

BTA12-600CW

## BTA/BTB12 and T12 Series

SNUBBERLESS™, LOGIC LEVEL & STANDARD

12A TRIACs

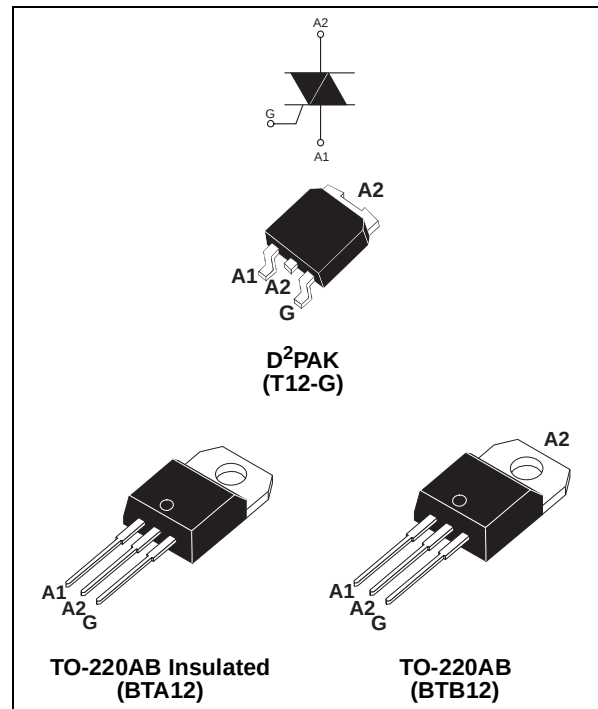
### MAIN FEATURES:

| 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 BTA/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)



### ABSOLUTE MAXIMUM RATINGS

| Symbol             | Parameter                                                                                    |                |                           | Value                   | Unit                                 |
|--------------------|----------------------------------------------------------------------------------------------|----------------|---------------------------|-------------------------|--------------------------------------|
| $I_{T(RMS)}$       | RMS on-state current (full sine wave)                                                        | D²PAK/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 = $25^\circ\text{C}$ ) | F = 50 Hz      | t = 20 ms                 | 120                     | A                                    |
|                    |                                                                                              | F = 60 Hz      | t = 16.7 ms               | 126                     |                                      |
| $I^2t$             | $I^2t$ Value for fusing                                                                      | tp = 10 ms     |                           | 78                      | $\text{A}^2\text{s}$                 |
| di/dt              | Critical rate of rise of on-state current<br>$I_G = 2 \times I_{GT}$ , tr ≤ 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                                                  | tp = 10 ms     | $T_j = 25^\circ\text{C}$  | $V_{DRM}/V_{RRM} + 100$ | V                                    |
| $I_{GM}$           | Peak gate current                                                                            | tp = 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                                    |
| $T_{stg}$<br>$T_j$ | Storage junction temperature range<br>Operating junction temperature range                   |                |                           |                         | - 40 to + 150<br>- 40 to + 125<br>°C |

## BTA/BTB12 and T12 Series

### ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = 25°C, unless otherwise specified)

#### ■ SNUBBERLESS™ and LOGIC LEVEL (3 Quadrants)

| Symbol                   | Test Conditions                                                                     | Quadrant     |      | T12   | BTA/BTB12 |     |     |      | Unit |
|--------------------------|-------------------------------------------------------------------------------------|--------------|------|-------|-----------|-----|-----|------|------|
|                          |                                                                                     |              |      | T1235 | TW        | SW  | CW  | BW   |      |
| I <sub>GT</sub> (1)      | V <sub>D</sub> = 12 V    R <sub>L</sub> = 30 Ω                                      | I - II - III | MAX. | 35    | 5         | 10  | 35  | 50   | mA   |
| V <sub>GT</sub>          |                                                                                     | I - II - III | MAX. | 1.3   |           |     |     |      | V    |
| V <sub>GD</sub>          | V <sub>D</sub> = V <sub>DRM</sub> R <sub>L</sub> = 3.3 kΩ<br>T <sub>j</sub> = 125°C | I - II - III | MIN. | 0.2   |           |     |     |      | V    |
| I <sub>H</sub> (2)       | I <sub>T</sub> = 100 mA                                                             |              | MAX. | 35    | 10        | 15  | 35  | 50   | mA   |
| I <sub>L</sub>           | I <sub>G</sub> = 1.2 I <sub>GT</sub>                                                | I - III      | MAX. | 50    | 10        | 25  | 50  | 70   | mA   |
|                          |                                                                                     | II           |      | 60    | 15        | 30  | 60  | 80   |      |
| dV/dt (2)                | V <sub>D</sub> = 67 %V <sub>DRM</sub> gate open<br>T <sub>j</sub> = 125°C           |              | MIN. | 500   | 20        | 40  | 500 | 1000 | V/μs |
| (dI/dt) <sub>c</sub> (2) | (dV/dt) <sub>c</sub> = 0.1 V/μs    T <sub>j</sub> = 125°C                           |              | MIN. | -     | 3.5       | 6.5 | -   | -    | A/ms |
|                          | (dV/dt) <sub>c</sub> = 10 V/μs    T <sub>j</sub> = 125°C                            |              |      | -     | 1         | 2.9 | -   | -    |      |
|                          | Without snubber    T <sub>j</sub> = 125°C                                           |              |      | 6.5   | -         | -   | 6.5 | 12   |      |

#### ■ STANDARD (4 Quadrants)

| Symbol                   | Test Conditions                                                                     | Quadrant           |      | BTA/BTB12 |           | Unit |
|--------------------------|-------------------------------------------------------------------------------------|--------------------|------|-----------|-----------|------|
|                          |                                                                                     |                    |      | C         | B         |      |
| I <sub>GT</sub> (1)      | V <sub>D</sub> = 12 V    R <sub>L</sub> = 30 Ω                                      | I - II - III<br>IV | MAX. | 25<br>50  | 50<br>100 | mA   |
| V <sub>GT</sub>          |                                                                                     | ALL                | MAX. | 1.3       |           | V    |
| V <sub>GD</sub>          | V <sub>D</sub> = V <sub>DRM</sub> R <sub>L</sub> = 3.3 kΩ    T <sub>j</sub> = 125°C | ALL                | MIN. | 0.2       |           | V    |
| I <sub>H</sub> (2)       | I <sub>T</sub> = 500 mA                                                             |                    | MAX. | 25        | 50        | mA   |
| I <sub>L</sub>           | I <sub>G</sub> = 1.2 I <sub>GT</sub>                                                | I - III - IV       | MAX. | 40        | 50        | mA   |
|                          |                                                                                     | II                 |      | 80        | 100       |      |
| dV/dt (2)                | V <sub>D</sub> = 67 %V <sub>DRM</sub> gate open    T <sub>j</sub> = 125°C           |                    | MIN. | 200       | 400       | V/μs |
| (dV/dt) <sub>c</sub> (2) | (dI/dt) <sub>c</sub> = 5.3 A/ms    T <sub>j</sub> = 125°C                           |                    | MIN. | 5         | 10        | V/μs |

### STATIC CHARACTERISTICS

| Symbol              | Test Conditions                         |            |      | Value | Unit |
|---------------------|-----------------------------------------|------------|------|-------|------|
| V <sub>T</sub> (2)  | I <sub>TM</sub> = 17 A      tp = 380 μs | Tj = 25°C  | MAX. | 1.55  | V    |
| V <sub>to</sub> (2) | Threshold voltage                       | Tj = 125°C | MAX. | 0.85  | V    |
| R <sub>d</sub> (2)  | Dynamic resistance                      | Tj = 125°C | MAX. | 35    | mΩ   |
| I <sub>DRM</sub>    | V <sub>DRM</sub> = V <sub>RRM</sub>     | Tj = 25°C  | MAX. | 5     | μA   |
| I <sub>RRM</sub>    |                                         | Tj = 125°C |      | 1     | mA   |

**Note 1:** minimum I<sub>GT</sub> is guaranteed at 5% of I<sub>GT</sub> max.

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

## THERMAL RESISTANCES

| Symbol        | Parameter             |                       | Value                          | Unit |
|---------------|-----------------------|-----------------------|--------------------------------|------|
| $R_{th(j-c)}$ | Junction to case (AC) |                       | D <sup>2</sup> PAK/TO-220AB    | °C/W |
|               |                       |                       | TO-220AB Insulated             |      |
| $R_{th(j-a)}$ | Junction to ambient   | S = 1 cm <sup>2</sup> | D <sup>2</sup> PAK             | °C/W |
|               |                       |                       | TO-220AB<br>TO-220AB Insulated |      |

S = Copper surface under tab

## PRODUCT SELECTOR

| Part Number     | Voltage (xxx) |       | Sensitivity | Type        | Package            |
|-----------------|---------------|-------|-------------|-------------|--------------------|
|                 | 600 V         | 800 V |             |             |                    |
| BTA/BTB12-xxxB  | X             | X     | 50 mA       | Standard    | TO-220AB           |
| BTA/BTB12-xxxBW | X             | X     | 50 mA       | Snubberless | TO-220AB           |
| BTA/BTB12-xxxC  | X             | X     | 25 mA       | Standard    | TO-220AB           |
| BTA/BTB12-xxxCW | X             | X     | 35 mA       | Snubberless | TO-220AB           |
| BTA/BTB12-xxxSW | X             | X     | 10 mA       | Logic level | TO-220AB           |
| BTA/BTB12-xxxTW | X             | X     | 5 mA        | Logic Level | TO-220AB           |
| T1235-xxxG      | X             | X     | 35 mA       | Snubberless | D <sup>2</sup> PAK |

BTB: non insulated TO-220AB package

BTA/BTB12 and T12 Series

OTHER INFORMATION

| Part Number        | Marking          | Weight | Base quantity | Packing mode |
|--------------------|------------------|--------|---------------|--------------|
| BTA/BTB12-xxxxyz   | BTA/BTB12-xxxxyz | 2.3 g  | 250           | Bulk         |
| BTA/BTB12-xxxxyzRG | BTA/BTB12-xxxxyz | 2.3 g  | 50            | Tube         |
| T1235-xxxG         | T1235xxxG        | 1.5 g  | 50            | Tube         |
| T1235-xxxG-TR      | T1235xxxG        | 1.5 g  | 1000          | Tape & reel  |

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

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

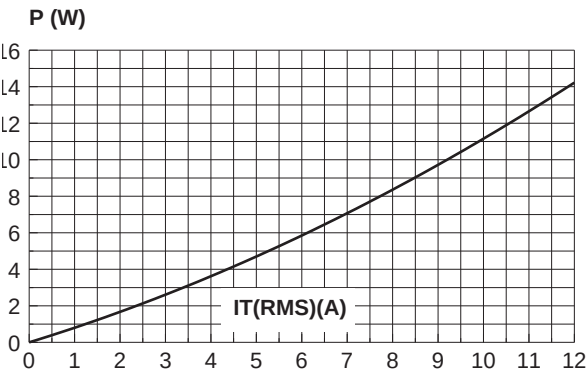


Fig. 2-1: RMS on-state current versus case temperature (full cycle).

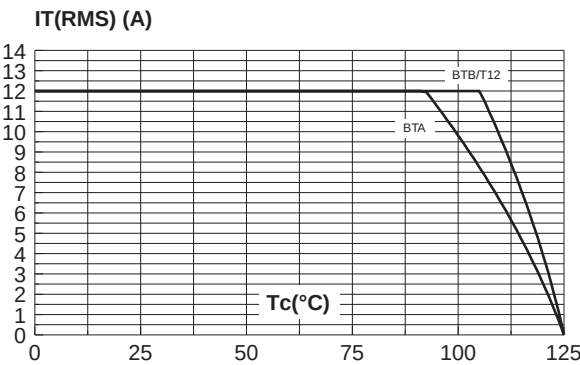


Fig. 2-2: RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35μm),full cycle.

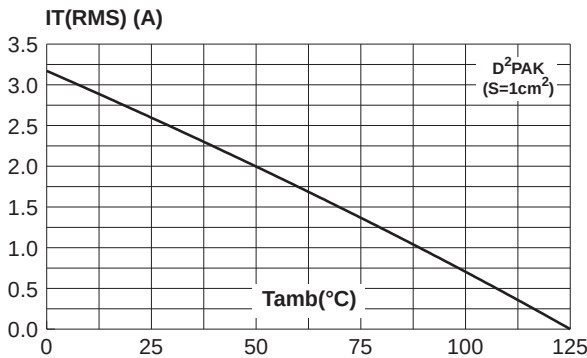
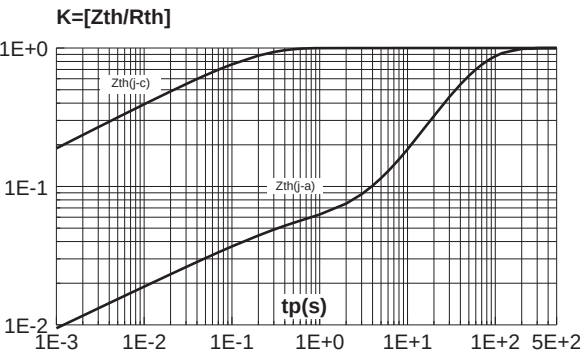
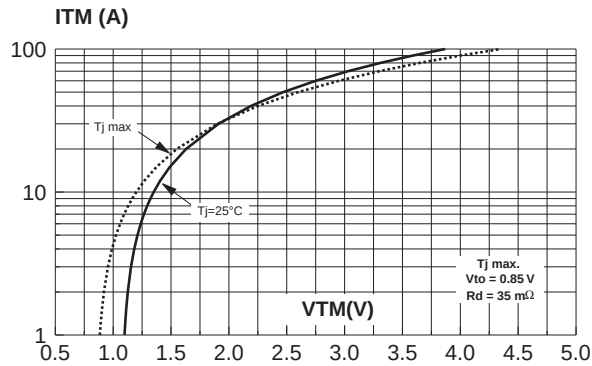


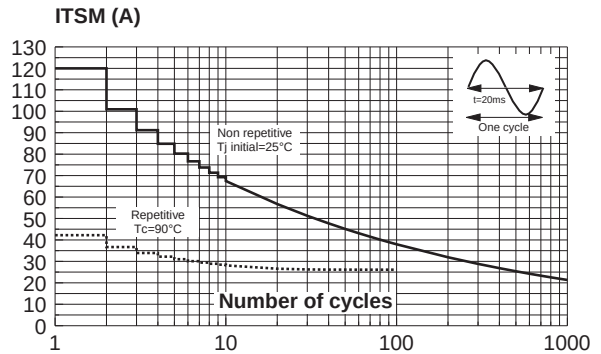
Fig. 3: Relative variation of thermal impedance versus pulse duration.



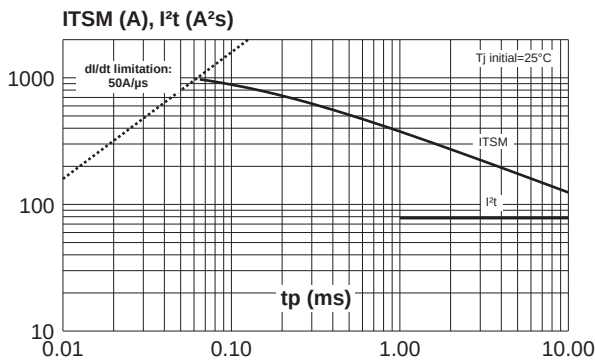
**Fig. 4:** On-state characteristics (maximum values).



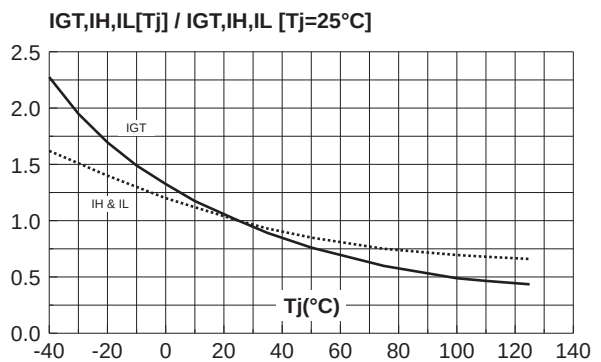
**Fig. 5:** Surge peak on-state current versus number of cycles.



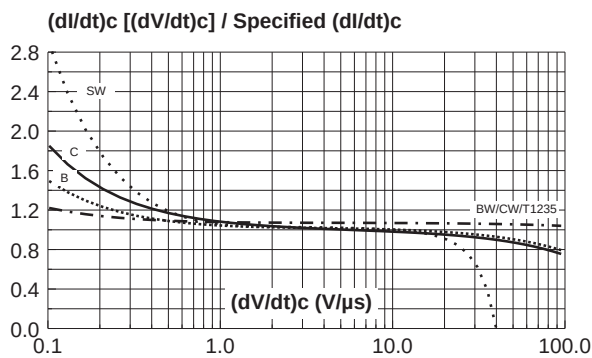
**Fig. 6:** Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10\text{ms}$ , and corresponding value of  $I^2t$ .



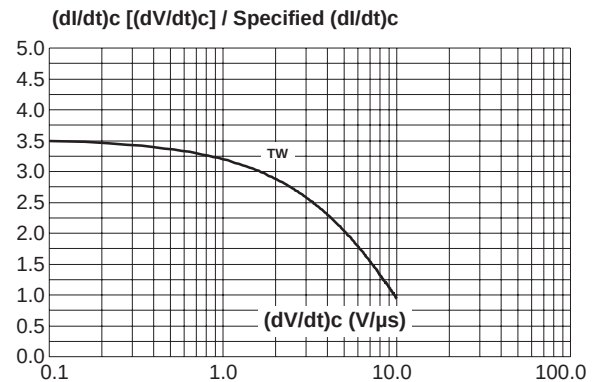
**Fig. 7:** Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values).



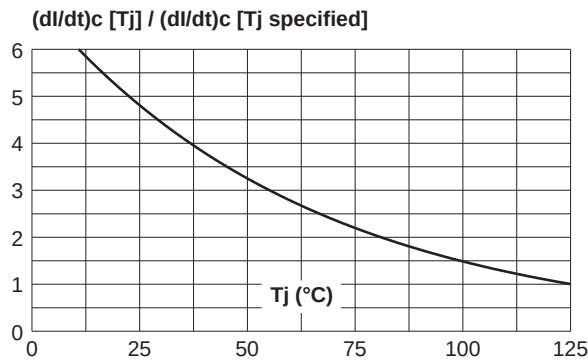
**Fig. 8-1:** Relative variation of critical rate of decrease of main current versus  $(dV/dt)_c$  (typical values) (BW/CW/T1235).



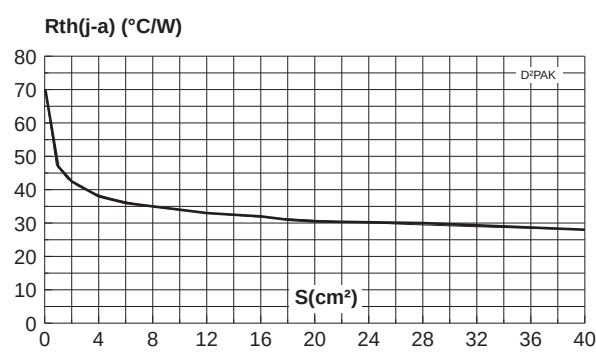
**Fig. 8-2:** Relative variation of critical rate of decrease of main current versus  $(dV/dt)_c$  (typical values) (TW).



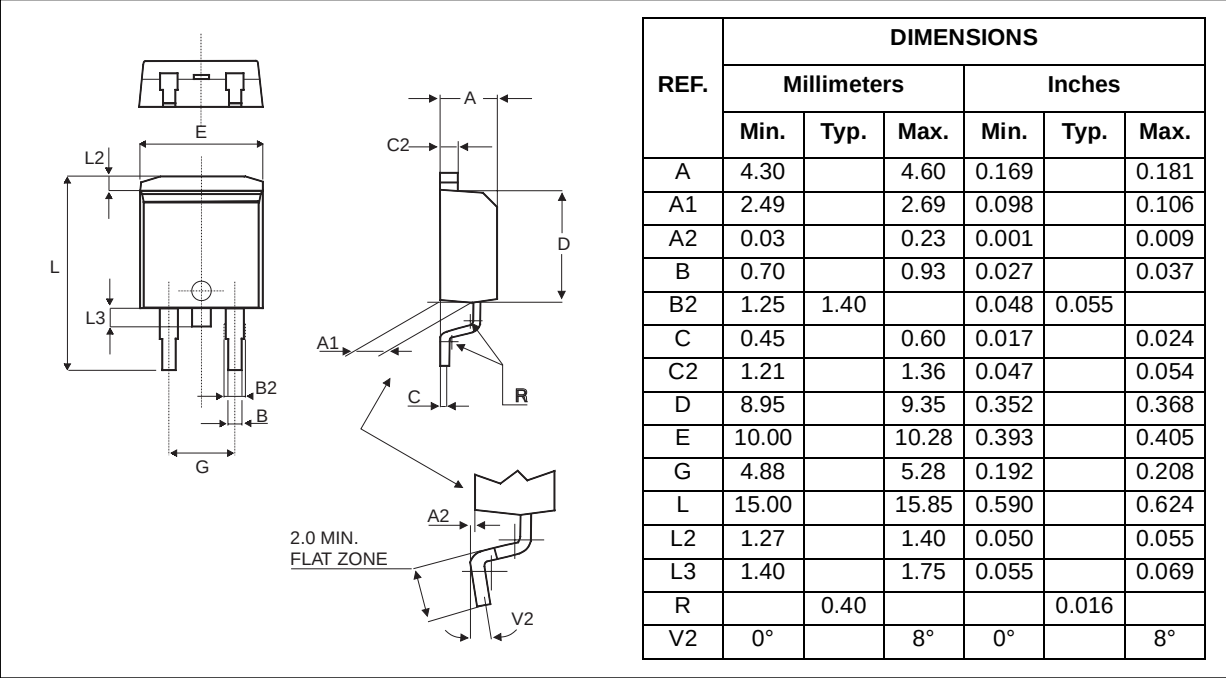
**Fig. 9:** Relative variation of critical rate of decrease of main current versus junction temperature.



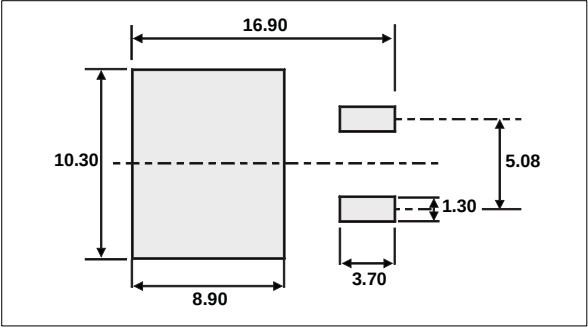
**Fig. 10:** D<sup>2</sup>PAK Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 μm).



**PACKAGE MECHANICAL DATA**  
D<sup>2</sup>PAK (Plastic)

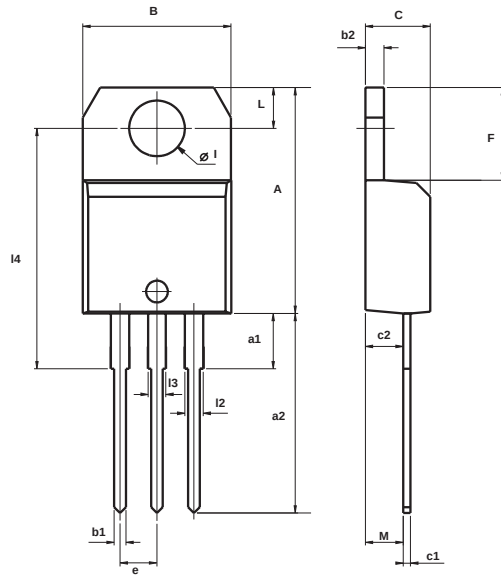


**FOOTPRINT DIMENSIONS (in millimeters)**  
D<sup>2</sup>PAK (Plastic)



## PACKAGE MECHANICAL DATA

TO-220AB / TO-220AB Ins.



| 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 |
| l    | 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 |       |