

# BTA208X-1000C0

## High commutation three-quadrant triacs

Rev. 01 — 3 September 2009

Product data sheet

## 1. Product profile

### 1.1 General description

Passivated high voltage, high commutation triac in a full pack, plastic package. This triac is intended for use in motor control circuits where high blocking voltage, high static and dynamic  $dV/dt$  as well as high  $dI_{com}/dt$  can occur. This device will commute the full rated RMS current at the maximum rated junction temperature without the aid of a snubber.

### 1.2 Features and benefits

- 3Q technology with superior commutation performance for improved noise immunity
- Enhanced immunity to voltage transients and noise
- High false trigger immunity
- Isolated package
- Very high blocking voltage capability of 1000 V

### 1.3 Applications

- General purpose motor control
- Reversible induction motor control

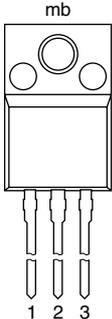
### 1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	-	1000	V
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(initial)} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; see <a href="#">Figure 4</a> and <a href="#">5</a>	-	-	65	A
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_h \leq 73\text{ °C}$ ; see <a href="#">Figure 3</a> , <a href="#">1</a> and <a href="#">2</a>	-	-	8	A
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>	5	11	35	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>	5	14	35	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>	5	25	35	mA

## 2. Pinning information

**Table 2. Pinning information**

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	 <p style="text-align: center;"><b>SOT186A (TO-220F)</b></p>	
2	T2	main terminal 2		
3	G	gate		
mb	n.c.	mounting base; isolated		

## 3. Ordering information

**Table 3. Ordering information**

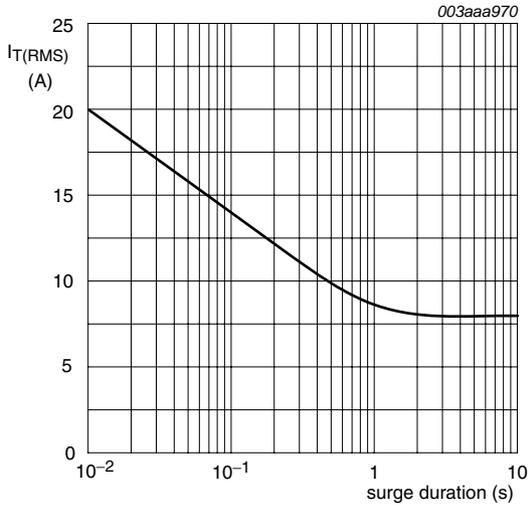
Type number	Package		Version
	Name	Description	
BTA208X-1000C0	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

## 4. Limiting values

**Table 4. Limiting values**

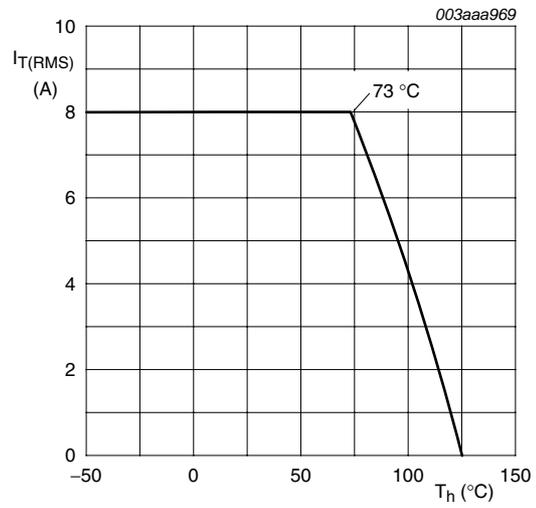
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	1000	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_h \leq 73\text{ }^\circ\text{C}$ ; see <a href="#">Figure 3, 1</a> and <a href="#">2</a>	-	8	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ }^\circ\text{C}$ ; $t_p = 20\text{ ms}$ ; see <a href="#">Figure 4</a> and <a href="#">5</a>	-	65	A
		full sine wave; $T_{j(init)} = 25\text{ }^\circ\text{C}$ ; $t_p = 16.7\text{ ms}$	-	71	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; sine-wave pulse	-	21	A <sup>2</sup> s
$di_T/dt$	rate of rise of on-state current	$I_T = 12\text{ A}$ ; $I_G = 0.2\text{ A}$ ; $di_G/dt = 0.2\text{ A}/\mu\text{s}$	-	100	A/ $\mu\text{s}$
$I_{GM}$	peak gate current		-	2	A
$P_{GM}$	peak gate power		-	5	W
$P_{G(AV)}$	average gate power		-	0.5	W
$T_{stg}$	storage temperature		-40	150	$^\circ\text{C}$
$T_j$	junction temperature		-	125	$^\circ\text{C}$

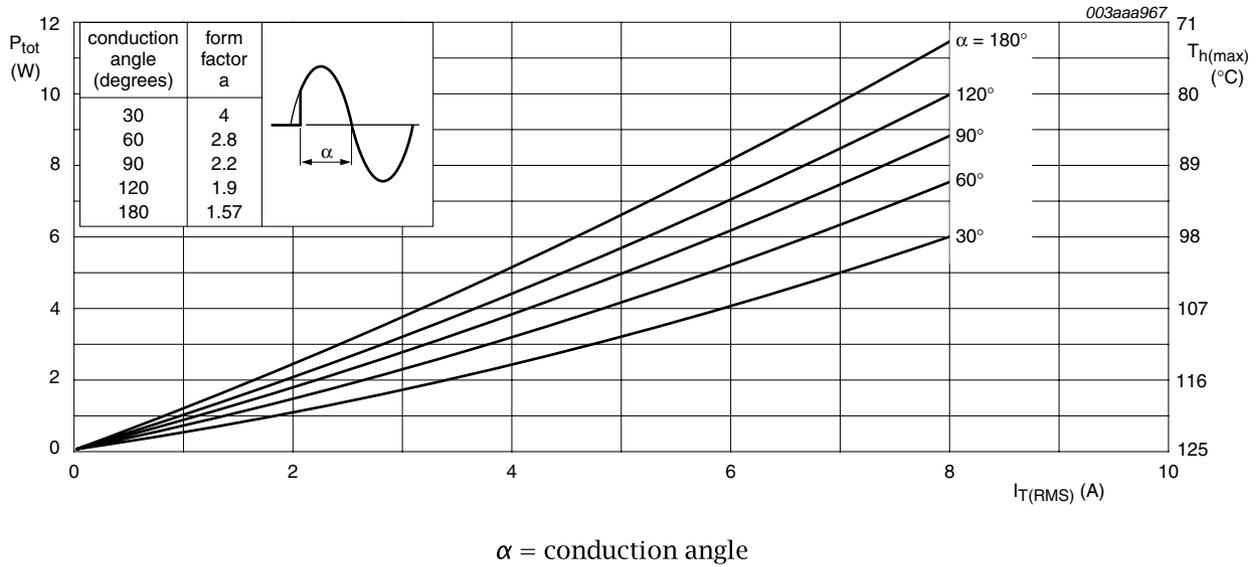


$f = 50 \text{ Hz}$ ,  $T_h = 73 \text{ }^\circ\text{C}$

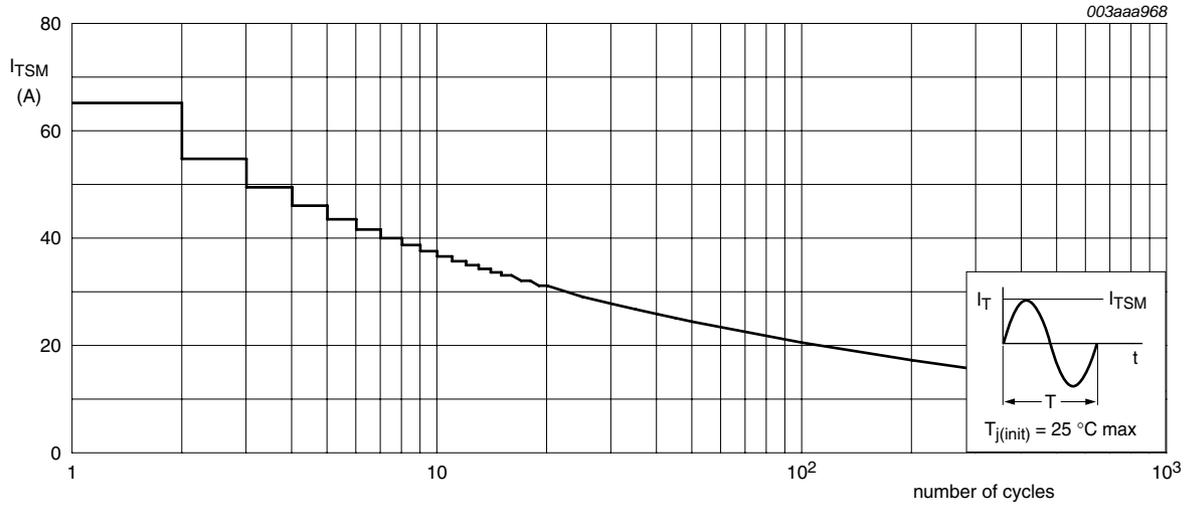
**Fig 1. RMS on-state current as a function of surge duration; maximum values**



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

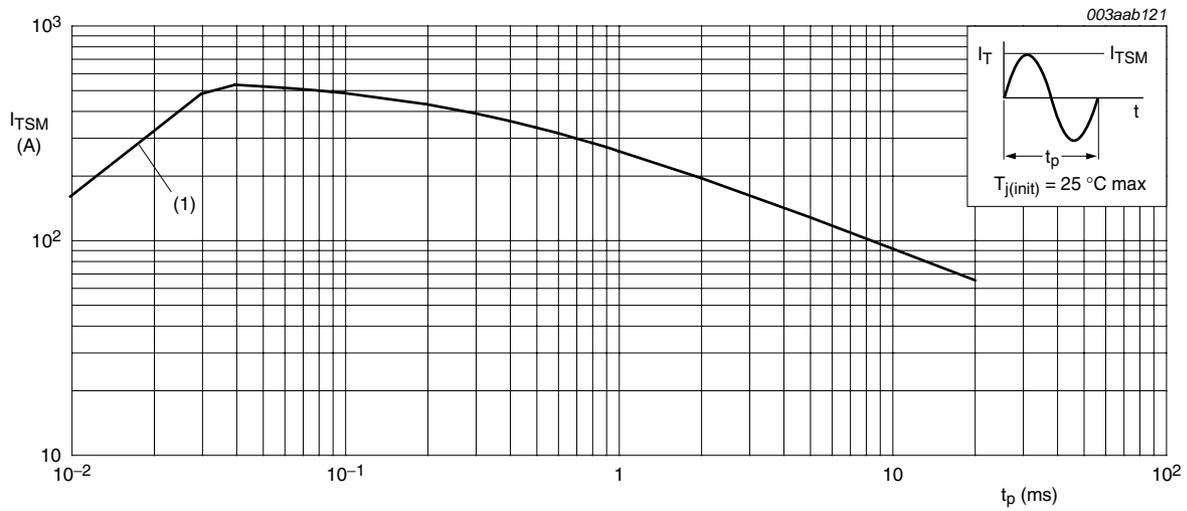


**Fig 3. Total power dissipation as a function of RMS on-state current; maximum values**



$f = 50\text{ Hz}$

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



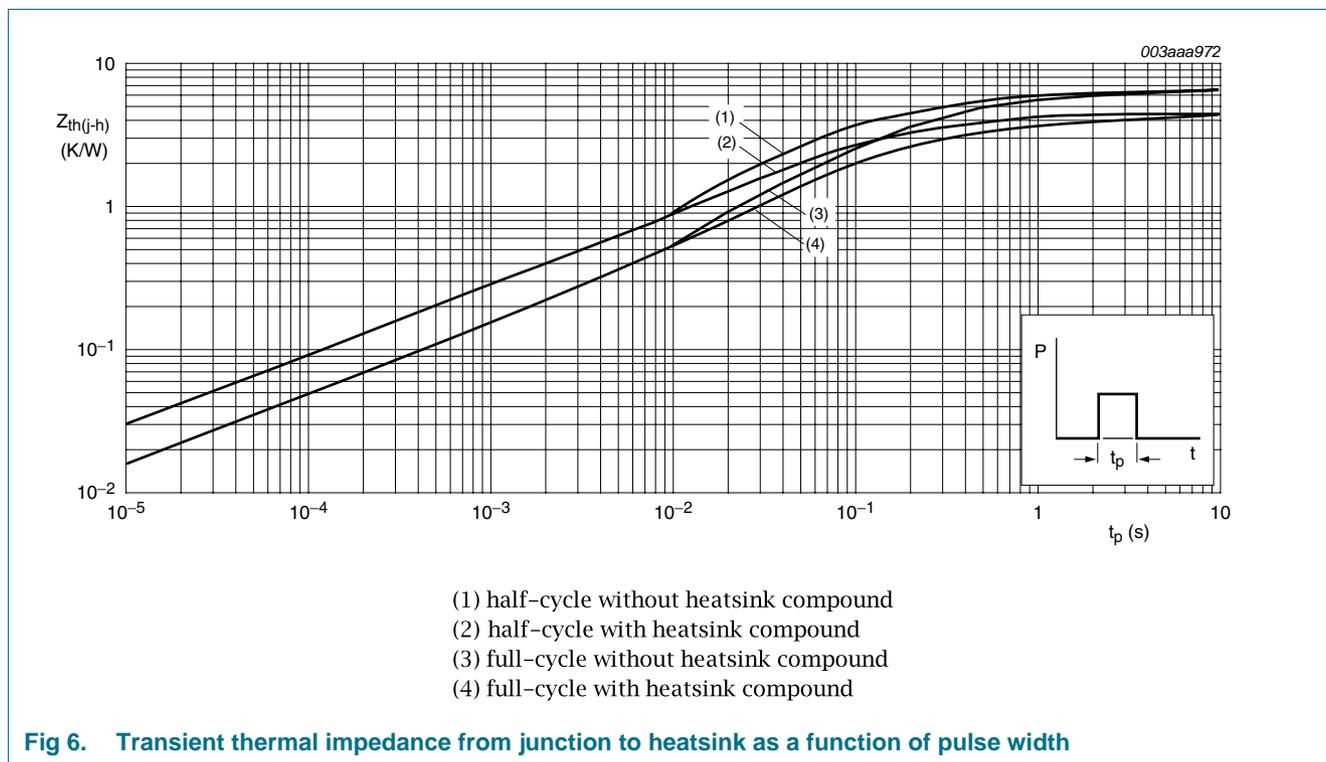
$t_p \leq 20\text{ ms(1) } dI_T/dt\text{ limit}$

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

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	full cycle or half cycle with heatsink compound; see <a href="#">Figure 6</a>	-	-	4.5	K/W
			-	-	6.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient		-	55	-	K/W



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

## 6. Isolation characteristics

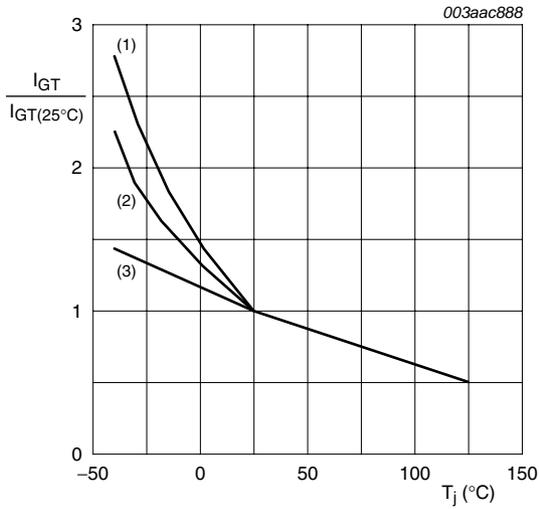
**Table 6. Isolation characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	from all terminals to external heatsink; sinusoidal waveform; clean and dust free; 50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; T <sub>h</sub> = 25 °C	-	-	2500	V
$C_{isol}$	isolation capacitance	from main terminal 2 to external heatsink; f = 1 MHz; T <sub>h</sub> = 25 °C	-	10	-	pF

## 7. Characteristics

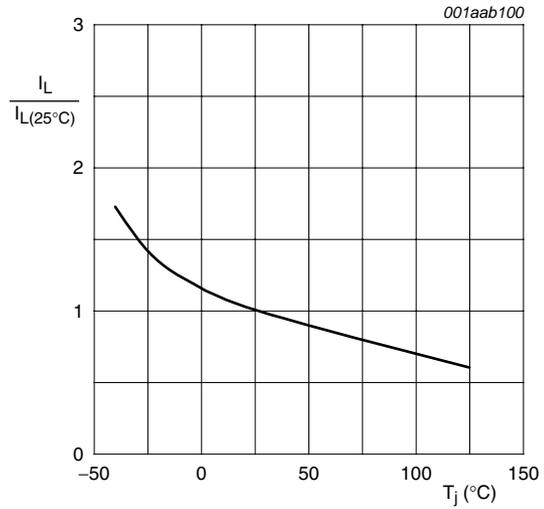
**Table 7. Characteristics**

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+; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>	5	11	35	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>	5	14	35	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>	5	25	35	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 8</a>	-	25	50	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 8</a>	-	48	75	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 8</a>	-	30	50	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 9</a>	-	20	50	mA
$V_T$	on-state voltage	$I_T = 10\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 10</a>	-	1.3	1.65	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 11</a>	-	0.7	1.5	V
		$V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ °C}$	0.25	0.4	-	V
$I_D$	off-state current	$V_D = 1000\text{ V}$ ; $T_j = 125\text{ °C}$	-	0.1	0.5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 670\text{ V}$ ; $T_j = 125\text{ °C}$ ; exponential waveform; gate open circuit	1500	4000	-	V/ $\mu$ s
$dl_{com}/dt$	rate of change of commutating current	$V_D = 400\text{ V}$ ; $T_j = 125\text{ °C}$ ; $I_{T(RMS)} = 8\text{ A}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; gate open circuit; see <a href="#">Figure 12</a>	12	32	-	A/ms
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 12\text{ A}$ ; $V_D = 1000\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $dl_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	$\mu$ s

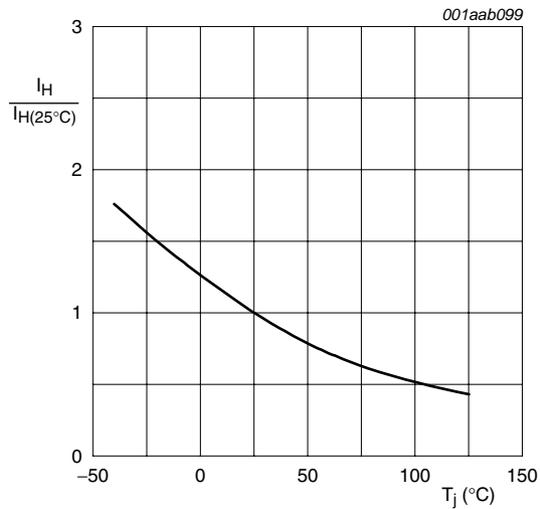


(1) T2- G-(2) T2+ G-(3) T2+ G+

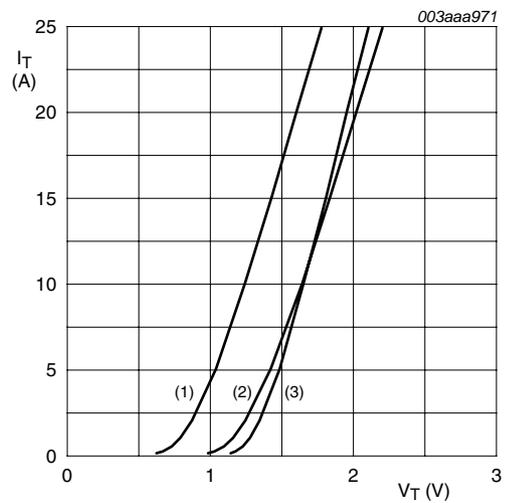
**Fig 7. Normalized gate trigger current as a function of junction temperature**



**Fig 8. Normalized latching current as a function of junction temperature**



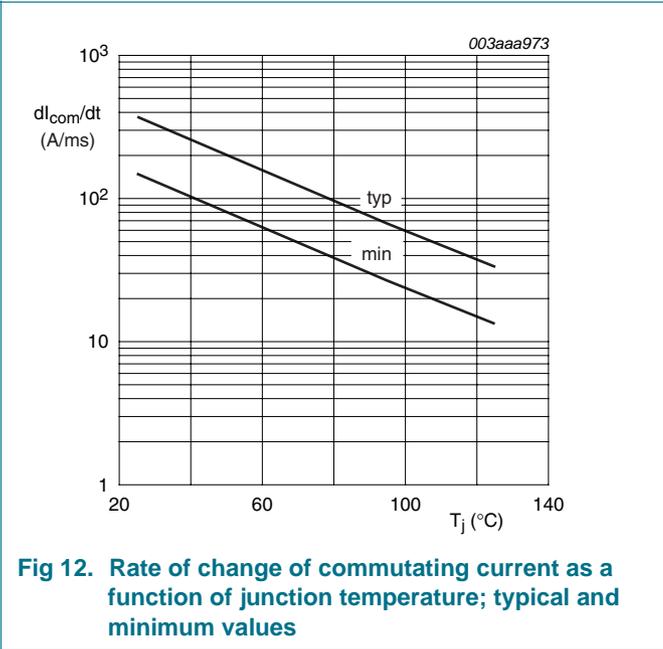
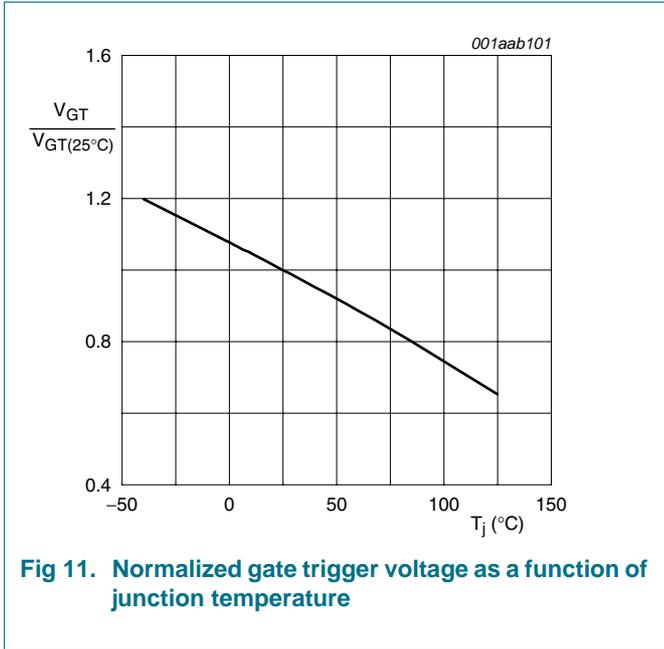
**Fig 9. Normalized holding current as a function of junction temperature**



$V_0 = 1.22 \text{ V}; R_s = 0.04 \Omega$

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

**Fig 10. On-state current as a function of on-state voltage**



**8. Package outline**

Plastic single-ended package; isolated heatsink mounted;  
1 mounting hole; 3-lead TO-220 'full pack'

SOT186A

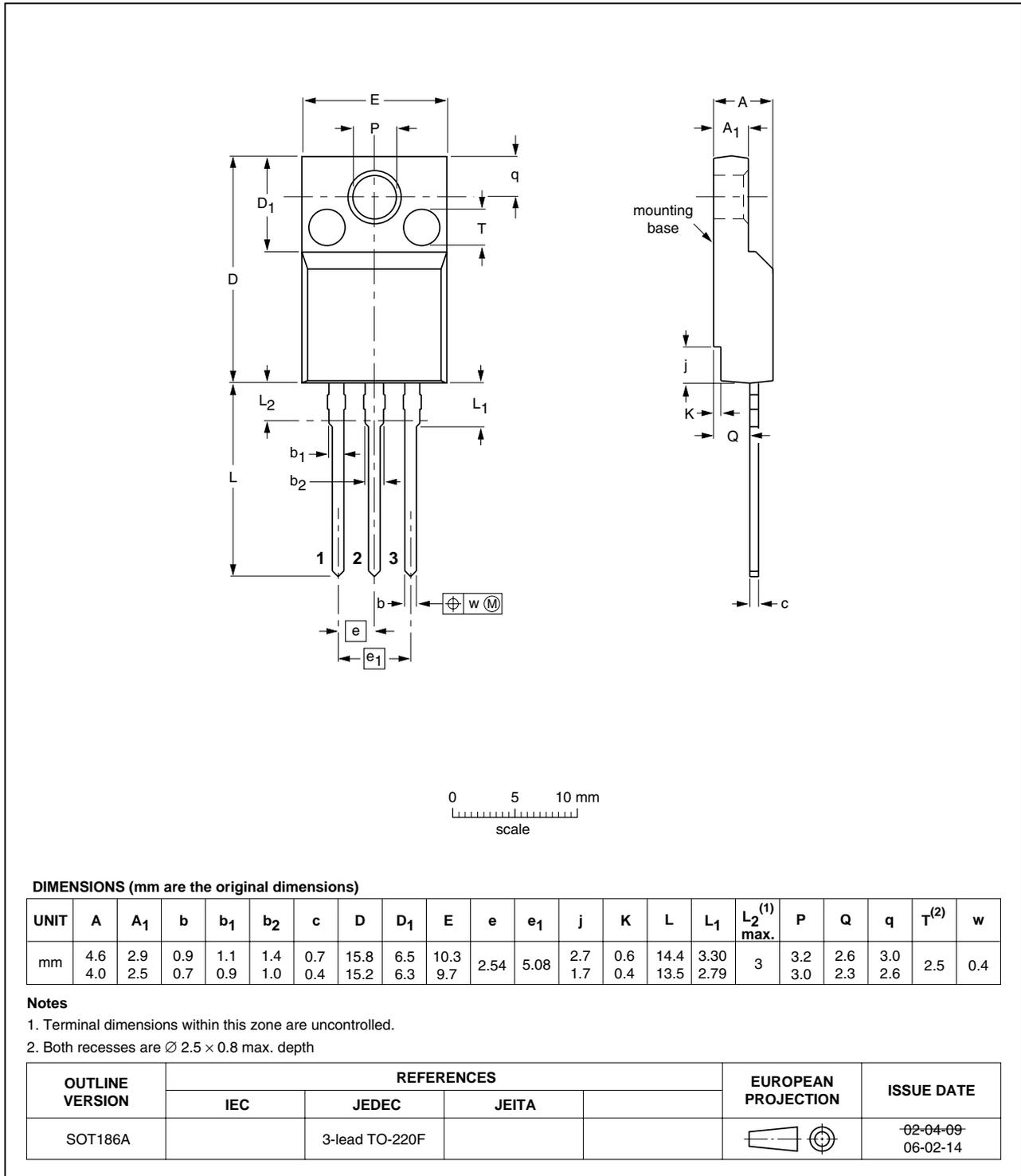


Fig 13. Package outline SOT186A (TO-220F)

## 9. Revision history

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Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA208X-1000C0_1	20090903	Product data sheet	-	-

## 10. Legal information

### 10.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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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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**12. Contents**

**1 Product profile . . . . .1**  
 1.1 General description . . . . .1  
 1.2 Features and benefits . . . . .1  
 1.3 Applications . . . . .1  
 1.4 Quick reference data . . . . .1  
**2 Pinning information . . . . .2**  
**3 Ordering information . . . . .2**  
**4 Limiting values . . . . .2**  
**5 Thermal characteristics . . . . .5**  
**6 Isolation characteristics . . . . .5**  
**7 Characteristics . . . . .6**  
**8 Package outline . . . . .9**  
**9 Revision history . . . . .10**  
**10 Legal information . . . . .11**  
 10.1 Data sheet status . . . . .11  
 10.2 Definitions . . . . .11  
 10.3 Disclaimers . . . . .11  
 10.4 Trademarks . . . . .11  
**11 Contact information . . . . .11**

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