

# BTA24, BTB24, BTA25, BTA26 and T25 series

# 25 A Triacs

### **Main features**

Symbol	Value	Unit
I <sub>T(RMS)</sub>	25	А
V <sub>DRM</sub> /V <sub>RRM</sub>	600 and 800	V
I <sub>GT (Q1</sub> )	35 to 50	mA

### Description

Available either in through-hole or surface-mount packages, the **BTA24**, **BTB24**, **BTA25**, **BTA26** and **T25** 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 T25 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).

### Order codes

Part Number	Marking
BTA24-xxxxRG	
BTB24-xxxxRG	
BTA25-xxxxRG	See Table 6 on page 6
BTA26-xxxxRG	See Table 0 on page 0
T25xx-xxxG	
T25xx-xxxG-TR	

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### 1 Characteristics

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Symbol	Symbol Parameter					
		D <sup>2</sup> PAK / TO-220AB	$T_c = 100^\circ C$			
I <sub>T(RMS)</sub>	RMS on-state current (full sine wave)	RD91 / TOP3 Ins.	$T_c = 90^\circ C$	25	А	
		TO-220AB Ins.	T <sub>c</sub> = 75° C			
1	Non repetitive surge peak on-state	F = 50 Hz	t = 20 ms	250	^	
<sup>I</sup> TSM	$I_{TSM}$ current (full cycle, $T_j$ initial = 25° C)	F = 60 Hz	t = 16.7 ms	260	A	
ľt	I <sup>2</sup> t Value for fusing	t <sub>p</sub> = 10 ms		340	A <sup>2</sup> s	
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 <sub>j</sub> = 125° C	50	A/µs	
V <sub>DSM</sub> /V <sub>RSM</sub>	Non repetitive surge peak off-state voltage	t <sub>p</sub> = 10 ms	T <sub>j</sub> = 25° C	V <sub>DSM</sub> /V <sub>RSM</sub> + 100	V	
I <sub>GM</sub>	Peak gate current	t <sub>p</sub> = 20 μs	$T_j = 125^\circ C$	4	А	
P <sub>G(AV)</sub>	Average gate power dissipation		T <sub>j</sub> = 125° C	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	

#### Table 1. Absolute maximum ratings

# Table 2. Electrical characteristics (T<sub>j</sub> = 25° C, unless otherwise specified), Snubberless™ and Logic Level (3 quadrants) T25-G, BTA/BTB24...W, BTA25...W, BTA26...W

Symbol	Test Conditions	Quadrant		T25	BTA/BTB		Unit
	Test Conditions	Quadrant		T2535	CW	BW	Unit
I <sub>GT</sub> <sup>(1)</sup>	V = 12 V P = 22 O	-    -	MAX.	35	35	50	mA
V <sub>GT</sub>	$V_D = 12 V R_L = 33 \Omega$	-    -	MAX.		1.3		V
V <sub>GD</sub>		1 - 11 - 111	MIN.		0.2		V
I <sub>H</sub> <sup>(2)</sup>	I <sub>T</sub> = 500 mA	L	MAX.	50	50	75	mA
IL	1 1.21	-	MAX.	70	70	80	mA
Ľ	$I_{G} = 1.2 I_{GT}$	II	IVIAA.	80	80	100	IIIA
dV/dt <sup>(2)</sup>	$V_D = 67 \% V_{DRM}$ gate open	T <sub>j</sub> = 125° C	MIN.	500	500	1000	V/µs
(dl/dt)c (2)	Without snubber	T <sub>j</sub> = 125° C	MIN.	13	13	22	A/ms

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

2. for both polarities of A2 referenced to A1.



Symbol	Test Conditions	Quadrant		Value	Unit
I <sub>GT</sub> <sup>(1)</sup>	$V_{\rm D} = 12  {\rm V}  {\rm R}_{\rm L} = 33  {\Omega}$	I - II - III - IV	MAX.	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> <sup>(2)</sup> )	I <sub>T</sub> = 500 mA		MAX.	80	mA
	1 101	I - III - IV	MAX.	70	
١L	$I_{G} = 1.2 I_{GT}$	II	MAX.	160	mA
dV/dt <sup>(2)</sup>	$V_D = 67 \% V_{DRM}$ gate open	T <sub>j</sub> = 125° C	MIN.	500	V/µs
(dV/dt)c <sup>(2)</sup>	(dl/dt)c = 13.3 A/ms	$T_j = 125^\circ C$	MIN.	10	V/µs

Table 3.Electrical characteristics ( $T_j = 25^\circ$  C, unless otherwise specified),<br/>Standard (4 quadrants), BTB24...B, BTA25...B, BTA26...B

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

2. for both polarities of A2 referenced to A1.

#### Table 4.Static characteristics

Symbol	Test Co	Value	Unit		
V <sub>T</sub> <sup>(1)</sup>	I <sub>TM</sub> = 35 A t <sub>p</sub> = 380 μs	$T_j = 25^\circ C$	MAX.	1.55	V
V <sub>t0</sub> <sup>(1)</sup>	Threshold voltage	T <sub>j</sub> = 125° C	MAX.	0.85	V
R <sub>d</sub> <sup>(1)</sup>	Dynamic resistance $T_j = 125^{\circ} C$ MAX.		16	mΩ	
I <sub>DRM</sub>		$T_j = 25^\circ C$	MAX.	5	μA
I <sub>RRM</sub>	$V_{DRM} = V_{RRM}$	$T_j = 125^\circ C$		3	mA

1. for both polarities of A2 referenced to A1.

#### Table 5.Thermal resistance

Symbol	Pa	Value	Unit	
		D <sup>2</sup> PAK / TO-220AB	0.8	
R <sub>th(j-c)</sub>	Junction to case (AC)	RD91 (Insulated) / TOP3 Insulated	1.1	° C/W
		TO-220AB Insulated	1.7	
	$^{(1)}S = 1 \text{ cm}^2$	D <sup>2</sup> PAK	45	
R <sub>th(j-a)</sub>	Junction to ambient	TOP3 Insulated	50	° C/W
		TO-220AB / TO-220AB Insulated	60	-

1. S = Copper surface under tab.



#### Figure 1. Maximum power dissipation versus Figure 2. RMS on-state current (full cycle)



BTA24

BTA25

T<sub>C</sub>(°C)

50

BTB / T25

125

100

IT(RMS)(A)

25

30

25

20

15

10

5

0

0





Relative variation of thermal impedance versus pulse duration

75



Figure 5. On-state characteristics (maximum values)

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





#### Figure 7. Non-repetitive surge peak on-state Figure 8. current for a sinusoidal pulse with width $t_p < 10$ ms and corresponding value of l<sup>2</sup>t





#### Figure 9. decrease of main current versus (dV/dt)c (typical values)

Relative variation of critical rate of Figure 10. Relative variation of critical rate of decrease of main current versus (dV/dt)c



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





### 2 Ordering information scheme

#### Figure 12. BTA and BTB series

	BT	A 2	4 - (	5 <b>00</b>	BW	R
Triac series						
Insulation A = insulated B = non insulated						
<u>Current</u> 24 = 25A in TO-220AB 25 = 25A in RD91 26 = 25A in TOP3						
Voltage 600 = 600V 800 = 800V						
Sensitivity and type B = 50mA Standard CW = 35mA Snubberless	BW = 50mA Snu	ibberle	ess			
Packing mode RG = Tube						

#### Figure 13. T25 series

Triac series Current 25 = 25A Sensitivity	T 25 35 - 600	G (-TR)
35 = 35mÅ		
Voltage 600 = 600V 800 = 800V		
Package G = D <sup>2</sup> PAK		
Packing mode Blanck = Tube -TR = Tape & Reel		

#### Table 6.Product Selector

Part Numbers	Voltage (xxx)		Sensitivity	Туре	Package
Fait Numbers	600 V	800 V	Sensitivity	туре	гаскауе
BTA24-xxxBRG	Х	Х	50 mA	Standard	TO-220AB
BTA/BTB <sup>(1)</sup> 24-xxxBWRG	Х	Х	50 mA	Snubberless	TO-220AB
BTA/BTB <sup>(1)</sup> 24-xxxCWRG	Х	Х	35 mA	Snubberless	TO-220AB
BTA25-xxxBRG	Х	Х	50 mA	Standard	RD91
BTA25-xxxBWRG	Х	Х	50 mA	Snubberless	RD91
BTA25-xxxCWRG	Х	Х	35 mA	Snubberless	RD91
BTA26-xxxBRG	Х	Х	50 mA	Standard	TOP3 Ins.
BTA26-xxxBWRG	Х	Х	50 mA	Snubberless	TOP3 Ins.
BTA26-xxxCWRG	Х	Х	35 mA	Snubberless	TOP3 Ins.
T2535-xxxG	Х	Х	35 mA	Snubberless	D <sup>2</sup> PAK

1. BTB: non insulated TO-220AB package



### 3 Package information

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Table 7.D<sup>2</sup>PAK Package dimensions





			DIMENSIONS				
	REF.	Millim	neters	rs Inches			
		Min.	Max.	Min.	Max.		
A2	Α		40.00		1.575		
	A1	29.90	30.30	1.177	1.193		
	A2		22.00		0.867		
	В		27.00		1.063		
	B1	13.50	16.50	0.531	0.650		
	B2		24.00		0.945		
	С		14.00		0.551		
N2 N1	C1		3.50		0.138		
I I I I I I I I I I I I I I I I I I I	C2	1.95	3.00	0.077	0.118		
	E3	0.70	0.90	0.027	0.035		
	F	4.00	4.50	0.157	0.177		
← A →	Ι	11.20	13.60	0.441	0.535		
	L1	3.10	3.50	0.122	0.138		
	L2	1.70	1.90	0.067	0.075		
	N1	33°	43°	33°	43°		
	N2	28°	38°	28°	38°		

 Table 8.
 RD91 Package dimensions



			DIMENSIONS						
		REF.	Mi	illimete	ers		Inches		
			Min.	Тур.	Max.	Min.	Тур.	Max.	
<mark>⊧ H</mark>	A	А	4.4		4.6	0.173		0.181	
R ØL	<b>B</b> →→	В	1.45		1.55	0.057		0.061	
ĸ		С	14.35		15.60	0.565		0.614	
		D	0.5		0.7	0.020		0.028	
F G		Е	2.7		2.9	0.106		0.114	
		F	15.8		16.5	0.622		0.650	
₽→← C		G	20.4		21.1	0.815		0.831	
		Н	15.1		15.5	0.594		0.610	
		J	5.4		5.65	0.213		0.222	
	E	К	3.4		3.65	0.134		0.144	
		ØL	4.08		4.17	0.161		0.164	
		Р	1.20		1.40	0.047		0.055	
		R		4.60			0.181		

#### Table 9. TOP3 Insulated package dimensions



		DIMENSIONS					
	REF.	Millimeters			Inches		
		Min.	Тур.	Max.	Min.	Тур.	Max.
	А	15.20		15.90	0.598		0.625
	a1		3.75			0.147	
B C C	a2	13.00		14.00	0.511		0.551
	В	10.00		10.40	0.393		0.409
	۶ b1	0.61		0.88	0.024		0.034
	b2	1.23		1.32	0.048		0.051
14 I <u>3</u>	С	4.40		4.60	0.173		0.181
	c1	0.49		0.70	0.019		0.027
12a2	c2	2.40		2.72	0.094		0.107
	е	2.40		2.70	0.094		0.106
	ı F	6.20		6.60	0.244		0.259
l⇔	ØI	3.75		3.85	0.147		0.151
	14	15.80	16.40	16.80	0.622	0.646	0.661
	L	2.65		2.95	0.104		0.116
	12	1.14		1.70	0.044		0.066
	13	1.14		1.70	0.044		0.066
	М		2.60			0.102	

 Table 10.
 TO-220AB (Insulated and non-insulated) Package dimensions

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.



## 4 Ordering information

Ordering type	Marking	Package	Weight	Base qty	Delivery mode	
BTA/BTB24-xxxyyzRG	BTA/BTB24xxxyyz	TO-220AB	2.3 g	50	Tube	
BTA25-xxxyyzRG	BTA25-xxxyyz	RD91	20 g	25	Bulk	
BTA26-xxxyzRG	BTA26-xxxyyz	TOP3 Ins.	4.5 g	30	Tube	
T2535-xxxG	T2535xxxG	D <sup>2</sup> PAK	1.5 g	50	Tube	
T2535-xxxG-TR	T2535xxxG	UPAN		1000	Tape and reel	

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

### 5 Revision History

Date	Revision	Description of Changes
Oct-2002	6A	Previous update.
13-Feb-2006	7	TO-220AB delivery mode changed from bulk to tube. ECOPACK statement added.
31-May-2006	8	Reformatted to current standard. $\rm T_{c}$ in figure 3 changed to $\rm T_{amb}$
31-Jul-2006	9	Typing error corrected on page 1 (BTB124 instead of BTB24)

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