



BTA316X-800B0

3Q Hi-Com Triac

Rev. 2 — 17 November 2011

Product data sheet

1. Product profile

1.1 General description

Planar passivated high commutation three quadrant triac in a SOT186A (TO-220F) "full pack" plastic package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series B0" triac will commutate the full rated RMS current at the maximum rated junction temperature without the aid of a snubber.

1.2 Features and benefits

- 3Q technology for improved noise immunity
- High immunity to false turn-on by dV/dt
- High minimum I_{GT} for guaranteed immunity to gate noise
- High voltage capability
- Isolated mounting base package
- Least sensitive gate for highest noise immunity
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only
- Very high commutation capability with maximum false trigger immunity

1.3 Applications

- Electronic thermostats
- High power motor controls - e.g. washing machines and vacuum cleaners
- Rectifier-fed DC inductive loads e.g. DC motors and solenoids
- Refrigeration and air conditioning compressors



1.4 Quick reference data

Table 1. Quick reference data

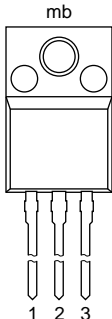
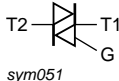
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------|--------------------------------------|--|-----|-----|-----|------|
| V_{DRM} | repetitive peak off-state voltage | | - | - | 800 | V |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 20\text{ ms}$; see Figure 4 ; see Figure 5 | - | - | 140 | A |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_h \leq 45\text{ °C}$; see Figure 1 ; see Figure 2 ; see Figure 3 | - | - | 16 | A |

Static characteristics

| | | | | | | |
|----------|----------------------|--|----|---|----|----|
| I_{GT} | gate trigger current | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; see Figure 7 | 10 | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; see Figure 7 | 10 | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; see Figure 7 | 10 | - | 50 | mA |

2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------------------|---|---|
| 1 | T1 | main terminal 1 |  |  sym051 |
| 2 | T2 | main terminal 2 | | |
| 3 | G | gate | | |
| mb | n.c. | mounting base; isolated | | |

SOT186A (TO-220F)

3. Ordering information

Table 3. Ordering information

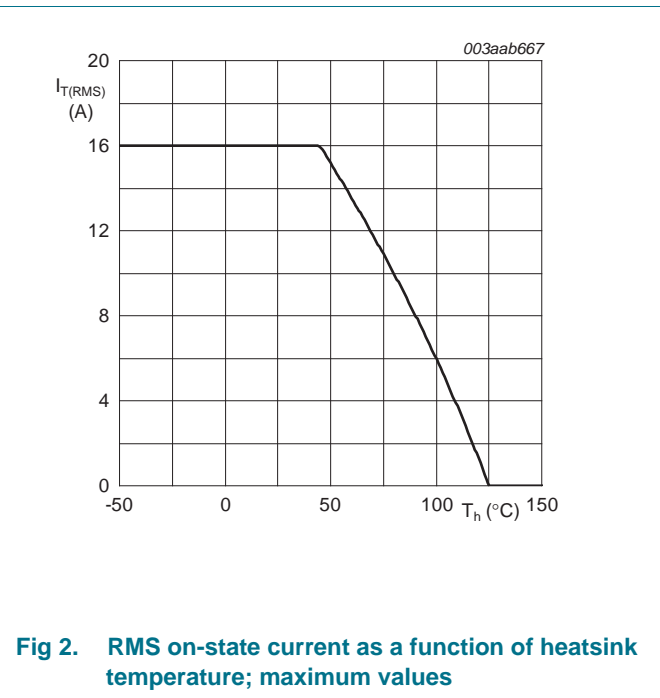
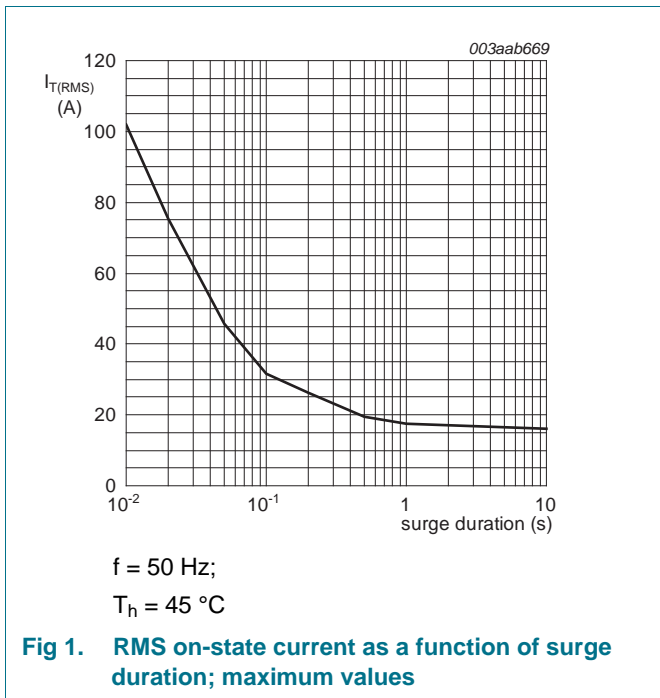
| Type number | Package | | |
|---------------|---------|---|---------|
| | Name | Description | Version |
| BTA316X-800B0 | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack" | SOT186A |

4. Limiting values

Table 4. 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 | | - | 800 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_h \leq 45\text{ °C}$; see Figure 1 ; see Figure 2 ; see Figure 3 | - | 16 | A |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 20\text{ ms}$; see Figure 4 ; see Figure 5 | - | 140 | A |
| | | full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$ | - | 150 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; sine-wave pulse | - | 98 | A ² s |
| dI_T/dt | rate of rise of on-state current | $I_T = 20\text{ A}$; $I_G = 0.2\text{ A}$; $dI_G/dt = 0.2\text{ A}/\mu\text{s}$ | - | 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 |



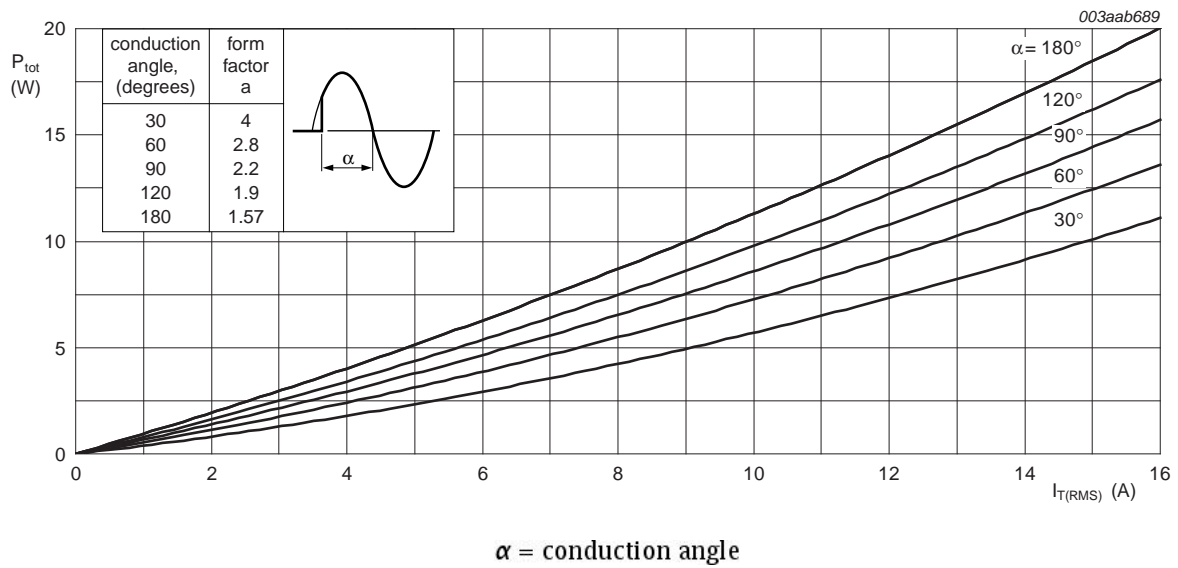


Fig 3. Total power dissipation as a function of RMS on-state current; maximum values

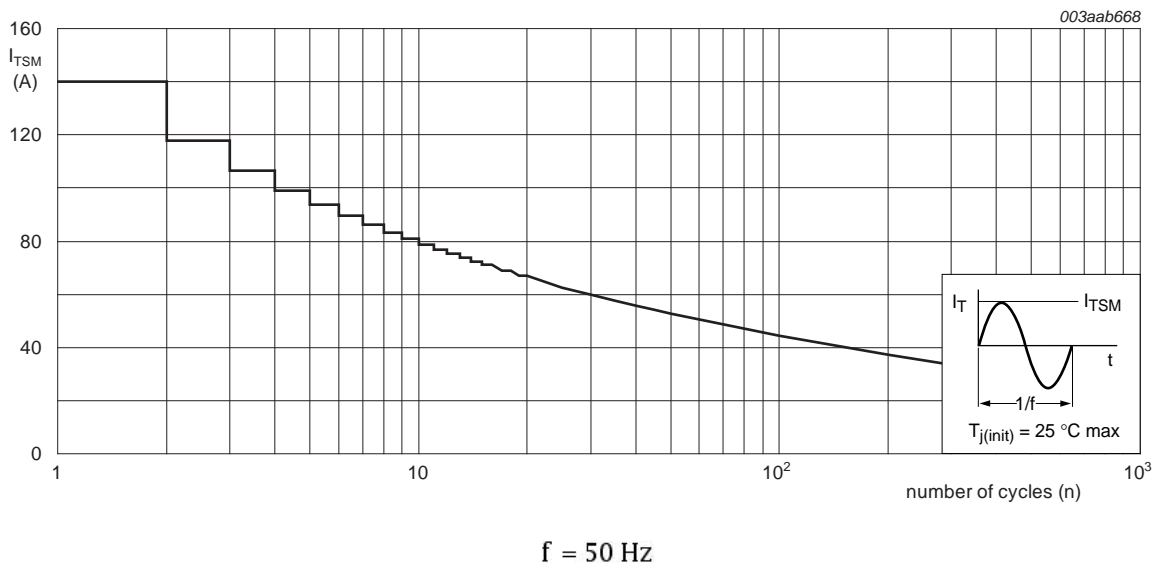
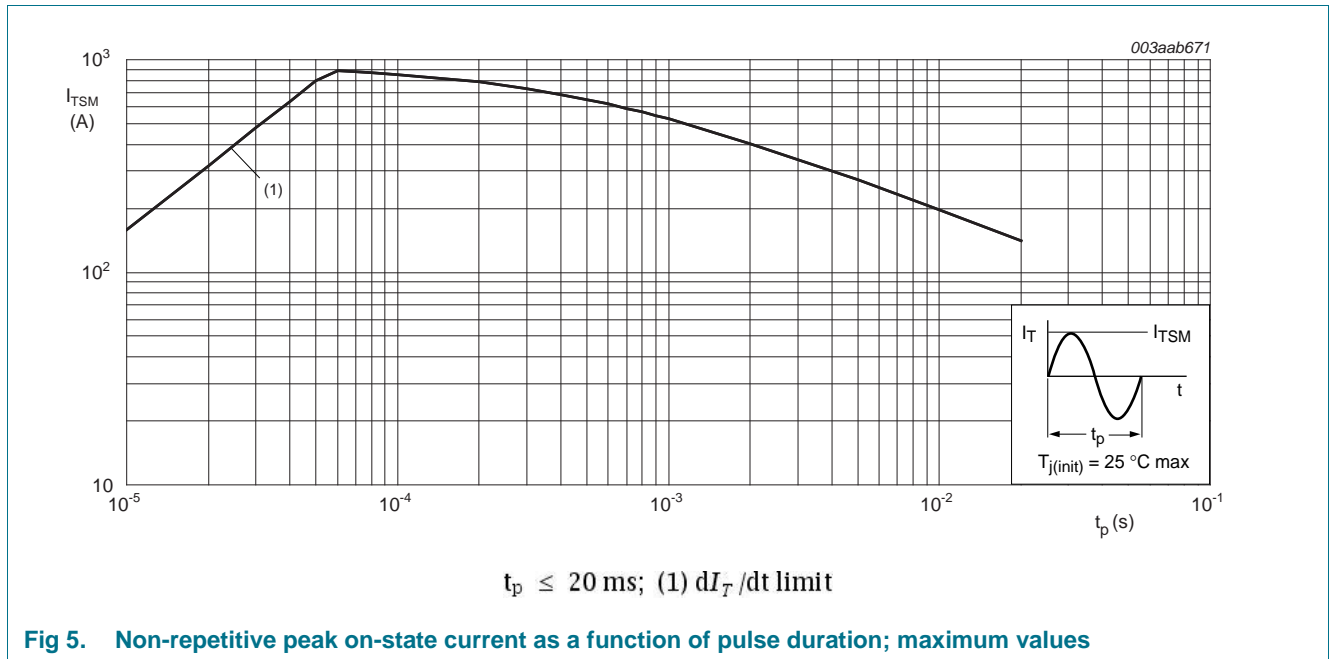


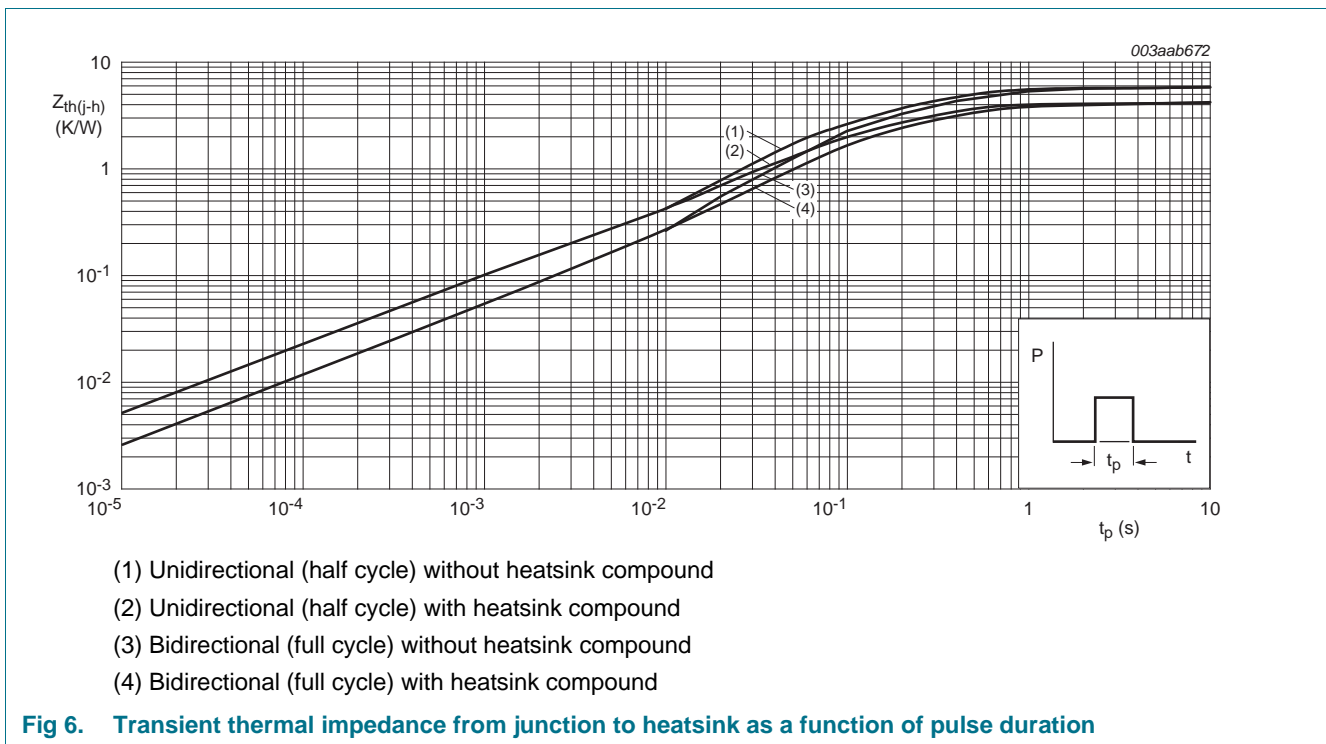
Fig 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|--|---|-----|-----|-----|------|
| $R_{th(j-h)}$ | thermal resistance from junction to heatsink | full cycle or half cycle; with heatsink compound; see Figure 6 | - | - | 4 | K/W |
| | | full cycle or half cycle; without heatsink compound; see Figure 6 | - | - | 5.5 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 55 | - | K/W |



6. Isolation characteristics

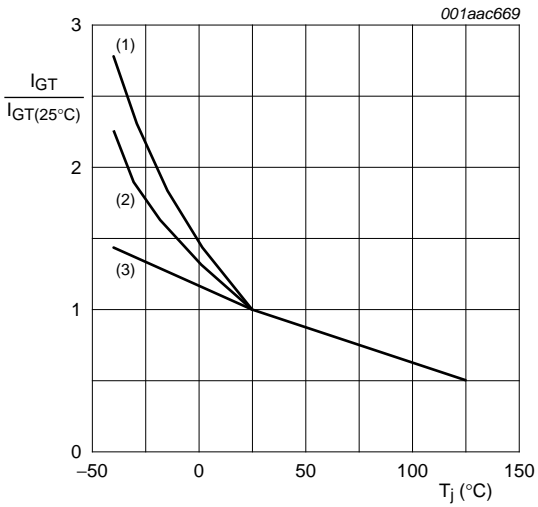
Table 6. Isolation characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------|-----------------------|--|-----|-----|------|------|
| $V_{isol(RMS)}$ | RMS isolation voltage | from all three terminals to external heatsink; sinusoidal waveform; clean and dust free ; 50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; T _h = 25 °C | - | - | 2500 | V |
| C_{isol} | isolation capacitance | from main terminal 2 to external heatsink ; f = 1 MHz; T _h = 25 °C | - | 10 | - | pF |

7. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------------|--|------|-----|-----|------------|
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; see Figure 7 | 10 | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; see Figure 7 | 10 | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; see Figure 7 | 10 | - | 50 | mA |
| I_L | latching current | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; see Figure 8 | - | - | 60 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; see Figure 8 | - | - | 90 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; see Figure 8 | - | - | 60 | mA |
| I_H | holding current | $V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; see Figure 9 | - | - | 60 | mA |
| V_T | on-state voltage | $I_T = 18\text{ A}$; $T_j = 25\text{ °C}$; see Figure 10 | - | 1.3 | 1.5 | V |
| V_{GT} | gate trigger voltage | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ °C}$; see Figure 11 | - | 0.8 | 1.5 | V |
| | | $V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125\text{ °C}$; see Figure 11 | 0.25 | 0.4 | - | V |
| I_D | off-state current | $V_D = 800\text{ V}$; $T_j = 125\text{ °C}$ | - | 0.1 | 0.5 | mA |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 536\text{ V}$; $T_j = 125\text{ °C}$; exponential waveform; gate open circuit | 2500 | - | - | V/ μ s |
| di_{com}/dt | rate of change of commutating current | $V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $I_{T(RMS)} = 16\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit | 20 | - | - | A/ms |



- (1) T2- G-
- (2) T2+ G-
- (3) T2+ G+

Fig 7. Normalized gate trigger current as a function of junction temperature

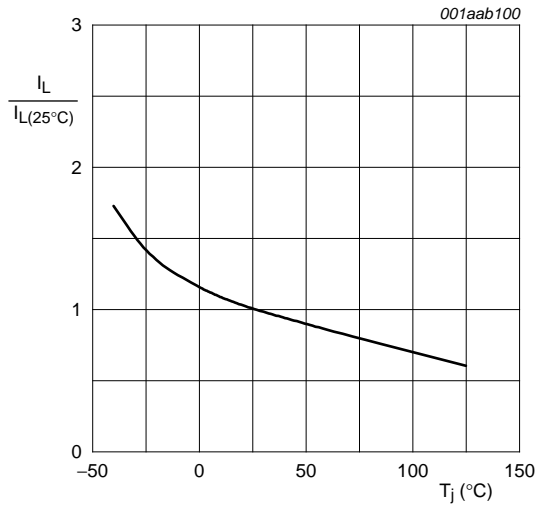


Fig 8. Normalized latching current as a function of junction temperature

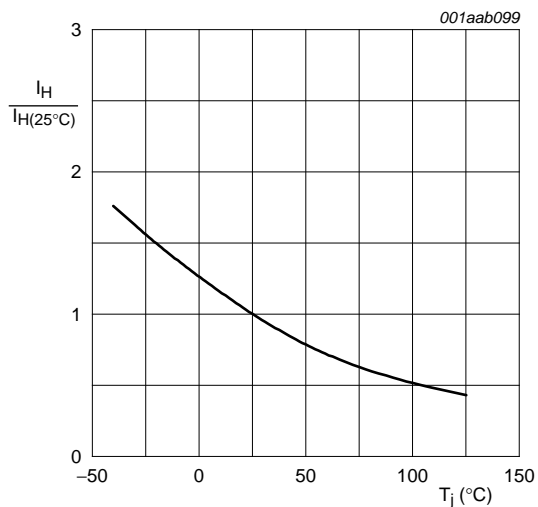
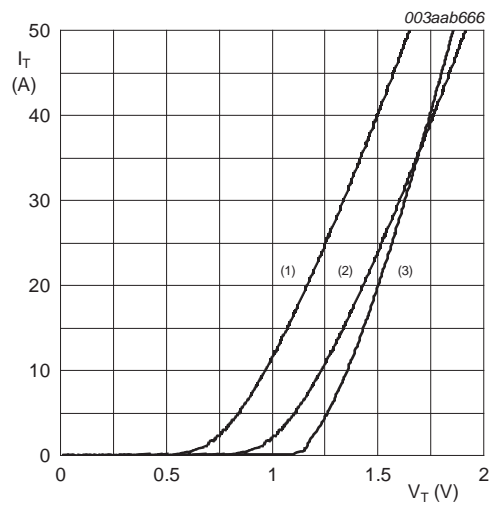


Fig 9. Normalized holding current as a function of junction temperature



$V_o = 1.024 \text{ V}$

$R_s = 0.021 \ \Omega$

(1) $T_j = 125^\circ\text{C}$; typical values

(2) $T_j = 125^\circ\text{C}$; maximum values

(3) $T_j = 25^\circ\text{C}$; maximum values

Fig 10. On-state current as a function of on-state voltage

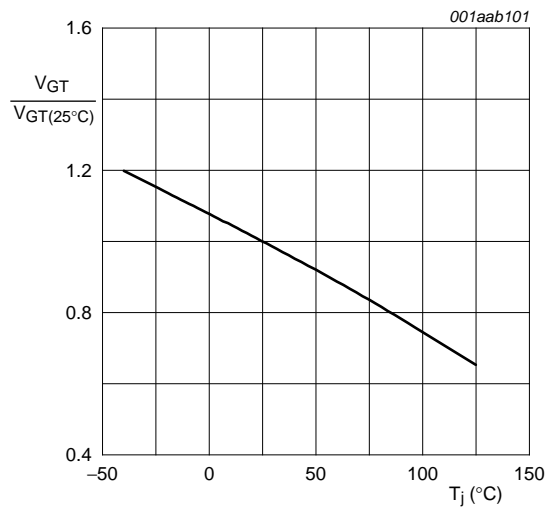


Fig 11. Normalized gate trigger voltage as a function of junction temperature

8. Package outline

Plastic single-ended package; isolated heatsink mounted;
1 mounting hole; 3-lead TO-220 'full pack'

SOT186A

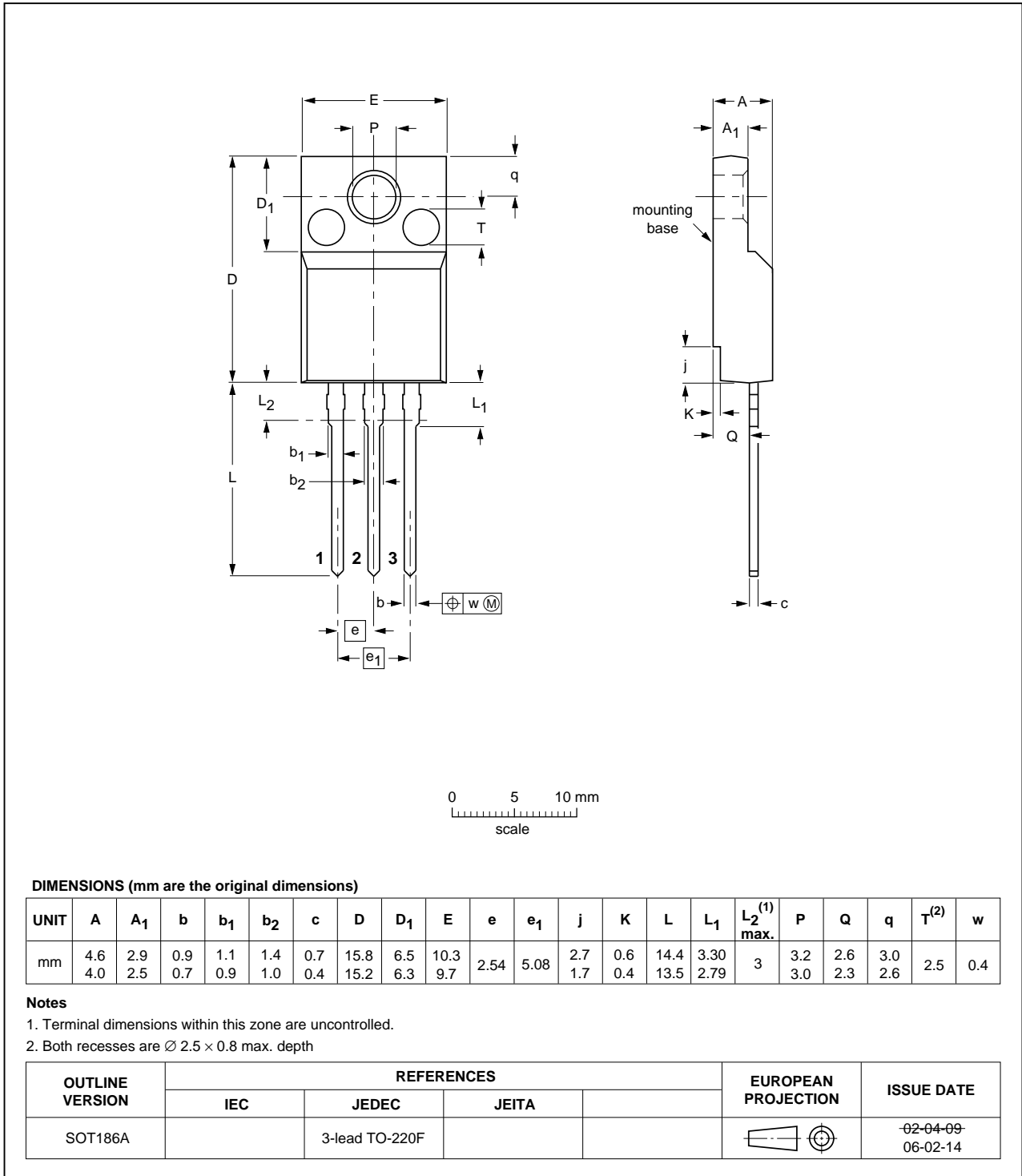


Fig 12. Package outline SOT186A (TO-220F)

9. Revision history

Table 8. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------------|-------------------------------|--------------------|---------------|-------------------|
| BTA316X-800B0 v.2 | 20111117 | Product data sheet | - | BTA316X-800B0 v.1 |
| Modifications: | • Various changes to content. | | | |
| BTA316X-800B0 v.1 | 20101112 | Product data sheet | - | - |

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|---|-------------------------------|---|
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| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

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