

BTA24, BTB24, BTA25 BTA26, BTB26, T25

25 A standard and Snubberless™ triacs

Features

- High current triac
- Low thermal resistance with clip bonding
- High commutation (4 quadrant) or very high commutation (3 quadrant) capability
- BTA series UL1557 certified (File ref: 81734)
- Packages are RoHS (2002/95/EC) compliant

Applications

Applications include the ON/OFF function in applications such as static relays, heating regulation, induction motor starting circuits, etc., or for phase control operation in light dimmers, motor speed controllers, and silmilar.

The snubberless versions (BTA/BTB...W and T25 series) are especially recommended for use on inductive loads, due to their high commutation performances. The BTA series provides an insulated tab (rated at 2500 $V_{\rm RMS}$).

Description

Available either in through-hole or surface-mount packages, the **BTA24**, **BTB24**, **BTA25**, **BTA26**, **BTB26** and **T25** triac series is suitable for general purpose mains power AC switching.

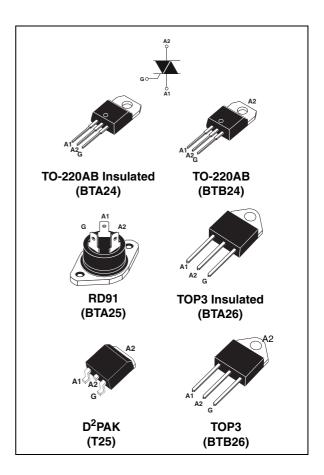


Table 1. Device summary

| Symbol | Parameter | BTA24 ⁽¹⁾ | BTB24 | BTA25 ⁽¹⁾ | BTA26 ⁽¹⁾ | BTB26 | T25 | Unit |
|------------------------------------|-----------------------------------|----------------------|-----------|----------------------|--------------------------|-------|-----------|------|
| I _{T(RMS)} | RMS on-state current | 25 | 25 | 25 | 25 | 25 | 25 | Α |
| V _{DRM} /V _{RRM} | Repetitive peak off-state voltage | 600 / 800 | 600 / 800 | 600 / 800 | 600 ⁽²⁾ / 800 | 600 | 600 / 800 | ٧ |
| I _{GT} (Snubberless) | Triggering gate current | 35 / 50 | 35 / 50 | 50 | 35 / 50 | - | 35 | mA |
| I _{GT} (Standard) | Triggering gate current | - | 50 | 50 | 50 | 50 | - | mA |

^{1.} Insulated packages

TM: Snubberless is a trademark of STMicroelectronics

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^{2. 600} V version available only with $I_{GT} = 50$ mA (Snubberless and Standard)

1 Characteristics

Table 2. Absolute maximum ratings

| Symbol | Parame | | Value | Unit | |
|------------------------------------|--|----------------------------------|-------------------------|---|------------------|
| | | TOP3 | T _c = 105° C | | |
| | RMS on-state current (full sine wave) | D ² PAK / TO-220AB | T _c = 100° C | 25 | Δ. |
| I _{T(RMS)} | | RD91 Ins/ TOP3 Ins. | T _c = 100° C | 25 | A |
| | | TO-220AB Ins. | T _c = 75° C | | |
| | Non repetitive surge peak on-state | F = 50 Hz | t = 20 ms | 250 | Α |
| I _{TSM} | current (full cycle, T_j initial = 25° C) | F = 60 Hz | t = 16.7 ms | 260 | A |
| l ² t | I^2 t Value for fusing $t_p = 10 \text{ ms}$ | | | 340 | A ² s |
| dI/dt | Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \le 100 \text{ ns}$ | 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 $t_p = 20 \mu s$ $T_j = 125^{\circ} C$ | | T _j = 125° C | 4 | Α |
| P _{G(AV)} | Average gate power dissipation $T_j = 125^{\circ} C$ | | | 1 | W |
| T _{stg} T _j | Storage junction temperature range Operating junction temperature range | | | - 40 to + 150 - 40 to + 125 | ° C |

Table 3. Electrical characteristics ($T_j = 25^{\circ}$ C, unless otherwise specified), Snubberless and logic level (3 quadrants) T25, BTA/BTB24...W, BTA25...W, BTA26...W

| Cumbal | Test Conditions | Quadrant | | T25 | BTA/BTB | | Unit |
|--------------------------------|--|-------------------------|--------|-------|---------|------|-------|
| Symbol | rest Conditions | Quaurant | | T2535 | CW | BW | Oilit |
| I _{GT} ⁽¹⁾ | $V_D = 12 \text{ V } R_L = 33 \Omega$ | I - II - III | MAX. | 35 | 35 | 50 | mA |
| V _{GT} | AD = 15 A UL = 22.75 | 1 - 11 - 111 | MAX. | | 1.3 | | ٧ |
| V _{GD} | $V_D = V_{DRM}$ $R_L = 3.3 \text{ k}\Omega$ $T_j = 125^{\circ} \text{ C}$ | 1 - 11 - 111 | MIN. | | 0.2 | | ٧ |
| I _H ⁽²⁾ | I _T = 500 mA | | MAX. | 50 | 50 | 75 | mA |
| IL | I _G = 1.2 I _{GT} | I - III | MAX. | 70 | 70 | 80 | mA |
| 'L | IG - 1.2 IGT | II | IVIAA. | 80 | 80 | 100 | ША |
| dV/dt (2) | V _D = 67 %V _{DRM} gate open | T _j = 125° C | MIN. | 500 | 500 | 1000 | V/µs |
| (dl/dt)c (2) | Without snubber | T _j = 125° C | MIN. | 13 | 13 | 22 | A/ms |

^{1.} minimum $I_{\mbox{\scriptsize GT}}$ is guaranted at 5% of $I_{\mbox{\scriptsize GT}}$ max.

^{2.} for both polarities of A2 referenced to A1.

Table 4. Electrical characteristics (T_j = 25° C, unless otherwise specified), standard (4 quadrants), BTB24...B, BTA25...B, BTA26...B, BTB26...B

| Symbol | Test Conditions | Quadrant | | Value | Unit |
|---------------------------------|---|-------------------------|--------|-------|------|
| I _{GT} ⁽¹⁾ | | 1 - 11 - 111 | MAX. | 50 | mA |
| 'GT` | $V_D = 12 \text{ V}$ $R_L = 33 \Omega$ | IV | IVIAA. | 100 | IIIA |
| V _{GT} | | ALL | MAX. | 1.3 | V |
| V _{GD} | $V_D = V_{DRM}$ $R_L = 3.3 \text{ k}\Omega$ $T_j = 125^{\circ} \text{ C}$ | ALL | MIN. | 0.2 | V |
| I _H ⁽²⁾) | I _T = 500 mA | | MAX. | 80 | mA |
| | I _G = 1.2 I _{GT} | I - III - IV | MAX. | 70 | mA |
| IL | IG = 1.2 IGT | II | IVIAA. | 160 | IIIA |
| dV/dt ⁽²⁾ | V _D = 67 %V _{DRM} gate open | T _j = 125° C | MIN. | 500 | V/µs |
| (dV/dt)c (2) | (dl/dt)c = 13.3 A/ms | T _j = 125° C | MIN. | 10 | V/µs |

^{1.} minimum $I_{\mbox{\scriptsize GT}}$ is guaranted at 5% of $I_{\mbox{\scriptsize GT}}$ max.

Table 5. Static characteristics

| Symbol | Test | Value | Unit | | |
|--------------------------------|--|-------------------------|--------|------|----|
| V _{TM} ⁽¹⁾ | $I_{TM} = 35 \text{ A}$ $t_p = 380 \mu\text{s}$ | T _j = 25° C | MAX. | 1.55 | V |
| V _{t0} (1) | Threshold voltage | T _j = 125° C | MAX. | 0.85 | V |
| R _d ⁽¹⁾ | Dynamic resistance | T _j = 125° C | MAX. | 16 | mΩ |
| I _{DRM} | V -V | T _j = 25° C | MAX. | 5 | μA |
| I _{RRM} | $V_{DRM} = V_{RRM}$ | T _j = 125° C | IVIAA. | 3 | mA |

^{1.} for both polarities of A2 referenced to A1.

Table 6. Thermal resistance

| Symbol | Parameter | | | Value | Unit |
|------------------------------------|--|----------------------------|---------------------------------|-------|-----------|
| | | | TOP 3 | 0.6 | |
| Б | lunation to social (AC) | | D ² PAK / TO-220AB | 0.8 | 0 0 1 1 1 |
| H _{th(j-c)} | R _{th(j-c)} Junction to case (AC) | | RD91 Insulated / TOP3 Insulated | 0.9 | ° C/W |
| | | | TO-220AB Insulated | 1.7 | |
| | | $^{(1)}S = 1 \text{ cm}^2$ | D ² PAK | 45 | |
| R _{th(j-a)} Junction to a | Junction to ambient | | TOP3 / TOP3 Insulated | 50 | ° C/W |
| | | | TO-220AB / TO-220AB Insulated | 60 | |

^{1.} S = Copper surface under tab.

^{2.} for both polarities of A2 referenced to A1.

Surge peak on-state current

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

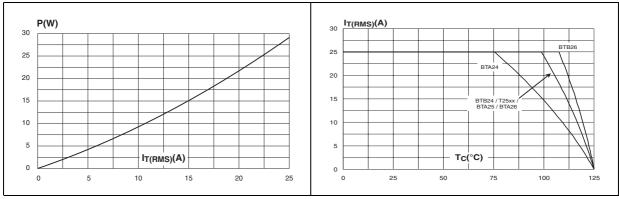


Figure 3. D²PAK RMS on-state current versus Figure 4. Relative variation of thermal ambient temperature (printed impedance versus pulse circuit board FR4, copper duration

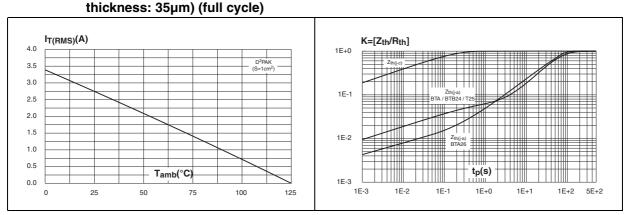


Figure 5. On-state characteristics (maximum values)

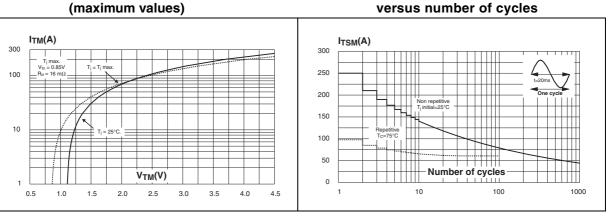
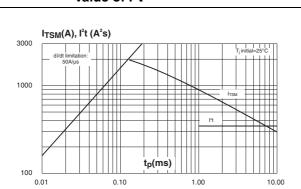


Figure 6.

Figure 7. Non-repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 10$ ms and corresponding value of l²t



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

Figure 8.

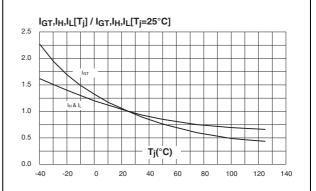
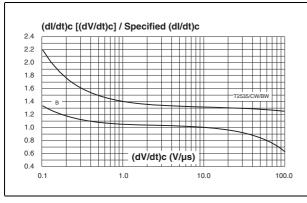
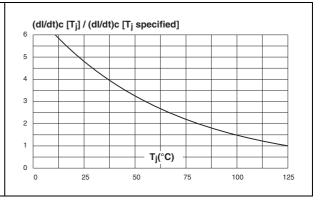


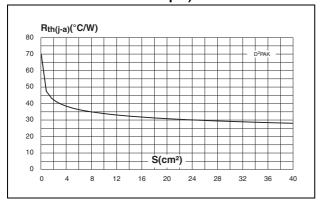
Figure 9. decrease of main current versus (dV/dt)c (typical values)

Relative variation of critical rate of Figure 10. Relative variation of critical rate of decrease of main current versus Ti





D²PAK 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

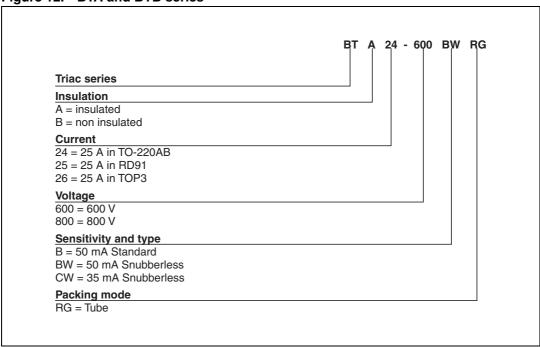
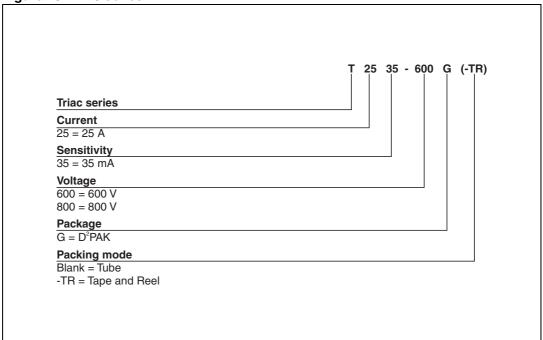


Figure 13. T25 series



3 Package information

- Epoxy meets UL94,V0
- Cooling method: C
- Recommended torque value: 0.4 0.5 Nm (TO-220AB), 0.9 1.2 Nm (TOP3 and RD91)
- Maximum torque value for BTB24 is 0.5 Nm

Table 7. D²PAK dimensions

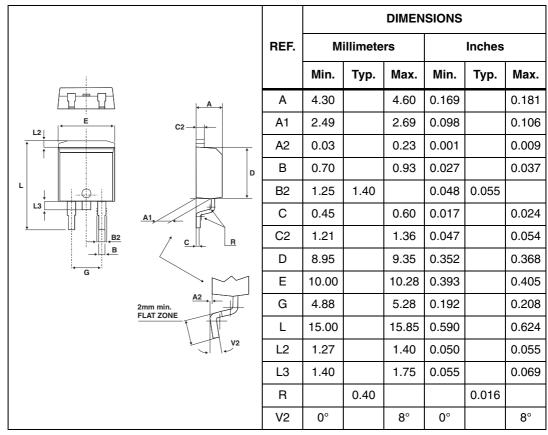


Figure 14. D²PAK footprint dimensions (in millimeters)

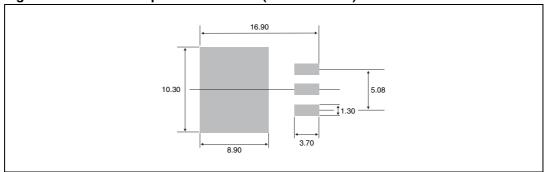
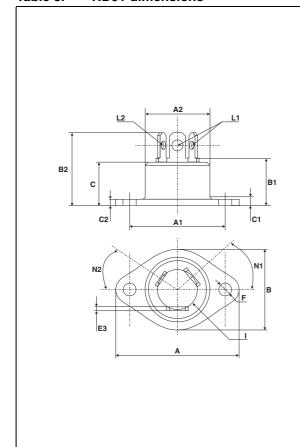


Table 8. RD91 dimensions



| | | DIMEN | ISIONS | |
|------|--------|--------|--------|-------|
| REF. | Millim | neters | Incl | hes |
| | Min. | Max. | Min. | Max. |
| 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 |
| C1 | | 3.50 | | 0.138 |
| 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 |
| I | 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° |

DIMENSIONS REF. Millimeters Inches Min. Тур. Max. Min. Тур. Max. 4.4 4.6 0.173 0.181 Α В 1.45 0.057 0.061 1.55 С 14.35 15.60 0.565 0.614 D 0.5 0.028 0.7 0.020 Е 2.9 0.106 0.114 2.7 0.650 F 15.8 16.5 0.622 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 Κ 3.4 0.144 3.65 0.134 ØL 4.08 4.17 0.161 0.164 Ρ 1.20 1.40 0.047 0.055 0.181 R 4.60

Table 9. TOP3 (insulated and non_insulated) dimensions

DIMENSIONS Millimeters REF. **Inches** Min. Тур. Max. Min. Тур. Max. 15.20 15.90 0.598 0.625 Α 3.75 0.147 a1 13.00 14.00 0.511 0.551 a2 10.00 В 10.40 0.393 0.409 0.88 0.024 0.034 b1 0.61 b2 1.23 1.32 0.048 0.051 С 4.40 4.60 0.173 0.181 c2 0.49 0.70 0.019 0.027 с1 2.72 0.094 0.107 c2 2.40 a2 2.40 2.70 0.094 0.106 е F 6.60 0.244 0.259 6.20 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 2.60 0.102

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

Table 11. Ordering information

| Ordering type | Marking | Package | Weight | Base qty | Delivery mode |
|-------------------|-----------------|--------------------|--------|----------|---------------|
| BTA/BTB24-xxxyzRG | BTA/BTB24 xxxyz | TO-220AB | 2.3 g | 50 | Tube |
| BTA25-xxxyz | BTA25xxxyz | RD91 | 20 g | 25 | Bulk |
| BTA26-xxxyRG | BTA26xxxyz | TOP3 Ins. | 4.5 g | 30 | Tube |
| BTB26-600BRG | BTB26600B | TOP3 | 4.5 g | 30 | Tube |
| T2535-xxxG | T2535 xxxG | D ² PAK | 1.5 g | 50 | Tube |
| T2535-xxxG-TR | T2535 xxxG | DIAN | 1.5 g | 1000 | Tape and reel |

Note: xxx = voltage, y = sensitivity, z = type

5 Revision history

Table 12. 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. T_c in figure 3 changed to T_{amb} |
| 31-Jul-2006 | 9 | Typing error corrected on page 1 (BTB124 instead of BTB24) |
| 05-Jul-2007 | 10 | Added BTB26-600BRG. Restructured cover page and section <i>2:</i> Ordering information scheme on page 6 to simplify product selection. Thermal resistance values updated in <i>Table 6</i> and <i>Figure 2</i> . Graphic for I ² t updated in <i>Figure 7</i> . |

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