



# BTA40, BTA41, BTB41

40 A standard TRIACs

## Features

- High current TRIAC
- Low thermal resistance with clip bonding
- High commutation capability
- BTA series UL1557 certified (File ref: 81734)
- Packages are RoHS (2002/95/EC) compliant

## Applications

- On/off function in static relays, heating regulation, induction motor starting circuits
- Phase control operations in light dimmers, motor speed controllers, and similar

## Description

Available in high power packages, the BTA/BTB40-41 series is suitable for general purpose AC switching.

The BTA series provides an insulated tab (rated at 2500 V rms).

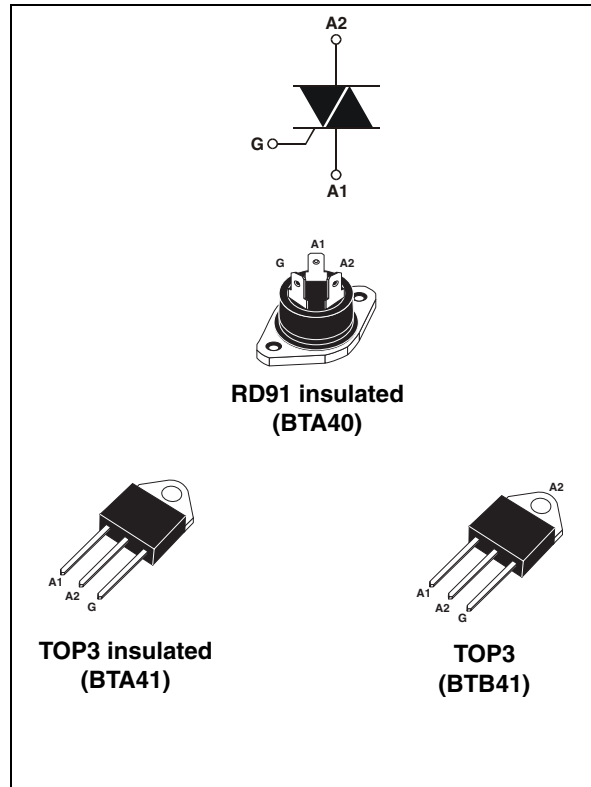


Table 1. Device summary

| Symbol            | Parameter                         | BTA40 <sup>(1)</sup> | BTA41 <sup>(1)</sup> | BTB41       | Unit |
|-------------------|-----------------------------------|----------------------|----------------------|-------------|------|
| $I_{T(RMS)}$      | On-state rms current              | 40                   | 41                   | 41          | A    |
| $V_{DRM}/V_{RRM}$ | Repetitive peak off-state voltage | 600 and 800          | 600 and 800          | 600 and 800 | V    |
| $I_{GT}$          | Triggering gate current           | 50                   | 50                   | 50          | mA   |

1. Insulated package

# 1 Characteristics

**Table 2. Absolute maximum ratings**

| Symbol             | Parameter                                                                                       |                         |                       | Value                          | Unit        |
|--------------------|-------------------------------------------------------------------------------------------------|-------------------------|-----------------------|--------------------------------|-------------|
| $I_{T(RMS)}$       | On-state rms current<br>(full sine wave)                                                        | TOP3                    | $T_C = 95\text{ °C}$  | 40                             | A           |
|                    |                                                                                                 | RD91 / TOP ins.         | $T_C = 80\text{ °C}$  |                                |             |
| $I_{TSM}$          | Non repetitive surge peak on-state<br>current (full cycle, $T_j$ initial = $25\text{ °C}$ )     | F = 50 Hz               | t = 20 ms             | 400                            | A           |
|                    |                                                                                                 | F = 60 Hz               | t = 16.7 ms           | 420                            |             |
| $I^2t$             | $I^2t$ Value for fusing                                                                         | $t_p = 10\text{ ms}$    |                       | 1000                           | $A^2s$      |
| 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              | $T_j = 125\text{ °C}$ | 50                             | A/ $\mu s$  |
| $V_{DSM}/V_{RSM}$  | Non repetitive surge peak off-state<br>voltage                                                  | $t_p = 10\text{ ms}$    | $T_j = 25\text{ °C}$  | $V_{DSM}/V_{RSM} + 100$        | V           |
| $I_{GM}$           | Peak gate current                                                                               | $t_p = 20\text{ }\mu s$ | $T_j = 125\text{ °C}$ | 8                              | A           |
| $P_{G(AV)}$        | Average gate power dissipation                                                                  |                         | $T_j = 125\text{ °C}$ | 1                              | W           |
| $T_{stg}$<br>$T_j$ | Storage junction temperature range<br>Operating junction temperature range                      |                         |                       | - 40 to + 150<br>- 40 to + 125 | $^{\circ}C$ |

**Table 3. Electrical characteristics ( $T_j = 25\text{ °C}$ , unless otherwise specified)**

| Symbol            | Parameter                                                        |                       |      | Value     | Unit       |
|-------------------|------------------------------------------------------------------|-----------------------|------|-----------|------------|
| $I_{GT}^{(1)}$    | $V_D = 12\text{ V}$ $R_L = 33\text{ }\Omega$                     | I - II - III<br>IV    | MAX. | 50<br>100 | mA         |
| $V_{GT}$          |                                                                  | ALL                   | MAX. | 1.3       |            |
| $V_{GD}$          | $V_D = V_{DRM}$ $R_L = 3.3\text{ k}\Omega$ $T_j = 125\text{ °C}$ | ALL                   | MIN. | 0.2       | V          |
| $I_H^{(2)}$       | $I_T = 500\text{ mA}$                                            |                       | MAX. | 80        | mA         |
| $I_L$             | $I_G = 1.2 I_{GT}$                                               | I - III - IV          | MAX. | 70        | mA         |
|                   |                                                                  | II                    |      | 160       |            |
| $dV/dt^{(2)}$     | $V_D = 67\% V_{DRM}$ gate open                                   | $T_j = 125\text{ °C}$ | MIN. | 500       | V/ $\mu s$ |
| $(dV/dt)_C^{(2)}$ | $(di/dt)_C = 20\text{ A/ms}$                                     | $T_j = 125\text{ °C}$ | MIN. | 10        | V/ $\mu s$ |

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

2. for both polarities of A2 referenced to A1

**Table 4. Static characteristics**

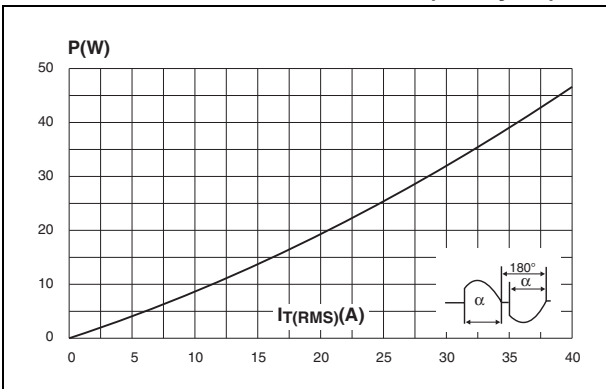
| Symbol                 | Test conditions                                          |                                   |      | Value | Unit |
|------------------------|----------------------------------------------------------|-----------------------------------|------|-------|------|
| $V_T^{(1)}$            | $I_{TM} = 60\text{ A}$<br>$t_p = 380\text{ }\mu\text{s}$ | $T_j = 25\text{ }^\circ\text{C}$  | 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. | 10    | mΩ   |
| $I_{DRM}$<br>$I_{RRM}$ | $V_{DRM} = V_{RRM}$                                      | $T_j = 25\text{ }^\circ\text{C}$  | MAX. | 5     | μA   |
|                        |                                                          | $T_j = 125\text{ }^\circ\text{C}$ |      | 5     | mA   |

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

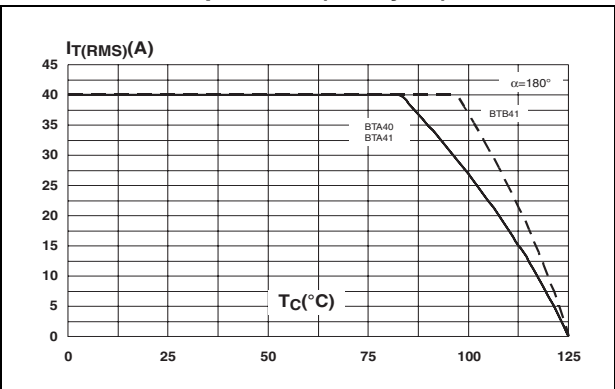
**Table 5. Thermal resistance**

| Symbol        | Test conditions       |                                   | Value | Unit               |
|---------------|-----------------------|-----------------------------------|-------|--------------------|
| $R_{th(j-c)}$ | Junction to case (AC) | RD91 (insulated) / TOP3 insulated | 0.9   | $^\circ\text{C/W}$ |
|               |                       | TOP3                              | 0.6   |                    |
| $R_{th(j-a)}$ | Junction to ambient   | TOP3 / TOP3 insulated             | 50    | $^\circ\text{C/W}$ |

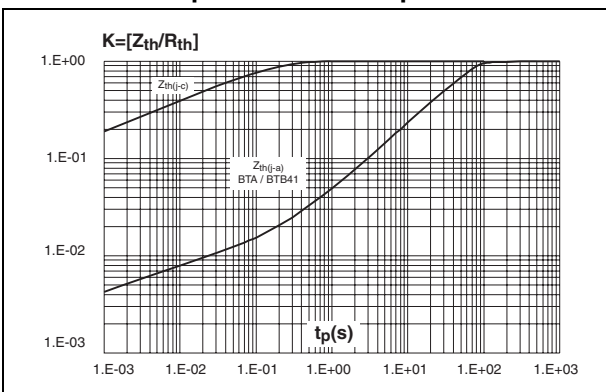
**Figure 1. Maximum power dissipation versus on-state rms current (full cycle)**



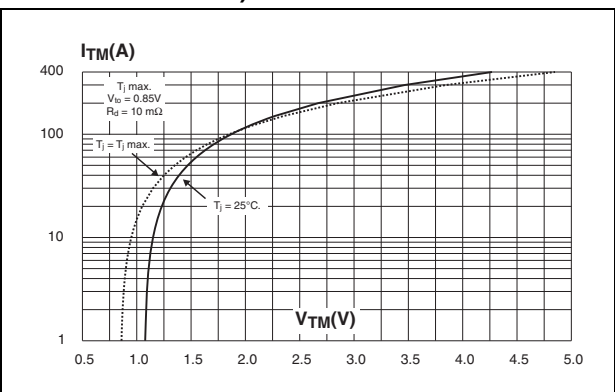
**Figure 2. On-state rms current versus case temperature (full cycle)**



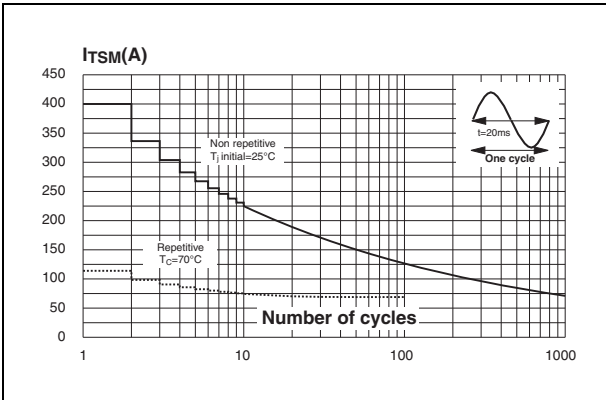
**Figure 3. Relative variation of thermal impedance versus pulse duration**



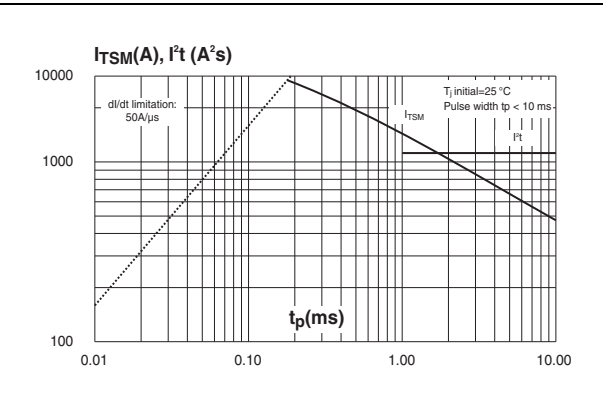
**Figure 4. On-state characteristics (maximum values)**



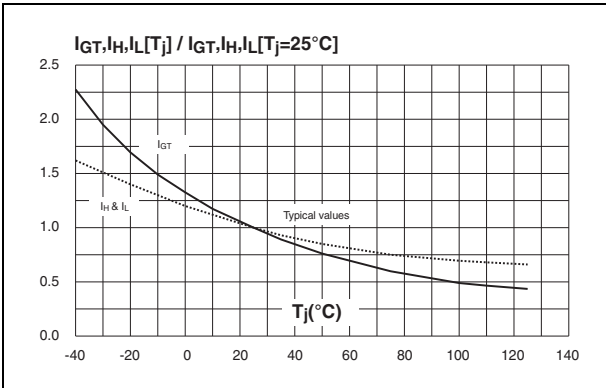
**Figure 5. Surge peak on-state current versus number of cycles**



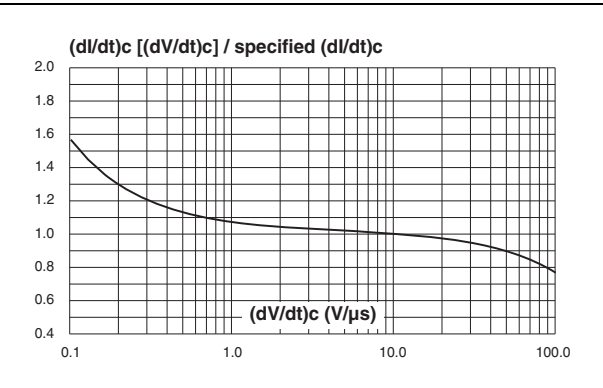
**Figure 6. Non-repetitive surge peak on-state current for a sinusoidal pulse and corresponding value of  $I^2t$**



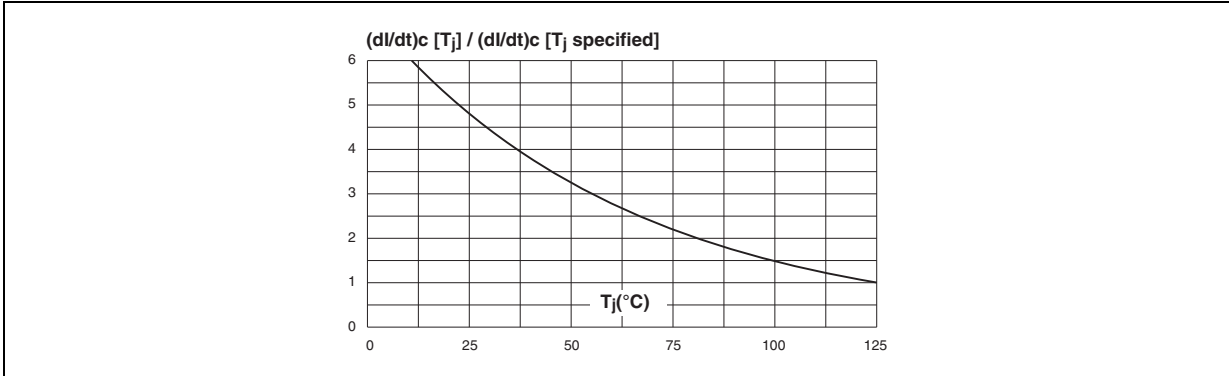
**Figure 7. Relative variation of gate trigger, holding and latching current versus junction temperature**



**Figure 8. Relative variation of critical rate of decrease of main current versus  $(dV/dt)_c$  (typical values)**

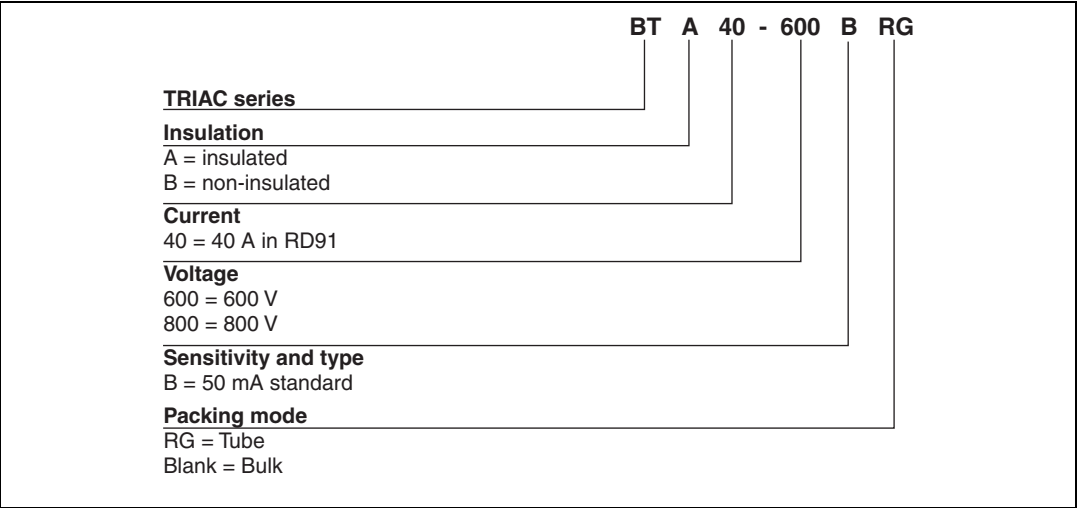


**Figure 9. Relative variation of critical rate of decrease of main current versus  $(dV/dt)_c$**



## 2      Ordering information scheme

Figure 10.    Ordering information scheme



### 3 Package information

- Epoxy meets UL94, V0
- Lead-free packages

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

**Table 6. TOP3 insulated and non-insulated dimensions**

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.4         | 4.6   | 0.173      | 0.181 |
| B    | 1.45        | 1.55  | 0.057      | 0.061 |
| C    | 14.35       | 15.60 | 0.565      | 0.614 |
| D    | 0.5         | 0.7   | 0.020      | 0.028 |
| E    | 2.7         | 2.9   | 0.106      | 0.114 |
| F    | 15.8        | 16.5  | 0.622      | 0.650 |
| G    | 20.4        | 21.1  | 0.815      | 0.831 |
| H    | 15.1        | 15.5  | 0.594      | 0.610 |
| J    | 5.4         | 5.65  | 0.213      | 0.222 |
| K    | 3.4         | 3.65  | 0.134      | 0.144 |
| ØL   | 4.08        | 4.17  | 0.161      | 0.164 |
| P    | 1.20        | 1.40  | 0.047      | 0.055 |
| R    | 4.60 typ.   |       | 0.181 typ. |       |

Table 7. RD91 dimensions

| Ref. | Dimensions  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | -           | 40.00 | -      | 1.575 |
| A1   | 29.90       | 30.30 | 1.177  | 1.193 |
| A2   | -           | 22.00 | -      | 0.867 |
| B    | -           | 27.00 | -      | 1.063 |
| B1   | 13.50       | 16.50 | 0.531  | 0.650 |
| B2   | -           | 24.00 | -      | 0.945 |
| C    | -           | 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°   |

## 4 Ordering information

**Table 8. Ordering information**

| Order code <sup>(1)</sup> | Marking   | Package   | Weight | Base qty | Delivery mode |
|---------------------------|-----------|-----------|--------|----------|---------------|
| BTA40-xxxB                | BTA40xxxB | RD91      | 20 g   | 25       | Bulk          |
| BTA41-xxxBRG              | BTA41xxxB | TOP3 Ins. | 4.5 g  | 30       | Tube          |
| BTB41-xxxBRG              | BTB41xxxB | TOP3      | 4.5 g  | 30       | Tube          |

1. xxx = voltage

## 5 Revision history

**Table 9. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                             |
|-------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sep-2003    | 5        | Last update.                                                                                                                                                                        |
| 25-Mar-2005 | 6        | TOP3 delivery mode changed from bulk to tube.                                                                                                                                       |
| 14-Oct-2005 | 7        | T <sub>C</sub> values for I <sub>T</sub> changed in Table 3. ECOPACK statement added.                                                                                               |
| 10-Aug-2009 | 8        | Updated <a href="#">Table 2</a> to correctly place packages. Updated <a href="#">Figure 2</a> . <a href="#">Table 5</a> changed to correctly place TOP3. Updated ECOPACK statement. |

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