

1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a SOT78 (TO-220AB) plastic package intended for use in applications requiring high bidirectional blocking voltage capability, high current inrush capability and high thermal cycling performance.

2. Features and benefits

- High junction operating temperature capability ($T_{j(max)} = 150\text{ °C}$)
- High thermal cycling performance
- Planar passivated for voltage ruggedness and reliability
- High voltage capacity
- Very high current surge capability

3. Applications

- DC Motor control
- Power converter
- Lighting and temperature control
- Softstart AC motor control
- AC power control
- Solid State Relay (SSR)

4. Quick reference data

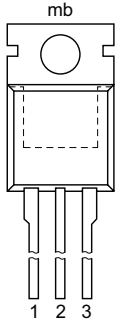

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Values | Unit |
|--------------------------------|--------------------------------------|---|--------|------|
| Absolute maximum rating | | | | |
| V_{RRM} | repetitive peak reverse voltage | | 1200 | V |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{mb} \leq 128\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | 31 | A |
| I_{TSM} | non-repetitive peak on-state current | half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 10\text{ ms}$; Fig. 4 ; Fig. 5 | 250 | A |
| | | half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 8.3\text{ ms}$ | 275 | A |
| T_j | junction temperature | | 150 | °C |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-----------------------------------|---|------|------|-----|------------|
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 25\text{ °C}$; Fig. 7 | - | - | 35 | 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 | - | 1.15 | 1.5 | V |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 804\text{ V}$; $T_J = 150\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; | 1000 | - | - | V/ μ s |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-----------------------------------|---|---|
| 1 | K | cathode |  |  |
| 2 | A | anode | | |
| 3 | G | gate | | |
| mb | A | mounting base; connected to anode | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | Version |
|-------------|----------|--|---------|
| | Name | Description | |
| BT152-1200T | TO-220AB | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB | SOT78 |

7. Marking

Table 4. Marking codes

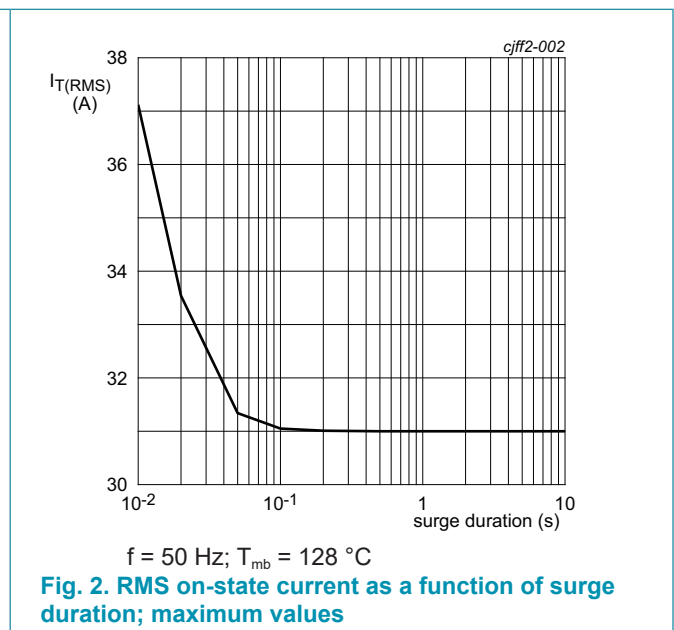
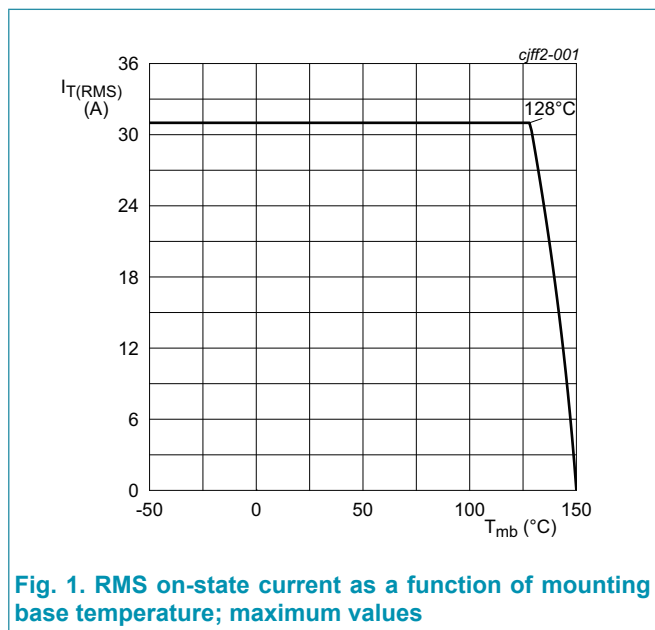
| Type number | Marking codes |
|-------------|---------------|
| BT152-1200T | BT152-1200T |

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 | | 1200 | V |
| V_{RRM} | repetitive peak reverse voltage | | 1200 | V |
| $I_{T(AV)}$ | average on-state current | half sine wave; $T_{mb} \leq 128\text{ °C}$; | 20 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{mb} \leq 128\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | 31 | A |
| I_{TSM} | non-repetitive peak on-state current | half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 10\text{ ms}$; Fig. 4 ; Fig. 5 | 250 | A |
| | | half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 8.3\text{ ms}$ | 275 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ms}$; sine wave | 312.5 | A^2s |
| di_T/dt | rate of rise of on-state current | $I_G = 60\text{mA}$ | 150 | $A/\mu s$ |
| I_{GM} | peak gate current | | 5 | A |
| V_{GM} | peak gate voltage | | 5 | V |
| P_{GM} | peak gate power | | 20 | W |
| $P_{G(AV)}$ | average gate power | over any 20 ms period | 0.5 | W |
| T_{stg} | storage temperature | | -40 to 150 | $^{\circ}C$ |
| T_j | junction temperature | | 150 | $^{\circ}C$ |



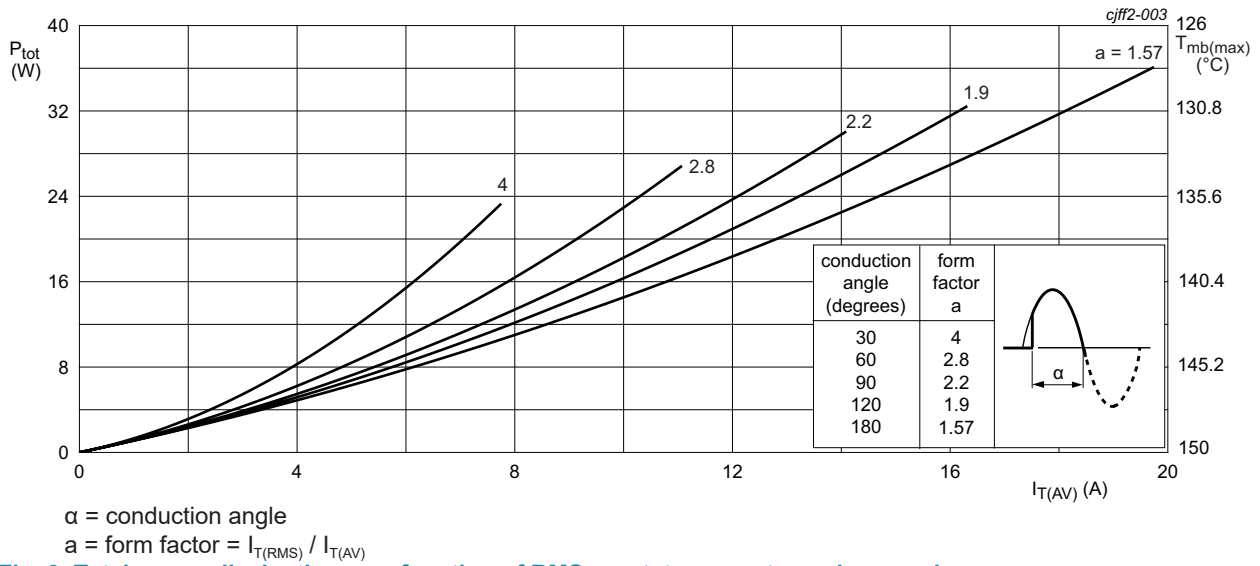


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

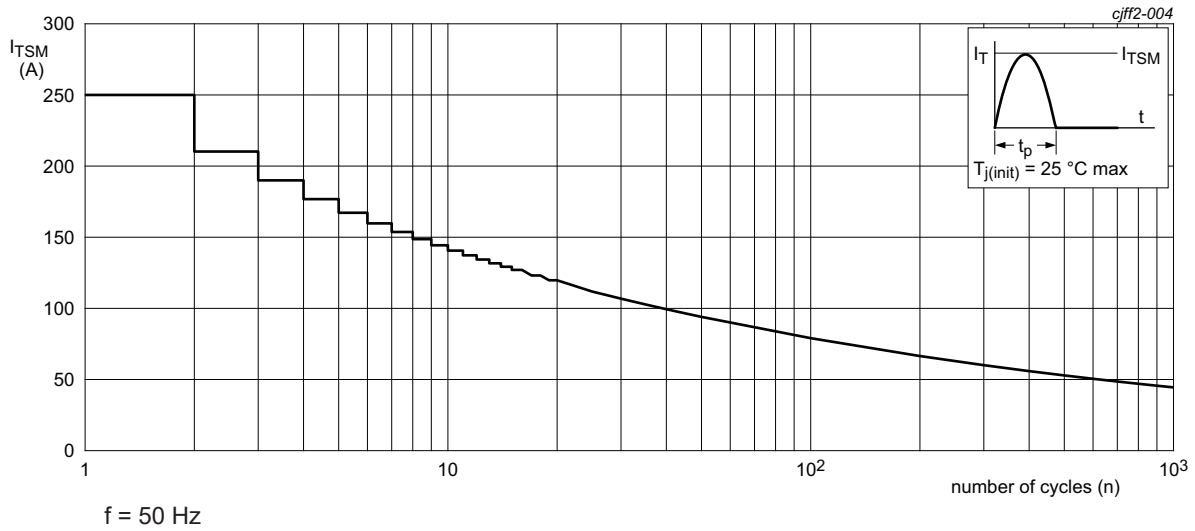


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

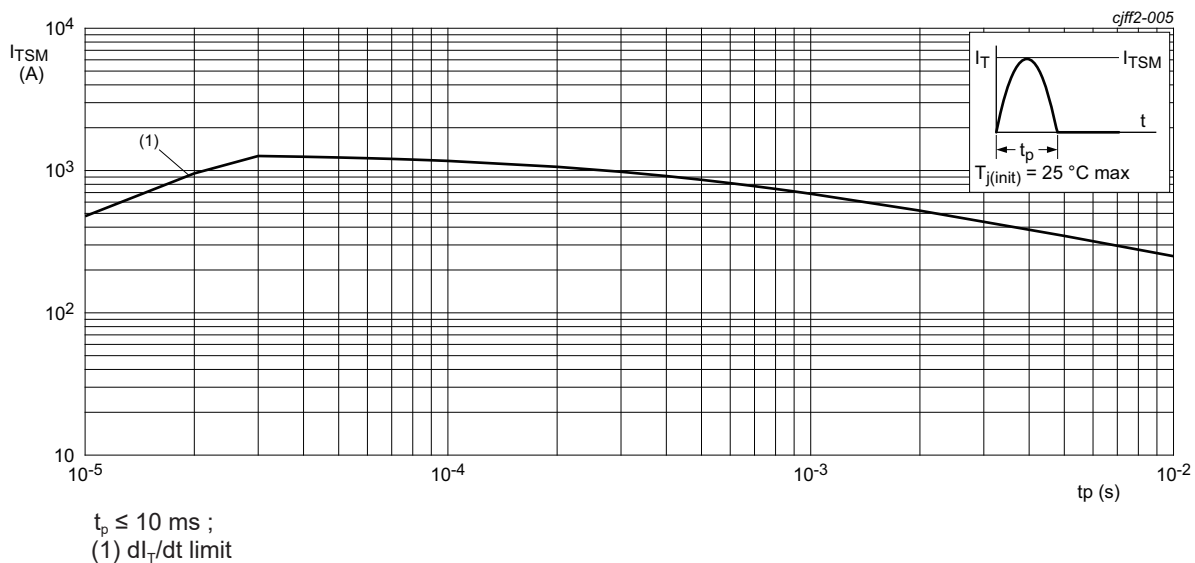


Fig. 5. Total power dissipation as a function of RMS on-state current; maximum values

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 | Fig. 6 | - | - | 0.6 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | - | 60 | - | K/W |

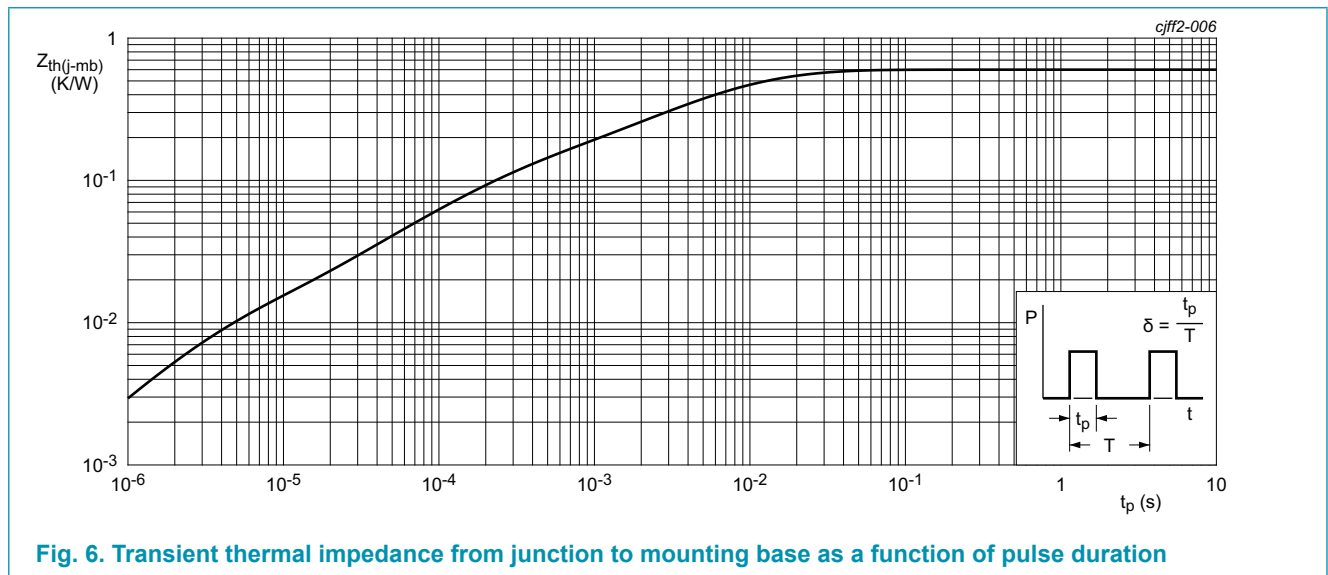


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-----------------------------------|--|------|------|-----|------------|
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C};$ Fig. 7 | - | - | 35 | mA |
| I_L | latching current | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C};$ Fig. 8 | - | - | 80 | mA |
| I_H | holding current | $V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C};$ Fig. 9 | - | - | 60 | mA |
| V_T | on-state voltage | $I_T = 20\text{ A}; T_j = 25\text{ }^\circ\text{C};$ Fig. 10 | - | 1.15 | 1.5 | 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 |
| | | $V_D = 1200\text{ V}; I_T = 0.1\text{ A}; T_j = 150\text{ }^\circ\text{C};$ Fig. 11 | 0.25 | 0.4 | - | V |
| I_D | off-state current | $V_D = 1200\text{ V}; T_j = 150\text{ }^\circ\text{C}$ | - | - | 2 | mA |
| I_R | reverse current | $V_D = 1200\text{ V}; T_j = 150\text{ }^\circ\text{C}$ | - | - | 2 | mA |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 804\text{ V}; T_j = 150\text{ }^\circ\text{C}; (V_{DM} = 67\%$ of V_{DRM}); exponential waveform | 1000 | - | - | V/ μ s |
| t_{gt} | gate-controlled turn-on time | $I_{TM} = 20\text{ A}; V_D = 800\text{ V}; I_G = 100\text{ mA}; (dI_G/dt)_M = 5\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}$ | - | 2 | - | μ s |
| t_q | commutated turn-off time | $V_{DM} = 804\text{ V}; T_j = 125\text{ }^\circ\text{C}; I_{TM} = 20\text{ A}; V_R = 25\text{ V}; dV_D/dt = 50\text{ V}/\mu\text{s}; (dI_T/dt)_M = 30\text{ A}/\mu\text{s}; (V_{DM} = 67\%$ of V_{DRM}) | - | 70 | - | μ s |

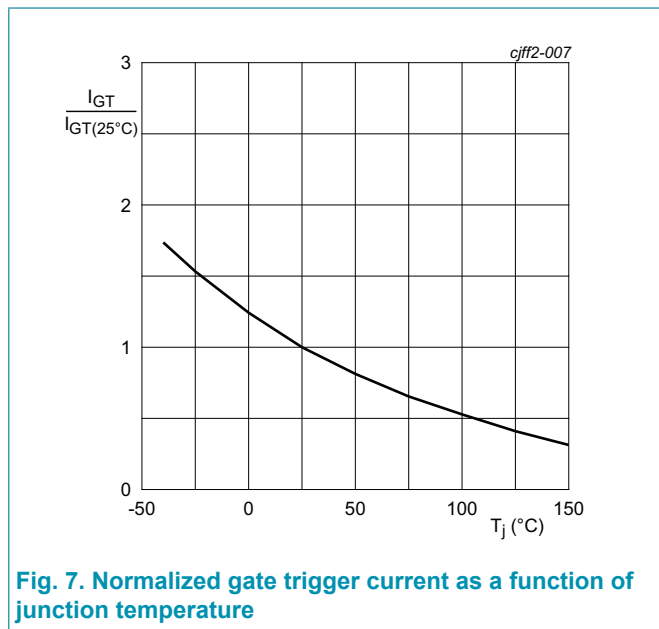


Fig. 7. Normalized gate trigger current as a function of junction temperature

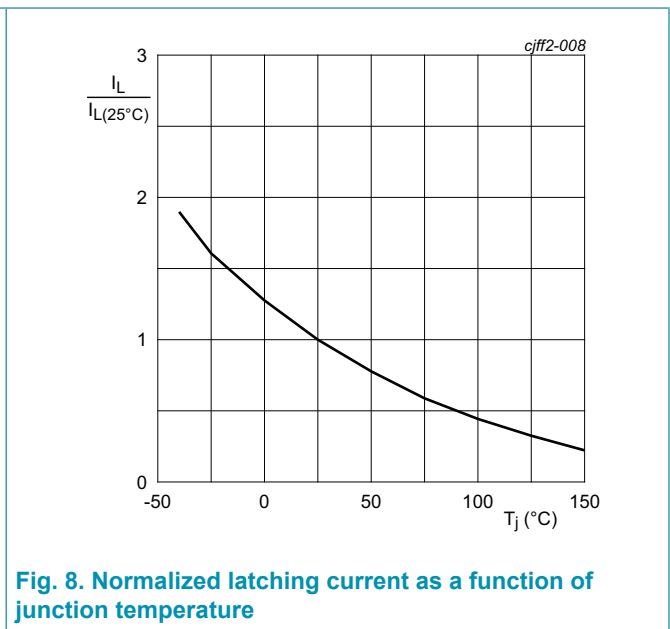


Fig. 8. Normalized latching current as a function of junction temperature

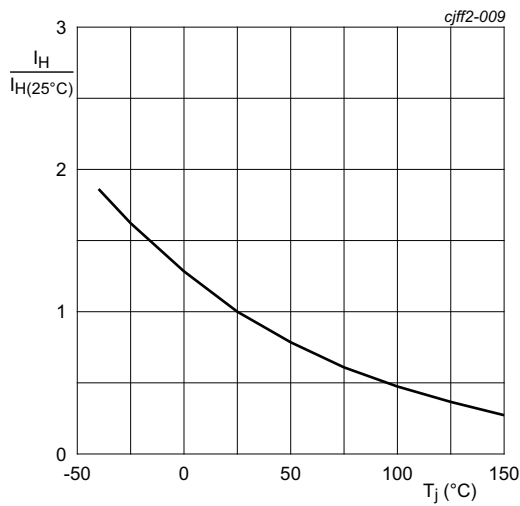
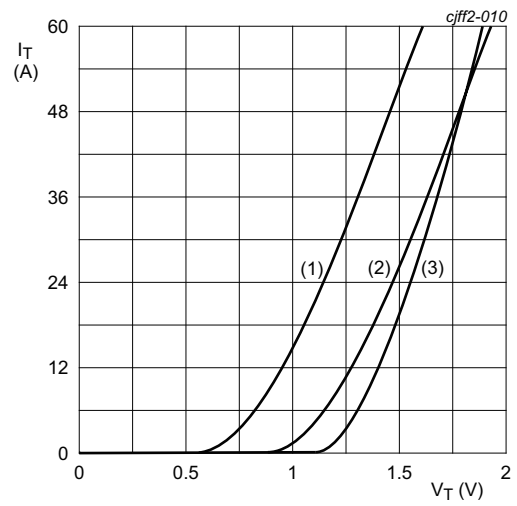


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 1.067 \text{ V}; R_s = 0.0156 \Omega$
 (1) $T_j = 150^\circ\text{C}$; typical values
 (2) $T_j = 150^\circ\text{C}$; maximum values
 (3) $T_j = 25^\circ\text{C}$; maximum values

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

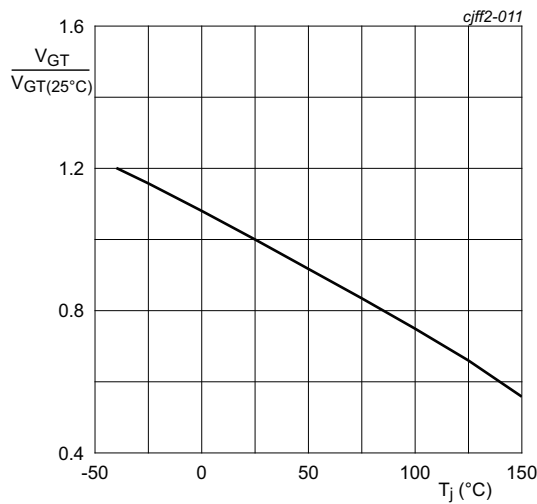
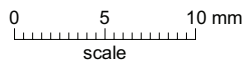
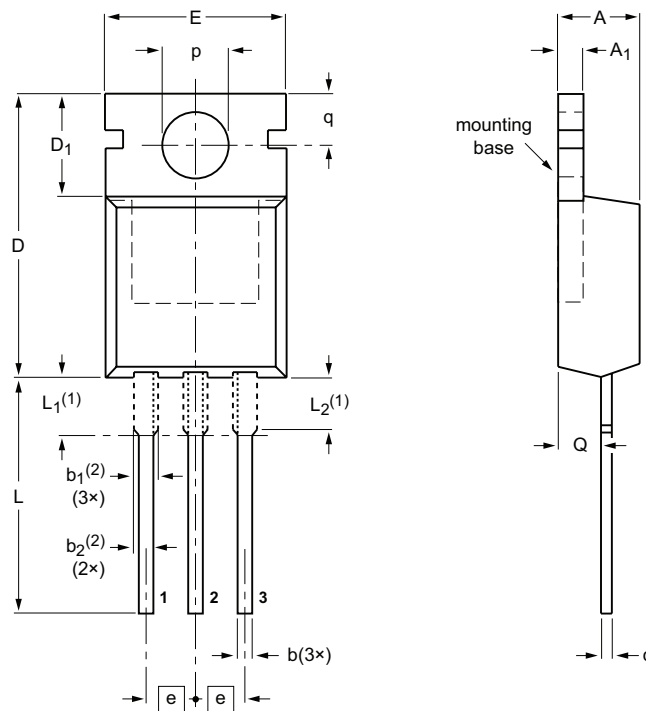


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

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

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| 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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- [2] The term 'short data sheet' is explained in section "Definitions".
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