

BTA201 series B, E and ER

1 A Three-quadrant triacs high commutation

Rev. 04 — 4 February 2008

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 commute 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
- $I_{T(RMS)} \leq 1$ A
- $V_{DRM} \leq 600$ V (BTA201-600B/E)
- $V_{DRM} \leq 800$ V (BTA201-800B/E/ER)
- $I_{GT} \leq 50$ mA (BTA201-600B/800B)
- $I_{GT} \leq 10$ mA (BTA201-600E/800E/ER)
- $I_{GT} \geq 5$ mA (BTA201-600B/800B)
- $I_{GT} \geq 1$ mA (BTA201-600E/800E/ER)

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Graphic symbol
B and E series			
1	main terminal 2 (T2)		
2	gate (G)		
3	main terminal 1 (T1)		
ER series			
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			

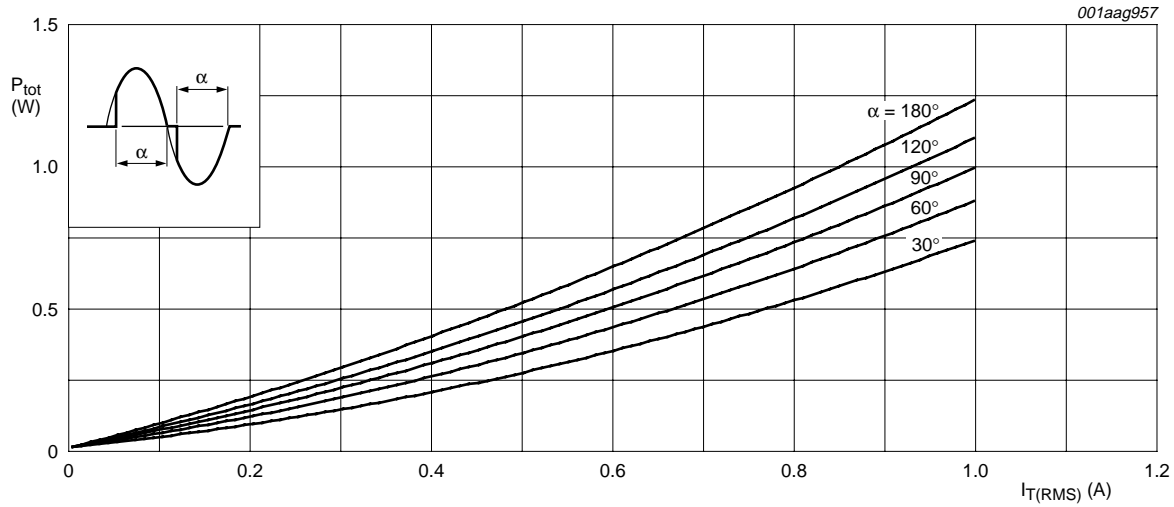
4. Limiting values

Table 3. Limiting values

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

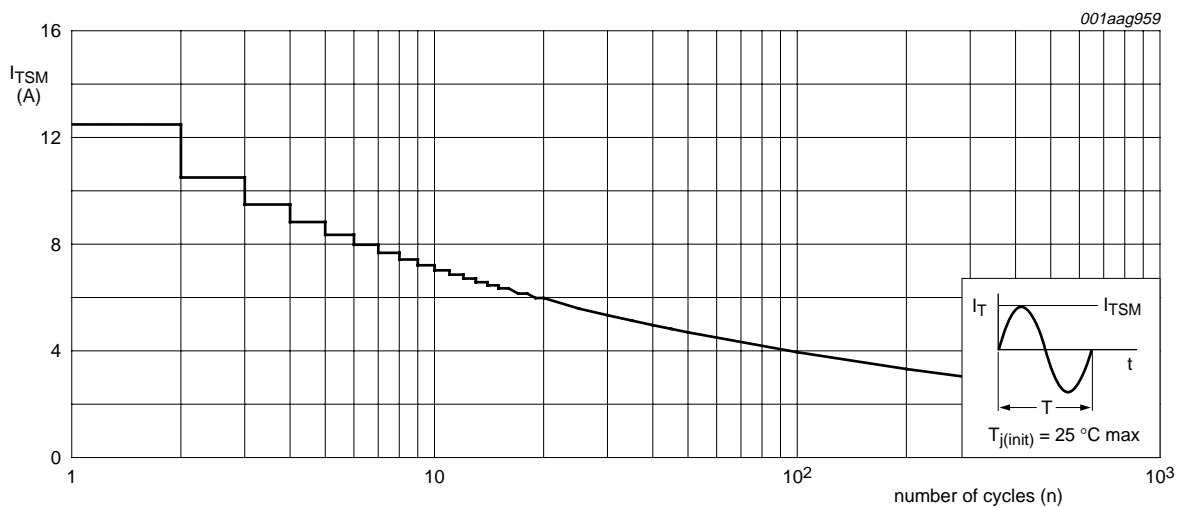
Symbol	Parameter	Conditions	Min	Max	Unit	
V_{DRM}	repetitive peak off-state voltage	BTA201-600B	[1]	-	600	V
		BTA201-600E	[1]	-	600	V
		BTA201-800B	-	-	800	V
		BTA201-800E	-	-	800	V
		BTA201-800ER	-	-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 54.3 \text{ }^\circ\text{C}$; see Figure 4 and 5	-	1	A	
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_j = 25 \text{ }^\circ\text{C}$ prior to surge; see Figure 2 and 3				
		$t = 20 \text{ ms}$	-	12.5	A	
		$t = 16.7 \text{ ms}$	-	13.7	A	
I^2t	I^2t for fusing	$t_p = 10 \text{ ms}$	-	0.78	A^2s	
di_T/dt	rate of rise of on-state current	$I_{TM} = 1.5 \text{ A}$; $I_G = 0.2 \text{ A}$; $di_G/dt = 0.2 \text{ A}/\mu\text{s}$	-	100	$\text{A}/\mu\text{s}$	
I_{GM}	peak gate current		-	2	A	
P_{GM}	peak gate power		-	5	W	
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.1	W	
T_{stg}	storage temperature		-40	+150	$^\circ\text{C}$	
T_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/ μs .



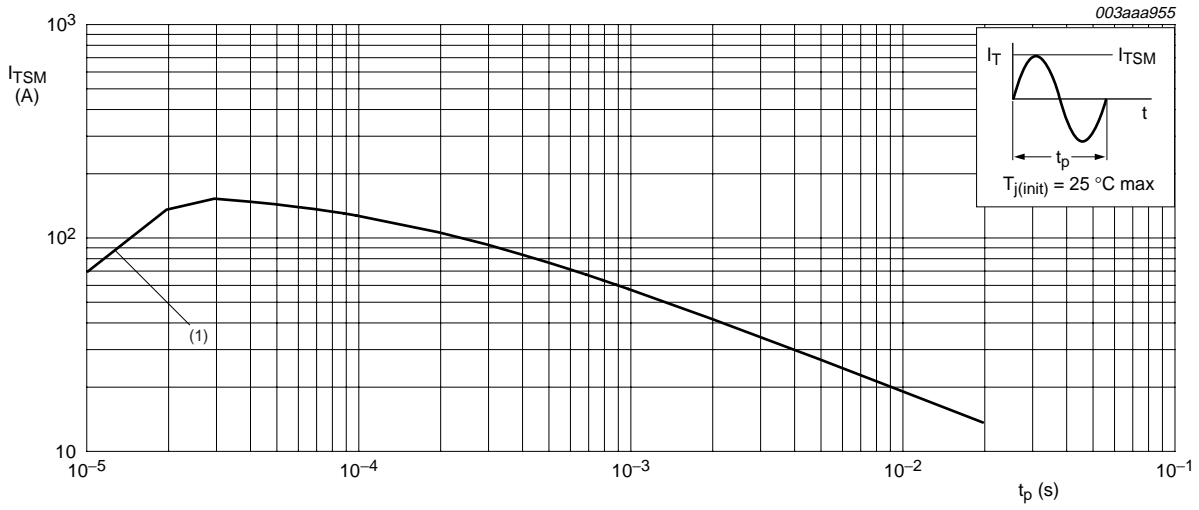
α = conduction angle

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



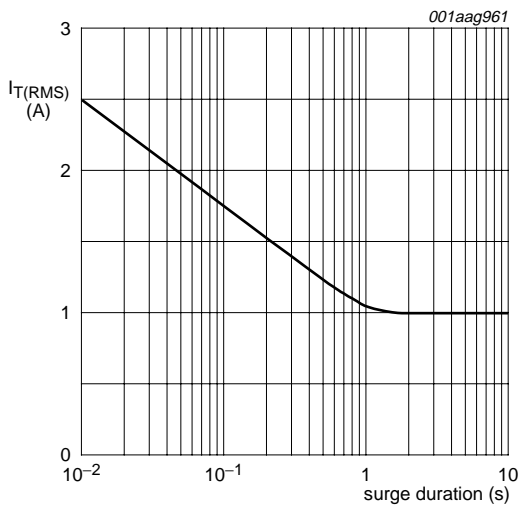
$f = 50\text{ Hz}$

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



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

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



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

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

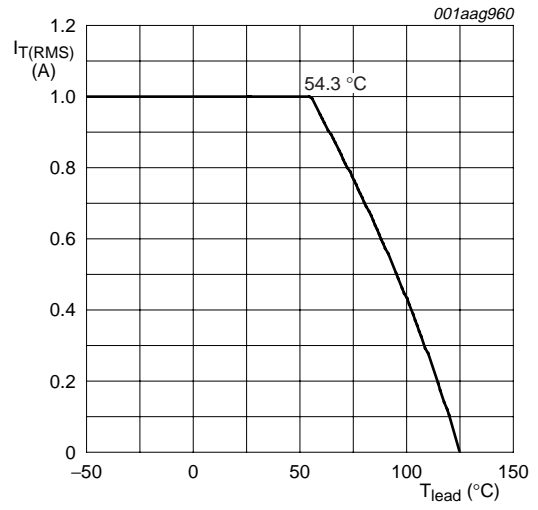
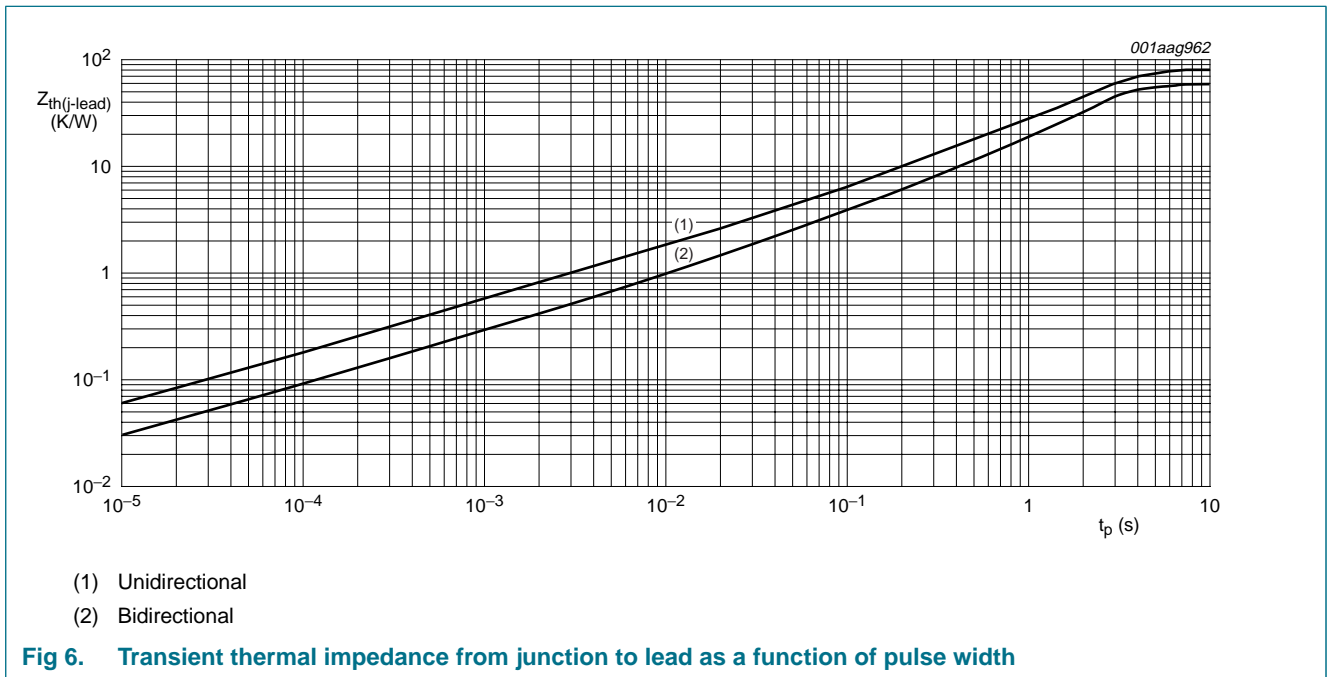


Fig 5. RMS on-state current as a function of lead temperature; maximum values

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 Figure 6	-	-	60	K/W
		half cycle; see Figure 6	-	-	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

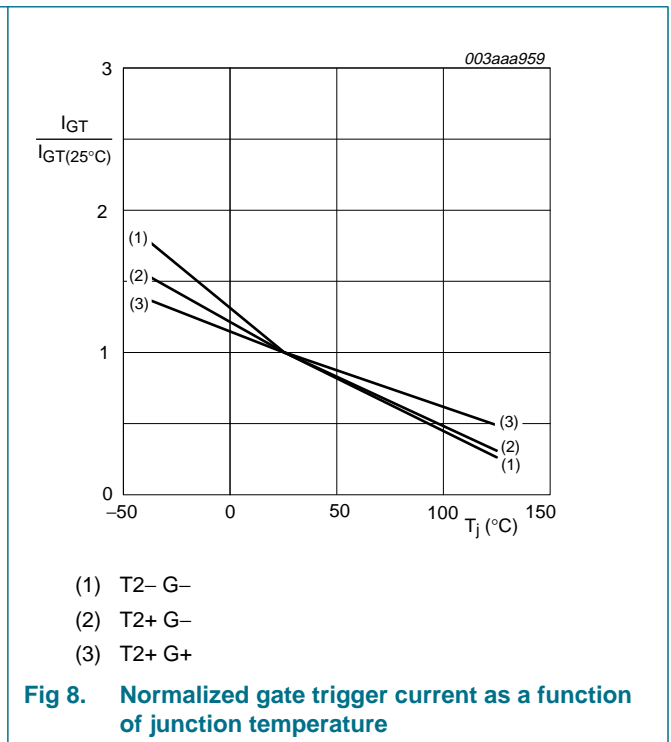
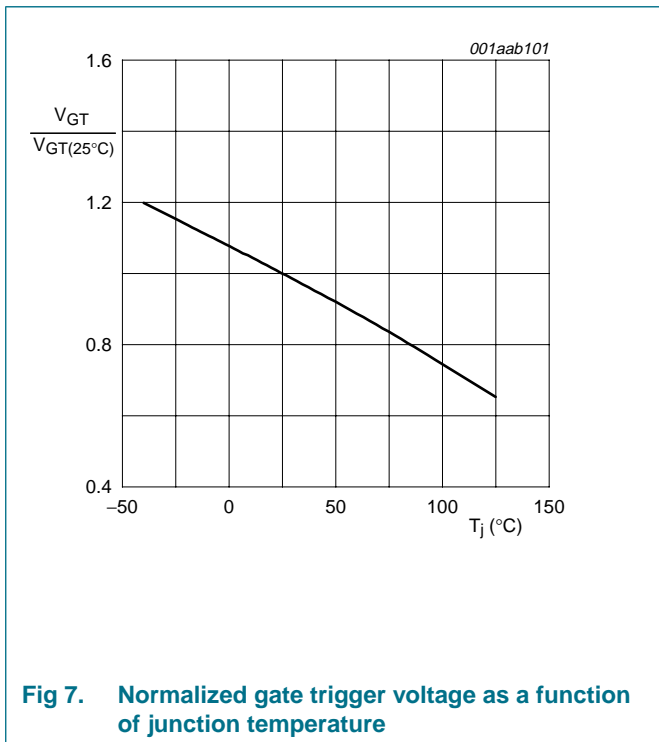
$T_j = 25\text{ °C}$ unless otherwise specified.

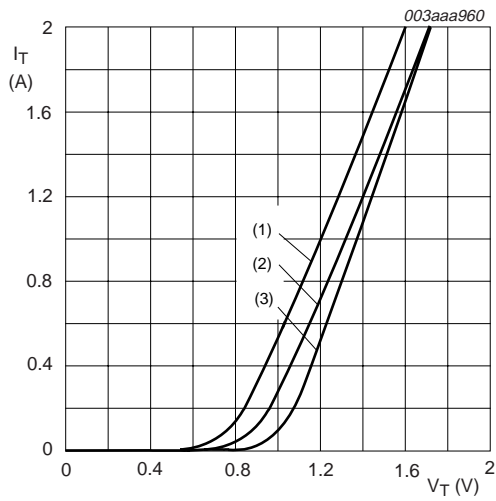
Symbol	Parameter	Conditions	BTA201-600B BTA201-800B			BTA201-600E BTA201-800E BTA201-800ER			Unit
			Min	Typ	Max	Min	Typ	Max	
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; see Figure 8							
		T2+ G+	5	-	50	1	-	10	mA
		T2+ G-	5	-	50	1	-	10	mA
		T2- G-	5	-	50	1	-	10	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_{GT} = 0.1\text{ A}$; see Figure 10							
		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 Figure 11	-	-	30	-	-	12	mA
V_T	on-state voltage	$I_T = 1.4\text{ A}$; see Figure 9	-	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 Figure 7	-	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 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/ μs
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	-	μs





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

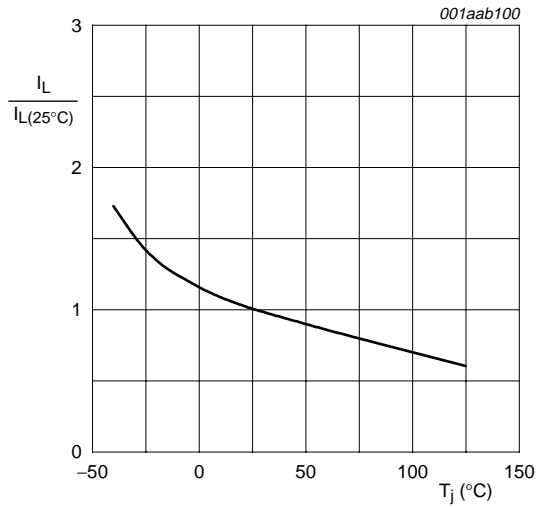


Fig 10. Normalized latching current as a function of junction temperature

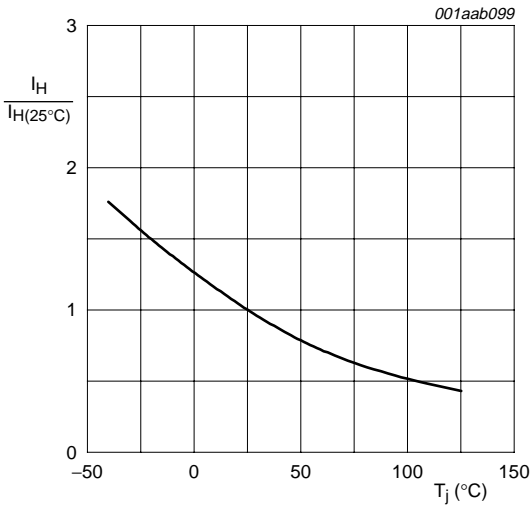
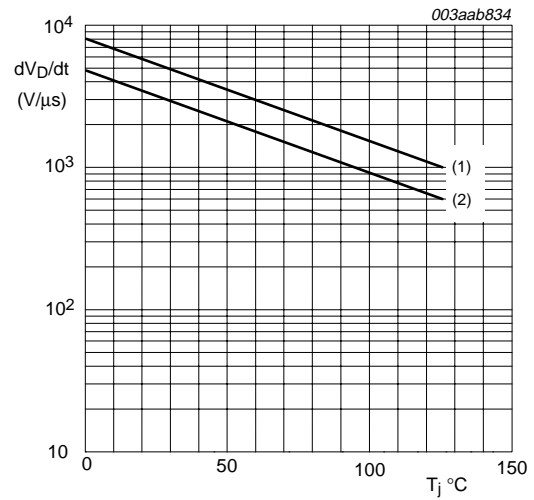


Fig 11. Normalized holding current as a function of junction temperature



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

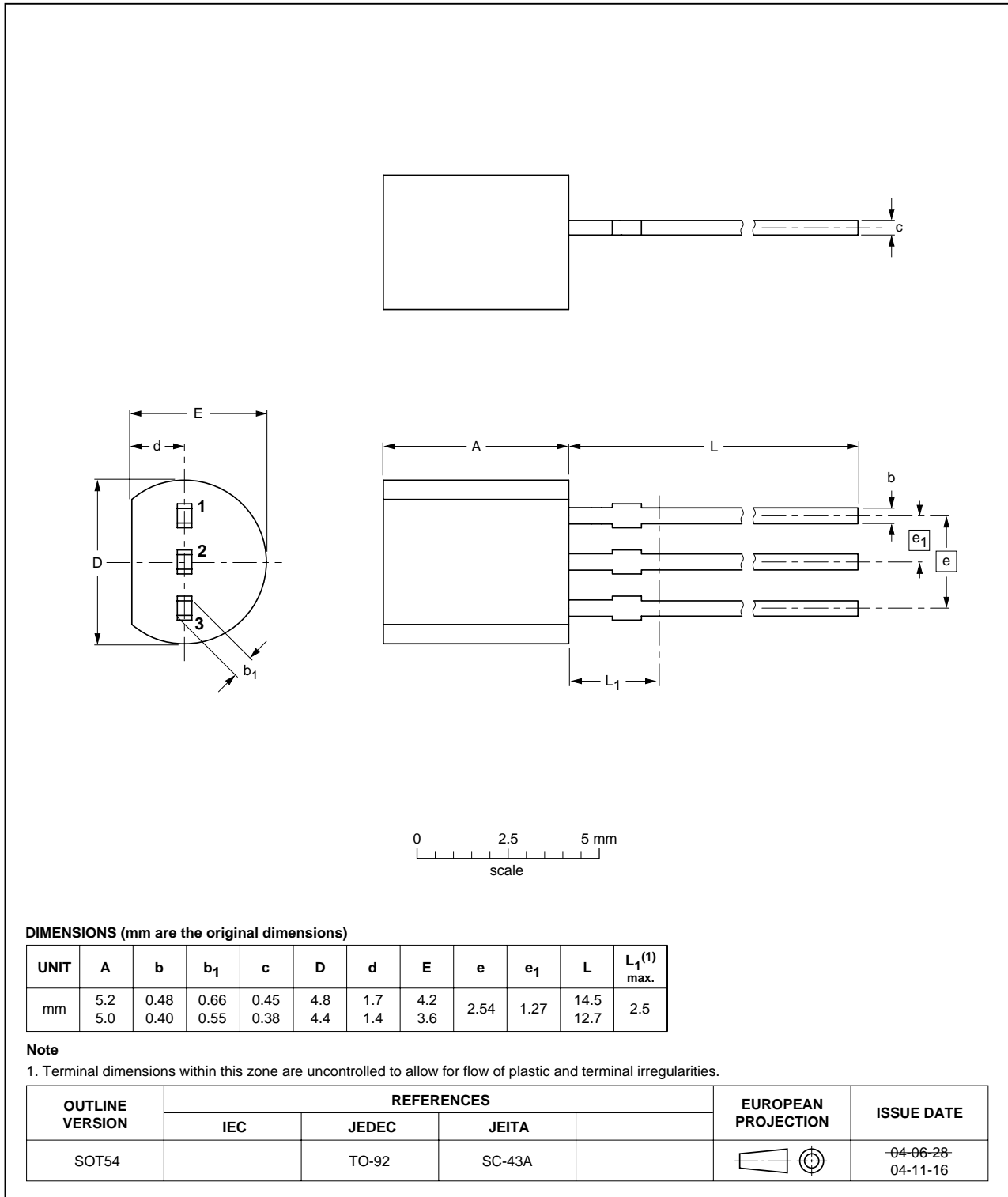


Fig 13. Package outline SOT54 (TO-92)

9. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA201_SER_B_E_ER_4	20080204	Product data sheet	-	BTA201_SER_B_E_ER_3
Modifications:				
<ul style="list-style-type: none"> • Figure 3: Changed figure. • Section 1.4 “Quick reference data” on page 1: Updated with minimum I_{GT} values added. • Table 3 “Limiting values” on page 2: I^2t condition, t_p; symbol update. • Table 5 “Static characteristics” on page 6: Minimum I_{GT} values added. 				
BTA201_SER_B_E_ER_3	20070910	Product data sheet	-	BTA201_SER_B_E_ER_2
Modifications:				
<ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Descriptive titles have been corrected. • Table 3 “Limiting values” on page 2: di_T/dt updated. • Table 6 “Dynamic characteristics” on page 7: dV_D/dt updated. • Figure 12 “Critical rate of rise of off-state voltage as a function of junction temperature; minimum values” on page 8: graph updated. 				
BTA201_SER_B_E_ER_2	20060113	Product data sheet	-	BTA201_SER_B_E_ER_1
Modifications:				
<ul style="list-style-type: none"> • Figure 4: Figure note corrected • Table 6 “Dynamic characteristics” on page 7: Units corrected • Figure 12: Figure title corrected 				
BTA201_SER_B_E_ER_1 (9397 750 15154)	20050825	Product data sheet	-	-

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10.1 Data sheet status

Document status ^{[1][2]}	Product status ^[3]	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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