

# BTA208X-1000C

Three quadrant triacs high commutation

Rev. 01 — 4 October 2005

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  $dI/dt$  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

- False trigger immunity
- 1000 V  $V_{DRM}$  guaranteed
- Isolated package

### 1.3 Applications

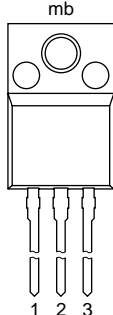

- Motor control
- Reversible induction motors

### 1.4 Quick reference data

- $I_{TSM} \leq 65$  A
- $V_{DRM} \leq 1000$  V
- $I_{T(RMS)} \leq 8$  A
- $I_{GT} \leq 35$  mA

## 2. Pinning information

Table 1: Pinning

Pin	Description	Simplified outline	Symbol
1	main terminal 1 (T1)		
2	main terminal 2 (T2)		
3	gate (G)		
mb	mounting base; isolated		

SOT186A (3-lead TO-220F)

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### 3. Ordering information

Table 2: Ordering information

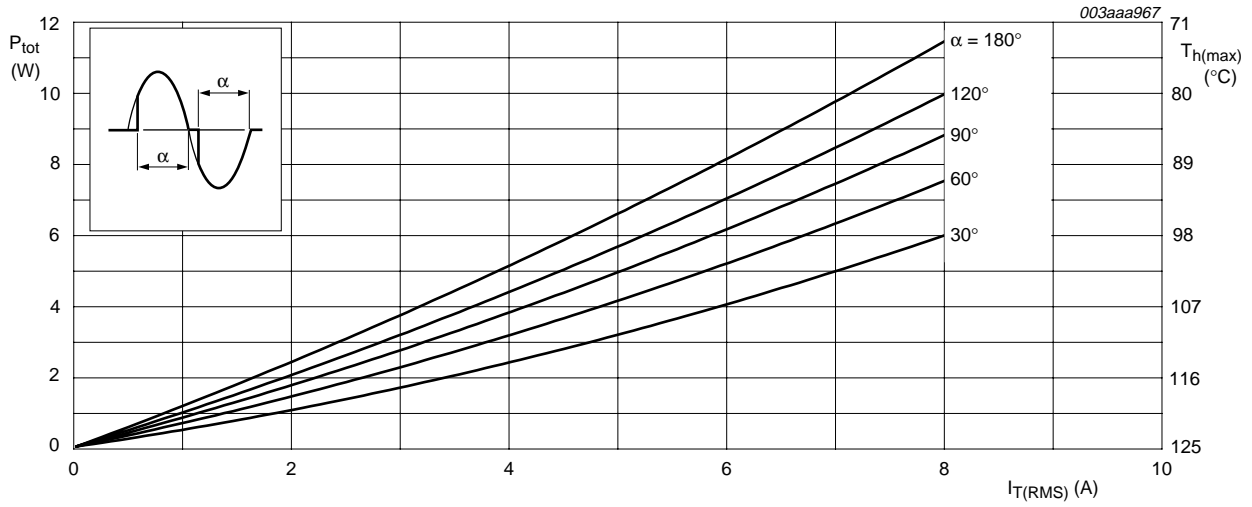
Type number	Package		Version
	Name	Description	
BTA208X-1000C	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 'full pack'	SOT186A

### 4. Limiting values

Table 3: Limiting values

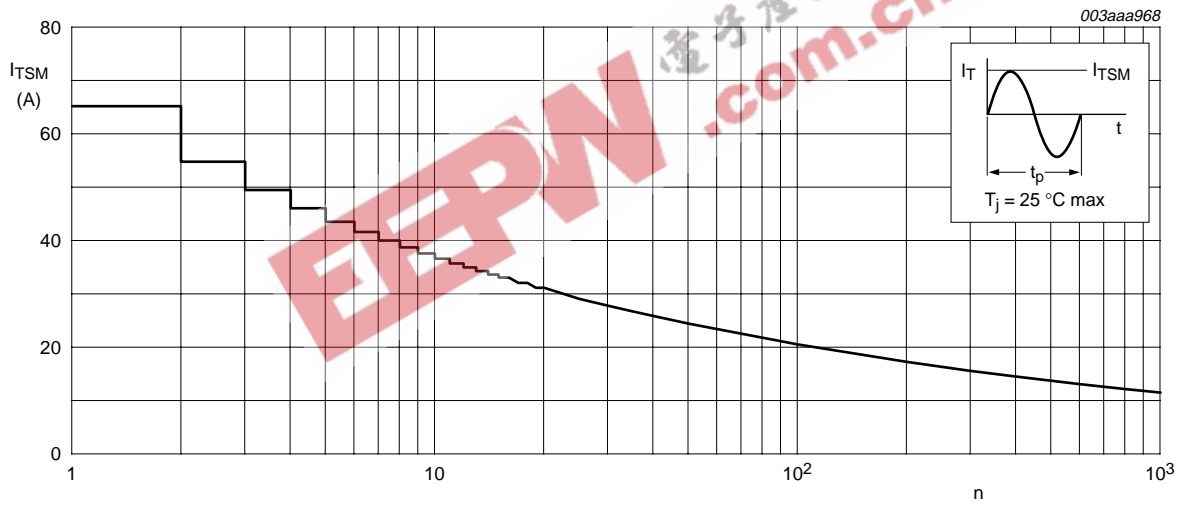
In accordance with the Absolute Maximum Rating System (IEC 60134).

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



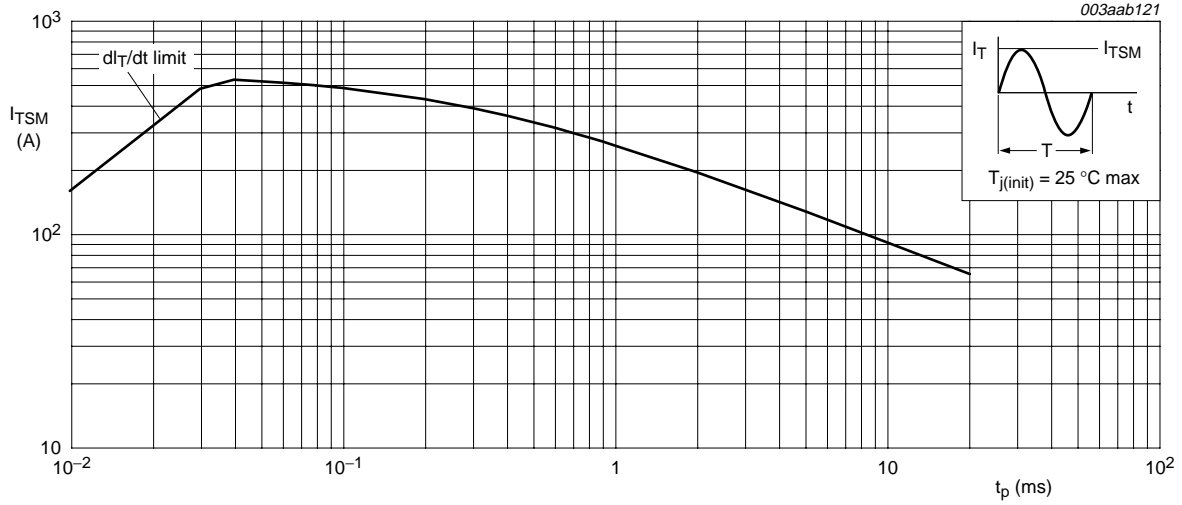
$\alpha$  = conduction angle

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

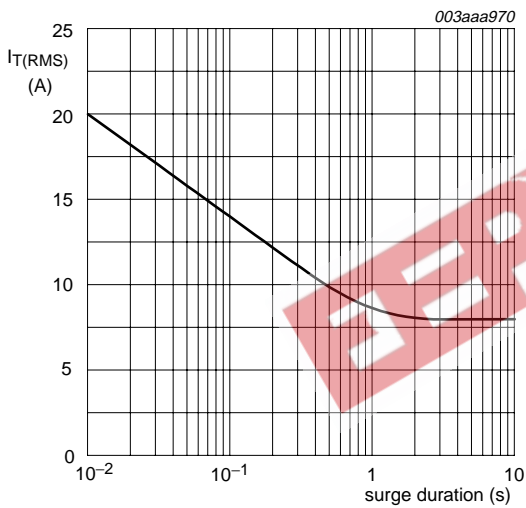


$f = 50 \text{ Hz}$

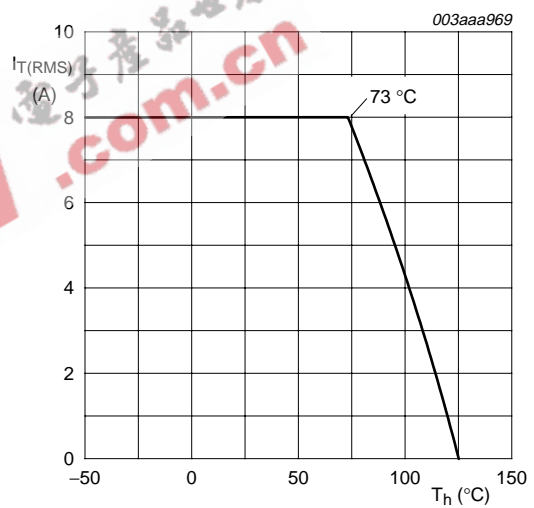
**Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values**



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



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



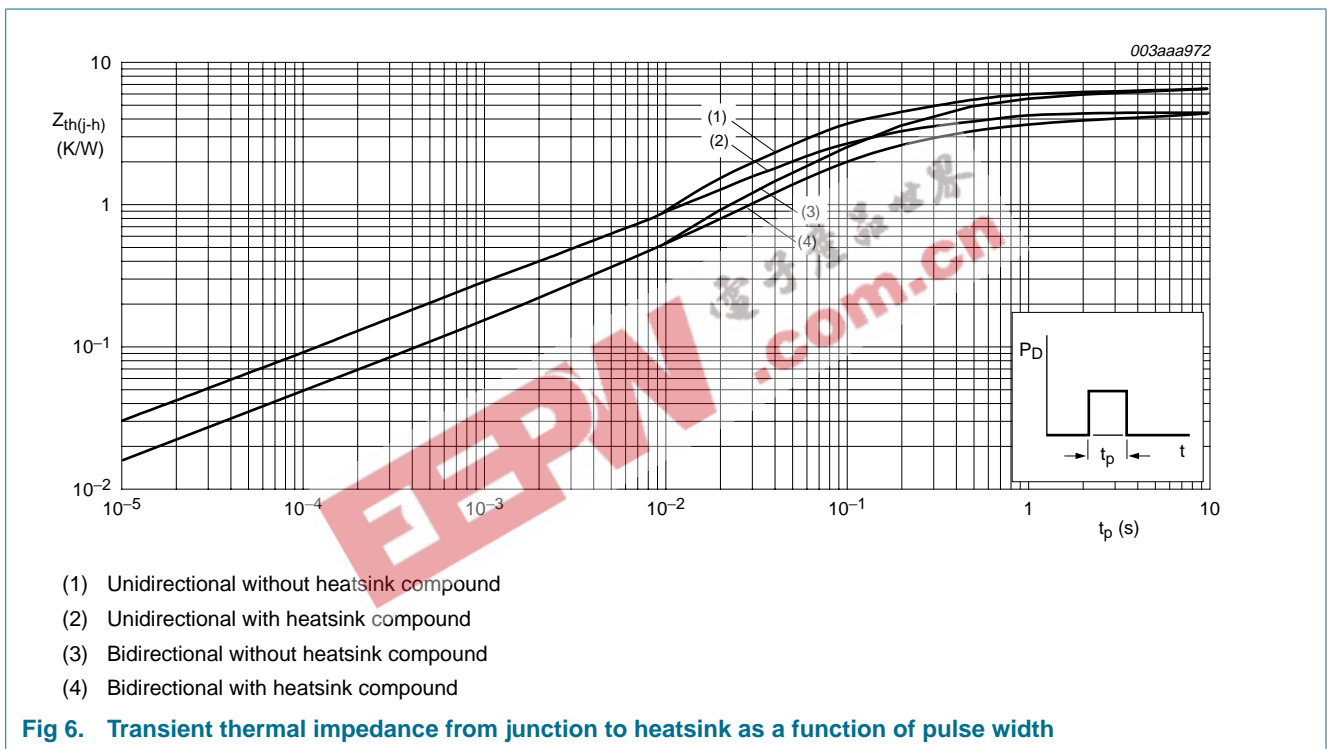
**Fig 5. RMS on-state current as a function of heatsink temperature; maximum values**

## 5. Thermal characteristics

**Table 4: Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{th(j-h)}$	thermal resistance from junction to heatsink	see <a href="#">Figure 6</a>	[1]	-	-	4.5	K/W
		see <a href="#">Figure 6</a>	[2]	-	-	6.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	55	-	K/W	

- [1] Full or half cycle; with heatsink compound.
- [2] Full or half cycle; without heatsink compound.



## 6. Isolation characteristics

**Table 5: Isolation limiting values and characteristics**

$T_h = 25^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{isol(rms)}$	RMS isolation voltage	f = 50 Hz to 60 Hz; sinusoidal waveform; RH ≤ 65 %; clean and dust free; from all three terminals to external heatsink	-	-	2500	V
$C_{isol}$	isolation capacitance	f = 1 MHz; from pin 2 to external heatsink	-	10	-	pF

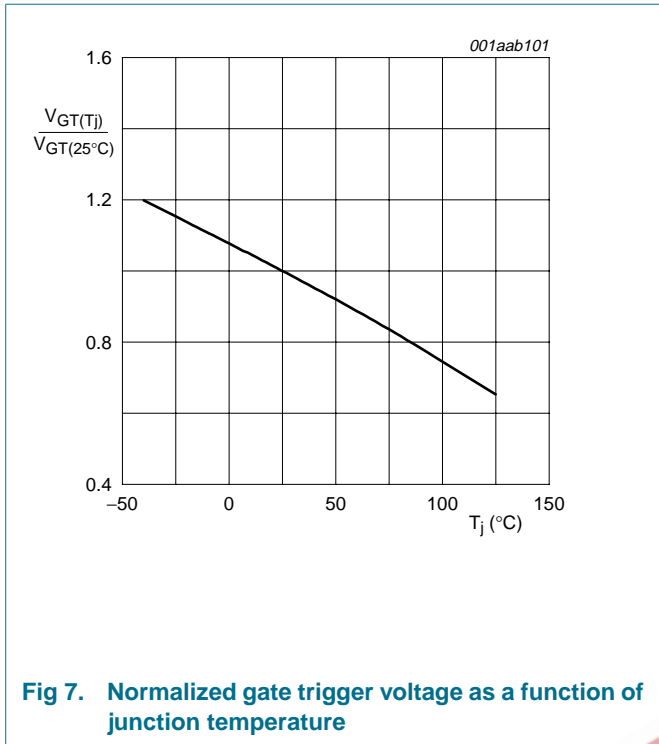
## 7. Characteristics

**Table 6: Characteristics**

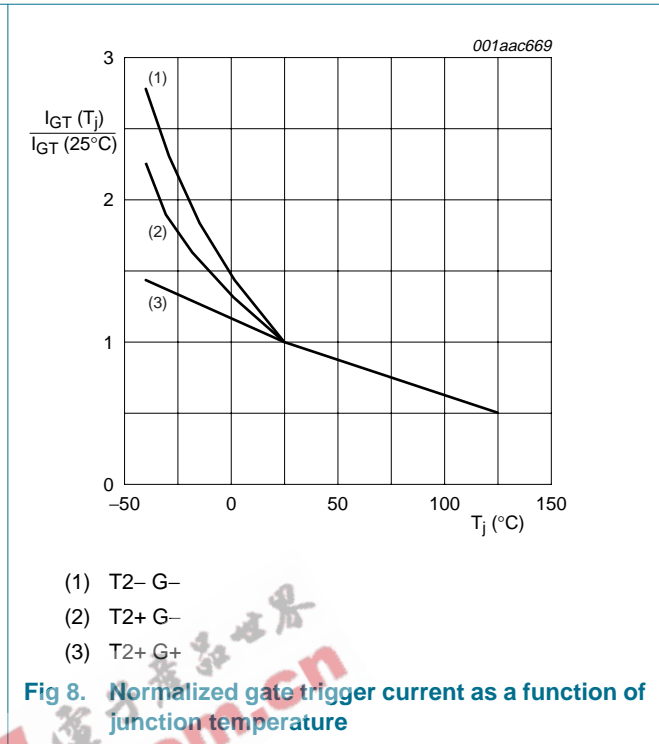
$T_j = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; see <a href="#">Figure 8</a> [1]				
		T2+ G+	2	6	35	mA
		T2+ G-	2	13	35	mA
		T2- G-	2	23	35	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$ ; see <a href="#">Figure 10</a>				
		T2+ G+	-	25	50	mA
		T2+ G-	-	48	75	mA
		T2- G-	-	30	50	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$ ; see <a href="#">Figure 11</a>	-	20	50	mA
$V_T$	on-state voltage	$I_T = 10\text{ A}$ ; see <a href="#">Figure 9</a>	-	1.3	1.65	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; see <a href="#">Figure 7</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	$V_D = V_{DRM(max)}$ ; $T_j = 125\text{ °C}$	-	0.1	0.5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 67\% V_{DRM(max)}$ ; $T_j = 125\text{ °C}$ ; exponential waveform; gate open circuit	1000	4000	-	V/ $\mu$ s
$di_{com}/dt$	rate of change of commutating current	$V_{DM} = 400\text{ V}$ ; $T_j = 125\text{ °C}$ ; $I_{T(RMS)} = 8\text{ A}$ ; without snubber; gate open circuit; see <a href="#">Figure 12</a>	12	32	-	A/ms
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 12\text{ A}$ ; $V_D = V_{DRM(max)}$ ; $I_G = 0.1\text{ A}$ ; $di_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	$\mu$ s

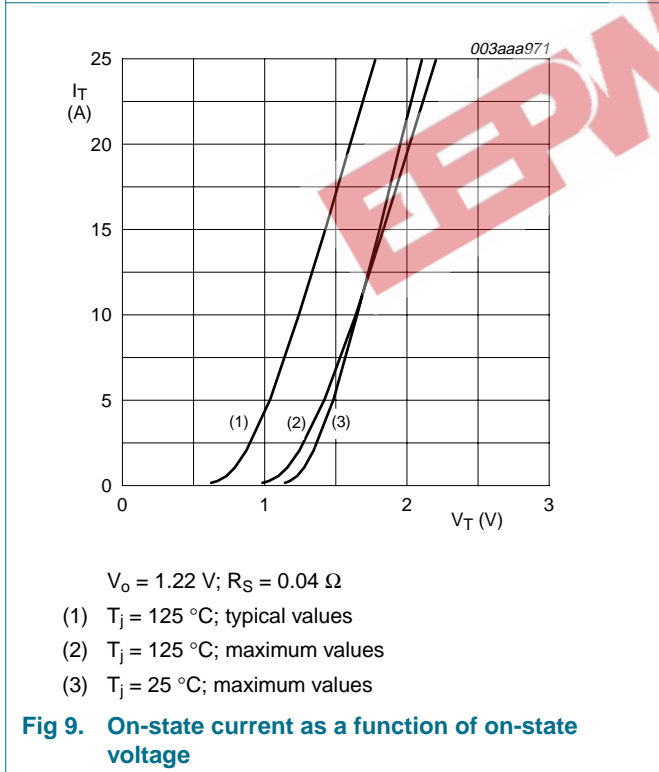
[1] Device will not trigger in the T2- G+ quadrant.



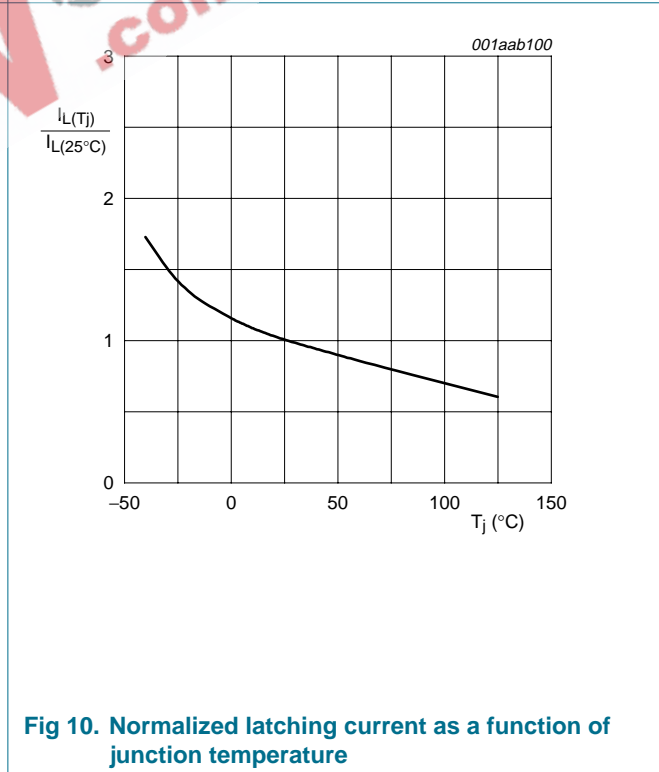
**Fig 7. Normalized gate trigger voltage as a function of junction temperature**



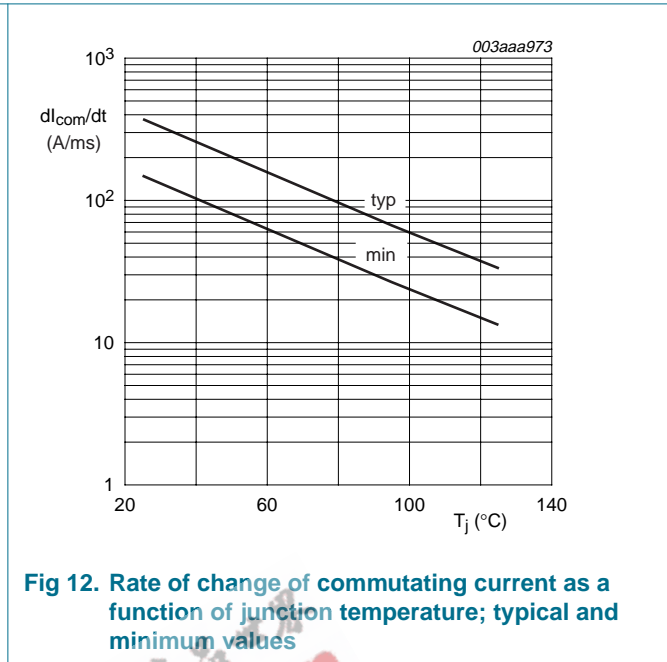
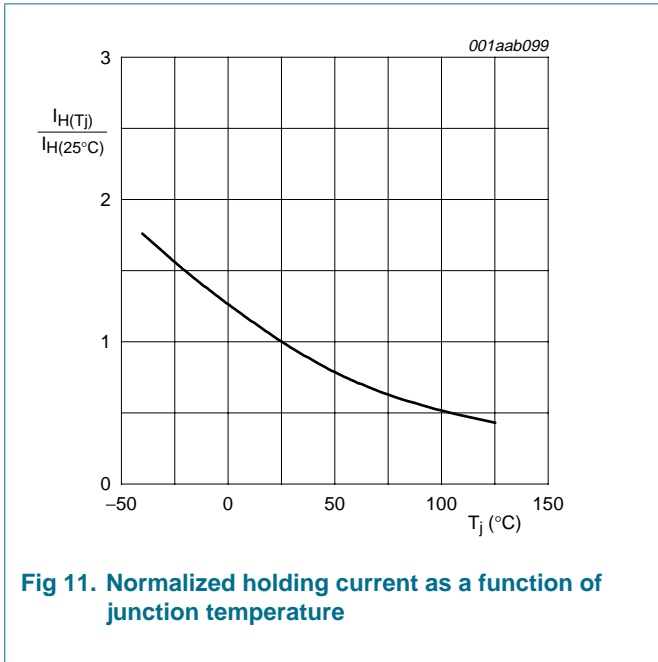
**Fig 8. Normalized gate trigger current as a function of junction temperature**



**Fig 9. On-state current as a function of on-state voltage**



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



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**8. Package outline**

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

SOT186A

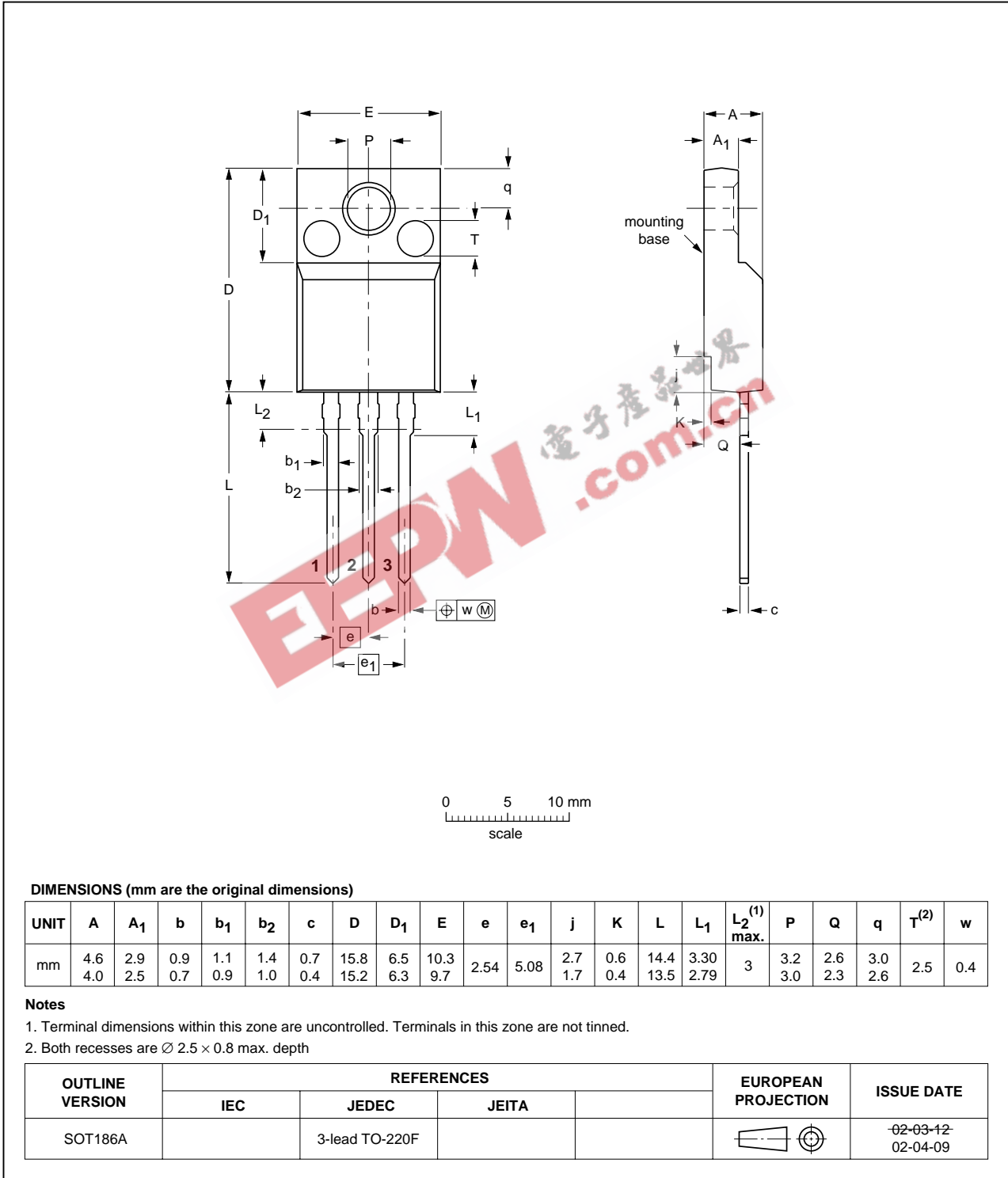


Fig 13. Package outline SOT186A (3-lead TO-220F)

## 9. Revision history

Table 7: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BTA208X-1000C_1	20051004	Product data sheet	-	-	-

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## 10. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2] [3]</sup>	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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