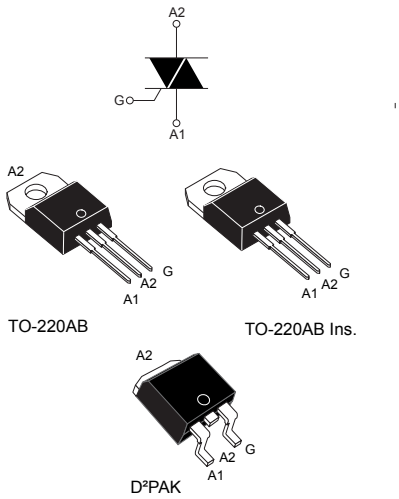
T1610, T1635, T1650
BTA16, BTB16

Datasheet

Snubberless, logic level and standard 16 A Triacs



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, Snubberless) capability
- Packages are RoHS (2011/65/EU) compliant
- Insulated tab BTA series, rated at 3500 V_{RMS})

Applications

- Snubberless versions (BTA/BTB...W and T1635) especially recommended for use on inductive loads, because of their high commutation performances
- On/off or phase angle function in applications such as static relays, light dimmers and appliance motor speed controllers

Description

Available either in through-hole or surface mount packages, the BTA16, BTB16 and T1610, T1635 and T1650 Triac series are suitable for general purpose mains power AC switching. They can be used as ON/OFF function in applications such as static
relays, heating regulation or induction motor starting circuit. They are also recommended for phase control operations in light dimmers and appliance motors speed controllers.

The Snubberless™ versions (W suffix and T1610, T1635, T1650) are especially recommended for use on inductive loads, because of their high commutation performance.

By using an internal ceramic pad, the Snubberless™ series provide an insulated tab (rated at 2500 V_{RMS}) .

Figure 1. Ordering information scheme (BTA16 and LTB16series)

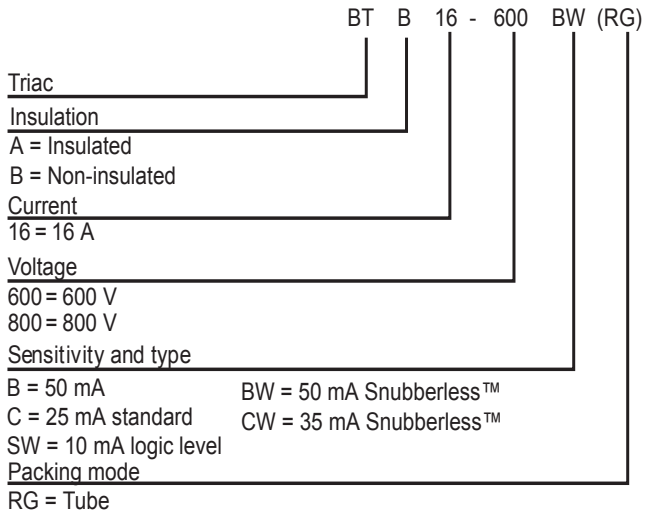
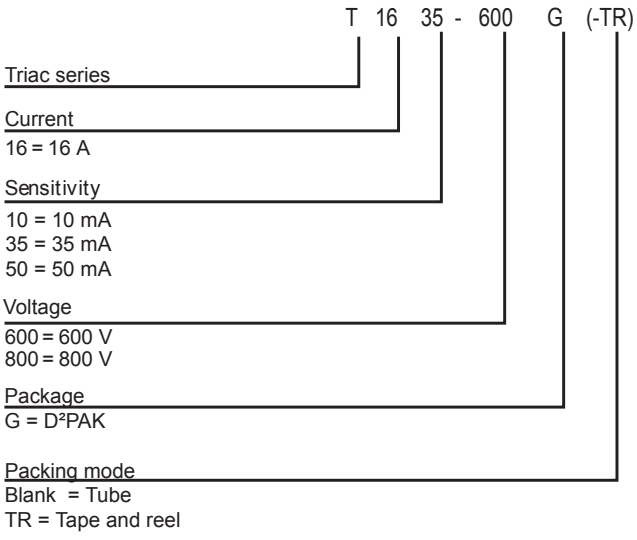


Figure 2. Ordering information scheme (T8 series)



1 Characteristics

Table 1. Absolute maximum ratings

Symbol	Parameters			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	TO-220AB, D^2PAK	T_c = 100 °C	16	A
		TO-220AB Ins.	T_c = 86 °C		
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_j initial = 25 °C)	F = 50 Hz	t_p = 20 ms	160	A
		F = 60 Hz	t_p = 16.7 ms	168	
I^2t	I^2t value for fusing	t_p = 10 ms		144	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 2. Static electrical characteristics

Symbol	Test conditions	T_j		Value	Unit
V_T(1)	I_{TM} = 22.5 A, t_p = 380 µs	25 °C	Max.	1.55	V
V_{TO}(1)	threshold on-state voltage	125 °C	Max.	0.85	V
R_D(1)	Dynamic resistance	125 °C	Max.	25	mΩ
I_{DRM}/I_{RRM}	V_{DRM} = V_{RRM}	25 °C	Max.	5	µA
		125 °C		2	mA

1. *For both polarities of A2 referenced to A1*

Table 3. Electrical characteristics (T_j = 25 °C, unless otherwise specified) - standard (4 quadrants)

Symbol	Parameters	Quadrant		BTA16 BTB16		Unit
				C	B	
I_{GT}(1)	V_D = 12 V, R_L = 33 Ω	I - II - III	Max.	25	50	mA
		IV		50	100	
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_H(2)	I_T = 500 mA		Max.	25	50	mA
I_L	I_G = 1.2 I_{GT}	I - III - IV	Max.	40	60	mA
		II	Max.	80	120	

Symbol	Parameters	Quadrant		BTA16 BTB16		Unit
				C	B	
dV/dt(2)	V_D = 67 % V_{DRM} gate open, T_j = 125 °C		Min.	200	400	V/µs
(dV/dt)c(2)	(dI/dt)c = 7 A/ms, T_j = 125 °C		Min.	5	10	V/µs

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) - Snubberless and logic level (3 quadrants)

Symbol	Parameters	Quadrant		T1610 / BTA16-SW / BTB16-SW	T1635 / BTA16-CW / BTB16-CW	T1650 / BTA16-BW / BTB16-BW	Unit
I_{GT}(1)	V_D = 12 V, R_L = 30 Ω	I - II - III	Max.	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_H(2)	I_T = 500 mA		Max.	15	35	50	mA
I_L	I_G = 1.2 I_{GT}	I - III	Max.	25	50	70	mA
		II	Max.	30	60	80	
(dV/dt)(2)	VD = 67 % V_{DRM} gate open, T_j = 125 °C		Min.	40	500	1000	V/µs
(dI/dt)c(2)	(dV/dt)c = 0.1 V/µs, T_j = 125 °C		Min.	8.5			A/ms
	(dV/dt)c = 10 V/µs, T_j = 125 °C			3.0			
	Without snubber, T_j = 125 °C				8.5	14	

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	Parameters		Value	Unit
$R_{th(j-c)}$	Max. junction to case (AC)	TO-220AB / D²PAK	1.2	°C/W
		TO-220AB insulated	2.1	
$R_{th(j-a)}$	Junction to ambient (S = 2 cm²)	D²PAK	45	
	Junction to ambient	TO-220AB / TO-220AB ins	60	

1. *Copper surface under tab.*

1.1 Characteristics (curves)

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

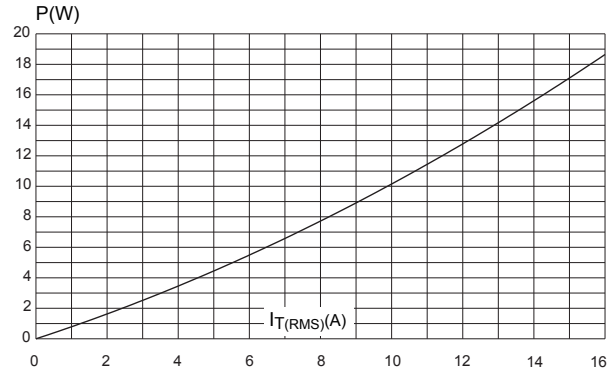


Figure 3. RMS on-state current versus case temperature (full cycle)

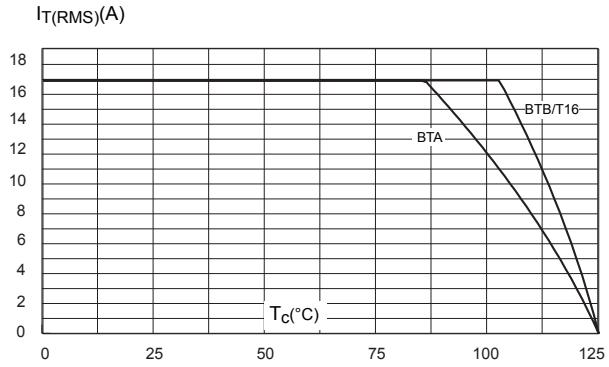


Figure 4. On-state rms current versus ambient temperature (full cycle)

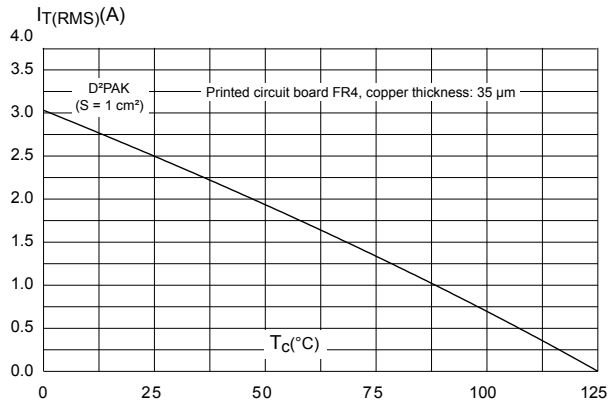


Figure 5. Relative variation of thermal impedance versus pulse duration

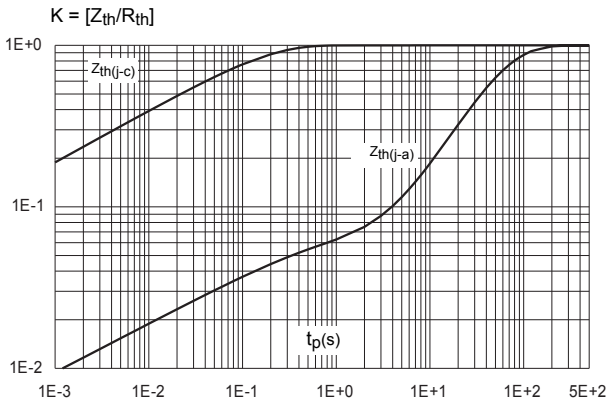


Figure 6. On-state characteristics (maximum values)

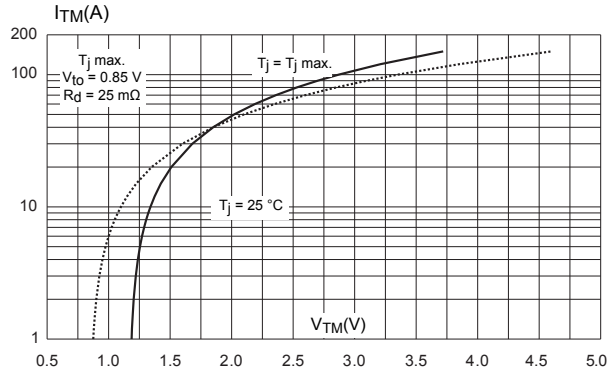


Figure 7. Surge peak on-state current versus number of cycles

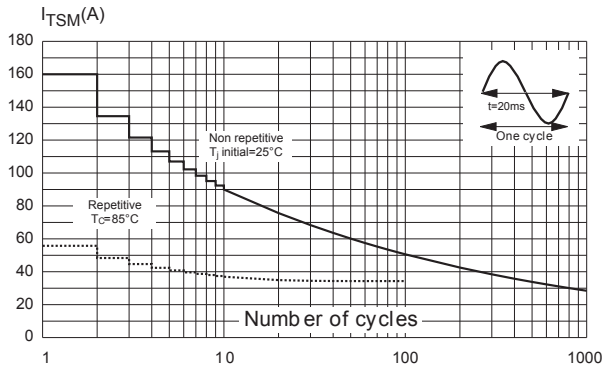


Figure 8. Non-repetitive surge peak on-state current for a sinusoidal

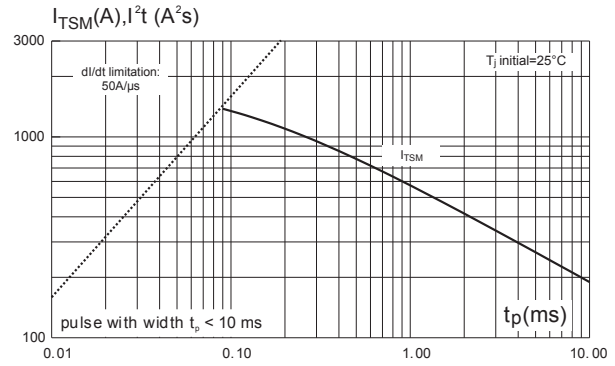


Figure 9. Relative variation of gate trigger current

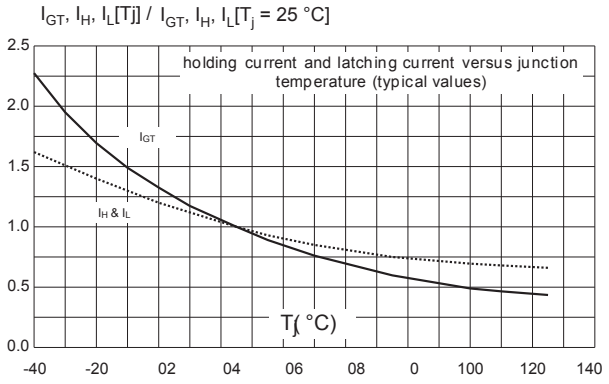


Figure 10. Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)

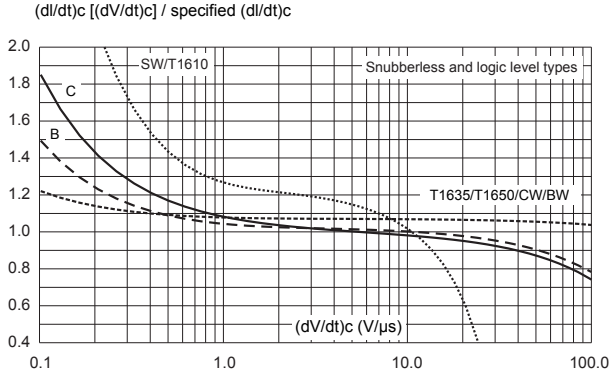
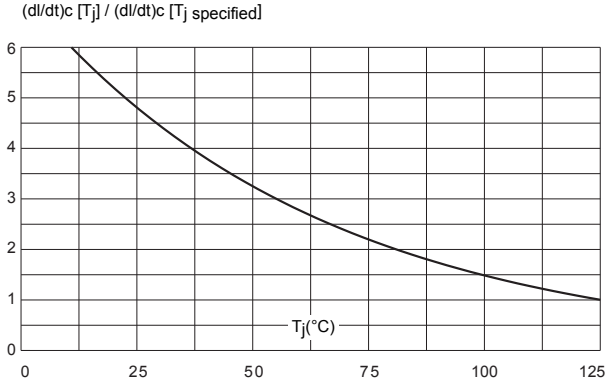


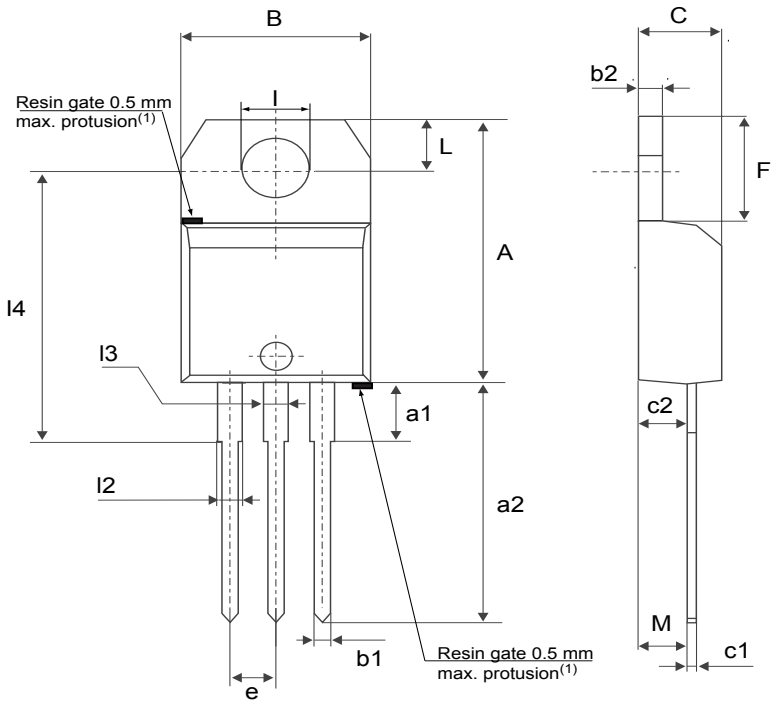
Figure 11. Relative variation of critical rate of decrease of main current versus (junction temperature (typical values)



2.1 TO-220AB Insulated and non Insulated package information

- Epoxy meets UL 94,V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.70 N·m

Figure 13. TO-220AB Insulated and non Insulated package outline



(1)Resin gate position accepted in one of the two positions or in the symmetrical opposites.

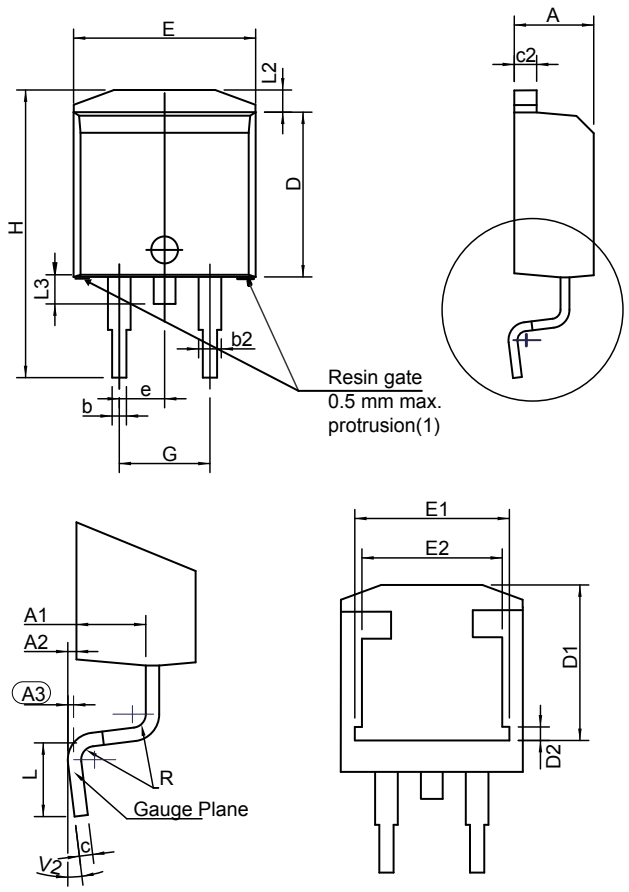
Table 6. TO-220ABInsulated and non Insulated package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	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
I2	1.14		1.70	0.0449		0.0669
I3	1.14		1.70	0.0449		0.0669
I4	15.80	16.40	16.80	0.6220	0.6457	0.6614
M		2.6			0.1024	

1. Inch dimensions are for reference only.

2.2 D²PAK package information

Figure 14. D²PAK package outline



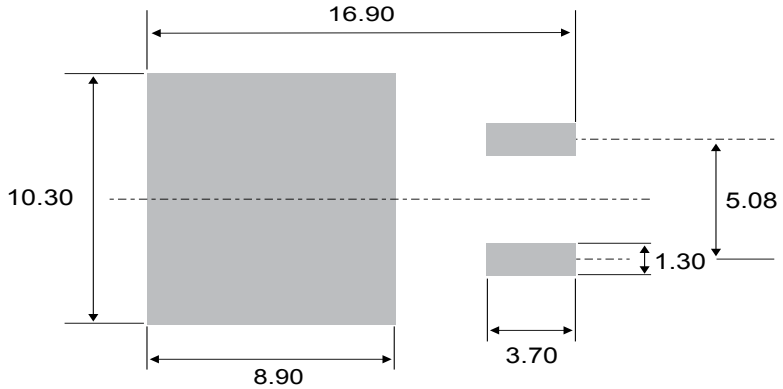
(1) Resin gate position accepted in one of the two positions or in the symmetrical opposites

Table 7. D²PAK package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	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
A3		0.25			0.0098	
b	0.70		0.93	0.0276		0.0366
b2	1.25		1.7	0.0492		0.0669
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	2.54			0.1		
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
H	15		15.85	0.5906		0.6240
L	1.78		2.28	0.0701		0.0898
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°

1. Dimensions in inches are given for reference only

Figure 15. D²PAK recommended footprint (dimensions are in mm)



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