

# BTA201 series B, E and ER

1 A Three-quadrant triacs high commutation

Rev. 03 — 10 September 2007

Product data sheet

## 1. Product profile

### 1.1 General description

Passivated, guaranteed commutation triacs in a plastic package. The 'sensitive gate' E and ER series are intended for interfacing with low power drivers, including microcontrollers. The high commutation B series are designed to commutate the full RMS current at the maximum junction temperature without the aid of a snubber.

### 1.2 Features

- Suitable for interfacing with low power drivers, including microcontrollers
- Reverse pinning option (ER type)

### 1.3 Applications

- Motor controls
- Solenoid drivers

### 1.4 Quick reference data

- $I_{TSM} \leq 12.5$  A
- $V_{DRM} \leq 600$  V (BTA201-600B)
- $V_{DRM} \leq 600$  V (BTA201-600E)
- $V_{DRM} \leq 800$  V (BTA201-800B)
- $V_{DRM} \leq 800$  V (BTA201-800E)
- $V_{DRM} \leq 800$  V (BTA201-800ER)
- $I_{T(RMS)} \leq 1$  A
- $I_{GT} \leq 50$  mA (BTA201-600B)
- $I_{GT} \leq 10$  mA (BTA201-600E)
- $I_{GT} \leq 50$  mA (BTA201-800B)
- $I_{GT} \leq 10$  mA (BTA201-800E)
- $I_{GT} \leq 10$  mA (BTA201-800ER)

## 2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
<b>B and E series</b>			
1	main terminal 2 (T2)	 SOT54 (TO-92)	 sym051
2	gate (G)		
3	main terminal 1 (T1)		
<b>ER series</b>			
1	main terminal 1 (T1)		
2	gate (G)		
3	main terminal 2 (T2)		

### 3. Ordering information

**Table 2. Ordering information**

Type number	Package		Version
	Name	Description	
BTA201-600B	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54
BTA201-600E			
BTA201-800B			
BTA201-800E			
BTA201-800ER			

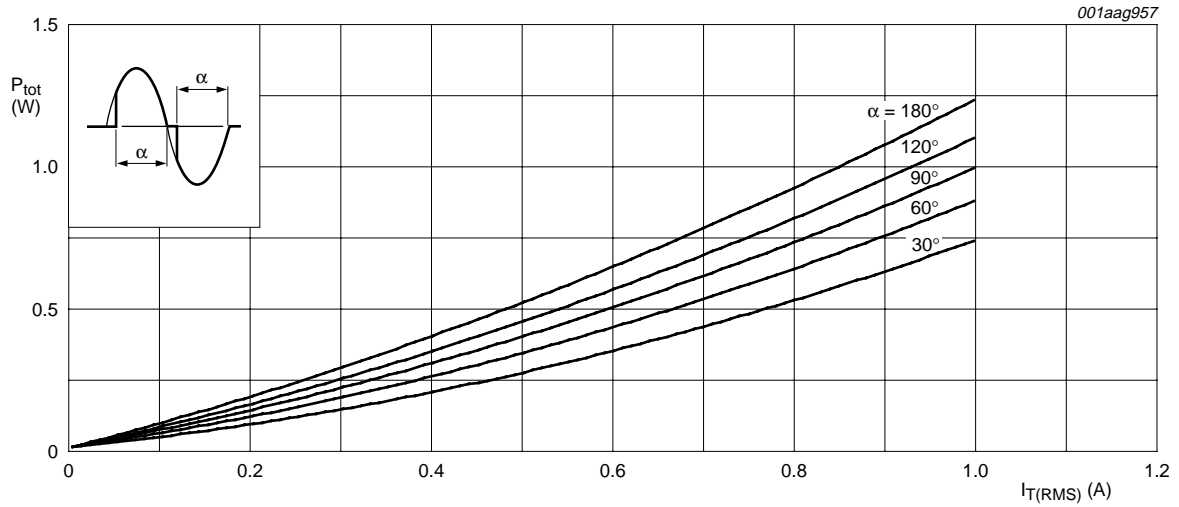
### 4. Limiting values

**Table 3. Limiting values**

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

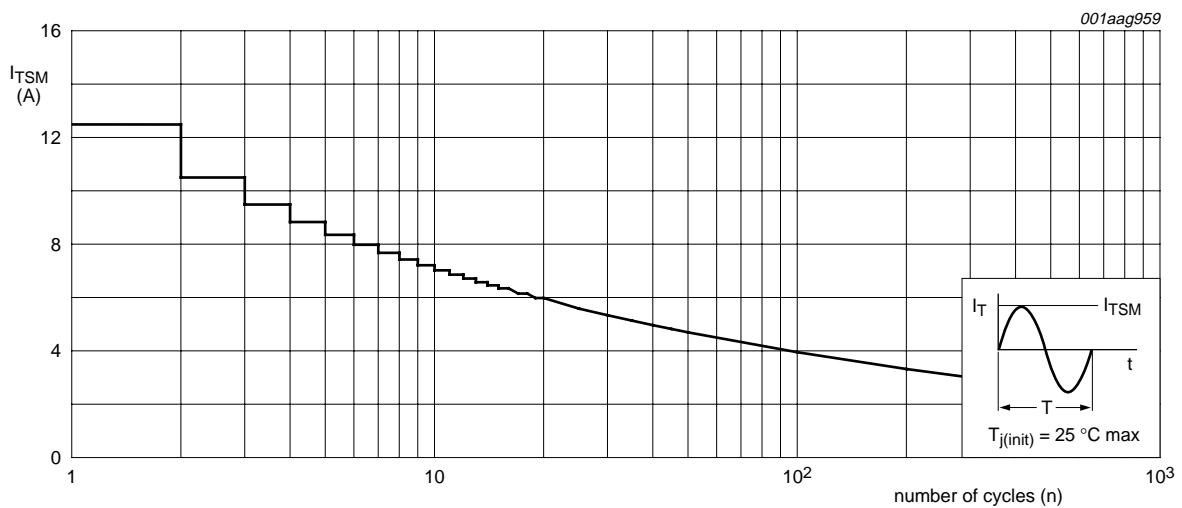
Symbol	Parameter	Conditions	Min	Max	Unit	
$V_{\text{DRM}}$	repetitive peak off-state voltage	BTA201-600B	[1]	-	600	V
		BTA201-600E	[1]	-	600	V
		BTA201-800B	-	-	800	V
		BTA201-800E	-	-	800	V
		BTA201-800ER	-	-	800	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{lead}} \leq 54.3 \text{ }^\circ\text{C}$ ; see <a href="#">Figure 4</a> and <a href="#">5</a>	-	1	A	
$I_{\text{TSM}}$	non-repetitive peak on-state current	full sine wave; $T_{\text{j}} = 25 \text{ }^\circ\text{C}$ prior to surge; see <a href="#">Figure 2</a> and <a href="#">3</a>				
		$t = 20 \text{ ms}$	-	12.5	A	
		$t = 16.7 \text{ ms}$	-	13.7	A	
$I^2t$	$I^2t$ for fusing	$t = 10 \text{ ms}$	-	0.78	$\text{A}^2\text{s}$	
$di_{\text{T}}/dt$	rate of rise of on-state current	$I_{\text{TM}} = 1.5 \text{ A}$ ; $I_{\text{G}} = 0.2 \text{ A}$ ; $di_{\text{G}}/dt = 0.2 \text{ A}/\mu\text{s}$	-	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 20 ms period	-	0.1	W	
$T_{\text{stg}}$	storage temperature		-40	+150	$^\circ\text{C}$	
$T_{\text{j}}$	junction temperature		-	125	$^\circ\text{C}$	

[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 6 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**

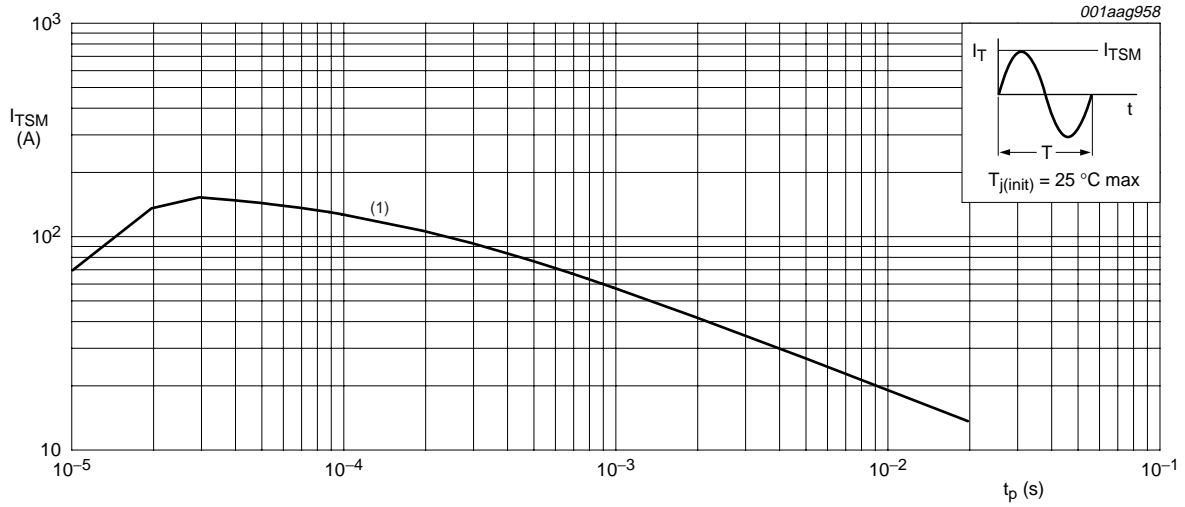
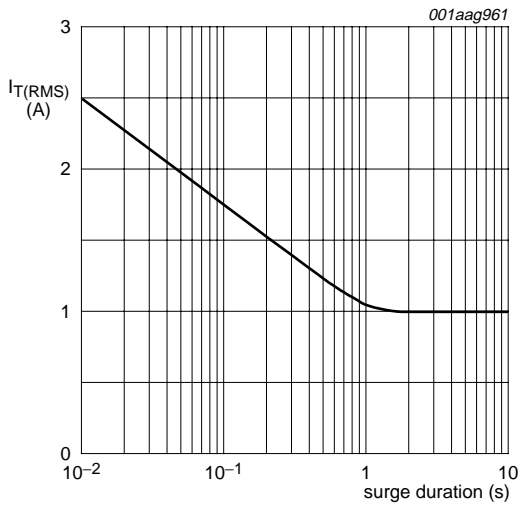


Fig 3. Non-repetitive peak on-state current as a function of pulse width; maximum values



f = 50 Hz; T<sub>lead</sub> ≤ 54.3 °C

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

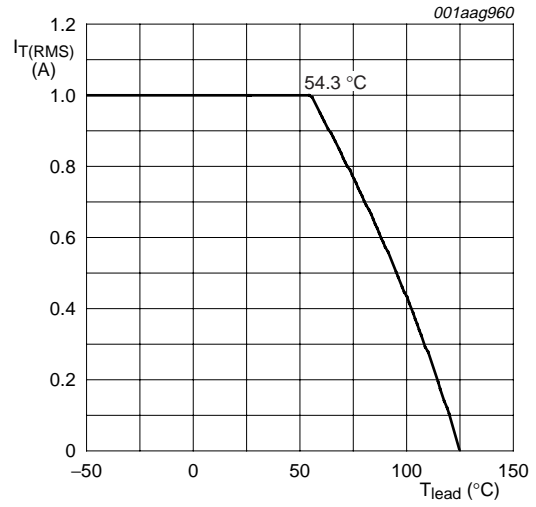
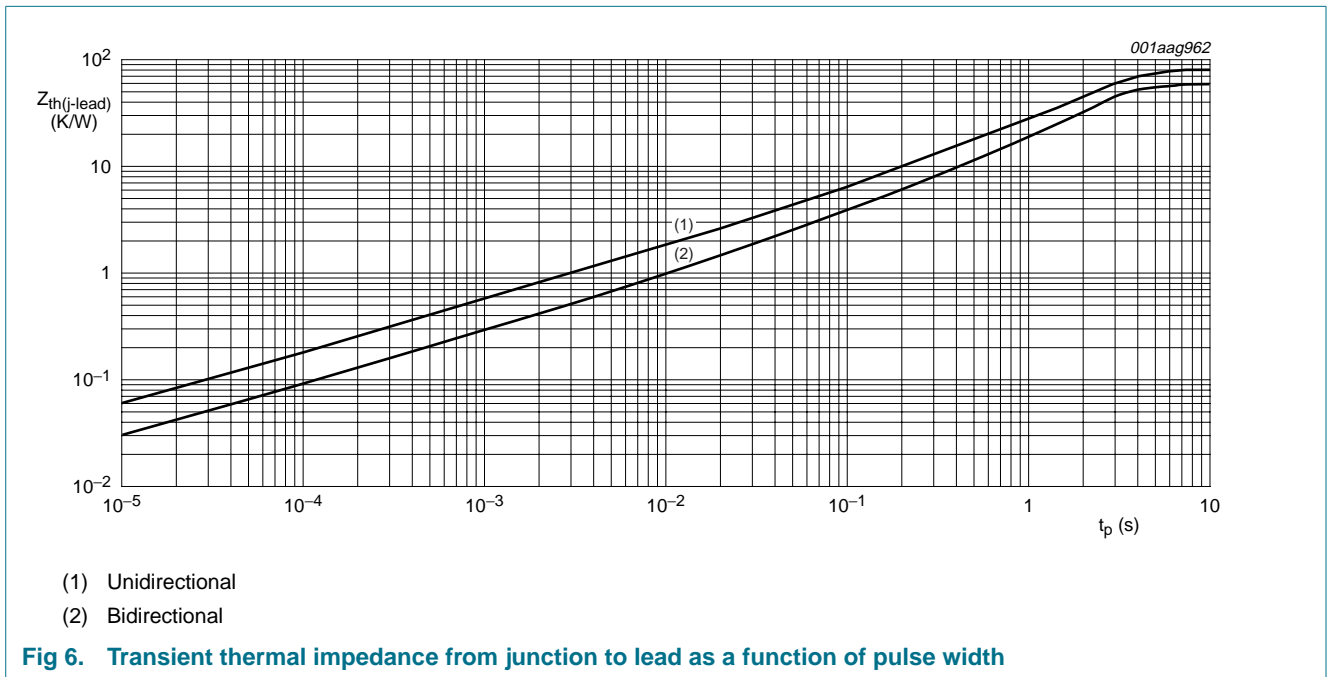


Fig 5. RMS on-state current as a function of lead temperature; maximum values

5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-lead)}$	thermal resistance from junction to lead	full cycle; see <a href="#">Figure 6</a>	-	-	60	K/W
		half cycle; see <a href="#">Figure 6</a>	-	-	80	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	printed-circuit board mounted; lead length = 4 mm	-	150	-	K/W



## 6. Static characteristics

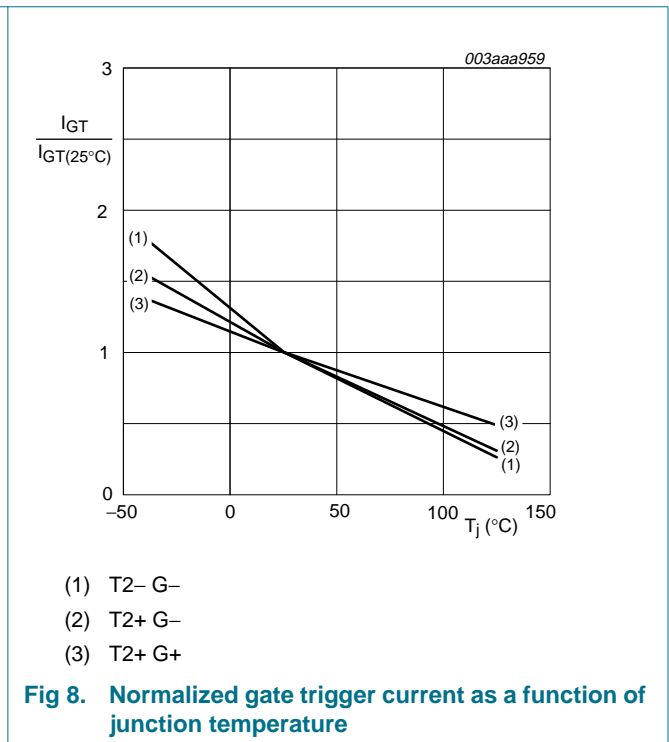
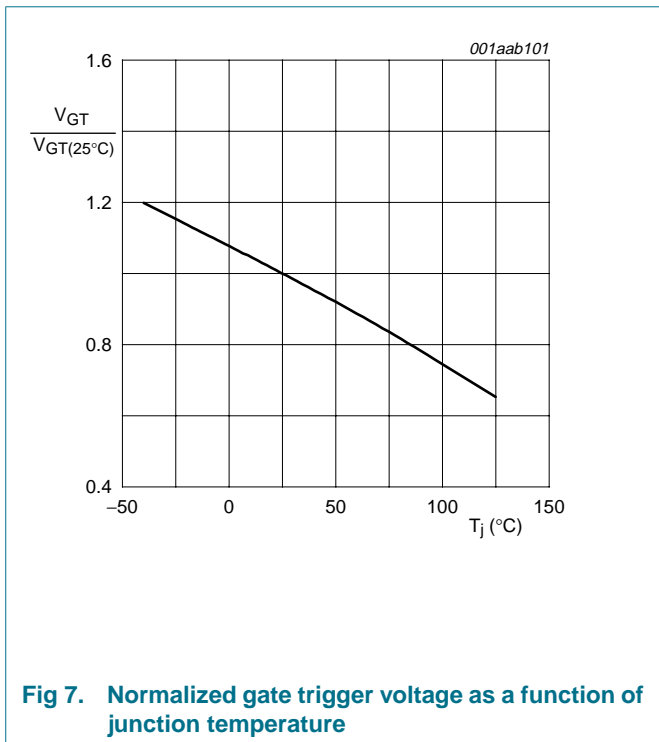
**Table 5. Static characteristics**  
*T<sub>j</sub> = 25 °C unless otherwise specified.*

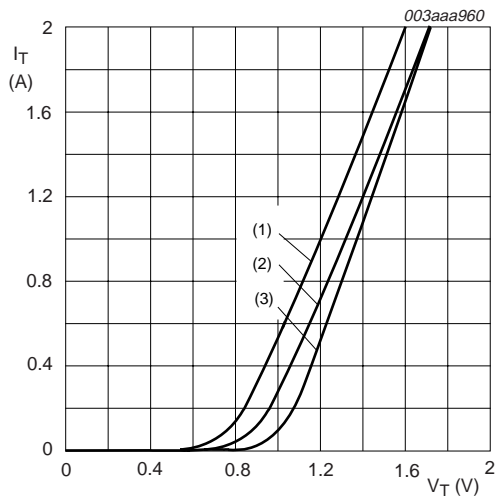
Symbol	Parameter	Conditions	BTA201-600B BTA201-800B			BTA201-600E BTA201-800E BTA201-800ER			Unit
			Min	Typ	Max	Min	Typ	Max	
I <sub>GT</sub>	gate trigger current	V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.1 A; see <a href="#">Figure 8</a>							
		T2+ G+	-	-	50	-	-	10	mA
		T2+ G-	-	-	50	-	-	10	mA
		T2- G-	-	-	50	-	-	10	mA
I <sub>L</sub>	latching current	V <sub>D</sub> = 12 V; I <sub>GT</sub> = 0.1 A; see <a href="#">Figure 10</a>							
		T2+ G+	-	-	30	-	-	12	mA
		T2+ G-	-	-	50	-	-	20	mA
		T2- G-	-	-	30	-	-	12	mA
I <sub>H</sub>	holding current	V <sub>D</sub> = 12 V; I <sub>GT</sub> = 0.1 A; see <a href="#">Figure 11</a>	-	-	30	-	-	12	mA
V <sub>T</sub>	on-state voltage	I <sub>T</sub> = 1.4 A; see <a href="#">Figure 9</a>	-	1.2	1.5	-	1.2	1.5	V
V <sub>GT</sub>	gate trigger voltage	V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.1 A; see <a href="#">Figure 7</a>	-	0.7	1.5	-	0.7	1.5	V
		V <sub>D</sub> = 400 V; I <sub>T</sub> = 0.1 A; T <sub>j</sub> = 125 °C	0.2	0.3	-	0.2	0.3	-	V
I <sub>D</sub>	off-state current	V <sub>D</sub> = V <sub>DRM(max)</sub> ; T <sub>j</sub> = 125 °C	-	0.1	0.5	-	0.1	0.5	mA

**7. Dynamic characteristics**

**Table 6. Dynamic characteristics**

Symbol	Parameter	Conditions	BTA201-600B BTA201-800B			BTA201-600E BTA201-800E BTA201-800ER			Unit
			Min	Typ	Max	Min	Typ	Max	
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 67\% V_{DRM(max)}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; exponential waveform; gate open circuit	1000	-	-	600	-	-	V/ $\mu\text{s}$
$di_{com}/dt$	rate of change of commutating current	$V_{DM} = 400\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; gate open circuit	12	-	-	2.5	-	-	A/ms
		$V_{DM} = 400\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $dV_{com}/dt = 10\text{ V}/\mu\text{s}$ ; gate open circuit	16	-	-	3.5	-	-	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	-	-	2	-	$\mu\text{s}$

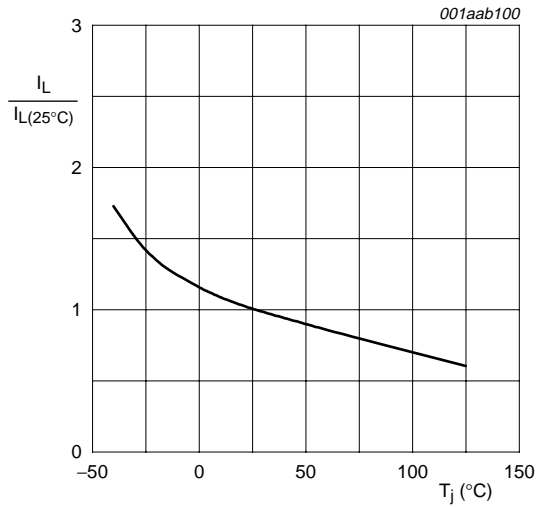




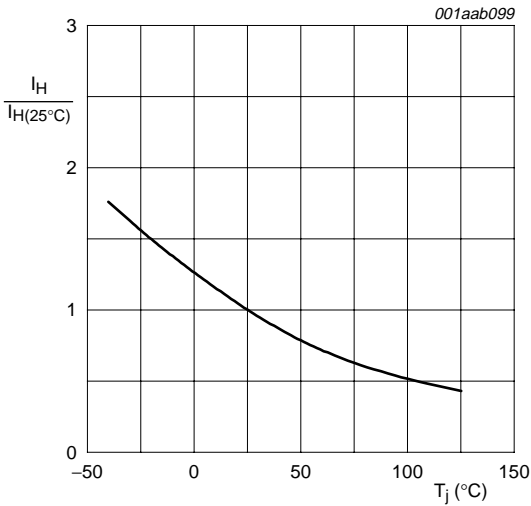
$V_o = 1.02 \text{ V}; R_s = 0.358 \Omega$

- (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

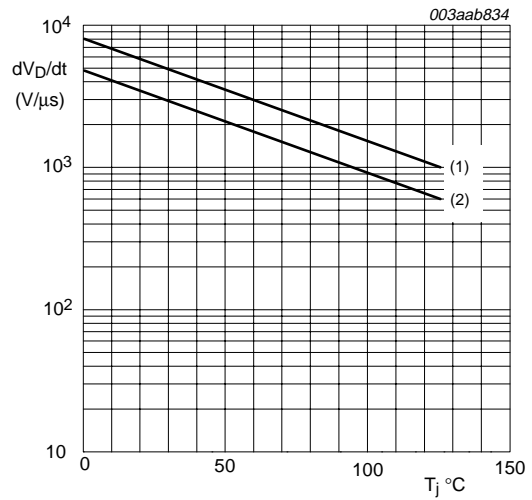
**Fig 9. On-state current as a function of on-state voltage**



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



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



Gate open circuit

- (1) BTA201 series B
- (2) BTA201 series E and ER

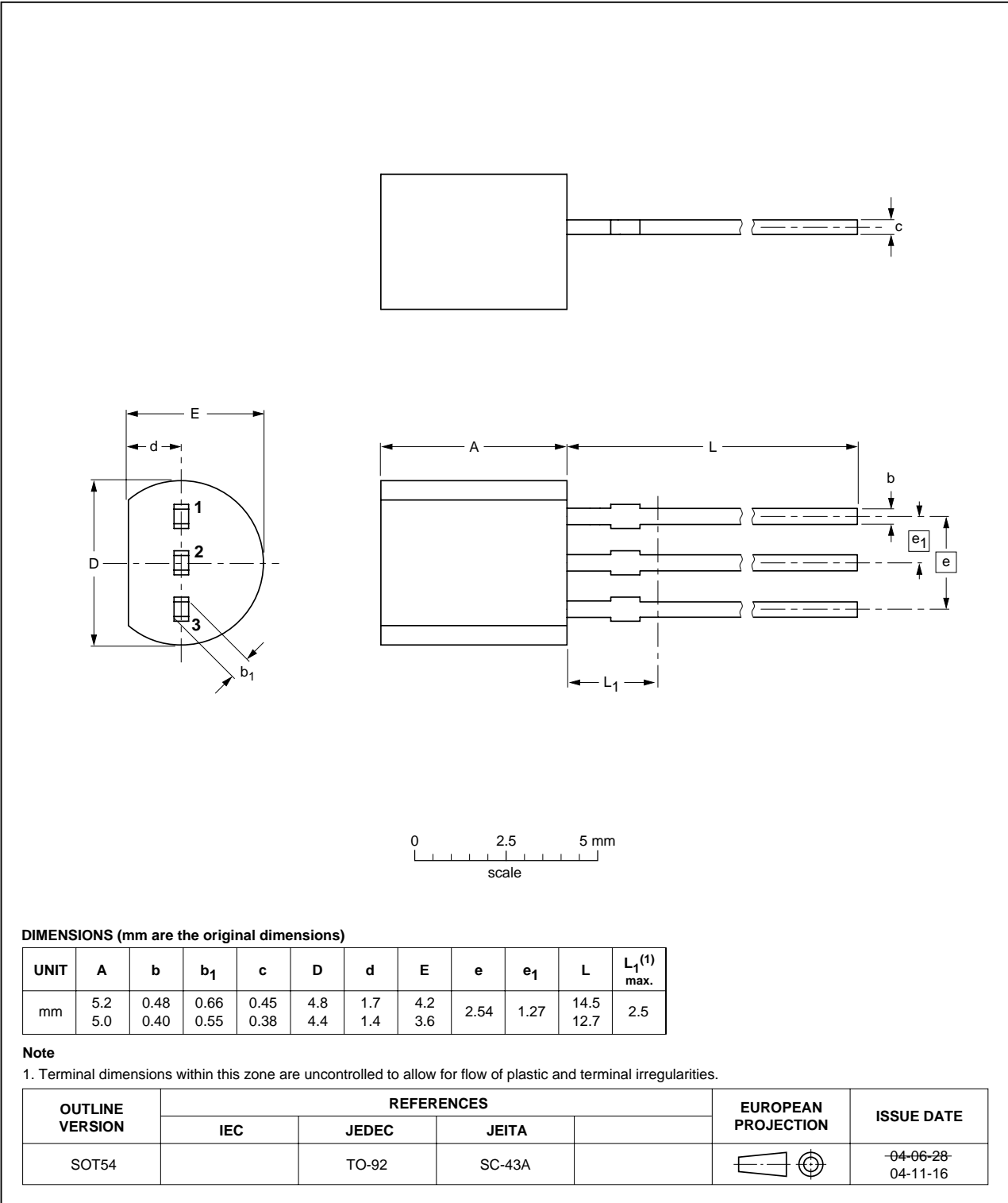
**Fig 12. Critical rate of rise of off-state voltage as a function of junction temperature; minimum values**



**8. Package outline**

Plastic single-ended leaded (through hole) package; 3 leads

SOT54



**Fig 13. Package outline SOT54 (TO-92)**

## 9. Revision history

**Table 7. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA201_SER_B_E_ER_3	20070910	Product data sheet	-	BTA201_SER_B_E_ER_2
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> <li>Descriptive titles have been corrected.</li> <li><a href="#">Table 3 "Limiting values" on page 2</a>: <math>di_T/dt</math> updated.</li> <li><a href="#">Table 6 "Dynamic characteristics" on page 7</a>: <math>dV_D/dt</math> updated.</li> <li><a href="#">Figure 12 "Critical rate of rise of off-state voltage as a function of junction temperature; minimum values" on page 8</a>: graph updated.</li> </ul>		
BTA201_SER_B_E_ER_2	20060113	Product data sheet	-	BTA201_SER_B_E_ER_1
Modifications:		<ul style="list-style-type: none"> <li>Figure 4: Figure note corrected</li> <li>Table 6 "Dynamic characteristics" on page 7: Units corrected</li> <li>Figure 12: Figure title corrected</li> </ul>		
BTA201_SER_B_E_ER_1 (9397 750 15154)	20050825	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.

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

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