

# BTA201 series B, E and ER

Triacs logic level

Rev. 02 — 13 January 2006

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 control
- Solenoid drivers

### 1.4 Quick reference data

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

## 2. Pinning information

Table 1: Pinning

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

### 3. Ordering information

**Table 2: Ordering information**

Type number	Package		
	Name	Description	Version
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	$I_{\text{TM}} = 1.5 \text{ A}$ ; $I_{\text{G}} = 0.2 \text{ A}$ ; $di_{\text{G}}/dt = 0.2 \text{ A}/\mu\text{s}$	-	50	$\text{A}/\mu\text{s}$
$I_{\text{GM}}$	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/ $\mu\text{s}$ .

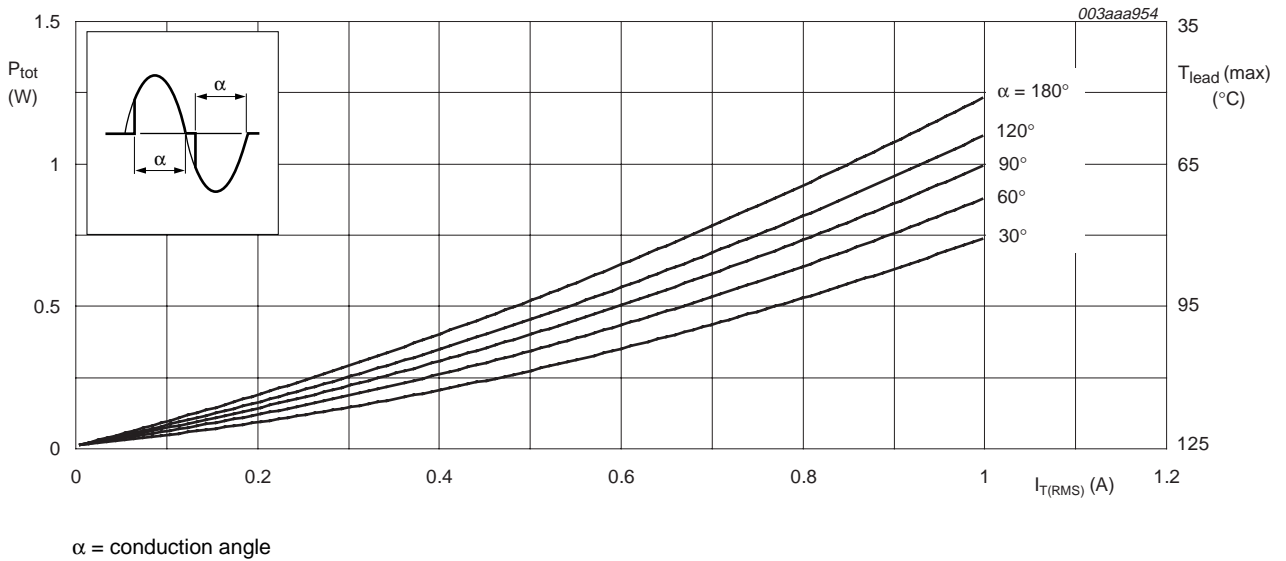


Fig 1. Total power dissipation as a function of RMS on-state current; maximum values

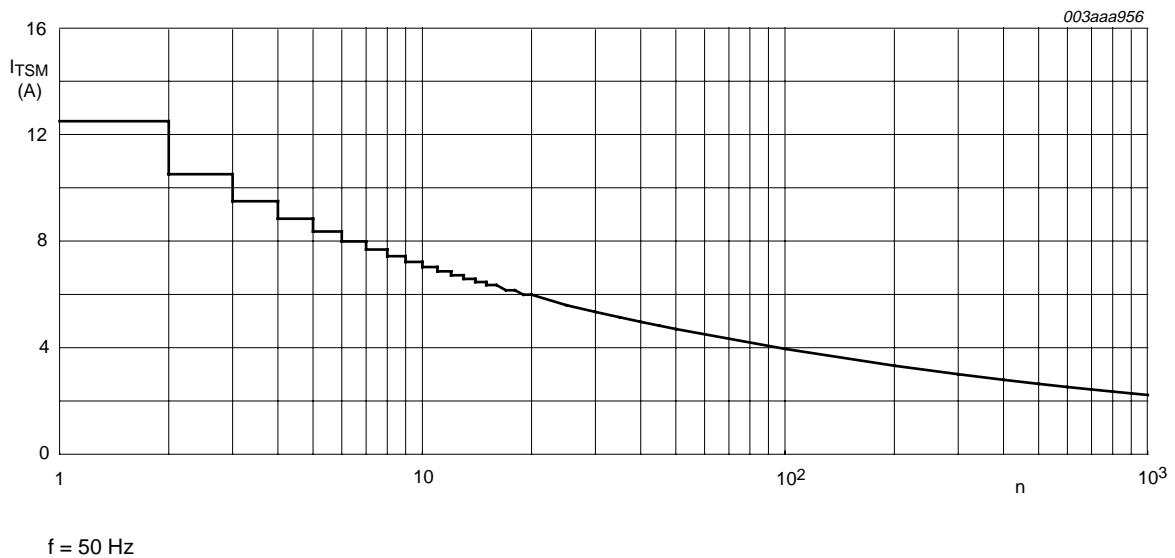
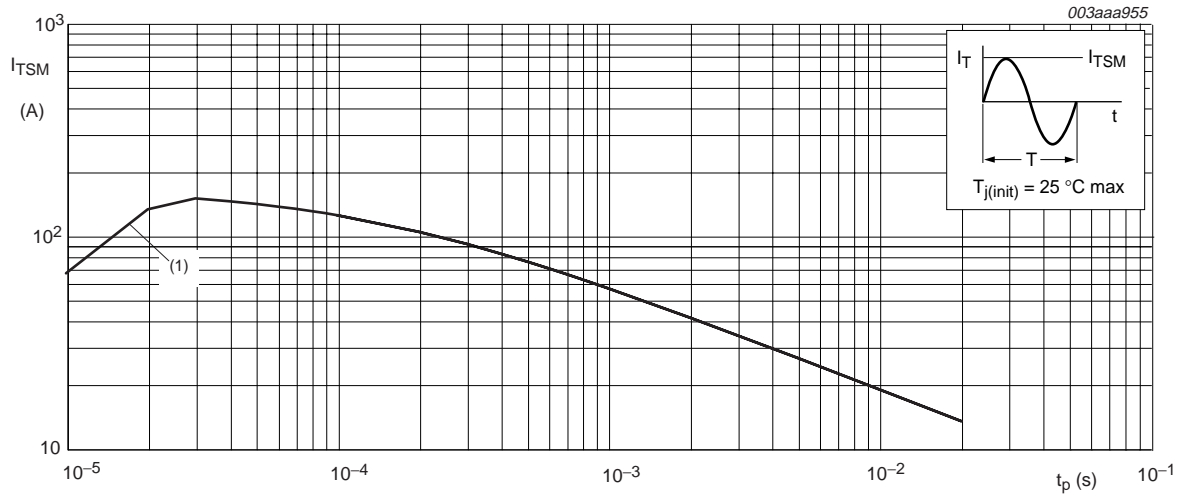


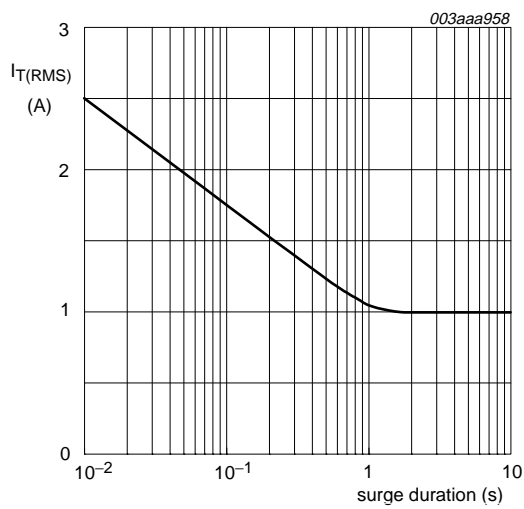
Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



$t_p \leq 20\text{ ms}$

(1)  $di_T/dt$  limit

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



$f = 50\text{ Hz}; T_{lead} \leq 54.3\text{ }^\circ\text{C}$

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

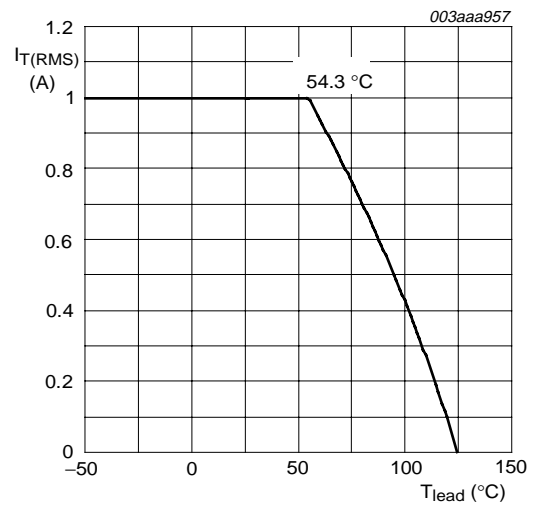
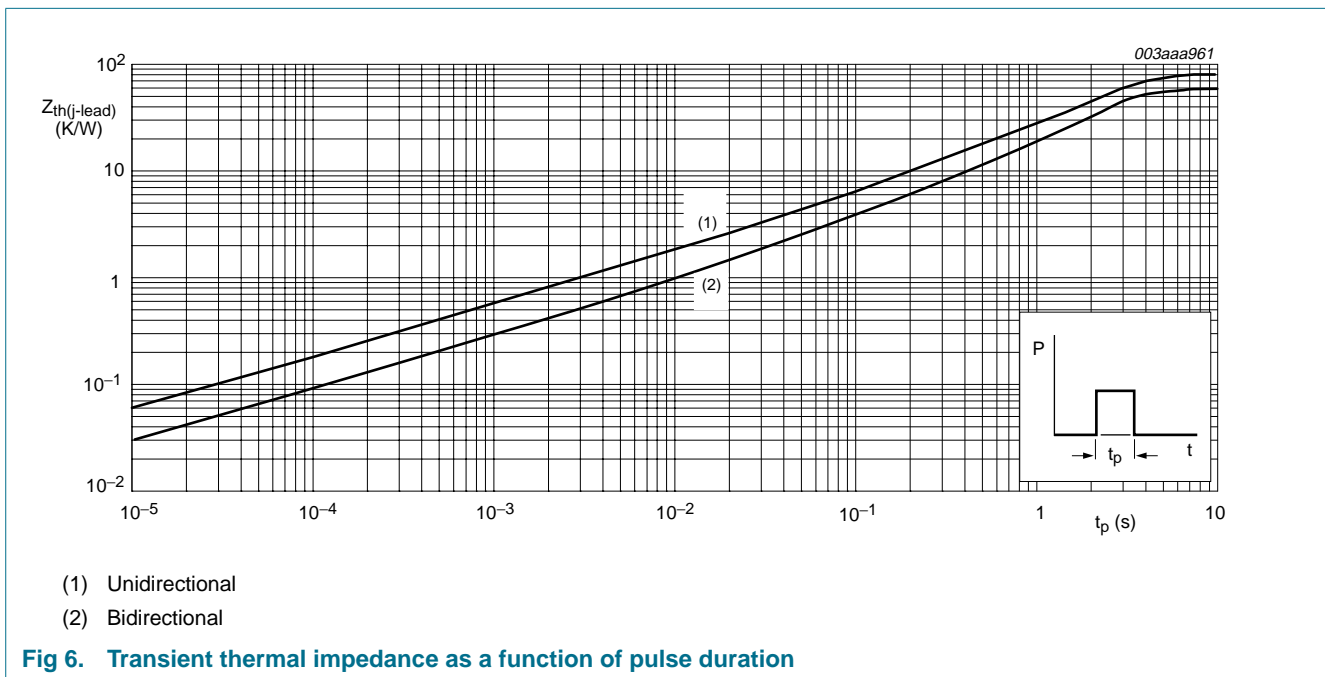


Fig 5. RMS on-state current as a function of lead temperature; maximum values

### 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**

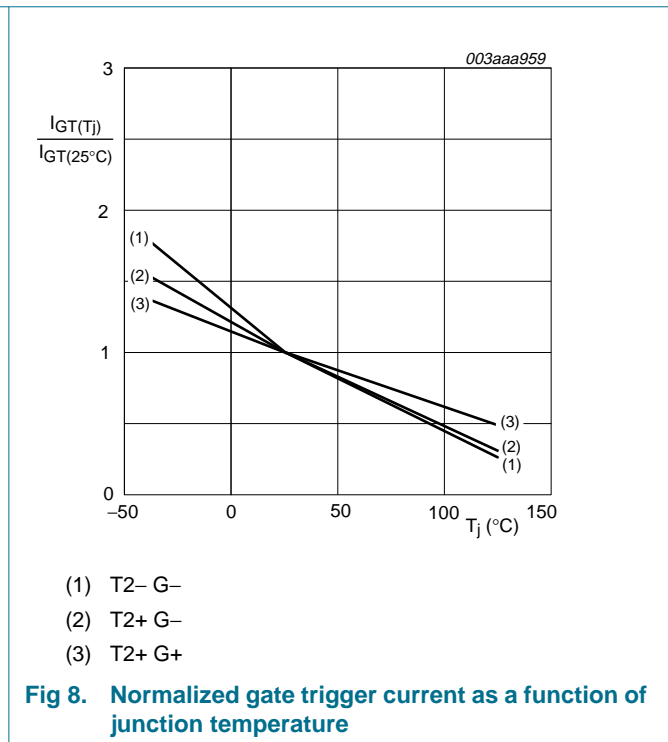
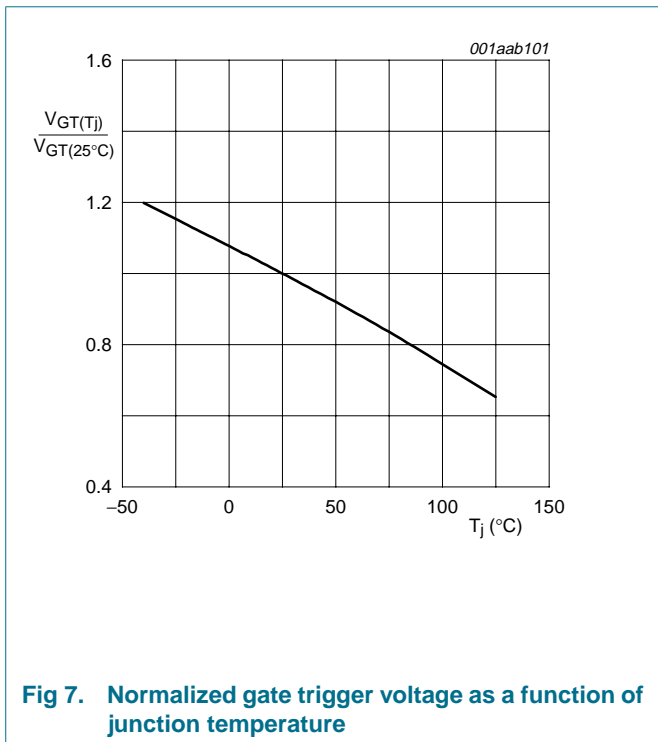
$T_j = 25\text{ °C}$  unless otherwise specified.

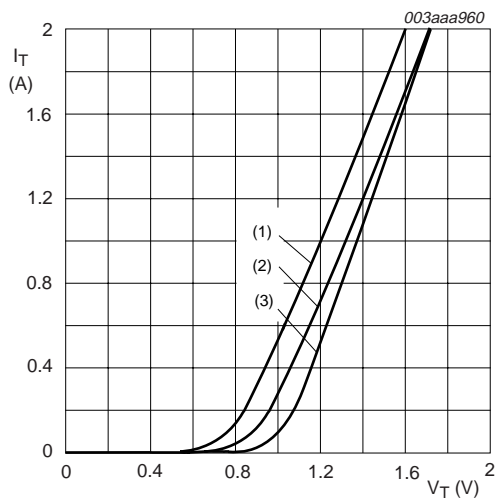
Symbol	Parameter	Conditions	BTA201-600B BTA201-800B			BTA201-600E BTA201-800E BTA201-800ER			Unit
			Min	Typ	Max	Min	Typ	Max	
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; see <a href="#">Figure 8</a>							
		T2+ G+	-	-	50	-	-	10	mA
		T2+ G-	-	-	50	-	-	10	mA
		T2- G-	-	-	50	-	-	10	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$ ; see <a href="#">Figure 10</a>							
		T2+ G+	-	-	30	-	-	12	mA
		T2+ G-	-	-	50	-	-	20	mA
		T2- G-	-	-	30	-	-	12	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$ ; see <a href="#">Figure 11</a>	-	-	30	-	-	12	mA
$V_T$	on-state voltage	$I_T = 1.4\text{ A}$ ; see <a href="#">Figure 9</a>	-	1.2	1.5	-	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	-	0.7	1.5	V
		$V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ °C}$	0.2	0.3	-	0.2	0.3	-	V
$I_D$	off-state current	$V_D = V_{DRM(max)}$ ; $T_j = 125\text{ °C}$	-	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 BTA21-800E 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	-	-	200	-	-	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	-	$\mu\text{s}$

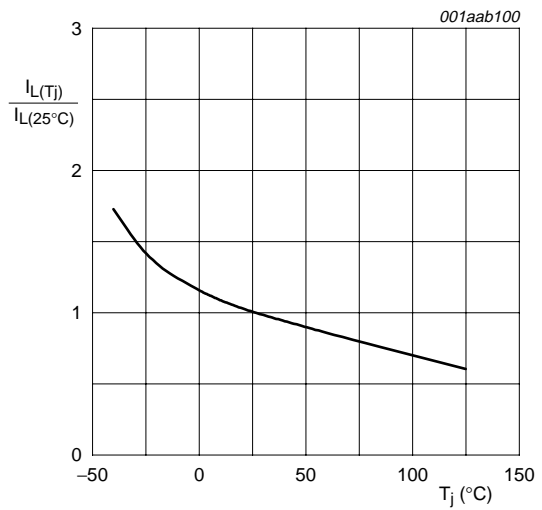




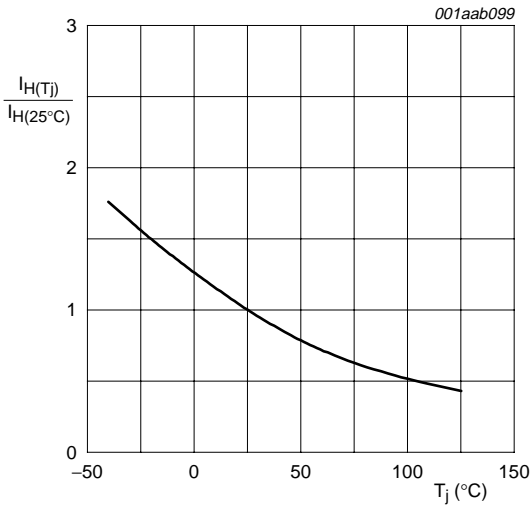
$V_o = 1.02 \text{ V}; R_s = 0.358 \Omega$

- (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

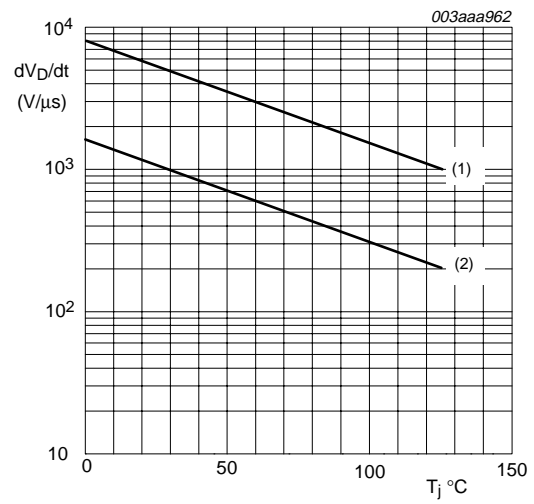
**Fig 9. On-state current as a function of on-state voltage**



**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

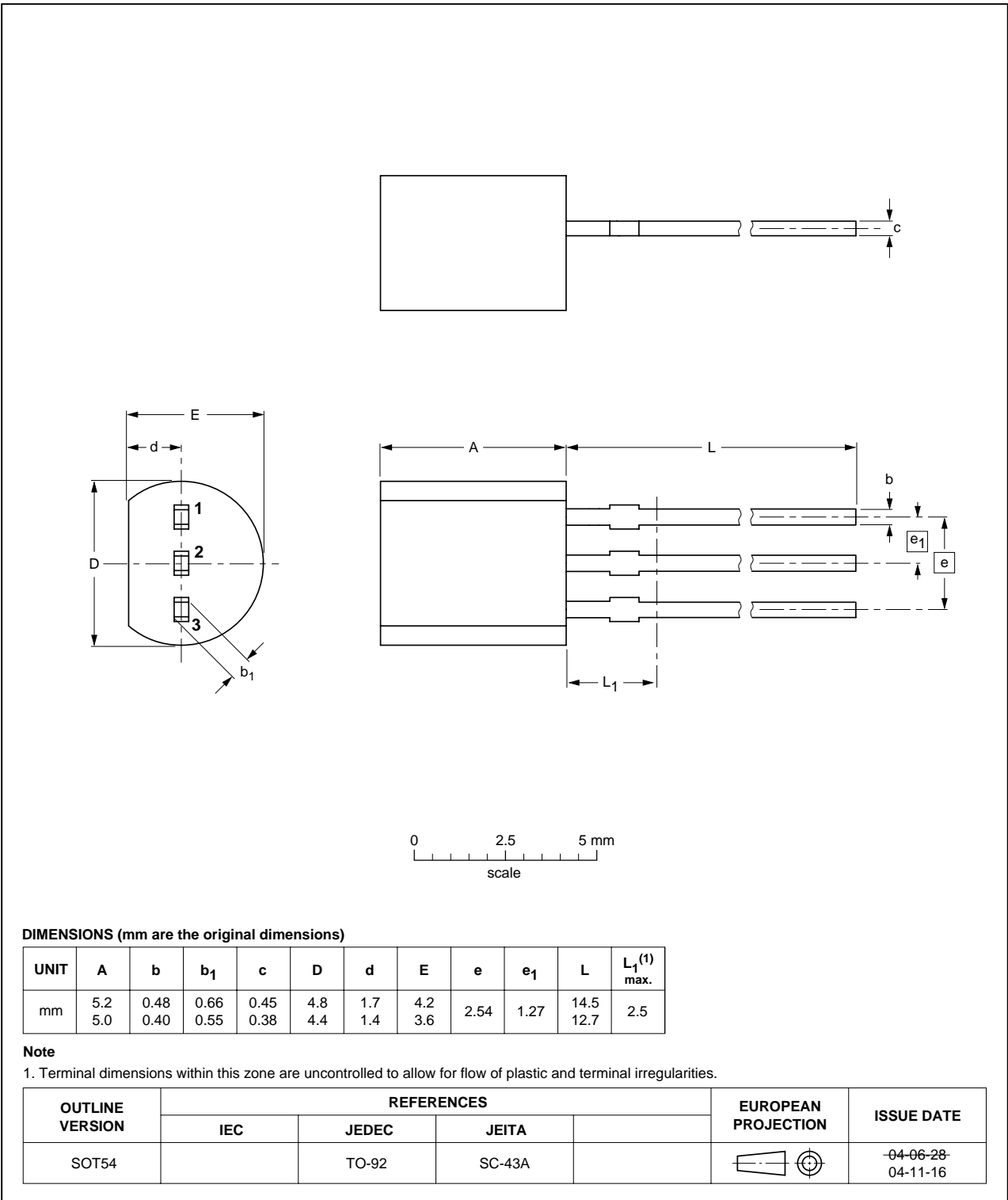


Fig 13. Package outline SOT54 (TO-92)

## 9. Revision history

**Table 7: Revision history**

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BTA201_SER_B_E_ER_2	20060113	Product data sheet	-	-	BTA201_SER_B_E_ER_1
Modifications:			<ul style="list-style-type: none"><li>• <a href="#">Figure 4</a>: Figure note corrected</li><li>• <a href="#">Table 6 "Dynamic characteristics"</a>: Units corrected</li><li>• <a href="#">Figure 12</a>: Figure title corrected</li></ul>		
BTA201_SER_B_E_ER_1	20050825	Product data sheet	-	9397 750 15154	-

## 10. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2]</sup> <sup>[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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