

BT151-500R

SCR, 12 A, 15mA, 500 V, SOT78

Rev. 05 — 2 March 2009

Product data sheet

1. Product profile

1.1 General description

Planar passivated SCR (Silicon Controlled Rectifier) in a SOT78 plastic package.

1.2 Features and benefits

- High reliability
- High surge current capability
- High thermal cycling performance

1.3 Applications

- Ignition circuits
- Motor control
- Protection Circuits
- Static switching

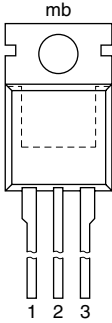

1.4 Quick reference data

Table 1. Quick reference

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|-----------------------------------|---|-----|-----|-----|------|
| V_{DRM} | repetitive peak off-state voltage | | - | - | 500 | V |
| $I_{\text{T(AV)}}$ | average on-state current | half sine wave; $T_{\text{mb}} \leq 109\text{ °C}$; see Figure 3 | - | - | 7.5 | A |
| $I_{\text{T(RMS)}}$ | RMS on-state current | half sine wave; $T_{\text{mb}} \leq 109\text{ °C}$; see Figure 1 ; see Figure 2 | - | - | 12 | A |
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_{\text{D}} = 12\text{ V}$; $T_{\text{j}} = 25\text{ °C}$; $I_{\text{T}} = 100\text{ mA}$; see Figure 8 | - | 2 | 15 | mA |

2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------|--|---|
| 1 | K | cathode |  |  |
| 2 | A | anode | | |
| 3 | G | gate | | |
| mb | mb | anode | | |

SOT78
(TO-220AB; SC-46)

3. Ordering information

Table 3. Ordering information

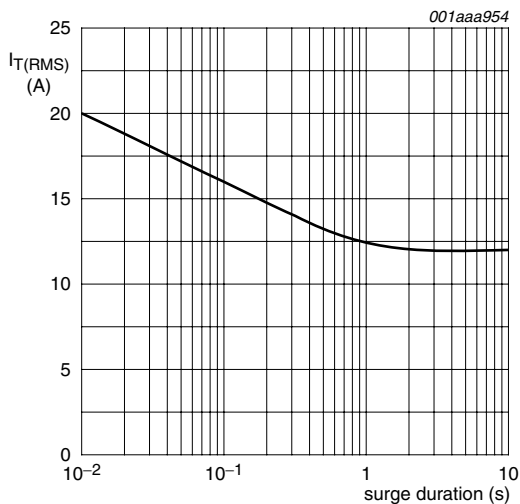
| Type number | Package | | Version |
|-------------|-----------|---|---------|
| | Name | Description | |
| BT151-500R | TO-220AB; | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead | SOT78 |
| | SC-46 | | |

4. Limiting values

Table 4. 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 | | - | 500 | V |
| V_{RRM} | repetitive peak reverse voltage | | - | 500 | V |
| $I_{T(AV)}$ | average on-state current | half sine wave; $T_{mb} \leq 109\text{ }^{\circ}\text{C}$; see Figure 3 | - | 7.5 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{mb} \leq 109\text{ }^{\circ}\text{C}$; see Figure 1 ; see Figure 2 | - | 12 | A |
| di_T/dt | rate of rise of on-state current | $I_T = 20\text{ A}$; $I_G = 50\text{ mA}$; $di_G/dt = 50\text{ mA}/\mu\text{s}$ | - | 50 | A/ μs |
| I_{GM} | peak gate current | | - | 2 | A |
| P_{GM} | peak gate power | | - | 5 | W |
| T_{stg} | storage temperature | | -40 | 150 | $^{\circ}\text{C}$ |
| T_j | junction temperature | | - | 125 | $^{\circ}\text{C}$ |
| I_{TSM} | non-repetitive peak on-state current | half sine wave; $t_p = 8.3\text{ ms}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ | - | 132 | A |
| | | half sine wave; $t_p = 10\text{ ms}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; see Figure 4 ; see Figure 5 | - | 120 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; sine-wave pulse | - | 72 | A ² s |
| $P_{G(AV)}$ | average gate power | over any 20 ms period | - | 0.5 | W |
| V_{RGM} | peak reverse gate voltage | | - | 5 | V |



$f = 50\text{ Hz}; T_{mb} = 109\text{ }^{\circ}\text{C}$

Fig 1. RMS on-state current as a function of surge duration; maximum values

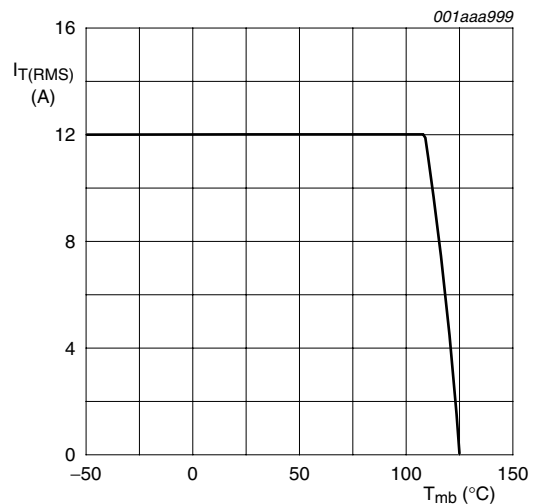


Fig 2. RMS on-state current as a function of mounting base temperature; maximum values

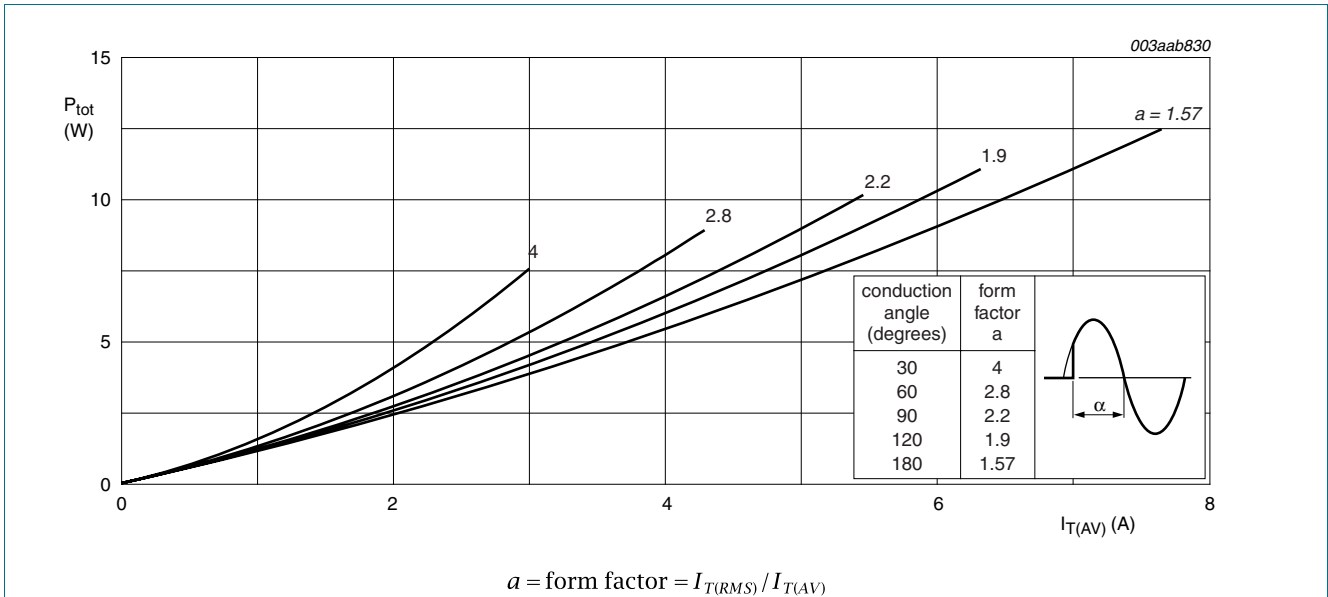


Fig 3. Total power dissipation as a function of average on-state current; maximum values

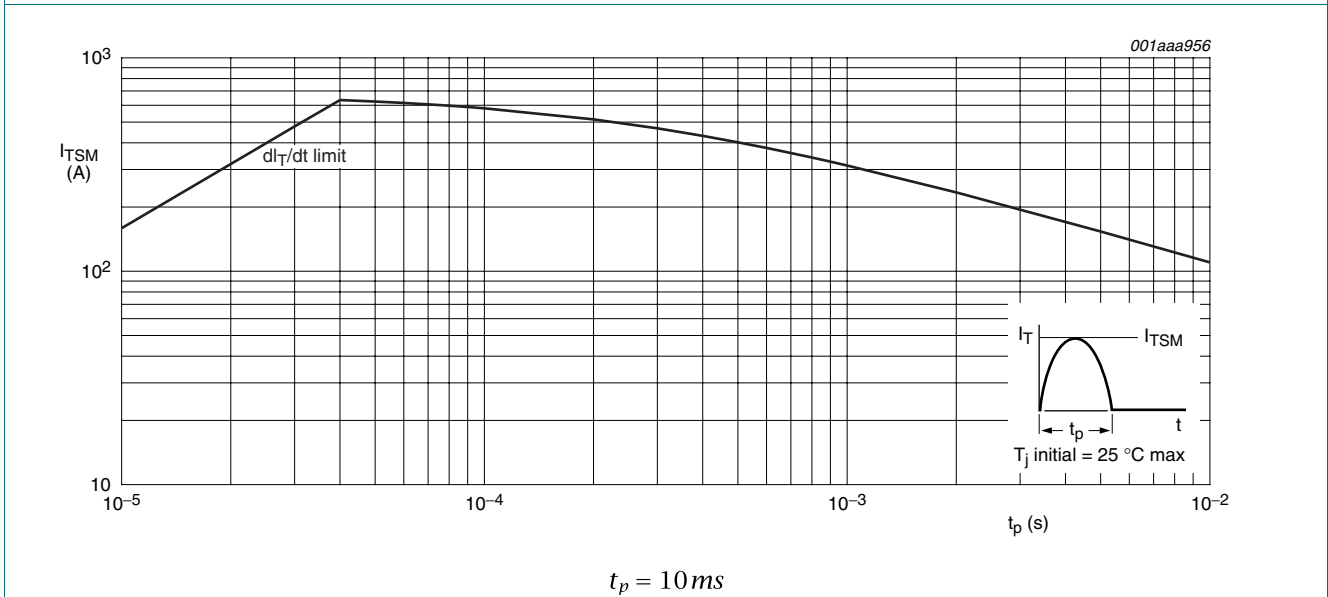
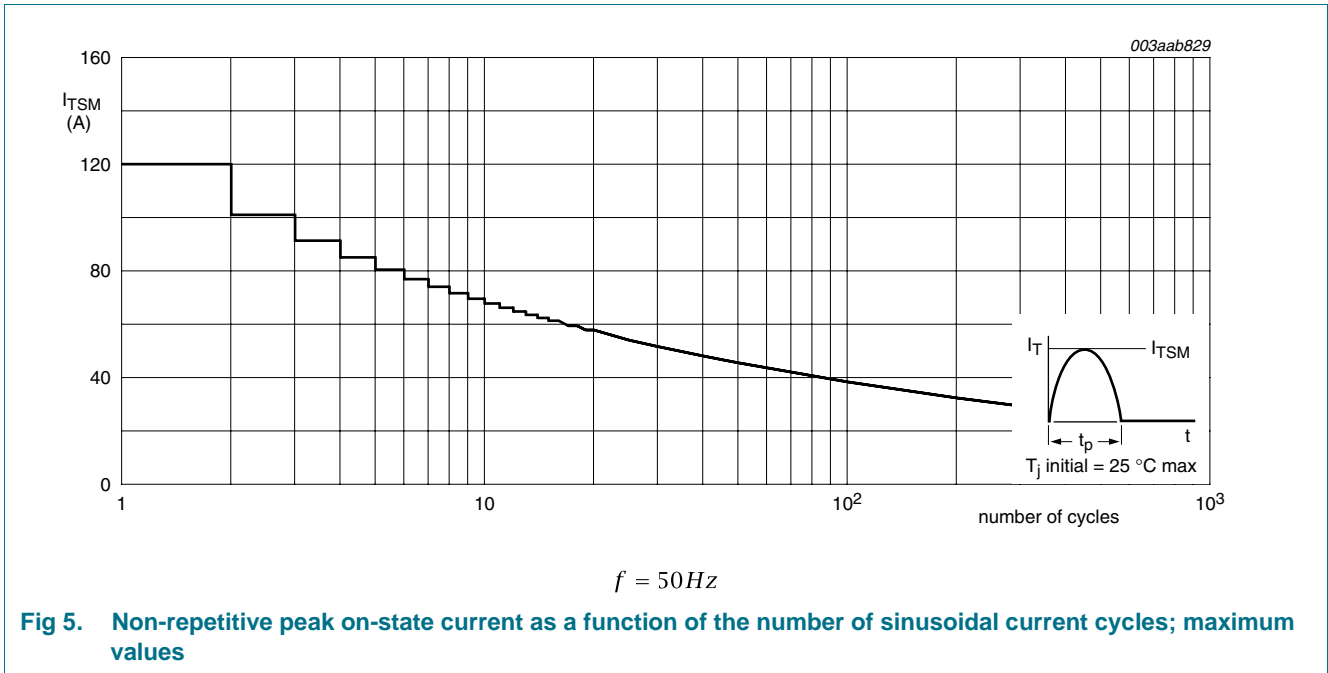


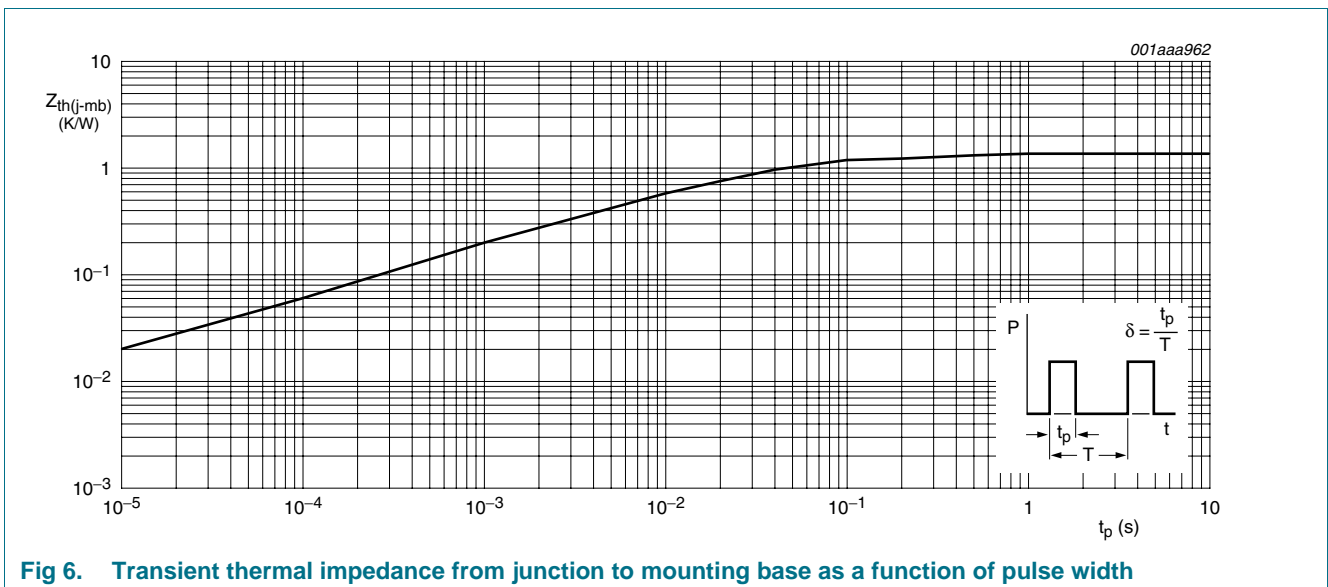
Fig 4. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values



5. Thermal characteristics

Table 5. Thermal characteristics

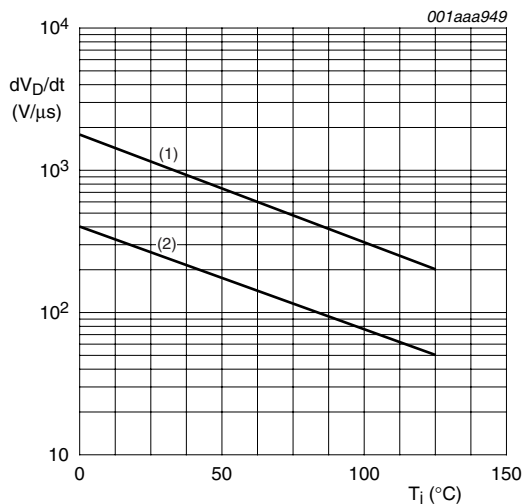
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|--|------------------------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | see Figure 6 | - | - | 1.3 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | | - | 60 | - | K/W |



6. Characteristics

Table 6. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-----------------------------------|---|------|------|------|------------------|
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; $I_T = 100\text{ mA}$; see Figure 8 | - | 2 | 15 | mA |
| I_L | latching current | $V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; see Figure 9 | - | 10 | 40 | mA |
| I_H | holding current | $V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; see Figure 10 | - | 7 | 20 | mA |
| V_T | on-state voltage | $I_T = 23\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; see Figure 11 | - | 1.4 | 1.75 | V |
| V_{GT} | gate trigger voltage | $I_T = 100\text{ mA}$; $V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; see Figure 12 | - | 0.6 | 1.5 | V |
| | | $I_T = 100\text{ mA}$; $V_D = 500\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$ | 0.25 | 0.4 | - | V |
| I_D | off-state current | $V_D = 500\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$ | - | 0.1 | 0.5 | mA |
| I_R | reverse current | $V_R = 500\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$ | - | 0.1 | 0.5 | mA |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 335\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; exponential waveform; gate open circuit | 50 | 130 | - | V/ μs |
| | | $V_{DM} = 335\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $R_{GK} = 100\text{ }\Omega$; exponential waveform; see Figure 7 | 200 | 1000 | - | V/ μs |
| t_{gt} | gate-controlled turn-on time | $I_{TM} = 40\text{ A}$; $V_D = 500\text{ V}$; $I_G = 100\text{ mA}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$; $T_j = 25\text{ }^\circ\text{C}$ | - | 2 | - | μs |
| t_q | commutated turn-off time | $V_{DM} = 335\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{TM} = 20\text{ A}$; $V_R = 25\text{ V}$; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$; $dV_D/dt = 50\text{ V}/\mu\text{s}$; $R_{GK} = 100\text{ }\Omega$ | - | 70 | - | μs |



(1) $R_{GK} = 100\text{ }\Omega$
 (2) Gate open circuit

Fig 7. Critical rate of rise of off-state voltage as a function of junction temperature; minimum values

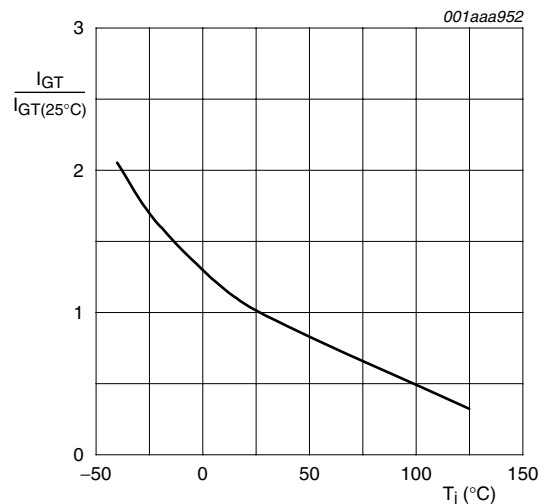


Fig 8. Normalized gate trigger current as a function of junction temperature

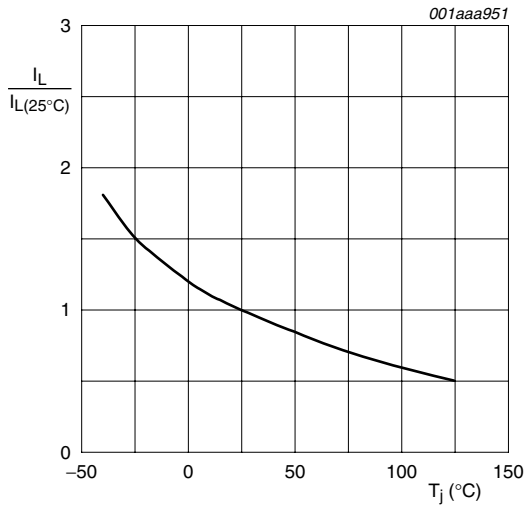


Fig 9. Normalized latching current as a function of junction temperature

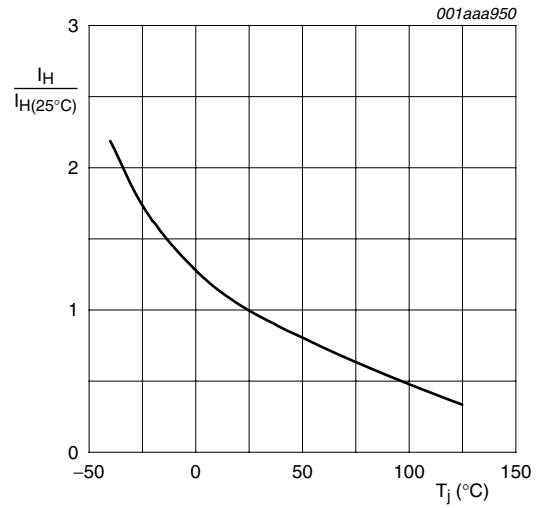
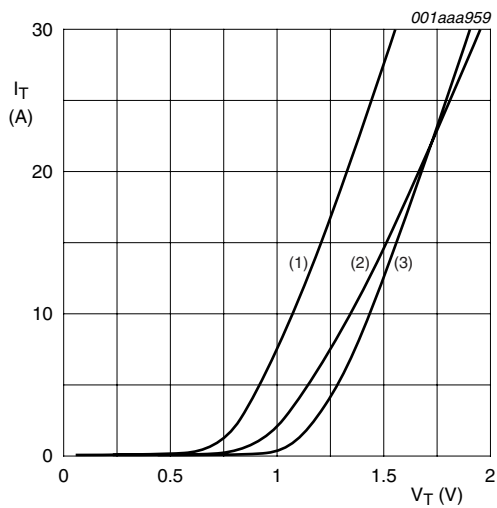


Fig 10. Normalized holding current as a function of junction temperature



- $V_0 = 1.06 \text{ V}; R_s = 0.0304 \Omega$
- (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 11. On-state current as a function of on-state voltage

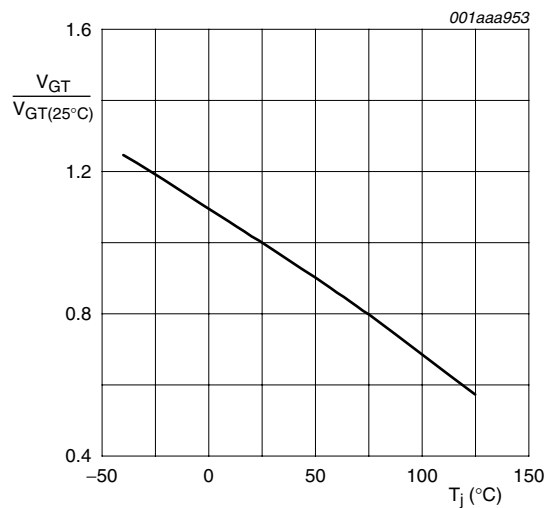


Fig 12. Normalized gate trigger voltage as a function of junction temperature

7. Package outline

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

SOT78

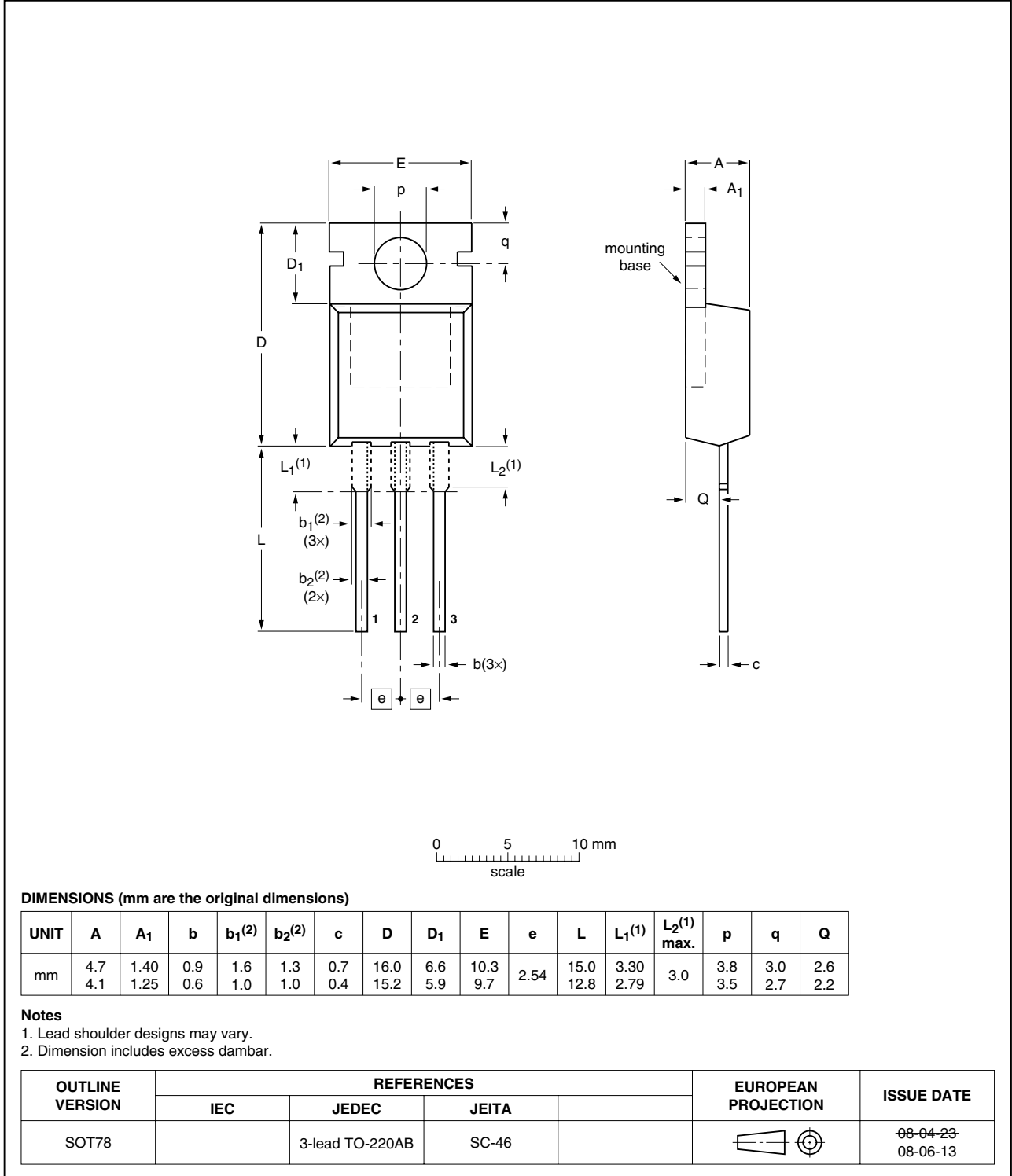


Fig 13. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------------------------|--------------|--|---------------|-----------------|
| BT151-500R_5 | 20090302 | Product data sheet | - | BT151_SER_L_R_4 |
| Modifications: | | <ul style="list-style-type: none">• Package outline updated.• Type number BT151-500R separated from data sheet BT151_SER_L_R_4. | | |
| BT151_SER_L_R_4 | 20061023 | Product data sheet | - | BT151_SERIES_3 |
| BT151_SERIES_3 (9397 750 13159) | 20040607 | Product specification | - | BT151_SERIES_2 |
| BT151_SERIES_2 | 19990601 | Product specification | - | BT151_SERIES_1 |
| BT151_SERIES_1 | 19970901 | Product specification | - | - |

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9.1 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. |
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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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