

# BTA16, BTB16 and T16 Series

#### SNUBBERLESS™, LOGIC LEVEL & STANDARD

# 16A TRIACs

#### Table 1: Main Features

Symbol	Value	Unit
I <sub>T(RMS)</sub>	16	А
V <sub>DRM</sub> /V <sub>RRM</sub>	600, 700 and 800	V
I <sub>GT (Q1</sub> )	10 to 50	mA

#### DESCRIPTION

Available either in through-hole or surface-mount packages, the **BTA16**, **BTB16** and **T16** triac series is suitable for general purpose AC switching. They can be used as an ON/OFF function in applications such as static relays, heating regulation, induction motor starting circuits... or for phase control operation in light dimmers, motor speed controllers, ...

The snubberless versions (BTA/BTB...W and T16 series) are specially recommended for use on inductive loads, thanks to their high commutation performances. By using an internal ceramic pad, the BTA series provides voltage insulated tab (rated at  $2500V_{RMS}$ ) complying with UL standards (File ref.: E81734).



#### **Table 2: Order Codes**

Part Number	Marking
BTA16-xxxxxRG	See page table 8 on
BTB16-xxxxRG	page 8
T16xx-xxxG	page o

# BTA16, BTB16 and T16 Series

Symbol	Parame	eter		Value	Unit
I <sub>T(RMS)</sub>	RMS on-state current (full sine	$\begin{array}{ c c c } D^2 PAK / & T_c = 100^{\circ} \\ TO-220AB & \end{array}$		16	A
, ,	wave)	TO-220AB Ins.	$T_c = 15^{\circ}C$		
Irou	Non repetitive surge peak on-state	F = 50 Hz	t = 20 ms	160	А
ITSM	current (full cycle, $T_j$ initial = 25°C)	F = 60 Hz	t = 16.7 ms	168	
l²t	I <sup>2</sup> t Value for fusing	t <sub>p</sub> = 10 ms	144	A²s	
dl/dt	Critical rate of rise of on-state current $I_G$ = 2 x $I_{GT}$ , $t_r \leq$ 100 ns	F = 120 Hz $T_j = 125^{\circ}C$		50	A/µs
V <sub>DSM</sub> /V <sub>RSM</sub>	Non repetitive surge peak off-state $t_p = 10 \text{ ms}$ $T_j = 25^{\circ}\text{C}$		V <sub>DSM</sub> /V <sub>RSM</sub> + 100	V	
I <sub>GM</sub>	Peak gate current	4	А		
P <sub>G(AV)</sub>	Average gate power dissipation	1	W		
T <sub>stg</sub> T <sub>j</sub>	Storage junction temperature range Operating junction temperature range	- 40 to + 150 - 40 to + 125	°C		

# Tables 4: Electrical Characteristics (T<sub>j</sub> = $25^{\circ}C$ , unless otherwise specified)

# ■ SNUBBERLESS and Logic Level (3 quadrants)

Symbol	Symbol Test Conditions Quadr			T16	T16 BTA16 / BTB16		B16	Unit
Symbol		Quadrant		T1635	SW	CW	BW	Omit
I <sub>GT</sub> (1)	$V_{\rm D} = 12  \text{V}  \text{R}_{\rm I} = 33  \Omega$	-    -	MAX.	35	10	35	50	mA
V <sub>GT</sub>	vD = 12 v 11[ = 00 32	-    -	MAX.		1	.3		V
V <sub>GD</sub>			MIN.		0	.2		V
I <sub>H</sub> (2)	I <sub>T</sub> = 500 mA	U	MAX.	35	15	35	50	mA
ΙL	I <sub>G</sub> = 1.2 I <sub>GT</sub>	-	MAX.	50	25	50	70	mA
·L		I	101/1/1	60	30	60	80	
dV/dt (2)	$V_D = 67 \% V_{DRM}$ gate open $T_j = 1$		MIN.	500	40	500	1000	V/µs
	(dV/dt)c = 0.1 V/µs	T <sub>j</sub> = 125°C		-	8.5	-	-	
(dl/dt)c (2)	(dV/dt)c = 10 V/µs	T <sub>j</sub> = 125°C	MIN.	-	3.0	-	-	A/ms
	Without snubber	$T_j = 125^{\circ}C$		8.5	-	8.5	14	

Symbol	Symbol Test Conditions			BTA16 / BTB16		Unit	
Symbol	Test conditions	Quadrant		С	В		
I <sub>GT</sub> (1)	$V_{\rm D} = 12  V  R_{\rm L} = 33  \Omega$	-    -      V	MAX.	25 50	50 100	mA	
V <sub>GT</sub>		ALL	MAX.	1.3		V	
V <sub>GD</sub>	$V_D = V_{DRM}$ $R_L = 3.3 \text{ k}\Omega$ $T_j = 125^{\circ}\text{C}$	ALL	MIN.	0.2		V	
I <sub>H</sub> (2)	I <sub>T</sub> = 500 mA		MAX.	25	50	mA	
I <sub>I</sub>	I <sub>G</sub> = 1.2 I <sub>GT</sub>	I - III - IV	MAX.	40	60	mA	
Ľ			MIAX.	80	120		
dV/dt (2)	$V_{D} = 67 \% V_{DRM}$ gate open	T <sub>j</sub> = 125°C	MIN.	200	400	V/µs	
(dV/dt)c (2)	(dl/dt)c = 7 A/ms	T <sub>j</sub> = 125°C	MIN.	5	10	V/µs	

## Standard (4 quadrants)

## **Table 5: Static Characteristics**

Symbol	Test Co		Value	Unit	
V <sub>T</sub> (2)	$I_{TM} = 22.5 \text{ A}$ $t_p = 380 \ \mu \text{s}$	$T_j = 25^{\circ}C$	MAX.	1.55	V
V <sub>to</sub> (2)	Threshold voltage	T <sub>j</sub> = 125°C	MAX.	0.85	V
R <sub>d</sub> (2)	Dynamic resistance	T <sub>j</sub> = 125°C	MAX.	25	mΩ
I <sub>DRM</sub>	V <sub>DRM</sub> = V <sub>RRM</sub>	T <sub>j</sub> = 25°C	MAX.	5	μA
I <sub>RRM</sub>	VDRM – VRRM	T <sub>j</sub> = 125°C		2	mA

Note 1: minimum  $I_{GT}$  is guaranted at 5% of  $I_{GT}$  max.

Note 2: for both polarities of A2 referenced to A1.

## Table 6: Thermal resistance

Symbol		Parameter			Unit
Bu a x	Junction to case (AC)		D <sup>2</sup> PAK / TO-220AB	1.2	°C/W
R <sub>th(j-c)</sub>			TO-220AB Insulated	2.1	0/11
Bullers	$R_{th(j-a)}$ Junction to ambient $S = 1 \text{ cm}^2$		D <sup>2</sup> PAK	45	°C/W
' 'th(j-a)			TO-220AB / TO-220AB Insulated	60	0/11

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S = Copper surface under tab.

Figure 1: Maximum power dissipation versus RMS on-state current (full cycle)



#### Figure 3: RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35µm) (full cycle)



Figure 5: On-state characteristics (maximum values)



Figure 2: RMS on-state current versus case temperature (full cycle)



Figure 4: Relative variation of thermal impedance versus pulse duration



Figure 6: Surge peak on-state current versus number of cycles



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Figure 7: Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10$  ms and corresponding value of  $l^2t$ 



Figure 9: Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values) (Snubberless & Logic level types)



Figure 11: D<sup>2</sup>PAK Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 µm)



Figure 8: Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)



Figure 10: Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values) (Standard types)



## BTA16, BTB16 and T16 Series





#### Figure 13: Ordering Information Scheme (T16 series)



#### **Table 7: Product Selector**

Part Numbers		Voltage (xxx)		Sensitivity	Type	Paakaga
Fait Nullibers	600 V	700 V	800 V	- Sensitivity	Туре	Package
BTA/BTB16-xxxB	Х	Х	Х	50 mA	Standard	TO-220AB
BTA/BTB16-xxxBW	Х	Х	Х	50 mA	Snubberless	TO-220AB
BTA/BTB16-xxxC	Х	Х	Х	25 mA	Standard	TO-220AB
BTA/BTB16-xxxCW	Х	Х	Х	35 mA	Snubberless	TO-220AB
BTA/BTB16-xxxSW	Х	Х	Х	10 mA	Logic level	TO-220AB
T1635-xxxG	Х		Х	35 mA	Snubberless	D <sup>2</sup> PAK

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BTB: non insulated TO-220AB package



			DIMEN	SIONS		
REF.	Mi	Millimeters				
	Min.	Тур.	Max.	Min.	Тур.	Max.
А	4.30		4.60	0.169		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
В	0.70		0.93	0.027		0.037
B2	1.25	1.40		0.048	0.055	
С	0.45		0.60	0.017		0.024
C2	1.21		1.36	0.047		0.054
D	8.95		9.35	0.352		0.368
E	10.00		10.28	0.393		0.405
G	4.88		5.28	0.192		0.208
L	15.00		15.85	0.590		0.624
L2	1.27		1.40	0.050		0.055
L3	1.40		1.75	0.055		0.069
R		0.40			0.016	
V2	0°		8°	0°		8°

Figure 14: D<sup>2</sup>PAK Package Mechanical Data

## Figure 15: D<sup>2</sup>PAK Foot Print Dimensions (in millimeters)



57





## Figure 16: TO-220AB Package Mechanical Data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

#### **Table 8: Ordering Information**

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
BTA/BTB16-xxxyzRG	BTA/BTB16xxxyz	TO-220AB	2.3 g	50	Tube
T1635-xxxG	T1635xxxG	D <sup>2</sup> PAK	1.5 g	50	Tube
T1635-xxxG-TR	T1635xxxG	DTAK	1.5 g	1000	Tape & reel

**Note:** xxx = voltage, yy = sensitivity, z = type

#### **Table 9: Revision History**

Date	Revision	Description of Changes
Oct-2002	6A	Last update.
13-Feb-2006	7	TO-220AB delivery mode changed from bulk to tube. ECOPACK statement added.

47/

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57