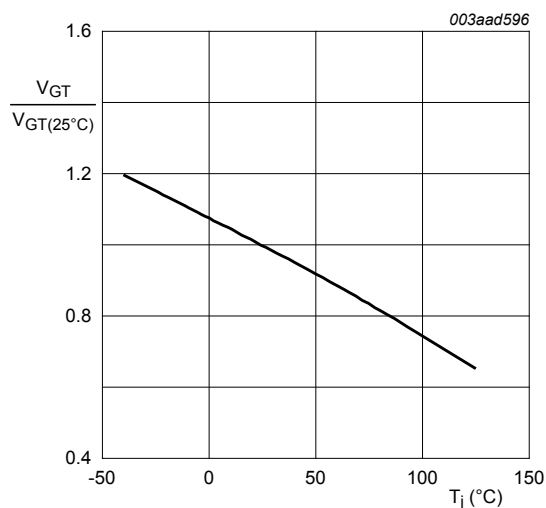


Fig. 13. Normalized gate trigger voltage as a function of junction temperature

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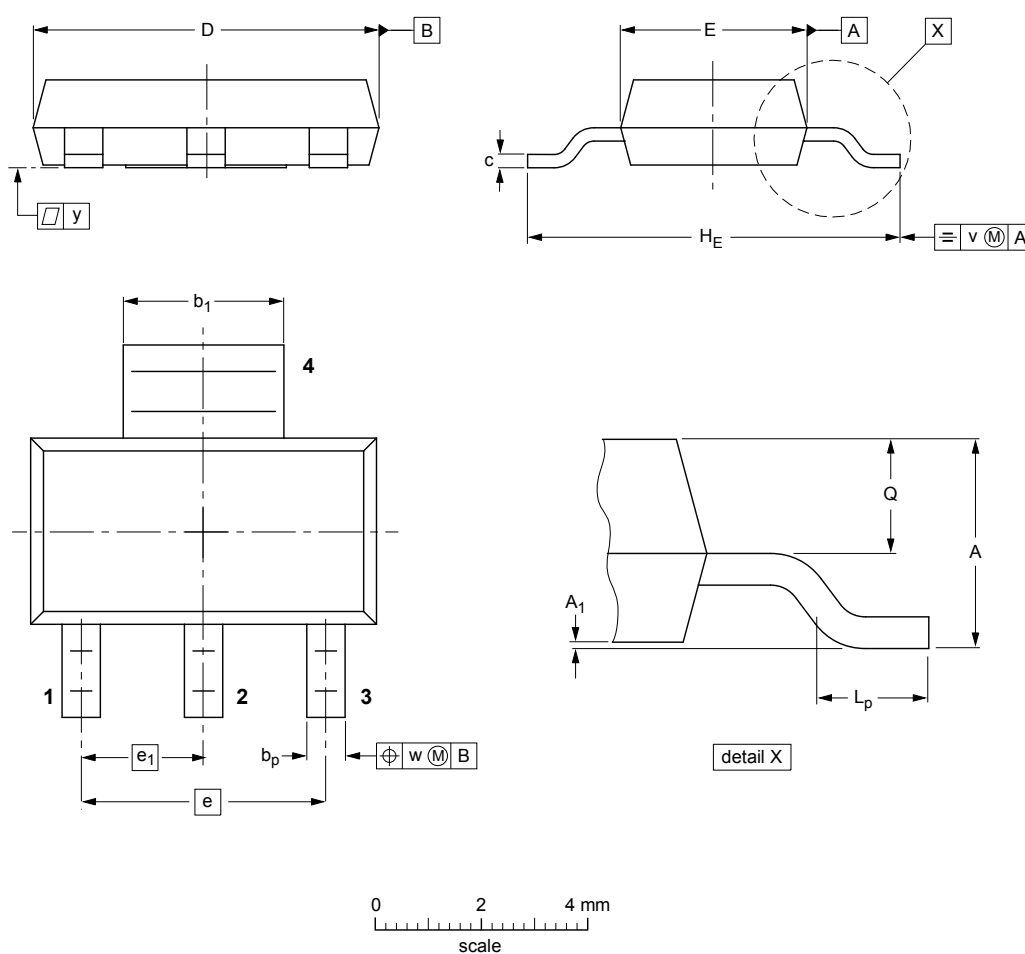
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### 10. Package outline

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

Fig. 14. Package outline SC-73 (SOT223)

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### 11. Soldering

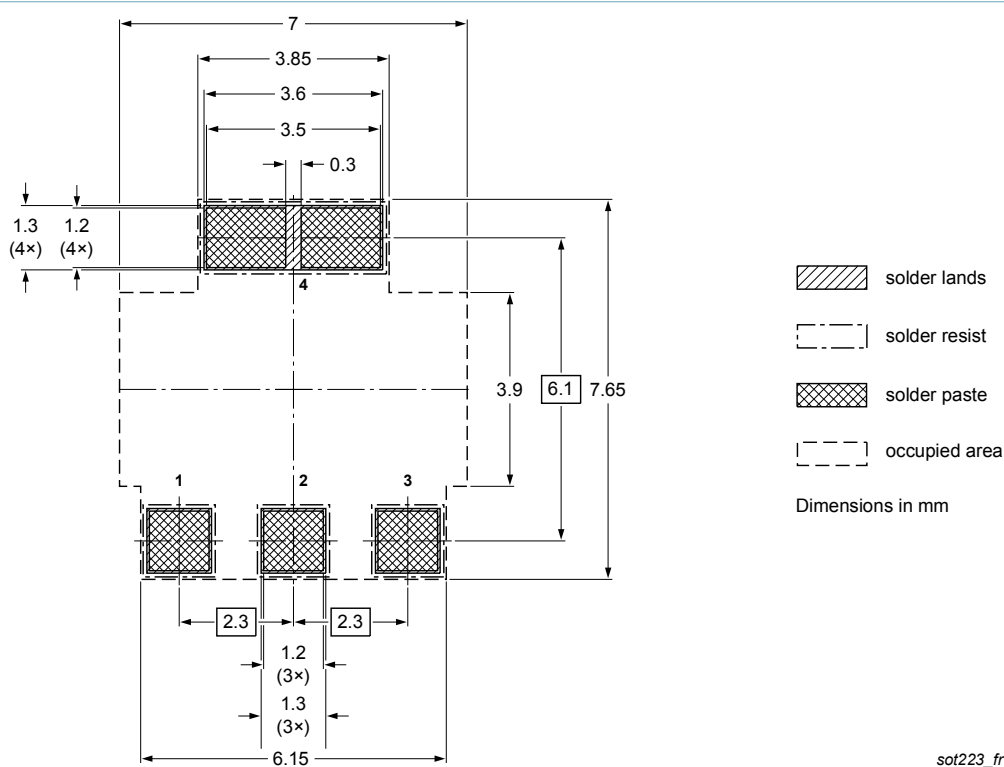


Fig. 15. Reflow soldering footprint for SC-73 (SOT223)

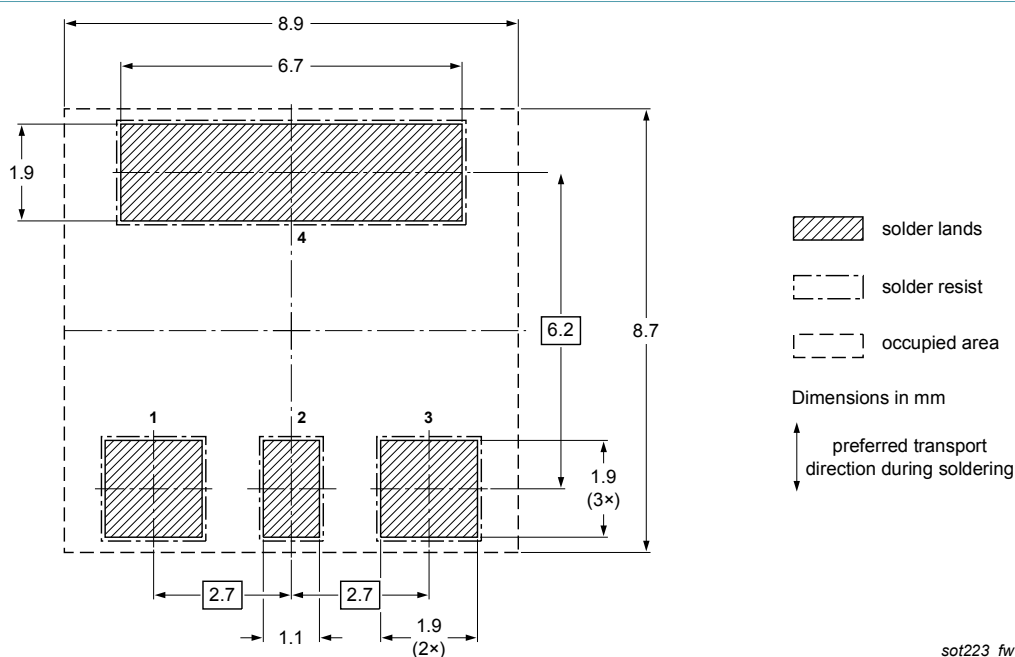


Fig. 16. Wave soldering footprint for SC-73 (SOT223)

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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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