

1. General description

Planar passivated four quadrant triac in a SOT78D (IITO-220) internally insulated plastic package intended for use in general purpose bidirectional switching and phase control applications.

2. Features and benefits

- High voltage capability
- Least sensitive gate for highest noise immunity
- High junction operating temperature capability ($T_{j(max)} = 150\text{ °C}$)
- High minimum I_{GT} for guaranteed immunity to gate noise
- Planar passivated for voltage ruggedness and reliability
- Triggering in all four quadrants
- Internally insulated package
- Isolated mounting base with 2500 V (RMS) isolation

3. Applications

- Applications subject to high temperature ($T_{j(max)} = 150\text{ °C}$)
- Compressor starting control circuits
- General purpose motor controls
- General purpose switching

4. Quick reference data

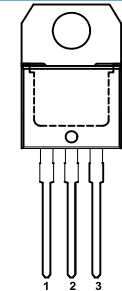
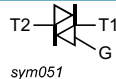
Table 1. Quick reference data

| 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; $T_{mb} \leq 112\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | 16 | A |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $t_p = 20\text{ ms}$; $T_{j(init)} = 25\text{ °C}$; Fig. 4 ; Fig. 5 | 160 | A |
| | | full sine wave; $t_p = 16.7\text{ ms}$; $T_{j(init)} = 25\text{ °C}$ | 176 | A |
| T_j | junction temperature | | 150 | °C |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|------|
| Static characteristics | | | | | | |
| I _{GT} | gate trigger current | V _D = 12 V; I _T = 0.1 A; T2+ G+ T _j = 25 °C; Fig. 7 | 10 | - | 50 | mA |
| | | V _D = 12 V; I _T = 0.1 A; T2+ G- T _j = 25 °C; Fig. 7 | 10 | - | 50 | mA |
| | | V _D = 12 V; I _T = 0.1 A; T2- G- T _j = 25 °C; Fig. 7 | 10 | - | 50 | mA |
| | | V _D = 12 V; I _T = 0.1 A; T2- G+ T _j = 25 °C; Fig. 7 | 10 | - | 70 | mA |
| I _H | holding current | V _D = 12 V; T _j = 25 °C; Fig. 9 | - | - | 60 | mA |
| V _T | on-state voltage | I _T = 20 A; T _j = 25 °C; Fig. 10 | - | 1.22 | 1.5 | V |
| Dynamic characteristics | | | | | | |
| dV _D /dt | rate of rise of off-state voltage | V _{DM} = 402 V; T _j = 125 °C; (V _{DM} = 67% of V _{DRM}); exponential waveform; gate open circuit | 500 | - | - | V/μs |
| | | V _{DM} = 402 V; T _j = 150 °C; (V _{DM} = 67% of V _{DRM}); exponential waveform; gate open circuit | 400 | - | - | V/μs |
| dI _{com} /dt | rate of change of commutating current | V _D = 400 V; T _j = 150 °C; I _{T(RMS)} = 16 A; dV _{com} /dt = 20 V/μs; gate open circuit; snubberless condition | 2 | - | - | A/ms |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| 1 | T1 | main terminal 1 |  <p>IITO-220 (SOT78D)</p> |  <p>sym051</p> |
| 2 | T2 | main terminal 2 | | |
| 3 | G | gate | | |
| mb | n.c | mounting base; isolated | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | Version |
|-------------|----------|------------------------------------------------------------------------------------------|-----------|
| | Name | Description | |
| BTA16-600B | IITO-220 | Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3 leads TO-220 | IITO-220E |

7. Marking

Table 4. Marking codes

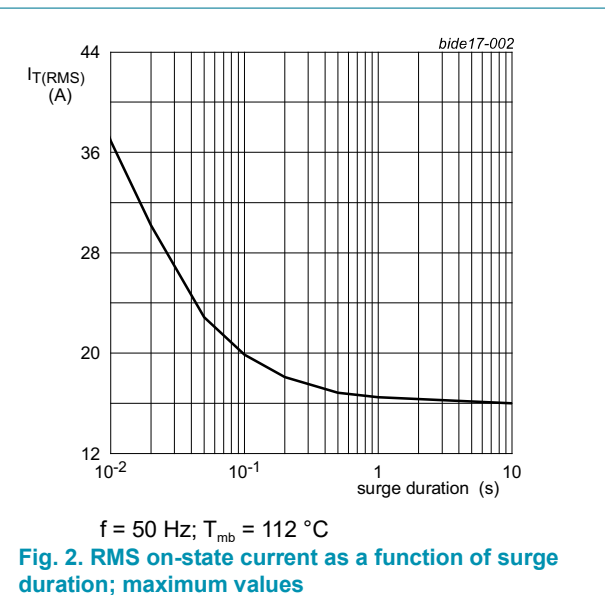
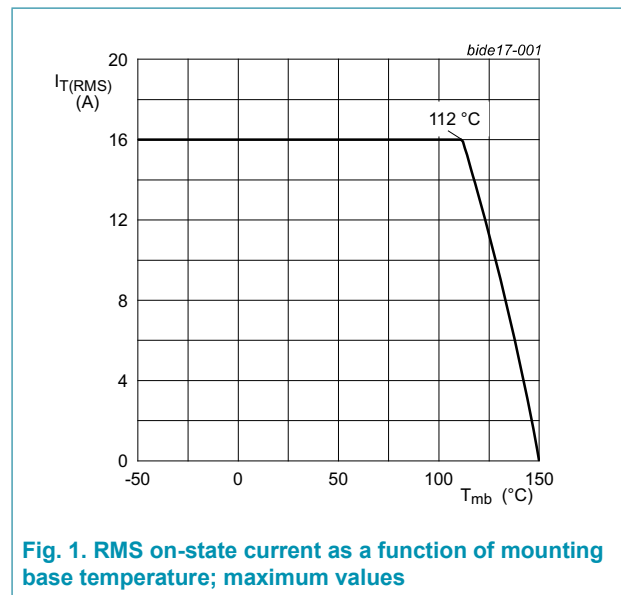
| Type number | Marking codes |
|-------------|---------------|
| BTA16-600B | BTA16-600B |

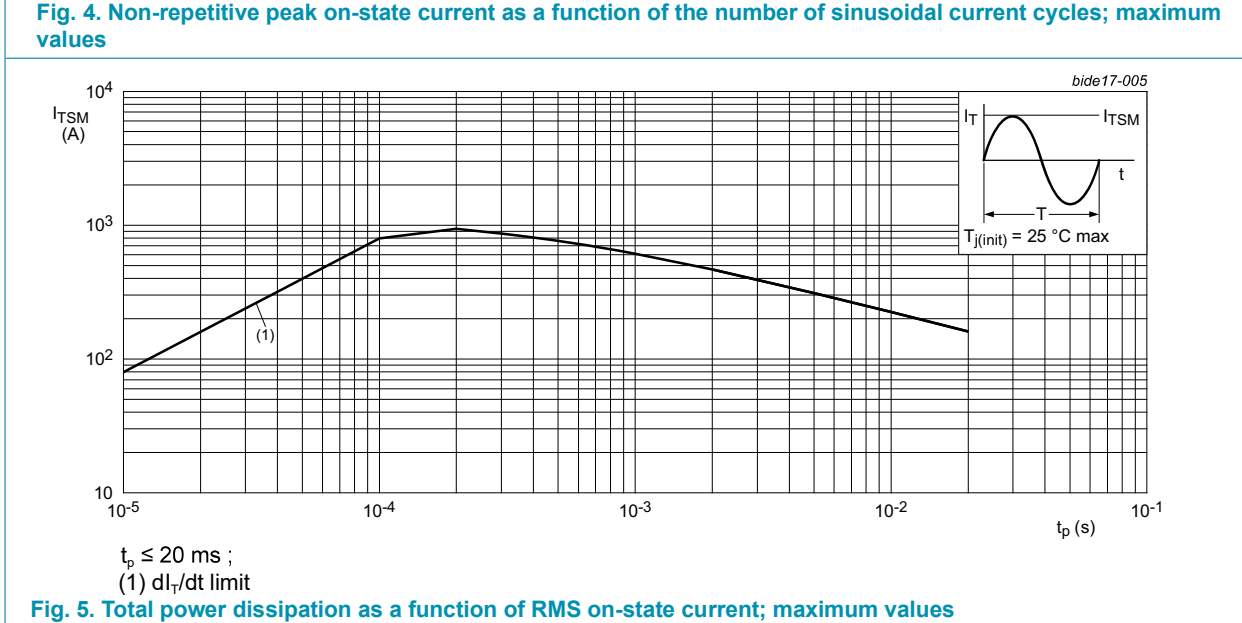
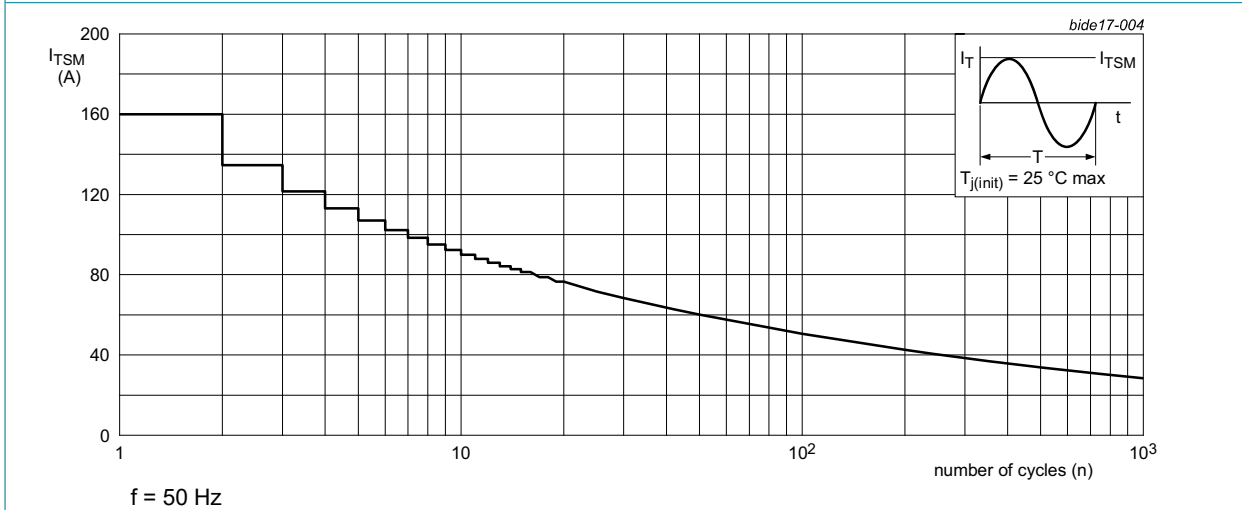
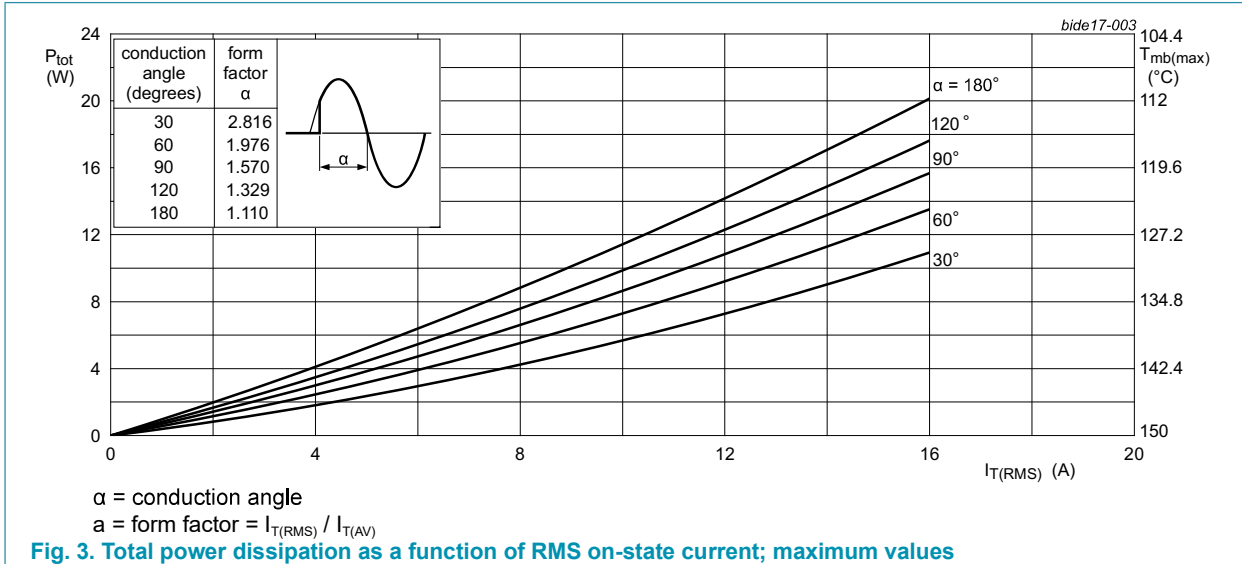
8. Limiting values

Table 4. 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; $T_{mb} \leq 112^\circ\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | 16 | A |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $t_p = 20\text{ ms}$; $T_{j(\text{init})} = 25^\circ\text{C}$; Fig. 4 ; Fig. 5 | 160 | A |
| | | full sine wave; $t_p = 16.7\text{ ms}$; $T_{j(\text{init})} = 25^\circ\text{C}$ | 176 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ms}$; sine wave | 128 | A^2s |
| di_T/dt | rate of rise of on-state current | $I_G = 150\text{mA}$ | 50 | $\text{A}/\mu\text{s}$ |
| 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 | $^\circ\text{C}$ |





9. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|------------------------------------------------------|------------------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | Fig. 6 | - | - | 1.9 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | - | 60 | - | K/W |

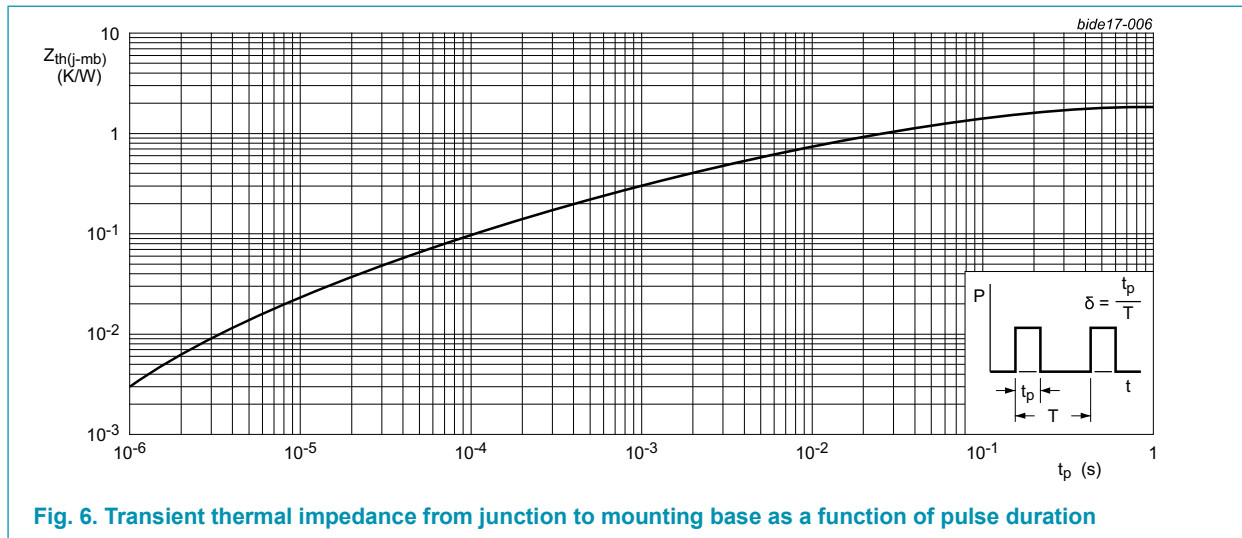


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Isolation characteristics

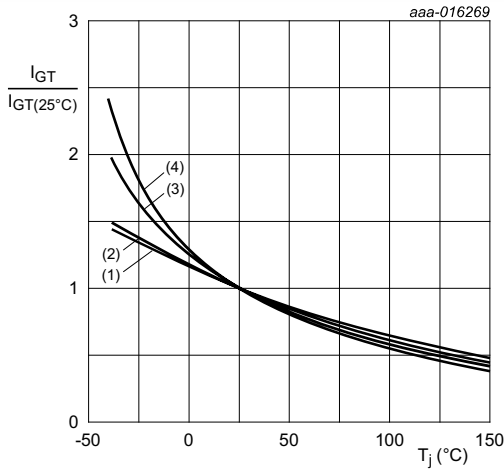
Table 6. Isolation characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------|-----|-----|------|------|
| $V_{isol(RMS)}$ | RMS isolation voltage | 50 Hz \leq f \leq 60 Hz; RH \leq 65 %; from all pins to external heatsink; sinusoidal waveform; clean and dust free | - | - | 2500 | V |
| C_{isol} | isolation capacitance | from cathode to external heatsink | - | 10 | - | PF |

11. 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 | - | 70 | mA |
| I_L | latching current | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; Fig. 8 | - | - | 60 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; Fig. 8 | - | - | 90 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; Fig. 8 | - | - | 60 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; 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 | $I_T = 20\text{ A}$; $T_j = 25\text{ °C}$; Fig. 10 | - | 1.22 | 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 | - | 0.7 | 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 | $V_D = 600\text{ V}$; $T_j = 25\text{ °C}$ | - | - | 5 | 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 | $V_{DM} = 402\text{ V}$; $T_j = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit | 500 | - | - | V/ μs |
| | | $V_{DM} = 402\text{ V}$; $T_j = 150\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit | 400 | - | - | V/ μs |
| di_{com}/dt | rate of change of commutating current | $V_D = 400\text{ V}$; $T_j = 150\text{ °C}$; $I_{T(RMS)} = 16\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; gate open circuit; snubberless condition | 2 | - | - | A/ms |



- (1) T2+ G+
- (2) T2+ G-
- (3) T2- G-
- (4) T2- G+

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

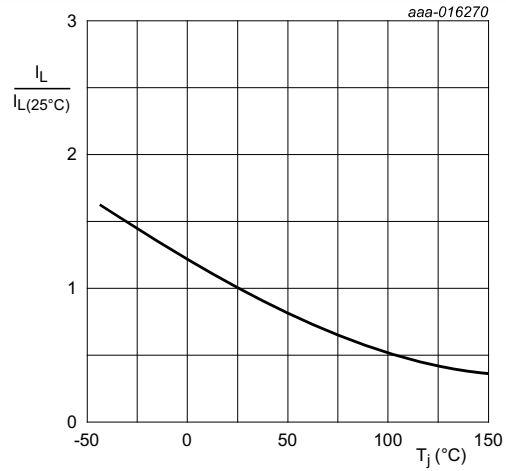


Fig. 8. Normalized latching current as a function of junction temperature

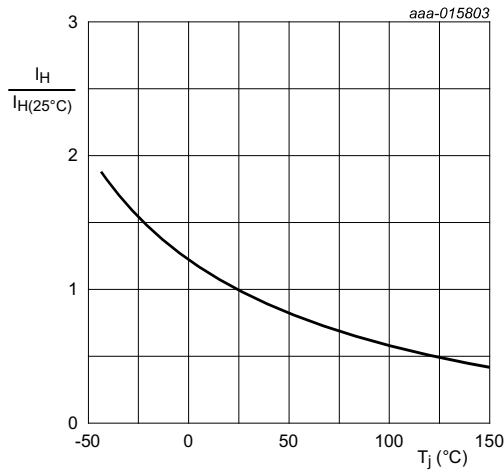
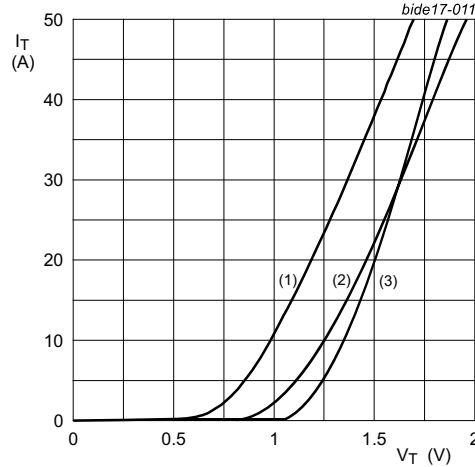


Fig. 9. Normalized holding current as a function of junction temperature



- $V_o = 1.053 \text{ V}; R_s = 0.0194 \ \Omega$
- (1) $T_j = 150 \text{ }^\circ\text{C}$; typical values
 - (2) $T_j = 150 \text{ }^\circ\text{C}$; maximum values
 - (3) $T_j = 25 \text{ }^\circ\text{C}$; maximum values

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

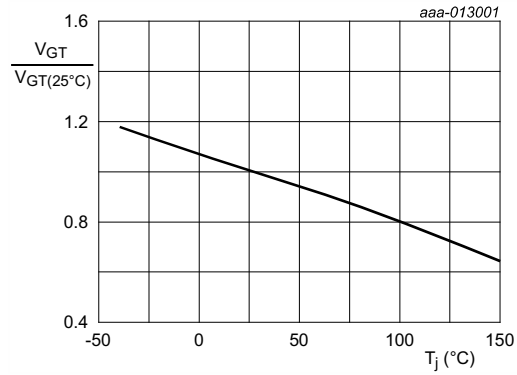
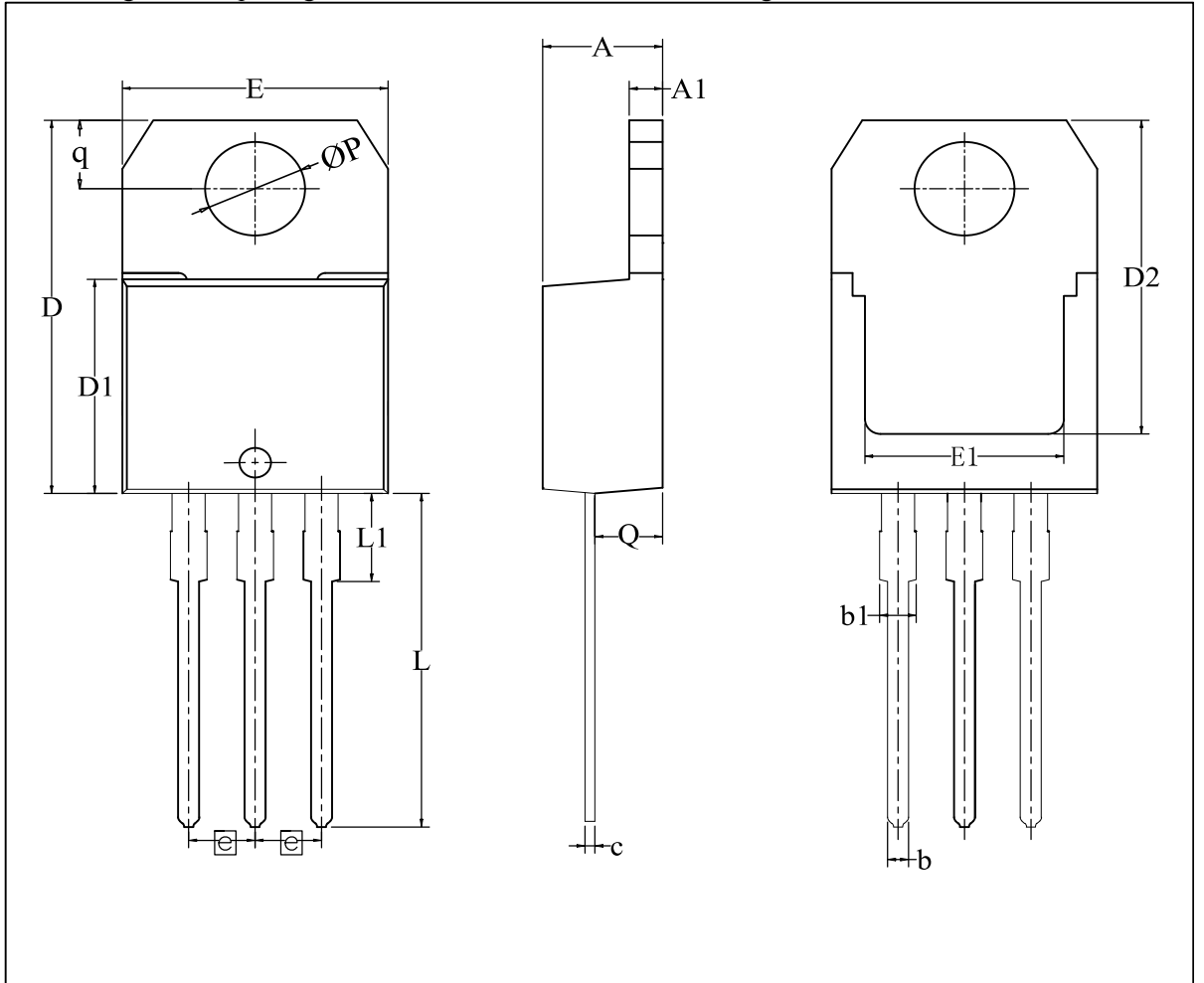


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

12. Package outline

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3 leads TO-220 ITO220



| Unit | A | A1 | b | b1 | c | D | D1 | D2 | E | E1 | e | L | L1 | P | Q | q |
|------|-----|------|------|------|------|------|-------|------|-------|-------|------|-------|------|------|------|------|
| MM | min | 4.30 | 1.25 | 0.69 | 1.20 | 0.40 | 15.20 | 8.50 | 12.20 | 10.00 | 6.86 | 12.80 | 2.70 | 3.70 | 2.40 | 2.70 |
| | max | 4.70 | 1.40 | 0.90 | 1.72 | 0.60 | 16.00 | 9.02 | 12.88 | 10.40 | 8.89 | 14.00 | 3.30 | 3.95 | 2.80 | 3.00 |

13. Legal information

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| Document status [1][2] | Product status [3] | Definition |
|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
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| 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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