

NXP BT136X-600 4Q Triac datasheet

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Planar passivated four quadrant triac in a SOT186A "full pack" plastic package intended for use in bidirectional switching and phase control applications.

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BT136X-600

4Q Triac

23 October 2013

Product data sheet

1. General description

Planar passivated four quadrant triac in a SOT186A "full pack" plastic package intended for use in bidirectional switching and phase control applications.

2. Features and benefits

- High blocking voltage capability
- Isolated package
- Less sensitive gate for improved noise immunity
- Planar passivated for voltage ruggedness and reliability
- Triggering in all four quadrants

3. Applications

- General purpose motor control
- General purpose switching

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_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5 | - | - | 25 | A |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_h \leq 92\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | - | - | 4 | A |
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; Fig. 7 | - | 5 | 35 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; Fig. 7 | - | 8 | 35 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; Fig. 7 | - | 11 | 35 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ °C}$; Fig. 7 | - | 30 | 70 | mA |

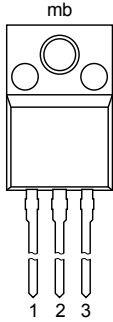



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5. Pinning information

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

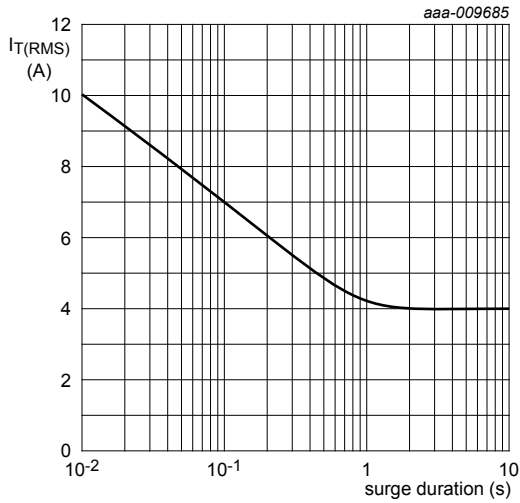
| Type number | Package | | |
|-------------|---------|---|---------|
| | Name | Description | Version |
| BT136X-600 | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack" | SOT186A |

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; $T_h \leq 92\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | - | 4 | A |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5 | - | 25 | A |
| | | full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$ | - | 27 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; SIN | - | 3.1 | A^2s |
| di_T/dt | rate of rise of on-state current | $I_T = 6\text{ A}$; $I_G = 0.2\text{ A}$; $dI_G/dt = 0.2\text{ A}/\mu s$; T2+ G+ | - | 50 | $A/\mu s$ |
| | | $I_T = 6\text{ A}$; $I_G = 0.2\text{ A}$; $dI_G/dt = 0.2\text{ A}/\mu s$; T2+ G- | - | 50 | $A/\mu s$ |
| | | $I_T = 6\text{ A}$; $I_G = 0.2\text{ A}$; $dI_G/dt = 0.2\text{ A}/\mu s$; T2- G- | - | 50 | $A/\mu s$ |
| | | $I_T = 6\text{ A}$; $I_G = 0.2\text{ A}$; $dI_G/dt = 0.2\text{ A}/\mu s$; T2- G+ | - | 10 | $A/\mu s$ |
| 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 | $^{\circ}C$ |
| T_j | junction temperature | | - | 125 | $^{\circ}C$ |



f = 50 Hz; T_h = 92 °C

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

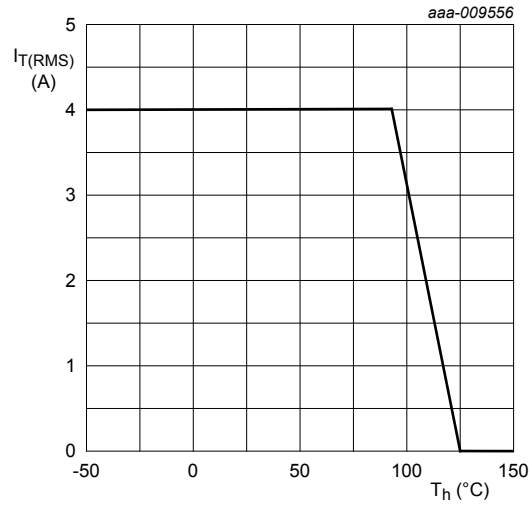
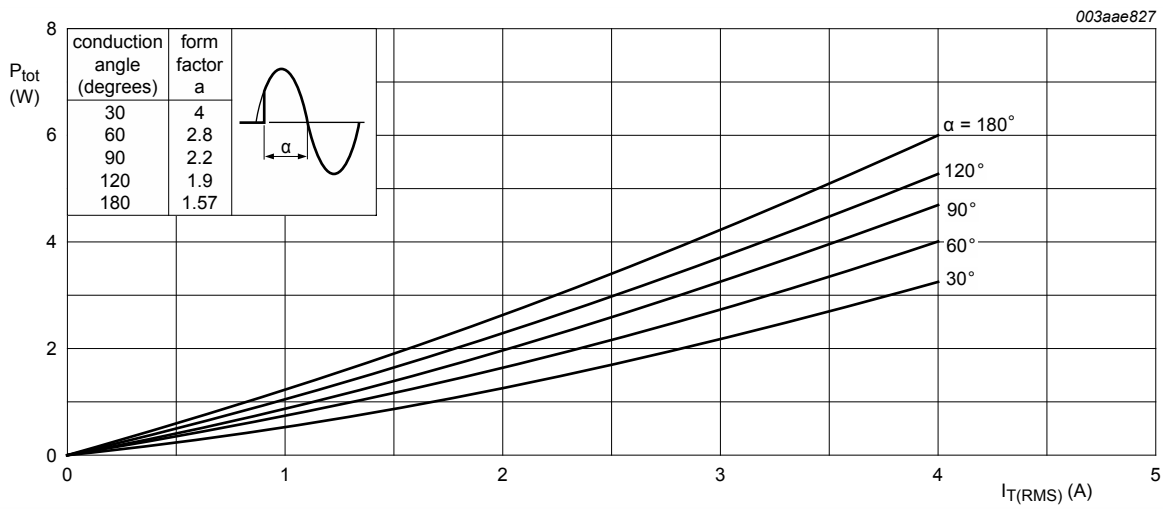


Fig. 2. RMS on-state current as a function of heatsink temperature; maximum values



α = conduction angle
 a = form factor = $I_{T(RMS)} / I_{T(AV)}$

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

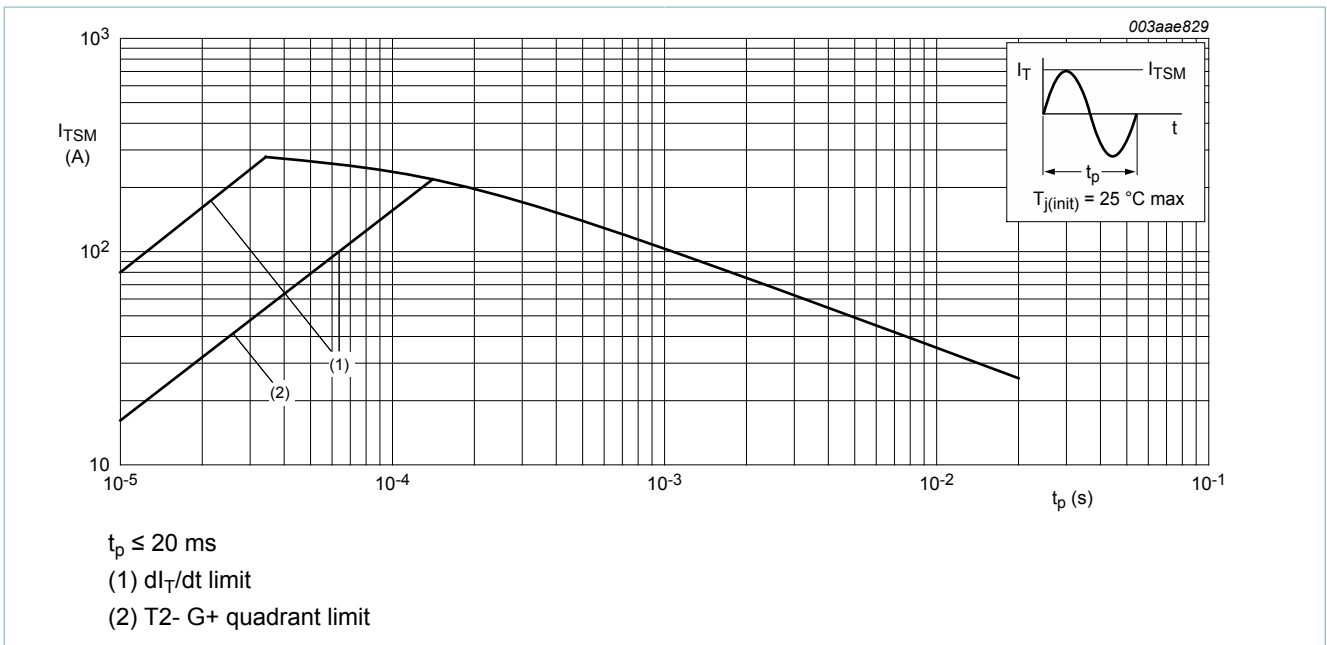


Fig. 4. Non-repetitive peak on-state current as a function of pulse width; maximum values

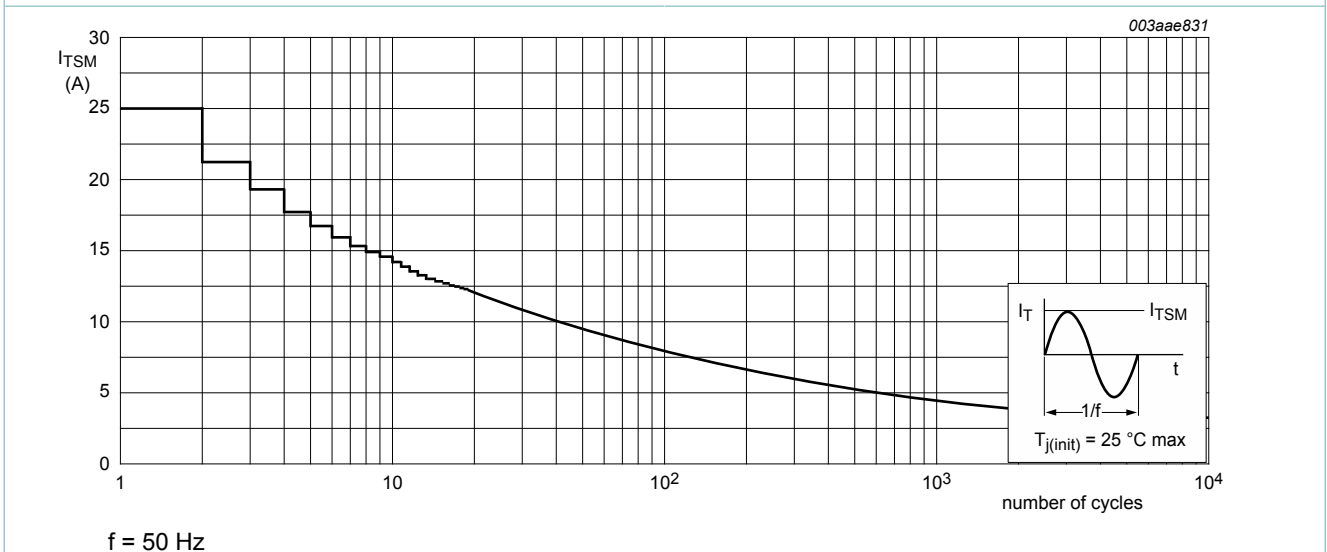
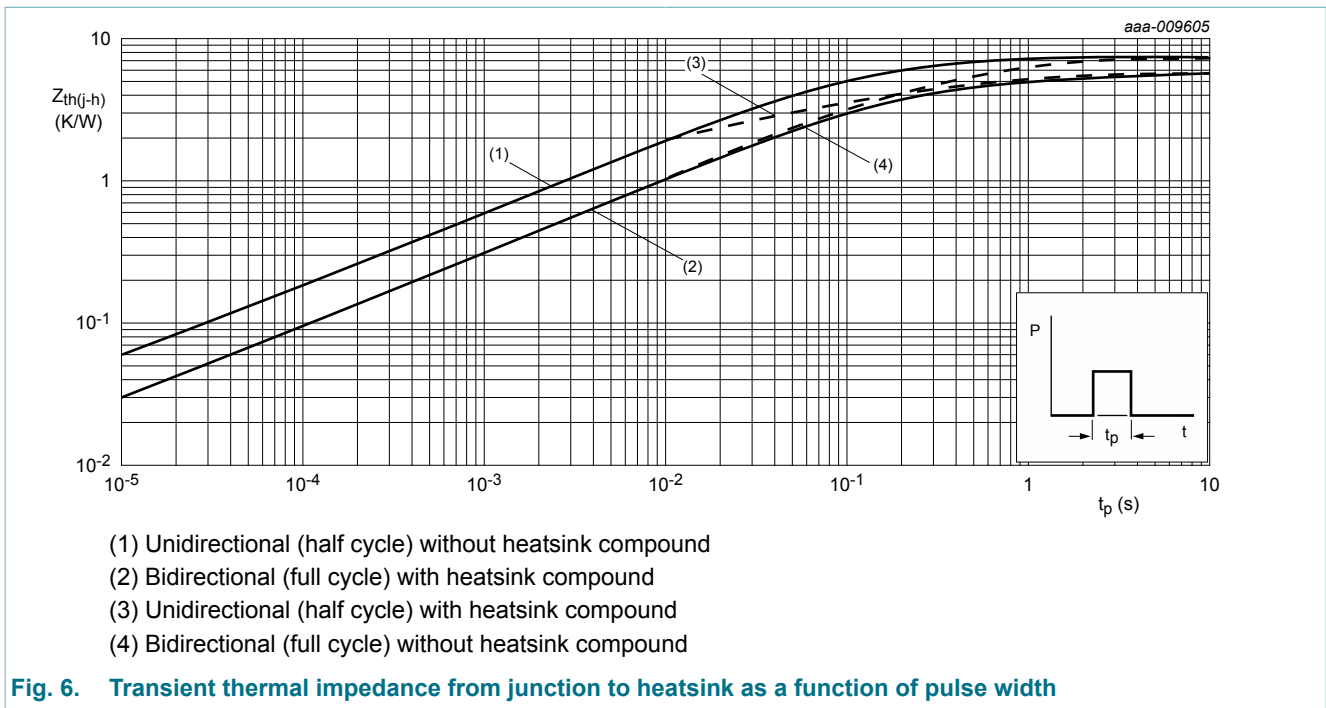


Fig. 5. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

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



9. Isolation characteristics

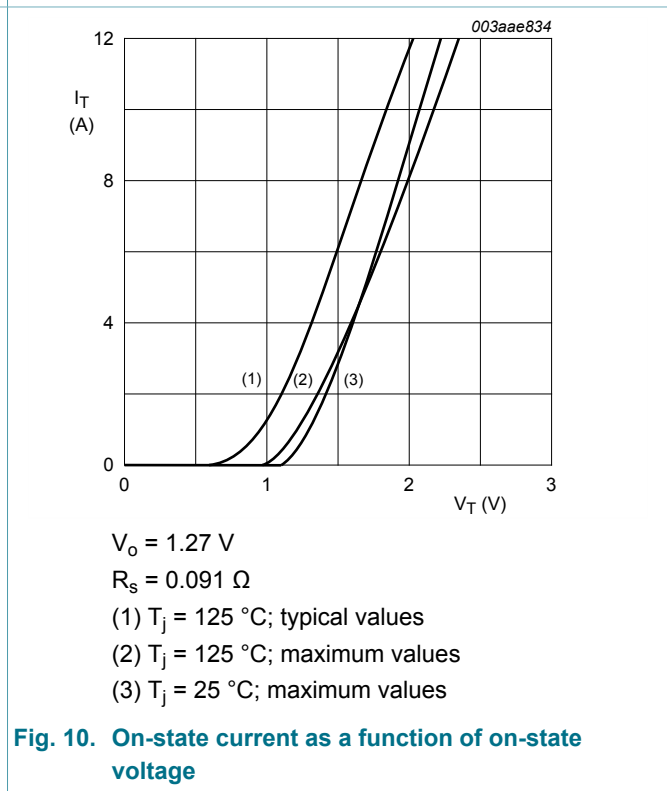
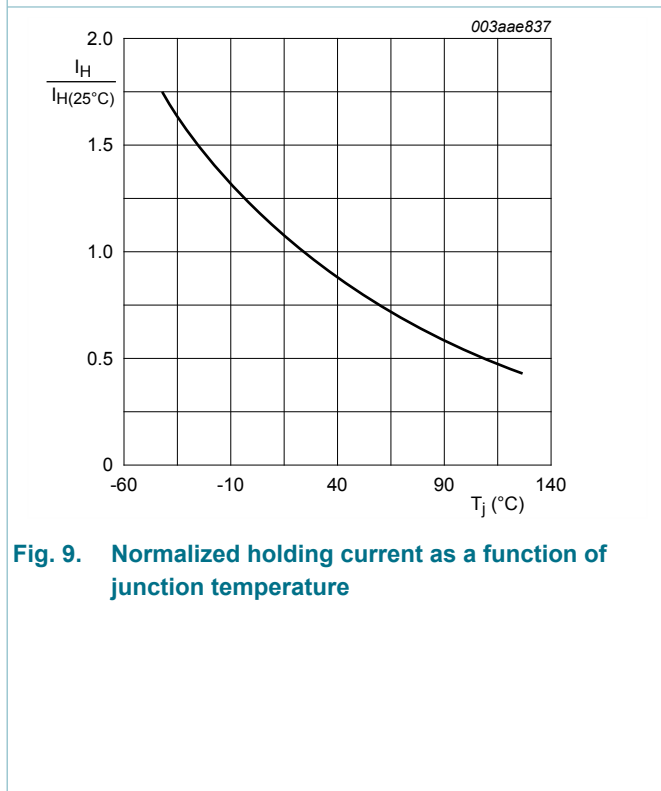
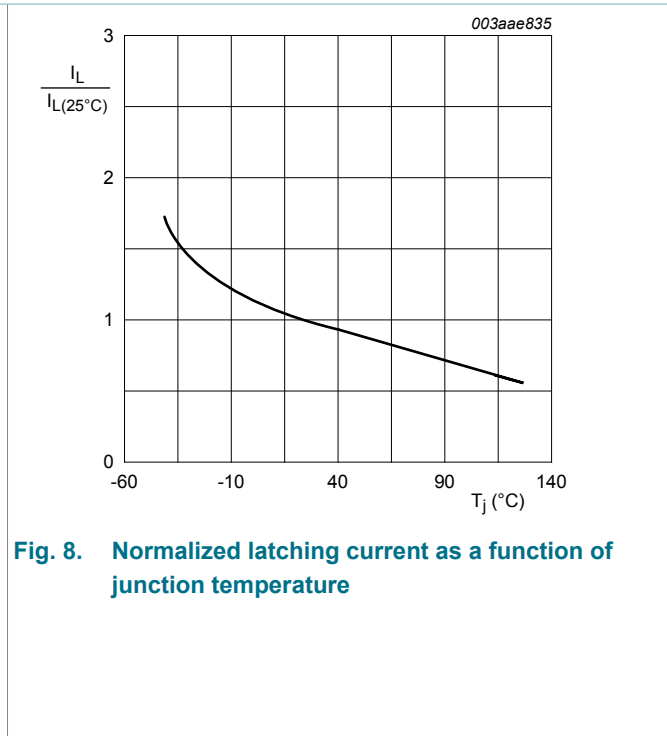
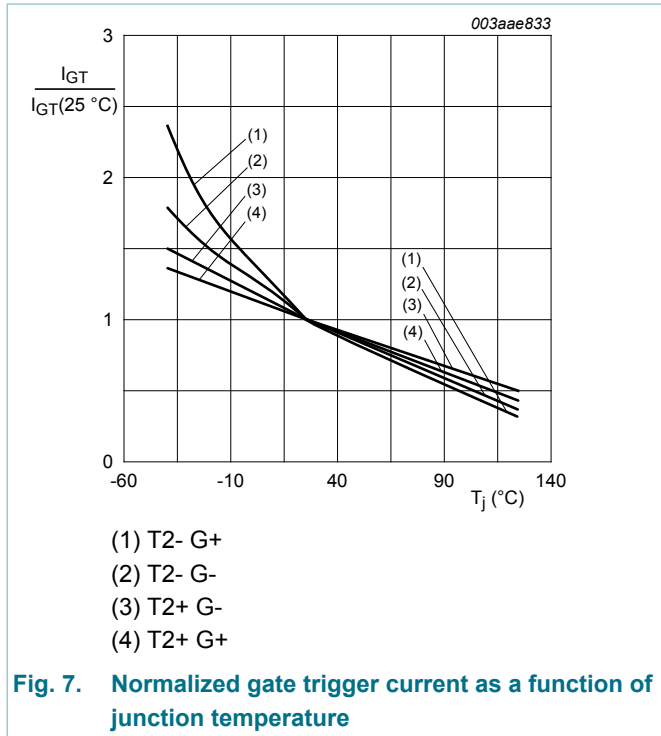
Table 6. Isolation characteristics

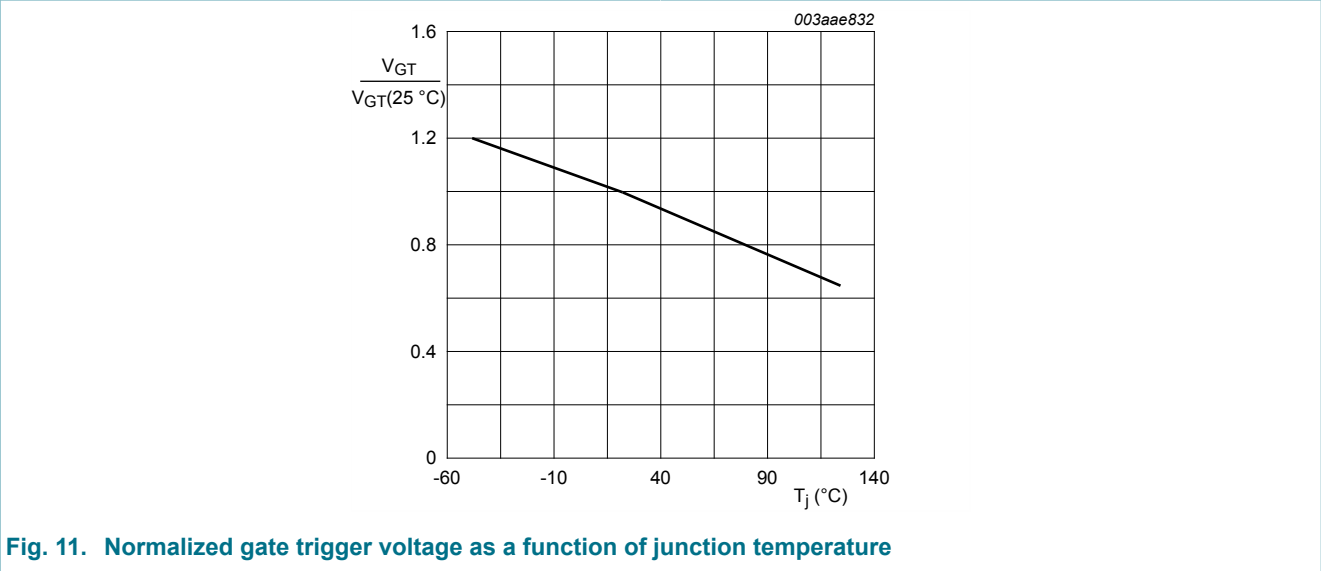
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------|-----------------------|--|-----|-----|------|------|
| $V_{isol(RMS)}$ | RMS isolation voltage | from all terminals to external heatsink; sinusoidal waveform; clean and dust free ; 50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; $T_h = 25\text{ °C}$ | - | - | 2500 | V |
| C_{isol} | isolation capacitance | from main terminal 2 to external heatsink ; f = 1 MHz; $T_h = 25\text{ °C}$ | - | 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+; $T_j = 25\text{ °C}$; Fig. 7 | - | 5 | 35 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; Fig. 7 | - | 8 | 35 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; Fig. 7 | - | 11 | 35 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ °C}$; Fig. 7 | - | 30 | 70 | mA |
| I_L | latching current | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; Fig. 8 | - | 7 | 20 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; Fig. 8 | - | 16 | 30 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; Fig. 8 | - | 5 | 20 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ °C}$; Fig. 8 | - | 7 | 30 | mA |
| I_H | holding current | $V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; Fig. 9 | - | 5 | 15 | mA |
| V_T | on-state voltage | $I_T = 5\text{ A}$; $T_j = 25\text{ °C}$; Fig. 10 | - | 1.4 | 1.7 | V |
| V_{GT} | gate trigger voltage | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 11 | - | 0.7 | 1 | V |
| | | $V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125\text{ °C}$; Fig. 11 | 0.25 | 0.4 | - | V |
| I_D | off-state current | $V_D = 600\text{ V}$; $T_j = 125\text{ °C}$ | - | 0.1 | 0.5 | mA |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 402\text{ V}$; $T_j = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit | 100 | 250 | - | V/ μ s |
| dV_{com}/dt | rate of change of commutating voltage | $V_D = 400\text{ V}$; $T_j = 95\text{ °C}$; $dI_{com}/dt = 1.8\text{ A/ms}$; $I_T = 4\text{ A}$; gate open circuit | - | 50 | - | V/ μ s |
| t_{gt} | gate-controlled turn-on time | $I_{TM} = 6\text{ A}$; $V_D = 600\text{ V}$; $I_G = 0.1\text{ A}$; $dI_G/dt = 5\text{ A}/\mu$ s | - | 2 | - | μ s |





11. Package outline

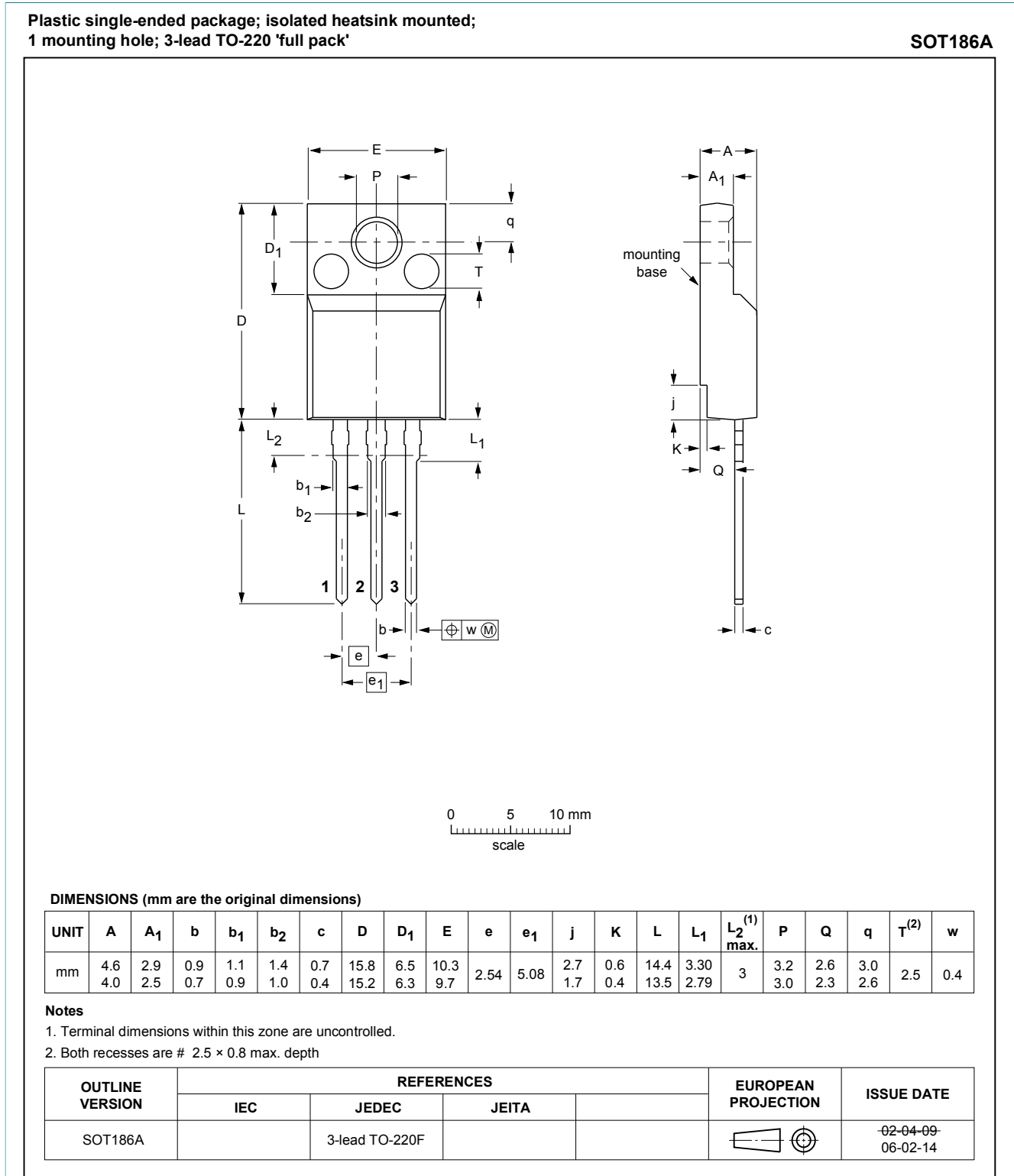


Fig. 12. Package outline TO-220F (SOT186A)

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