



BTA12, BTB12 and T12 Series

SNUBBERLESS™, LOGIC LEVEL & STANDARD

12A TRIACs

Table 1: Main Features

| Symbol | Value | Unit |
|-------------------|-------------|------|
| $I_{T(RMS)}$ | 12 | A |
| V_{DRM}/V_{RRM} | 600 and 800 | V |
| $I_{GT}(Q_1)$ | 5 to 50 | mA |

DESCRIPTION

Available either in through-hole or surface-mount packages, the **BTA12**, **BTB12** and **T12** triac series is suitable for general purpose AC switching. They 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, motor speed controllers,...

The snubberless versions (BTA/BTB...W and T12 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 microcontrollers.

By using an internal ceramic pad, the BTA series provides voltage insulated tab (rated at $2500V_{RMS}$) complying with UL standards (File ref.: E81734).

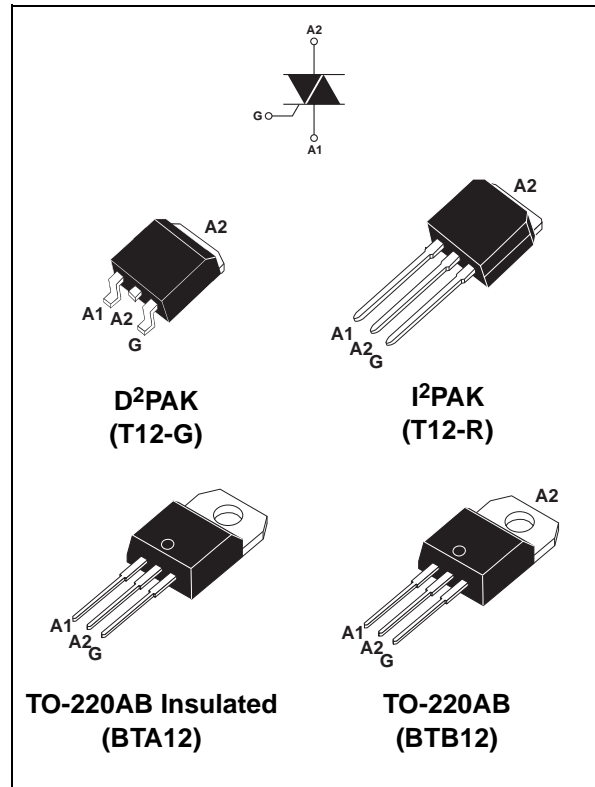


Table 2: Order Codes

| Part Number | Marking |
|---------------|----------------------------|
| BTA12-xxxxxRG | See page table 8 on page 9 |
| BTB12-xxxxxRG | |
| T12xx-xxxG | |
| T12xx-xxxG-TR | |
| T12xx-xxxR | |

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Table 3: Absolute Maximum Ratings

| Symbol | Parameter | | Value | Unit | |
|--------------------|--|--|---------------------------|--------------------------------|------------------|
| $I_{T(RMS)}$ | RMS on-state current (full sine wave) | I ² PAK/D ² PAK/ TO-220AB | $T_c = 105^\circ\text{C}$ | 12 | A |
| | | TO-220AB Ins. | $T_c = 90^\circ\text{C}$ | | |
| I_{TSM} | Non repetitive surge peak on-state current (full cycle, T_j initial = 25°C) | F = 50 Hz | t = 20 ms | 120 | A |
| | | F = 60 Hz | t = 16.7 ms | 126 | |
| I^2t | I^2t Value for fusing | $t_p = 10$ ms | | 78 | A ² s |
| di/dt | Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100$ ns | F = 120 Hz | $T_j = 125^\circ\text{C}$ | 50 | A/ μs |
| V_{DSM}/V_{RSM} | Non repetitive surge peak off-state voltage | $t_p = 10$ ms | $T_j = 25^\circ\text{C}$ | $V_{DRM}/V_{RRM} + 100$ | V |
| I_{GM} | Peak gate current | $t_p = 20$ μs | $T_j = 125^\circ\text{C}$ | 4 | A |
| $P_{G(AV)}$ | Average gate power dissipation | | $T_j = 125^\circ\text{C}$ | 1 | W |
| T_{stg} T_j | Storage junction temperature range Operating junction temperature range | | | - 40 to + 150 - 40 to + 125 | $^\circ\text{C}$ |

Tables 4: Electrical Characteristics ($T_j = 25^\circ\text{C}$, unless otherwise specified)

■ **SNUBBERLESS and Logic Level (3 quadrants)**

| Symbol | Test Conditions | Quadrant | | T12 | | BTA12 / BTB12 | | | | Unit |
|--------------|--|--------------|------|-------|-------|---------------|-----|-----|------|------------------|
| | | | | T1205 | T1235 | TW | SW | CW | BW | |
| I_{GT} (1) | $V_D = 12$ V $R_L = 30$ Ω | I - II - III | MAX. | 5 | 35 | 5 | 10 | 35 | 50 | mA |
| V_{GT} | | I - II - III | MAX. | 1.3 | | | | | | V |
| V_{GD} | $V_D = V_{DRM}$ $R_L = 3.3$ k Ω $T_j = 125^\circ\text{C}$ | I - II - III | MIN. | 0.2 | | | | | | V |
| I_H (2) | $I_T = 100$ mA | | MAX. | 10 | 35 | 10 | 15 | 35 | 50 | mA |
| I_L | $I_G = 1.2$ I_{GT} | I - III | MAX. | 10 | 50 | 10 | 25 | 50 | 70 | mA |
| | | II | | 15 | 60 | 15 | 30 | 60 | 80 | |
| dV/dt (2) | $V_D = 67\%$ V_{DRM} gate open $T_j = 125^\circ\text{C}$ | | MIN. | 20 | 500 | 20 | 40 | 500 | 1000 | V/ μs |
| (di/dt)c (2) | $(dV/dt)c = 0.1$ V/ μs $T_j = 125^\circ\text{C}$ | | MIN. | 3.5 | | 3.5 | 6.5 | | | A/ms |
| | $(dV/dt)c = 10$ V/ μs $T_j = 125^\circ\text{C}$ | | | 1 | | 1 | 2.9 | | | |
| | Without snubber $T_j = 125^\circ\text{C}$ | | | | 6.5 | | | 6.5 | 12 | |

■ Standard (4 quadrants)

| Symbol | Test Conditions | Quadrant | | BTA12 / BTB12 | | Unit |
|--------------------------|--|--------------------|------|---------------|-----------|------------------|
| | | | | C | B | |
| I_{GT} (1) | $V_D = 12\text{ V}$ $R_L = 30\ \Omega$ | 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 5: Static Characteristics

| Symbol | Test Conditions | | | Value | Unit | |
|------------------------|---|--------------------------|---------------------------|-------|------|---------------|
| V_T (2) | $I_{TM} = 17\text{ A}$ $t_p = 380\ \mu\text{s}$ | $T_j = 25^\circ\text{C}$ | 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. | 35 | 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 |

Note 1: minimum I_{GT} is guaranteed at 5% of I_{GT} max.

Note 2: for both polarities of A2 referenced to A1.

Table 6: Thermal resistance

| Symbol | Parameter | | Value | Unit | |
|---------------|-----------------------|-----------------------|---|------|--------------------|
| $R_{th(j-c)}$ | Junction to case (AC) | | I ² PAK / D ² PAK / TO-220AB | 1.4 | $^\circ\text{C/W}$ |
| | | | TO-220AB Insulated | 2.3 | |
| $R_{th(j-a)}$ | Junction to ambient | S = 1 cm ² | D ² PAK | 45 | $^\circ\text{C/W}$ |
| | | | TO-220AB / I ² PAK TO-220AB Insulated | 60 | |

S = Copper surface under tab.

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

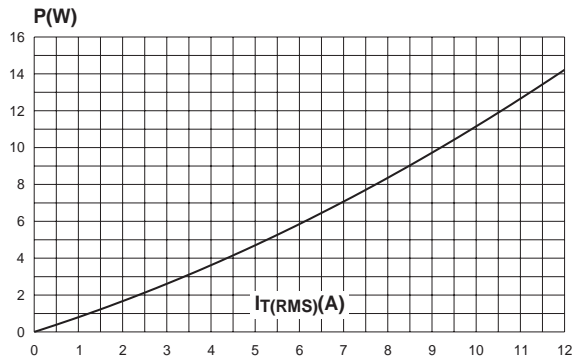


Figure 2: RMS on-state current versus case temperature (full cycle)

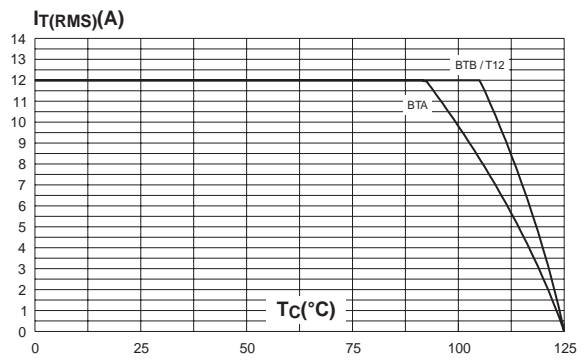


Figure 3: RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35µm) (full cycle)

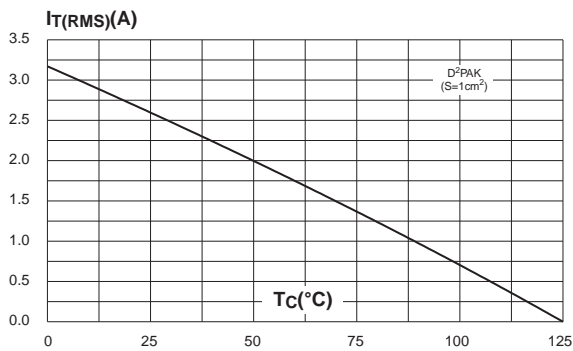


Figure 4: Relative variation of thermal impedance versus pulse duration

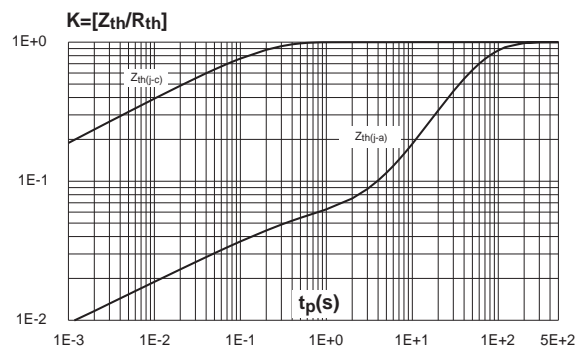


Figure 5: On-state characteristics (maximum values)

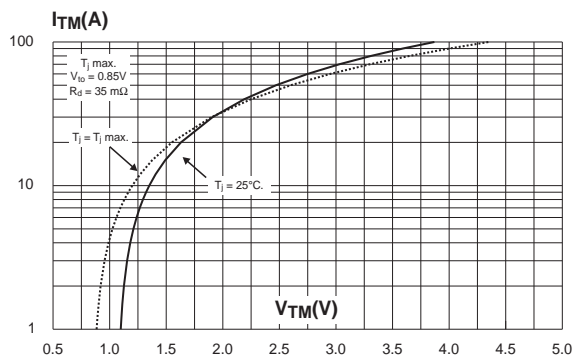


Figure 6: Surge peak on-state current versus number of cycles

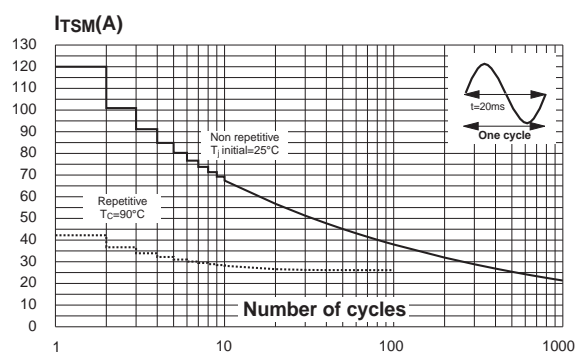


Figure 7: Non-repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 10$ ms and corresponding value of I^2t

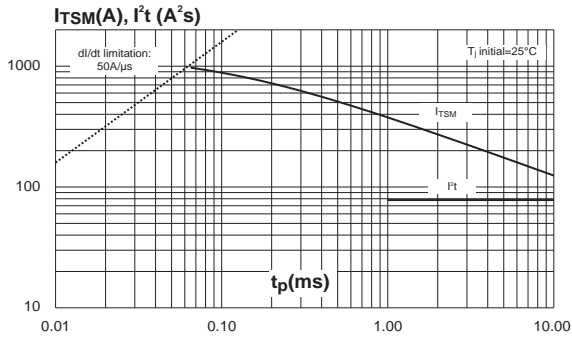


Figure 8: Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)

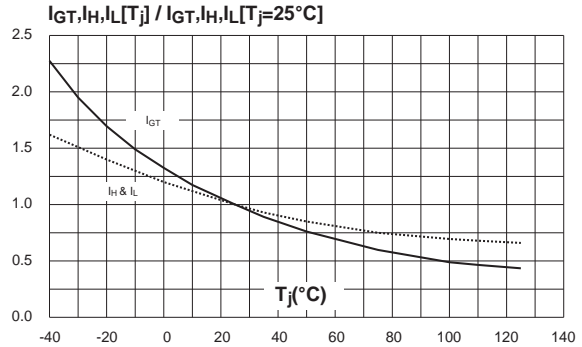


Figure 9: Relative variation of critical rate of decrease of main current versus $(dV/dt)_c$ (typical values) (BW/CW/T1235)

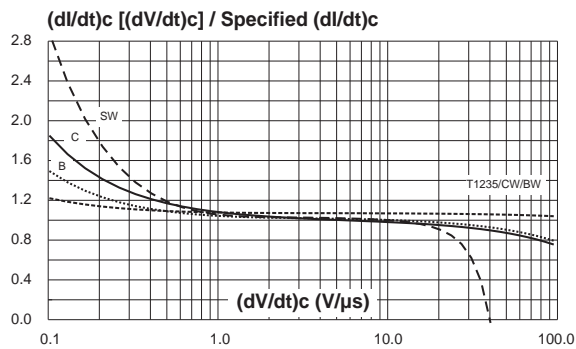


Figure 10: Relative variation of critical rate of decrease of main current versus $(dV/dt)_c$ (typical values) (TW/T1205)

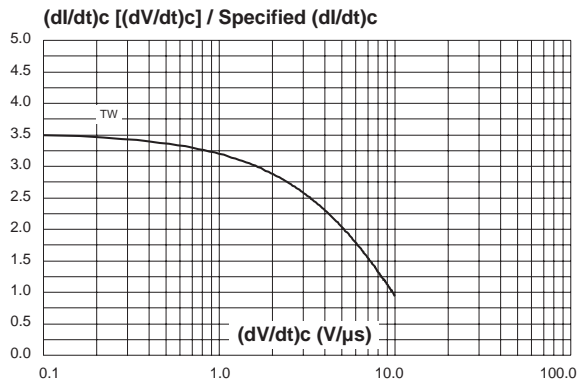


Figure 11: Relative variation of critical rate of decrease of main current versus junction temperature

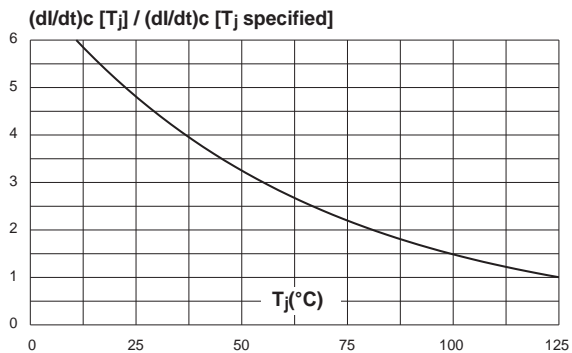
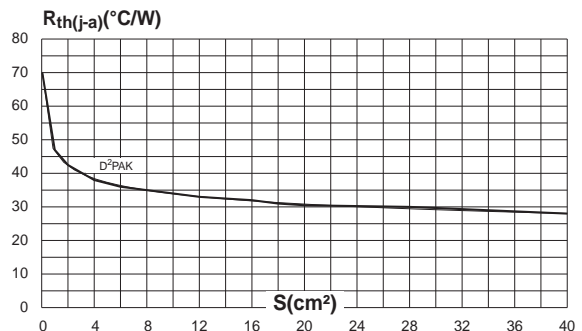


Figure 12: D²PAK Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 μm)



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Figure 13: Ordering Information Scheme (BTA and BTB series)

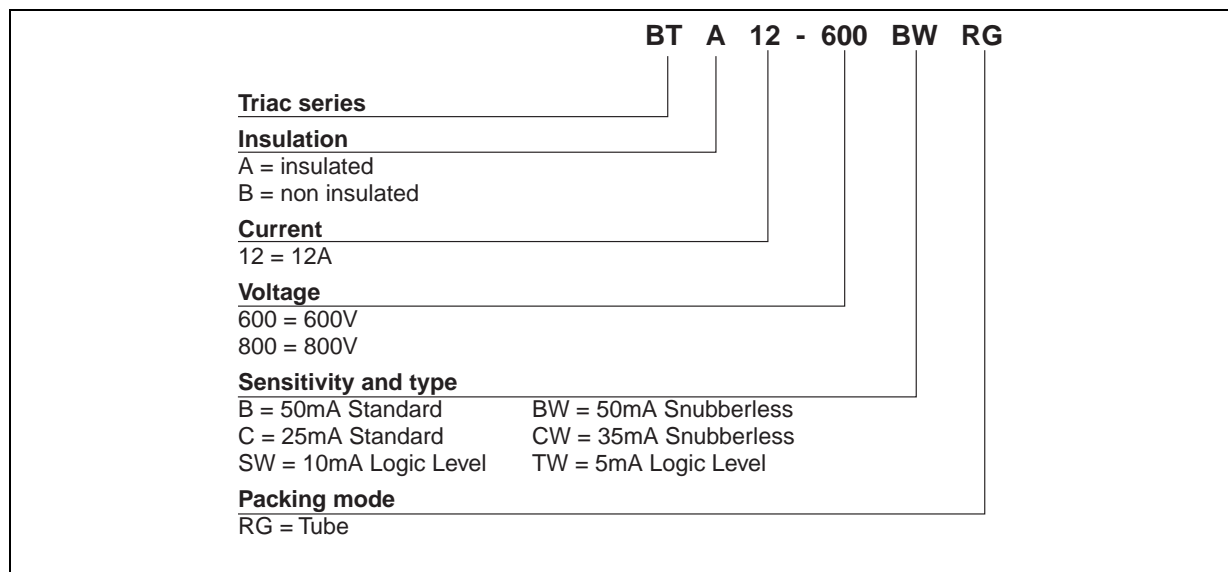


Figure 14: Ordering Information Scheme (T12 series)

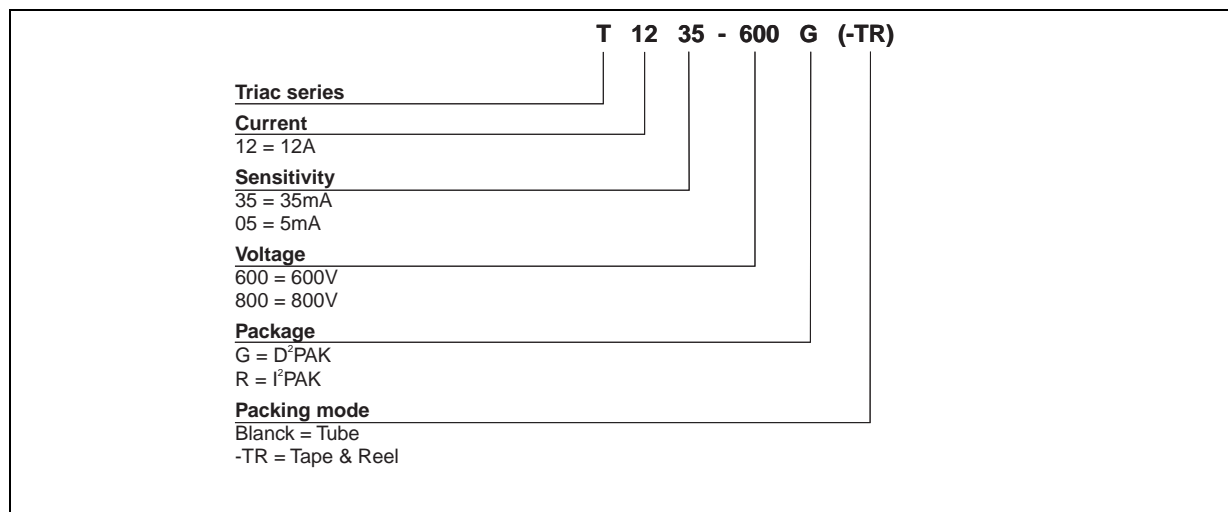


Table 7: Product Selector

| Part Number | Voltage (xxx) | | Sensitivity | Type | Package |
|-------------------|---------------|-------|-------------|-------------|--------------------|
| | 600 V | 800 V | | | |
| BTA/BTB12-xxxBRG | X | X | 50 mA | Standard | TO-220AB |
| BTA/BTB12-xxxBWRG | X | X | 50 mA | Snubberless | TO-220AB |
| BTA/BTB12-xxxCRG | X | X | 25 mA | Standard | TO-220AB |
| BTA/BTB12-xxxCWRG | X | X | 35 mA | Snubberless | TO-220AB |
| BTA/BTB12-xxxSWRG | X | X | 10 mA | Logic Level | TO-220AB |
| BTA/BTB12-xxxTWRG | X | X | 5 mA | Logic Level | TO-220AB |
| T1205-xxxG | X | X | 5 mA | Snubberless | D ² PAK |
| T1235-xxxG | X | X | 35 mA | Snubberless | D ² PAK |
| T1235-xxxR | X | X | 35 mA | Snubberless | I ² PAK |

BTB: non insulated TO-220AB package

Figure 15: D²PAK Package Mechanical Data

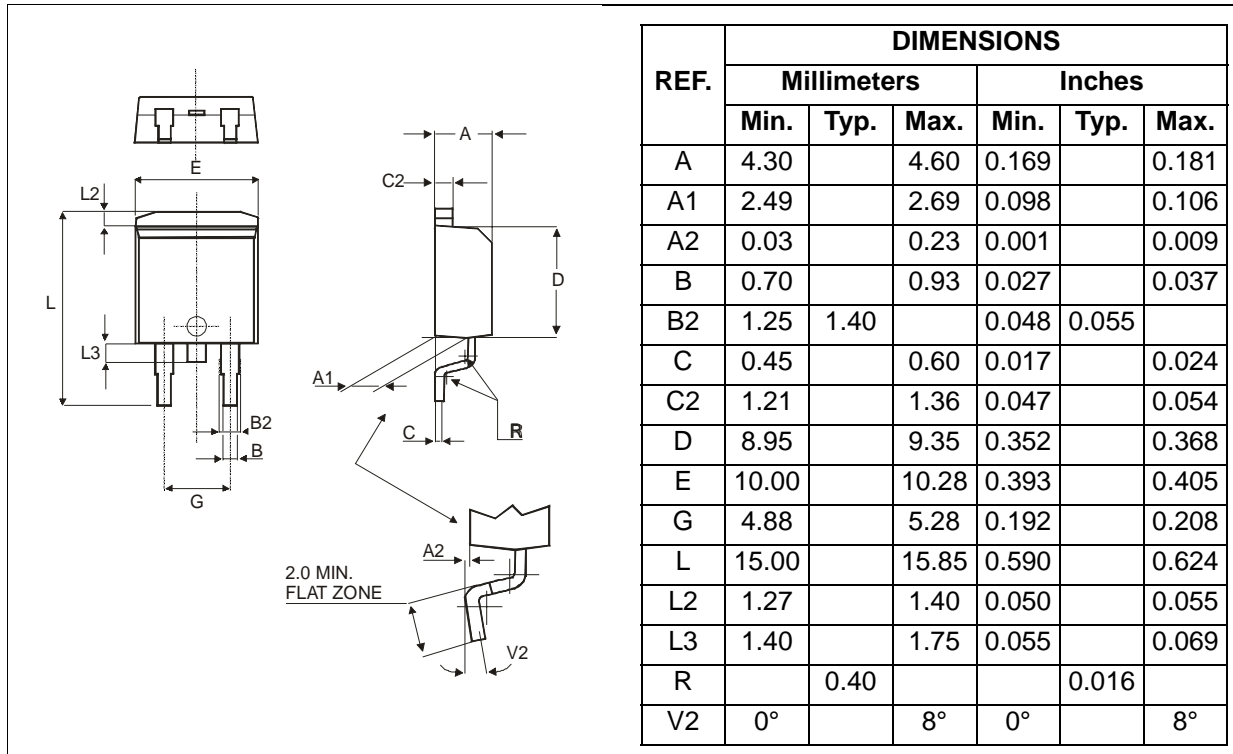
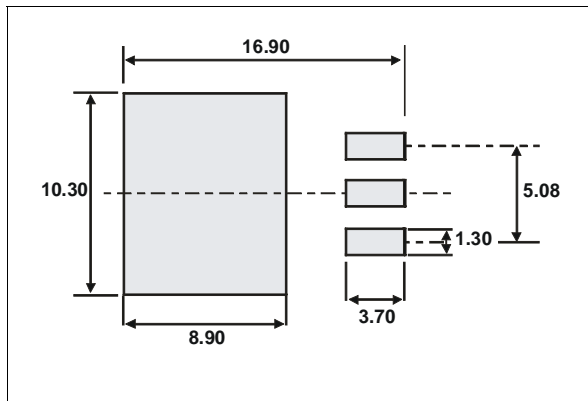


Figure 16: D²PAK Foot Print Dimensions
(in millimeters)



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Figure 17: TO-220AB Insulated and non insulated) Package Mechanical Data

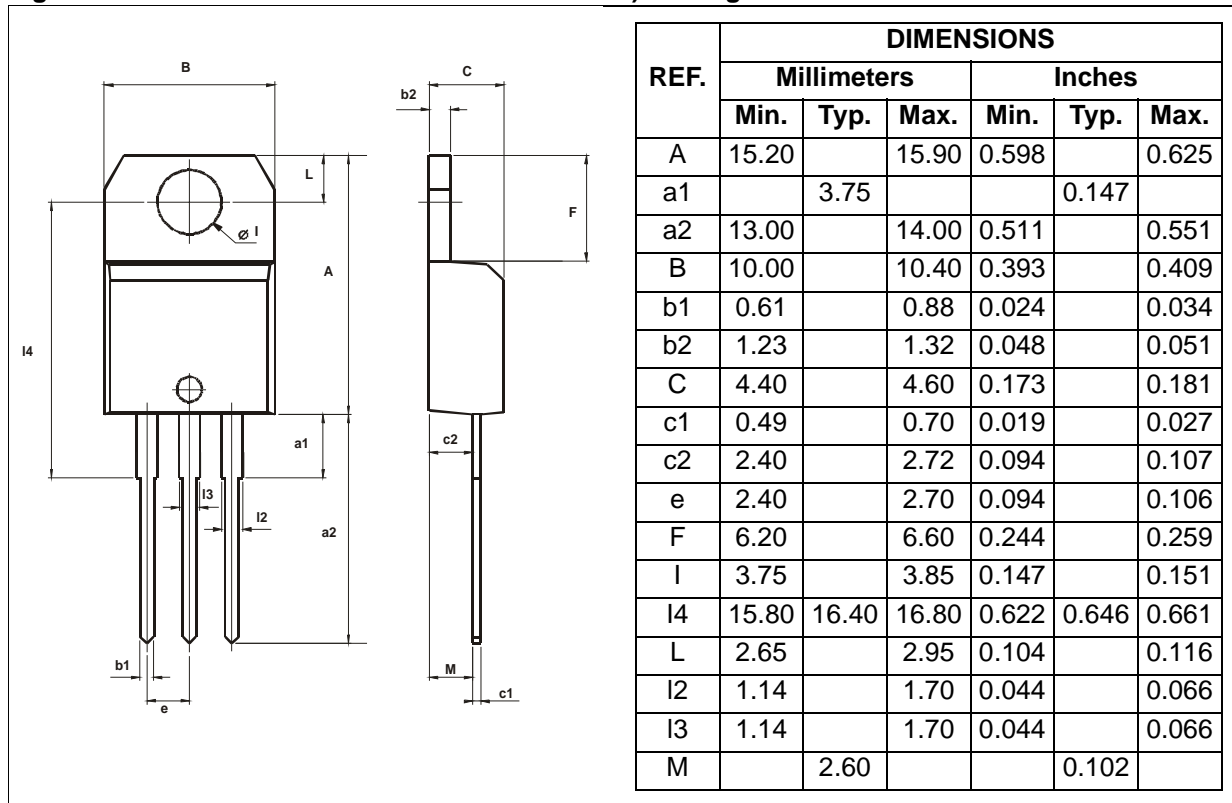


Figure 18: I²PAK Package Mechanical Data

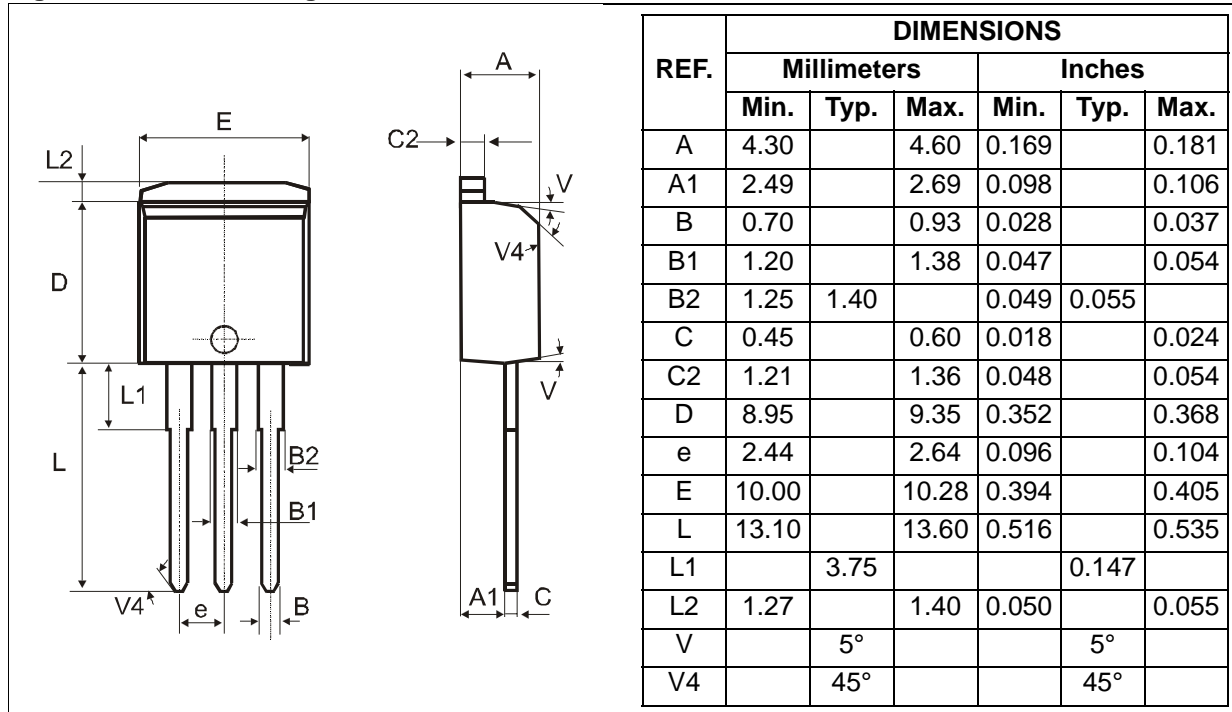


Table 8: Ordering Information

| Ordering type | Marking | Package | Weight | Base qty | Delivery mode |
|--------------------|------------------|--------------------|--------|----------|---------------|
| BTA/BTB12-xxxzyzRG | BTA/BTB12-xxxzyz | TO-220AB | 2.3 g | 50 | Tube |
| T1205-xxxG | T1205-xxxG | D ² PAK | 1.5 g | 50 | Tube |
| T1205-xxxG-TR | T1205-xxxG | | | 1000 | Tape and reel |
| T1235-xxxG | T1235xxxG | D ² PAK | 1.5 g | 50 | Tube |
| T1235-xxxG-TR | T1235xxxG | | | 1000 | Tape & reel |
| T1235-xxxR | T1235-xxxR | I ² PAK | 1.5 g | 50 | Tube |

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

Table 9: Revision History

| Date | Revision | Description of Changes |
|-------------|----------|--|
| Sep-2002 | 6A | Last update. |
| 01-Jun-2005 | 7 | 1. I ² PAK package added. 2. TO-220AB delivery mode changed from bulk to tube. |
| 28-Jul-2005 | 8 | T1205 added |

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