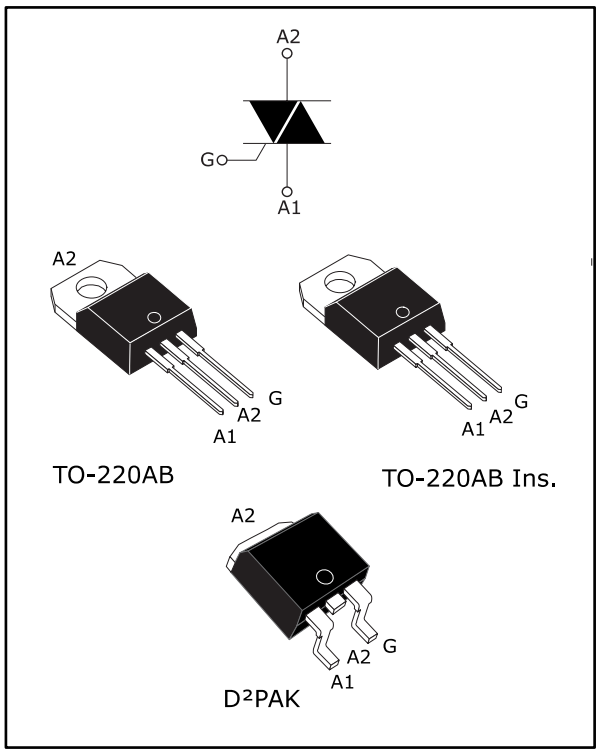
BTA12, BTB12, T12xx

12 A Snubberless™, logic level and standard Triacs

Datasheet - production data



Features

- Medium current Triac
- Low thermal resistance with clip bonding
- Low thermal resistance insulation ceramic for insulated BTA
- High commutation (4Q) or very high commutation (3Q) capability
- BTA series UL1557 certified (file ref: 81734)
- Packages are RoHS (2002/95/EC) compliant

Applications

ON/OFF or phase angle function in applications such as static relays, light dimmers and appliance motors speed controllers.

The Snubberless™ versions (BTA/BTB...W and T12 series) are especially recommended for use on inductive loads, because of their high commutation performance. The BTA series provide an insulated tab (rated at 2500 V_{RMS}).

Description

Available either in through-hole or surface mount packages, the BTA12, BTB12 and T12xx Triac series are suitable for general purpose mains power AC switching.

Table 1: Device summary

Symbol	T12xx	BTA12	BTB12
$I_{T(RMS)}$	12	12	12
V_{DRM}/V_{RRM}	600/800		
I_{GT}(Snubberless)	5/10/35/50		
I_{GT}(standard)	-	25/50	

1 Characteristics

Table 2: Absolute maximum ratings

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	I²PAK / D²PAK / TO-220AB	T_c = 105 °C	12	A
		TO-220AB Ins.	T_c = 90 °C		
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_j initial = 25 °C)	F = 50 Hz	t_p = 20 ms	120	A
		F = 60 Hz	t_p = 16.7 ms	126	
I^2t	I^2t value for fusing		t_p = 10 ms	78	A^2s
dI/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 °C	50	A/µs
V_{DSM}/V_{RSM}	Non repetitive surge peak off-state voltage	t_p = 10 ms	T_j = 25 °C	V_{DRM}/V_{RRM} + 100	V
I_{GM}	Peak gate current	t_p = 20 µs	T_j = 125 °C	4	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 125 °C	1	W
T_{stg}	Storage junction temperature range			-40 to +150	°C
T_j	Operating junction temperature range			-40 to +125	°C

Table 3: Electrical characteristics (T_j = 25 °C, unless otherwise specified) - Snubberless and logic level Triac (3 quadrants)

Symbol	Parameter	Quadrant		T1205 BTB12-TW BTA12-TW	T1210 BTB12-SW BTA12-SW	T1235 BTB12-CW BTA12-CW	T1250 BTB12-BW BTA12-BW	Unit
I_{GT}(1)	V_D = 12 V, R_L = 30 Ω	I - II - III	Max.	5	10	35	50	mA
V_{GT}			Max.	1.3				V
V_{GD}	V_D = V_{DRM}, R_L = 3.3 kΩ, T_j = 125 °C		Min.	0.2				V
I_L	I_G = 1.2 x I_{GT}	I - III II	Max.	10 15	25 30	50 60	70 80	mA
I_H(2)	I_{TM} = 100 mA		Max.	10	15	35	50	mA
dV/dt(2)	V_D = 67 % V_{DRM} gate open, 125 °C		Min.	20	40	500	1000	V/µs
(dI/dt)c(2)	(dV/dt)c = 0.1 V/µs, 125 °C		Min.	3.5	6.5			A/ms
	(dV/dt)c = 10 V/µs, 125 °C			1	2.9			
	Without snubber, 125 °C					6.5	12	

Notes:

(1)Minimum I_{GT} is guaranteed at 5% of I_{GT} max.

(2)For both polarities of A2 referenced to A1

Table 4: Electrical characteristics (T_j = 25 °C, unless otherwise specified) - standard Triac (4 quadrants)

Symbol	Parameter	Quadrant		Value		Unit
				C	B	
I_{GT}(1)	V_D = 12 V, R_L = 30 Ω	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 kΩ, T_j = 125 °C	All	Min.	0.2		V
I_L	I_G = 1.2 x I_{GT}	I - III - IV II	Max.	40 80	50 100	mA
I_H(2)	I_{TM} = 500 mA		Max.	25	50	mA
dV/dt(2)	V_D = 67 % V_{DRM}, gate open, 125 °C		Min.	200	400	V/µs
(dV/dt)c(2)	(dI/dt)c = 5.3 A/ms, 125 °C		Min.	5	10	

Notes:

(1)Minimum I_{GT} is guaranteed at 5% of I_{GT} max.

(2)For both polarities of A2 referenced to A1.

Table 5: Static electrical characteristics

Symbol	Test Conditions	T_j		Value	Unit
V_{TM}(1)	I_{TM} = 17 A, t_p = 380 µs	25 °C	Max.	1.55	V
V_{TO}(2)	threshold on-state voltage	125 °C	Max.	0.85	V
R_D(2)	Dynamic resistance	125 °C	Max.	35	mΩ
I_{DRM}/I_{RRM}	V_{DRM} = V_{RRM}	25 °C	Max.	5	µA
		125 °C		1	mA

Notes:

(1)For both polarities of A2 referenced to A1

Table 6: Thermal resistance

Symbol	Parameter			Value	Unit
$R_{th(j-c)}$	Junction to case (AC)	D²PAK / TO-220AB	Max.	1.4	°C/W
		TO-220AB insulated		2.3	
$R_{th(j-a)}$	Junction to ambient (S = 1 cm²)(1)	D²PAK	Typ.	45	
	Junction to ambient	TO-220AB / TO-220AB insulated	Typ.	60	

Notes:

(1)Copper surface under tab.

1.1 Characteristics (curves)

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

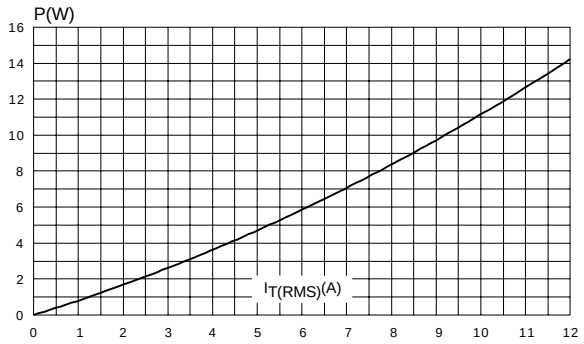


Figure 2: RMS on-state current versus case temperature (full cycle)

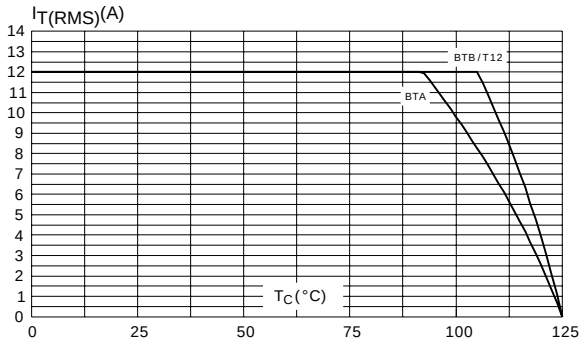


Figure 3: RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35 µm) (full cycle)

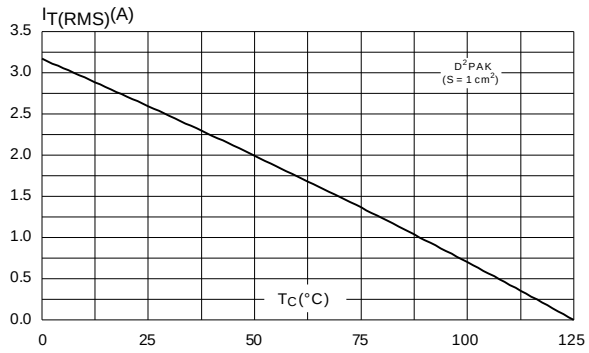


Figure 4: Relative variation of thermal impedance versus pulse duration

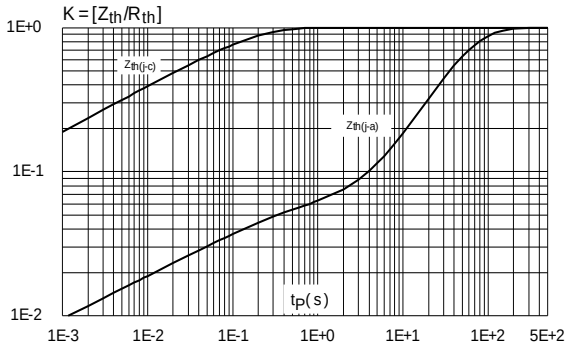


Figure 5: On-state characteristics (maximum values)

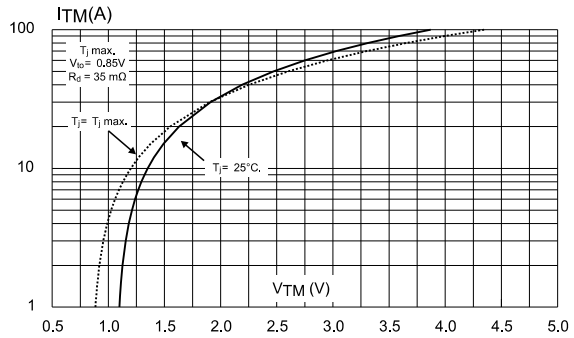


Figure 6: Surge peak on-state current versus number of cycles

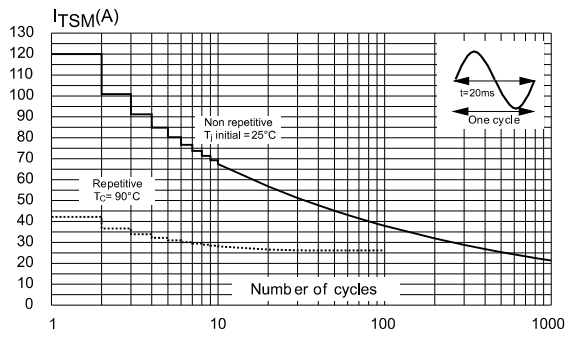


Figure 7: Non-repetitive surge peak on-state current

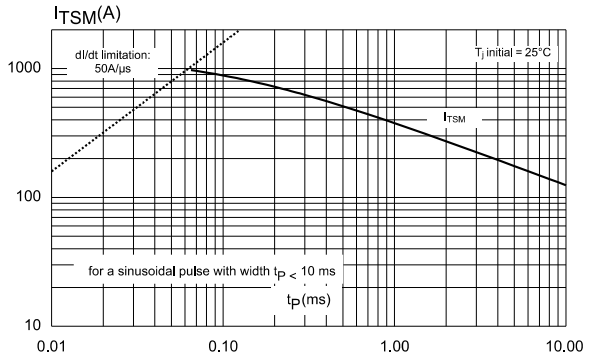


Figure 8: Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)

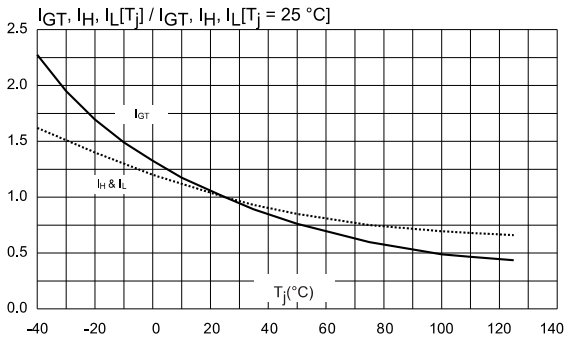


Figure 9: Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)

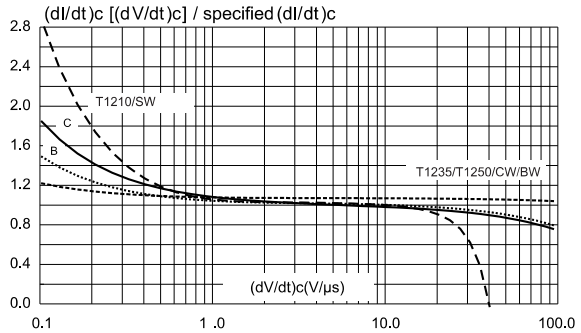


Figure 10: Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values) (TW)

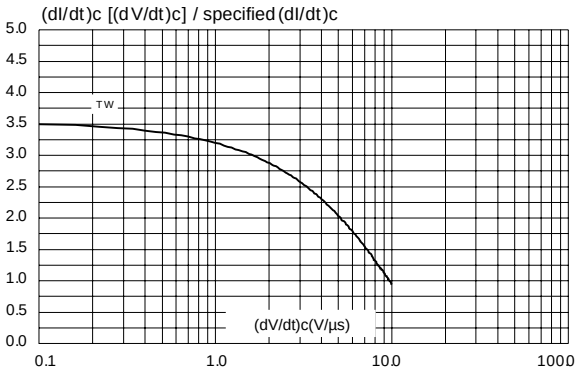


Figure 11: Relative variation of critical rate of decrease of main current versus junction temperature

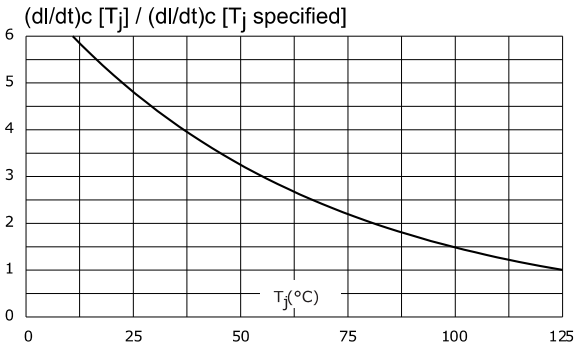
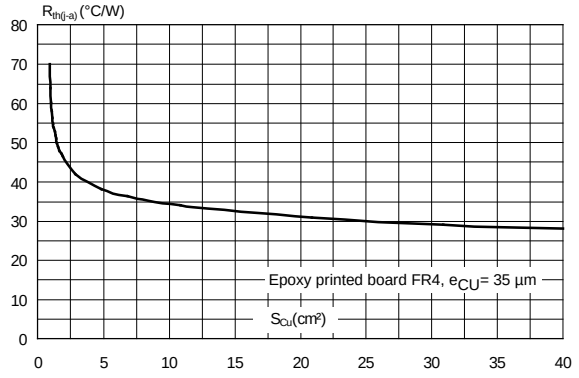


Figure 12: Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 µm)



2 Package information

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***. ECOPACK® is an ST trademark.

- Epoxy meets UL 94,V0
- Lead-free package

2.1 D²PAK package information

Figure 13: D²PAK package outline

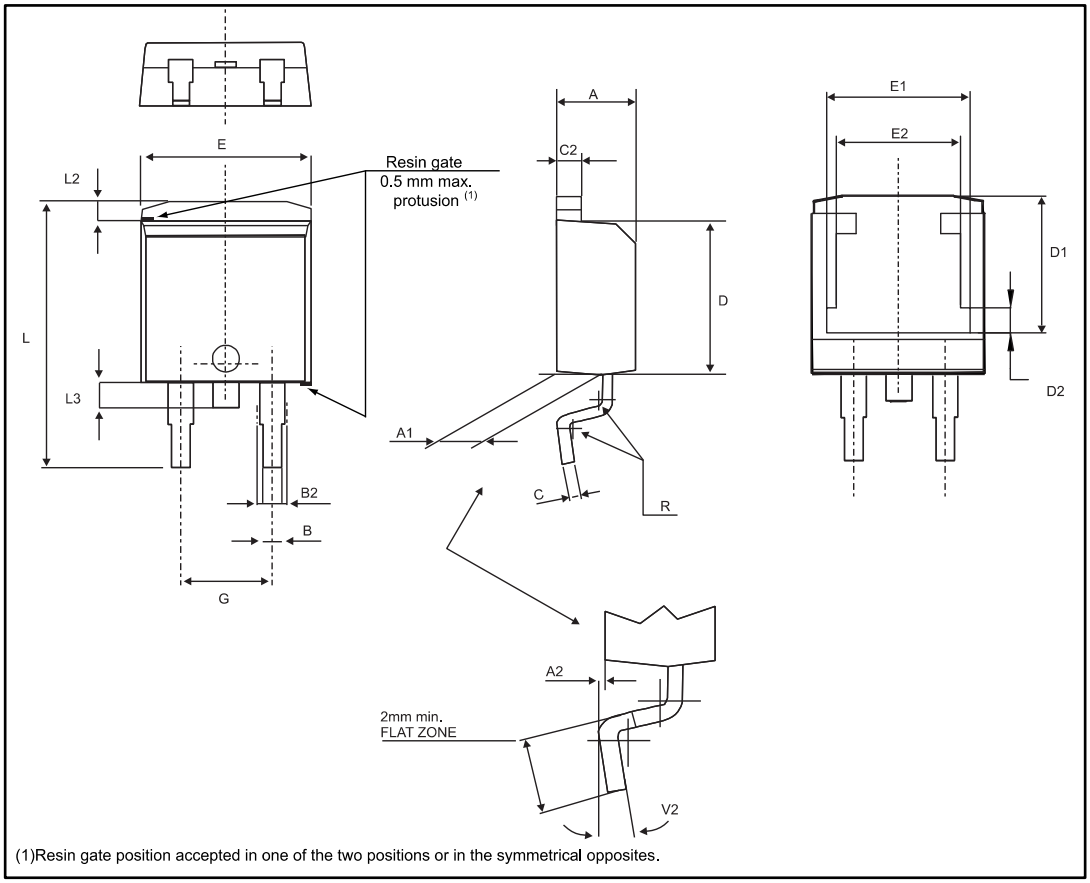


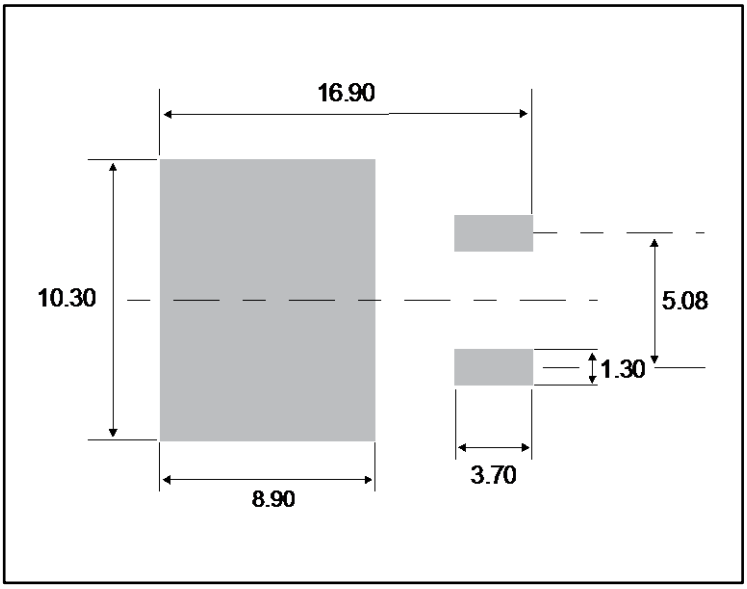
Table 7: D²PAK package mechanical data

Ref.	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.30		4.60	0.1693		0.1811
A1	2.49		2.69	0.0980		0.1059
A2	0.03		0.23	0.0012		0.0091
B	0.70		0.93	0.0276		0.0366
B2	1.25	1.40		0.0492	0.0551	
C	0.45		0.60	0.0177		0.0236
C2	1.21		1.36	0.0476		0.0535
D	8.95		9.35	0.3524		0.3681
D1	7.50		8.00	0.2953		0.3150
D2	1.30		1.70	0.0512		0.0669
E	10.00		10.28	0.3937		0.4047
E1	8.30		8.70	0.3268		0.3425
E2	6.85		7.25	0.2697		0.2854
G	4.88		5.28	0.1921		0.2079
L	15		15.85	0.5906		0.6240
L2	1.27		1.40	0.0500		0.0551
L3	1.40		1.75	0.0551		0.0689
R		0.40			0.0157	
V2	0°		8°	0°		8°

Notes:

[1]Dimensions in inches are given for reference only

Figure 14: D²PAK recommended footprint (dimensions are in mm)



2.2 TO-220AB (NIns. and Ins.) package information

Figure 15: TO-220AB (NIns. and Ins.) package outline

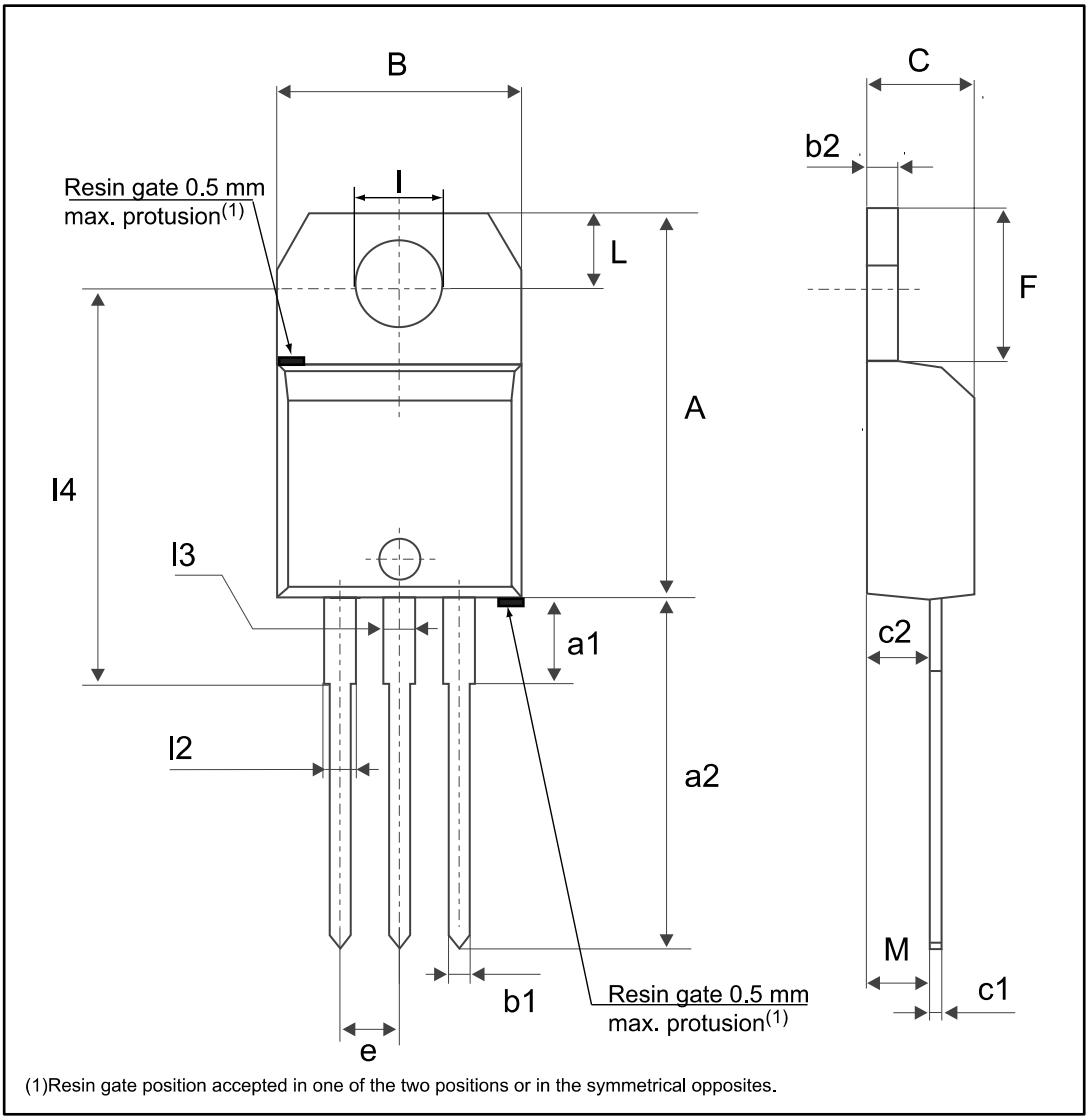


Table 8: TO-220AB (NIns. and Ins.) package mechanical data

Ref.	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.5984		0.6260
a1		3.75			0.1476	
a2	13.00		14.00	0.5118		0.5512
B	10.00		10.40	0.3937		0.4094
b1	0.61		0.88	0.0240		0.0346
b2	1.23		1.32	0.0484		0.0520
C	4.40		4.60	0.1732		0.1811
c1	0.49		0.70	0.0193		0.0276
c2	2.40		2.72	0.0945		0.1071
e	2.40		2.70	0.0945		0.1063
F	6.20		6.60	0.2441		0.2598
I	3.73		3.88	0.1469		0.1528
L	2.65		2.95	0.1043		0.1161
l2	1.14		1.70	0.0449		0.0669
l3	1.14		1.70	0.0449		0.0669
l4	15.80	16.40	16.80	0.6220	0.6457	0.6614
M		2.6			0.1024	

Notes:

(1)Inch dimensions are for reference only.

3 Ordering information

Figure 16: BTA12 and BTB12 series ordering information scheme

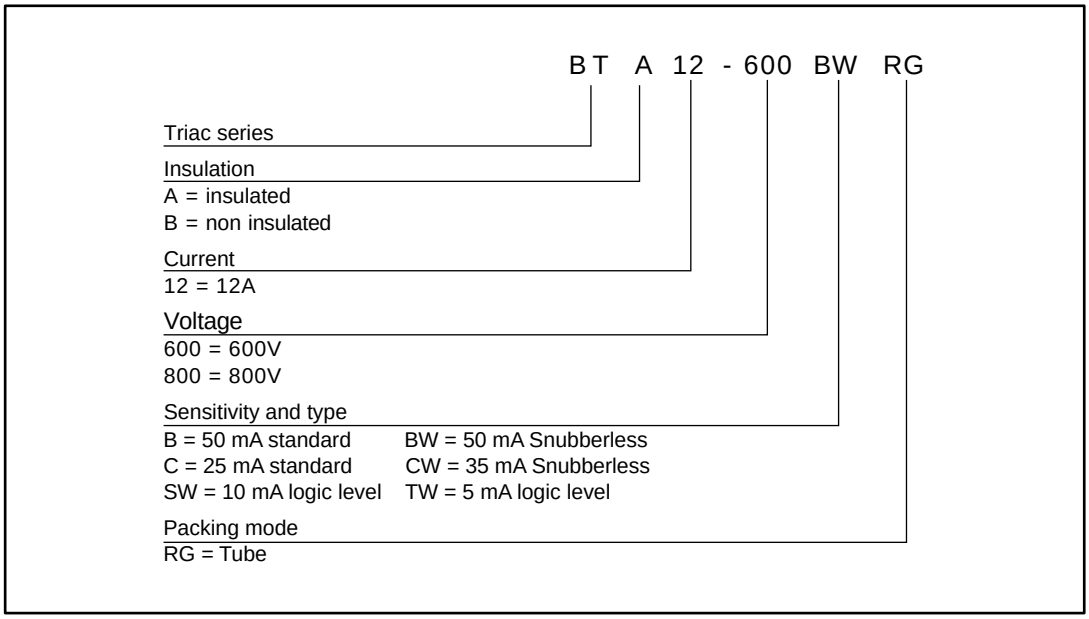


Figure 17: T12xx series ordering information scheme

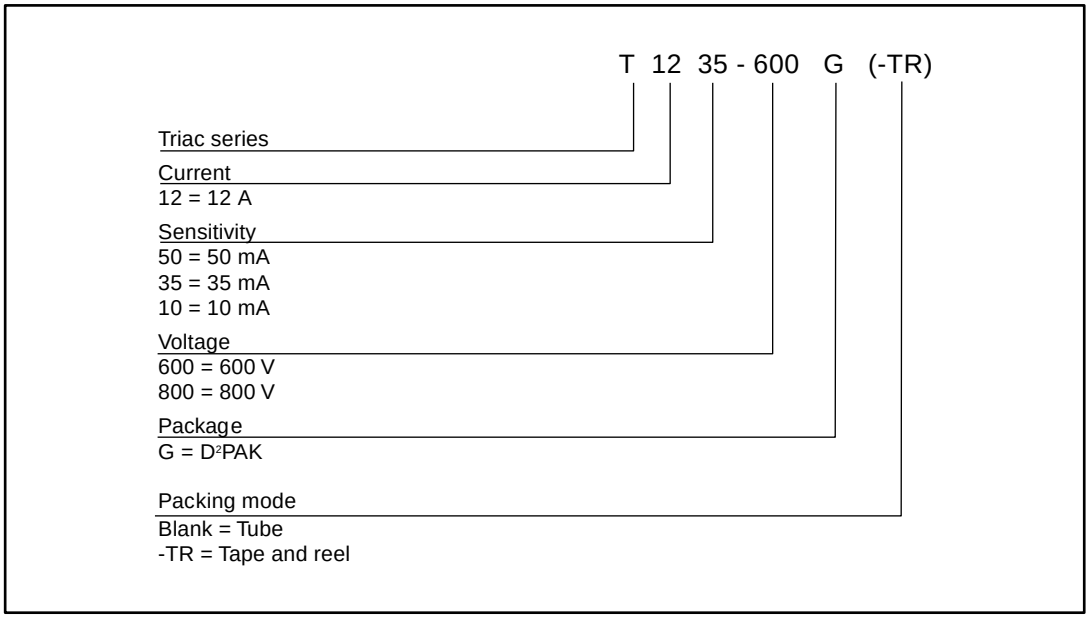


Table 9: Product selector

Part number	Voltage (xxx)		Sensitivity	Type	Package
	600	800			
BTB12-600C	X		25 mA	Standard	TO-220AB
BTB12-600B	X		50 mA	Standard	TO-220AB
BTB12-600TW	X		5 mA	Snubberless™	TO-220AB
BTB12-600SW	X		10 mA	Snubberless™	TO-220AB
BTB12-xxxCW	X	X	35 mA	Snubberless™	TO-220AB
BTB12-600BW	X		50 mA	Snubberless™	TO-220AB
BTA12-600C	X		25 mA	Standard	TO-220AB Ins.
BTA12-xxxB	X	X	50 mA	Standard	TO-220AB Ins.
BTA12-600TW	X		5 mA	Snubberless™	TO-220AB Ins.
BTA12-xxxSW	X	X	10 mA	Snubberless™	TO-220AB Ins.
BTA12-xxxCW	X	X	35 mA	Snubberless™	TO-220AB Ins.
BTA12-xxxBW	X	X	50 mA	Snubberless™	TO-220AB Ins.
T1205-600G	X		5 mA	Snubberless™	D²PAK
T1210-6G	X		10 mA	Snubberless™	D²PAK
T1210-800G		X	10 mA	Snubberless™	D²PAK
T1235-xxxG	X	X	35 mA	Snubberless™	D²PAK
T1250-600G	X		50 mA	Snubberless™	D²PAK

Table 10: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
BTA12-600BRG	BTA12-600B	TO-220AB Ins.	1.9 g	50	Tube
BTA12-600BWRG	BTA12-600BW				
BTA12-600CRG	BTA12-600C				
BTA12-600CWRG	BTA12-600CW				
BTA12-600SWRG	BTA12-600SW				
BTA12-600TWRG	BTA12-600TW				
BTA12-800BRG	BTA12-800B				
BTA12-800BWRG	BTA12-800BW				
BTA12-800CWRG	BTA12-800CW				
BTA12-800SWRG	BTA12-800SW				
BTB12-600BRG	BTB12-600B	TO-220AB			
BTB12-600BWRG	BTB12-600BW				
BTB12-600CRG	BTB12-600C				
BTB12-600CWRG	BTB12-600CW				
BTB12-600SWRG	BTB12-600SW				
BTB12-600TWRG	BTB12-600TW				
BTB12-800CWRG	BTB12-800CW				
T1205-600G-TR	T1205-600G	D²PAK	1.38 g	1000	Tape and reel 13"
T1210-6G-TR	T1210-6G				
T1210-800G-TR	T1210-800G				
T1235-600G-TR	T1235-600G				
T1235-800G-TR	T1235-800G				
T1250-600G-TR	T1250-600G				
T1210-6G	T1210-6G			50	Tube
T1235-600G	T1235-600G				

4 Revision history

Table 11: Document revision history

Date	Revision	Changes
Sep-2002	6A	Last update.
25-Mar-2005	7	1. I2PAK package added. 2. TO-220AB delivery mode changed from bulk to tube.
27-May-2005	8	T1210 added
28-Sep-2007	9	Reformatted to current standards. T1250 added
02-Feb-2017	10	Removed I²PAK package. Updated *Figure 7: "Non-repetitive surge peak on-state current"* and *Table 9: "Product selector"* and *Table 10: "Ordering information"*.

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