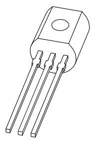


BTA201 series B, E and ER

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 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

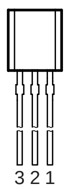
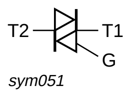
- Motor controls
- Solenoid drivers

1.4 Quick reference data

- $I_{TSM} \leq 12.5$ A
- $I_{T(RMS)} \leq 1$ 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		 SOT54 (TO-92)	
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)		

founded by Philips

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			

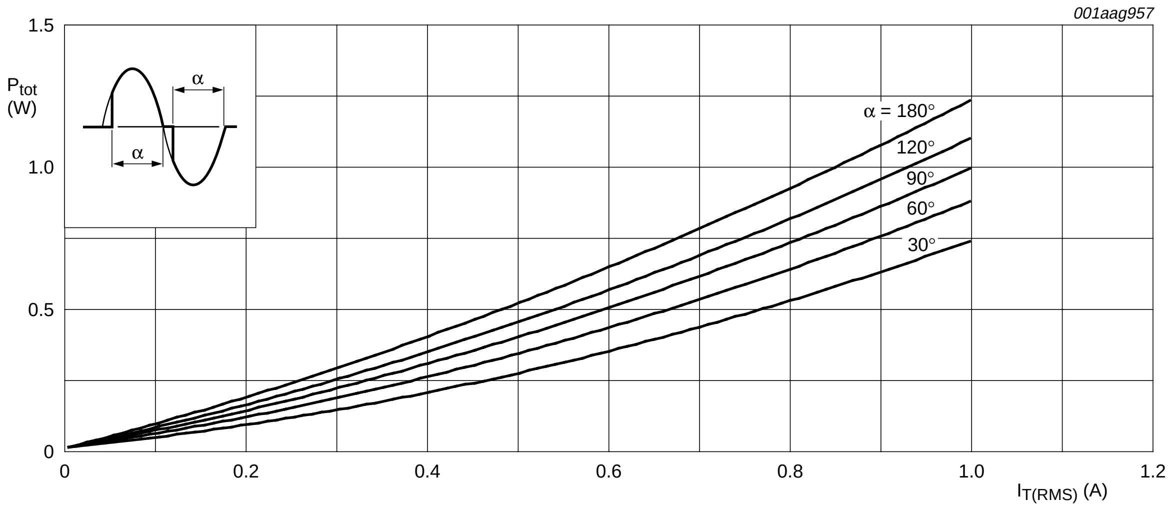
4. Limiting values

Table 3. Limiting values

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

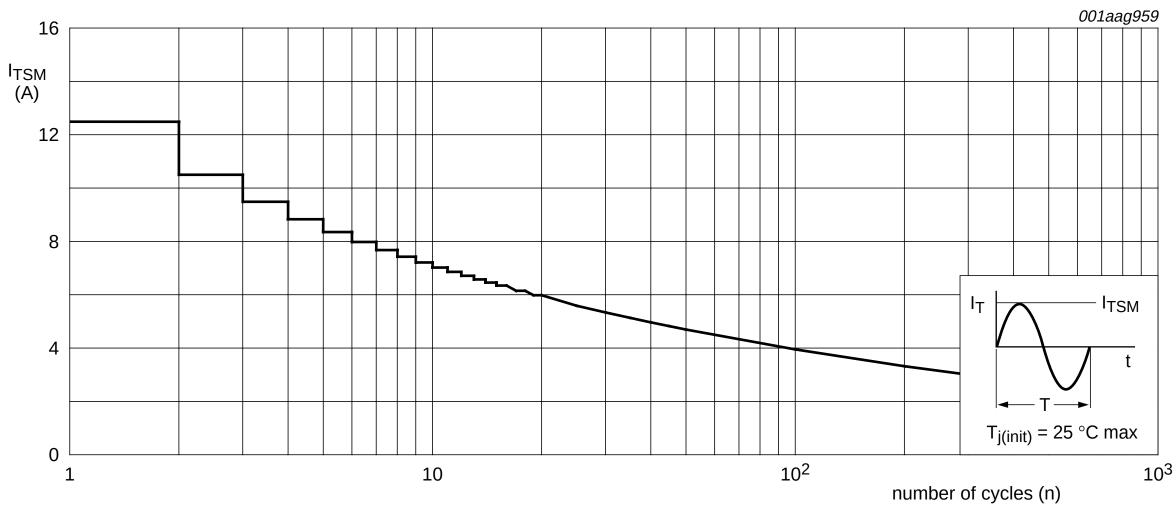
Symbol	Parameter	Conditions		Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage					
		BTA201-600B	[1]	-	600	V
		BTA201-600E	[1]	-	600	V
		BTA201-800B		-	800	V
		BTA201-800E		-	800	V
		BTA201-800ER		-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 54.3$ °C; see Figure 4 and 5		-	1	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_j = 25$ °C prior to surge; see Figure 2 and 3				
		t = 20 ms		-	12.5	A
		t = 16.7 ms		-	13.7	A
I^2t	I^2t for fusing	$t_p = 10$ ms		-	0.78	A^2s
dI_T/dt	rate of rise of on-state current	$I_{TM} = 1.5$ A; $I_G = 0.2$ A; $dI_G/dt = 0.2$ A/µs		-	100	A/µs
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	°C
T_j	junction temperature			-	125	°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.



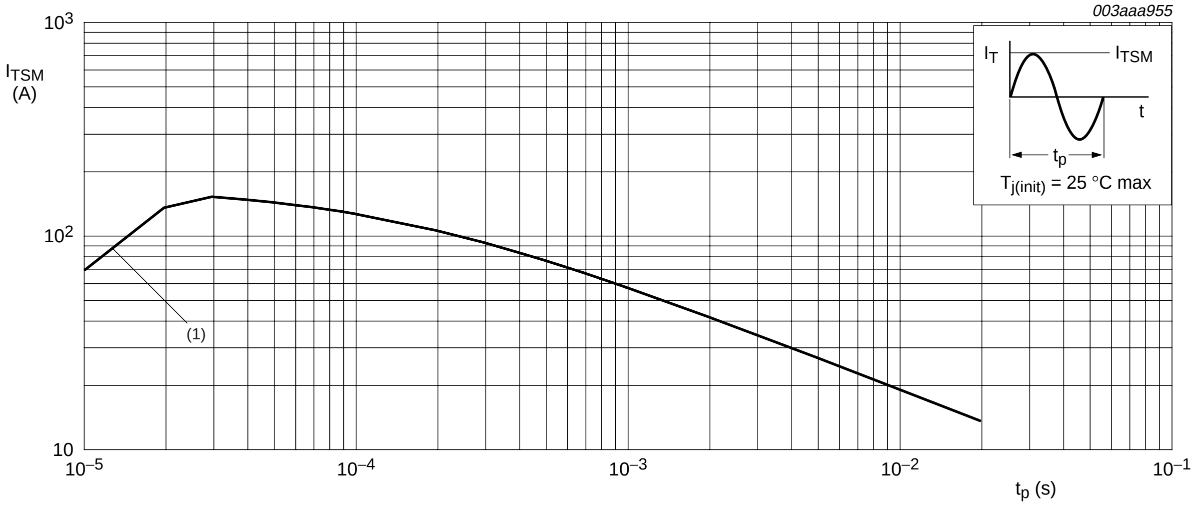
α = conduction angle

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



f = 50 Hz

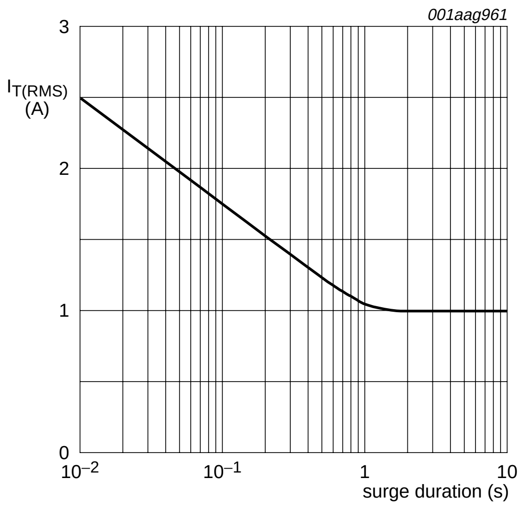
Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



$t_p \leq 20$ ms

(1) dI_T/dt limit

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



f = 50 Hz; $T_{lead} \leq 54.3$ °C

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

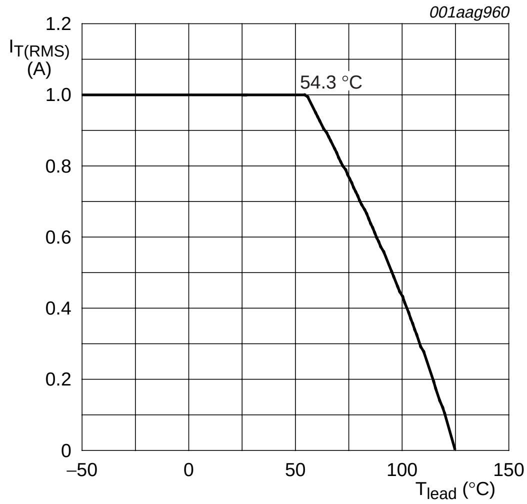
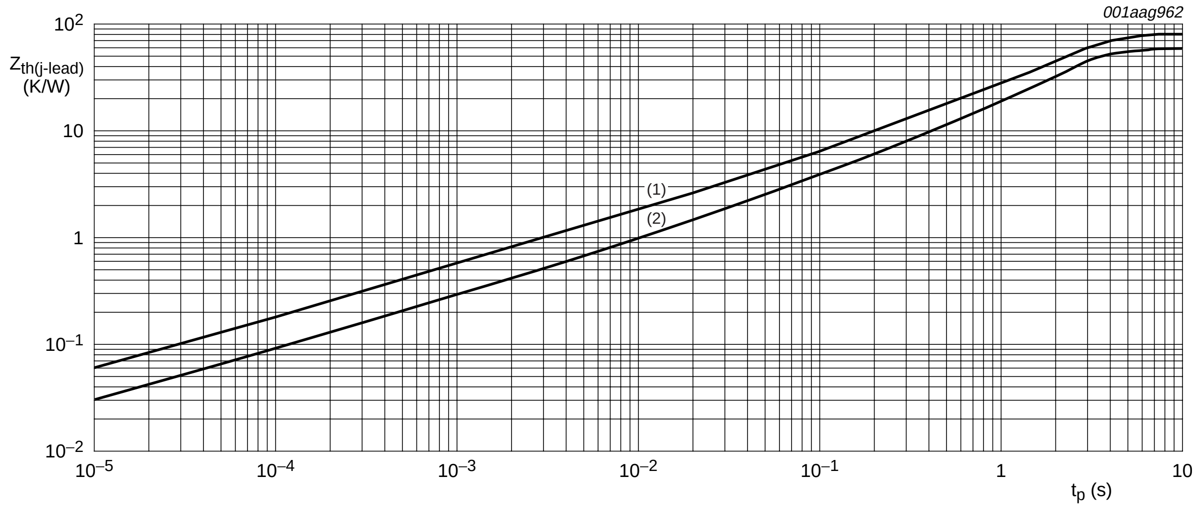


Fig 5. RMS on-state current as a function of lead temperature; maximum values

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 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



(1) Unidirectional

(2) Bidirectional

Fig 6. Transient thermal impedance from junction to lead as a function of pulse width

6. Static characteristics

Table 5. Static characteristics

T_j = 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_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 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 V; I_{GT} = 0.1 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 V; I_{GT} = 0.1 A; see Figure 11	-	-	30	-	-	12	mA
V_T	on-state voltage	I_T = 1.4 A; see Figure 9	-	1.2	1.5	-	1.2	1.5	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; see Figure 7	-	0.7	1.5	-	0.7	1.5	V
		V_D = 400 V; I_T = 0.1 A; T_j = 125 °C	0.2	0.3	-	0.2	0.3	-	V
I_D	off-state current	$V_D = V_{DRM(max)}$; T_j = 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 °C; exponential waveform; gate open circuit	1000	-	-	600	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_{DM} = 400 V; T_j = 125 °C; dV_{com}/dt = 20 V/µs; gate open circuit	12	-	-	2.5	-	-	A/ms
		V_{DM} = 400 V; T_j = 125 °C; dV_{com}/dt = 10 V/µs; gate open circuit	16	-	-	3.5	-	-	A/ms
t_{gt}	gate-controlled turn-on time	I_{TM} = 20 A; V_D = $V_{DRM(max)}$; I_G = 0.1 A; dI_G/dt = 5 A/µs	-	2	-	-	2	-	µs

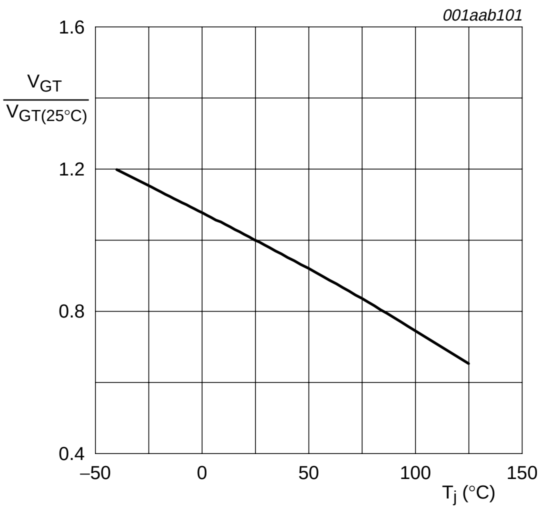
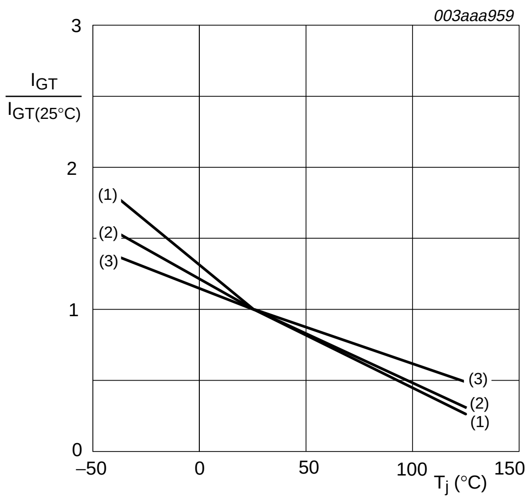


Fig 7. Normalized gate trigger voltage as a function of junction temperature

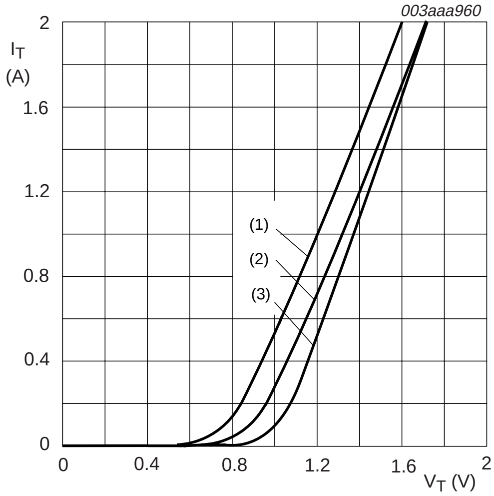


(1) T2− G−

(2) T2+ G−

(3) T2+ G+

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



V_o = 1.02 V; R_s = 0.358 Ω

(1) T_j = 125 °C; typical values

(2) T_j = 125 °C; maximum values

(3) T_j = 25 °C; maximum values

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

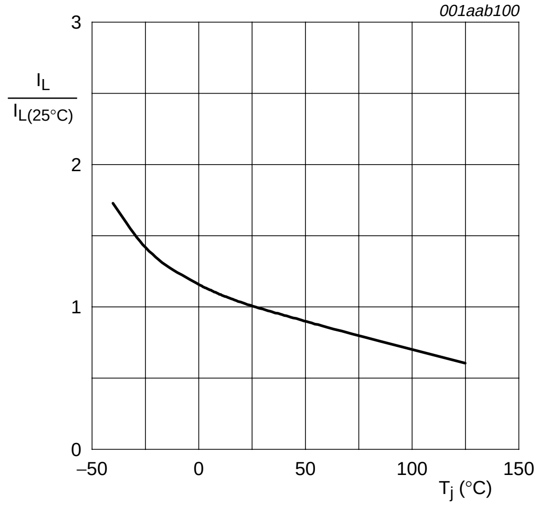


Fig 10. Normalized latching current as a function of junction temperature

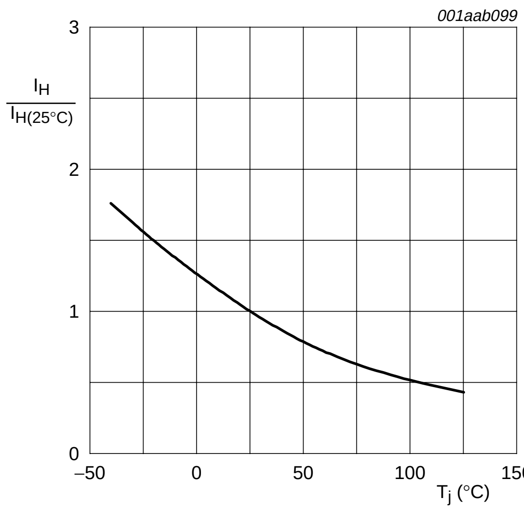
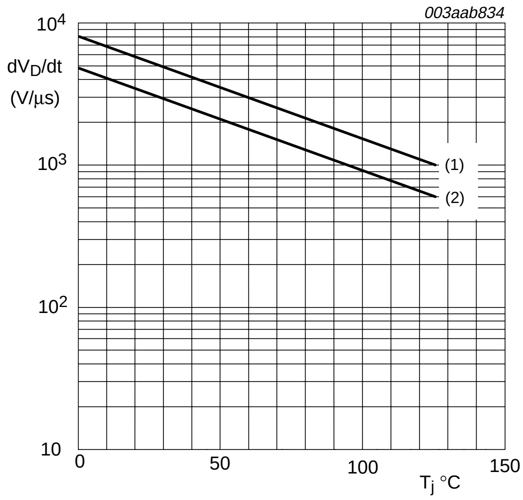


Fig 11. Normalized holding current as a function of junction temperature



Gate open circuit

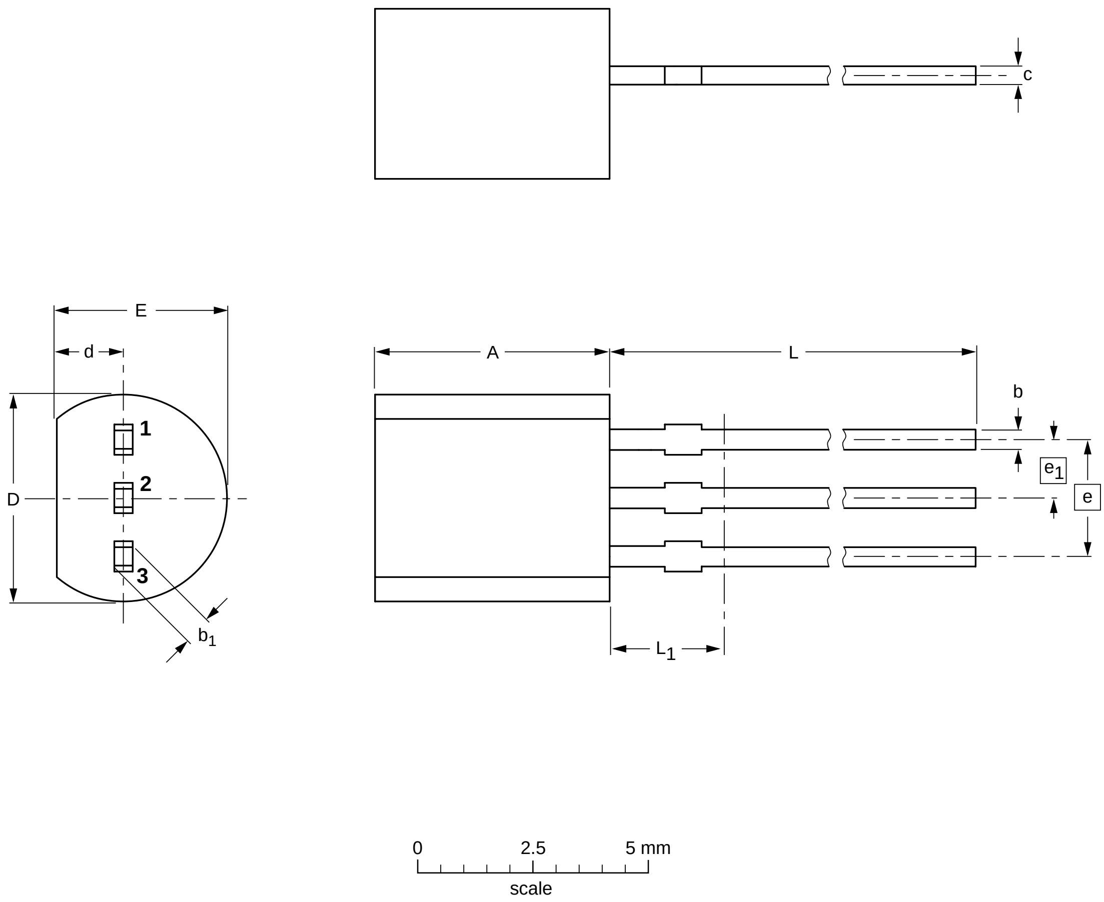
(1) BTA201 series B

(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**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	b_1	c	D	d	E	e	e_1	L	L_1(1) max.
mm	5.2 5.0	0.48 0.40	0.66 0.55	0.45 0.38	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 12.7	2.5

Note

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

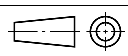
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT54		TO-92	SC-43A			~~04-06-28~~ 04-11-16

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:	• 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:	• 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 uprated. • Table 6 “Dynamic characteristics” on page 7: dV_D/dt uprated. • 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:	• 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	-	-

10. Legal information

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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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11. Contact information

For more information, please visit: **http://www.nxp.com**

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12. Contents

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