



# BTA225-600BT

Three quadrant triacs high commutation

Rev. 2 — 9 November 2011

Product data sheet

## 1. Product profile

### 1.1 General description

Passivated high commutation triac in a SOT78 (TO-220AB) plastic package. Intended for use in circuits where high static and dynamic dV/dt and high dl/dt can occur. These devices will commutate the full rated RMS current at the maximum rated junction temperature, without the aid of a snubber.

### 1.2 Features and benefits

- High maximum junction temperature
- High commutation capability

### 1.3 Applications

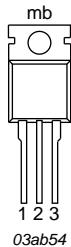
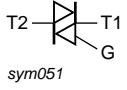
- Motor control
- Industrial and domestic heating

### 1.4 Quick reference data

- $V_{DRM} \leq 600$  V
- $I_{TSM} \leq 200$  A
- $I_{T(RMS)} \leq 25$  A
- $I_{GT} \leq 50$  mA (T2+ G+; T2+ G-; T2- G-)

## 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, connected to main terminal 2 (T2)	 03ab54	 sym051

**SOT78 (TO-220AB)**



### 3. Ordering information

**Table 2. Ordering information**

Type number	Package		
	Name	Description	Version
BTA225-600BT	SC-46	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

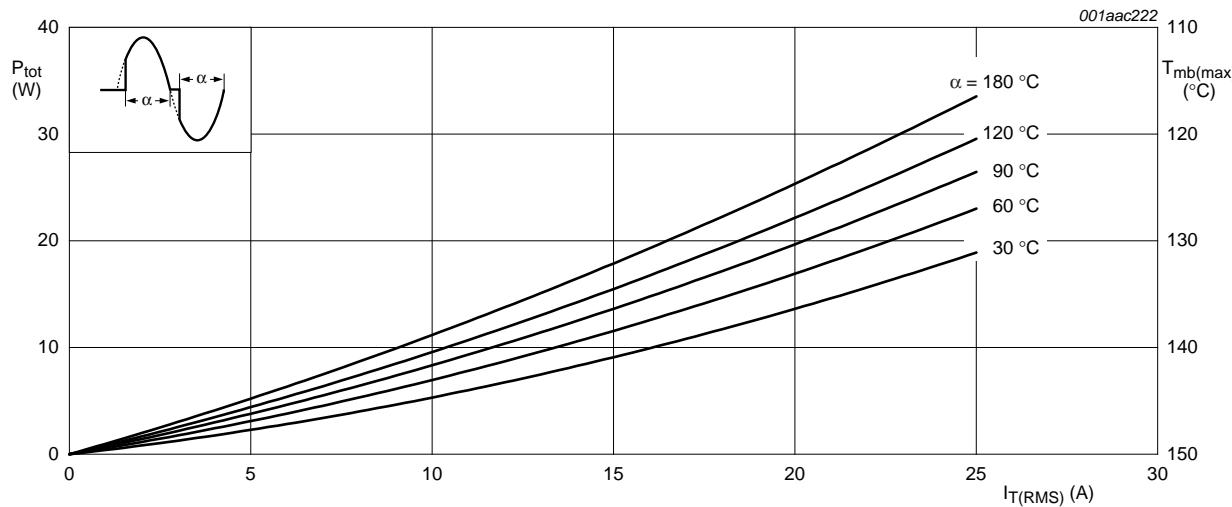
### 4. Limiting values

**Table 3. Limiting values**

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

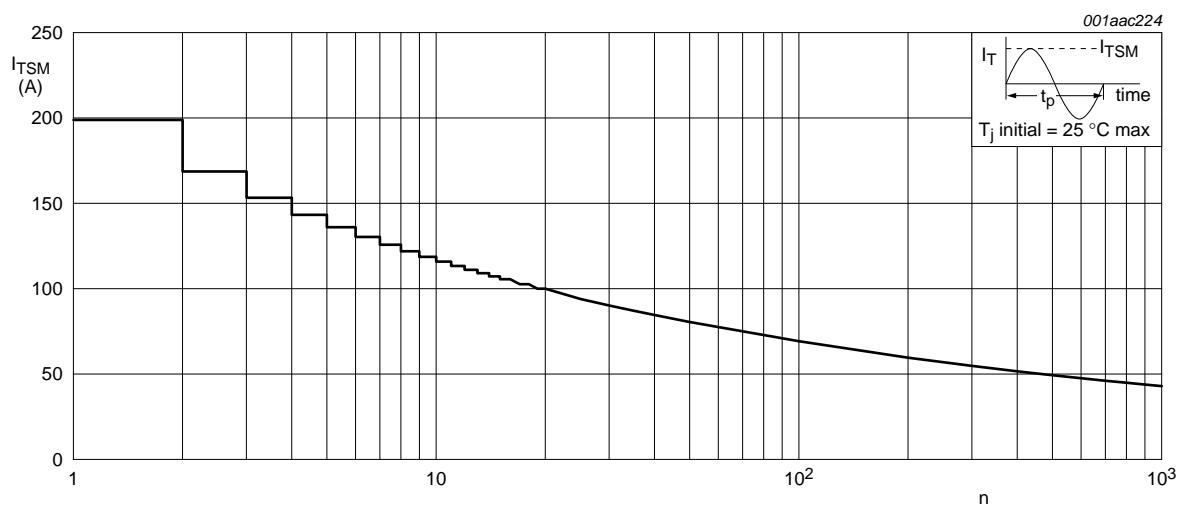
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage	[1]	-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 116^\circ\text{C}$ ; see <a href="#">Figure 4</a> and <a href="#">5</a>	-	25	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_j = 25^\circ\text{C}$ prior to surge; see <a href="#">Figure 2</a> and <a href="#">3</a>			
		$t_p = 20 \text{ ms}$	-	200	A
		$t_p = 16.7 \text{ ms}$	-	220	A
$I^2t$	$I^2t$ for fusing	$t = 10 \text{ ms}$	-	200	$\text{A}^2\text{s}$
$dI_T/dt$	repetitive rate of rise of on-state current after triggering	$I_{TM} = 30 \text{ A}; I_G = 0.2 \text{ A}; dI_G/dt = 0.2 \text{ A}/\mu\text{s}$	-	100	$\text{A}/\mu\text{s}$
$I_{GM}$	peak gate current		-	2	A
$V_{GM}$	peak gate voltage		-	5	V
$P_{GM}$	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	$^\circ\text{C}$
$T_j$	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/ $\mu\text{s}$ .



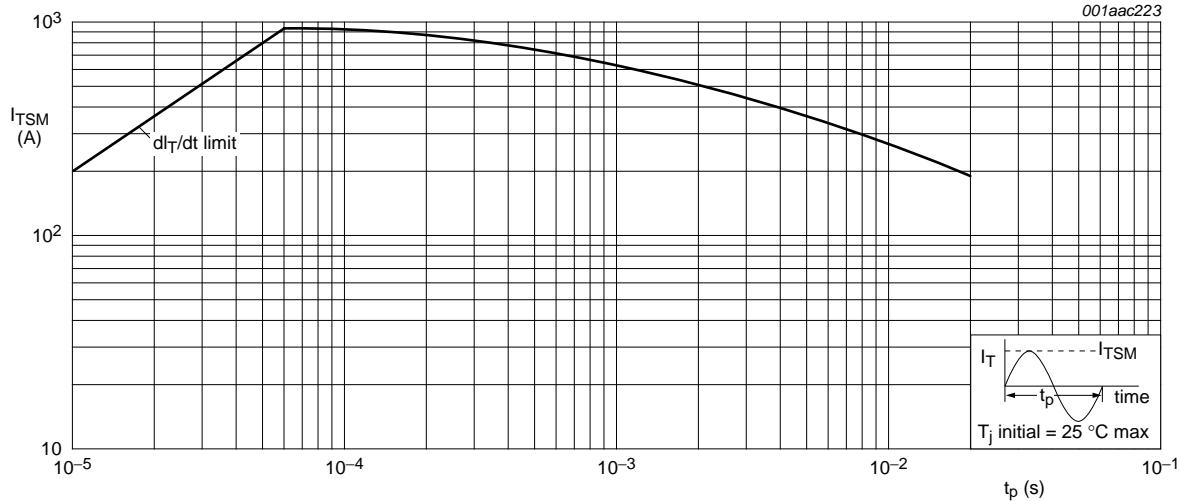
$\alpha$  = conduction angle

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

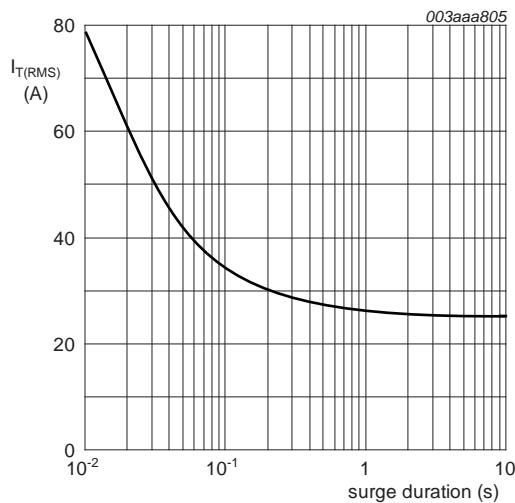


$f = 50$  Hz

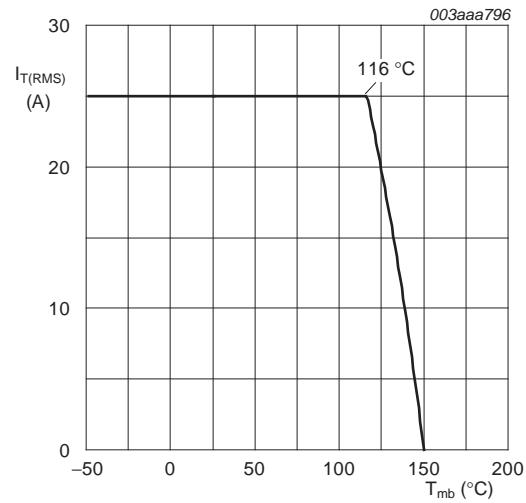
Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



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



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

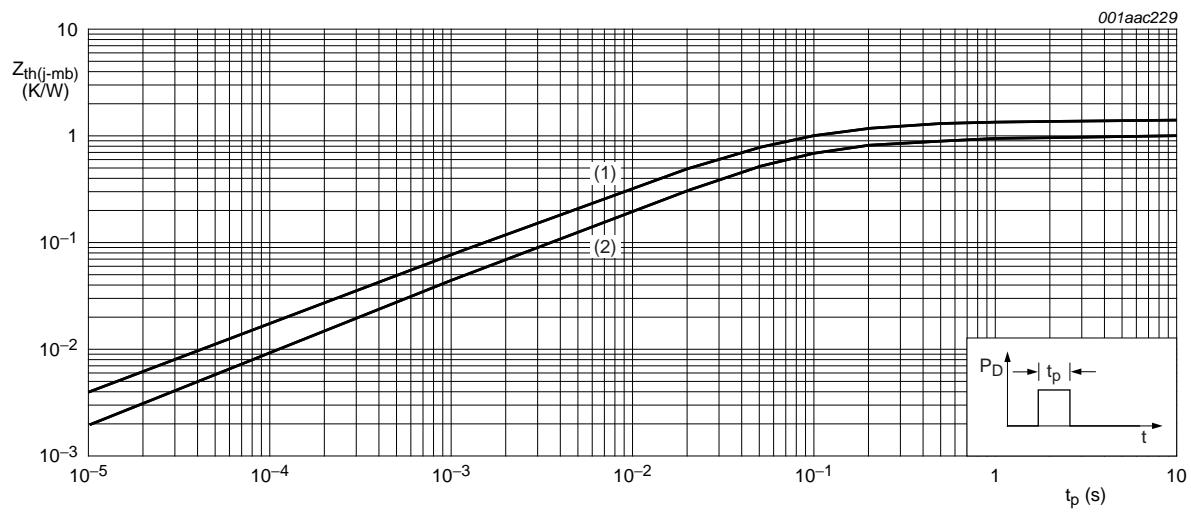


**Fig 5.** RMS on-state current as a function of mounting base temperature; maximum values

## 5. Thermal characteristics

**Table 4. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j\text{-}mb)}$	thermal resistance from junction to mounting base	full cycle	-	-	1.0	K/W
		half cycle	-	-	1.4	K/W
$R_{th(j\text{-}a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W



- (1) Unidirectional
- (2) Bidirectional

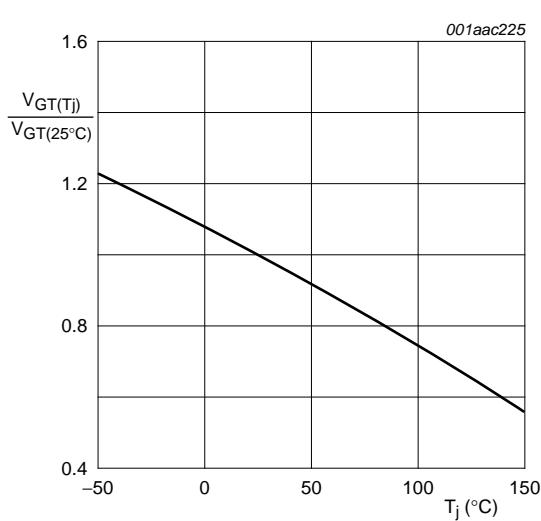
**Fig 6. Transient thermal impedance as a function of pulse width**

## 6. Characteristics

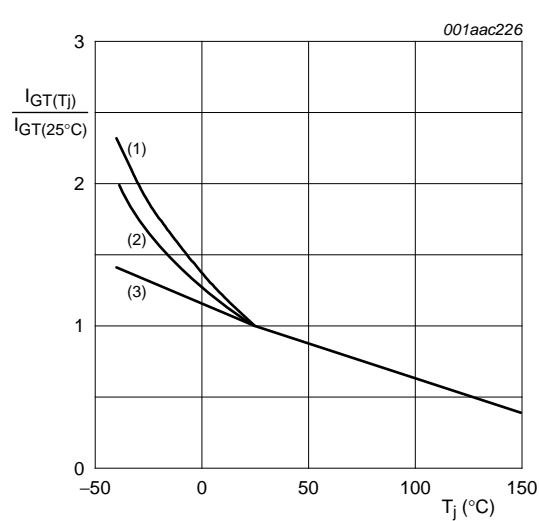
**Table 5. Characteristics** $T_j = 25^\circ\text{C}$  unless otherwise specified.

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	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	$I_T = 30 \text{ A}$ ; see <a href="#">Figure 9</a>	-	1.3	1.55	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
		$V_D = 400 \text{ V}; I_T = 0.1 \text{ A}$ ; $T_j = 150^\circ\text{C}$	0.25	0.4	-	V
$I_D$	off-state leakage current	$V_D = V_{DRM(\max)}; T_j = 150^\circ\text{C}$	-	1	5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	critical rate of rise of off-state voltage	$V_{DM} = 67\% V_{DRM(\max)}$ ; $T_j = 150^\circ\text{C}$ ; exponential waveform; gate open circuit	1000	4000	-	V/ $\mu\text{s}$
$dl_{com}/dt$	critical rate of change of commuting current	$V_{DM} = 400 \text{ V}; T_j = 150^\circ\text{C}$ ; $I_{T(RMS)} = 25 \text{ A}$ ; without snubber; gate open circuit; see <a href="#">Figure 12</a>	9	20	-	A/ms
$t_{gt}$	gate controlled turn-on time	$I_{TM} = 30 \text{ A}; V_D = V_{DRM(\max)}$ ; $I_G = 0.1 \text{ A}; dl_G/dt = 5 \text{ A}/\mu\text{s}$	-	2	-	$\mu\text{s}$

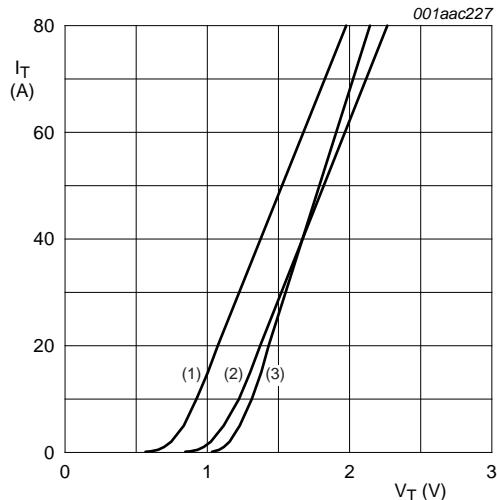
[1] Device does not trigger in the T2-, G+ quadrant.



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



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

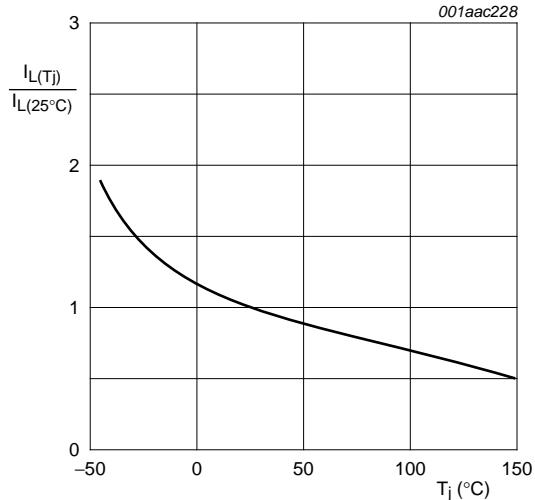


$V_O = 1.073 \text{ V}$

$R_S = 0.015 \Omega$

- (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 9.** On-state current characteristics



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

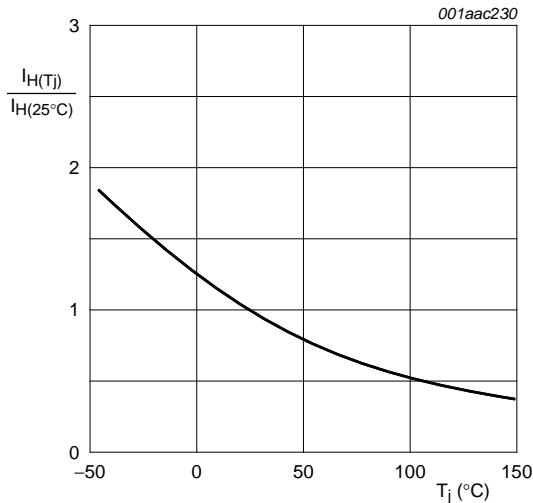


Fig 11. Normalized holding current as a function of junction temperature

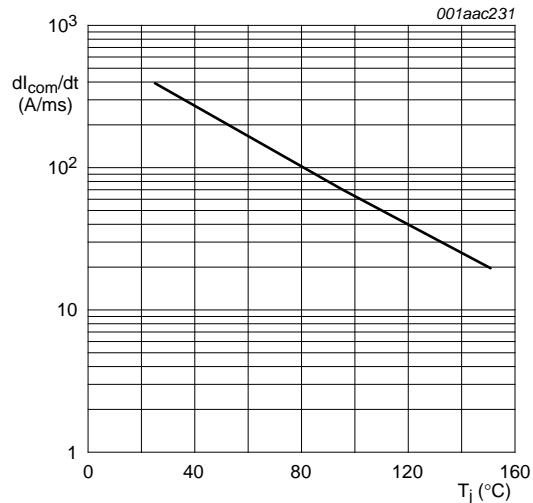


Fig 12. Critical rate of change of commutating current as a function of junction temperature; typical values

## 7. Package information

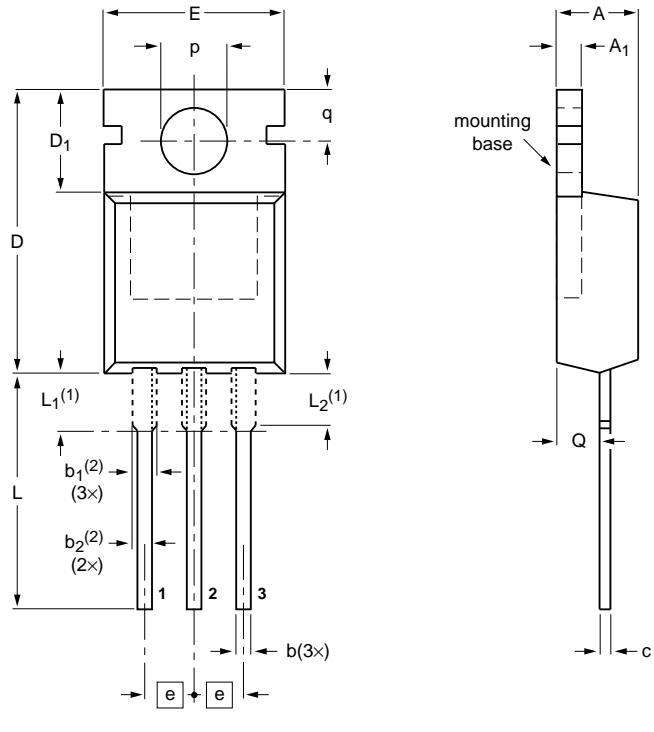
Refer to mounting instructions for SOT78 (TO-220AB) package.

Epoxy meets requirements of UL94 V-0 at  $1/8$  inch.

## 8. Package outline

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

SOT78



0 5 10 mm  
scale

### DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub>	b	b <sub>1</sub> <sup>(2)</sup>	b <sub>2</sub> <sup>(2)</sup>	c	D	D <sub>1</sub>	E	e	L	L <sub>1</sub> <sup>(1)</sup>	L <sub>2</sub> <sup>(1)</sup> max.	p	q	Q
mm	4.7	1.40	0.9	1.6	1.3	0.7	16.0	6.6	10.3	2.54	15.0	3.30	3.0	3.8	3.0	2.6
	4.1	1.25	0.6	1.0	1.0	0.4	15.2	5.9	9.7		12.8	2.79	3.0	3.5	2.7	2.2

### Notes

1. Lead shoulder designs may vary.
2. Dimension includes excess dambar.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			08-04-23 08-06-13

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

## 9. Revision history

**Table 6. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA225-600BT v.2	20111109	Product data sheet	-	BTA225-600BT v.1
Modifications:	<ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>Legal texts have been adapted to the new company name where appropriate.</li></ul>			
BTA225-600BT v.1	20050303	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.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

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

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