BT151-650R

SCR, 12 A, 15mA, 650 V, SOT78 Rev. 05 — 27 February 2009

Product data sheet

Product profile 1.

1.1 General description

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

1.2 Features and benefits

High reliability

- High thermal cycling performance
- High surge current capability

1.3 Applications

- Ignition circuits
- Motor control

- Protection Circuits
- Static switching

1.4 Quick reference data

Table 1. **Quick reference**

| Symbol | Parameter | Conditions | Min | Тур | Max | Unit |
|---------------------|-----------------------------------|---|-----|-----|-----|------|
| V_{DRM} | repetitive peak off-state voltage | | - | - | 650 | V |
| $I_{T(AV)}$ | average on-state current | half sine wave; T _{mb} ≤ 109 °C; see <u>Figure 3</u> | - | - | 7.5 | Α |
| I _{T(RMS)} | RMS on-state current | half sine wave; T _{mb} ≤ 109 °C; see <u>Figure 1</u> ; see <u>Figure 2</u> | - | - | 12 | Α |
| Static ch | aracteristics | | | | | |
| I _{GT} | gate trigger current | $V_D = 12 \text{ V; } T_j = 25 \text{ °C;}$ $I_T = 100 \text{ mA; see } \frac{\text{Figure 8}}{\text{ or } 100 \text{ mA;}}$ | - | 2 | 15 | mA |



2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------|---------------------------|----------------|
| 1 | K | cathode | | |
| 2 | Α | anode | mb | A → K |
| 3 | G | gate | 205 | G sym037 |
| mb | mb | anode | | |
| | | | SOT78 (TO-220AB;SC-46) | |

3. Ordering information

Table 3. Ordering information

| Type number | | | |
|-------------|--------------------|--|---------|
| | Name | Description | Version |
| BT151-650R | TO-220AB; SC-46 | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB | SOT78 |

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 | | - | 650 | V |
| V_{RRM} | repetitive peak reverse voltage | | - | 650 | V |
| I _{T(AV)} | average on-state current | half sine wave; T _{mb} ≤ 109 °C; see <u>Figure 3</u> | - | 7.5 | Α |
| I _{T(RMS)} | RMS on-state current | half sine wave; $T_{mb} \le 109 ^{\circ}\text{C}$; see Figure 1; see Figure 2 | - | 12 | Α |
| 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 | Α |
| P_{GM} | peak gate power | | - | 5 | W |
| T _{stg} | storage temperature | | -40 | 150 | °C |
| Tj | junction temperature | | - | 125 | °C |
| I _{TSM} | non-repetitive peak | half sine wave; $t_p = 8.3 \text{ ms}$; $T_{j(init)} = 25 \text{ °C}$ | - | 132 | Α |
| | on-state current | half sine wave; $t_p = 10$ ms; $T_{j(init)} = 25$ °C; see Figure 4; see Figure 5 | - | 120 | Α |
| I ² t | I2t for fusing | t _p = 10 ms; sine-wave pulse | - | 72 | A^2s |
| $P_{G(AV)}$ | average gate power | over any 20 ms period | - | 0.5 | W |
| V_{RGM} | peak reverse gate voltage | | - | 5 | V |

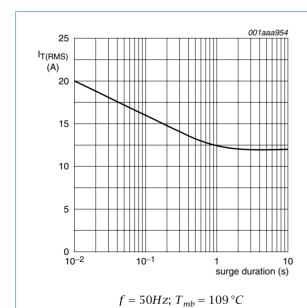


Fig 1. RMS on-state current as a function of surge duration; maximum values

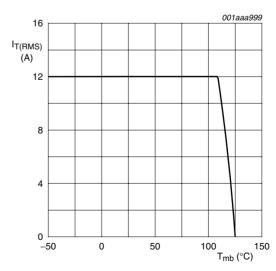


Fig 2. RMS on-state current as a function of mounting base temperature; maximum values

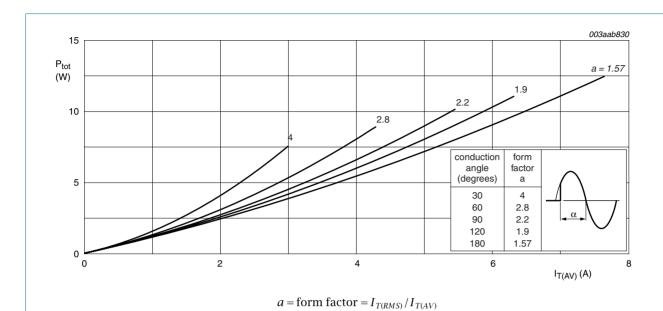


Fig 3. Total power dissipation as a function of average on-state current; maximum values

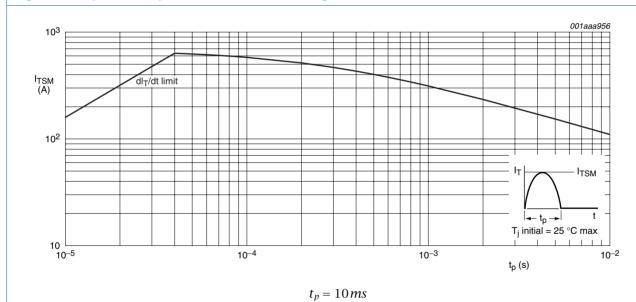
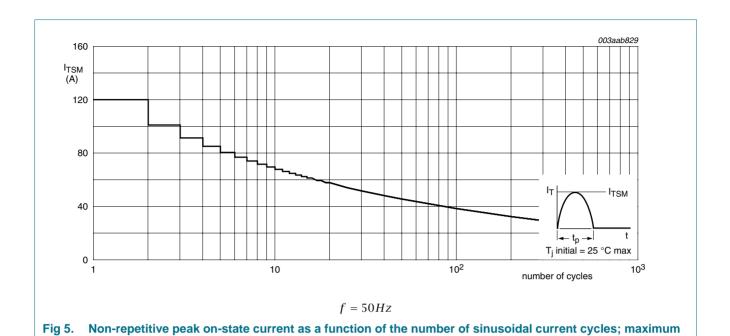


Fig 4. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values

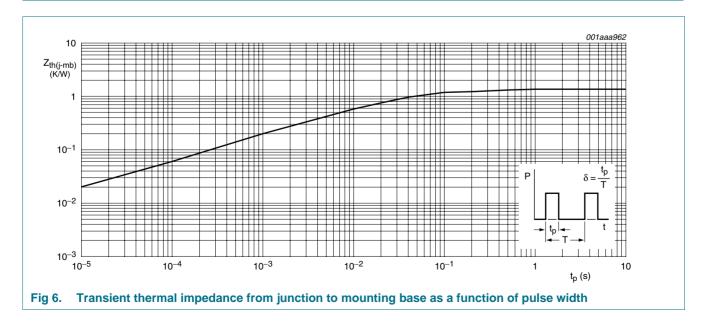


5. Thermal characteristics

Table 5. Thermal characteristics

values

| Symbol | Parameter | Conditions | Min | Тур | 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

| | • Harastoriotics | | | | | |
|---------------------------------------|-----------------------------------|--|------|------|------|------|
| Symbol | Parameter | Conditions | Min | Тур | Max | Unit |
| Static cha | racteristics | | | | | |
| I _{GT} | gate trigger current | $V_D = 12 \text{ V}; T_j = 25 \text{ °C}; I_T = 100 \text{ mA}; \text{ see}$ Figure 8 | - | 2 | 15 | mA |
| IL | latching current | $V_D = 12 \text{ V; } T_j = 25 \text{ °C; see } \frac{\text{Figure 9}}{}$ | - | 10 | 40 | mA |
| I _H | holding current | V _D = 12 V; T _j = 25 °C; see <u>Figure 10</u> | - | 7 | 20 | mA |
| V_{T} | on-state voltage | $I_T = 23 \text{ A}; T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure 11}}{\text{Figure 11}}$ | - | 1.4 | 1.75 | V |
| V_{GT} | gate trigger voltage | I_T = 100 mA; V_D = 12 V; T_j = 25 °C; see Figure 12 | - | 0.6 | 1.5 | V |
| | | $I_T = 100 \text{ mA}; V_D = 650 \text{ V}; T_j = 125 ^{\circ}\text{C}$ | 0.25 | 0.4 | - | V |
| I_D | off-state current | $V_D = 650 \text{ V}; T_j = 125 \text{ °C}$ | - | 0.1 | 0.5 | mΑ |
| I _R | reverse current | V _R = 650 V; T _j = 125 °C | - | 0.1 | 0.5 | mΑ |
| Dynamic | characteristics | | | | | |
| dV _D /dt rate of rivoltage | rate of rise of off-state voltage | V_{DM} = 435 V; T_j = 125 °C; exponential waveform; gate open circuit | 50 | 130 | - | V/µs |
| | | V_{DM} = 435 V; T_j = 125 °C; R_{GK} = 100 Ω ; exponential waveform; see Figure 7 | 200 | 1000 | - | V/µs |
| t _{gt} | gate-controlled turn-on time | $I_{TM} = 40 \text{ A}; V_D = 650 \text{ V}; I_G = 100 \text{ mA};$ $dI_G/dt = 5 \text{ A/}\mu\text{s}; T_j = 25 \text{ °C}$ | - | 2 | - | μs |
| t _q | commutated turn-off time | $V_{DM} = 435 \text{ V}; T_j = 125 \text{ °C}; I_{TM} = 20 \text{ A};$ $V_R = 25 \text{ V}; (dI_T/dt)_M = 30 \text{ A/µs};$ $dV_D/dt = 50 \text{ V/µs}; R_{GK} = 100 \Omega$ | - | 70 | - | μs |
| | | | | | | |

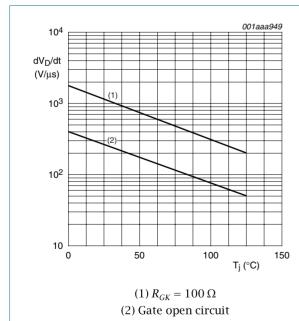


Fig 7. Critical rate of rise of off-state voltage as a function of junction temperature; minimum values

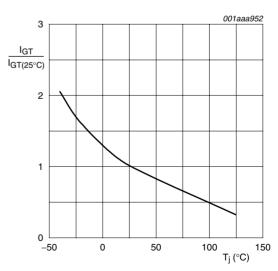


Fig 8. Normalized gate trigger current as a function of junction temperature

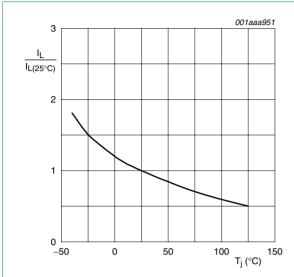


Fig 9. Normalized latching current as a function of junction temperature

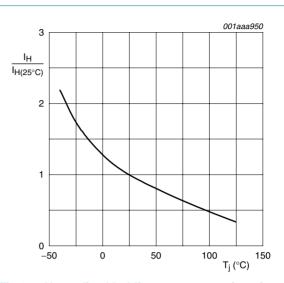
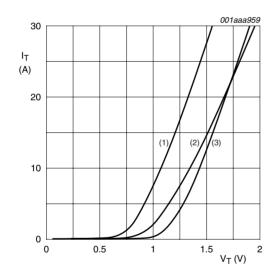


Fig 10. Normalized holding current as a function of junction temperature



 $V_0 = 1.06 \ V; \ R_s = 0.0304 \ \Omega$ (1) $T_j = 150 \ ^{\circ}C;$ typical values (2) $T_j = 150 \ ^{\circ}C;$ maximum values (3) $T_j = 25 \ ^{\circ}C;$ maximum values

Fig 11. On-state current as a function of on-state voltage

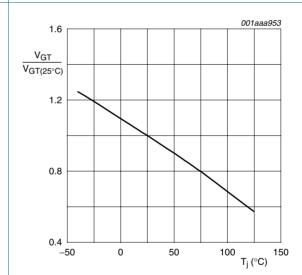


Fig 12. Normalized gate trigger voltage as a function of junction temperature

7. Package outline

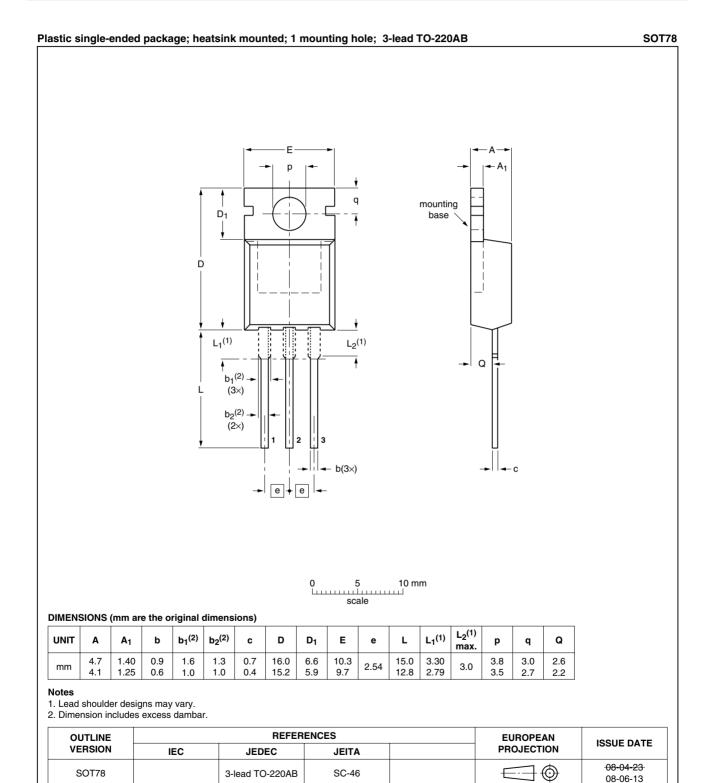


Fig 13. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

| Tuble II Itelioleli illott | J. J | | | |
|---------------------------------|--------------------------------|-------------------------|-------------------------|-----------------|
| Document ID | Release date | Data sheet status | Change notice | Supersedes |
| BT151-650R_5 | 20090227 | Product data sheet | - | BT151_SER_L_R_4 |
| Modifications: | Package ou | utline updated. | | |
| | Type numb | er BT151-650R separated | I from data sheet BT151 | I_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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| Document status [1][2] | Product status[3] | Definition |
|--------------------------------|-------------------|---|
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| 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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