

## Features

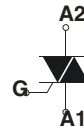
- Medium current Triac
- Low thermal resistance with clip bonding
- Low thermal resistance insulation ceramic for insulated BTA
- High commutation (4Q) or very high commutation (3Q) capability
- BTA series UL1557 certified (File ref: 81734)
- RoHS ( 2002/95/EC) compliant
- Insulated tab (BTA series, rated at 2500 V<sub>RMS</sub>)

## 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

 TO-220AB  
insulated  
BTA16

 TO-220AB  
BTB16

 D<sup>2</sup>PAK  
T1610G T1635G


## Description

Available either in through-hole or surface-mount packages, the BTA16, BTB16, T1610 and T1635 Triacs series are suitable for general purpose mains power AC switching.

**Table 1. Device summary**

| Symbol                             | Parameter                         | BTA16 <sup>(1)</sup> | BTB16   | T1610   | T1635   |
|------------------------------------|-----------------------------------|----------------------|---------|---------|---------|
| I <sub>T(RMS)</sub>                | On-state rms current              | 16                   | 16      | 16      | 16      |
| V <sub>DRM</sub> /V <sub>RRM</sub> | Repetitive peak off-state voltage | 600/800              | 600/800 | 600/800 | 600/800 |
| I <sub>GT</sub> (Snubberless)      | Triggering gate current           | 35/50                | 35/50   | -       | 35      |
| I <sub>GT</sub> (logic level)      | Triggering gate current           | 10                   | 10      | 10      | -       |
| I <sub>GT</sub> (standard)         | Triggering gate current           | 25/50                | 25/50   | -       | -       |

1. Insulated

**TM:** Snubberless is a trademark of STMicroelectronics

**Table 2. Absolute maximum ratings**

| Symbol                  | Parameter  |                                  | Value                             | Unit                       |                  |
|-------------------------|--|----------------------------------|-----------------------------------|----------------------------|------------------|
| $I_{T(RMS)}$            | On-state rms current<br>(full sine wave)   | D <sup>2</sup> PAK /<br>TO-220AB | $T_c = 100\text{ }^\circ\text{C}$ | 16                         | A                |
|                         |  | TO-220AB<br>insulated            | $T_c = 86\text{ }^\circ\text{C}$  |                            |                  |
| $I_{TSM}$               | Non repetitive surge peak on-state<br>current<br>(full cycle, $T_j$ initial = $25\text{ }^\circ\text{C}$ ) | F = 50 Hz                        | t = 20 ms                         | 160                        | A                |
|                         |  | F = 60 Hz                        | t = 16.7 ms                       | 168                        |                  |
| $I^2t$                  | $I^2t$ value for fusing  | $t_p = 10\text{ ms}$             |                                   | 144                        | A <sup>2</sup> s |
| dI/dt                   | Critical rate of rise of on-state current<br>$I_G = 2 \times I_{GT}$ , $t_r \leq 100\text{ ns}$            | F = 120 Hz                       | $T_j = 125\text{ }^\circ\text{C}$ | 50                         | A/ $\mu\text{s}$ |
| $V_{DSM}/$<br>$V_{RSM}$ | Non repetitive surge peak off-state<br>voltage   | $t_p = 10\text{ ms}$             | $T_j = 25\text{ }^\circ\text{C}$  | $V_{DRM}/V_{RRM}$<br>+ 100 | V                |
| $I_{GM}$                | Peak gate current  | $t_p = 20\text{ }\mu\text{s}$    | $T_j = 125\text{ }^\circ\text{C}$ | 4                          | A                |
| $P_{G(AV)}$             | Average gate power dissipation   |                                  | $T_j = 125\text{ }^\circ\text{C}$ | 1                          | W                |
| $T_{stg}$               | Storage temperature range  |                                  |                                   | -40 to + 150               |                  |
| $T_j$                   | Maximum operating junction temperature   |                                  |                                   | -40 to + 125               |                  |

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

| Symbol                      | Test conditions  | Quadrant                          |      | T1610 | T1635 | BTA16 / BTB16 |     |      | Unit             |
|-----------------------------|--|-----------------------------------|------|-------|-------|---------------|-----|------|------------------|
|                             |  |                                   |      |       |       | SW            | CW  | BW   |                  |
| $I_{GT}^{(1)}$              | $V_D = 12\text{ V}$<br>$R_L = 33\text{ }\Omega$                                    | I - II - III                      | Max. | 10    | 35    | 10            | 35  | 50   | mA               |
| $V_{GT}$                    |  | I - II - III                      | Max. | 1.3   |       |               |     |      | V                |
| $V_{GD}$                    | $V_D = V_{DRM}$<br>$R_L = 3.3\text{ k}\Omega$<br>$T_j = 125\text{ }^\circ\text{C}$ | I - II - III                      | Min. | 0.2   |       |               |     |      | V                |
| $I_H^{(2)}$                 | $I_T = 500\text{ mA}$  |                                   | Max. | 15    | 35    | 15            | 35  | 50   | mA               |
| $I_L$                       | $I_G = 1.2 I_{GT}$   | I - III                           | Max. | 25    | 50    | 25            | 50  | 70   | mA               |
|                             |  | II                                |      | 30    | 60    | 30            | 60  | 80   |                  |
| dV/dt (2)                   | $V_D = 67\% V_{DRM}$<br>gate open  | $T_j = 125\text{ }^\circ\text{C}$ | Min. | 40    | 500   | 40            | 500 | 1000 | V/ $\mu\text{s}$ |
| (dI/dt) <sub>c</sub><br>(2) | (dV/dt) <sub>c</sub> = 0.1 V/ $\mu\text{s}$  | $T_j = 125\text{ }^\circ\text{C}$ | Min. | 8.5   | -     | 8.5           | -   | -    | A/ms             |
|                             | (dV/dt) <sub>c</sub> = 10 V/ $\mu\text{s}$   | $T_j = 125\text{ }^\circ\text{C}$ |      | 3.0   | -     | 3.0           | -   | -    |                  |
|                             | Without snubber  | $T_j = 125\text{ }^\circ\text{C}$ |      | -     | 8.5   | -             | 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 4. Electrical characteristics ( $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified) standard (4 quadrants)**

| Symbol            | Test conditions  | Quadrant                          |      | BTA16 / BTB16 |           | Unit             |
|-------------------|--|-----------------------------------|------|---------------|-----------|------------------|
|                   |  |                                   |      | C             | B         |                  |
| $I_{GT}^{(1)}$    | $V_D = 12\text{ V}$ $R_L = 33\ \Omega$                                       | I - II - III<br>IV                | Max. | 25<br>50      | 50<br>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            | 60        | mA               |
|                   |  | II                                |      | 80            | 120       |                  |
| $dV/dt^{(2)}$     | $V_D = 67\ \%V_{DRM}$ gate open  | $T_j = 125\text{ }^\circ\text{C}$ | Min. | 200           | 400       | V/ $\mu\text{s}$ |
| $(dV/dt)_c^{(2)}$ | $(dI/dt)_c = 7\text{ A/ms}$  | $T_j = 125\text{ }^\circ\text{C}$ | Min. | 5             | 10        | V/ $\mu\text{s}$ |

1. Minimum  $I_{GT}$  is guaranteed at 5% of  $I_{GT\text{ max}}$
2. For both polarities of A2 referenced to A1

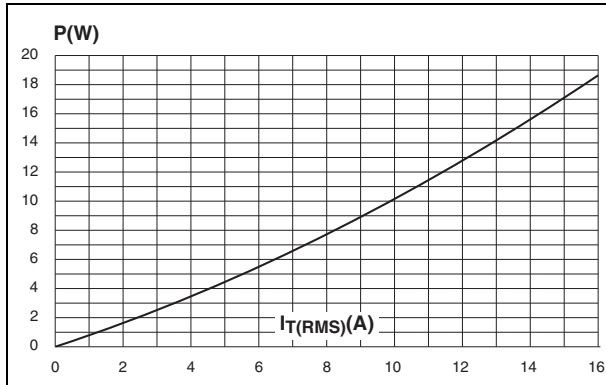
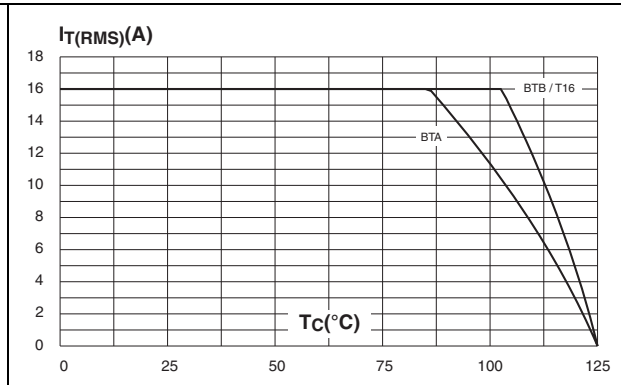
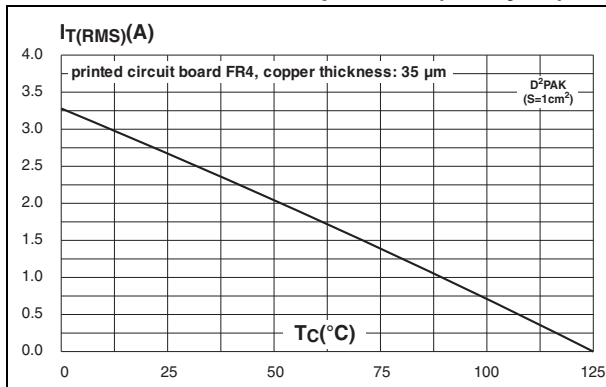
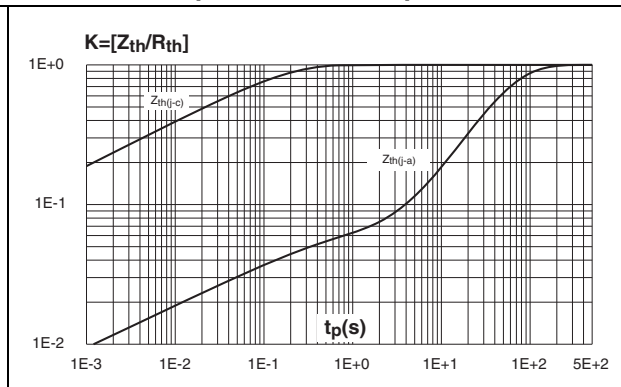
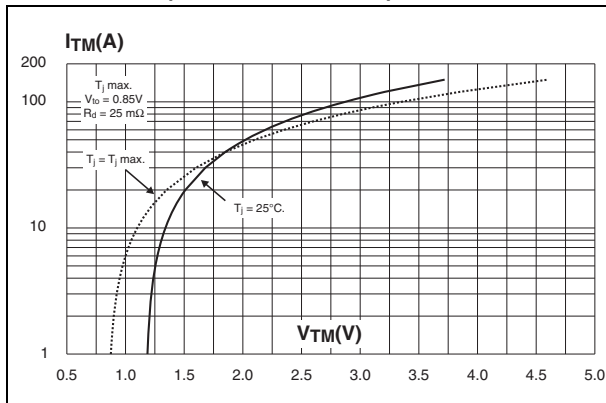
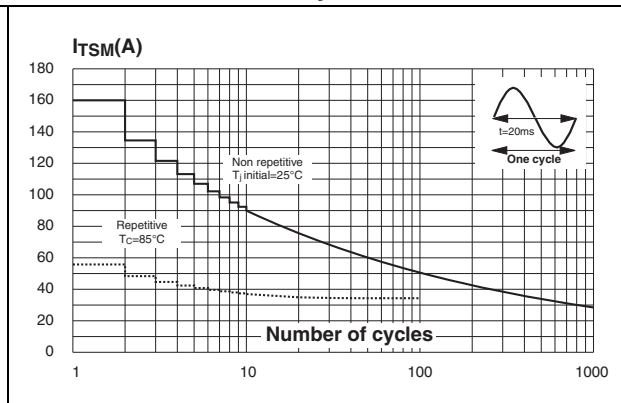
**Table 5. Static characteristics**

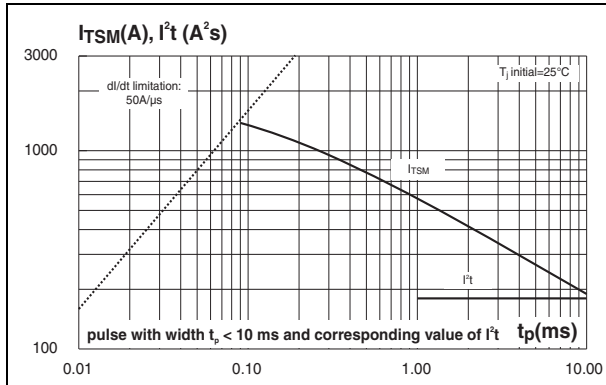
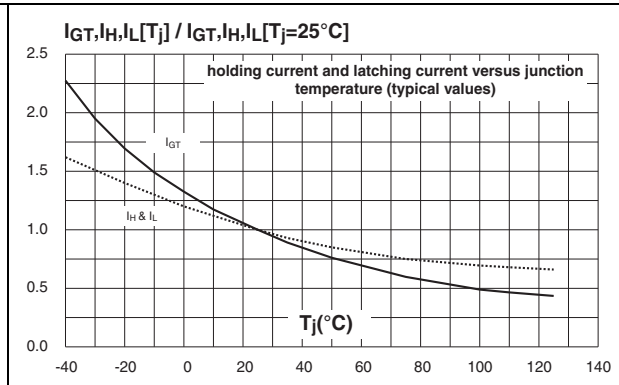
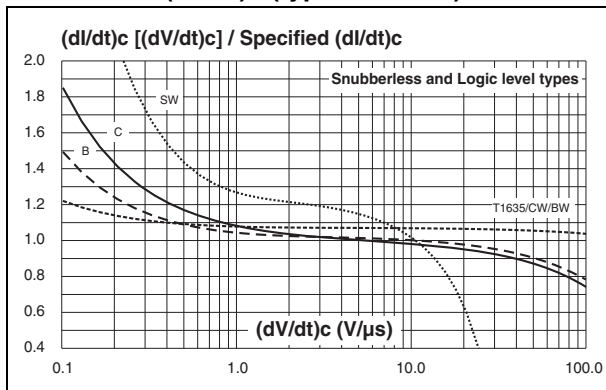
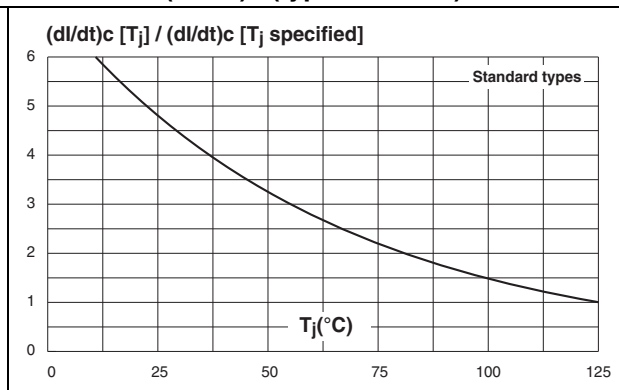
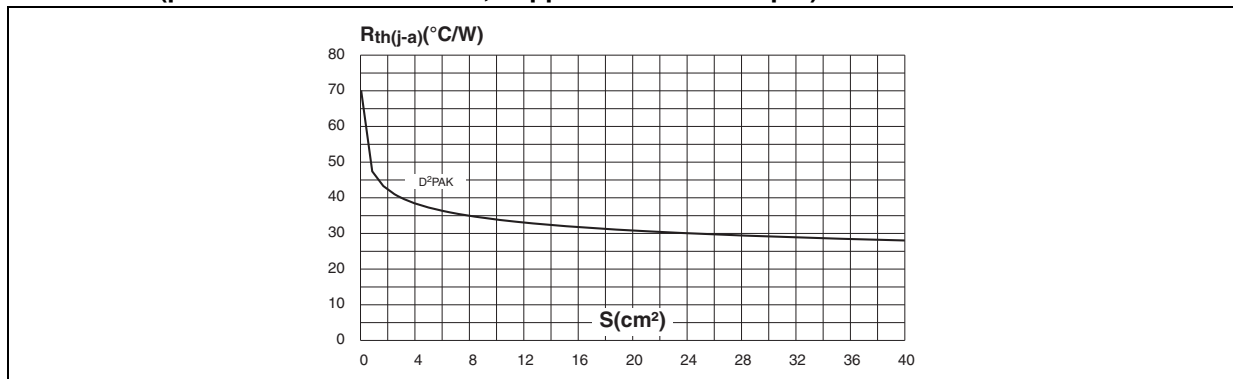
| Symbol                 | Test conditions                                   |                                   | Value | Unit |               |
|------------------------|---|-----------------------------------|-------|------|---------------|
| $V_T^{(2)}$            | $I_{TM} = 22.5\text{ A}$ $t_p = 380\ \mu\text{s}$ | $T_j = 25\text{ }^\circ\text{C}$  | Max.  | 1.55 | V             |
| $V_{to}^{(2)}$         | 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.  | 25   | m $\Omega$    |
| $I_{DRM}$<br>$I_{RRM}$ | $V_{DRM} = V_{RRM}$                               | $T_j = 25\text{ }^\circ\text{C}$  | Max.  | 5    | $\mu\text{A}$ |
|                        |   | $T_j = 125\text{ }^\circ\text{C}$ |       | 2    | mA            |

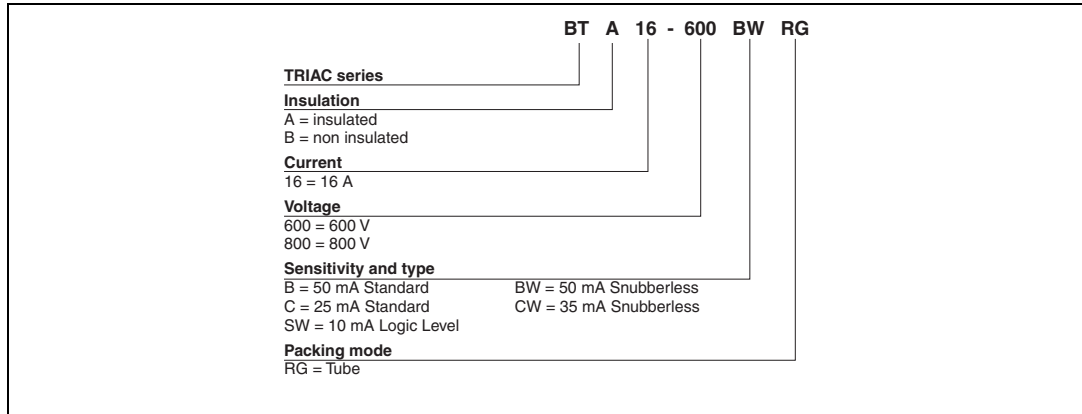
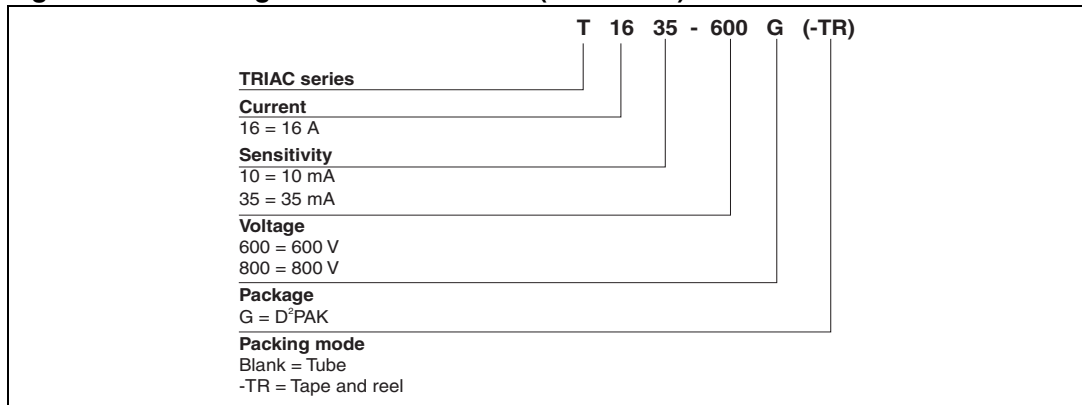
**Table 6. Thermal resistance**

| Symbol        | Parameter             | Value  | Unit |                    |
|---------------|-----------------------|--|------|--------------------|
| $R_{th(j-c)}$ | Junction to case (AC) | D <sup>2</sup> PAK / TO-220AB                | 1.2  | $^\circ\text{C/W}$ |
|               |                       | TO-220AB insulated                           | 2.1  |                    |
| $R_{th(j-a)}$ | Junction to ambient   | $S^{(1)} = 1\text{ cm}^2$ D <sup>2</sup> PAK | 45   | $^\circ\text{C/W}$ |
|               |                       | TO-220AB / TO-220AB insulated                | 60   |                    |

1. S = Copper surface under tab

**Figure 1. Maximum power dissipation versus on-state rms 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. D<sup>2</sup>PAK thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 μm)**


**Figure 12. Ordering information scheme (BTA16 and BTB16 series)**

**Figure 13. Ordering information scheme (T16 series)**

**Table 7. Product selector**

| Device <sup>(1)</sup> | Voltage (xxx) |       | Sensitivity | Type        | Package            |
|-----------------------|---------------|-------|-------------|-------------|--------------------|
|                       | 600 V         | 800 V |             |             |                    |
| BTA/BTB16-xxxB        | X             | X     | 50 mA       | Standard    | TO-220AB           |
| BTA/BTB16-xxxBW       | X             | X     | 50 mA       | Snubberless | TO-220AB           |
| BTA/BTB16-xxxC        | X             |       | 25 mA       | Standard    | TO-220AB           |
| BTA/BTB16-xxxCW       | X             | X     | 35 mA       | Snubberless | TO-220AB           |
| BTA/BTB16-xxxSW       | X             | X     | 10 mA       | Logic level | TO-220AB           |
| T1610-xxxG            | X             | X     | 10 mA       | Logic level | D <sup>2</sup> PAK |
| T1635-xxxG            | X             | X     | 35 mA       | Snubberless | D <sup>2</sup> PAK |

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