

# BTA316B series B, C and E

16 A Three-quadrant triacs high commutation

Rev. 01 — 19 April 2007

Product data sheet

## 1. Product profile

### 1.1 General description

Passivated, new generation, high commutation triacs in a SOT404 plastic single-ended surface-mountable package

### 1.2 Features

- Very high commutation performance maximized at each gate sensitivity
- High immunity to dV/dt

### 1.3 Applications

- High power motor control - e.g. washing machines and vacuum cleaners
- Refrigeration and air conditioning compressors
- Non-linear rectifier-fed motor loads
- Electronic thermostats

### 1.4 Quick reference data

- $V_{DRM} \leq 600$  V (BTA316B-600B/C/E)
- $V_{DRM} \leq 800$  V (BTA316B-800B/C/E)
- $I_{TSM} \leq 140$  A ( $t = 20$  ms)
- $I_{T(RMS)} \leq 16$  A ( $t = 20$  ms)
- $I_{GT} \leq 50$  mA (BTA316B series B)
- $I_{GT} \leq 35$  mA (BTA316B series C)
- $I_{GT} \leq 10$  mA (BTA316B series E)

## 2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	main terminal 1 (T1)	<p style="text-align: center;">SOT404 (D2PAK)</p>	<p style="text-align: center;">sym051</p>
2	main terminal 2 (T2)		
3	gate (G)		
mb	mounting base; main terminal 2 (T2)		

### 3. Ordering information

**Table 2. Ordering information**

Type number	Package		Version
	Name	Description	
BTA316B-600B	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3-leads (one lead cropped)	SOT404
BTA316B-600C			
BTA316B-600E			
BTA316B-800B			
BTA316B-800C			
BTA316B-800E			

### 4. Limiting values

**Table 3. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit	
V <sub>DRM</sub>	repetitive peak off-state voltage	BTA316B-600B; BTA316B-600C; BTA316B-600E	[1]	-	600	V
		BTA316B-800B; BTA316B-800C; BTA316B-800E	-	-	800	V
I <sub>T(RMS)</sub>	RMS on-state current	full sine wave; T <sub>mb</sub> ≤ 101 °C; see <a href="#">Figure 4</a> and <a href="#">5</a>	-	16	A	
I <sub>TSM</sub>	non-repetitive peak on-state current	full sine wave; T <sub>j</sub> = 25 °C prior to surge; see <a href="#">Figure 2</a> and <a href="#">3</a>	-	-	-	
		t = 20 ms	-	140	A	
		t = 16.7 ms	-	150	A	
I <sup>2</sup> t	I <sup>2</sup> t for fusing	t = 10 ms	-	98	A <sup>2</sup> s	
di <sub>T</sub> /dt	rate of rise of on-state current	I <sub>TM</sub> = 20 A; I <sub>G</sub> = 0.2 A; di <sub>G</sub> /dt = 0.2 A/μs	-	100	A/μs	
I <sub>GM</sub>	peak gate current		-	2	A	
P <sub>GM</sub>	peak gate power		-	5	W	
P <sub>G(AV)</sub>	average gate power	over any 20 ms period	-	0.5	W	
T <sub>stg</sub>	storage temperature		-40	+150	°C	
T <sub>j</sub>	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 15 A/μs.

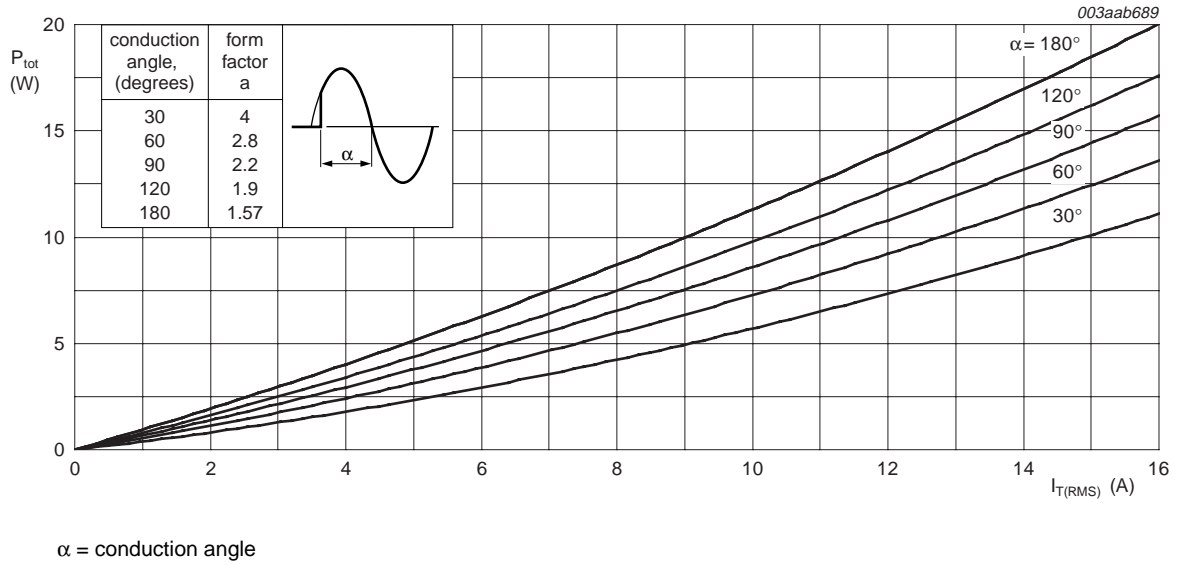


Fig 1. Total power dissipation as a function of RMS on-state current; maximum values

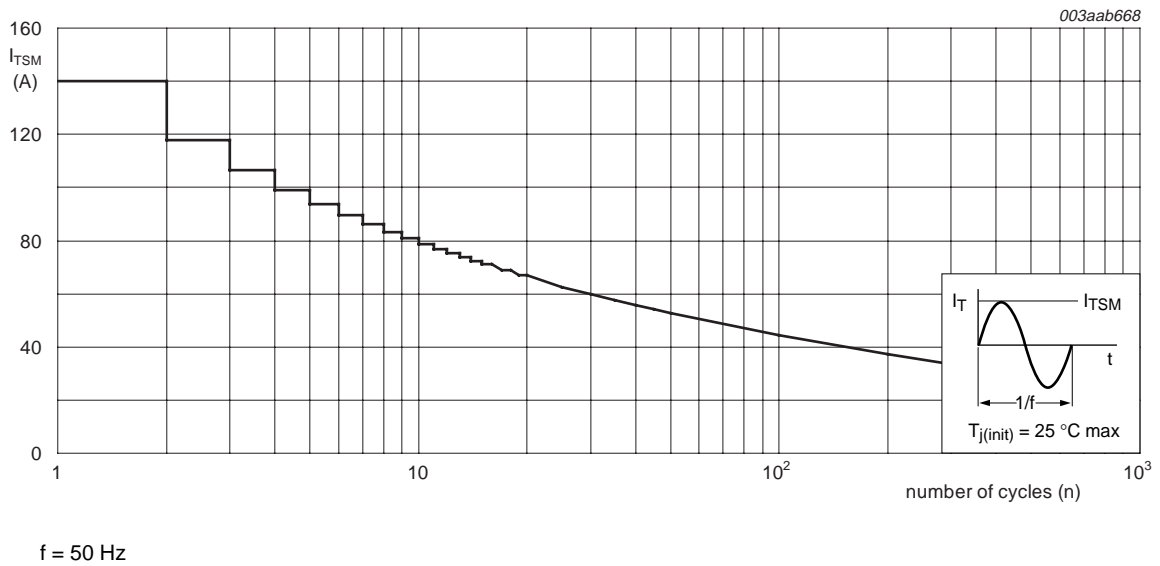
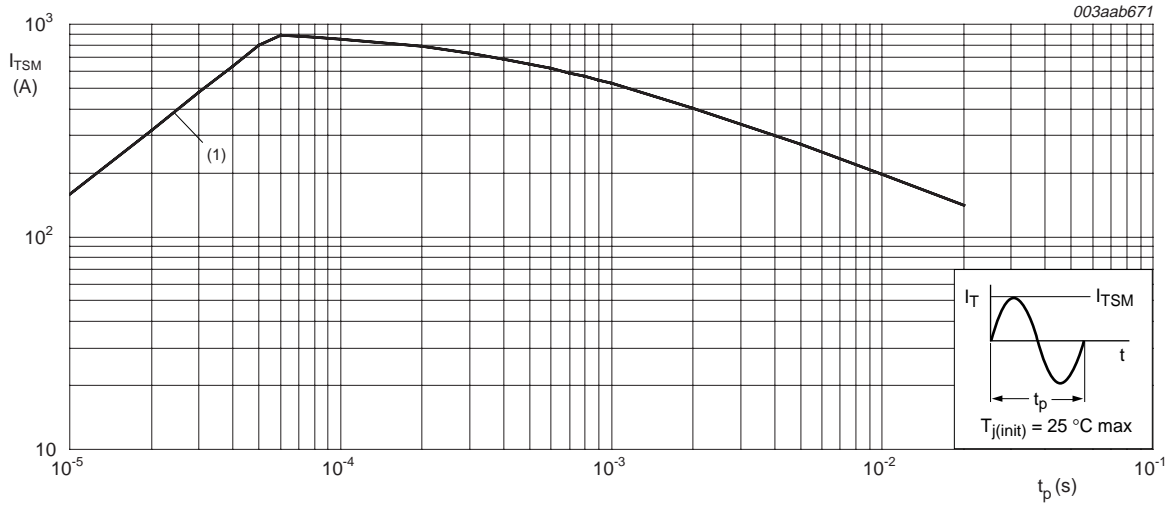


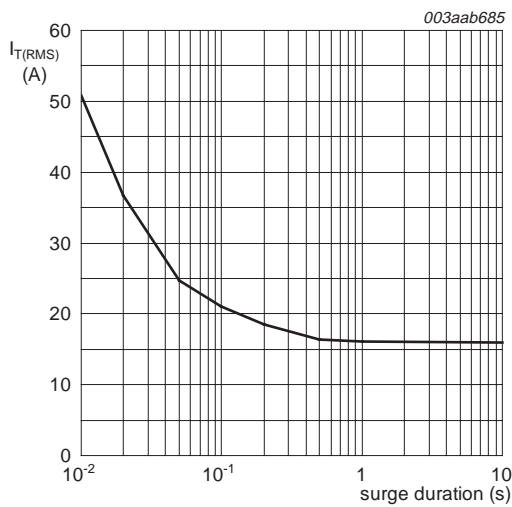
Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



$t_p \leq 20 \text{ ms}$

(1)  $di_T/dt$  limit

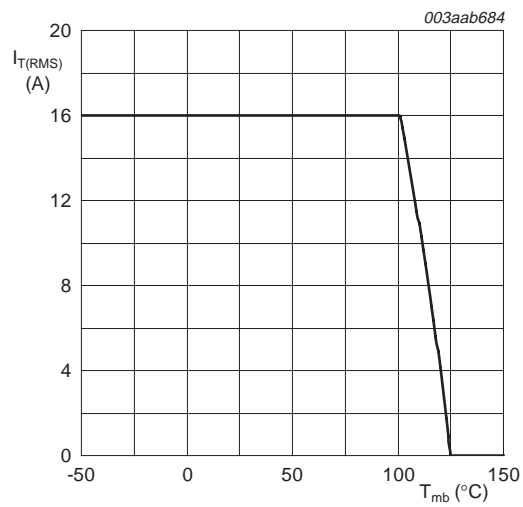
**Fig 3. Non-repetitive peak on-state current as a function of pulse duration; maximum values**



$f = 50 \text{ Hz}$ ;

$T_{mb} = 101 \text{ °C}$

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

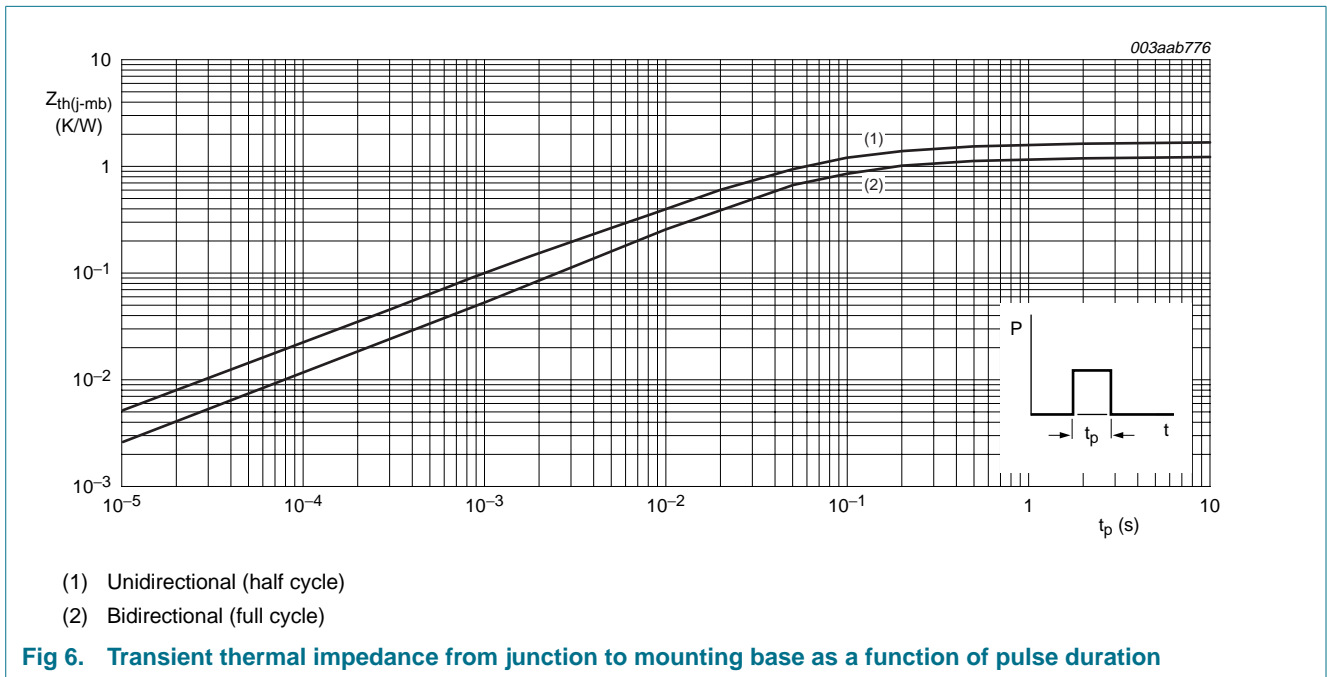


**Fig 5. RMS on-state current as a function of mounting base temperature; maximum values**

5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	half cycle; see <a href="#">Figure 6</a>	-	-	1.7	K/W
		full cycle; see <a href="#">Figure 6</a>	-	-	1.2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on a printed circuit board; minimum footprint	-	55	-	K/W



## 6. Static characteristics

**Table 5. Static characteristics**

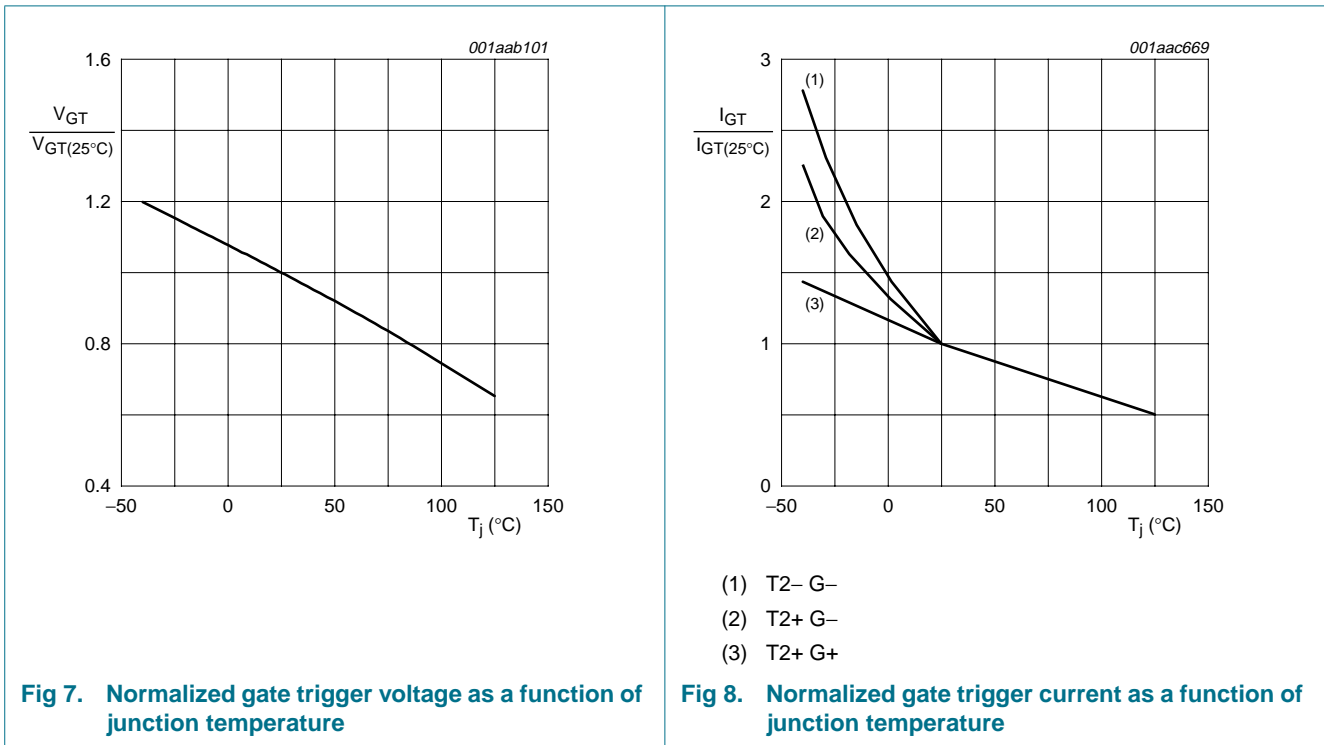
$T_j = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	BTA316B-600B BTA316B-800B			BTA316B-600C BTA316B-800C			BTA316B-600E BTA316B-800E			Unit	
			Min	Typ	Max	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+	2	-	50	2	-	35	-	-	10	mA
			T2+ G-	2	-	50	2	-	35	-	-	10	mA
			T2- G-	2	-	50	2	-	35	-	-	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+	-	-	60	-	-	50	-	-	25	mA
			T2+ G-	-	-	90	-	-	60	-	-	30	mA
			T2- G-	-	-	60	-	-	50	-	-	30	mA
$I_H$	holding current	$V_D = 12\text{ V};$ $I_{GT} = 0.1\text{ A};$ see <a href="#">Figure 11</a>	-	-	60	-	-	35	-	-	15	mA	
$V_T$	on-state voltage	$I_T = 18\text{ A};$ see <a href="#">Figure 9</a>	-	1.3	1.5	-	1.3	1.5	-	1.3	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>	-	0.8	1.5	-	0.8	1.5	-	0.8	1.5	V	
		$V_D = 400\text{ V};$ $I_T = 0.1\text{ A};$ $T_j = 125\text{ °C}$	0.25	0.4	-	0.25	0.4	-	0.25	0.4	-	V	
$I_D$	off-state current	$V_D = V_{DRM(max)};$ $T_j = 125\text{ °C}$	-	0.1	0.5	-	0.1	0.5	-	0.1	0.5	mA	

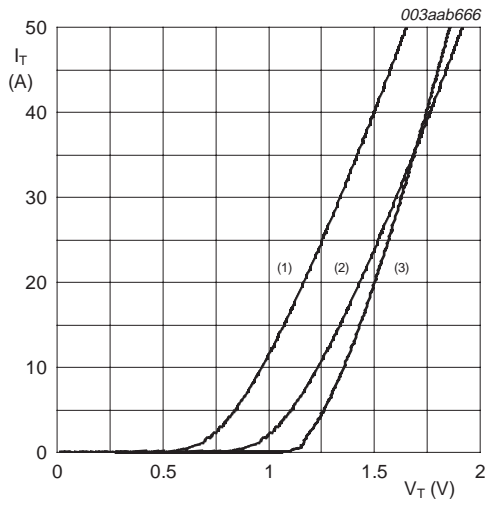
**7. Dynamic characteristics**

**Table 6. Dynamic characteristics**

Symbol	Parameter	Conditions	BTA316B-600B BTA316B-800B			BTA316B-600C BTA316B-800C			BTA316B-600E BTA316B-800E			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 0.67 \times V_{DRM(max)}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; exponential waveform; gate open circuit	1000	-	-	500	-	-	60	-	-	V/ $\mu\text{s}$
$di_{com}/dt$	rate of change of commutating current	$V_{DM} = 400\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 16\text{ A}$ ; without snubber; gate open circuit	20	-	-	15	-	-	5	-	-	A/ms
		$V_{DM} = 400\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 16\text{ A}$ ; $dV/dt = 10\text{ V}/\mu\text{s}$ ; gate open circuit	-	-	-	-	-	-	8	-	-	A/ms
		$V_{DM} = 400\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 16\text{ A}$ ; $dV/dt = 1\text{ V}/\mu\text{s}$ ; gate open circuit	-	-	-	-	-	-	12	-	-	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	-	-	2	-	$\mu\text{s}$

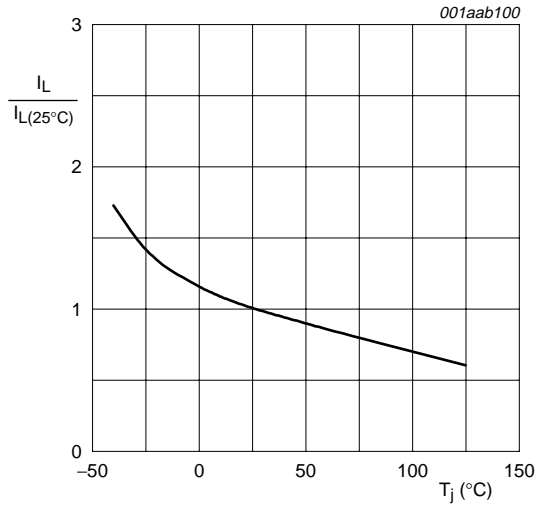




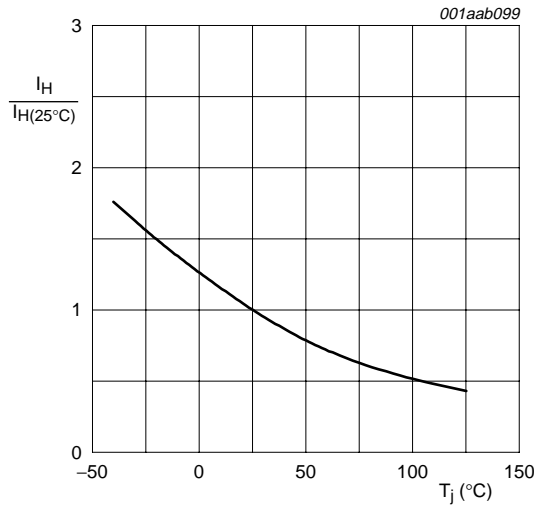


$V_o = 1.024 \text{ V}$   
 $R_s = 0.021 \text{ } \Omega$   
 (1)  $T_j = 125 \text{ } ^\circ\text{C}$ ; typical values  
 (2)  $T_j = 125 \text{ } ^\circ\text{C}$ ; maximum values  
 (3)  $T_j = 25 \text{ } ^\circ\text{C}$ ; maximum values

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



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

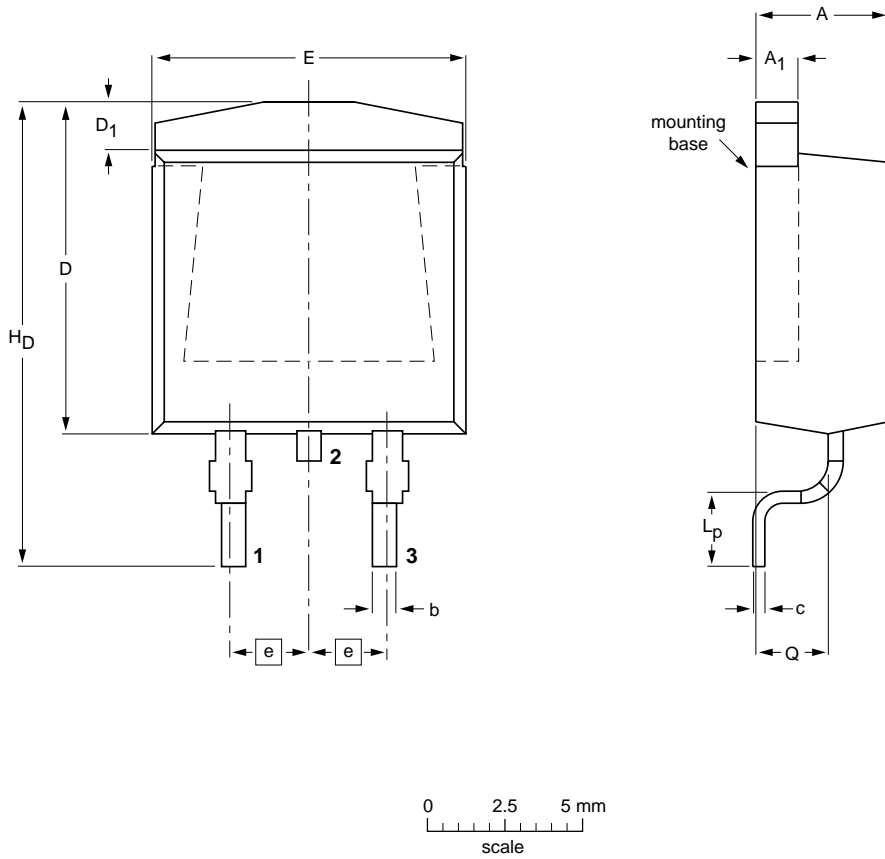


**Fig 11. Normalized holding current as a function of junction temperature**

**8. Package outline**

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)

**SOT404**



**DIMENSIONS (mm are the original dimensions)**

UNIT	A	A <sub>1</sub>	b	c	D max.	D <sub>1</sub>	E	e	L <sub>p</sub>	H <sub>D</sub>	Q
mm	4.50	1.40	0.85	0.64	11	1.60	10.30	2.54	2.90	15.80	2.60
	4.10	1.27	0.60	0.46		1.20	9.70		2.10	14.80	2.20

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT404						05-02-11 06-03-16

**Fig 12. Package outline SOT404 (D2PAK)**

## 9. Revision history

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**Table 7. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA316B_SER_B_C_E_1	20070419	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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## 12. Contents

<b>1</b>	<b>Product profile</b> .....	<b>1</b>
1.1	General description .....	1
1.2	Features .....	1
1.3	Applications .....	1
1.4	Quick reference data .....	1
<b>2</b>	<b>Pinning information</b> .....	<b>1</b>
<b>3</b>	<b>Ordering information</b> .....	<b>2</b>
<b>4</b>	<b>Limiting values</b> .....	<b>2</b>
<b>5</b>	<b>Thermal characteristics</b> .....	<b>5</b>
<b>6</b>	<b>Static characteristics</b> .....	<b>6</b>
<b>7</b>	<b>Dynamic characteristics</b> .....	<b>7</b>
<b>8</b>	<b>Package outline</b> .....	<b>10</b>
<b>9</b>	<b>Revision history</b> .....	<b>11</b>
<b>10</b>	<b>Legal information</b> .....	<b>12</b>
10.1	Data sheet status .....	12
10.2	Definitions .....	12
10.3	Disclaimers .....	12
10.4	Trademarks .....	12
<b>11</b>	<b>Contact information</b> .....	<b>12</b>
<b>12</b>	<b>Contents</b> .....	<b>13</b>

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