



BTA316 series B and C

16 A Three-quadrant triacs high commutation

Rev. 01 — 11 April 2007

Product data sheet

1. Product profile

1.1 General description

Passivated, new generation, high commutation triacs in a SOT78 plastic package

1.2 Features

- Very high commutation performance maximized at each gate sensitivity
- High immunity to dV/dt

1.3 Applications

- High power motor control - e.g. washing machines and vacuum cleaners
- Refrigeration and air conditioning compressors
- Non-linear rectifier-fed motor loads
- Electronic thermostats

1.4 Quick reference data

- $V_{DRM} \leq 600$ V (BTA316-600B/C)
- $V_{DRM} \leq 800$ V (BTA316-800B/C)
- $I_{TSM} \leq 140$ A ($t = 20$ ms)
- $I_{GT} \leq 50$ mA (BTA316 series B)
- $I_{GT} \leq 35$ mA (BTA316 series C)
- $I_{T(RMS)} \leq 16$ A

2. Pinning information

Table 1. Pinning

| Pin | Description | Simplified outline | Symbol |
|-----|-------------------------------------|--------------------|--------|
| 1 | main terminal 1 (T1) | | |
| 2 | main terminal 2 (T2) | | |
| 3 | gate (G) | | |
| mb | mounting base; main terminal 2 (T2) | | |

3. Ordering information

Table 2. Ordering information

| Type number | Package | | Version |
|-------------|---------|--|---------|
| | Name | Description | |
| BTA316-600B | SC-46 | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB | SOT78 |
| BTA316-600C | | | |
| BTA316-800B | | | |
| BTA316-800C | | | |

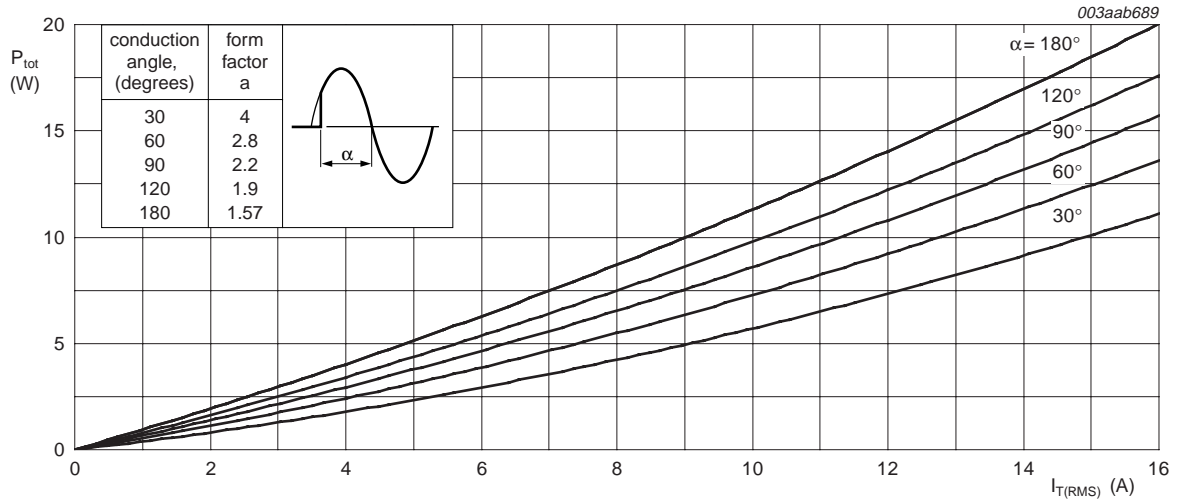
4. Limiting values

Table 3. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

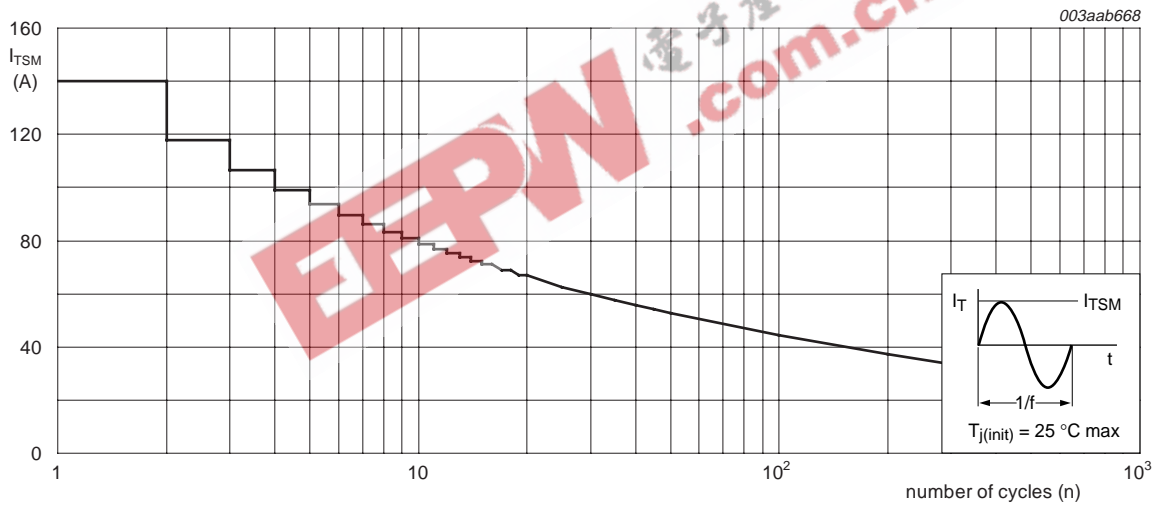
| Symbol | Parameter | Conditions | Min | Max | Unit |
|---------------------|--------------------------------------|---|-----|------|------------------|
| V _{DRM} | repetitive peak off-state voltage | BTA316-600B; BTA316-600C ^[1] | - | 600 | V |
| | | BTA316-800B; BTA316-800C | - | 800 | V |
| I _{T(RMS)} | RMS on-state current | full sine wave; T _{mb} ≤ 101 °C; see Figure 4 and 5 | - | 16 | A |
| I _{TSM} | non-repetitive peak on-state current | full sine wave; T _j = 25 °C prior to surge; see Figure 2 and 3 | - | - | - |
| | | t = 20 ms | - | 140 | A |
| | | t = 16.7 ms | - | 150 | A |
| I ² t | I ² t for fusing | t = 10 ms | - | 98 | A ² s |
| di _T /dt | rate of rise of on-state current | I _{TM} = 20 A; I _G = 0.2 A; di _G /dt = 0.2 A/μs | - | 100 | A/μs |
| I _{GM} | peak gate current | | - | 2 | A |
| P _{GM} | peak gate power | | - | 5 | W |
| P _{G(AV)} | average gate power | over any 20 ms period | - | 0.5 | W |
| T _{stg} | storage temperature | | -40 | +150 | °C |
| T _j | junction temperature | | - | 125 | °C |

[1] Although not recommended, off-state voltages up to 800 V may be applied without damage, but the triac may switch to the on-state. The rate of rise of current should not exceed 15 A/μs.



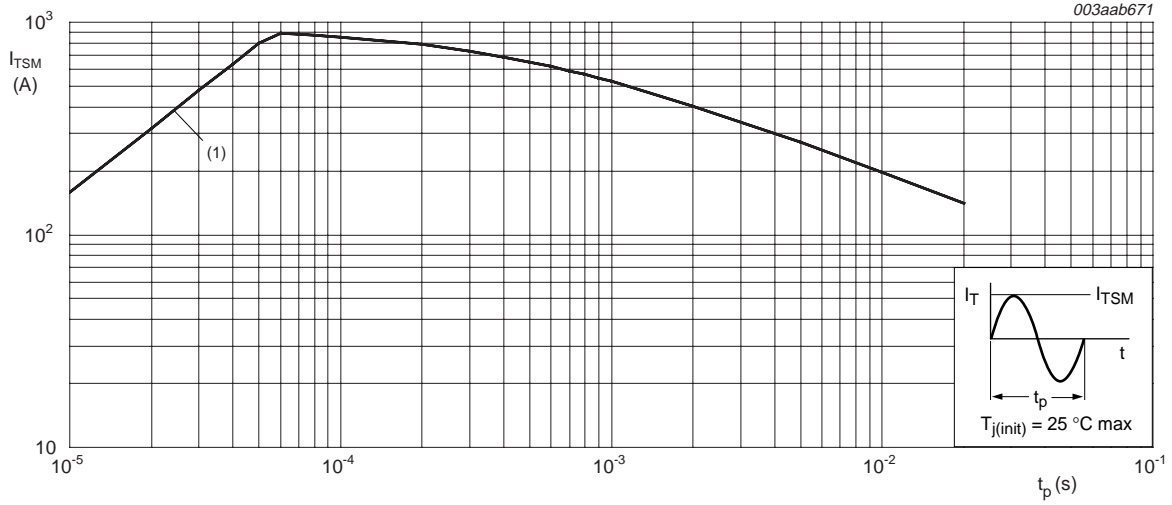
α = conduction angle

Fig 1. Total power dissipation as a function of RMS on-state current; maximum values



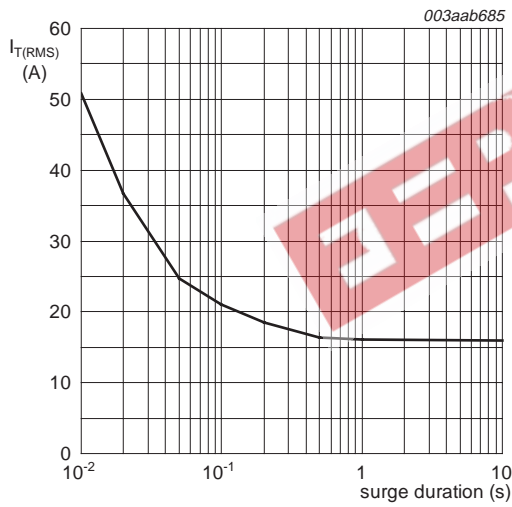
f = 50 Hz

Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



$t_p \leq 20 \text{ ms}$
 (1) dI_T/dt limit

Fig 3. Non-repetitive peak on-state current as a function of pulse duration; maximum values



$f = 50 \text{ Hz}$;
 $T_{mb} = 101 \text{ }^\circ\text{C}$

Fig 4. RMS on-state current as a function of surge duration; maximum values

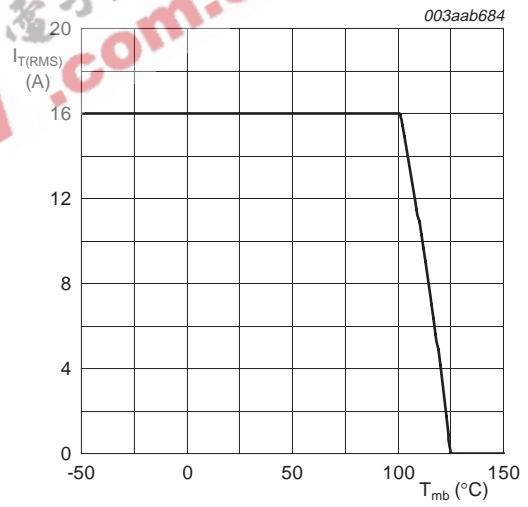


Fig 5. RMS on-state current as a function of mounting base temperature; maximum values

5. Thermal characteristics

Table 4. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|---|--|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | half cycle; see Figure 6 | - | - | 1.7 | K/W |
| | | full cycle; see Figure 6 | - | - | 1.2 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 60 | - | K/W |

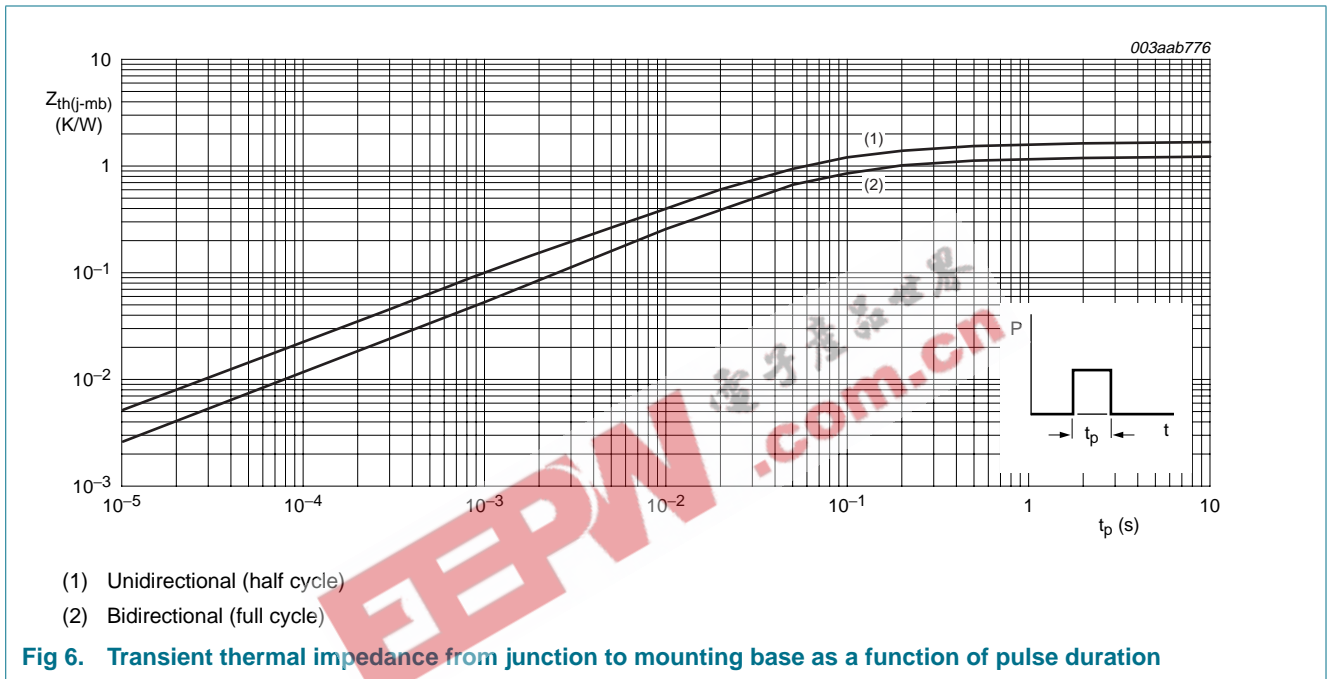


Fig 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Static characteristics

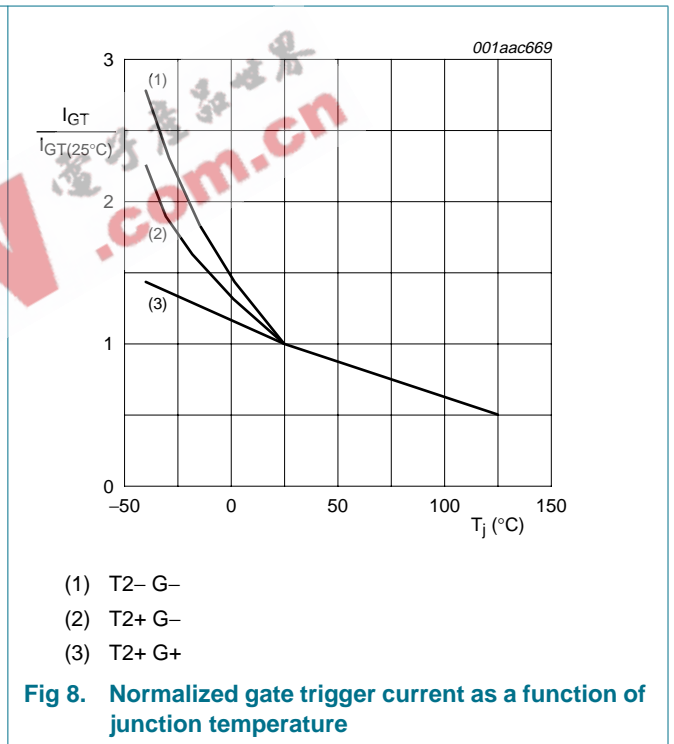
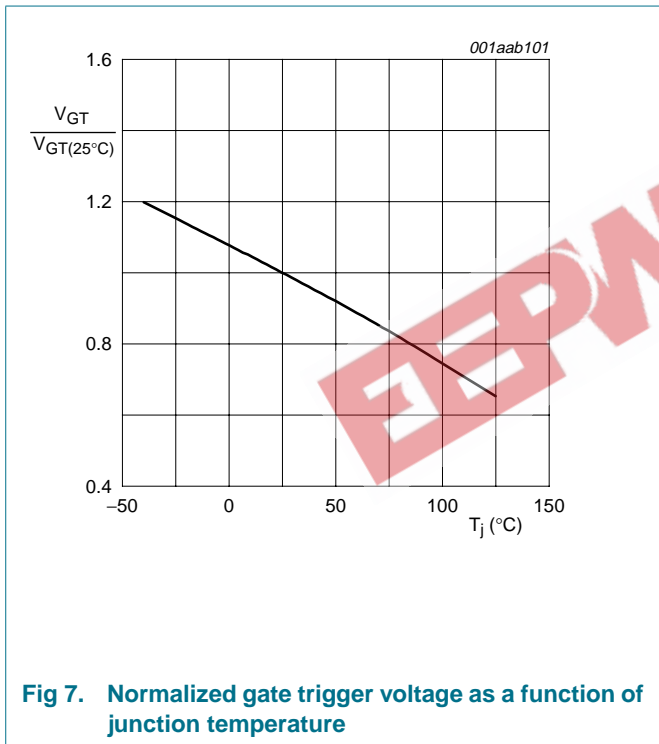
Table 5. Static characteristics
T_j = 25 °C unless otherwise specified.

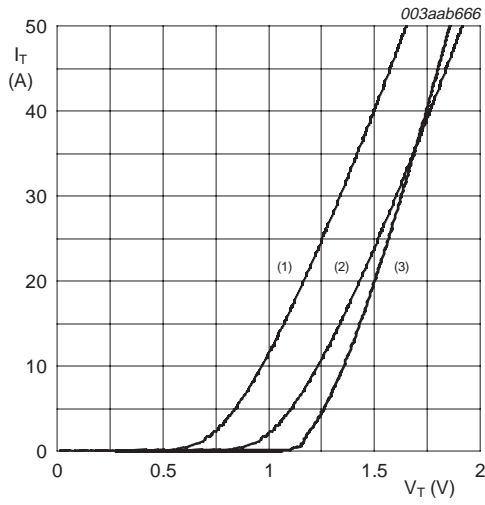
| Symbol | Parameter | Conditions | BTA316-600B BTA316-800B | | | BTA316-600C BTA316-800C | | | Unit |
|-----------------|----------------------|---|----------------------------|-----|-----|----------------------------|-----|-----|------|
| | | | Min | Typ | Max | Min | Typ | Max | |
| I _{GT} | gate trigger current | V _D = 12 V; I _T = 0.1 A; see Figure 8 | | | | | | | |
| | | T2+ G+ | 2 | - | 50 | 2 | - | 35 | mA |
| | | T2+ G- | 2 | - | 50 | 2 | - | 35 | mA |
| I _L | latching current | V _D = 12 V; I _{GT} = 0.1 A; see Figure 10 | | | | | | | |
| | | T2+ G+ | - | - | 60 | - | - | 50 | mA |
| | | T2+ G- | - | - | 90 | - | - | 60 | mA |
| I _H | holding current | V _D = 12 V; I _{GT} = 0.1 A; see Figure 11 | - | - | 60 | - | - | 35 | mA |
| | | T2- G- | - | - | 60 | - | - | 50 | mA |
| | | T2- G- | - | - | 60 | - | - | 50 | mA |
| V _T | on-state voltage | I _T = 18 A; see Figure 9 | - | 1.3 | 1.5 | - | 1.3 | 1.5 | V |
| V _{GT} | gate trigger voltage | V _D = 12 V; I _T = 0.1 A; see Figure 7 | - | 0.8 | 1.5 | - | 0.8 | 1.5 | V |
| | | V _D = 400 V; I _T = 0.1 A; T _j = 125 °C | 0.25 | 0.4 | - | 0.25 | 0.4 | - | V |
| I _D | off-state current | V _D = V _{DRM(max)} ; T _j = 125 °C | - | 0.1 | 0.5 | - | 0.1 | 0.5 | mA |

7. Dynamic characteristics

Table 6. Dynamic characteristics

| Symbol | Parameter | Conditions | BTA316-600B BTA316-800B | | | BTA316-600C BTA316-800C | | | Unit |
|---------------|---------------------------------------|---|----------------------------|-----|-----|----------------------------|-----|-----|------------------|
| | | | Min | Typ | Max | Min | Typ | Max | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 0.67 \times V_{DRM(max)}$; $T_j = 125\text{ }^\circ\text{C}$; exponential waveform; gate open circuit | 1000 | - | - | 500 | - | - | V/ μs |
| di_{com}/dt | rate of change of commutating current | $V_{DM} = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{T(RMS)} = 16\text{ A}$; without snubber; gate open circuit | 20 | - | - | 15 | - | - | A/ms |
| t_{gt} | gate-controlled turn-on time | $I_{TM} = 20\text{ A}$; $V_D = V_{DRM(max)}$; $I_G = 0.1\text{ A}$; $di_G/dt = 5\text{ A}/\mu\text{s}$ | - | 2 | - | - | 2 | - | μs |





$V_o = 1.024 \text{ V}$

$R_s = 0.021 \text{ } \Omega$

- (1) $T_j = 125 \text{ } ^\circ\text{C}$; typical values
- (2) $T_j = 125 \text{ } ^\circ\text{C}$; maximum values
- (3) $T_j = 25 \text{ } ^\circ\text{C}$; maximum values

Fig 9. On-state current as a function of on-state voltage

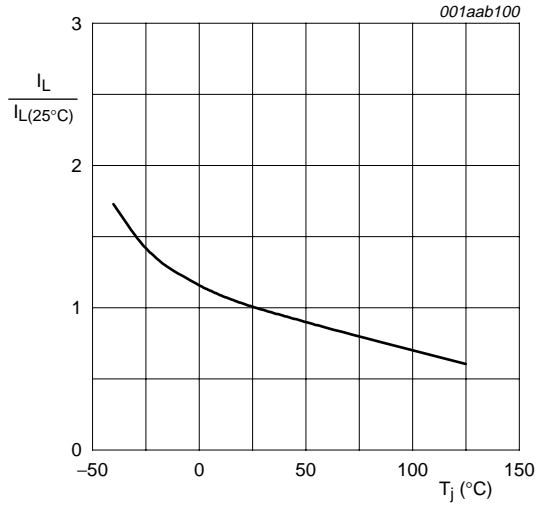


Fig 10. Normalized latching current as a function of junction temperature

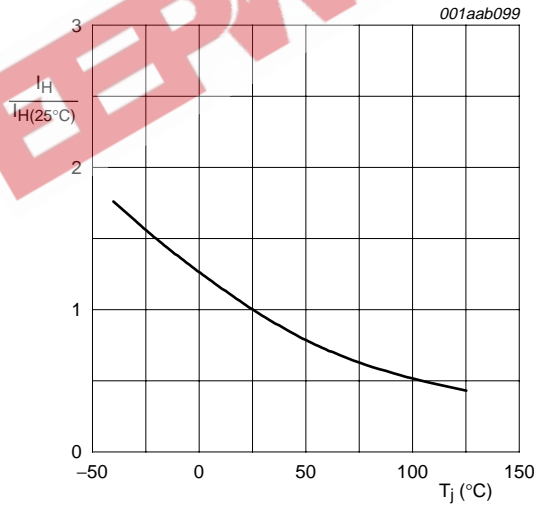


Fig 11. Normalized holding current as a function of junction temperature

8. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

SOT78

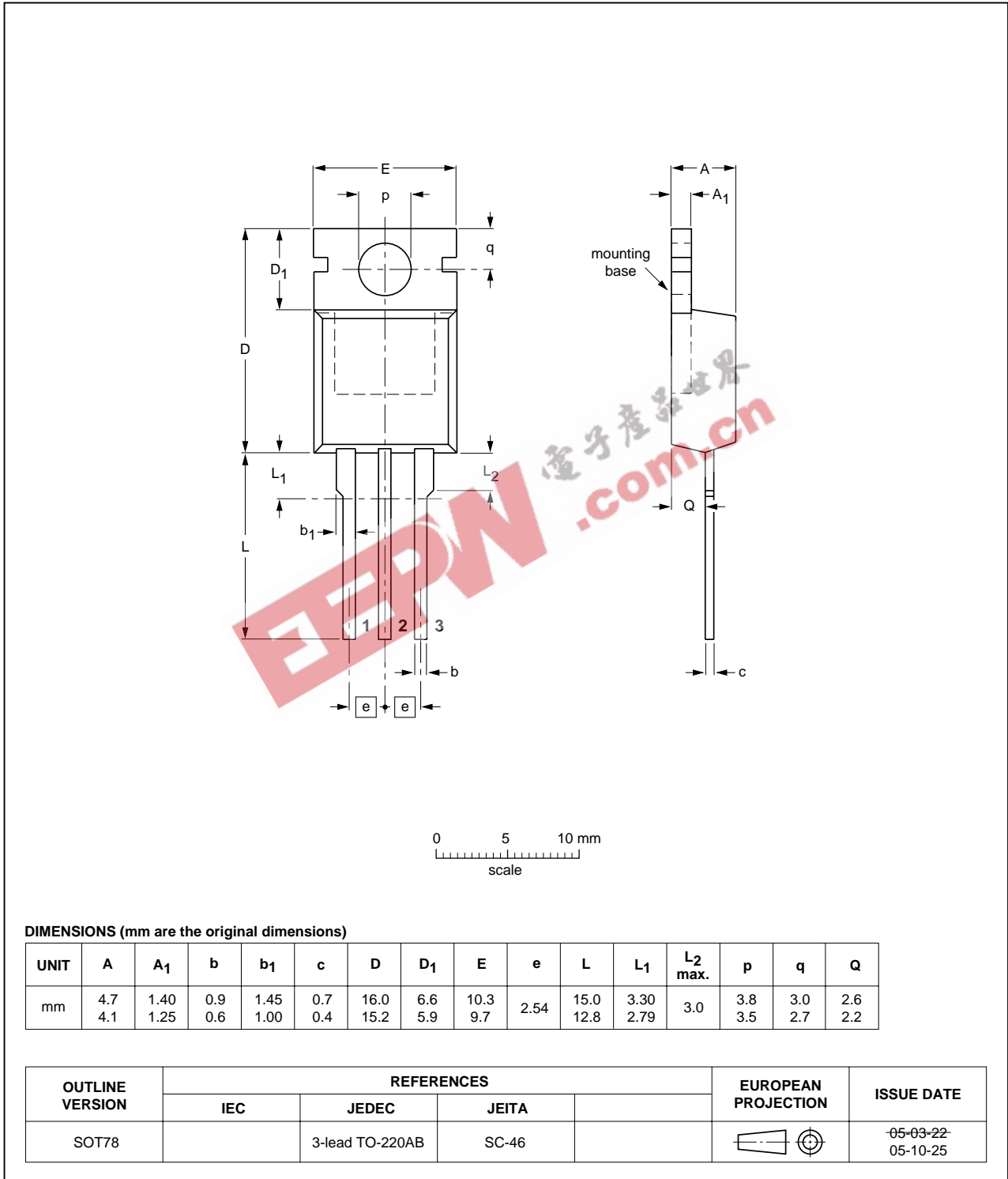


Fig 12. Package outline SOT78 (3-lead TO-220AB)

9. Revision history

Table 7. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|------------------|--------------|--------------------|---------------|------------|
| BTA316_SER_B_C_1 | 20070411 | Product data sheet | - | - |

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10.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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