

1. General description

Planar passivated four quadrant triac in a SOT78 (TO-220AB) plastic package intended for use in general purpose bidirectional switching and phase control applications.

2. Features and benefits

- High blocking voltage capability
- Least sensitive gate for highest noise immunity
- High minimum I_{GT} for guaranteed immunity to gate noise
- Planar passivated for voltage ruggedness and reliability
- Triggering in all four quadrants

3. Applications

- General purpose motor controls
- Lighting controls
- Applications where only positive gate drive is available
- Applications where gate noise or interference may occur

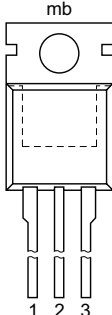
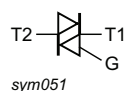
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|--------------------------------------|---|-----|-----|-----|------------|
| V_{DRM} | repetitive peak off-state voltage | | - | - | 500 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{mb} \leq 102\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | - | - | 8 | A |
| T_j | junction temperature | | - | - | 125 | °C |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(initial)} = 25\text{ °C}$; $t_p = 20\text{ ms}$; 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 | 10 | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; Fig. 7 | 10 | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; Fig. 7 | 10 | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ °C}$; Fig. 7 | 10 | - | 100 | 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 | 200 | - | - | V/ μ s |

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 | T2 | mounting base; main terminal 2 | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|--------------|----------|--|---------|
| | Name | Description | Version |
| BTA137-600G0 | TO-220AB | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB | SOT78 |

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; $T_{mb} \leq 102\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | - | 8 | A |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 20\text{ ms}$; Fig 4 ; Fig 5 | - | 65 | A |
| | | full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 16.7\text{ ms}$ | - | 71 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; sine-wave pulse | - | 21 | A^2s |
| di_T/dt | rate of rise of on-state current | $I_G = 0.1\text{ A}$; T2+ G+ | - | 50 | $\text{A}/\mu\text{s}$ |
| | | $I_G = 0.1\text{ A}$; T2+ G- | - | 50 | $\text{A}/\mu\text{s}$ |
| | | $I_G = 0.1\text{ A}$; T2- G- | - | 50 | $\text{A}/\mu\text{s}$ |
| | | $I_G = 0.2\text{ A}$; T2- G+ | - | 10 | $\text{A}/\mu\text{s}$ |
| 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 | $^{\circ}\text{C}$ |
| T_j | junction temperature | | - | 125 | $^{\circ}\text{C}$ |

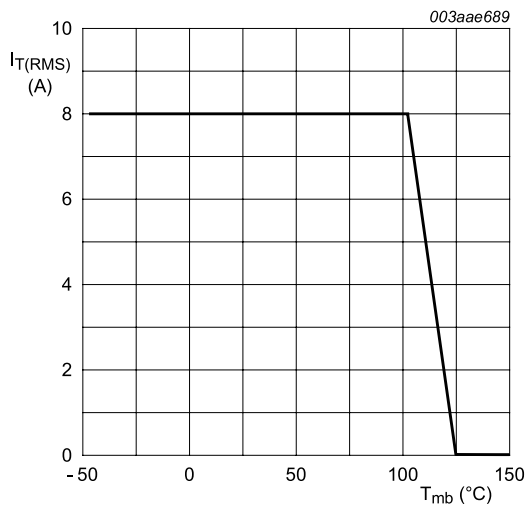
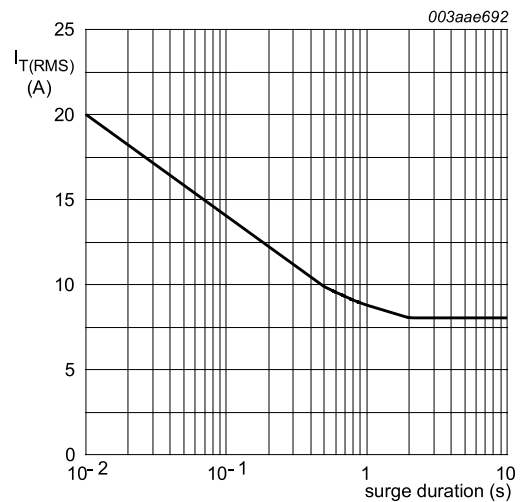


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



$f = 50\text{ Hz}$; $T_{mb} \leq 102\text{ }^{\circ}\text{C}$

Fig. 2. RMS on-state current as a function of surge duration; maximum values

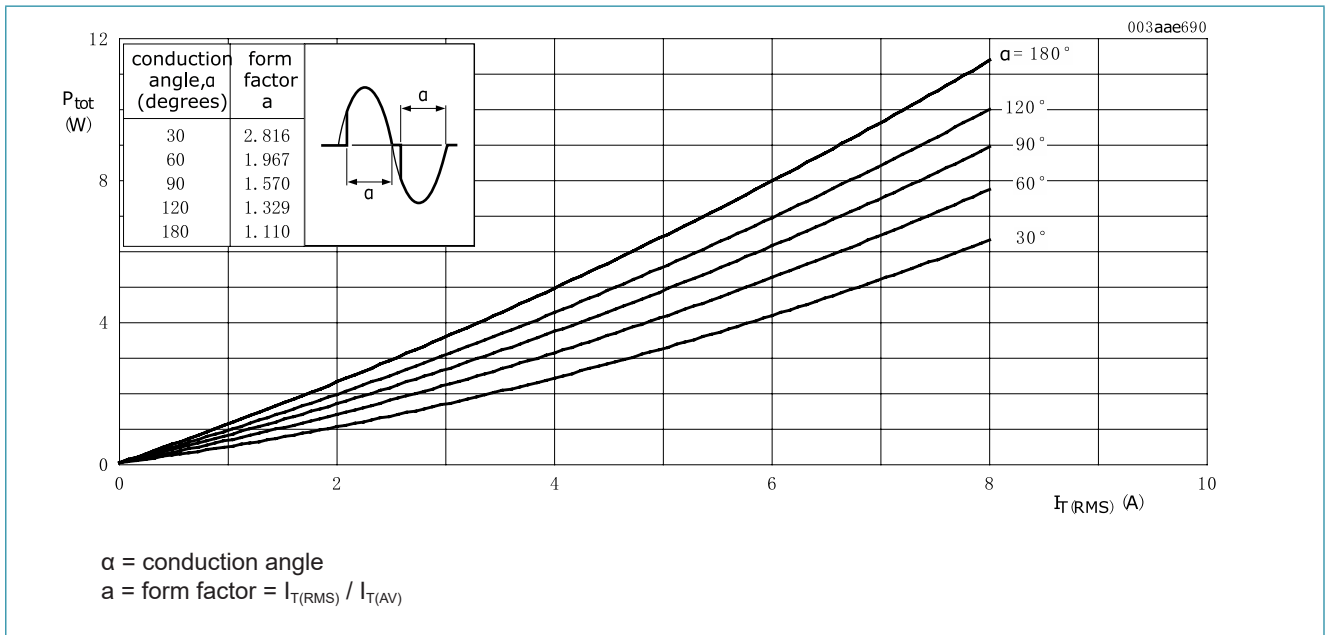


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

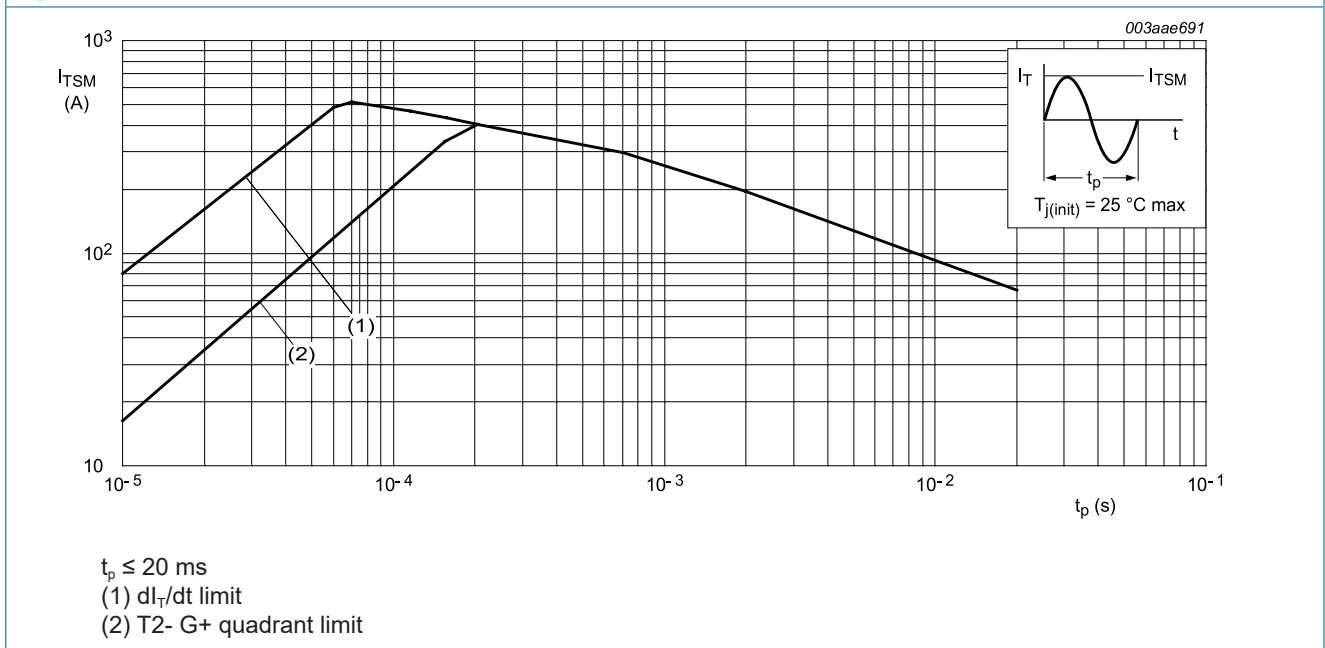
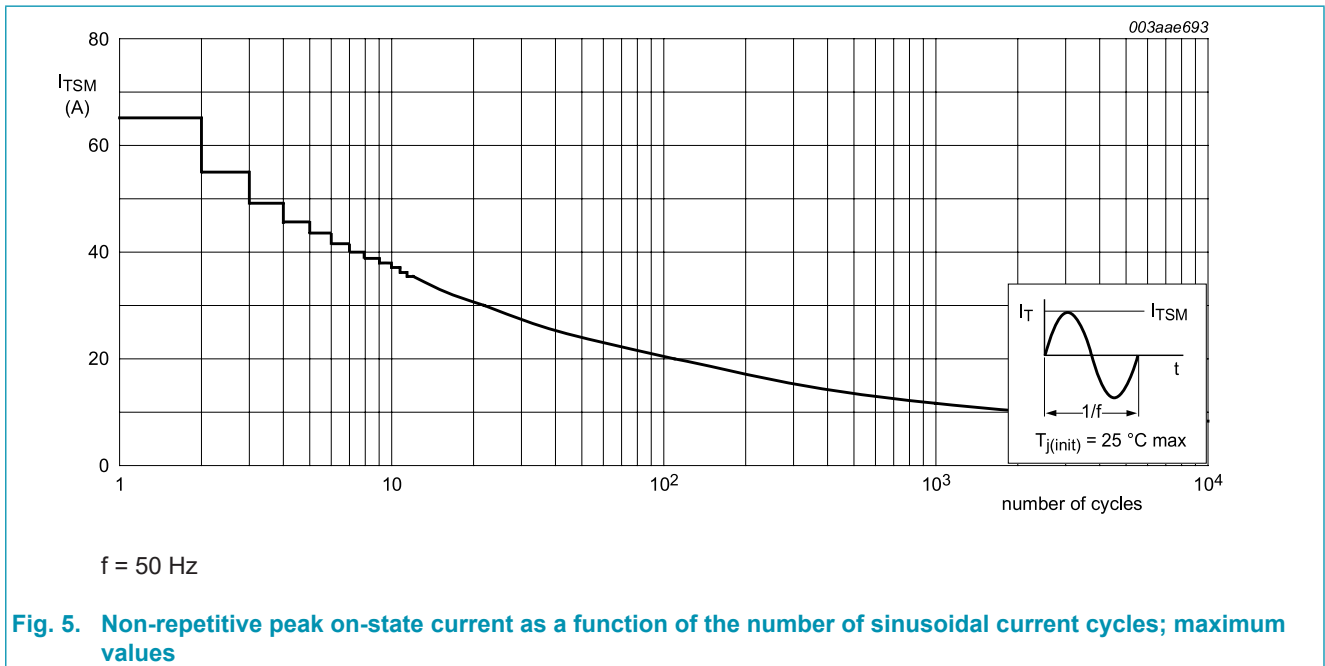


Fig. 4. Non-repetitive peak on-state current as a function of pulse width; maximum values



8. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|---|------------------------------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | full cycle; Fig. 6 | - | - | 2 | K/W |
| | | half cycle; Fig. 6 | - | - | 2.4 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 60 | - | K/W |

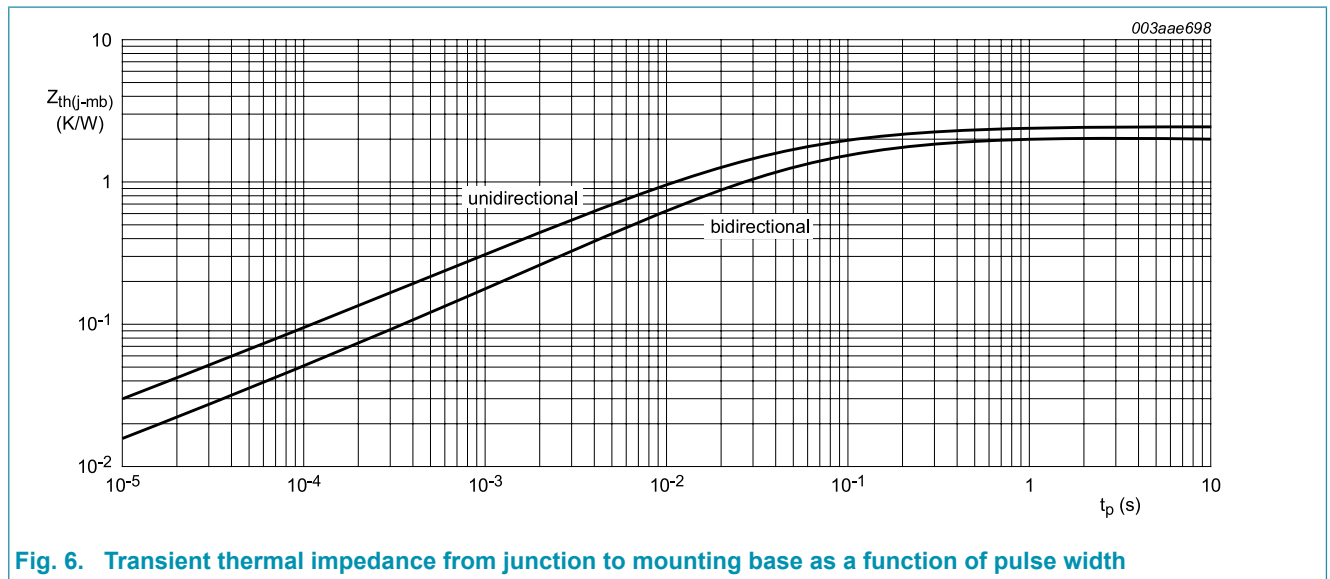
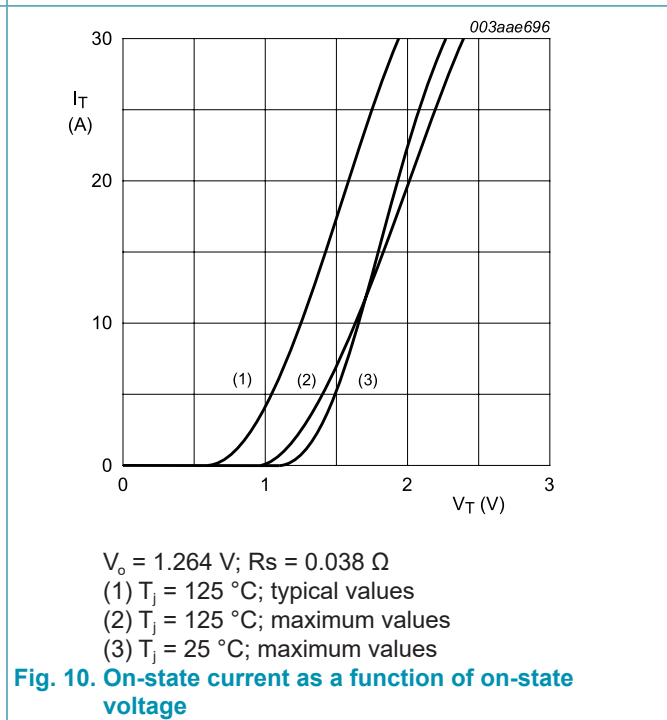
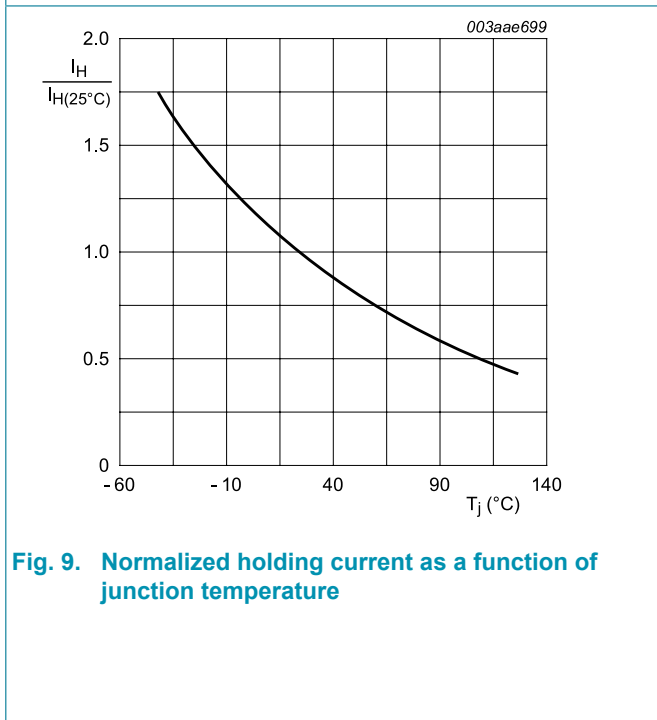
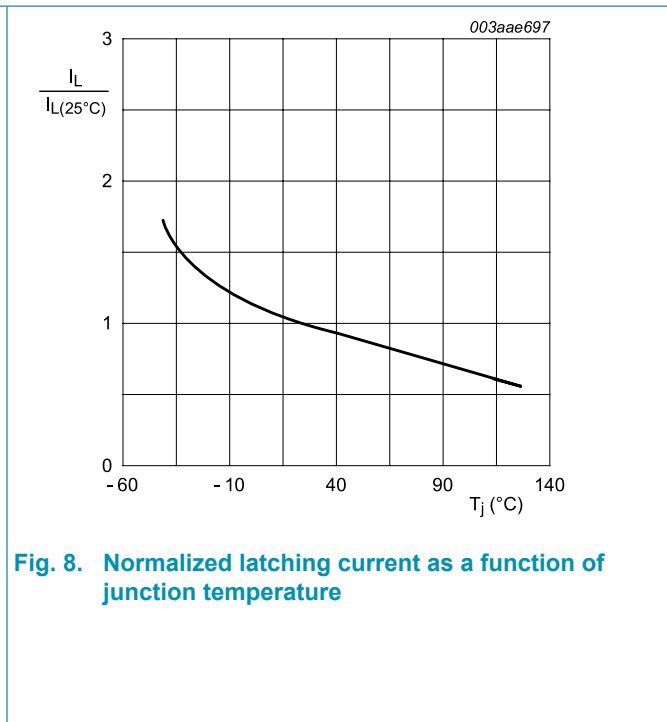
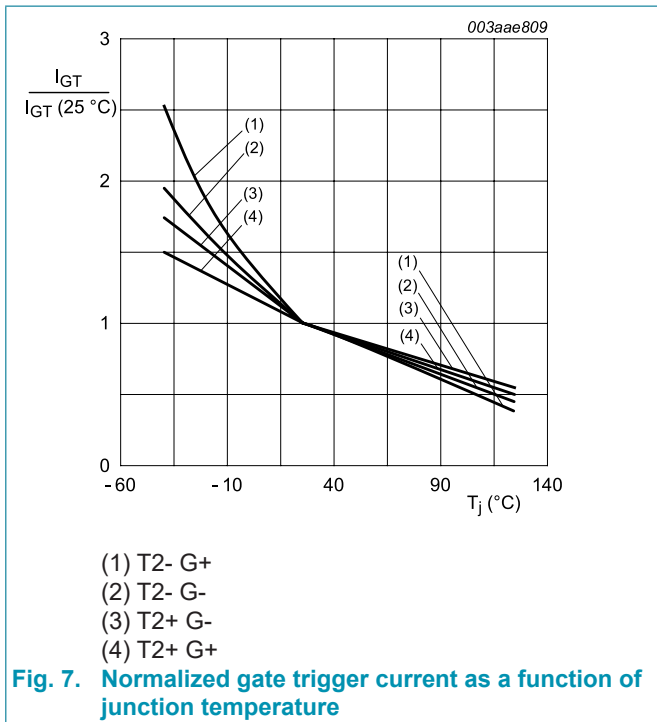


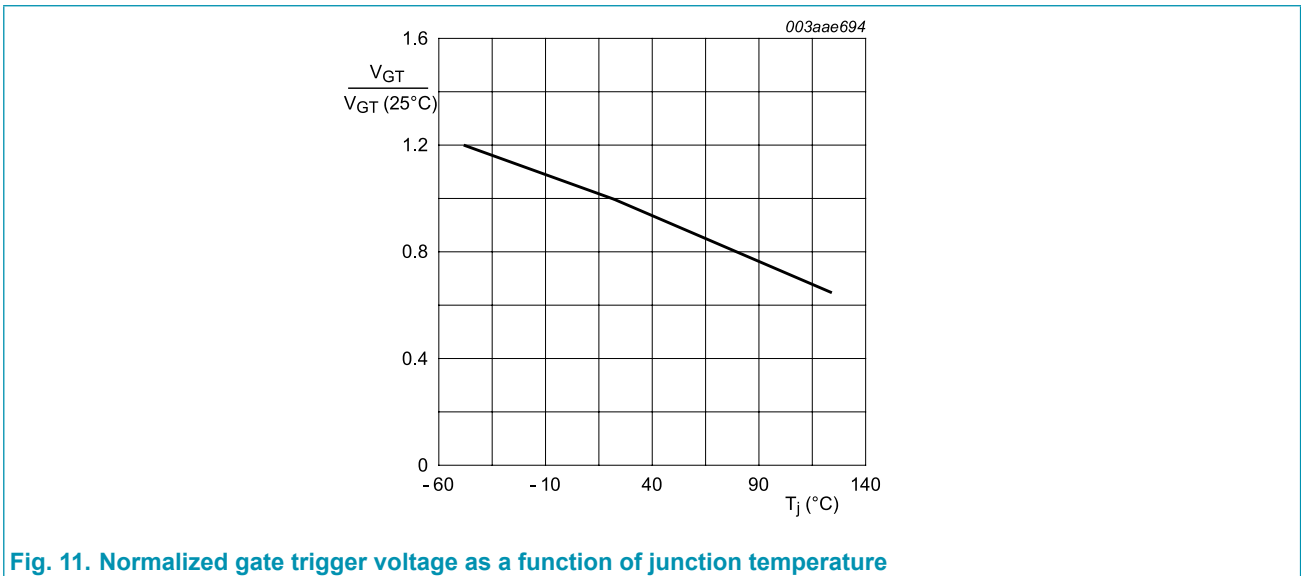
Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse width

9. Characteristics

Table 6. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------------|--|------|-----|------|------------------|
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_2+ G+;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 7 | 10 | - | 50 | mA |
| | | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_2+ G-;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 7 | 10 | - | 50 | mA |
| | | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_2- G-;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 7 | 10 | - | 50 | mA |
| | | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_2- G+;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 7 | 10 | - | 100 | mA |
| I_L | latching current | $V_D = 12\text{ V}; I_G = 0.1\text{ A}; T_2+ G+;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 8 | - | - | 45 | mA |
| | | $V_D = 12\text{ V}; I_G = 0.1\text{ A}; T_2+ G-;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 8 | - | - | 60 | mA |
| | | $V_D = 12\text{ V}; I_G = 0.1\text{ A}; T_2- G-;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 8 | - | - | 45 | mA |
| | | $V_D = 12\text{ V}; I_G = 0.1\text{ A}; T_2- G+;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 8 | - | - | 60 | mA |
| I_H | holding current | $V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C};$ Fig. 9 | - | - | 40 | mA |
| V_T | on-state voltage | $I_T = 10\text{ A}; T_j = 25\text{ }^\circ\text{C};$ Fig. 10 | - | 1.3 | 1.65 | V |
| V_{GT} | gate trigger voltage | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C};$ Fig. 11 | - | 0.7 | 1 | V |
| | | $V_D = 400\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C};$ 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 | 200 | - | - | V/ μs |
| dV_{com}/dt | rate of change of commutating voltage | $V_D = 400\text{ V}; T_j = 95\text{ }^\circ\text{C}; dl_{com}/dt = 3.6\text{ A/}$ ms; $I_T = 8\text{ A};$ gate open circuit | 10 | - | - | V/ μs |
| t_{gt} | gate-controlled turn-on time | $I_{TM} = 12\text{ A}; V_D = 600\text{ V}; I_G = 0.1\text{ A};$ $dl_G/dt = 5\text{ A}/\mu\text{s}$ | - | 2 | - | μs |





10. Package outline

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

SOT78



DIMENSIONS (mm are the original dimensions)

| UNIT | A | A ₁ | b | b ₁ (2) | b ₂ (2) | c | D | D ₁ | E | e | L | L ₁ (1) | L ₂ (1) max. | p | q | Q |
|------|------------|----------------|------------|--------------------|--------------------|------------|--------------|----------------|-------------|------|--------------|--------------------|----------------------------|------------|------------|------------|
| mm | 4.7 4.1 | 1.40 1.25 | 0.9 0.6 | 1.6 1.0 | 1.3 1.0 | 0.7 0.4 | 16.0 15.2 | 6.6 5.9 | 10.3 9.7 | 2.54 | 15.0 12.8 | 3.30 2.79 | 3.0 | 3.8 3.5 | 3.0 2.7 | 2.6 2.2 |

Notes

- Lead shoulder designs may vary.
- Dimension includes excess dambar.

| OUTLINE VERSION | REFERENCES | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-----------------|-------|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | |
| SOT78 | | 3-lead TO-220AB | SC-46 | | 08-04-23 08-06-13 |

11. Legal information

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|--------------------------------|--------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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- [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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12. Contents

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Date of release: 11 July 2018

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А