

Description

Available either in through-hole or surface-mount packages, the BTA08, BTB08, T810, T835 is suitable for general purpose AC switching. It can be used as an ON/OFF function in applications such as static relays, heating regulation, induction motor starting circuits or for phase control operation in light dimmers and motor speed controllers, etc.

The Snubberless versions (BTABTB08_xxxxW and T8 series) are specially recommended for use on inductive loads, thanks to their high commutation performances.

Logic level versions are designed to interface directly with low power drivers such as micro-controller.

By using an internal ceramic pad, the BTA series provides voltage insulated tab (rated at 2500 VRMS) complying with UL standards (file ref.: E81734).

Features

- On-state rms current, $I_{T(RMS)}$ 8 A
- Repetitive peak off-state voltage, V_{DRM}/V_{RRM} 600 to 800 V
- Triggering gate current, $I_{GT(Q1)}$ 5 to 50 mA

1 Characteristics

Table 1. Absolute maximum ratings ($T_j = 25\text{ °C}$ unless otherwise stated)

| Symbol | Parameter | | | Value | Unit |
|--------------------|---|-------------------------|-----------------------|--------------------------------|-------------|
| $I_{T(rms)}$ | On-state rms current (full sine wave) | IPAK, DPAK, TO-220AB | $T_c = 110\text{ °C}$ | 8 | A |
| | | TO-220ABIns. | $T_c = 100\text{ °C}$ | | |
| I_{TSM} | Non repetitive surge peak on-state current (full cycle, T_j initial = 25 °C) | F = 50 Hz | t = 20 ms | 80 | A |
| | | F = 60 Hz | t = 16.7 ms | 84 | |
| I^2t | I^2t value for fusing | | $t_p = 10\text{ ms}$ | 36 | A^2s |
| dI/dt | Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100\text{ ns}$ | F = 120 Hz | $T_j = 125\text{ °C}$ | 50 | A/ μs |
| I_{GM} | Peak gate current | $t_p = 20\text{ }\mu s$ | $T_j = 125\text{ °C}$ | 4 | A |
| $P_{G(AV)}$ | Average gate power dissipation | | $T_j = 125\text{ °C}$ | 1 | W |
| T_{stg} T_j | Storage junction temperature range Operating junction temperature range | | | - 40 to + 150 - 40 to + 150 | $^{\circ}C$ |

Table 2. Electrical characteristics ($T_j = 25\text{ °C}$, unless otherwise specified) Snubberless and logic level (3 quadrants)

| Symbol | Test conditions | Quadrant | | T8 | | BTA08 / BTB08 | | | | Unit |
|-------------------|---|--------------|------|------|------|---------------|------|-----|------|------------|
| | | | | T810 | T835 | TW | SW | CW | BW | |
| $I_{GT}^{(1)}$ | $V_D = 12\text{ V}$ $R_L = 30\text{ }\Omega$ | I - II - III | MAX. | 10 | 35 | 5 | 10 | 35 | 50 | mA |
| V_{GT} | | I - II - III | MAX. | 1.3 | | | | | | V |
| V_{GD} | $V_D = V_{DRM}$ $R_L = 3.3\text{ k}\Omega$ $T_j = 125\text{ °C}$ | I - II - III | MIN. | 0.2 | | | | | | V |
| $I_H^{(2)}$ | $I_T = 100\text{ mA}$ | | MAX. | 15 | 35 | 10 | 15 | 35 | 50 | mA |
| I_L | $I_G = 1.2 I_{GT}$ | I - III | MAX. | 25 | 50 | 10 | 25 | 50 | 70 | mA |
| | | II | | 30 | 60 | 15 | 30 | 60 | 80 | |
| $dV/dt^{(2)}$ | $V_D = 67\% V_{DRM}$ gate open $T_j = 125\text{ °C}$ | | MIN. | 40 | 400 | 20 | 40 | 400 | 1000 | V/ μs |
| $(dI/dt)_c^{(2)}$ | $(dV/dt)_c = 0.1\text{ V}/\mu s$ $T_j = 125\text{ °C}$ | | MIN. | 5.4 | - | 3.5 | 5.4 | - | - | A/ms |
| | $(dV/dt)_c = 10\text{ V}/\mu s$ $T_j = 125\text{ °C}$ | | | 2.8 | - | 1.5 | 2.98 | - | - | |
| | Without snubber $T_j = 125\text{ °C}$ | | | - | 4.5 | - | - | 4.5 | 7 | |

Table 3. Standard (4 quadrants)

| Symbol | Test conditions | Quadrant | | BTA08 / BTB08 | | Unit |
|-------------------|--|-----------------------------|------|---------------|-----------|------------------|
| | | | | C | B | |
| $I_{GT}^{(1)}$ | $V_D = 12\text{ V}, R_L = 33\ \Omega$ | I - II - III IV | MAX. | 25 50 | 50 100 | mA |
| V_{GT} | | ALL | MAX. | 1.3 | | V |
| V_{GD} | $V_D = V_{DRM}, R_L = 3.3\text{ k}\ \Omega, T_j = 125\ ^\circ\text{C}$ | 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 | 50 | mA |
| | | II | | 80 | 100 | |
| $dV/dt^{(2)}$ | $V_D = 67\% V_{DRM}$ gate open | $T_j = 125\ ^\circ\text{C}$ | MIN. | 200 | 400 | V/ μs |
| $(dV/dt)_c^{(2)}$ | $(dI/dt)_c = 5.3\text{ A/ms}$ | $T_j = 125\ ^\circ\text{C}$ | MIN. | 5 | 10 | V/ μs |

Table 4. Static characteristics

| Symbol | Test conditions | | | Value | Unit | |
|------------------------|--|----------------------------|-----------------------------|-------|------|---------------|
| $V_{TM}^{(1)}$ | $I_{TM} = 11\text{ A}, t_p = 380\ \mu\text{s}$ | $T_j = 25\ ^\circ\text{C}$ | MAX. | 1.55 | V | |
| $V_{t0}^{(2)}$ | Threshold voltage | | $T_j = 125\ ^\circ\text{C}$ | MAX. | 0.85 | V |
| $R_d^{(2)}$ | Dynamic resistance | | $T_j = 125\ ^\circ\text{C}$ | MAX. | 50 | m Ω |
| I_{DRM} I_{RRM} | $V_{DRM} = V_{RRM}$ | | $T_j = 25\ ^\circ\text{C}$ | MAX. | 5 | μA |
| | | | $T_j = 125\ ^\circ\text{C}$ | | 1 | 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 | Parameter | | Value | Unit | |
|---------------|-----------------------|-----------------------|---|------|--------------------|
| $R_{th(j-c)}$ | Junction to case (AC) | | IPAK / D ² PAK / DPAK / TO-220AB | 1.6 | $^\circ\text{C/W}$ |
| | | | TO-220AB Insulated | 2.5 | |
| $R_{th(j-a)}$ | Junction to ambient | $S = 1\text{ cm}^2$ | D ² PAK | 45 | $^\circ\text{C/W}$ |
| | | $S = 0.5\text{ cm}^2$ | DPAK | 70 | |
| | | | TO-220AB / TO-220AB Insulated | 60 | |
| | | | IPAK | 100 | |

S = Copper surface under tab.

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

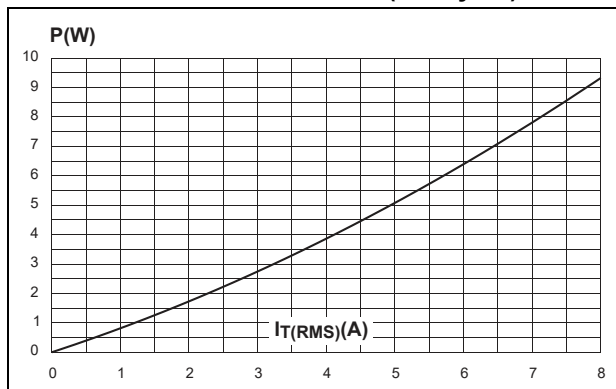


Figure 2. RMS on-state current versus case temperature (full cycle)

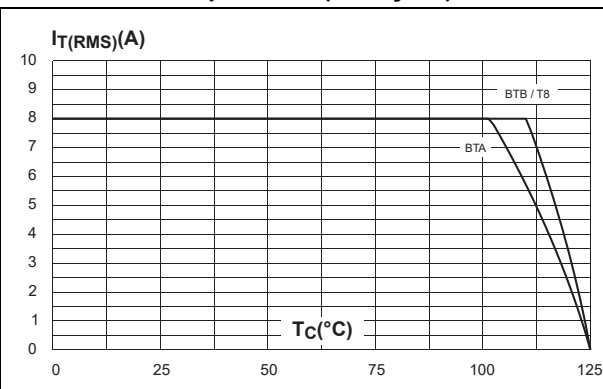


Figure 3. RMS on-state current versus ambient temperature (full cycle)

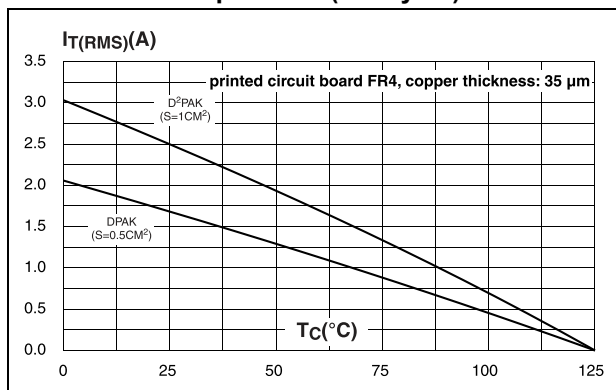


Figure 4. Relative variation of thermal impedance versus pulse duration

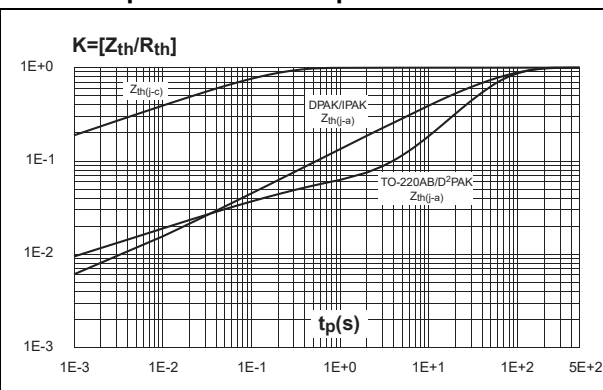


Figure 5. On-state characteristics (maximum values)

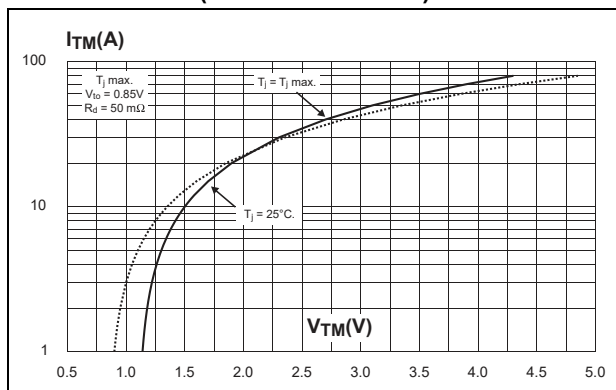


Figure 6. Surge peak on-state current versus number of cycles

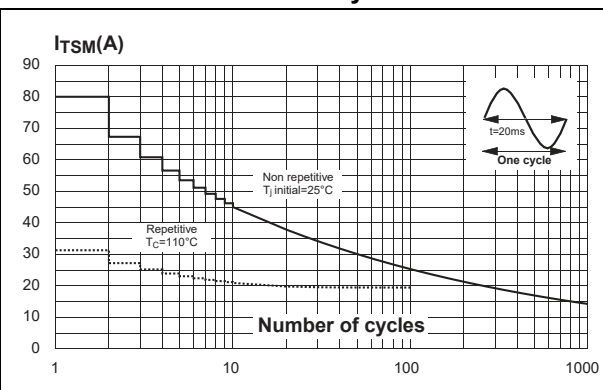


Figure 7. Non-repetitive surge peak on-state current for a sinusoidal

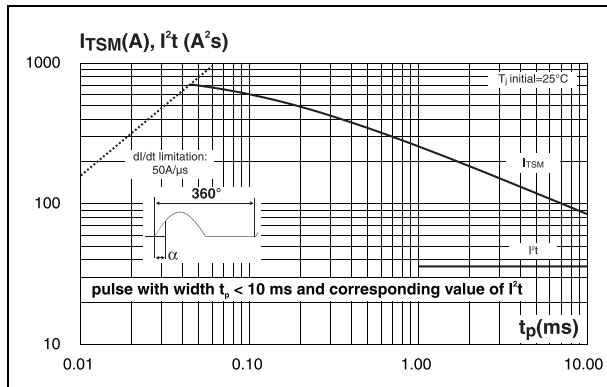


Figure 8. Relative variation of gate trigger current

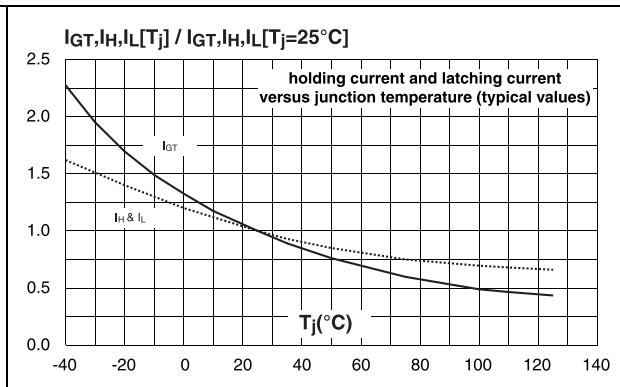


Figure 9. Relative variation of critical rate of decrease of main current versus $(dV/dt)_c$ (typical values)

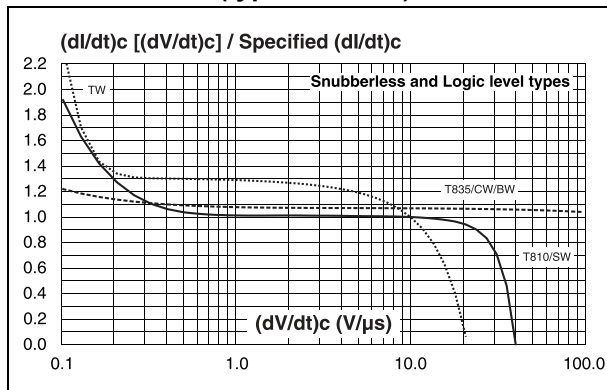


Figure 10. Relative variation of critical rate of decrease of main current versus $(dV/dt)_c$ (typical values)

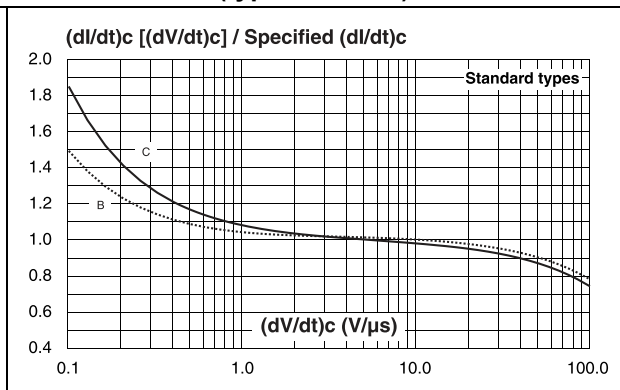


Figure 11. Relative variation of critical rate of decrease of main current versus junction temperature

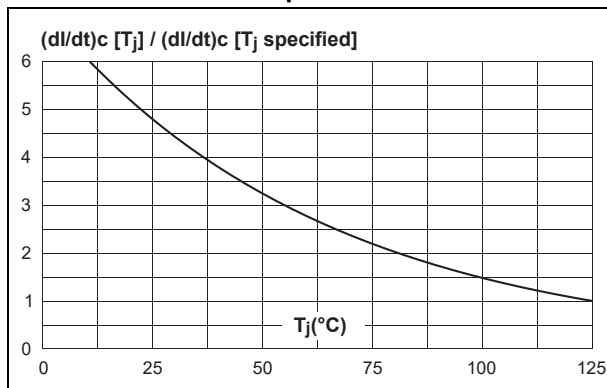
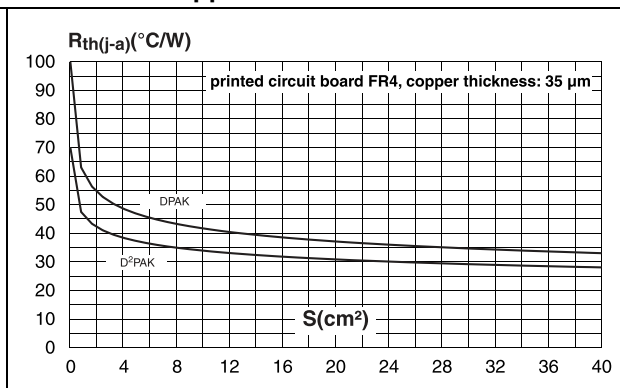


Figure 12. DPAK and D²PAK thermal resistance junction to ambient versus copper surface under tab

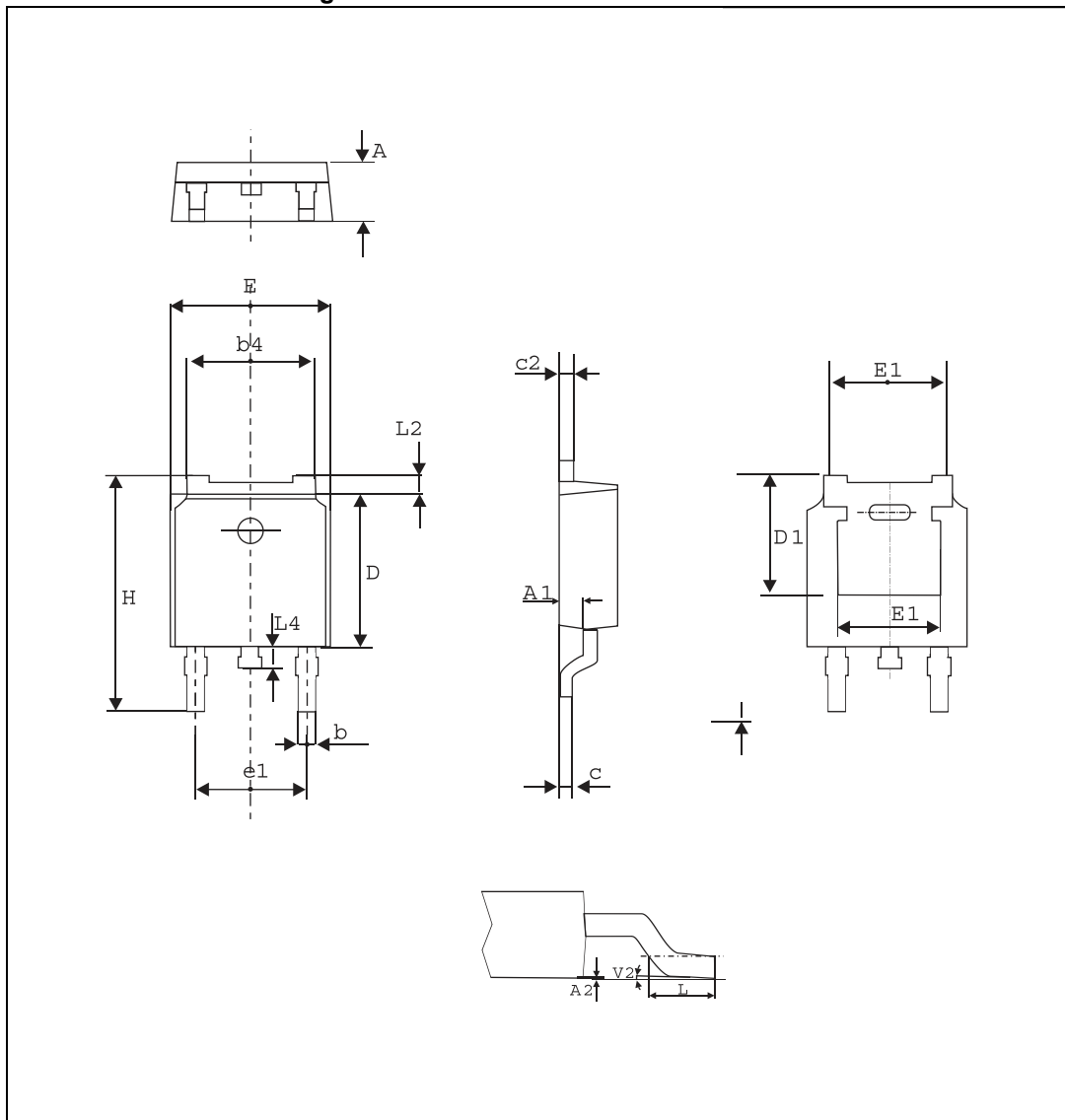


2 Package information

- Epoxy meets UL94, V0
- Lead-free package
- Recommended torque: 0.4 to 0.6 N·m

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Figure 13. DPAK dimension definitions



Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 6. DPAK dimension values

| Ref. | Dimensions | | | | | |
|------|-------------|------|-------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.18 | | 2.40 | 0.086 | | 0.094 |
| A1 | 0.90 | | 1.10 | 0.035 | | 0.043 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| b | 0.64 | | 0.90 | 0.025 | | 0.035 |
| b4 | 4.95 | | 5.46 | 0.195 | | 0.215 |
| c | 0.46 | | 0.61 | 0.018 | | 0.024 |
| c2 | 0.46 | | 0.60 | 0.018 | | 0.023 |
| D | 5.97 | | 6.22 | 0.235 | | 0.244 |
| D1 | 5.10 | | | 0.201 | | |
| E | 6.35 | | 6.73 | 0.250 | | 0.264 |
| E1 | | 4.32 | | | 0.170 | |
| e1 | 4.40 | | 4.70 | 0.173 | | 0.185 |
| H | 9.35 | | 10.40 | 0.368 | | 0.409 |
| L | 1.00 | | 1.78 | 0.039 | | 0.070 |
| L2 | | | 1.27 | | | 0.05 |
| L4 | 0.60 | | 1.02 | 0.023 | | 0.040 |
| V2 | 0° | | 8° | 0° | | 8° |

Figure 14. Footprint (dimensions in mm)

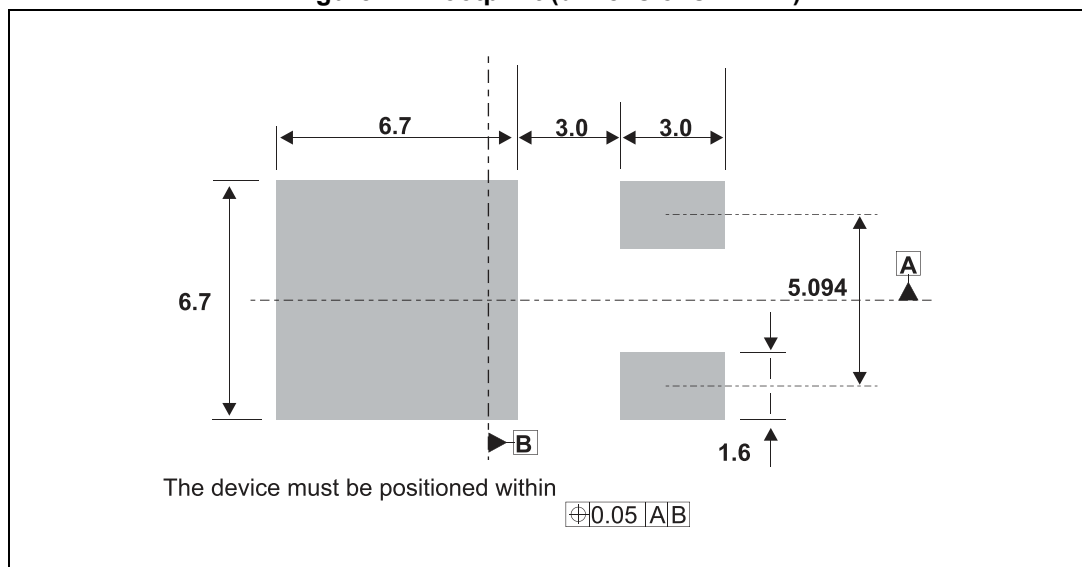
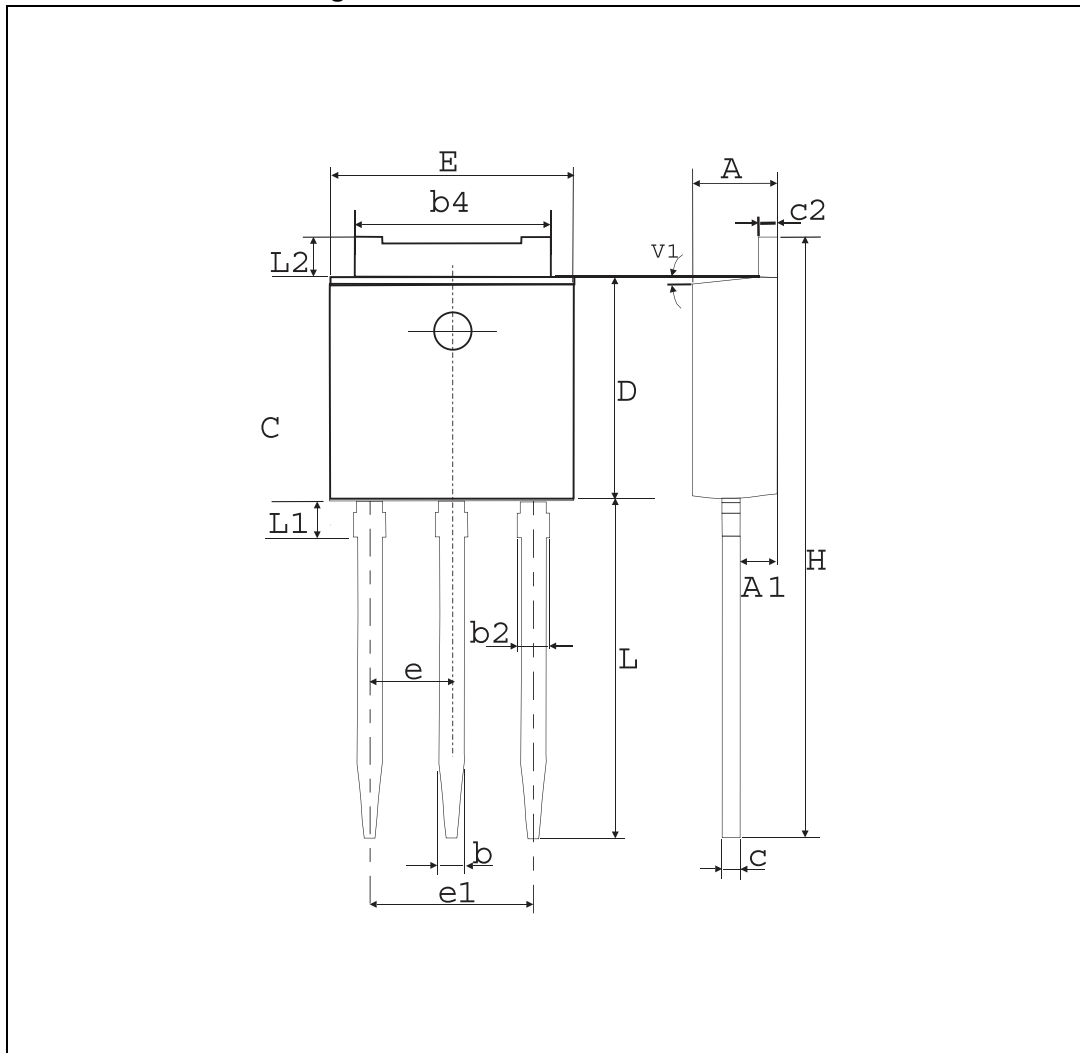


Figure 15. IPAK dimension definitions



Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 7. IPAK dimension values

| Ref. | Dimensions | | | | | |
|------|-------------|-------|------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.20 | | 2.40 | 0.086 | | 0.094 |
| A1 | 0.90 | | 1.10 | 0.035 | | 0.043 |
| b | 0.64 | | 0.90 | 0.025 | | 0.035 |
| b2 | | | 0.95 | | | 0.037 |
| b4 | 5.20 | | 5.43 | 0.204 | | 0.213 |
| c | 0.45 | | 0.60 | 0.017 | | 0.023 |
| c2 | 0.46 | | 0.60 | 0.018 | | 0.023 |
| D | 6 | | 6.20 | 0.236 | | 0.244 |
| E | 6.40 | | 6.70 | 0.252 | | 0.263 |
| e | | 2.28 | | | 0.090 | |
| e1 | 4.40 | | 4.60 | 0.173 | | 0.181 |
| H | | 16.10 | | | 0.634 | |
| L | 9 | | 9.60 | 0.354 | | 0.377 |
| L1 | 0.8 | | 1.20 | 0.031 | | 0.047 |
| L2 | | 0.80 | 1.25 | | 0.031 | 0.049 |
| V1 | | 10° | | | 10° | |

Figure 16. TO-220AB (Nlns. & Ins. 20-up) dimension definitions

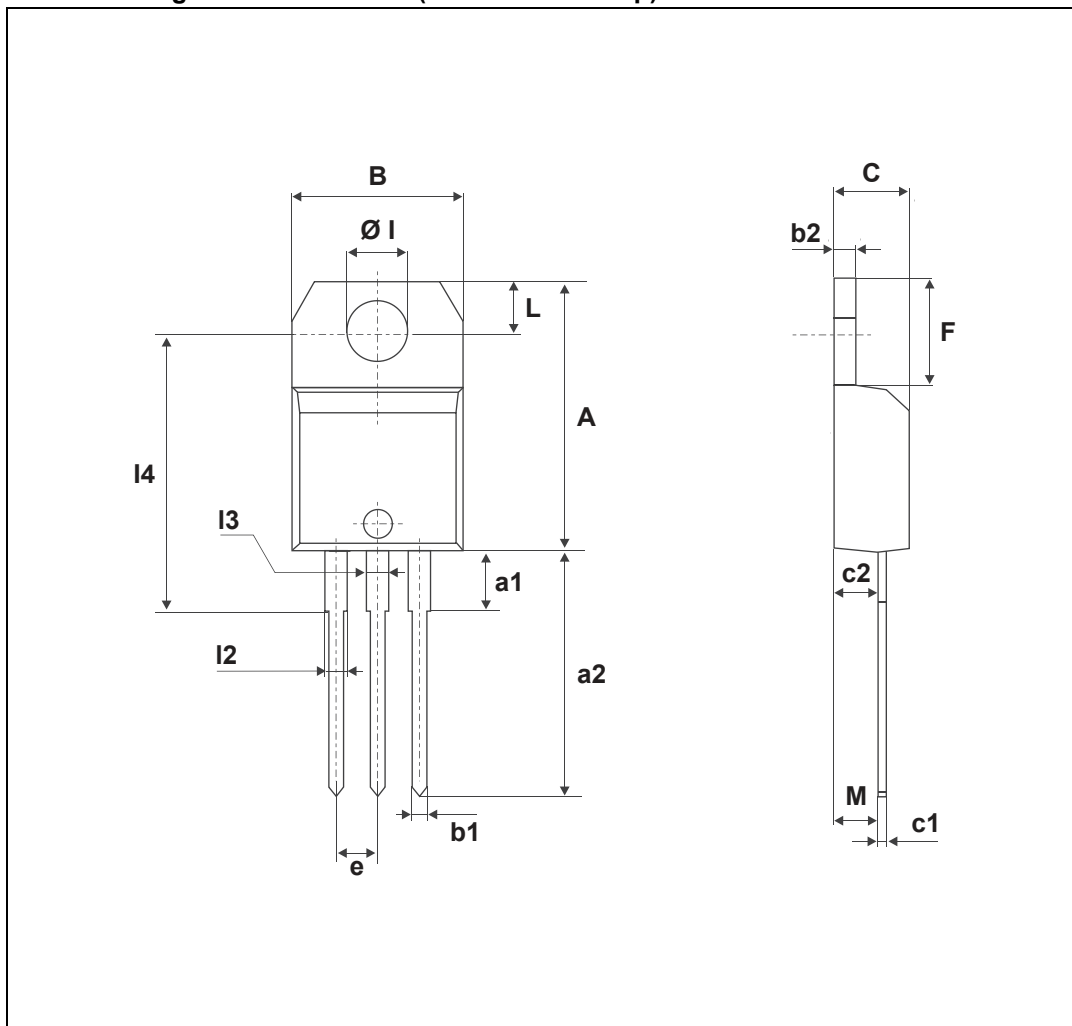


Table 8. TO-220AB (Nlns. & Ins. 20-up) dimension values

| Ref. | Dimensions | | | | | |
|------|-------------|-------|-------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 15.20 | | 15.90 | 0.598 | | 0.625 |
| a1 | | 3.75 | | | 0.147 | |
| a2 | 13.00 | | 14.00 | 0.511 | | 0.551 |
| B | 10.00 | | 10.40 | 0.393 | | 0.409 |
| b1 | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b2 | 1.23 | | 1.32 | 0.048 | | 0.051 |
| C | 4.40 | | 4.60 | 0.173 | | 0.181 |
| c1 | 0.49 | | 0.70 | 0.019 | | 0.027 |
| c2 | 2.40 | | 2.72 | 0.094 | | 0.107 |
| e | 2.40 | | 2.70 | 0.094 | | 0.106 |
| F | 6.20 | | 6.60 | 0.244 | | 0.259 |
| Øl | 3.75 | | 3.85 | 0.147 | | 0.151 |
| l4 | 15.80 | 16.40 | 16.80 | 0.622 | 0.646 | 0.661 |
| L | 2.65 | | 2.95 | 0.104 | | 0.116 |
| l2 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| l3 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| M | | 2.60 | | | 0.102 | |

Figure 17. D²PAK dimension definitions

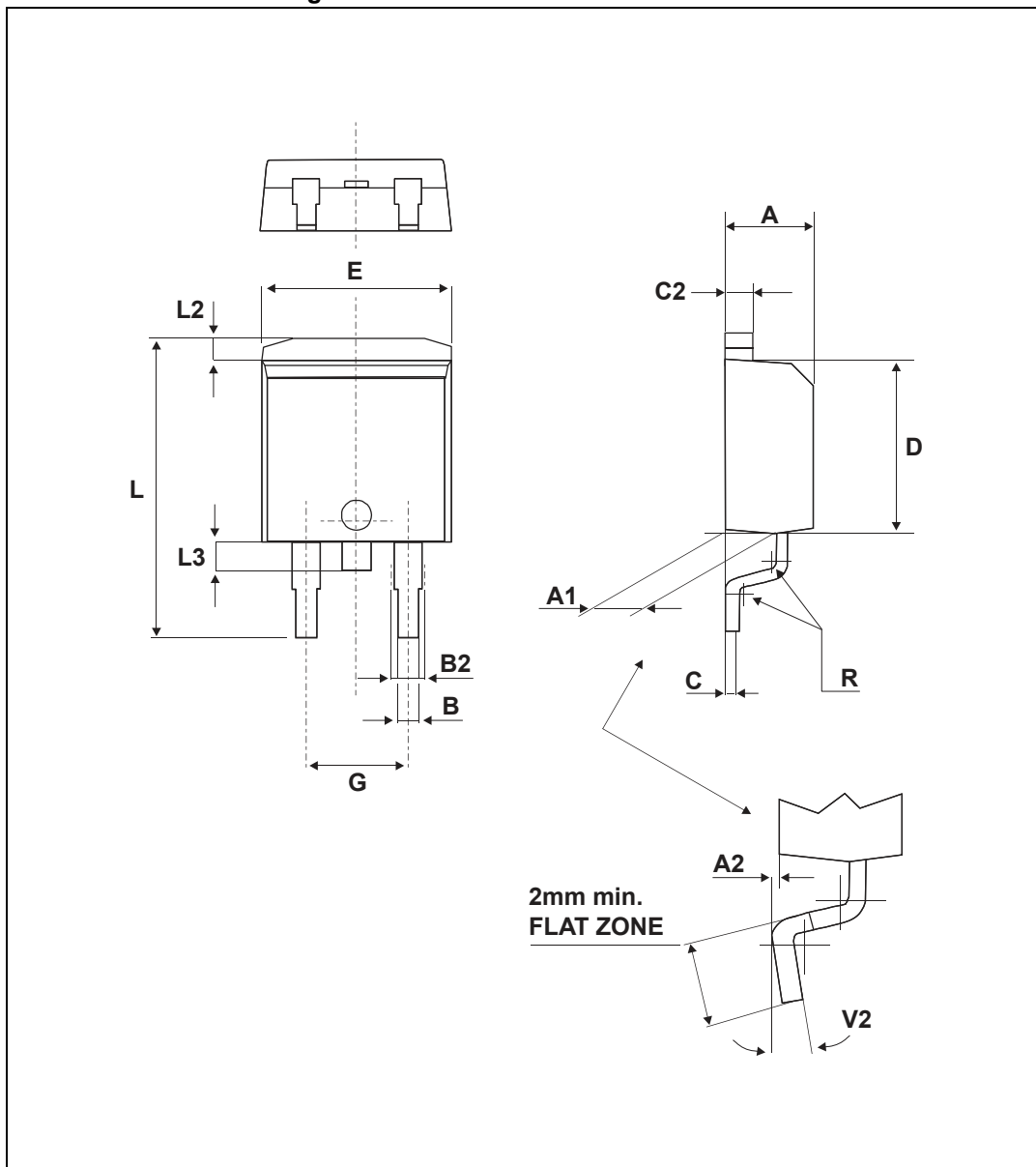
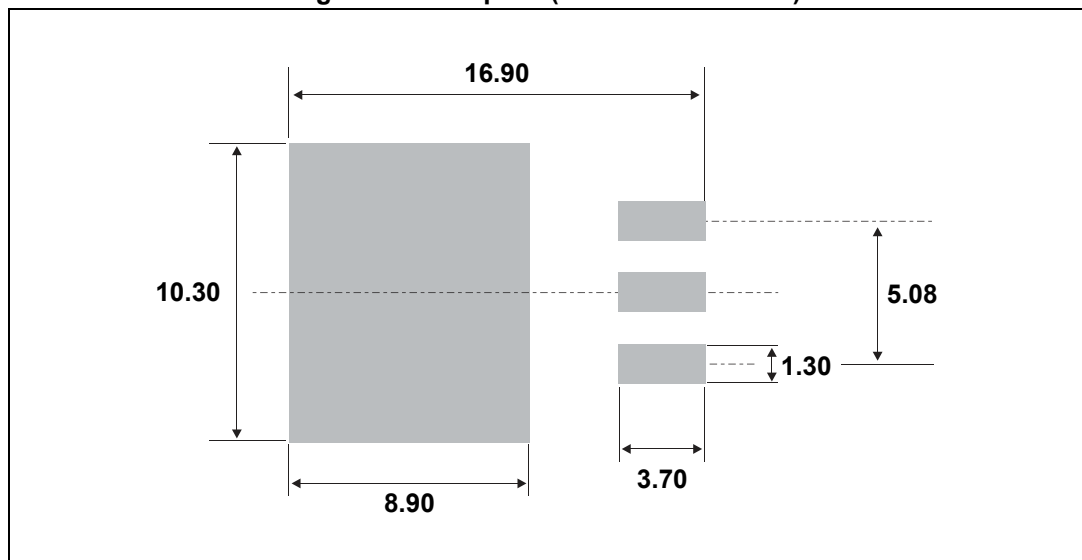


Table 9. D²PAK dimension values

| Ref. | Dimensions | | | | | |
|------|-------------|------|-------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.30 | | 4.60 | 0.169 | | 0.181 |
| A1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.70 | | 0.93 | 0.027 | | 0.037 |
| B2 | 1.25 | 1.40 | | 0.048 | 0.055 | |
| C | 0.45 | | 0.60 | 0.017 | | 0.024 |
| C2 | 1.21 | | 1.36 | 0.047 | | 0.054 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| E | 10.00 | | 10.28 | 0.393 | | 0.405 |
| G | 4.88 | | 5.28 | 0.192 | | 0.208 |
| L | 15.00 | | 15.85 | 0.590 | | 0.624 |
| L2 | 1.27 | | 1.40 | 0.050 | | 0.055 |
| L3 | 1.40 | | 1.75 | 0.055 | | 0.069 |
| R | 0.40 | | | 0.016 | | |
| V2 | 0° | | 8° | 0° | | 8° |

Figure 18. Footprint (dimensions in mm)



3 Ordering information

Figure 19. Ordering information scheme (BTA08 and BTB08 series)

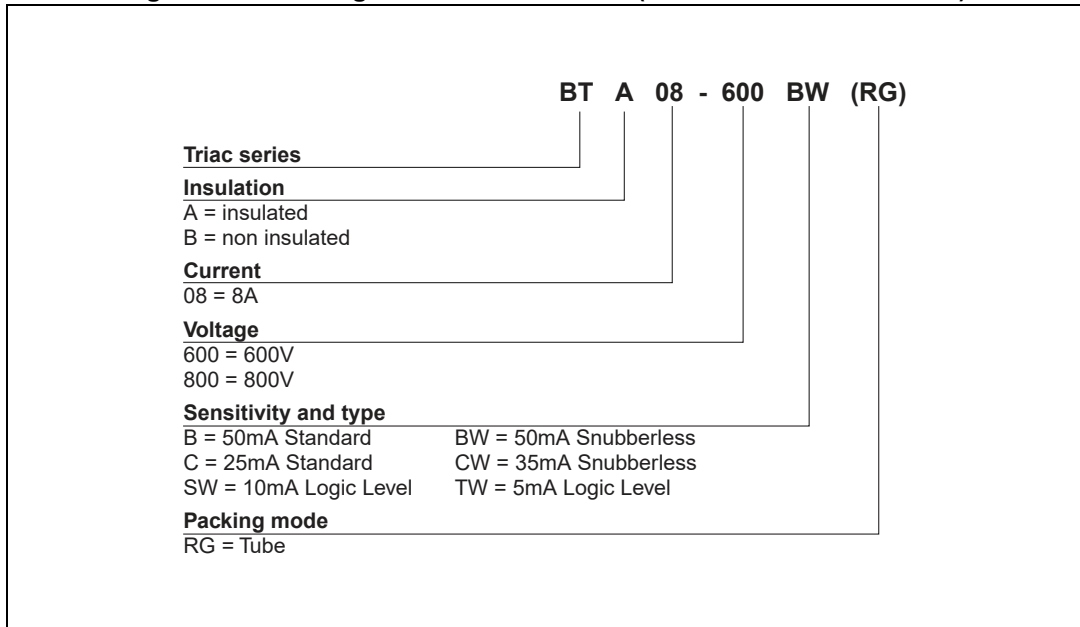


Figure 20. Ordering information scheme (T8 series)

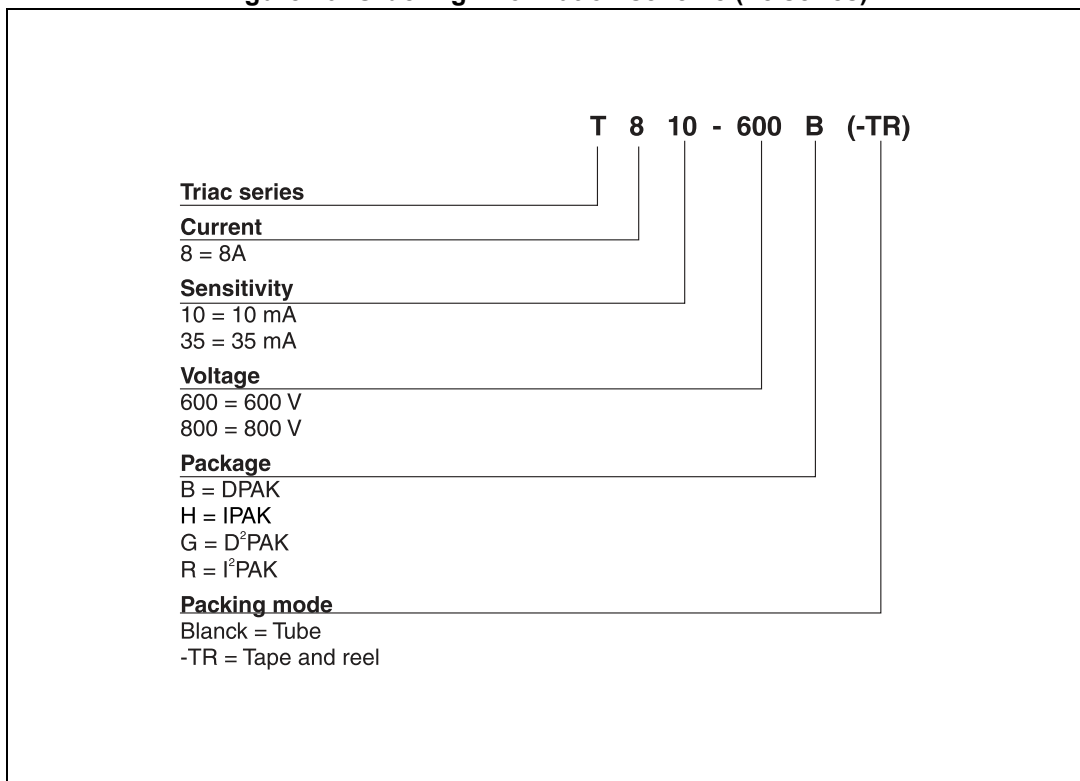


Table 10. Product selector

| Part Number | Voltage (xxx) | | Sensitivity | Type | Package |
|-----------------|---------------|-------|-------------|-------------|--------------------|
| | 600 V | 800 V | | | |
| BTA/BTB08-xxxB | X | X | 50 mA | Standard | TO-220AB |
| BTA/BTB08-xxxBW | X | X | 50 mA | Snubberless | TO-220AB |
| BTA/BTB08-xxxC | X | X | 25 mA | Standard | TO-220AB |
| BTA/BTB08-xxxCW | X | X | 35 mA | Snubberless | TO-220AB |
| BTA/BTB08-xxxSW | X | X | 10 mA | Logic level | TO-220AB |
| BTA/BTB08-xxxTW | X | X | 5 mA | Logic Level | TO-220AB |
| T810-xxxG | X | X | 10 mA | Logic Level | D ² PAK |
| T810-xxxH | X | X | 10 mA | Logic Level | IPAK |
| T835-xxxB | X | X | 35 mA | Snubberless | DPAK |
| T835-xxxG | X | X | 35 mA | Snubberless | D ² PAK |
| T835-xxxH | X | X | 35 mA | Snubberless | IPAK |

BTB: non insulated TO-220AB package

xxx = voltage, y (y) = sensitivity, z = type

Table 11. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|--------------|----------|--------------------|--------|----------|---------------|
| T810-600G | T810-600 | D ² PAK | 1.5 g | 50 | Tube |
| T835-600G | T835-600 | | | | |
| T810-800G | T810-800 | | | | |
| T835-800G | T835-800 | | | | |
| T810-600G-TR | T810-600 | | | | Tape and reel |
| T835-600G-TR | T835-600 | | | | |
| T810-800G-TR | T810-800 | | | | |
| T835-800G-TR | T835-800 | | | | |
| T835-600B | T835-600 | DPAK | 0.3 g | 75 | Tube |
| T835-800B | T835-800 | | | | |
| T810-600H | T810-600 | IPAK | 0.4 g | 75 | Tube |
| T835-600H | T835-600 | | | | |
| T810-800H | T810-800 | | | | |
| T835-800H | T835-800 | | | | |

Table 11. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|---------------|-------------|----------|--------|----------|---------------|
| BTA08-800SWRG | BTA08-800SW | TO-220AB | 2.3 g | 50 g | Tube |
| BTB08-600SWRG | BTB08-600SW | | | | |
| BTB08-800SWRG | BTB08-800SW | | | | |
| BTA08-600SWRG | BTA08-600SW | | | | |
| BTA08-800CRG | BTA08-800C | | | | |
| BTB08-600CRG | BTB08-600C | | | | |
| BTB08-800CRG | BTB08-800C | | | | |
| BTA08-600CRG | BTA08-600C | | | | |
| BTA08-800CWRG | BTA08-800CW | | | | |
| BTB08-600CWRG | BTB08-600CW | | | | |
| BTB08-800CWRG | BTB08-800CW | | | | |
| BTA08-600CWRG | BTA08-600CW | | | | |
| BTA08-800TWRG | BTA08-800TW | | | | |
| BTB08-600TWRG | BTB08-600TW | | | | |
| BTB08-800TWRG | BTB08-800TW | | | | |
| BTA08-600TWRG | BTA08-600TW | | | | |
| BTA08-800BRG | BTA08-800B | | | | |
| BTA08-800BWRG | BTA08-800BW | | | | |
| BTB08-600BRG | BTB08-600B | | | | |
| BTB08-600BWRG | BTB08-600BW | | | | |
| BTB08-800BRG | BTB08-800B | TO-220AB | 2.3 g | 50 | Tube |
| BTB08-800BWRG | BTB08-800BW | | | | |
| BTA08-600BRG | BTA08-600B | | | | |
| BTA08-600BWRG | BTA08-600BW | | | | |
| T835-600B | T835-600 | DPAK | 0.3 g | 2500 | Tape and reel |
| T835-800B | T835-800 | | | | |

4 Revision history

Table 12. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| Apr-2002 | 5A | Last update. |
| 13-Feb-2006 | 6 | TO-220AB delivery mode changed from bulk to tube. ECOPACK statement added. |
| 10-Mar-2010 | 7 | Updated ECOPACK statement and Figure 20 |
| 02-Jun-2014 | 8 | Updated DPAK and IPAK package information and reformatted to current standard. |

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