

1. General description

Planar passivated four quadrant triac in a SOT186A (TO-220F) plastic package intended for use in general purpose bidirectional switching and phase control applications.

2. Features and benefits

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

3. Applications

- General purpose motor control
- General purpose switching

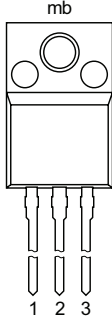

4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Values | | | Unit |
|--------------------------------|--------------------------------------|---|--------|-----|-----|------|
| Absolute maximum rating | | | | | | |
| V_{DRM} | repetitive peak off-state voltage | | 600 | | | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_h \leq 73\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | 8 | | | 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 | 65 | | | A |
| 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 | 25 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; Fig. 7 | - | 8 | 25 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; Fig. 7 | - | 11 | 25 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ °C}$; Fig. 7 | - | 30 | 70 | mA |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------------------|---|---|
| 1 | T1 | main terminal 1 |  |  |
| 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 |
| BT137X-600F | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack" | SOT186A |

7. Marking

Table 4. Marking codes

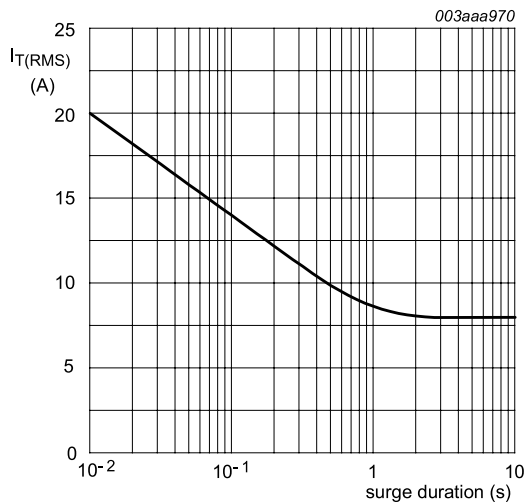
| Type number | Marking codes |
|-------------|---------------|
| BT137X-600F | BT137X-600F |

8. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | Values | Unit |
|--------------|--------------------------------------|---|------------|-------------|
| V_{DRM} | repetitive peak off-state voltage | | 600 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_h \leq 73\text{ °C}$; Fig 1 ; Fig 2 ; Fig 3 | 8 | 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 | 65 | A |
| | | full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$ | 71 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; SIN | 21 | A^2s |
| di_T/dt | rate of rise of on-state current | $I_G = 50\text{ mA}$; T2+ G+ | 50 | $A/\mu s$ |
| | | $I_G = 50\text{ mA}$; T2+ G- | 50 | $A/\mu s$ |
| | | $I_G = 50\text{ mA}$; T2- G- | 50 | $A/\mu s$ |
| | | $I_G = 140\text{ mA}$; T2- G+ | 140 | $A/\mu s$ |
| 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 to 150 | $^{\circ}C$ |
| T_j | junction temperature | | 125 | $^{\circ}C$ |



$f = 50\text{ Hz}$; $T_h = 73\text{ °C}$

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

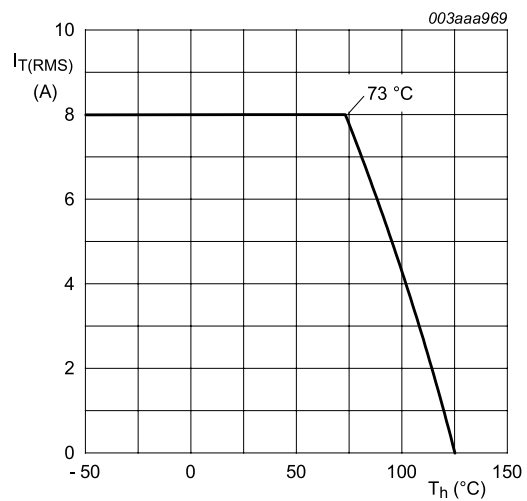


Fig. 2. RMS on-state current as a function of heatsink temperature; maximum values

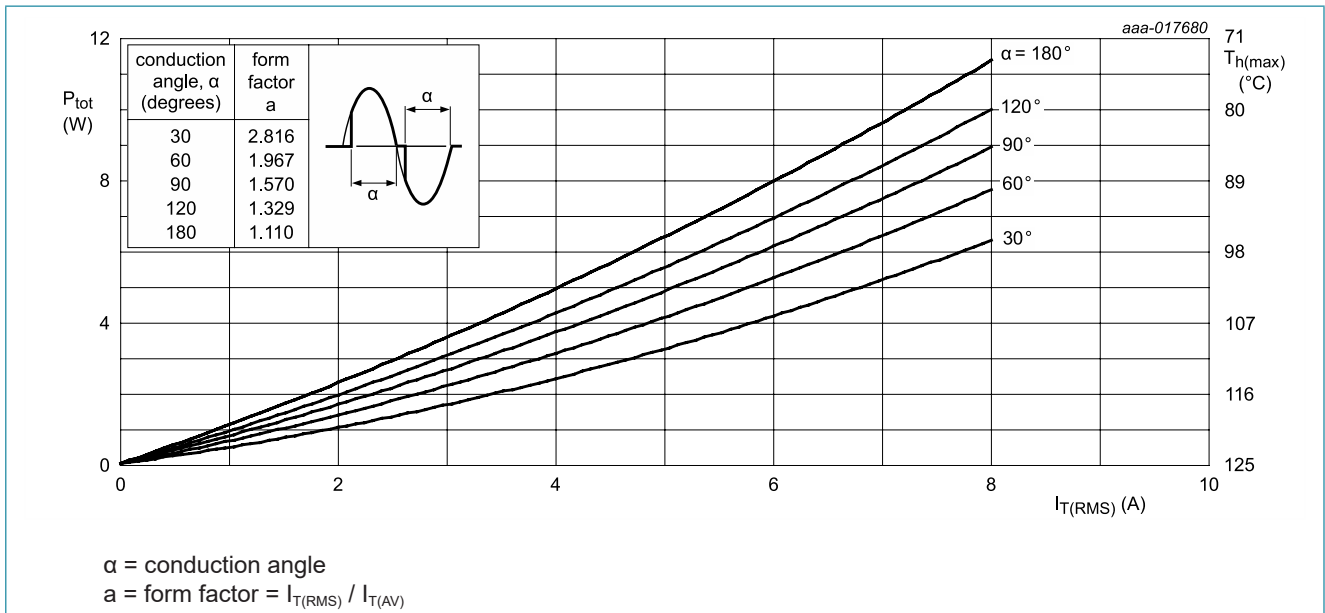


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

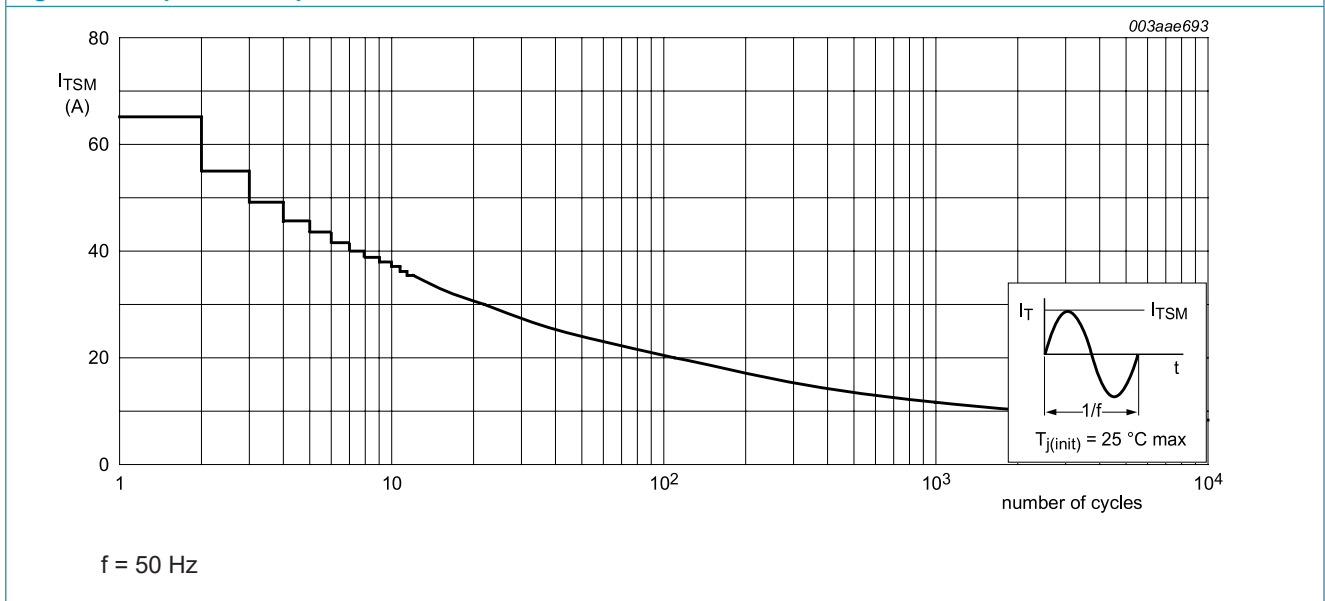


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

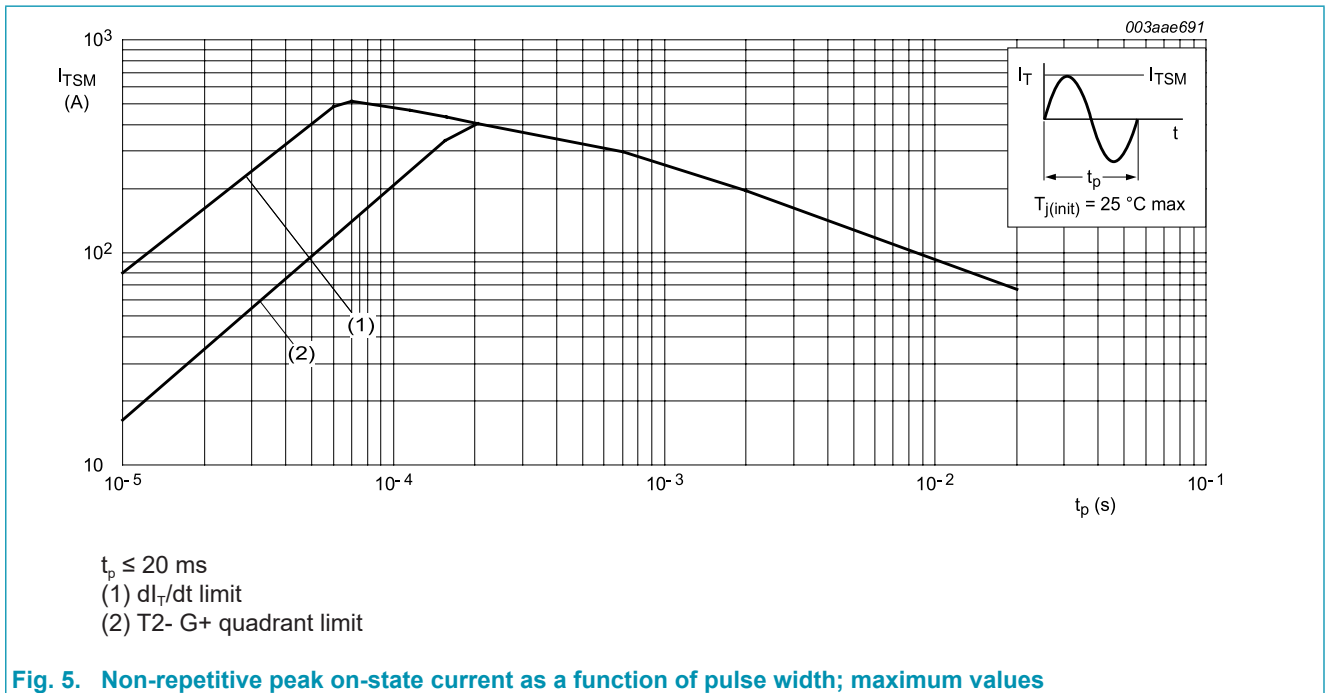


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

9. Thermal characteristics

Table 6. 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 | - | - | 4.5 | K/W |
| | | full or half cycle; without heatsink compound; Fig 6 | - | - | 6.5 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 55 | - | K/W |

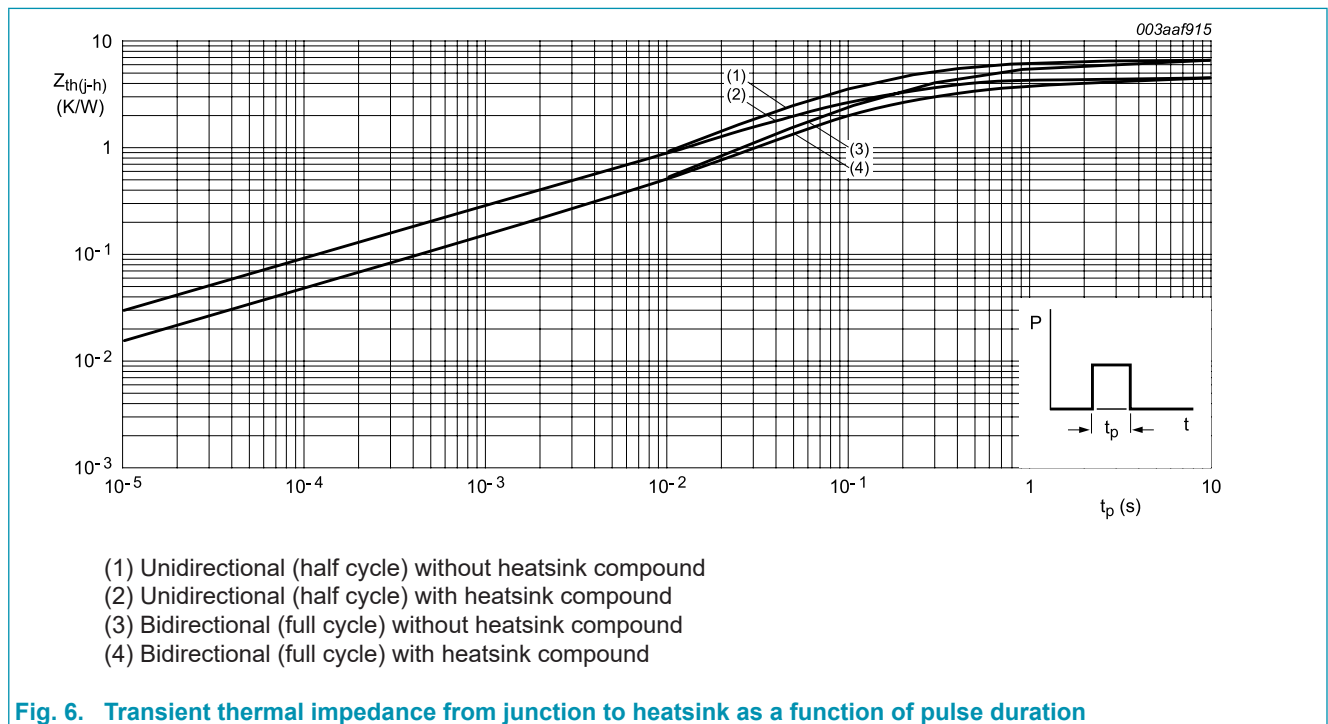


Fig. 6. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

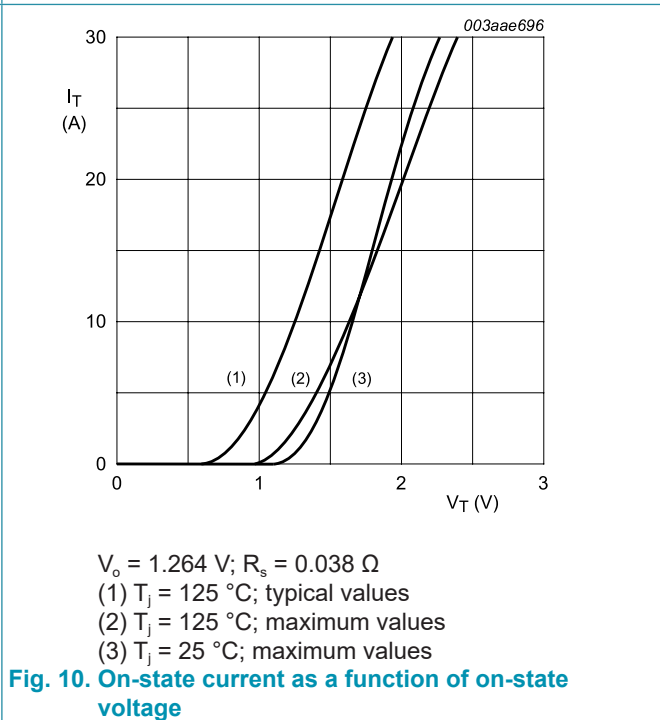
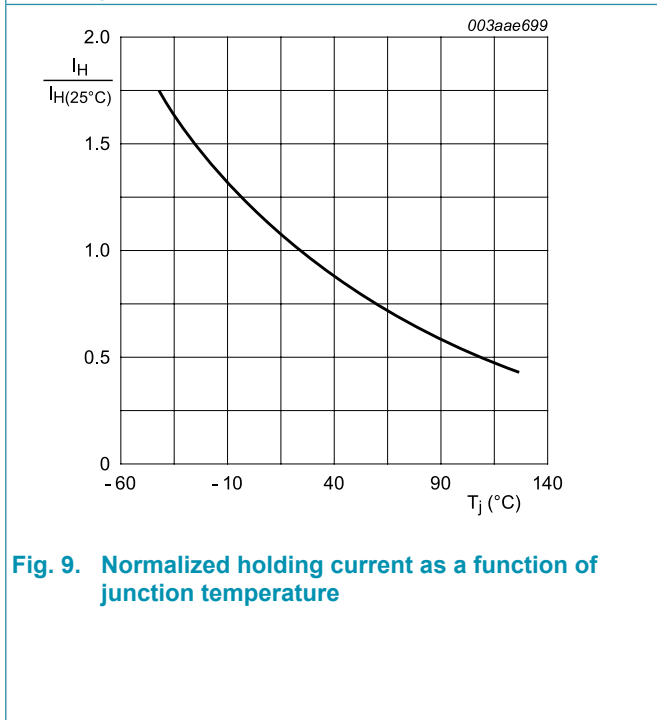
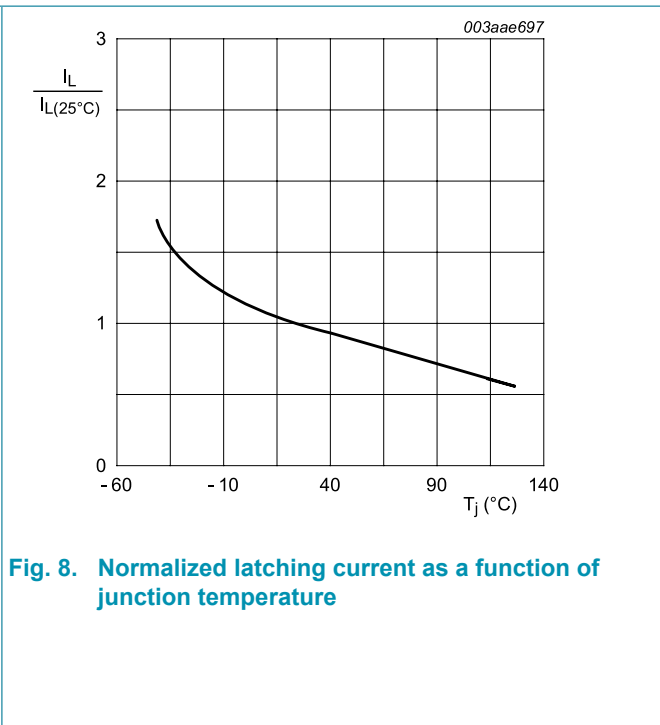
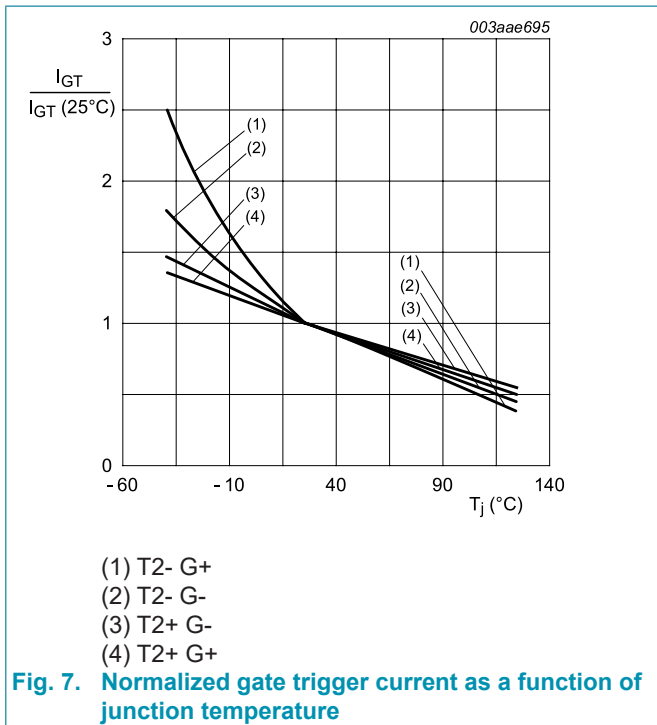
Table 7. Isolation characteristics

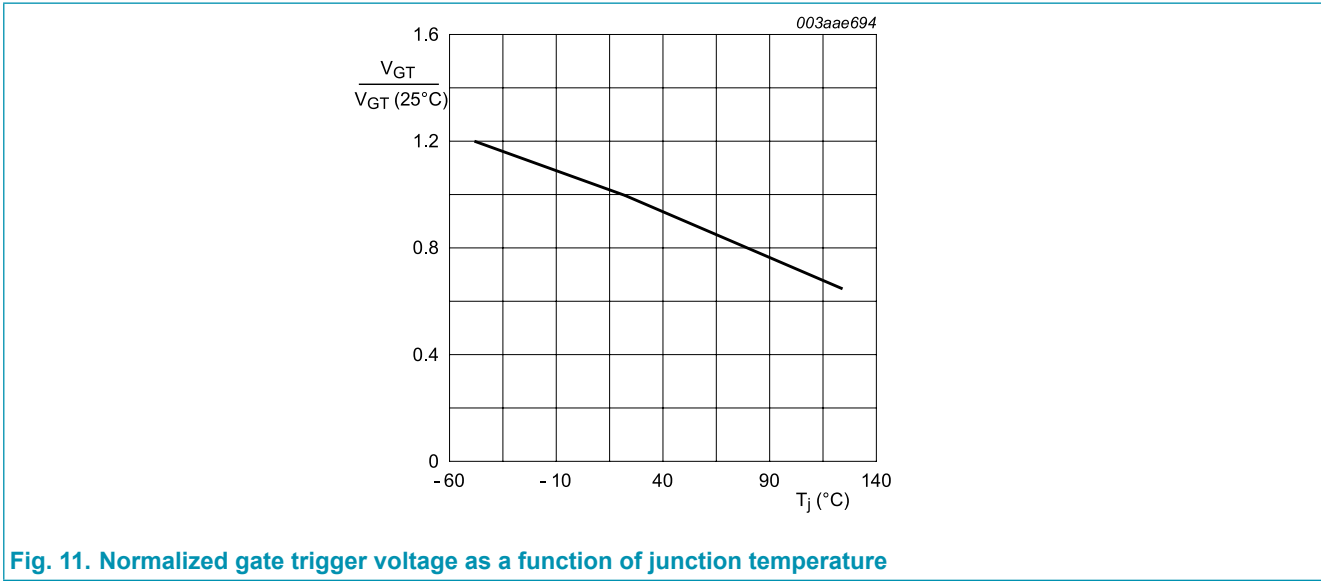
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------|-----------------------|--|-----|-----|------|------|
| $V_{isol(RMS)}$ | RMS isolation voltage | from all terminals to external heatsink; sinusoidal waveform; clean and dust free; $50\text{ Hz} \leq f \leq 60\text{ Hz}$;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

11. Characteristics

Table 8. 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 | 25 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_J = 25\text{ °C}$; Fig. 7 | - | 8 | 25 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_J = 25\text{ °C}$; Fig. 7 | - | 11 | 25 | 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 | 30 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G-; $T_J = 25\text{ °C}$; Fig. 8 | - | 16 | 45 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G-; $T_J = 25\text{ °C}$; Fig. 8 | - | 5 | 30 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G+; $T_J = 25\text{ °C}$; Fig. 8 | - | 7 | 45 | mA |
| I_H | holding current | $V_D = 12\text{ V}$; $T_J = 25\text{ °C}$; Fig. 9 | - | 5 | 20 | mA |
| V_T | on-state voltage | $I_T = 10\text{ A}$; $T_J = 25\text{ °C}$; Fig. 10 | - | 1.3 | 1.65 | 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 | 50 | 250 | - | V/ μ s |
| dV_{com}/dt | rate of change of commutating voltage | $V_D = 400\text{ V}$; $T_J = 95\text{ °C}$; $dI_{com}/dt = 3.6\text{ A/ms}$; $I_T = 8\text{ A}$ | - | 20 | - | V/ μ s |
| t_{gt} | gate-controlled turn-on time | $V_D = 600\text{ V}$; $I_{TM} = 12\text{ A}$; $I_G = 0.1\text{ A}$; $dI_G/dt = 5\text{ A}/\mu$ s | - | 2 | - | μ s |





12. Package outline

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

SOT186A



| UNIT | A | A ₁ | b | b ₁ | b ₂ | c | D | D ₁ | E | e | e ₁ | j ⁽²⁾ | k ⁽²⁾ | L | L ₁ | L ₂ ⁽¹⁾ max. | P | Q | q | W | T ⁽³⁾ |
|------|-----|----------------|-----|----------------|----------------|-----|------|----------------|------|------|----------------|------------------|------------------|------|----------------|---------------------------------------|-----|-----|-----|-----|------------------|
| mm | 4.6 | 2.9 | 0.9 | 1.1 | 1.4 | 0.7 | 15.8 | 6.5 | 10.3 | 2.54 | 5.08 | 2.7 | 0.6 | 14.4 | 3.30 | 3 | 3.2 | 2.6 | 3.0 | 0.4 | 2.5 |
| | 4.0 | 2.5 | 0.7 | 0.9 | 1.0 | 0.4 | 15.2 | 6.3 | 9.7 | | | 1.7 | 0.4 | 13.5 | 2.79 | | 3.0 | 2.3 | 2.6 | | |

Notes

1. Terminal dimensions within this zone are uncontrolled
2. Dot lines area designs may vary
3. Eject pin mark is for reference only

| OUTLINE VERSION | REFERENCES | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------------|-------|---------------------|------------|
| | IEC | JEDEC | JEITA | | |
| SOT186A | | 3 LEADS TO220F | | | 2013-11-14 |

13. Legal information

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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14. Contents

| | |
|------------------------------------|----|
| 1. General description..... | 1 |
| 2. Features and benefits | 1 |
| 3. Applications | 1 |
| 4. Quick reference data | 1 |
| 5. Pinning information..... | 2 |
| 6. Ordering information..... | 2 |
| 7. Marking..... | 2 |
| 8. Limiting values | 3 |
| 9. Thermal characteristics | 6 |
| 10. Isolation Characteristics..... | 6 |
| 11. Characteristics..... | 7 |
| 12. Package outline | 10 |
| 13. Legal information | 11 |
| 14. Contents | 13 |

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Date of release: 18 April 2018

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