

1. General description

Planar passivated four quadrant triac in a TO220 plastic package intended for use in general purpose bidirectional switching and phase control applications.

2. Features and benefits

- Least sensitive gate for highest noise immunity
- High voltage capability
- 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 control
- General purpose switching

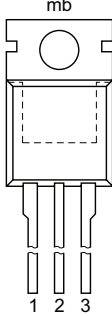
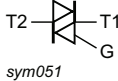
4. Quick reference data

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; $T_{mb} \leq 100\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | 25 | | | A |
| 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 | 190 | | | A |
| T_j | junction temperature | | 150 | | | °C |
| 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 |

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 | Orderable part number | Packing method | Small packing quantity | Package version | Package issue date |
|---------------|--------------|-----------------------|----------------|------------------------|-----------------|--------------------|
| BTA140-600G0T | TO220 | BTA140-600G0TQ | Tube | 50 | SOT78 | 13-June-2008 |

7. Marking

Table 4. Marking codes

| Type number | Marking codes |
|---------------|---------------|
| BTA140-600G0T | BTA140-600G0T |

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 |
| $I_{\text{T(RMS)}}$ | RMS on-state current | full sine wave; $T_{\text{mb}} \leq 100^{\circ}\text{C}$; Fig 1 ; Fig 2 ; Fig 3 | 25 | A |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{\text{j(init)}} = 25^{\circ}\text{C}$; $t_{\text{p}} = 20 \text{ ms}$; Fig 4 ; Fig 5 | 190 | A |
| | | full sine wave; $T_{\text{j(init)}} = 25^{\circ}\text{C}$; $t_{\text{p}} = 16.7 \text{ ms}$ | 209 | A |
| I^2t | I^2t for fusing | $t_{\text{p}} = 10 \text{ ms}$; SIN | 180 | A^2s |
| di_{T}/dt | rate of rise of on-state current | $I_{\text{G}} = 0.1 \text{ A}$; T2+ G+ | 50 | $\text{A}/\mu\text{s}$ |
| | | $I_{\text{G}} = 0.1 \text{ A}$; T2+ G- | 50 | $\text{A}/\mu\text{s}$ |
| | | $I_{\text{G}} = 0.1 \text{ A}$; T2- G- | 50 | $\text{A}/\mu\text{s}$ |
| | | $I_{\text{G}} = 0.2 \text{ A}$; T2- G+ | 10 | $\text{A}/\mu\text{s}$ |
| I_{GM} | peak gate current | | 2 | A |
| P_{GM} | peak gate power | | 5 | W |
| $P_{\text{G(AV)}}$ | average gate power | over any 20 ms period | 0.5 | W |
| T_{stg} | storage temperature | | -40 to 150 | $^{\circ}\text{C}$ |
| T_{j} | junction temperature | | 150 | $^{\circ}\text{C}$ |

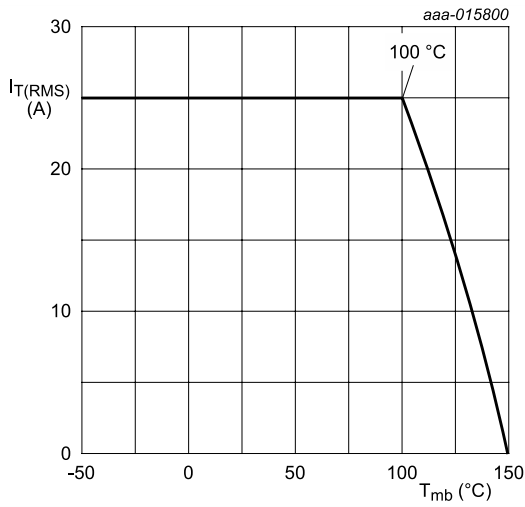
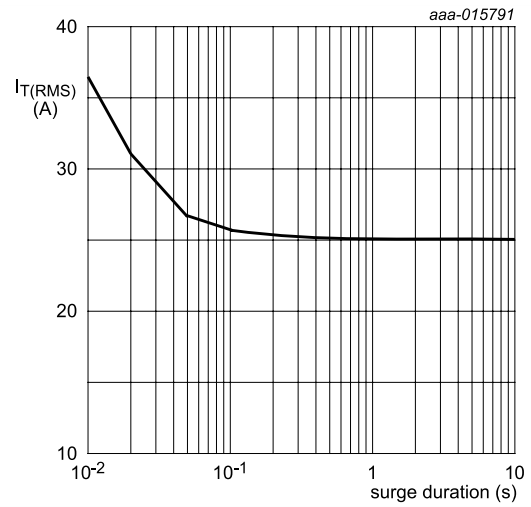
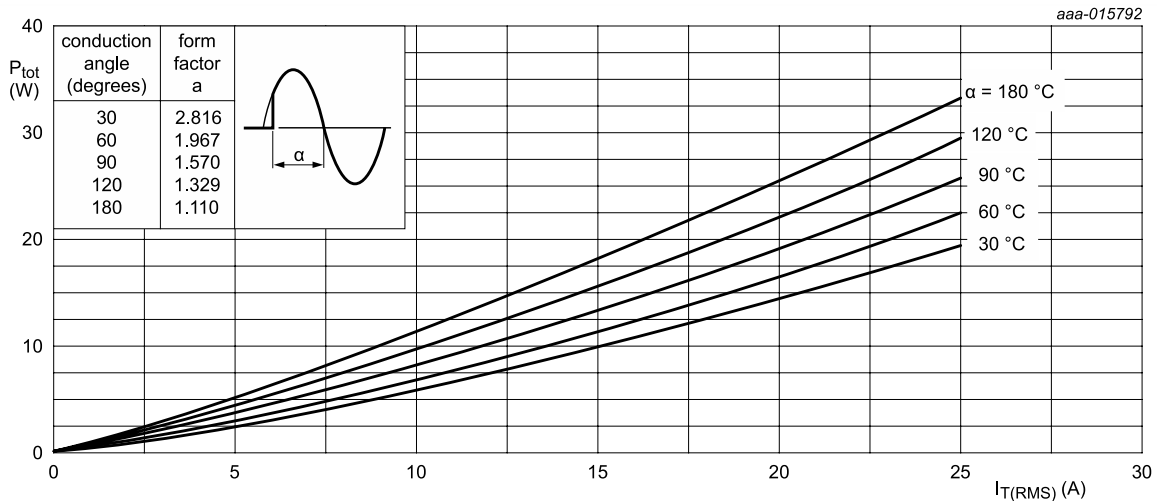


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



f = 50 Hz; T_{mb} = 100 °C

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

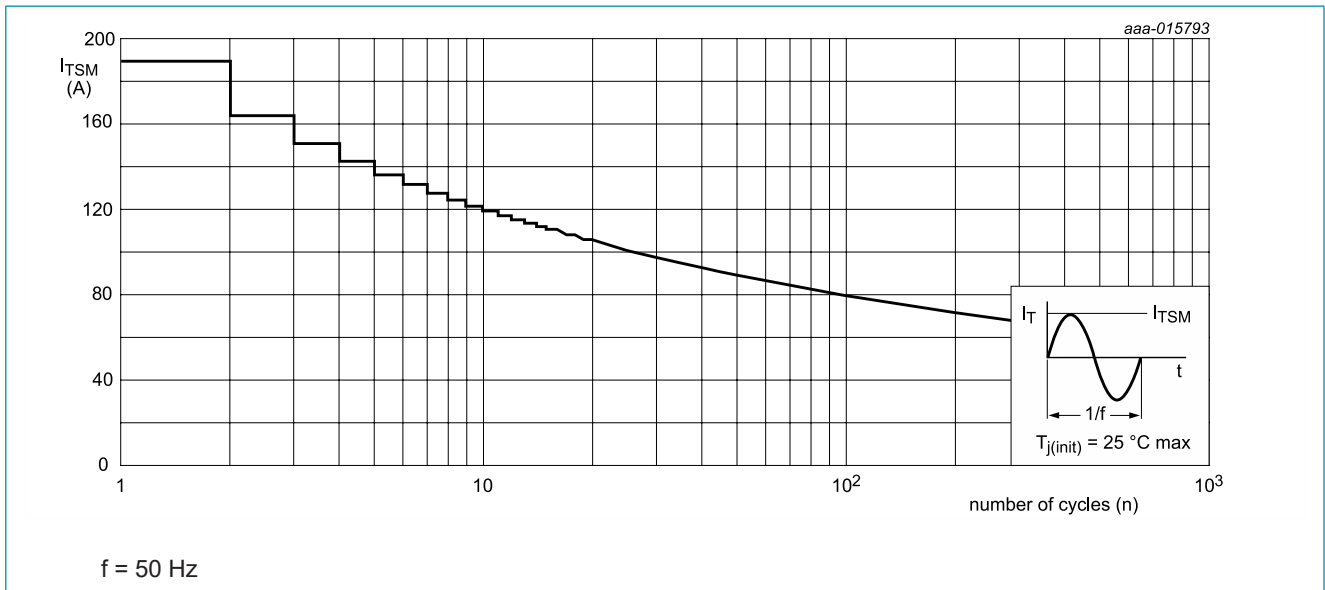


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

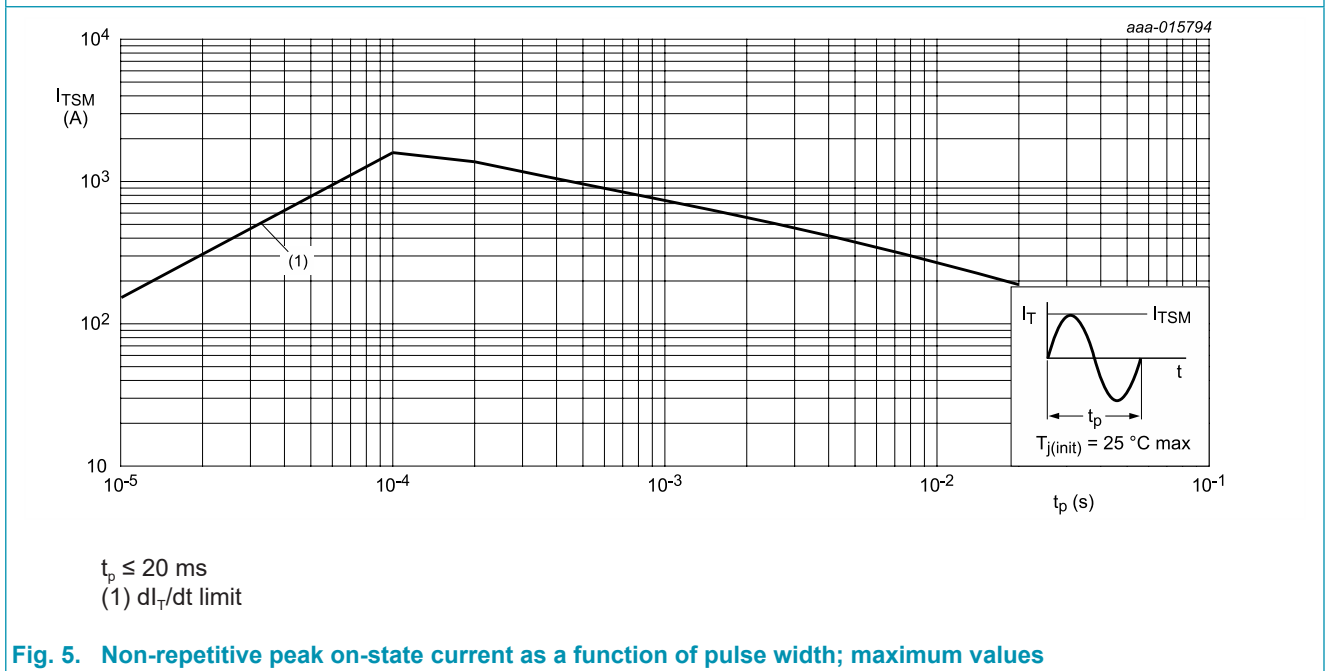


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|---|-----------------------------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | full cycle; Fig.6 | - | - | 1.5 | K/W |
| | | half cycle | - | - | 2 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 60 | - | K/W |

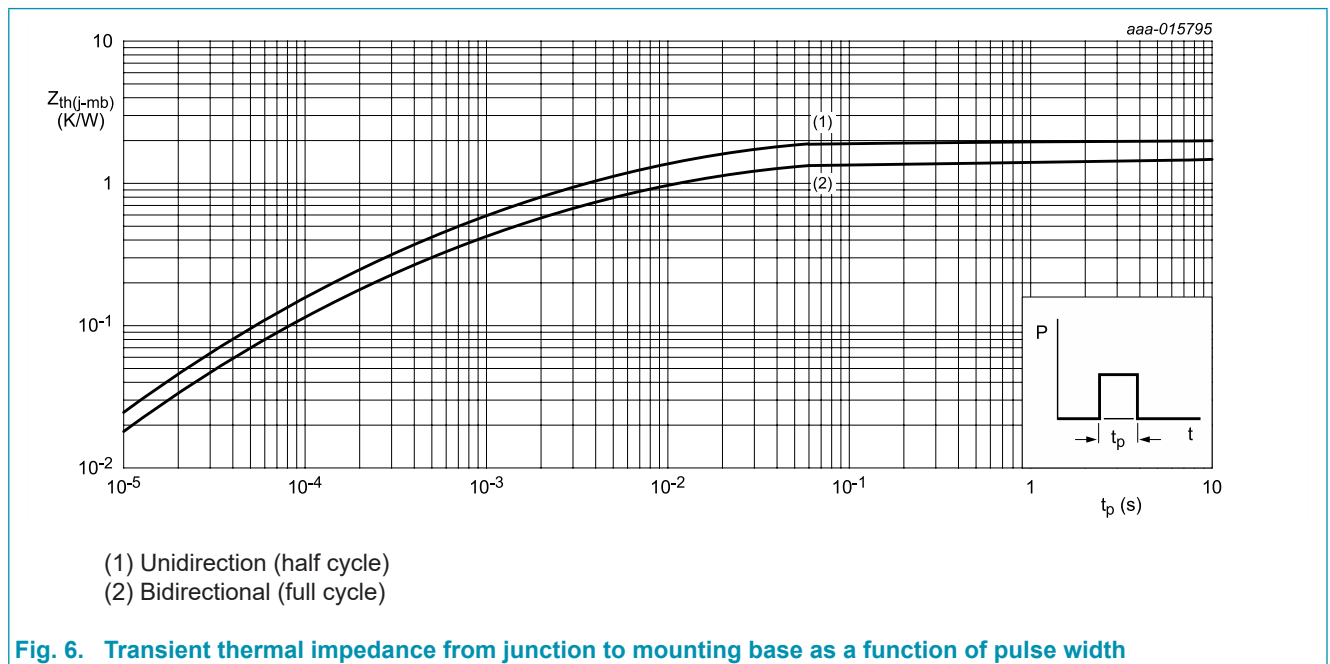
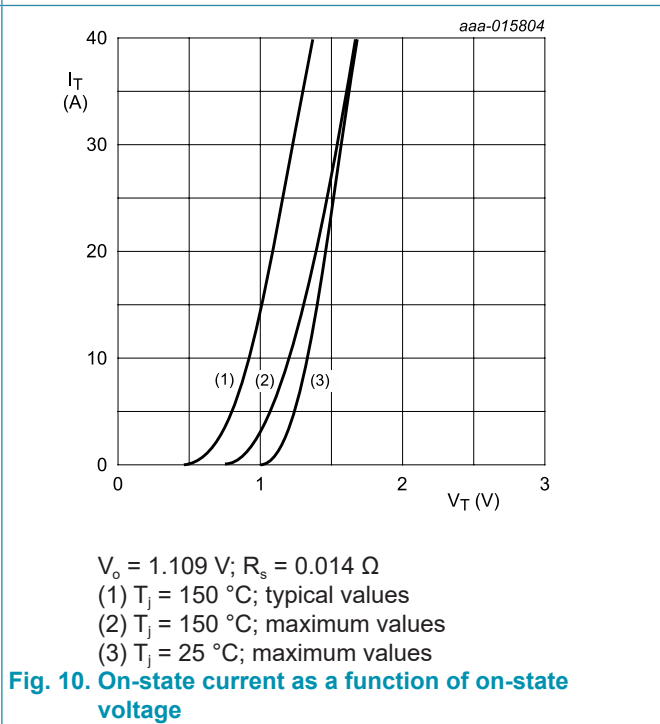
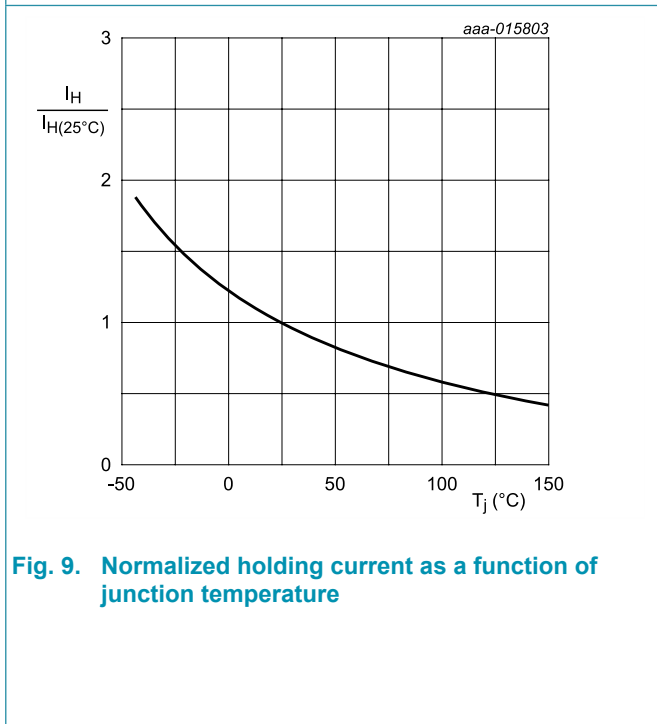
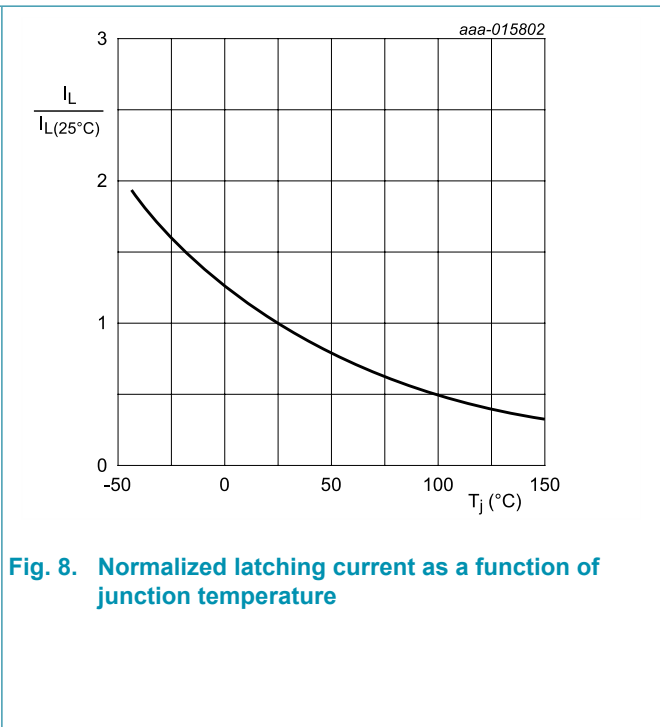
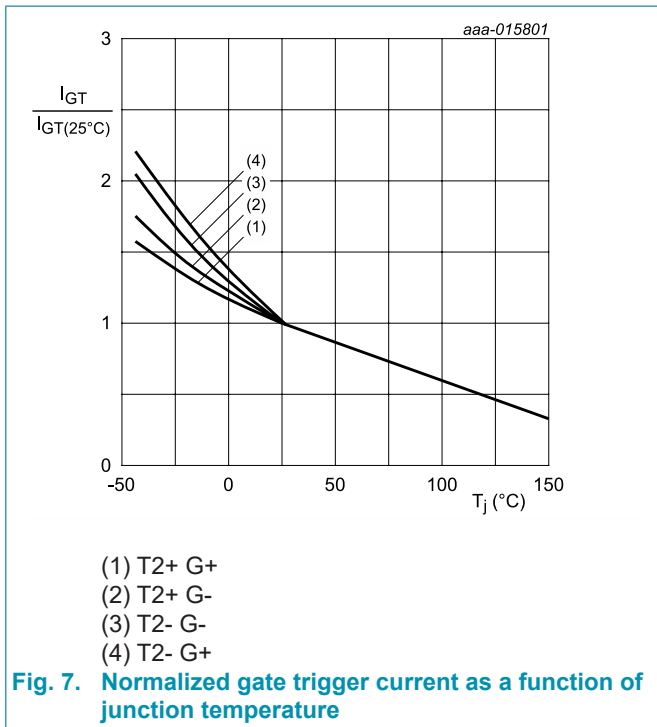


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse width

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 | 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 |
| I_L | latching current | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G+; $T_J = 25\text{ °C}$; Fig. 8 | - | - | 60 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G-; $T_J = 25\text{ °C}$; Fig. 8 | - | - | 90 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G-; $T_J = 25\text{ °C}$; Fig. 8 | - | - | 60 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G+; $T_J = 25\text{ °C}$; Fig. 8 | - | - | 90 | mA |
| I_H | holding current | $V_D = 12\text{ V}$; $T_J = 25\text{ °C}$; Fig. 9 | - | - | 60 | mA |
| V_T | on-state voltage | $I_T = 30\text{ A}$; $T_J = 25\text{ °C}$; Fig. 10 | - | 1.3 | 1.55 | 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 |
| | | $V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 150\text{ °C}$; Fig. 11 | 0.25 | 0.4 | - | V |
| I_D | off-state current | $V_D = 600\text{ V}$; $T_J = 25\text{ °C}$ | - | - | 10 | μA |
| | | $V_D = 600\text{ V}$; $T_J = 150\text{ °C}$ | - | 0.4 | 2 | mA |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 402\text{ V}$; $T_J = 150\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit | 200 | - | - | V/μs |
| dI_{com}/dt | rate of change of commutating voltage | $V_D = 400\text{ V}$; $T_J = 150\text{ °C}$; $I_{T(RMS)} = 25\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit | 3 | 12 | - | A/μs |
| t_{gt} | gate-controlled turn-on time | $I_{TM} = 30\text{ A}$; $V_D = 600\text{ V}$; $I_G = 0.1\text{ mA}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$ | - | 2 | - | μs |



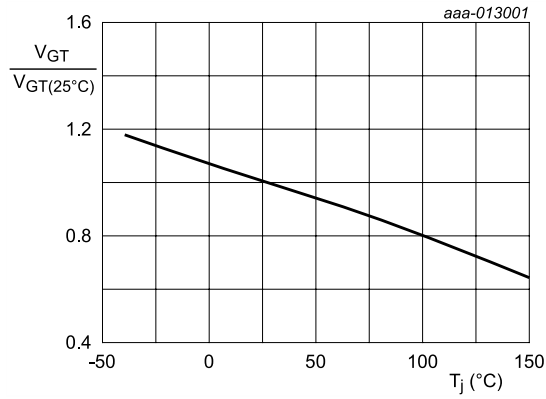
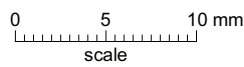
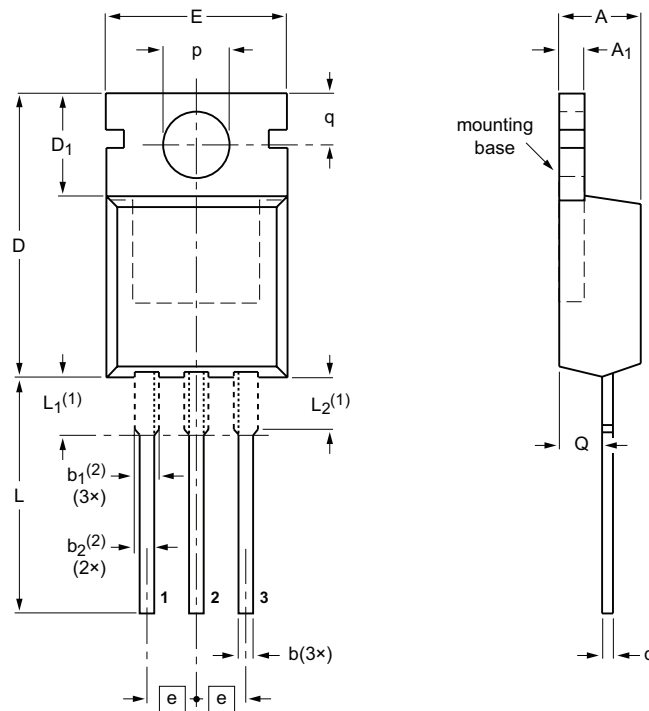


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. 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

- 1. Lead shoulder designs may vary.
- 2. 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 |

12. 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. |
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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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