

12 A Three-quadrant triacs high commutation high temperature

Rev. 01 — 11 April 2007

Product data sheet

1. Product profile

1.1 General description

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

1.2 Features

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

1.3 Applications

- High temperature, high power motor control e.g. vacuum cleaners
- Refrigeration and air conditioning compressors
- Heating and cooking appliances
- Non-linear rectifier-fed motor loads
- Electronic thermostats for heating and cooling loads
- Solid state relays

1.4 Quick reference data

- $V_{DRM} \le 600 \text{ V (BTA312B-600CT)}$
- V_{DRM} ≤ 800 V (BTA312B-800ET)
- $I_{TSM} \le 95 \text{ A (t = 20 ms)}$
- $I_{GT} \le 35 \text{ mA (BTA312B-600CT)}$
- $I_{GT} \le 10 \text{ mA (BTA312B-800ET)}$
- $I_{T(RMS)} \le 12 A$

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	main terminal 1 (T1)		
2	main terminal 2 (T2)	mb	T2—T1
3	gate (G)		sym051
mb	mounting base; main terminal 2 (T2)		
		SOT404 (D2PAK)	



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3. Ordering information

Table 2. Ordering information

Type number	Package					
	Name	Description	Version			
BTA312B-600CT	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3-leads (one lead				
BTA312B-800ET		cropped)				

4. Limiting values

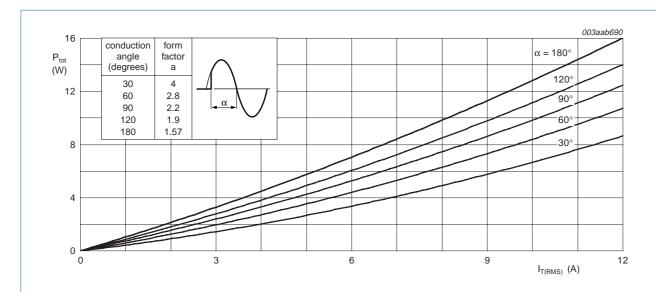
Table 3. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage	BTA312B-600CT	<u>[1]</u> _	600	V
		BTA312B-800ET	-	800	V
I _{T(RMS)}	RMS on-state current	full sine wave; $T_{mb} \le 126$ °C; see Figure 4 and 5	-	12	Α
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	-	95	А
		t = 16.7 ms	-	105	Α
l ² t	I ² t for fusing	t = 10 ms	-	45	A ² s
dI _T /dt	rate of rise of on-state current	$I_{TM} = 20 \text{ A}; I_G = 0.2 \text{ A};$ $dI_G/dt = 0.2 \text{ A}/\mu\text{s}$	-	100	A/μs
I _{GM}	peak gate current		-	2	Α
P_GM	peak gate power		-	5	W
P _{G(AV)}	average gate power	over any 20 ms period	-	0.5	W
T _{stg}	storage temperature		-40	+150	°C
T _j	junction temperature		-	150	°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.

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 α = conduction angle

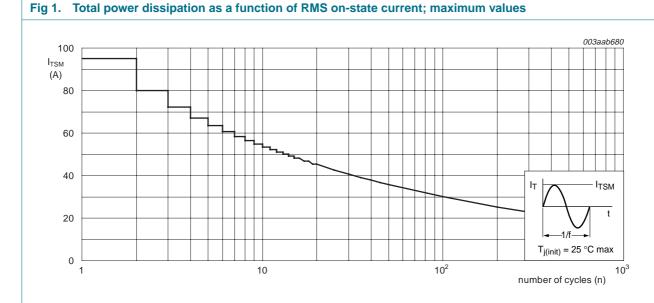
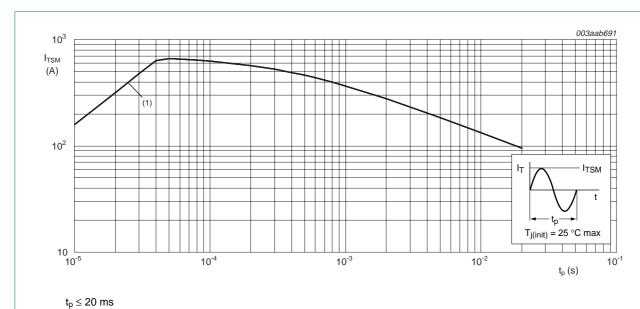


Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

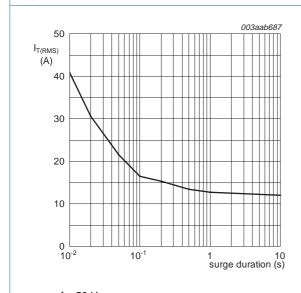
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(1) dl_T/dt limit

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



f = 50 Hz $T_{mb} = 126$ °C

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

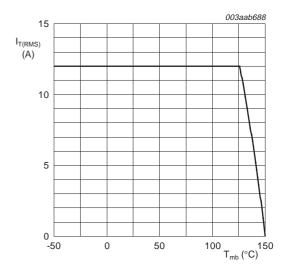
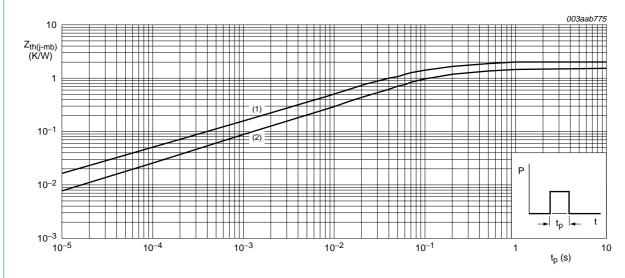


Fig 5. RMS on-state current as a function of mounting base temperature; maximum values

5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	half cycle; see Figure 6	-	-	2.0	K/W
		full cycle; see Figure 6	-	-	1.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on printed circuit board; minimum footprint	-	55	-	K/W



- (1) Unidirectional (half cycle)
- (2) Bidirectional (full cycle)

Fig 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Static characteristics

Table 5. Static characteristics

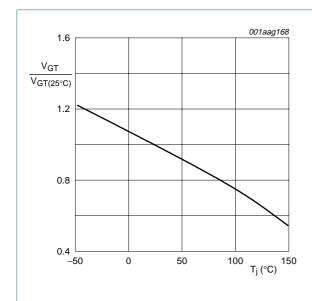
 $T_i = 25 \,^{\circ}C$ unless otherwise specified.

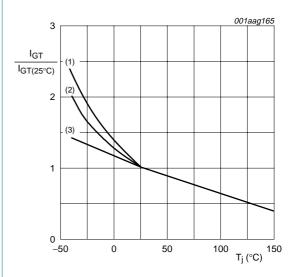
Symbol	Parameter	Conditions		BTA312B-600CT			BTA312B-800ET		
				Тур	Max	Min	Тур	Max	
I _{GT}	gate trigger	$V_D = 12 \text{ V; } I_T = 0.1 \text{ A; see } \frac{\text{Figure 8}}{}$	'	'	'	'	'	'	
	current	T2+ G+	2	-	35	-	-	10	mΑ
		T2+ G-	2	-	35	-	-	10	mΑ
		T2- G-	2	-	35	-	-	10	mΑ
I _L latching current	V _D = 12 V; I _{GT} = 0.1 A; see <u>Figure 10</u>								
		T2+ G+	-	-	50	-	-	25	mΑ
		T2+ G-	-	-	60	-	-	30	mΑ
		T2- G-	-	-	50	-	-	25	mΑ
I _H	holding current	V _D = 12 V; I _{GT} = 0.1 A; see <u>Figure 11</u>	-	-	35	-	-	15	mΑ
V_{T}	on-state voltage	I _T = 15 A; see <u>Figure 9</u>	-	1.3	1.6	-	1.3	1.6	V
V_{GT}	gate trigger	$V_D = 12 \text{ V; } I_T = 0.1 \text{ A; see } Figure 7$	-	8.0	1.5	-	0.7	1.5	V
	voltage	$V_D = 400 \text{ V}; I_T = 0.1 \text{ A}; T_j = 150 ^{\circ}\text{C}$	0.25	-	-	0.25	-	-	V
I _D	off-state current	$V_D = V_{DRM(max)}$; $T_j = 150 ^{\circ}C$	-	0.4	2	-	0.4	2	mA

7. Dynamic characteristics

Table 6. Dynamic characteristics

Symbol	Parameter	Conditions	BTA312B-600CT			BTA312B-800ET			Unit
				Тур	Max	Min	Тур	Max	
dV _D /dt	rate of rise of off-state voltage	$V_{DM} = 0.67 \times V_{DRM(max)}$; $T_j = 150$ °C; exponential waveform; gate open circuit	300	-	-	30	-	-	V/μs
dl _{com} /dt rate of change of commutating current		$V_{DM} = 400 \text{ V}; T_j = 150 ^{\circ}\text{C}; I_{T(RMS)} = 12 \text{ A};$ without snubber; gate open circuit	8	-	-	2	-	-	A/ms
	$V_{DM} = 400 \text{ V}; T_j = 150 ^{\circ}\text{C}; I_{T(RMS)} = 12 \text{ A};$ dV/dt = 10 V/µs; gate open circuit	13	-	-	3.5	-	-	A/ms	
		$V_{DM} = 400 \text{ V}; T_j = 150 ^{\circ}\text{C}; I_{T(RMS)} = 12 \text{ A};$ dV/dt = 1 V/µs; gate open circuit	20	-	-	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

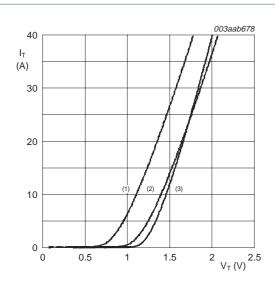




- (1) T2-G-
- (2) T2+ G-
- (3) T2+ G+

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

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



 $V_o = 1.127 \text{ V}$ $R_s = 0.027 \Omega$

(1) $T_i = 150 \,^{\circ}\text{C}$; typical values

(2) $T_j = 150 \,^{\circ}\text{C}$; maximum values

(3) $T_j = 25$ °C; maximum values

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

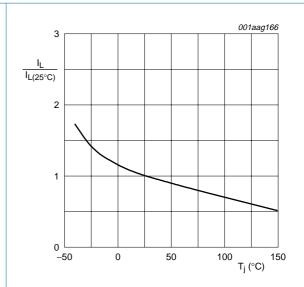


Fig 10. Normalized latching current as a function of junction temperature

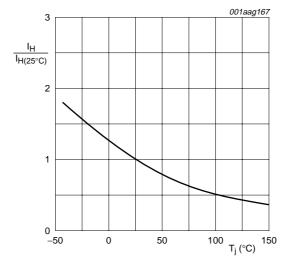


Fig 11. Normalized holding current as a function of junction temperature

8. Package outline

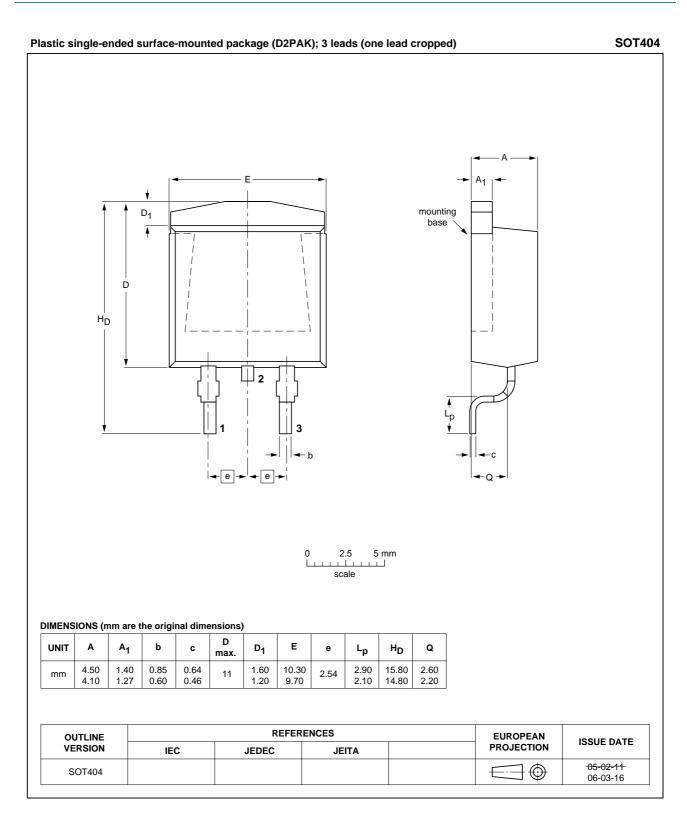


Fig 12. Package outline SOT404 (D2PAK)

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9. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA312B_SER_CT_ET_1	20070411	Product data sheet	-	-

12 A Three-quadrant triacs high commutation high temperature

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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.

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- [2] The term 'short data sheet' is explained in section "Definitions"
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BTA312B series CT and ET

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Date of release: 11 April 2007

Document identifier: BTA312B_SER_CT_ET_1