

1. General description

Planar passivated high commutation three quadrant triac in a 3-lead TO220 plastic package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series BT" triac will commute the full RMS current at the maximum rated junction temperature without the aid of a snubber where "high junction operating temperature capability" is required.

2. Features and benefits

- High commutation capability with maximum false trigger immunity
- High immunity to false turn-on by dV/dt
- Planar passivated for voltage ruggedness and reliability
- High junction operating temperature capability
- Triggering in three quadrants only
- 3Q technology for improved noise immunity
- High voltage capability

3. Applications

- Applications subject to high temperature
- Electronic thermostats (heating and cooling)
- High power motor controls e.g. washing machines and vacuum cleaners
- Rectifier-fed DC inductive loads e.g. DC motors and solenoids

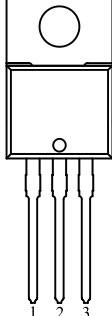
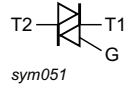
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Values | | | Unit |
|--------------------------------|--------------------------------------|--|--------|-----|-----|------|
| Absolute maximum rating | | | | | | |
| V_{DRM} | repetitive peak off-state voltage | | 600 | | | V |
| I_{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 | 140 | | | A |
| T_j | junction temperature | | 150 | | | °C |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{mb} \leq 126\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | 16 | | | 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 | 2 | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; Fig. 7 | 2 | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; Fig. 7 | 2 | - | 50 | 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 |
|--------------|--------------|-----------------------|----------------|------------------------|-----------------|--------------------|
| BTA316-600BT | TO220 | BTA316-600BT,127 | Tube | 50 | TO220E | 26-April-2019 |

7. Marking

Table 4. Marking codes

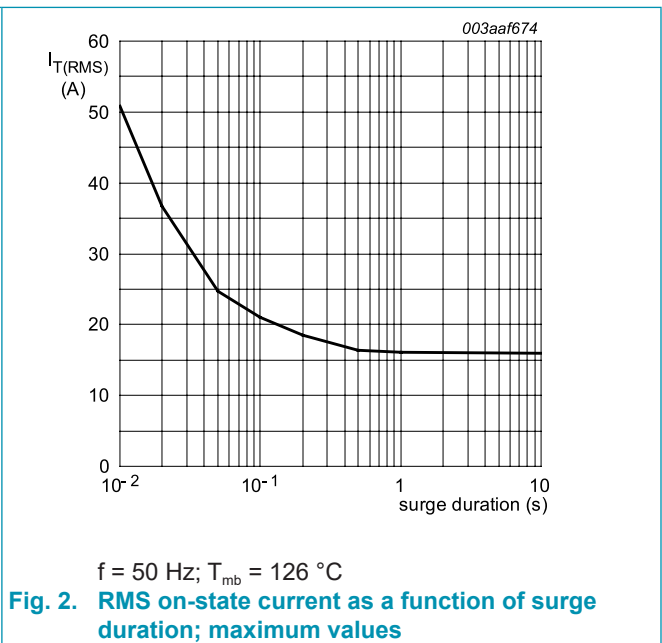
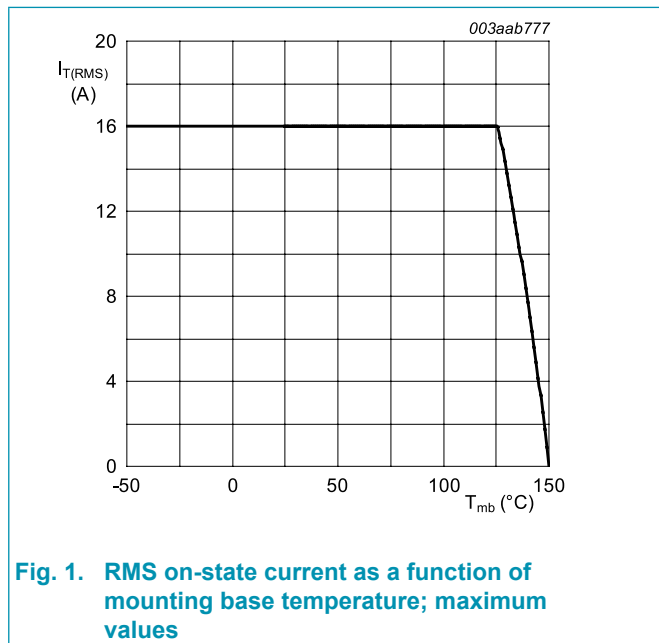
| Type number | Marking codes |
|--------------|-----------------|
| BTA316-600BT | BTA316 600BT |

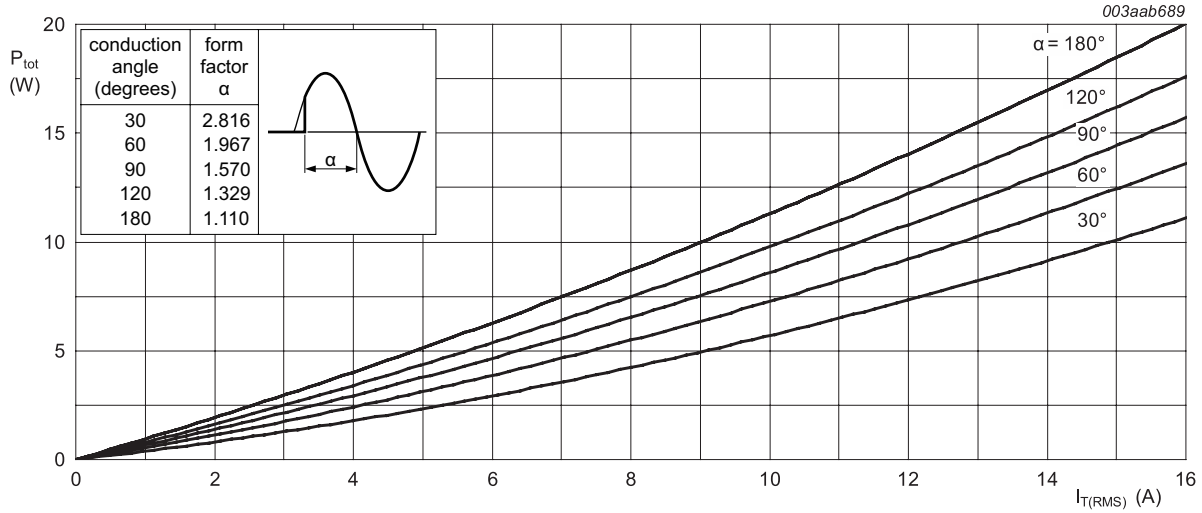
8. Limiting values

Table 5. Limiting values

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

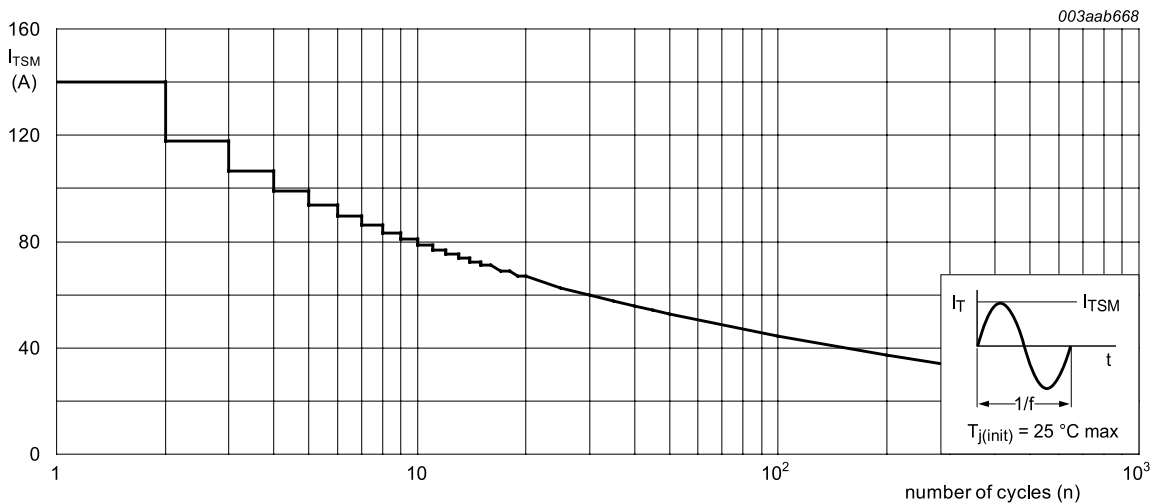
| Symbol | Parameter | Conditions | Values | Unit |
|--------------|--------------------------------------|---|------------|------------------------|
| V_{DRM} | repetitive peak off-state voltage | | 600 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{mb} \leq 126\text{ }^{\circ}\text{C}$; Fig 1 ; Fig 2 ; Fig 3 | 16 | 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 | 140 | A |
| | | full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 16.7\text{ ms}$ | 150 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; SIN | 98 | A^2s |
| di_T/dt | rate of rise of on-state current | $I_T = 20\text{ A}$; $I_G = 0.2\text{ A}$; $di_G/dt = 0.2\text{ A}/\mu\text{s}$ | 100 | $\text{A}/\mu\text{s}$ |
| 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 to 150 | $^{\circ}\text{C}$ |
| T_j | junction temperature | | 150 | $^{\circ}\text{C}$ |





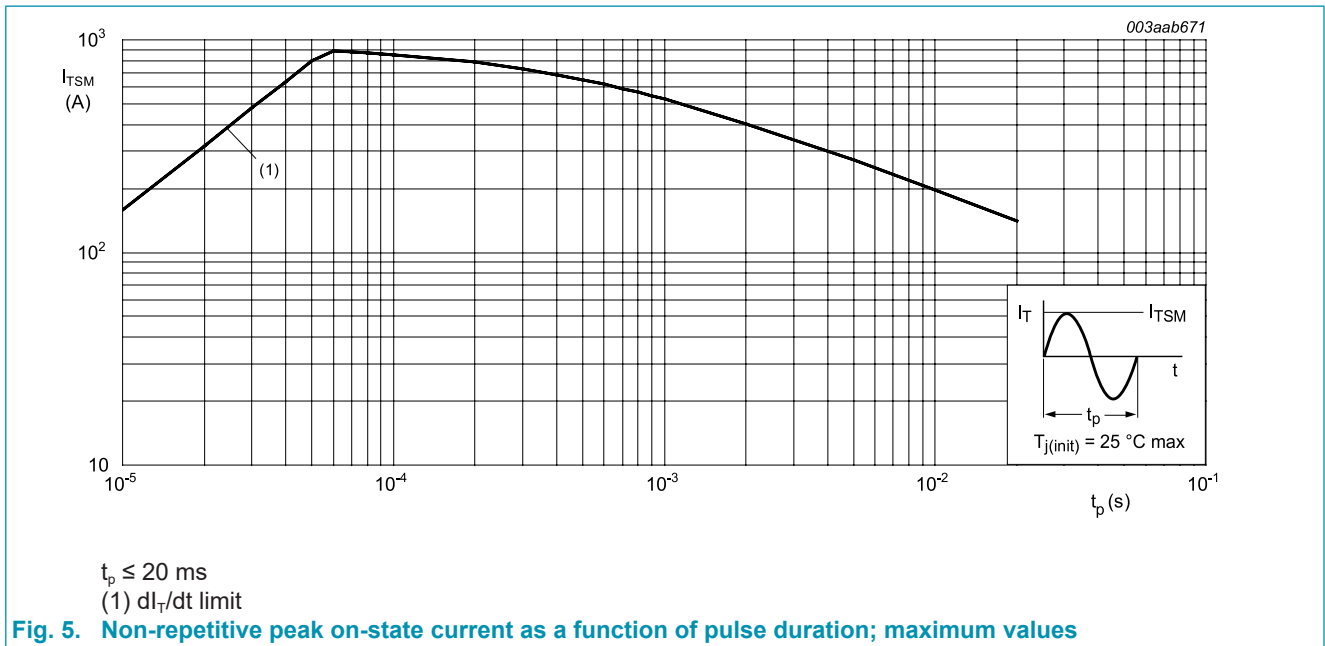
α = conduction angle
 a = form factor = $I_{T(RMS)} / I_{T(AV)}$

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



f = 50 Hz

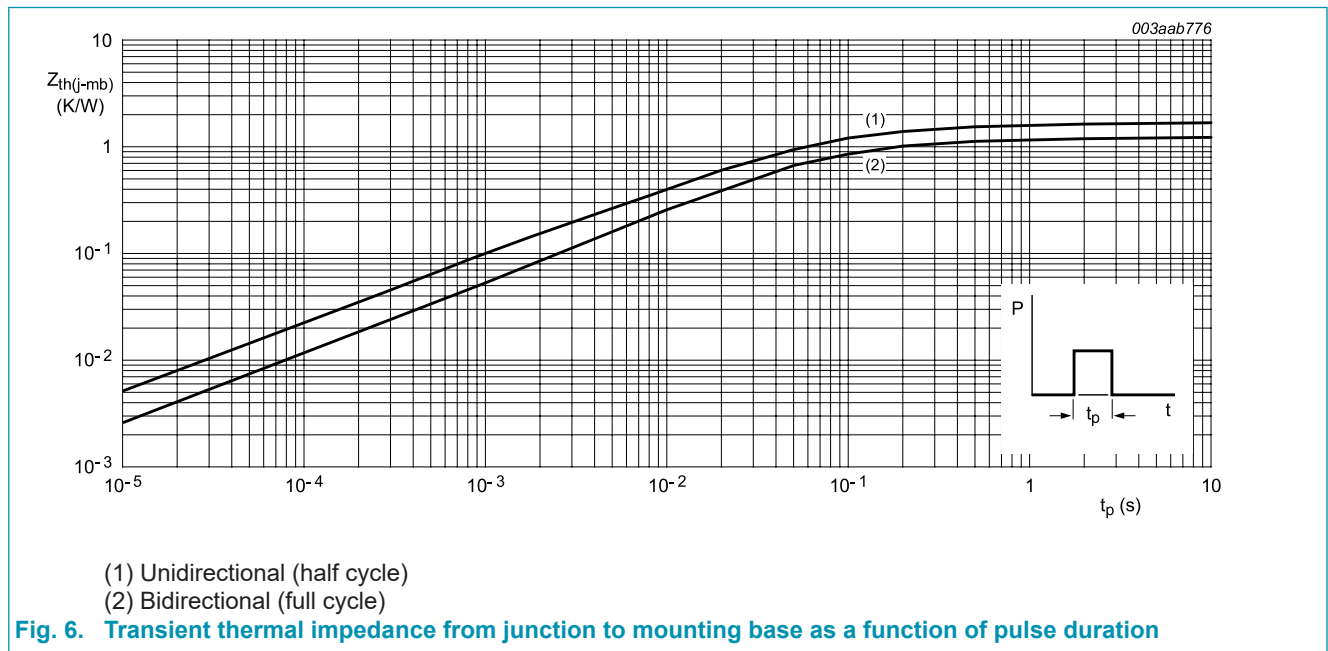
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



9. Thermal characteristics

Table 6. Thermal characteristics

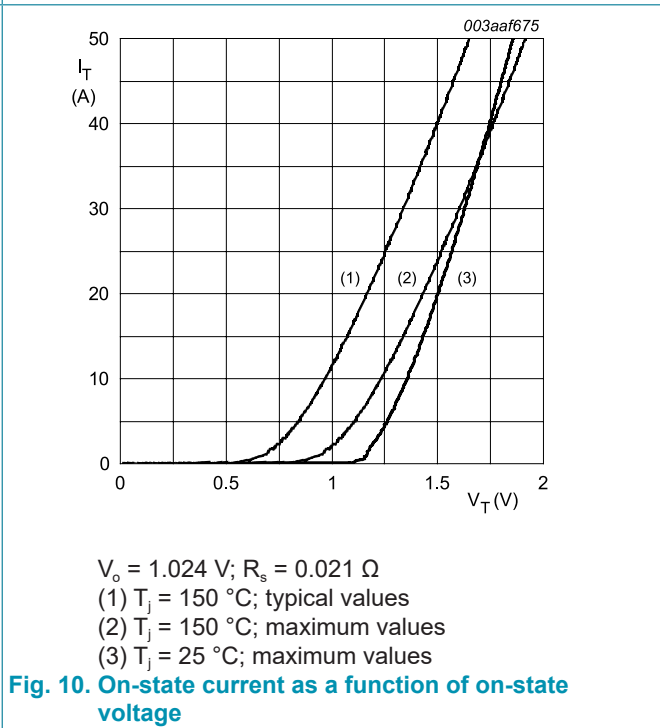
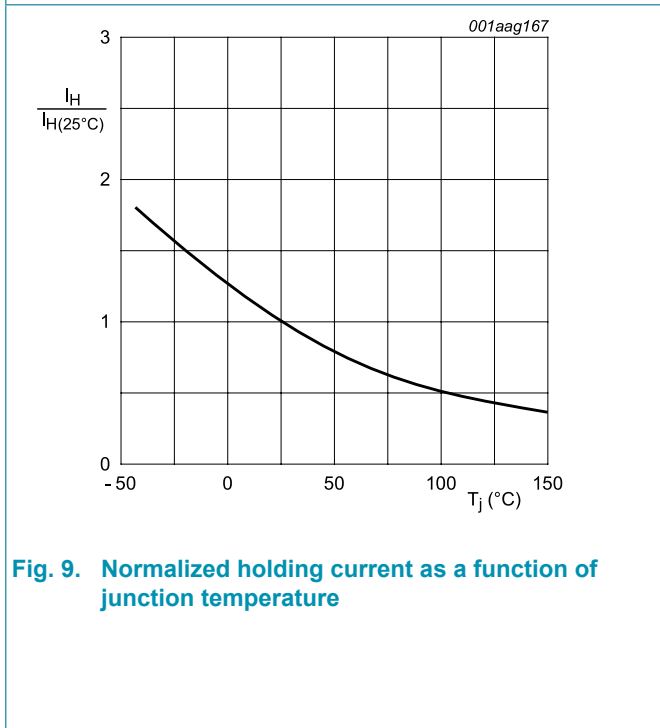
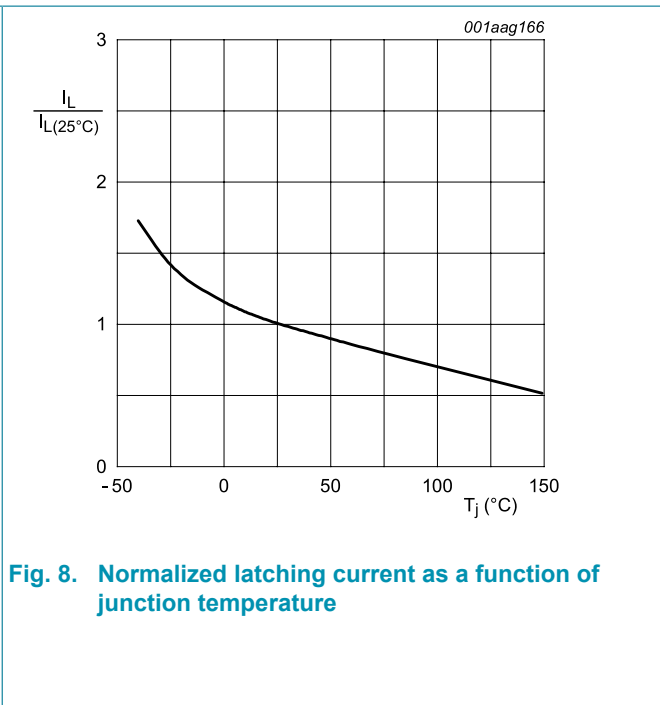
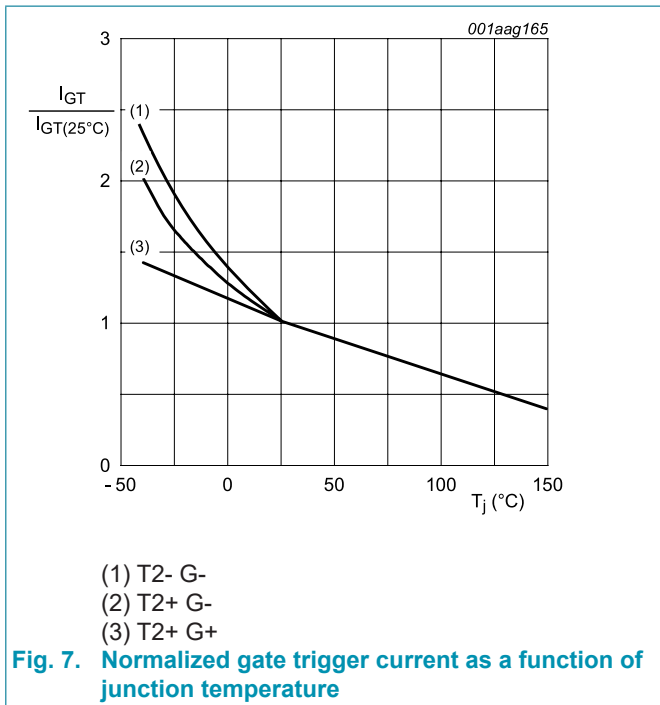
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|---|-------------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | full cycle; Fig 6 | - | - | 1.2 | K/W |
| | | half cycle; Fig 6 | - | - | 1.7 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 60 | - | K/W |



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 | 2 | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; Fig. 7 | 2 | - | 50 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; Fig. 7 | 2 | - | 50 | 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 |
| I_H | holding current | $V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; Fig. 9 | - | - | 60 | mA |
| V_T | on-state voltage | $I_T = 18\text{ A}$; $T_j = 25\text{ °C}$; Fig. 10 | - | 1.3 | 1.5 | V |
| V_{GT} | gate trigger voltage | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 11 | - | 0.8 | 1 | V |
| | | $V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 150\text{ °C}$ | 0.25 | 0.4 | - | V |
| I_D | off-state current | $V_D = 600\text{ V}$; $T_j = 150\text{ °C}$ | - | 0.24 | 1.2 | 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 | 600 | - | - | V/ μ s |
| dI_{com}/dt | rate of change of commutating current | $V_D = 400\text{ V}$; $T_j = 150\text{ °C}$; $I_{T(RMS)} = 16\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu$ s; (snubberless condition); gate open circuit | 8 | - | - | A/ms |



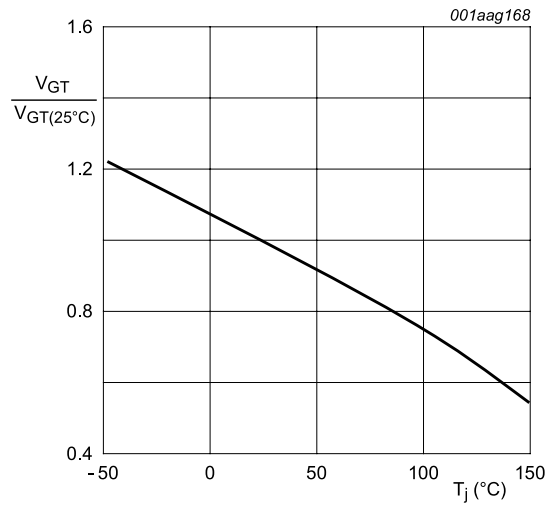
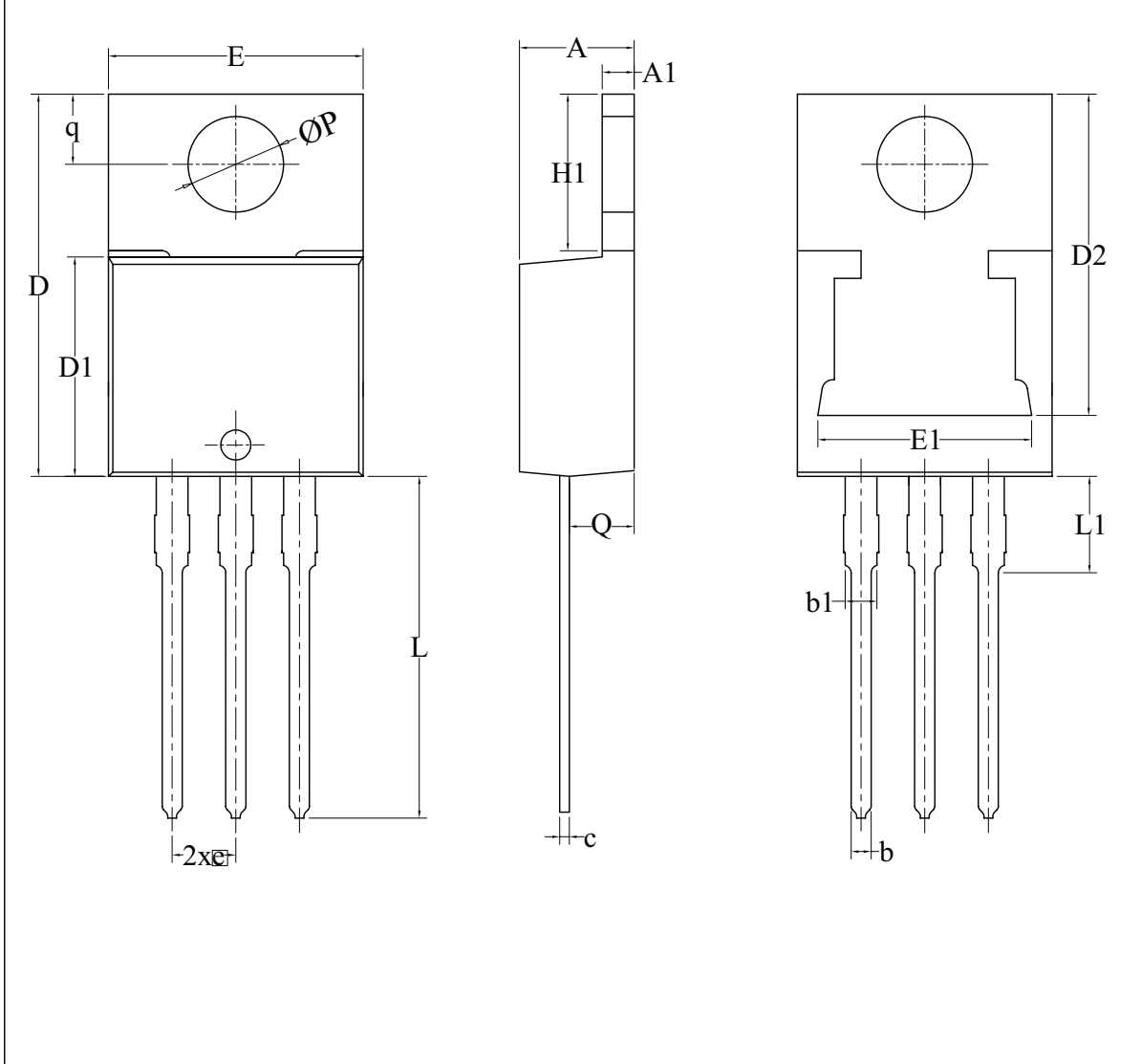


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

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

TO220



| Unit | A | A1 | b | b1 | c | D | D1 | D2 | E | E1 | e | H1 | L | L1 | P | Q | q |
|------|-----|------|------|------|------|------|-------|------|-------|-------|------|---------------|-------|-------|------|------|------|
| MM | min | 4.35 | 1.14 | 0.69 | 1.20 | 0.36 | 14.95 | 8.50 | 12.20 | 10.00 | 8.25 | 6.00 | 13.00 | 3.40 | 3.70 | 2.40 | 2.60 |
| | max | 4.75 | 1.40 | 1.01 | 1.45 | 0.61 | 15.55 | 9.02 | 12.88 | 10.40 | 8.89 | 2.54 (BSC) | 6.40 | 14.00 | 3.80 | 3.95 | 2.80 |

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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. |
| 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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