

# BTA216-600BT

Triacs high commutation

Rev. 01 — 25 August 2005

Product data sheet

## 1. Product profile

### 1.1 General description

Passivated high commutation triac in a plastic envelope. Featuring high maximum junction temperature and high commutation capability. Intended for use in circuits where high static and dynamic  $dV/dt$  and 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

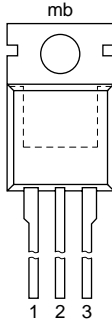

- High maximum junction temperature
- High commutation capability

### 1.3 Quick reference data

- $V_{DRM} \leq 600$  V
- $I_{GT} \leq 50$  mA
- $T_j \leq 150$  °C
- $I_{T(RMS)} \leq 16$  A
- $I_{TSM} \leq 140$  A
- $di_{com}/dt = 18$  A/ms

## 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 <a href="#">[1]</a>		

SOT78 (TO-220AB)

[1] Connected to main terminal 2 (T2)

### 3. Ordering information

**Table 2: Ordering information**

Type number	Package		Version
	Name	Description	
BTA216-600BT	TO-220AB	plastic single-ended package; heatsink mounted; 3 leads; 1 mounting hole	SOT78

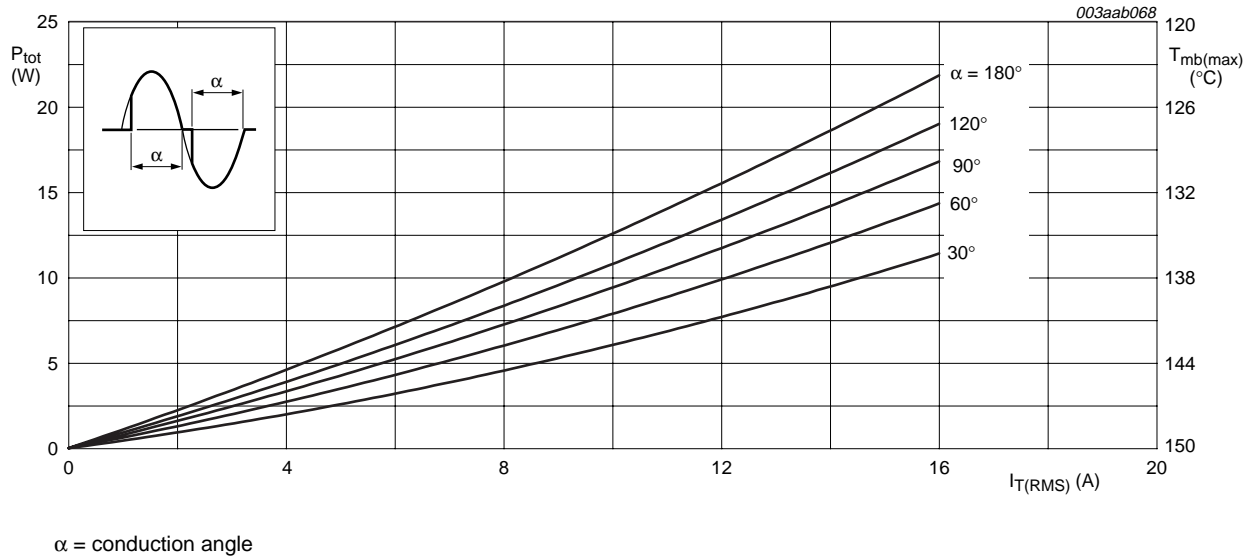
### 4. Limiting values

**Table 3: Limiting values**

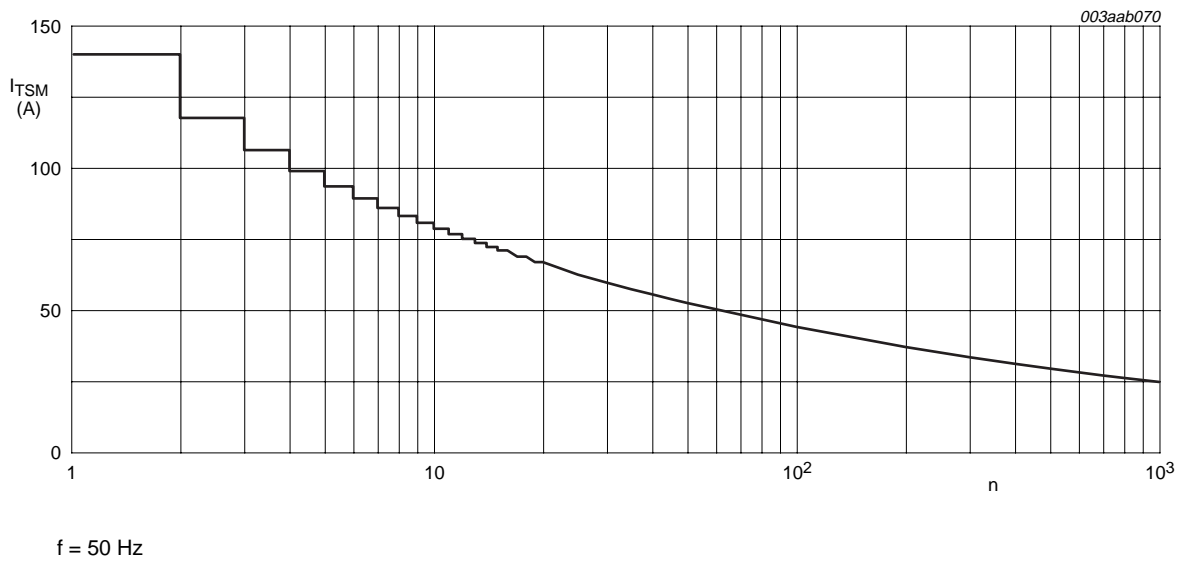
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{\text{DRM}}$	repetitive peak off-state voltage		[1] -	600	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{mb}} \leq 124\text{ °C}$ ; see <a href="#">Figure 4</a> and <a href="#">5</a>	-	16	A
$I_{\text{TSM}}$	non-repetitive peak on-state current	full sine wave; $T_{\text{j}} = 25\text{ °C}$ prior to surge; see <a href="#">Figure 2</a> and <a href="#">3</a>			
		$t = 20\text{ ms}$	-	140	A
		$t = 16.7\text{ ms}$	-	150	A
$I^2t$	$I^2t$ for fusing	$t = 10\text{ ms}$	-	98	$\text{A}^2\text{s}$
$di_{\text{T}}/dt$	rate of rise of on-state current	$I_{\text{TM}} = 20\text{ A}$ ; $I_{\text{G}} = 0.2\text{ A}$ ; $di_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$	-	100	$\text{A}/\mu\text{s}$
$I_{\text{GM}}$	peak gate current		-	2	A
$V_{\text{GM}}$	peak gate voltage		-	5	V
$P_{\text{GM}}$	peak gate power		-	5	W
$P_{\text{G(AV)}}$	average gate power	over any 20 ms period	-	0.5	W
$T_{\text{stg}}$	storage temperature		-40	+150	$^{\circ}\text{C}$
$T_{\text{j}}$	junction temperature		-	150	$^{\circ}\text{C}$

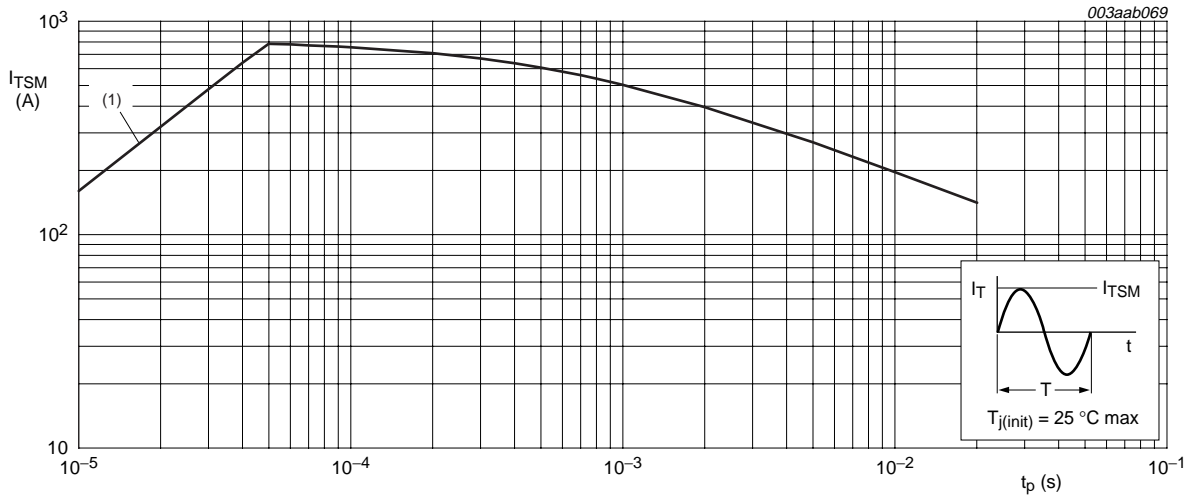
[1] Although not recommended, off-state voltages up to 800 V may be applied without damage, but the triac may switch to the on-state. The rate of rise of current should not exceed 15 A/ $\mu\text{s}$ .



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

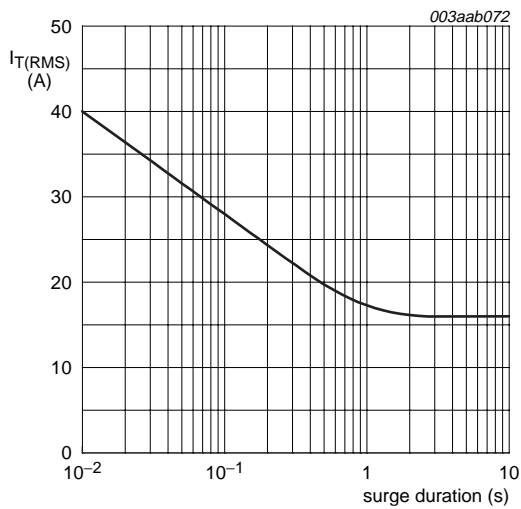


**Fig 2. Non-repetitive peak on-state current as a function of number of half cycles; sinusoidal currents; maximum values**



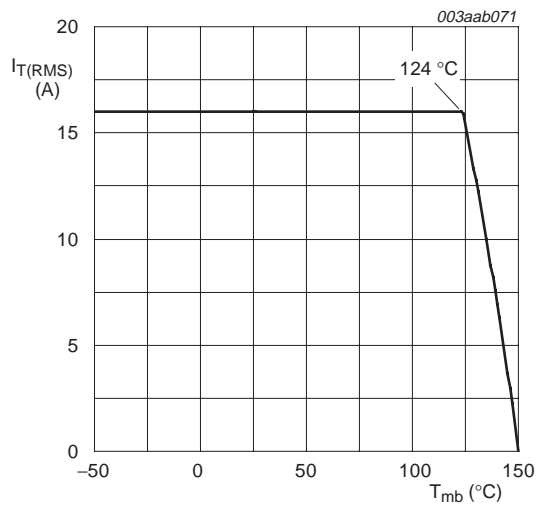
$t_p \leq 20\text{ ms}$   
 (1)  $di_T/dt$  limit

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



$f = 50\text{ Hz}; T_{mb} \leq 131\text{ °C}$

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

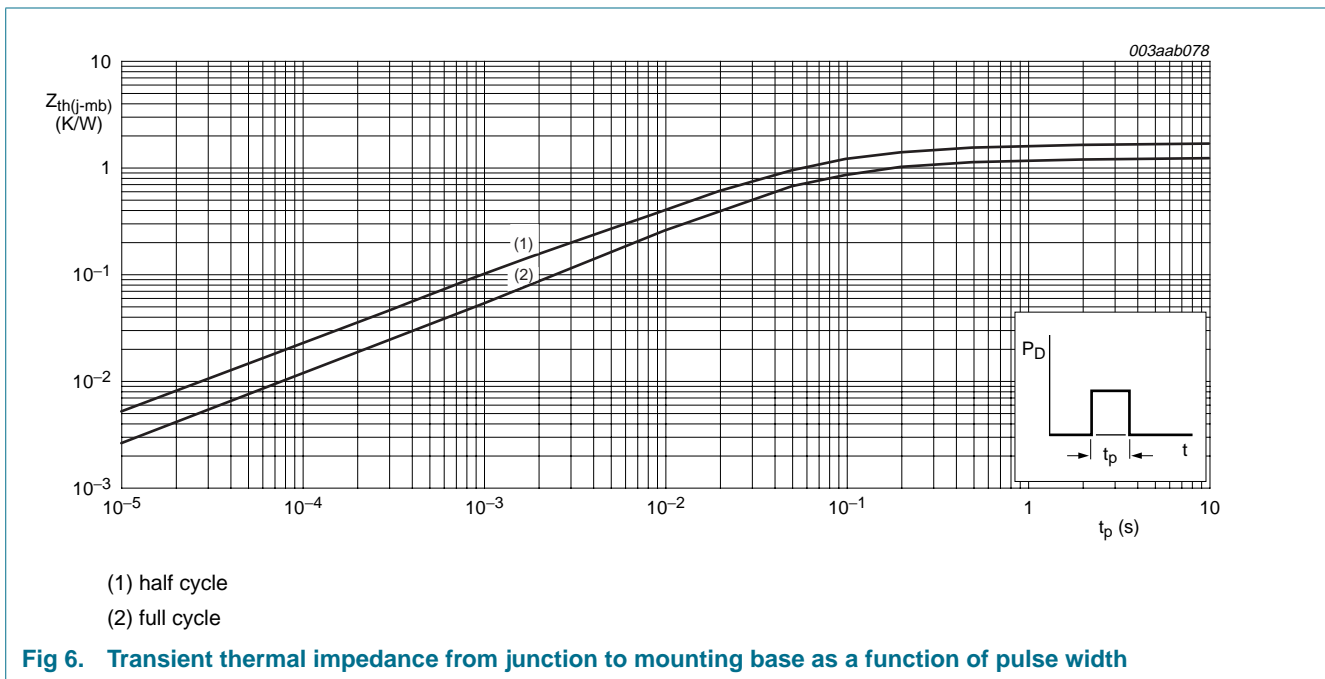


**Fig 5. RMS on-state current as a function of mounting base temperature; maximum values**

## 5. Thermal characteristics

**Table 4: Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; see <a href="#">Figure 6</a>	-	-	1.2	K/W
		half cycle; see <a href="#">Figure 6</a>	-	-	1.7	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W



## 6. Static characteristics

**Table 5: Static characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; see <a href="#">Figure 8</a>	[1]			
		T2+ G+	2	18	50	mA
		T2+ G-	2	21	50	mA
		T2- G-	2	34	50	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$ ; see <a href="#">Figure 10</a>				
		T2+ G+	-	31	60	mA
		T2+ G-	-	34	90	mA
		T2- G-	-	30	60	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$ ; see <a href="#">Figure 11</a>	-	31	60	mA
$V_T$	on-state voltage	$I_T = 20\text{ A}$ ; see <a href="#">Figure 9</a>	-	1.2	1.5	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
		$V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 150\text{ °C}$	0.25	0.4	-	V
$I_D$	off-state current	$V_D = V_{DRM(max)}$ ; $T_j = 150\text{ °C}$	-	0.5	3	mA

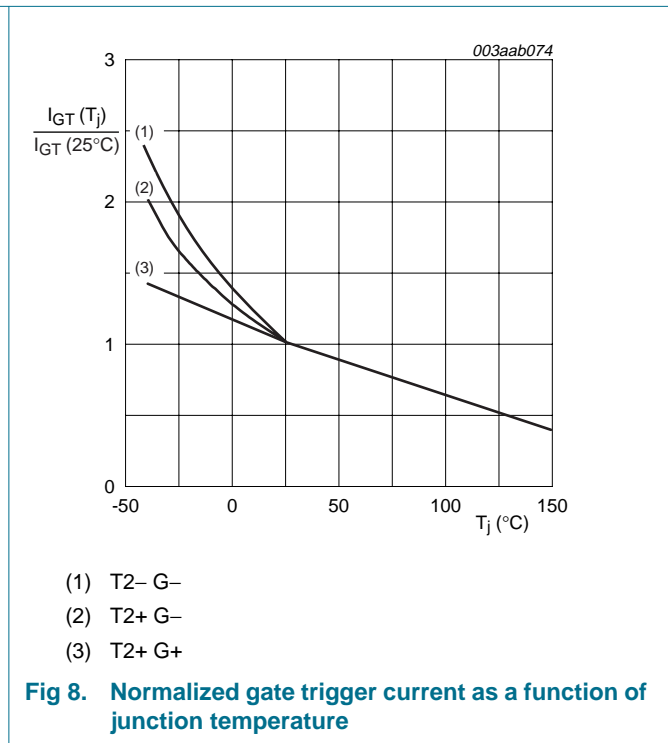
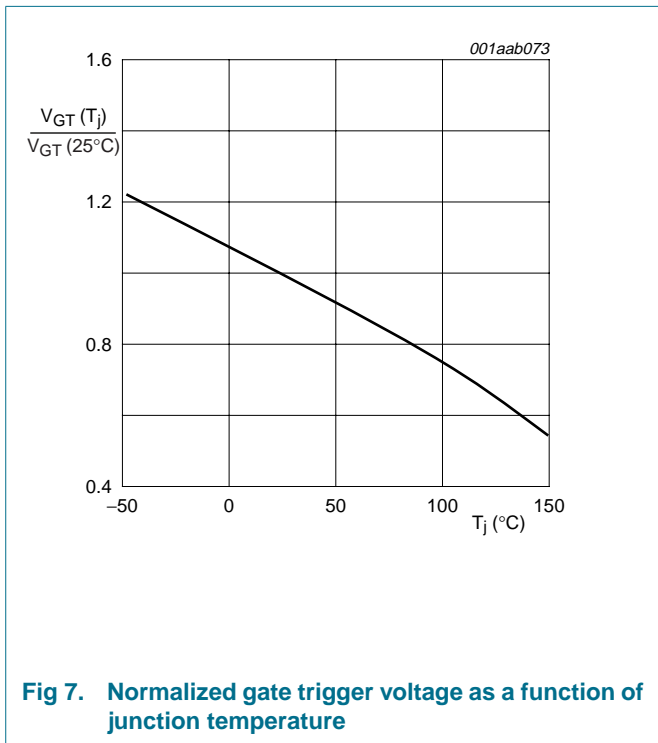
[1] Device does not trigger in the T2- G+ quadrant.

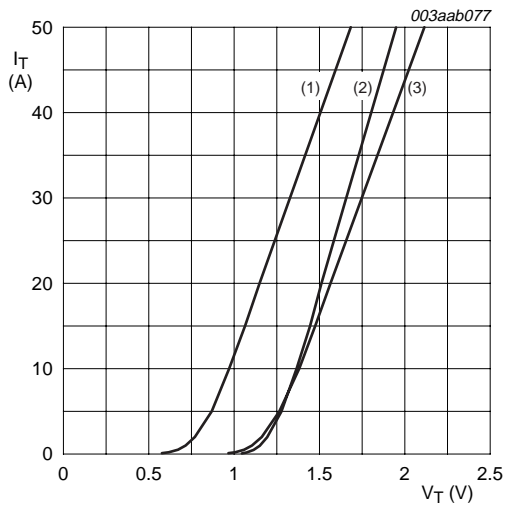
## 7. Dynamic characteristics

**Table 6: Dynamic characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 0.67V_{DRM(max)}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; exponential waveform; gate open circuit	500	1500	-	V/ $\mu\text{s}$
$di_{com}/dt$	rate of change of commutating current	$V_{DM} = 400\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 16\text{ A}$ ; without snubber; gate open circuit; see <a href="#">Figure 12</a>	9	18	-	A/ms
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 20\text{ A}$ ; $V_D = V_{DRM(max)}$ ; $I_G = 0.1\text{ A}$ ; $di_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	$\mu\text{s}$

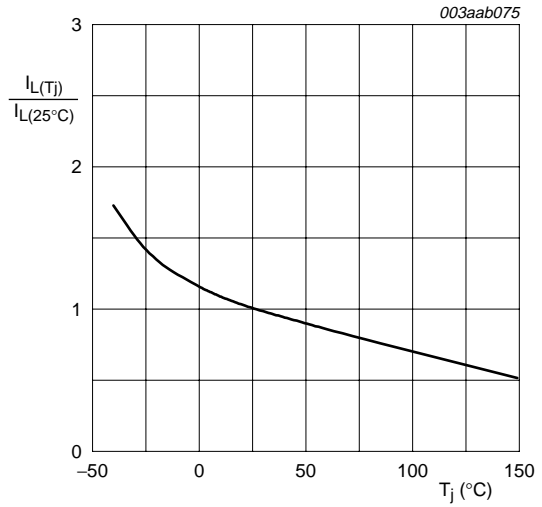




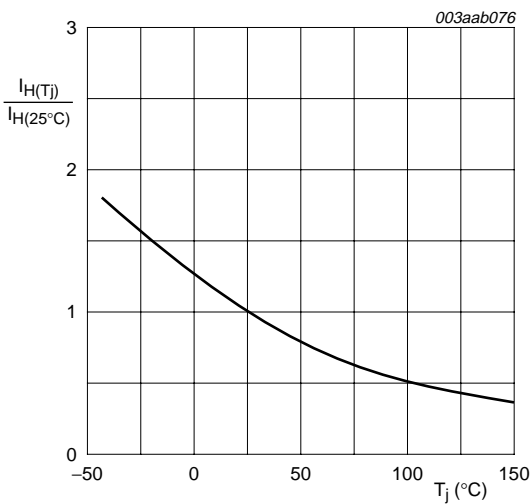
$V_O = 1.195 \text{ V}; R_S = 18 \text{ m}\Omega$

- (1)  $T_j = 150 \text{ }^\circ\text{C}$ ; typical values
- (2)  $T_j = 25 \text{ }^\circ\text{C}$ ; maximum values
- (3)  $T_j = 150 \text{ }^\circ\text{C}$ ; maximum values

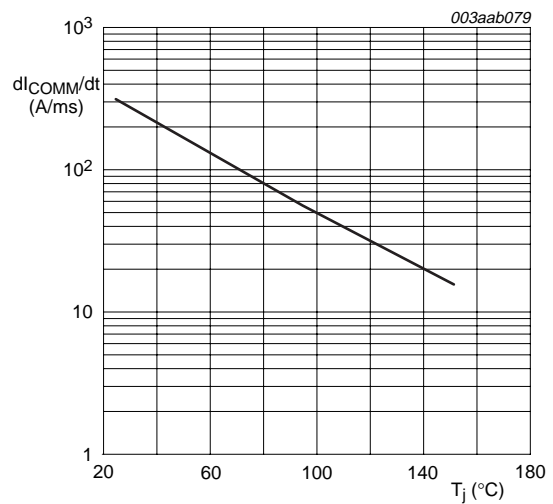
**Fig 9. On-state characteristic**



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



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



**Fig 12. Rate of change of commutating current as a function of junction temperature; typical values**

## 8. Package information

Plastic meets UL94 V-0 at 1/8 inch.



**9. Package outline**

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

SOT78

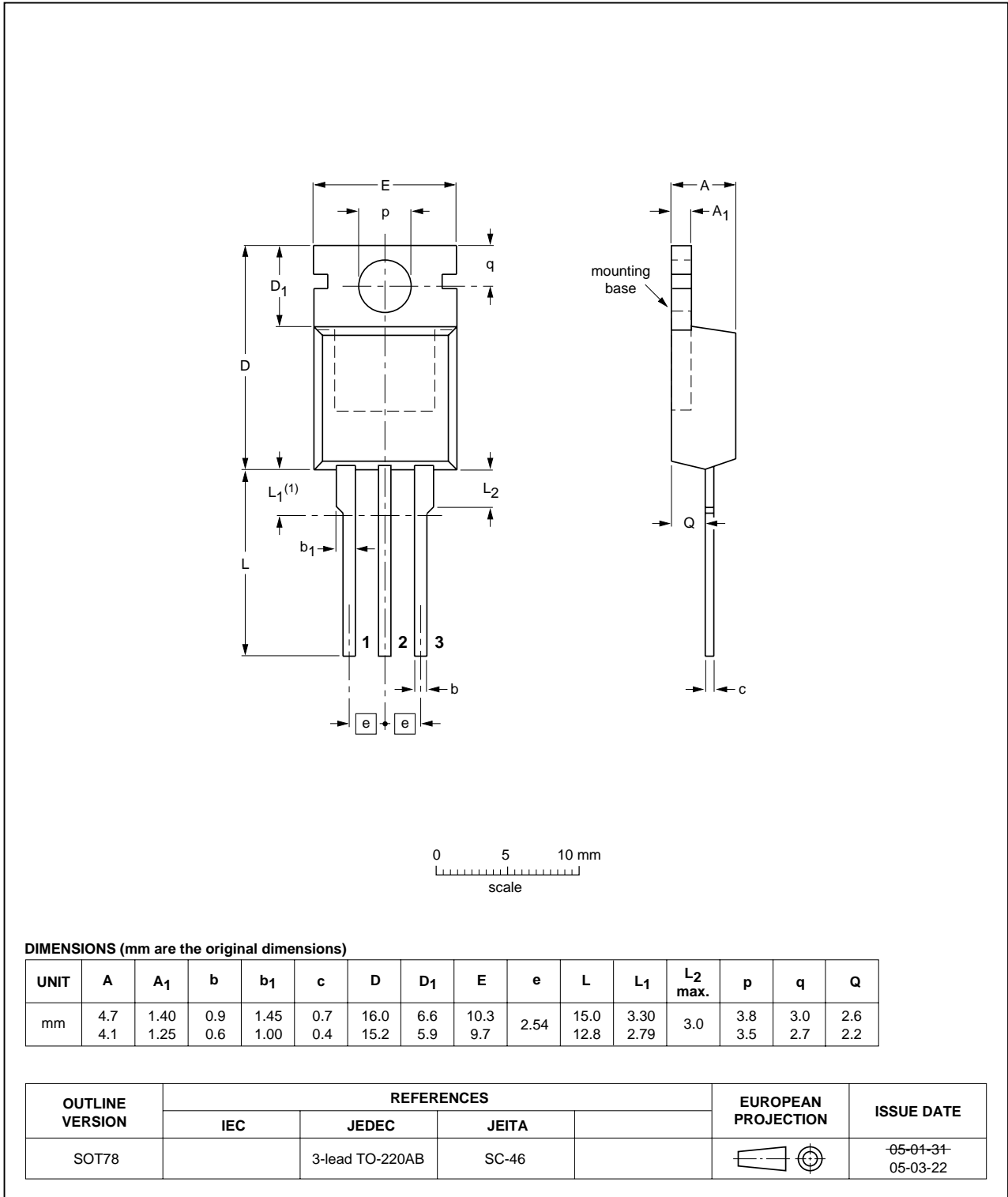


Fig 13. Package outline SOT78 (TO-220AB)

## 10. Revision history

Table 7: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BTA216-600BT_1	20050825	Product data sheet	-	-	-

## 11. 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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Date of release: 25 August 2005  
Document number: BTA216-600BT\_1

Published in The Netherlands