

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 B" triac will commute the full rated RMS current at the maximum rated junction temperature without the aid of a snubber.

2. Features and benefits

- 3Q technology for improved noise immunity
- High commutation capability with maximum false trigger immunity
- High immunity to false turn on by dV/dt
- High voltage capability
- Isolated mounting base package
- Less sensitive gate for very high noise immunity
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only

3. Applications

- General purpose motor control circuits
- Home appliances
- Rectifier-fed DC inductive loads e.g. DC motors and solenoids

4. Quick reference data

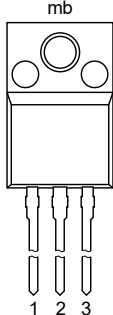
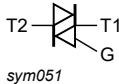
Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|--------------------------------------|---|-----|-----|-----|------|
| V_{DRM} | repetitive peak off-state voltage | | - | - | 600 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_h \leq 92\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | - | - | 4 | A |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5 | - | - | 25 | A |
| | | full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$ | - | - | 27 | A |
| T_j | junction temperature | | - | - | 125 | °C |
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; Fig. 7 | - | - | 50 | mA |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------------|---|------|-----|-----|------------------|
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7 | - | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7 | - | - | 50 | mA |
| I_H | holding current | $V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 9 | - | - | 30 | mA |
| V_T | on-state voltage | $I_T = 5\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 10 | - | 1.4 | 1.7 | V |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 402\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit | 1000 | - | - | V/ μs |
| dI_{com}/dt | rate of change of commutating current | $V_D = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{T(RMS)} = 4\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit | 6 | - | - | A/ms |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------------------|--|---|
| 1 | T1 | main terminal 1 |  <p>TO-220F (SOT186A)</p> |  |
| 2 | T2 | main terminal 2 | | |
| 3 | G | gate | | |
| mb | n.c. | mounting base; isolated | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|--------------|---------|---|---------|
| | Name | Description | Version |
| BTA204X-600B | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack" | SOT186A |

7. 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 | | - | 600 | V |
| I _{T(RMS)} | RMS on-state current | full sine wave; T _h ≤ 92 °C; Fig. 1; Fig. 2; Fig. 3 | - | 4 | A |
| I _{TSM} | non-repetitive peak on-state current | full sine wave; T _{j(init)} = 25 °C; t _p = 20 ms; Fig. 4; Fig. 5 | - | 25 | A |
| | | full sine wave; T _{j(init)} = 25 °C; t _p = 16.7 ms | - | 27 | A |
| I ² t | I ² t for fusing | t _p = 10 ms; SIN | - | 3.1 | A ² s |
| di _T /dt | rate of rise of on-state current | I _G = 0.2 A | - | 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 |

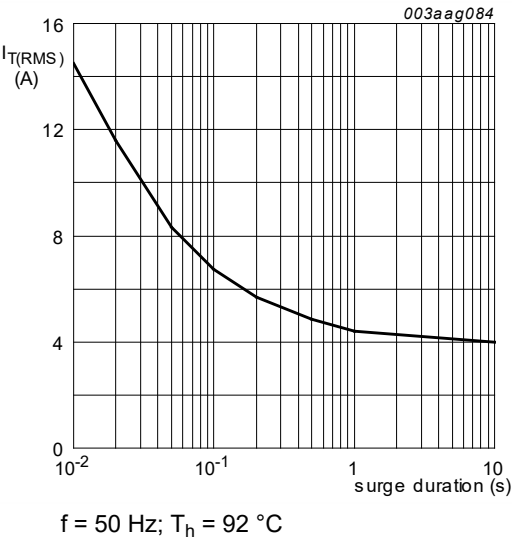


Fig. 1. RMS on-state current as a function of surge duration; maximum values

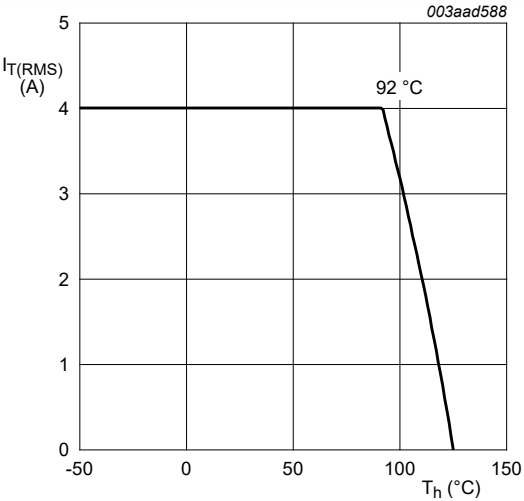


Fig. 2. RMS on-state current as a function of heatsink temperature; maximum values

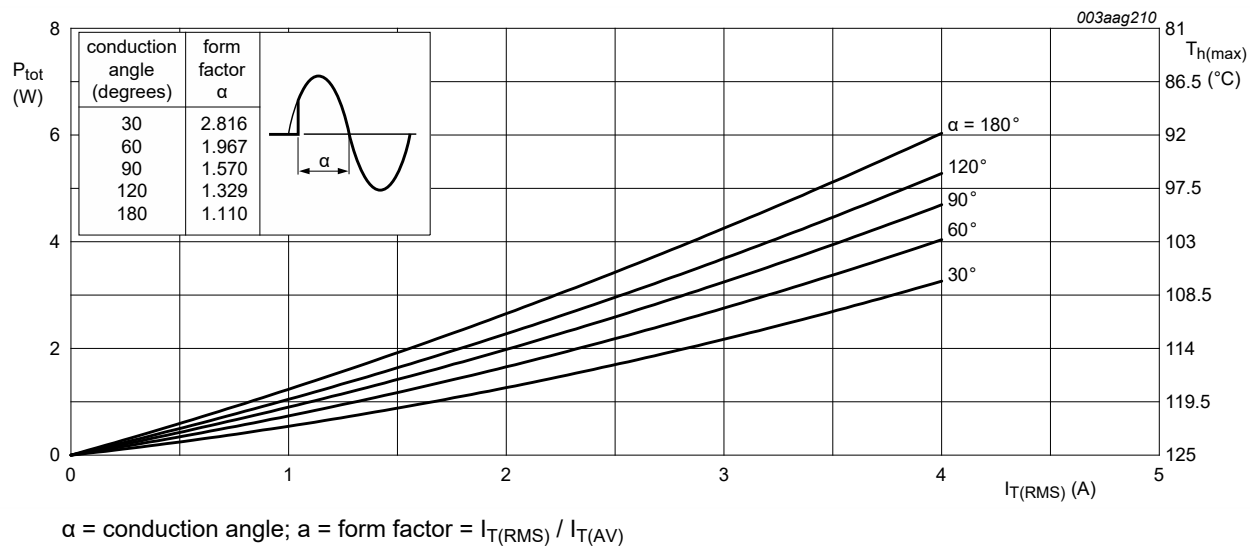


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

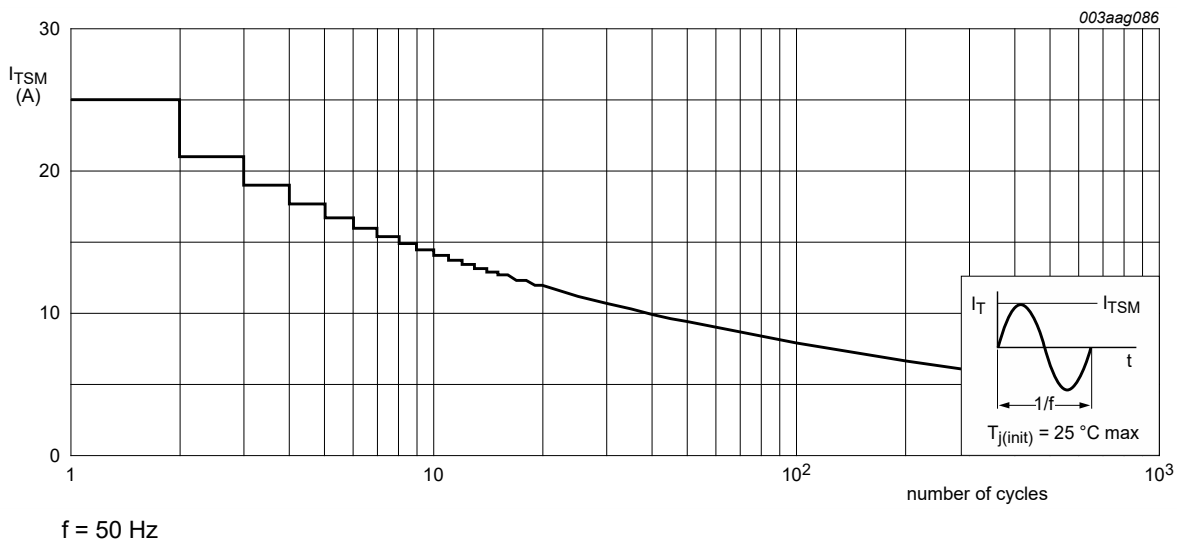
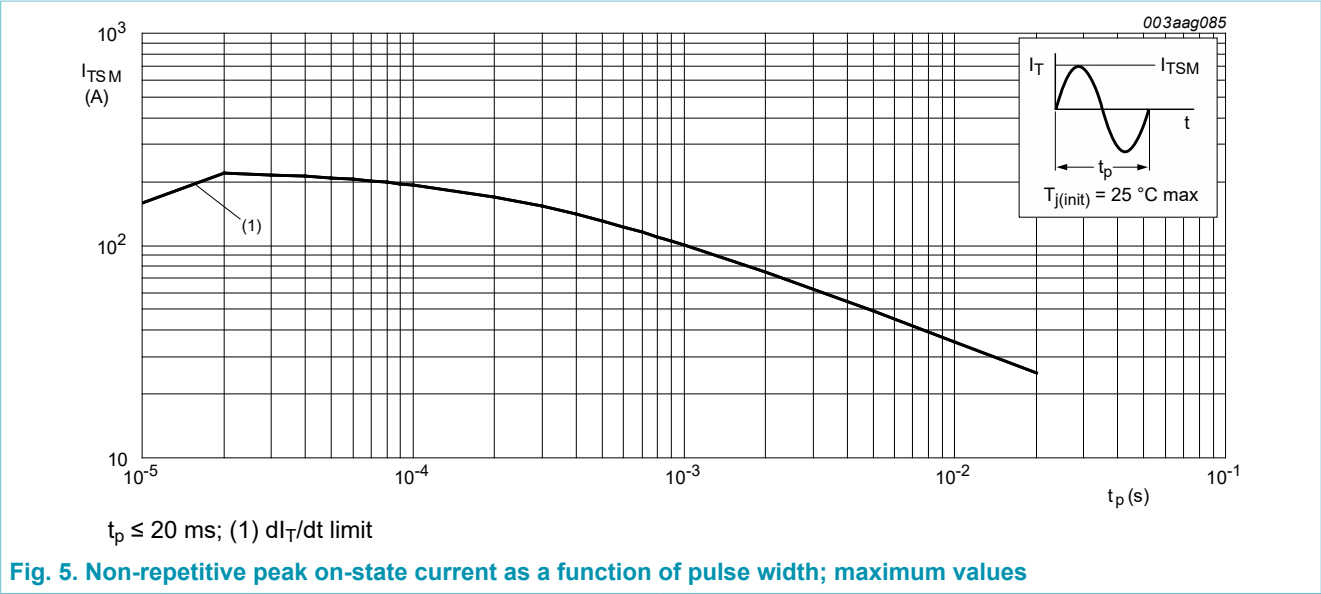


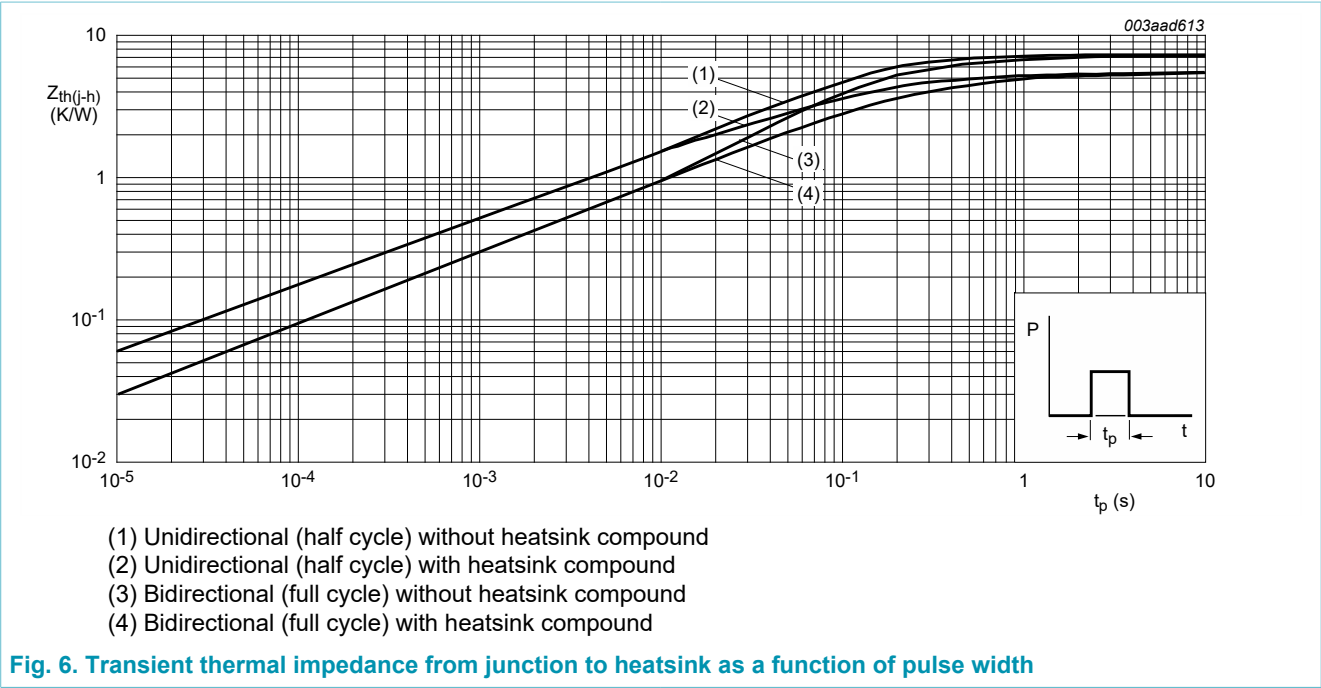
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



8. 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; Fig. 6 | - | - | 5.5 | K/W |
| | | full cycle or half cycle; without heatsink compound | - | - | 7.2 | K/W |
| R _{th(j-a)} | thermal resistance from junction to ambient free air | in free air | - | 55 | - | K/W |



9. Isolation characteristics

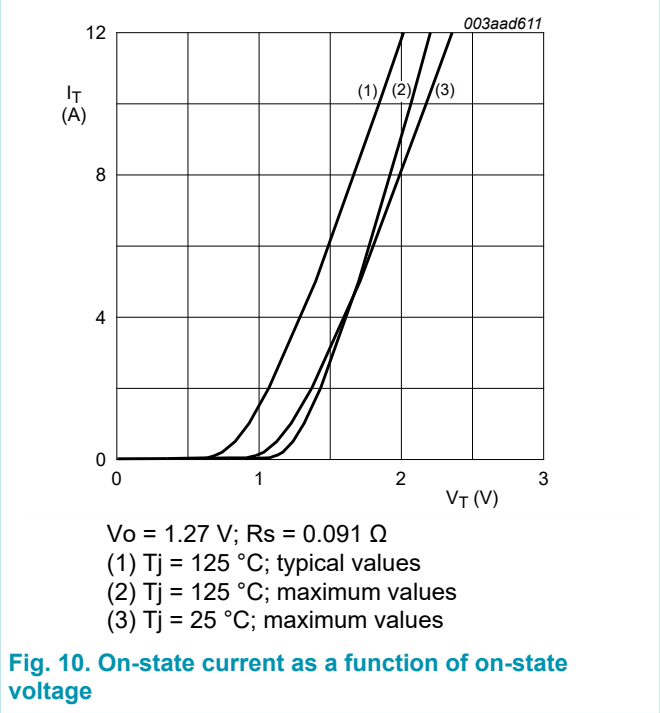
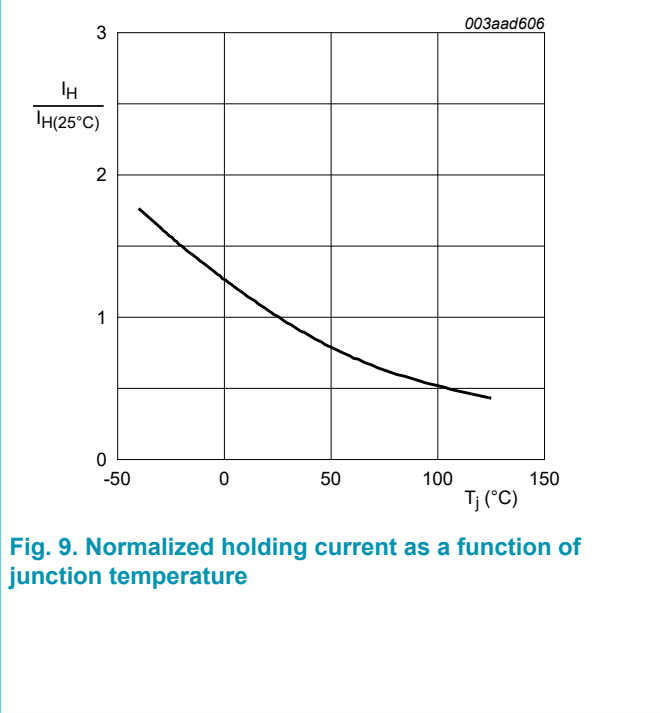
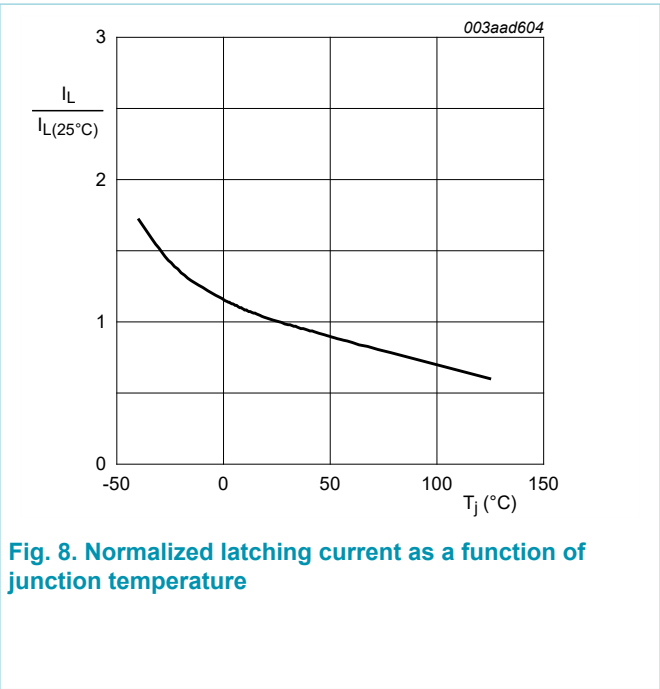
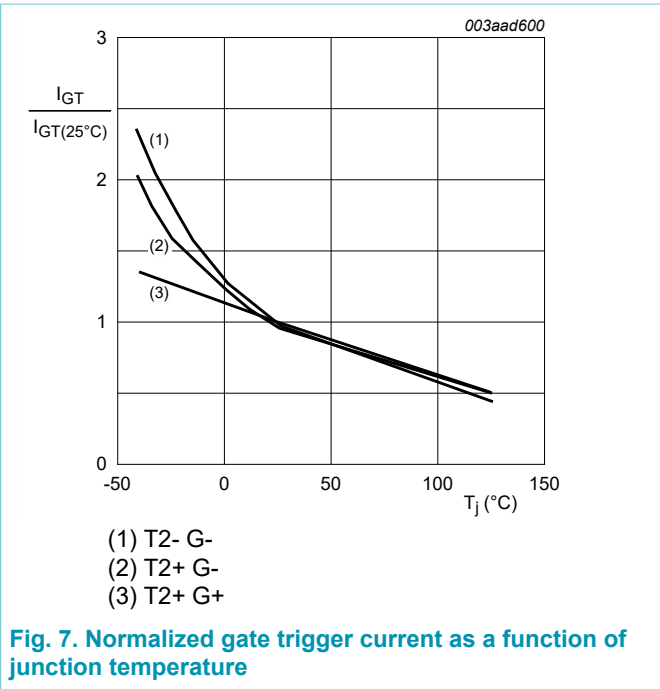
Table 6. Isolation characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------------|-----------------------|---|-----|-----|------|------|
| V _{isol(RMS)} | RMS isolation voltage | from all 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 |

10. 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+; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7 | - | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7 | - | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7 | - | - | 50 | mA |
| I_L | latching current | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8 | - | - | 30 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8 | - | - | 45 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8 | - | - | 30 | mA |
| I_H | holding current | $V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 9 | - | - | 30 | mA |
| V_T | on-state voltage | $I_T = 5\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 10 | - | 1.4 | 1.7 | V |
| V_{GT} | gate trigger voltage | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 11 | - | 0.7 | 1 | V |
| | | $V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125\text{ }^\circ\text{C}$; Fig. 11 | 0.25 | 0.4 | - | V |
| I_D | off-state current | $V_D = 600\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$ | - | 0.1 | 0.5 | mA |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 402\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit | 1000 | - | - | V/ μs |
| dI_{com}/dt | rate of change of commutating current | $V_D = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{T(RMS)} = 4\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit | 6 | - | - | A/ms |



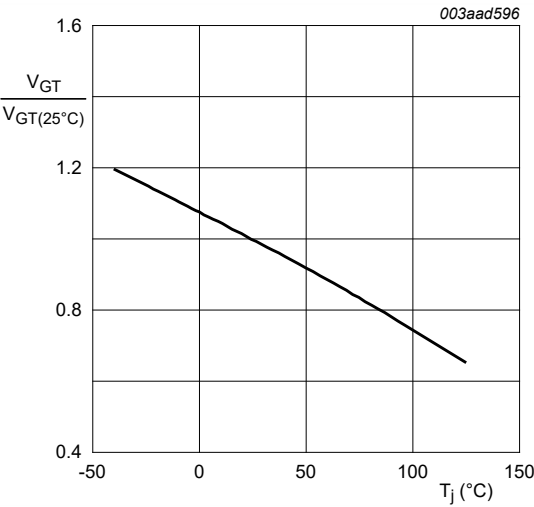
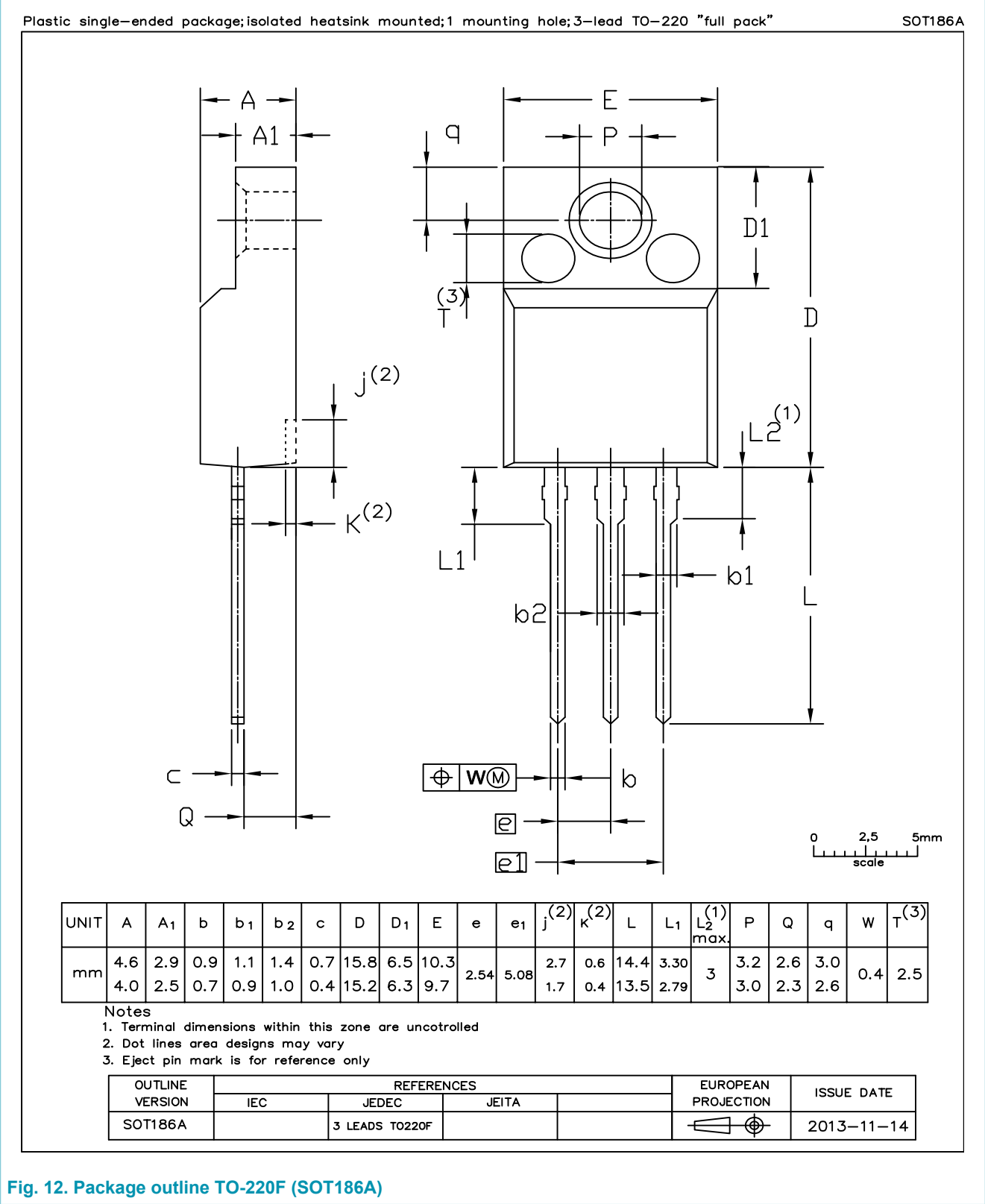


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline



12. Legal information

Data sheet status

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