



**THE DATASHEET OF
BTA316B-600B0J**



1. General description

Planar passivated high commutation three quadrant triac in a SOT404 plastic package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series B0" triac will commute the full RMS current at the maximum rated junction temperature without the aid of a snubber.

2. Features and benefits

- 3Q technology for improved noise immunity
- High immunity to false turn-on by dV/dt
- High minimum I_{GT} for guaranteed immunity to gate noise
- High voltage capability
- Surface mountable package
- Least sensitive gate for highest noise immunity
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only
- Very high commutation capability with maximum false trigger immunity

3. Applications

- 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
- Refrigeration and air conditioning compressors

4. Quick reference data

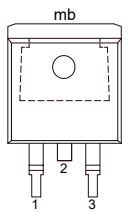

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|--------------------|
| V_{DRM} | repetitive peak off-state voltage | | - | - | 600 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{mb} \leq 101\text{ }^{\circ}\text{C}$; 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 |
| T_j | junction temperature | | - | - | 125 | $^{\circ}\text{C}$ |
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ }^{\circ}\text{C}$; Fig. 7 | 10 | - | 50 | mA |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----|-----|------------------|
| | | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2+ \text{ G-}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 7}$ | 10 | - | 50 | mA |
| | | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2- \text{ G-}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 7}$ | 10 | - | 50 | mA |
| I_H | holding current | $V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 9}$ | - | - | 60 | mA |
| V_T | on-state voltage | $I_T = 18\text{ A}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 10}$ | - | 1.3 | 1.5 | V |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 402\text{ V}; T_j = 125\text{ }^\circ\text{C}; (V_{DM} = 67\% \text{ of } V_{DRM}); \text{exponential waveform; gate open circuit}$ | 2500 | - | - | V/ μs |
| dI_{com}/dt | rate of change of commutating current | $V_D = 400\text{ V}; T_j = 125\text{ }^\circ\text{C}; I_{T(RMS)} = 16\text{ A}; dV_{com}/dt = 20\text{ V}/\mu\text{s}; (\text{snubberless condition}); \text{gate open circuit}$ | 20 | - | - | A/ms |
| | | $V_D = 400\text{ V}; T_j = 125\text{ }^\circ\text{C}; I_{T(RMS)} = 16\text{ A}; dV_{com}/dt = 10\text{ V}/\mu\text{s}; \text{gate open circuit}$ | 30 | - | - | A/ms |
| | | $V_D = 400\text{ V}; T_j = 125\text{ }^\circ\text{C}; I_{T(RMS)} = 16\text{ A}; dV_{com}/dt = 1\text{ V}/\mu\text{s}; \text{gate open circuit}$ | 50 | - | - | A/ms |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|--------------------------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| 1 | T1 | main terminal 1 |  <p>D2PAK (SOT404)</p> |  <p>sym051</p> |
| 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 |
| BTA316B-600B0 | D2PAK | plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) | SOT404 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|---------------|---------------|
| BTA316B-600B0 | BTA316B-600B0 |

8. Limiting values

Table 5. 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; $T_{mb} \leq 101\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | - | 16 | A |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5 | - | 140 | A |
| | | full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$ | - | 150 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; sine-wave pulse | - | 98 | A ² s |
| di_T/dt | rate of rise of on-state current | $I_G = 100\text{ mA}$ | - | 100 | A/ μ 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 | °C |
| T_j | junction temperature | | - | 125 | °C |

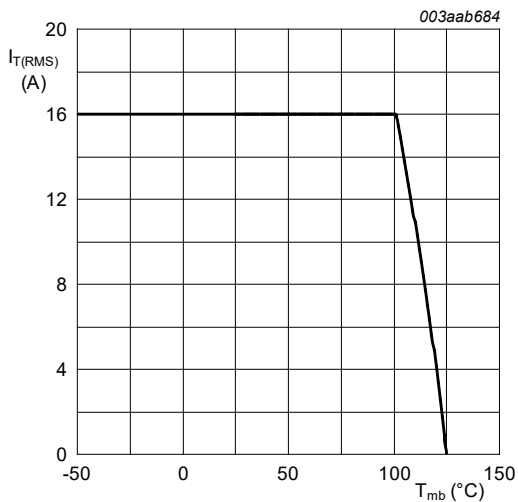
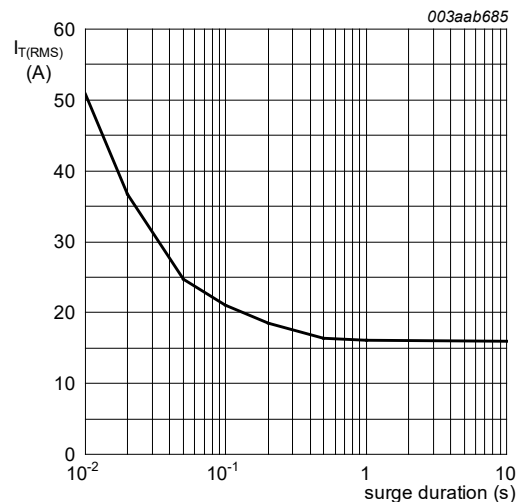


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



$f = 50\text{ Hz}$; $T_{mb} = 101\text{ °C}$

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

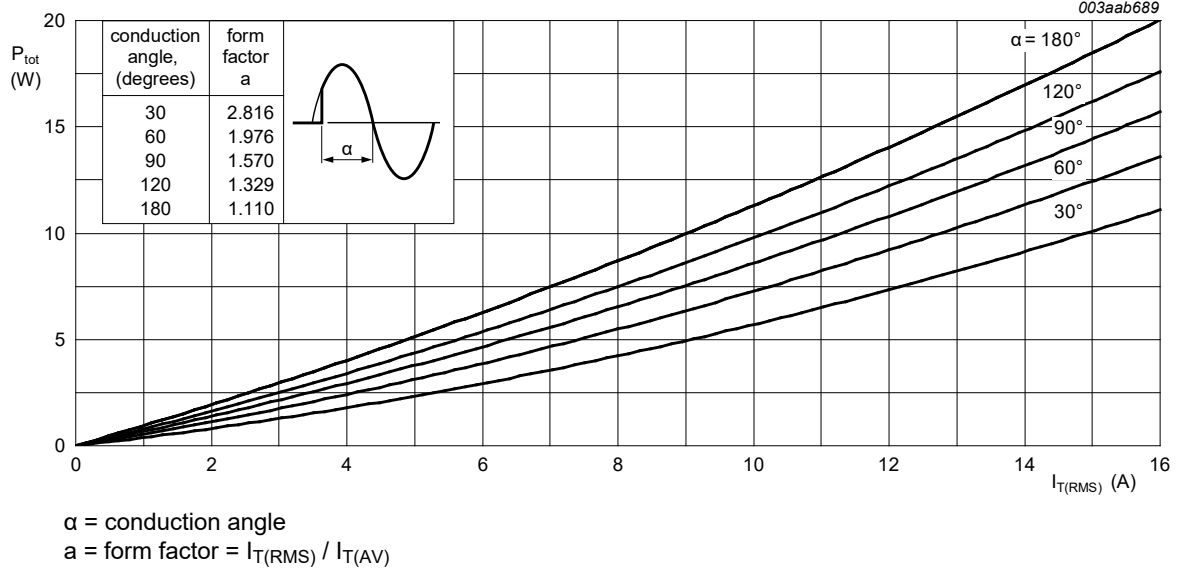


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

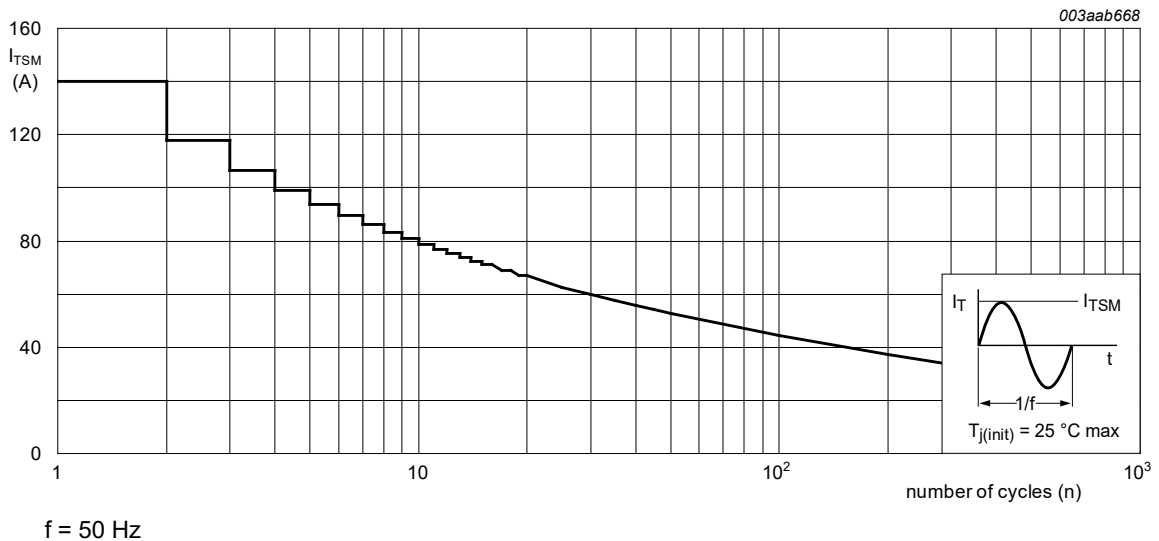
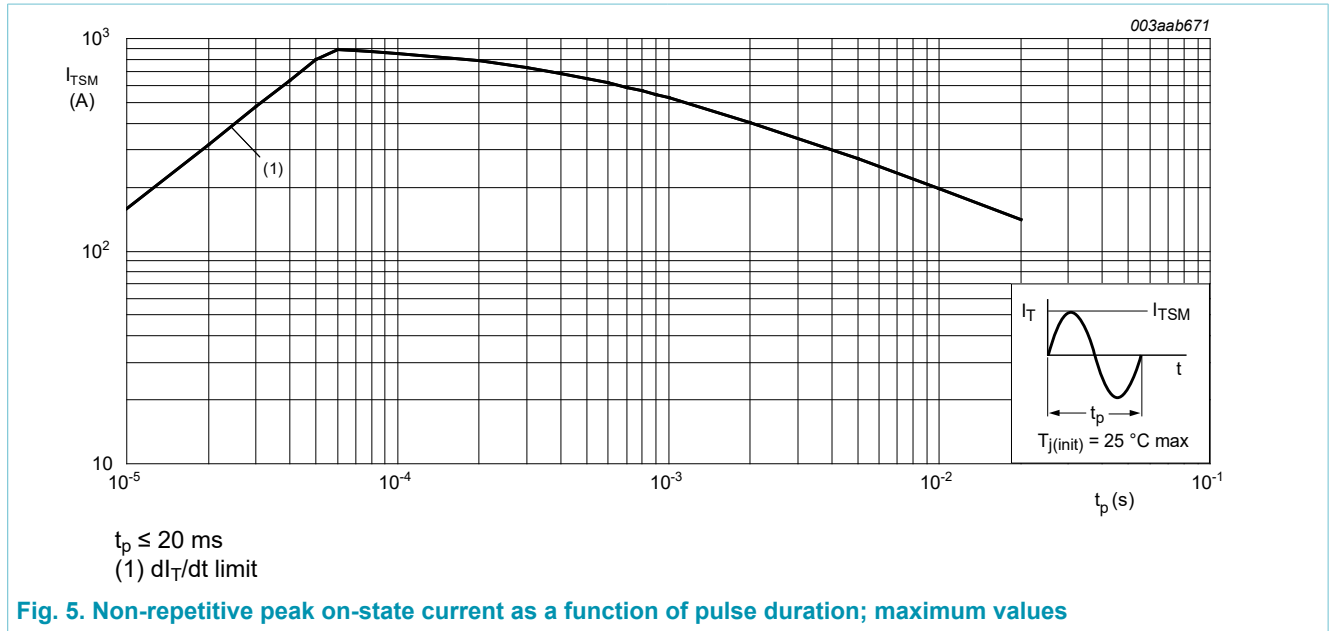


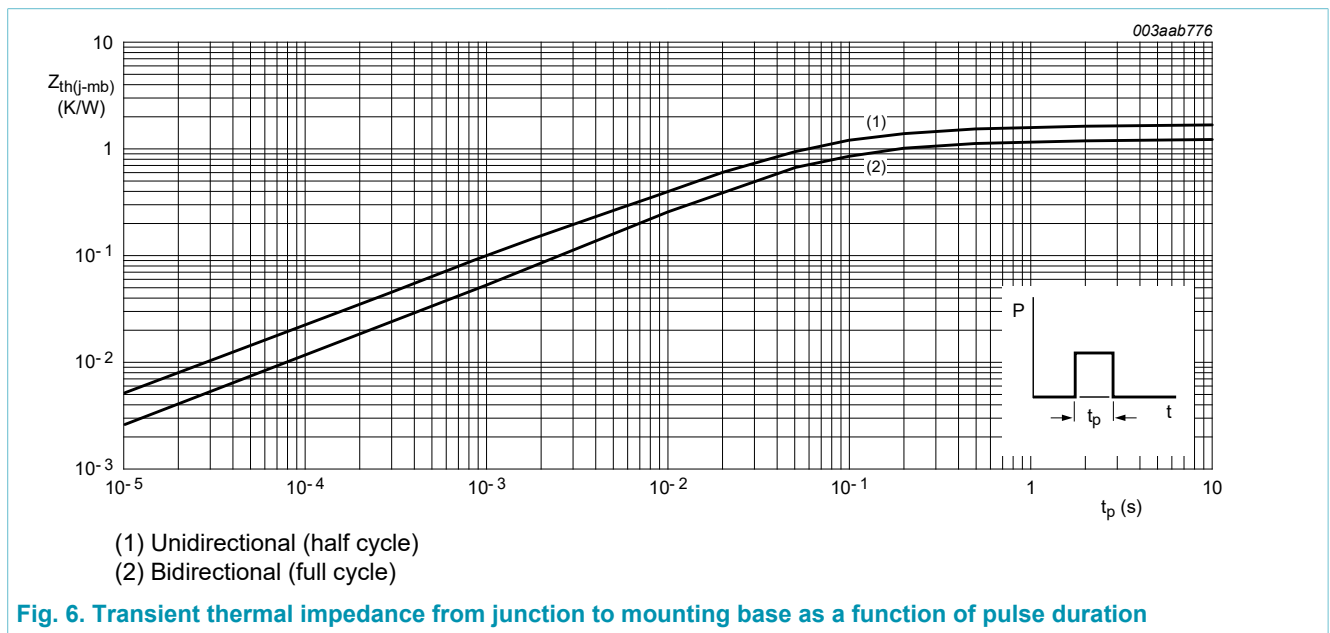
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



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 free air | 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 | 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 |
| 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 |
| | | $V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125\text{ °C}$; 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 | 2500 | - | - | V/ μ s |
| dI_{com}/dt | rate of change of commutating current | $V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $I_{T(RMS)} = 16\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit | 20 | - | - | A/ms |
| | | $V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $I_{T(RMS)} = 16\text{ A}$; $dV_{com}/dt = 10\text{ V}/\mu\text{s}$; gate open circuit | 30 | - | - | A/ms |
| | | $V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $I_{T(RMS)} = 16\text{ A}$; $dV_{com}/dt = 1\text{ V}/\mu\text{s}$; gate open circuit | 50 | - | - | A/ms |

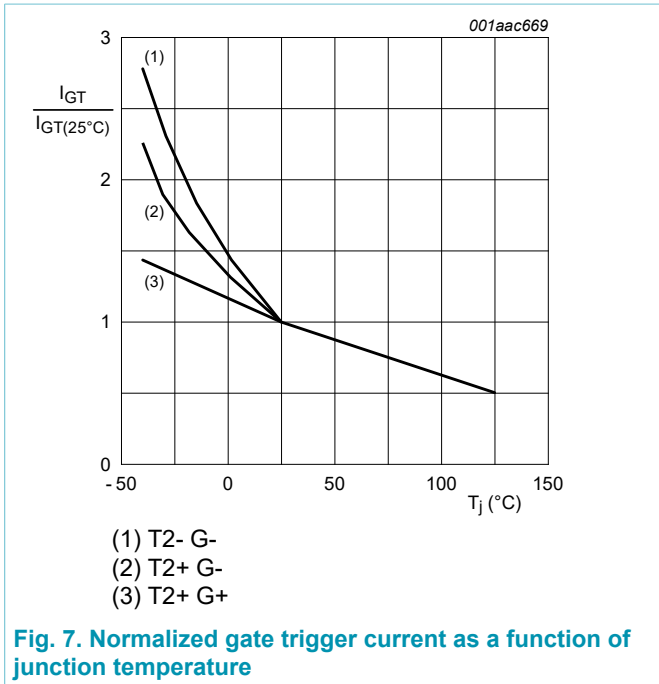


Fig. 7. Normalized gate trigger current as a function of junction temperature

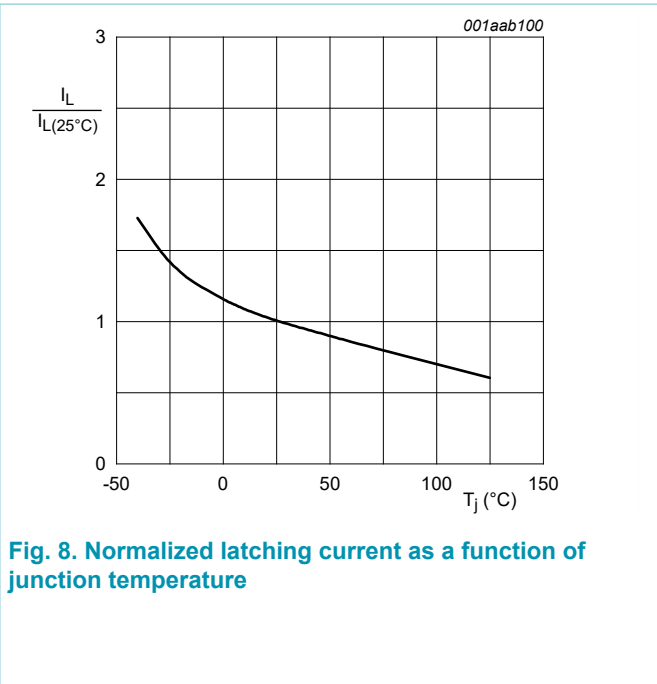


Fig. 8. Normalized latching current as a function of junction temperature

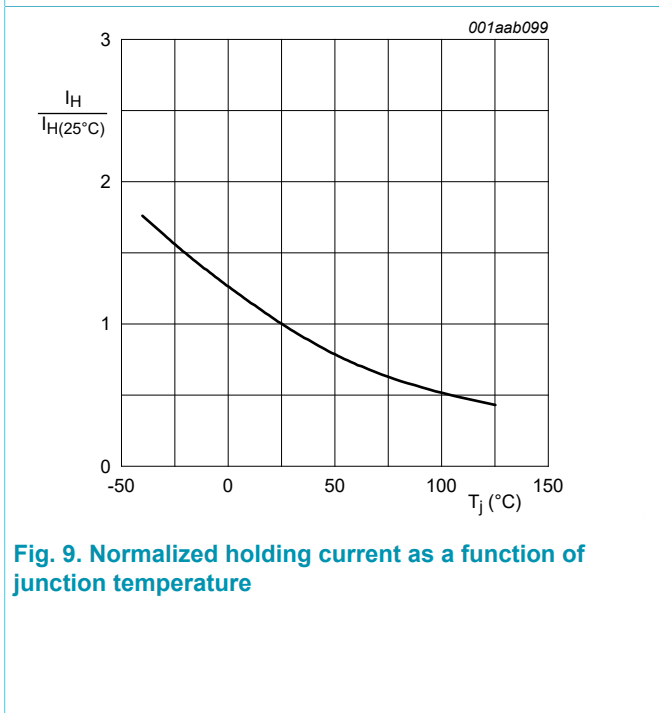


Fig. 9. Normalized holding current as a function of junction temperature

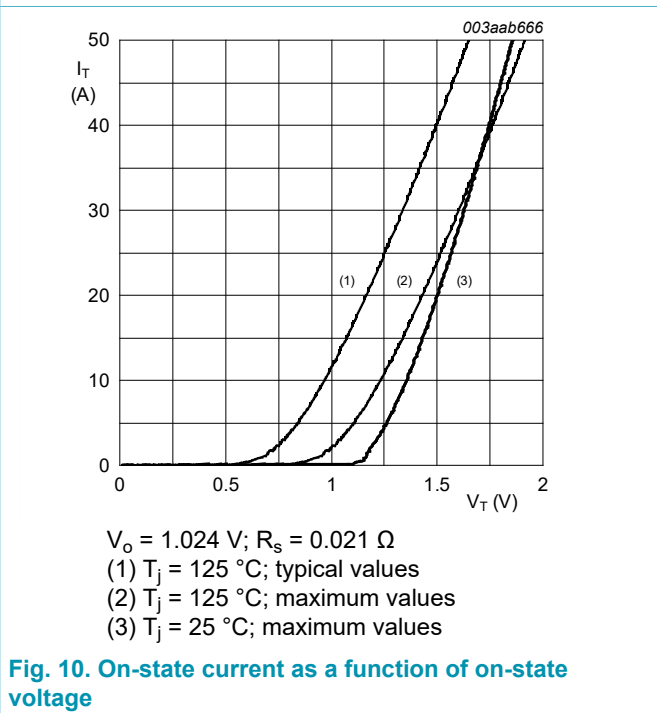


Fig. 10. On-state current as a function of on-state voltage

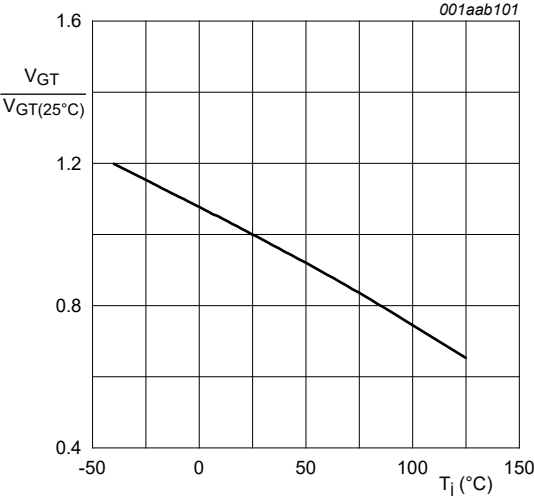


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

12. Legal information

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