

## Snubberless™, logic level and standard 8 A Triacs

### Features

- On-state rms current,  $I_{T(RMS)}$  8 A
- Repetitive peak off-state voltage,  $V_{DRM}/V_{RRM}$  600 to 800 V
- Triggering gate current,  $I_{GT}(Q_1)$  5 to 50 mA

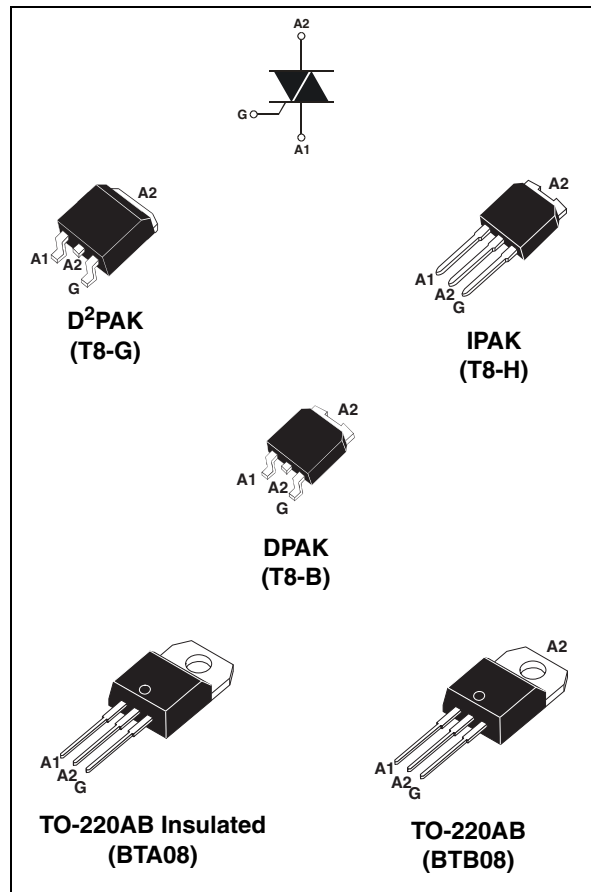
### Description

Available either in through-hole or surface-mount packages, the **BTA08**, **BTB08** and **T8** 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 T8 series) are specially recommended for use on inductive loads, thanks to their high commutation performances.

Logic level versions are designed to interface directly with low power drivers such as microcontrollers.

By using an internal ceramic pad, the BTA series provides voltage insulated tab (rated at 2500  $V_{RMS}$ ) complying with UL standards (file ref.: E81734).



# 1 Characteristics

**Table 1. Absolute maximum ratings**

Symbol	Parameter		Value	Unit	
$I_{T(RMS)}$	On-state rms current (full sine wave)	IPAK/D <sup>2</sup> PAK/DPAK/ TO-220AB	$T_c = 110\text{ °C}$	8	A
		TO-220AB Ins.	$T_c = 100\text{ °C}$		
$I_{TSM}$	Non repetitive surge peak on-state current (full cycle, $T_j$ initial = 25 °C)	F = 50 Hz	t = 20 ms	80	A
		F = 60 Hz	t = 16.7 ms	84	
$I^2t$	$I^2t$ value for fusing	$t_p = 10\text{ ms}$		36	A <sup>2</sup> s
dI/dt	Critical rate of rise of on-state current $I_G = 2$ $\times I_{GT}$ , $t_r \leq 100\text{ ns}$	F = 120 Hz	$T_j = 125\text{ °C}$	50	A/ $\mu$ s
$I_{GM}$	Peak gate current	$t_p = 20\text{ }\mu$ s	$T_j = 125\text{ °C}$	4	A
$P_{G(AV)}$	Average gate power dissipation		$T_j = 125\text{ °C}$	1	W
$T_{stg}$ $T_j$	Storage junction temperature range Operating junction temperature range			- 40 to + 150 - 40 to + 125	°C

**Table 2. Electrical characteristics ( $T_j = 25\text{ °C}$ , unless otherwise specified)  
Snubberless and logic level (3 quadrants)**

Symbol	Test conditions	Quadrant		T8		BTA08 / BTB08				Unit	
				T810	T835	TW	SW	CW	BW		
$I_{GT}^{(1)}$	$V_D = 12\text{ V}$ $R_L = 30\text{ }\Omega$	I - II - III	MAX.	10	35	5	10	35	50	mA	
$V_{GT}$		I - II - III	MAX.	1.3						V	
$V_{GD}$	$V_D = V_{DRM}$ $R_L = 3.3\text{ k}\Omega$ $T_j = 125\text{ °C}$	I - II - III	MIN.	0.2						V	
$I_H^{(2)}$	$I_T = 100\text{ mA}$		MAX.	15	35	10	15	35	50	mA	
$I_L$	$I_G = 1.2 I_{GT}$		I - III	MAX.	25	50	10	25	50	70	mA
			II	MAX.	30	60	15	30	60	80	
dV/dt <sup>(2)</sup>	$V_D = 67\% V_{DRM}$ gate open $T_j = 125\text{ °C}$		MIN.	40	400	20	40	400	1000	V/ $\mu$ s	
(dI/dt) <sub>c</sub> <sup>(2)</sup>	$(dV/dt)_c = 0.1\text{ V}/\mu$ s $T_j = 125\text{ °C}$		MIN.	5.4	-	3.5	5.4	-	-	A/ms	
	$(dV/dt)_c = 10\text{ V}/\mu$ s $T_j = 125\text{ °C}$			2.8	-	1.5	2.98	-	-		
	Without snubber $T_j = 125\text{ °C}$			-	4.5	-	-	4.5	7		

**Table 3. Standard (4 quadrants)**

Symbol	Test conditions	Quadrant		BTA08 / BTB08		Unit
				C	B	
$I_{GT}^{(1)}$	$V_D = 12\text{ V}, R_L = 33\ \Omega$	I - II - III IV	MAX.	25 50	50 100	mA
$V_{GT}$		ALL	MAX.	1.3		V
$V_{GD}$	$V_D = V_{DRM}, R_L = 3.3\text{ k}\Omega, T_j = 125\text{ }^\circ\text{C}$	ALL	MIN.	0.2		V
$I_H^{(2)}$	$I_T = 500\text{ mA}$		MAX.	25	50	mA
$I_L$	$I_G = 1.2 I_{GT}$	I - III - IV	MAX.	40	50	mA
		II		80	100	
$dV/dt^{(2)}$	$V_D = 67\% V_{DRM}$ gate open	$T_j = 125\text{ }^\circ\text{C}$	MIN.	200	400	V/ $\mu\text{s}$
$(dV/dt)_c^{(2)}$	$(dI/dt)_c = 5.3\text{ A/ms}$	$T_j = 125\text{ }^\circ\text{C}$	MIN.	5	10	V/ $\mu\text{s}$

**Table 4. Static characteristics**

Symbol	Test conditions			Value	Unit
$V_{TM}^{(1)}$	$I_{TM} = 11\text{ A}, t_p = 380\ \mu\text{s}$	$T_j = 25\text{ }^\circ\text{C}$	MAX.	1.55	V
$V_{t0}^{(2)}$	Threshold voltage	$T_j = 125\text{ }^\circ\text{C}$	MAX.	0.85	V
$R_d^{(2)}$	Dynamic resistance	$T_j = 125\text{ }^\circ\text{C}$	MAX.	50	m $\Omega$
$I_{DRM}$ $I_{RRM}$	$V_{DRM} = V_{RRM}$	$T_j = 25\text{ }^\circ\text{C}$	MAX.	5	$\mu\text{A}$
		$T_j = 125\text{ }^\circ\text{C}$		1	mA

1. minimum  $I_{GT}$  is guaranteed at 5% of  $I_{GT}$  max.
2. for both polarities of A2 referenced to A1.

**Table 5. Thermal resistance**

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case (AC)	IPAK / D <sup>2</sup> PAK / DPAK / TO-220AB	1.6	$^\circ\text{C/W}$
		TO-220AB Insulated	2.5	
$R_{th(j-a)}$	Junction to ambient	S = 1 cm <sup>2</sup> D <sup>2</sup> PAK	45	$^\circ\text{C/W}$
		S = 0.5 cm <sup>2</sup> DPAK	70	
		TO-220AB / TO-220AB Insulated	60	
		IPAK	100	

S = Copper surface under tab.

Figure 1. Maximum power dissipation versus rms on-state current (full cycle)

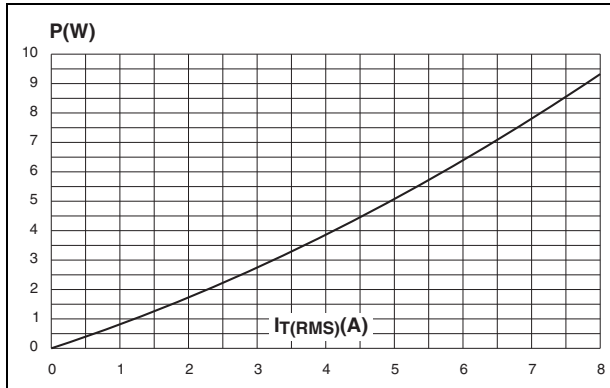


Figure 2. On-state rms current versus case temperature (full cycle)

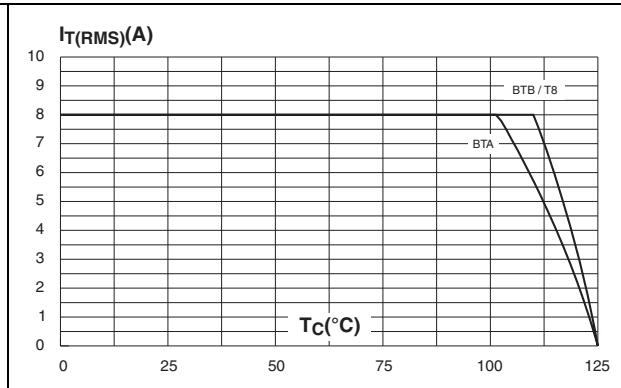


Figure 3. On-state rms current versus ambient temperature (full cycle)

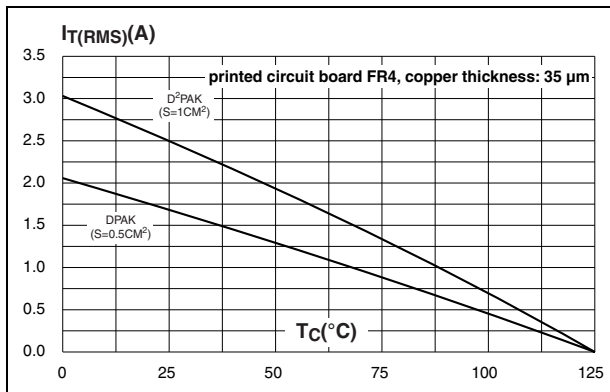


Figure 4. Relative variation of thermal impedance versus pulse duration

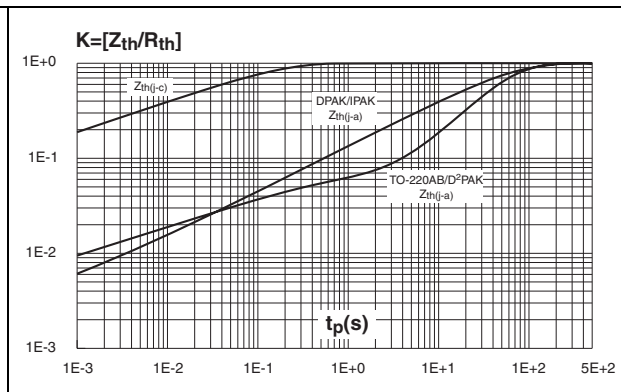


Figure 5. On-state characteristics (maximum values)

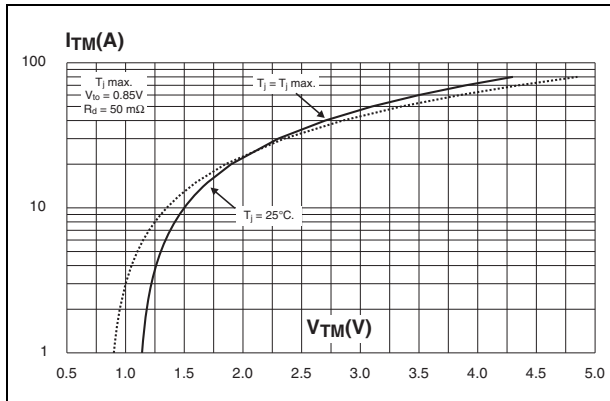


Figure 6. Surge peak on-state current versus number of cycles

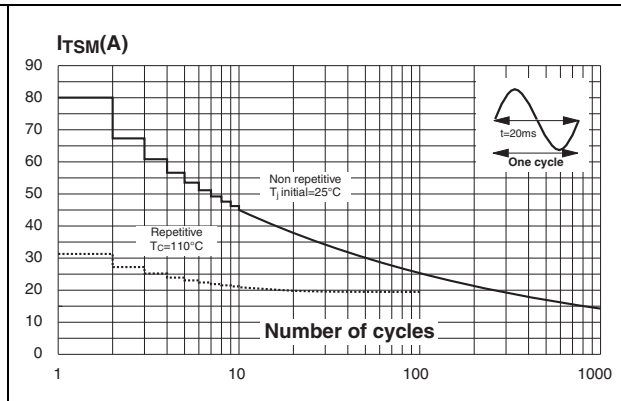


Figure 7. Non-repetitive surge peak on-state current for a sinusoidal

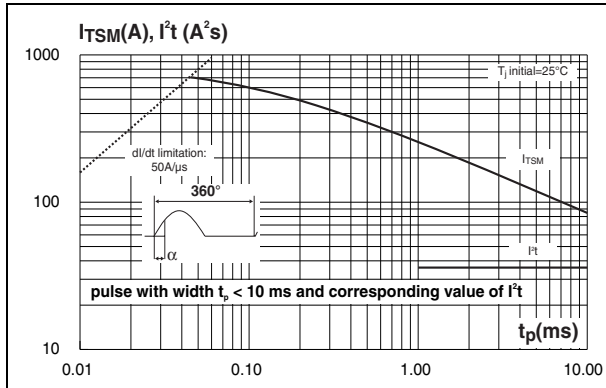


Figure 8. Relative variation of gate trigger current

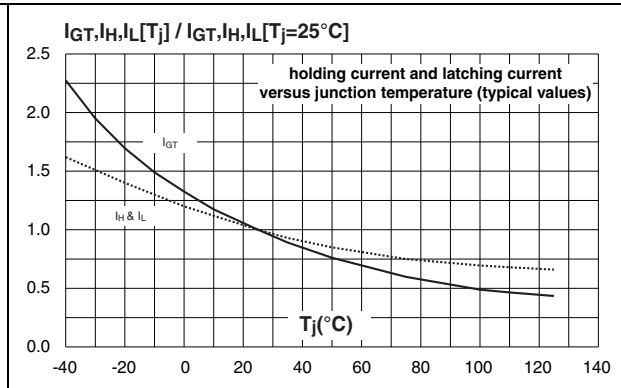


Figure 9. Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)

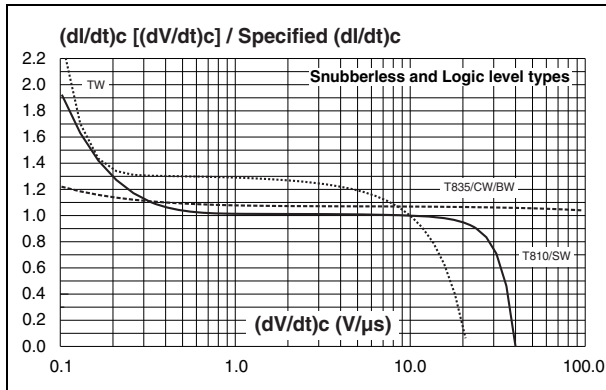


Figure 10. Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)

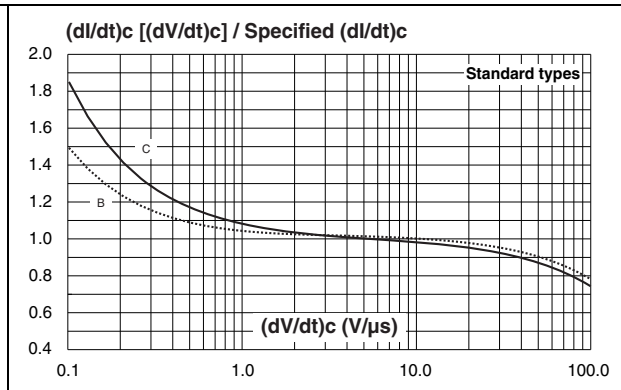


Figure 11. Relative variation of critical rate of decrease of main current versus junction temperature

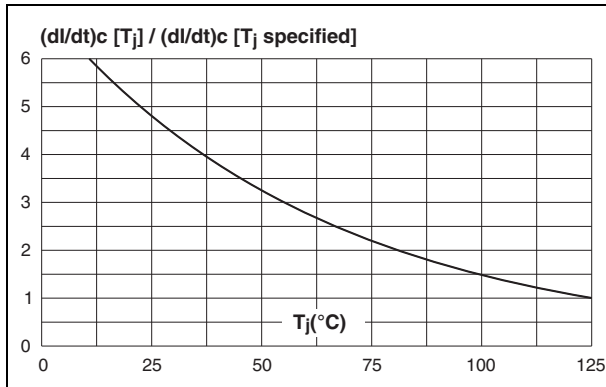
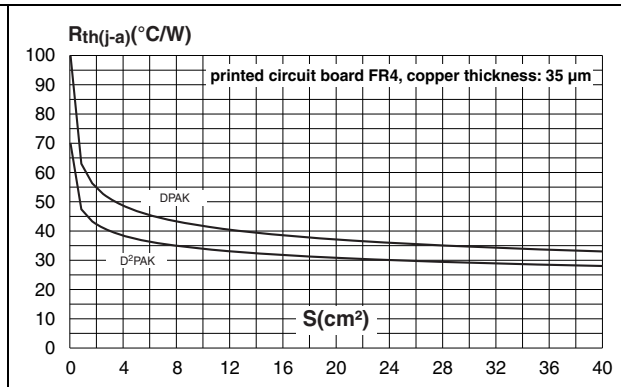


Figure 12. DPAK and D<sup>2</sup>PAK thermal resistance junction to ambient versus copper surface area under tab



## 2 Package information

- Epoxy meets UL94, V0
- Lead-free packages

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

**Table 6. D<sup>2</sup>PAK dimensions**

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	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
B	0.70		0.93	0.027		0.037
B2	1.25	1.40		0.048	0.055	
C	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 13. Footprint (dimensions in mm)**

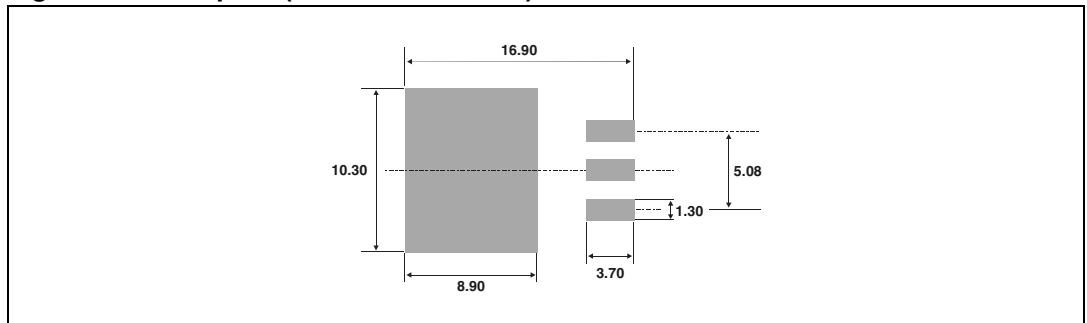


Table 7. DPAK dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.20	2.40	0.086	0.094
A1	0.90	1.10	0.035	0.043
A2	0.03	0.23	0.001	0.009
B	0.64	0.90	0.025	0.035
B2	5.20	5.40	0.204	0.212
C	0.45	0.60	0.017	0.023
C2	0.48	0.60	0.018	0.023
D	6.00	6.20	0.236	0.244
E	6.40	6.60	0.251	0.259
G	4.40	4.60	0.173	0.181
H	9.35	10.10	0.368	0.397
L2	0.80 typ.		0.031 typ.	
L4	0.60	1.00	0.023	0.039
V2	0°	8°	0°	8°

Figure 14. Footprint (dimensions in mm)

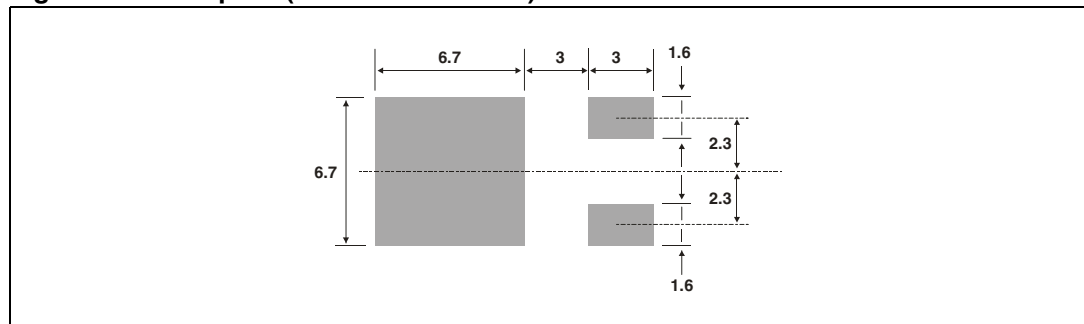
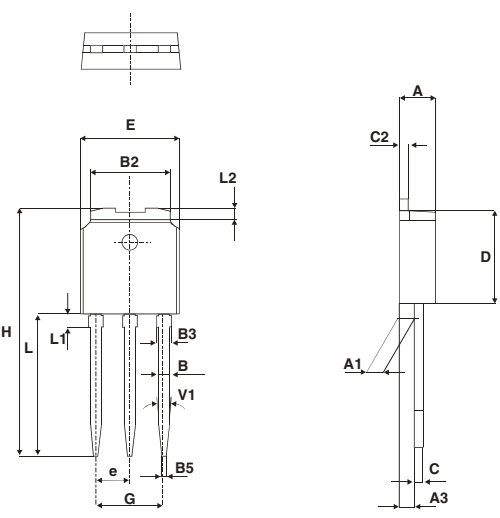


Table 8. IPAK dimensions



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.20		2.40	0.086		0.094
A1	0.90		1.10	0.035		0.043
A3	0.70		1.30	0.027		0.051
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.212
B3			0.95			0.037
B5		0.30			0.035	
C	0.45		0.60	0.017		0.023
C2	0.48		0.60	0.019		0.023
D	6		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
e		2.28			0.090	
G	4.40		4.60	0.173		0.181
H		16.10			0.634	
L	9		9.40	0.354		0.370
L1	0.8		1.20	0.031		0.047
L2		0.80	1		0.031	0.039
V1		10°			10°	



TO-220AB (NIns. and Ins. 20-up) dimensions

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
e	2.40		2.70	0.094		0.106
F	6.20		6.60	0.244		0.259
ØI	3.75		3.85	0.147		0.151
I4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
I2	1.14		1.70	0.044		0.066
I3	1.14		1.70	0.044		0.066
M		2.60			0.102	

### 3 Ordering information

Figure 15. Ordering information scheme (BTA08 and BTB08 series)

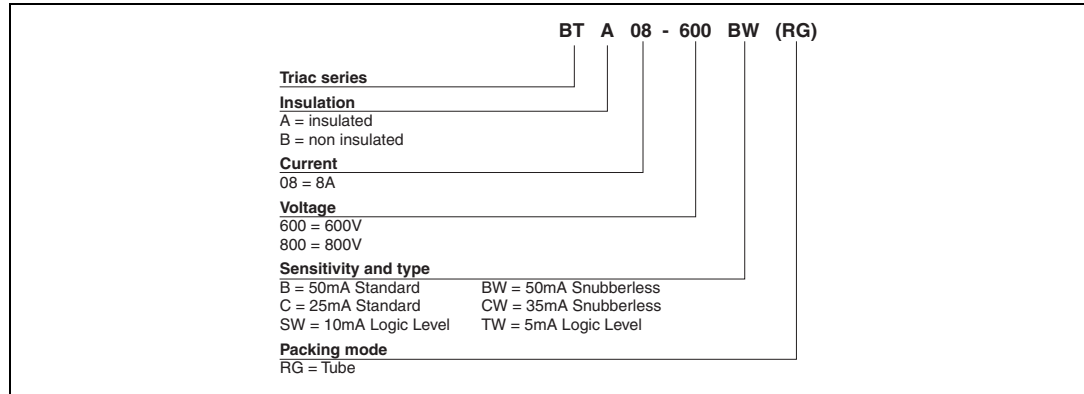


Figure 16. Ordering information scheme (T8 series)

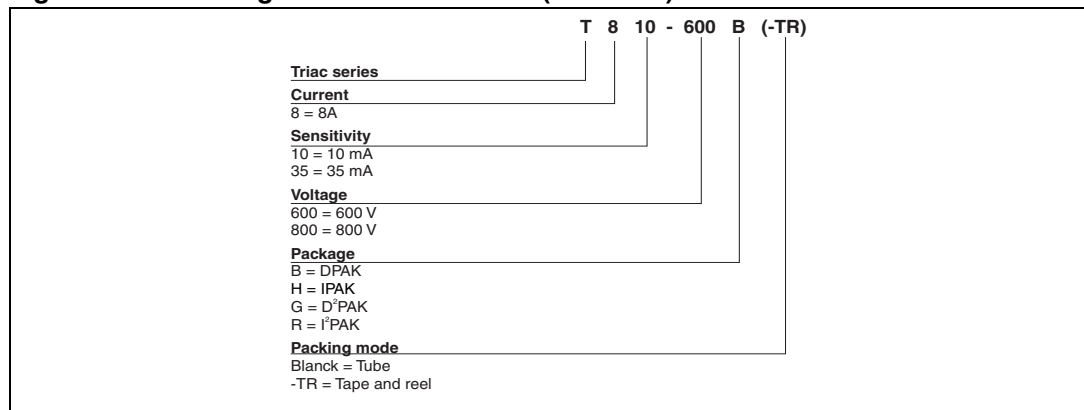


Table 9. Product Selector

Part Number	Voltage (xxx)		Sensitivity	Type	Package
	600 V	800 V			
BTA/BTB08-xxxB	X	X	50 mA	Standard	TO-220AB
BTA/BTB08-xxxBW	X	X	50 mA	Snubberless	TO-220AB
BTA/BTB08-xxxC	X	X	25 mA	Standard	TO-220AB
BTA/BTB08-xxxCW	X	X	35 mA	Snubberless	TO-220AB
BTA/BTB08-xxxSW	X	X	10 mA	Logic level	TO-220AB
BTA/BTB08-xxxTW	X	X	5 mA	Logic Level	TO-220AB
T810-xxxG	X	X	10 mA	Logic Level	D <sup>2</sup> PAK
T810-xxxH	X	X	10 mA	Logic Level	IPAK
T835-xxxB	X	X	35 mA	Snubberless	DPAK
T835-xxxG	X	X	35 mA	Snubberless	D <sup>2</sup> PAK
T835-xxxH	X	X	35 mA	Snubberless	IPAK

**BTB:** non insulated TO-220AB package

## 4 Ordering information

**Table 10. Ordering information**

Order code	Marking	Package	Weight	Base qty	Delivery mode
BTA/BTB08-xxxzyzRG	BTA/BTB08-xxxzyz	TO-220AB	2.3 g	50	Tube
T8yy-xxxG	T8yyxx	D <sup>2</sup> PAK	1.5 g	50	Tube
T8yy-xxxG-TR	T8yyxx			1000	Tape and reel
T8yy-xxxB	T8yyxx	DPAK	0.3 g	75	Tube
T8yy-xxxB-TR	T8yyxx			2500	Tape and reel
T8yy-xxxH	T8yyxx	IPAK	0.4 g	75	Tube

xxx = voltage, yy = sensitivity, z = type

## 5 Revision history

**Table 11. Document revision history**

Date	Revision	Changes
Apr-2002	5A	Last update.
13-Feb-2006	6	TO-220AB delivery mode changed from bulk to tube. ECOPACK statement added.
10-Mar-2010	7	Updated ECOPACK statement and <a href="#">Figure 16</a> .

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