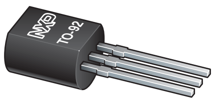



# BT131 series D and E

**Triacs logic level**

**Rev. 3 — 3 November 2011** **Product data sheet**

## 1. Product profile

### 1.1 General description

Passivated, sensitive gate triacs in a SOT54 plastic package.

### 1.2 Features and benefits

- Designed to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

### 1.3 Applications

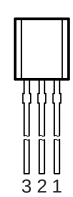
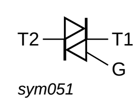
- General purpose switching and phase control

### 1.4 Quick reference data

- $V_{DRM} \leq 600$ V (BT131-600D)
- $V_{DRM} \leq 800$ V (BT131-800D)
- $I_{T(RMS)} \leq 1$ A
- $V_{DRM} \leq 600$ V (BT131-600E)
- $V_{DRM} \leq 800$ V (BT131-800E)
- $I_{TSM} \leq 12.5$ A

## 2. Pinning information

**Table 1. Pinning**

| Pin | Description | Simplified outline | Symbol |
|---|---|---|---|
| 1 | main terminal 2 (T2) |   **SOT54 (TO-92)** |   |
| 2 | gate (G) | | |
| 3 | main terminal 1 (T1) | | |

# 3. Ordering information

**Table 2. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BT131-600D | TO-92 | plastic single-ended leaded (through hole) package; 3 leads | SOT54 |
| BT131-600E | | | |
| BT131-800D | | | |
| BT131-800E | | | |

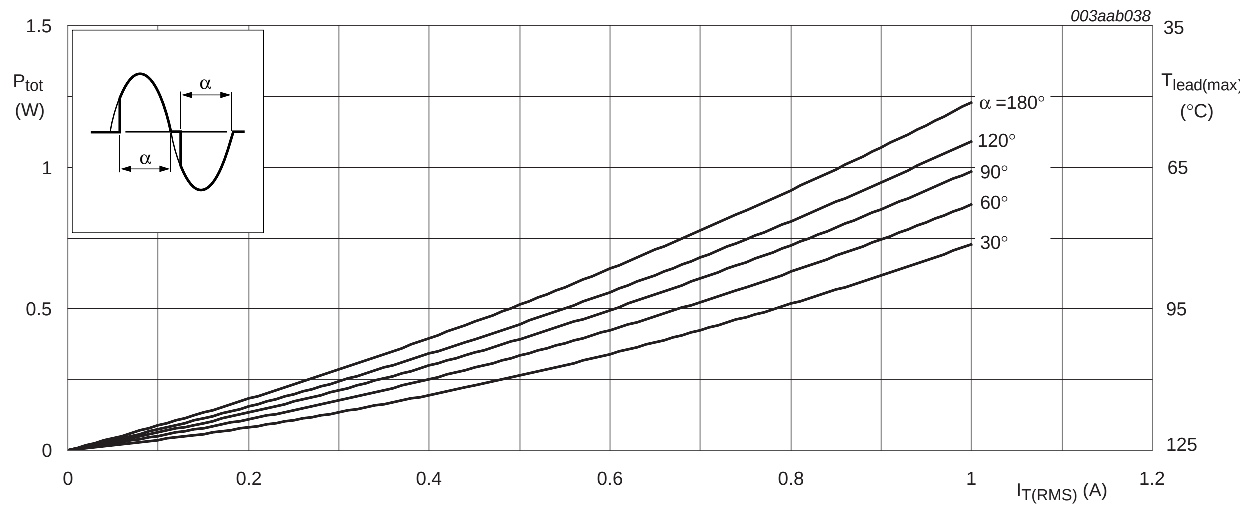
# 4. Limiting values

**Table 3. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

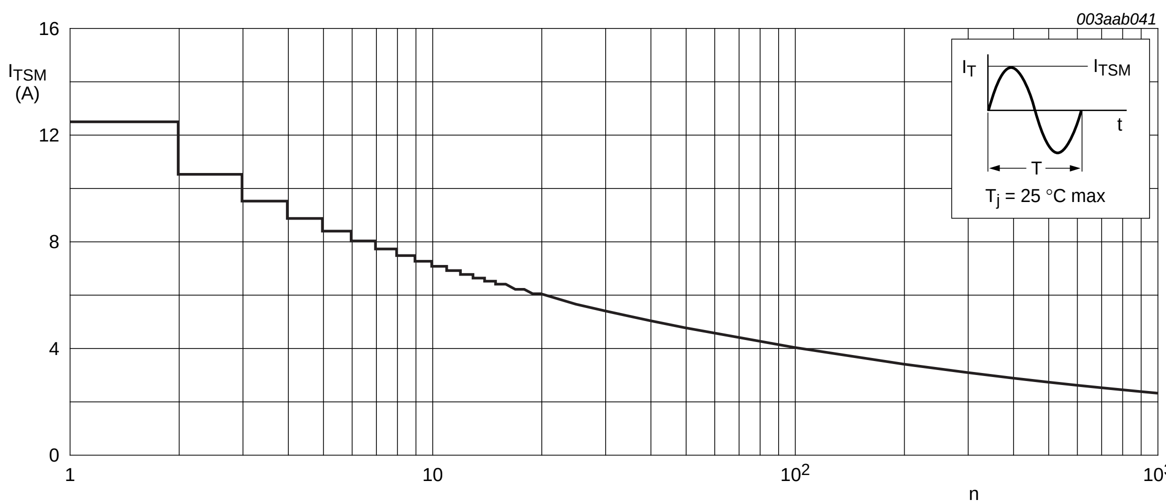
| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{DRM}$ | repetitive peak off-state voltage | | | | | |
| | BT131-600D, BT131-600E | | [1] | - | 600 | V |
| | BT131-800D, BT131-800E | | | - | 800 | V |
| $I_{T(RMS)}$ | RMS on-state current | all conduction angles; $T_{lead}$ = 51.2 °C; see Figure 1, 4 and 5 | | - | 1 | A |
| $I_{TSM}$ | non-repetitive peak on-state current | half sine wave; $T_j$ = 25 °C prior to surge; see Figure 2 and 3 | | | | |
| | | t = 20 ms | | - | 12.5 | A |
| | | t = 16.7 ms | | - | 13.7 | A |
| $I^2t$ | $I^2t$ for fusing | t = 10 ms | | - | 0.78 | $A^2s$ |
| $dI_T/dt$ | rate of rise of on-state current | $I_{TM}$ = 1.5 A; $I_G$ = 200 mA; $dI_G/dt$ = 200 mA/µs | | | | |
| | | T2+ G+ | | - | 50 | A/µs |
| | | T2+ G− | | - | 50 | A/µs |
| | | T2− G− | | - | 50 | A/µs |
| | | T2− G+ | | - | 10 | A/µs |
| $I_{GM}$ | peak gate current | | | - | 2 | A |
| $P_{GM}$ | peak gate power | | | - | 5 | W |
| $P_{G(AV)}$ | average gate power | over any 20 ms period | | - | 0.1 | W |
| $T_{stg}$ | storage temperature | | | −40 | +150 | °C |
| $T_j$ | junction temperature | | | - | 125 | °C |

[1] Although not recommended, off-state voltages up to 800 V may be applied without damage, but the triac may switch to the on-state. The rate of rise of current should not exceed 3 A/µs.



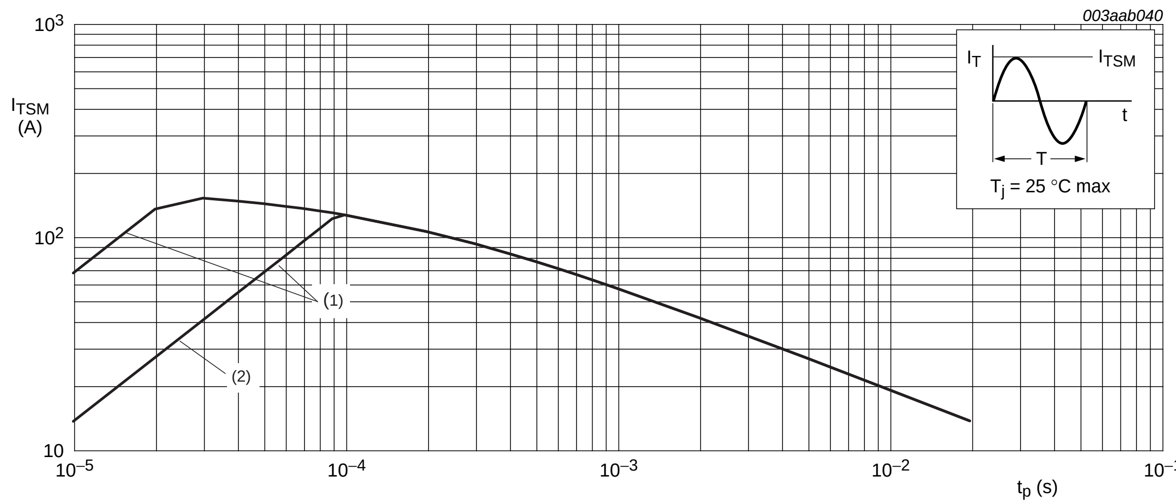

a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

**Fig 1. Total power dissipation as a function of RMS on-state current; maximum values**




f = 50 Hz

**Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values**

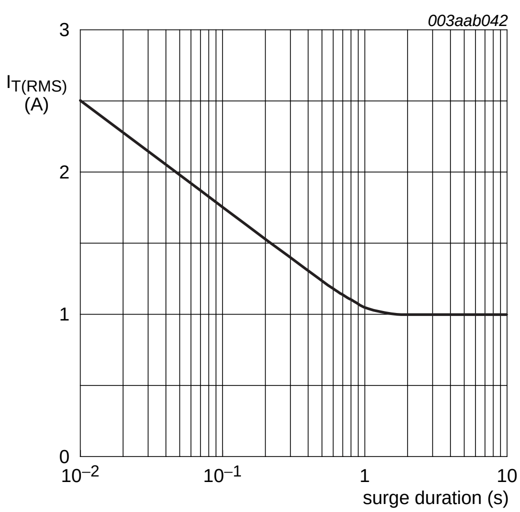



$t_p \leq 20$ ms

(1) $dI_T/dt$ limit

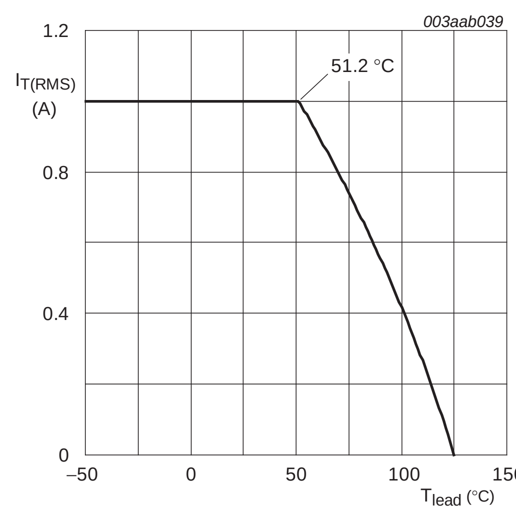
(2) T2– G+ quadrant

**Fig 3. Non-repetitive peak on-state current as a function of pulse duration for sinusoidal currents; maximum values**




f = 50 Hz; $T_{lead} \leq 51.2$ °C

**Fig 4. RMS on-state current as a function of surge duration, for sinusoidal currents; maximum values**




(1) $T_{lead}$ = 51.2 °C

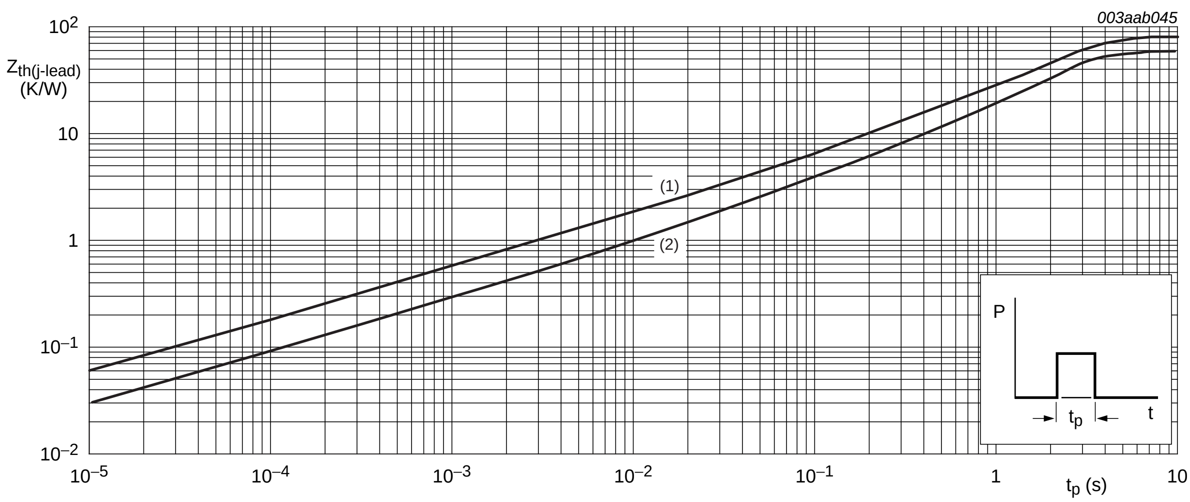
**Fig 5. RMS on-state current as a function of lead temperature; maximum values**

# 5. Thermal characteristics

**Table 4. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-lead)}$ | thermal resistance from junction to lead | full cycle | | - | - | 60 | K/W |
| | | half cycle | | - | - | 80 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | see Figure 6 | [1] | - | 150 | - | K/W |

[1] Mounted on a printed-circuit board; lead length = 4 mm




(1) half cycle

(2) full cycle

**Fig 6. Transient thermal impedance as a function of pulse duration**

## 6. Characteristics

**Table 5. Characteristics**

*$T_j$ = 25 °C unless otherwise stated.*

| Symbol | Parameter | Conditions | BT131-600D BT131-800D | | | BT131-600E BT131-800E | | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Typ | Max | |
| **Static characteristics** | | | | | | | | | |
| $I_{GT}$ | gate trigger current | $V_D$ = 12 V; $I_T$ = 100 mA; see Figure 8 | | | | | | | |
| | | T2+ G+ | - | - | 5 | - | - | 10 | mA |
| | | T2+ G– | - | - | 5 | - | - | 10 | mA |
| | | T2– G– | - | - | 5 | - | - | 10 | mA |
| | | T2– G+ | - | - | 7 | - | - | 10 | mA |
| $I_L$ | latching current | $V_D$ = 12 V; $I_{GT}$ = 100 mA; see Figure 10 | | | | | | | |
| | | T2+ G+ | - | - | 10 | - | - | 15 | mA |
| | | T2+ G– | - | - | 20 | - | - | 25 | mA |
| | | T2– G– | - | - | 10 | - | - | 15 | mA |
| | | T2– G+ | - | - | 10 | - | - | 15 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $I_{GT}$ = 100 mA; see Figure 11 | - | 1.3 | 10 | - | 1.3 | 10 | mA |
| $V_T$ | on-state voltage | $I_T$ = 1.4 A; see Figure 9 | - | 1.2 | 1.5 | - | 1.2 | 1.5 | V |
| $V_{GT}$ | gate trigger voltage | $I_T$ = 100 mA; see Figure 7 | | | | | | | |
| | | $V_D$ = 12 V; $T_j$ = 25 °C | - | 0.7 | 1.5 | - | 0.7 | 1.5 | V |
| | | $V_D$ = 400 V; $T_j$ = 125 °C | 0.2 | 0.3 | - | 0.2 | 0.3 | - | V |
| $I_D$ | off-state current | $V_D = V_{DRM(max)}$; $T_j$ = 125 °C | - | 0.1 | 0.5 | - | 0.1 | 0.5 | mA |
| **Dynamic characteristics** | | | | | | | | | |
| $dV_{com}/dt$ | rate of change of commutating voltage | $V_{DM}$ = 400 V; $T_j$ = 125 °C; $dI_{com}/dt$ = 0.5 A/ms | 3 | - | - | 5 | - | - | V/µs |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 67 % of $V_{DRM(max)}$; $T_j$ = 125 °C; exponential waveform; $R_{GK}$ = 1 kΩ; see Figure 12 | 20 | - | - | 50 | - | - | V/µs |
| $t_{gt}$ | gate-controlled turn-on time | $I_{TM}$ = 1.5 A; $V_D = V_{DRM(max)}$; $I_G$ = 100 mA; $dI_G/dt$ = 5 A/µs | - | 2 | - | - | 2 | - | µs |

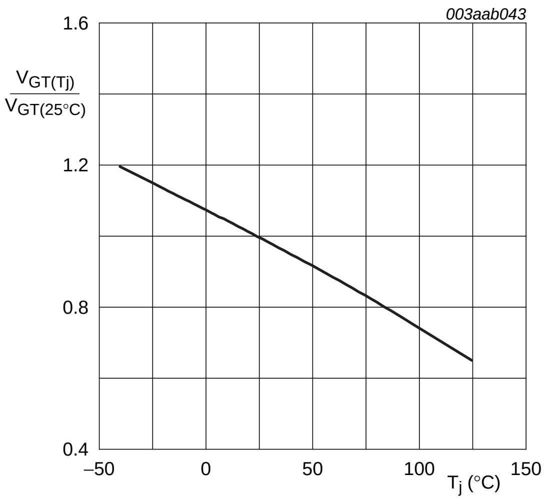
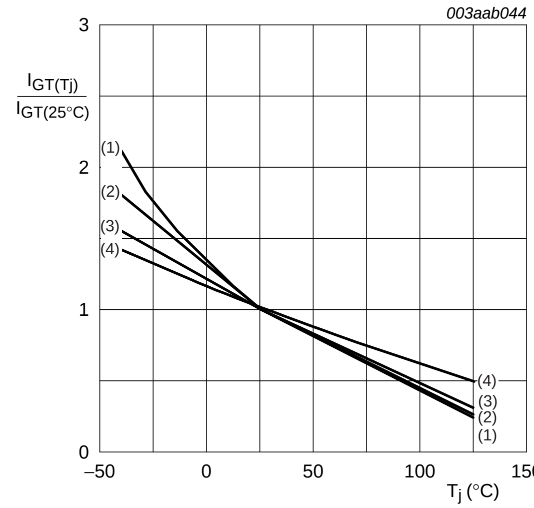
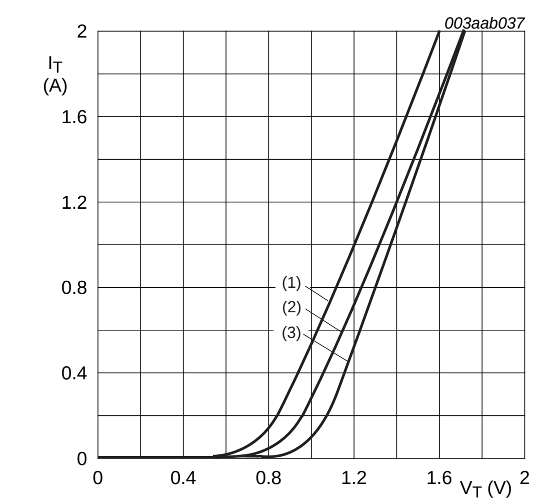



Fig 7. Normalized gate trigger voltage as a function of junction temperature




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

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




$V_o$ = 0.92 V
$R_s$ = 0.4 Ω.

(1) $T_j$ = 125 °C; typical values
(2) $T_j$ = 125 °C; maximum values
(3) $T_j$ = 25 °C; maximum values

Fig 9. On-state current characteristics

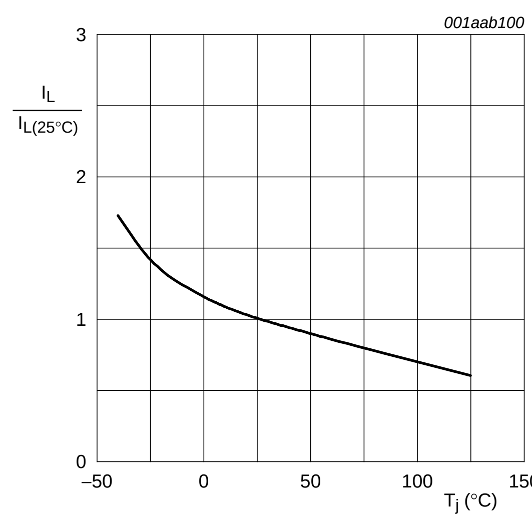



Fig 10. Normalized latching current as a function of junction temperature

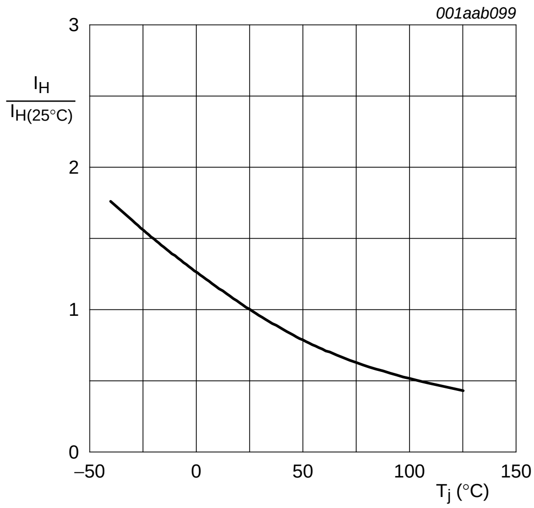
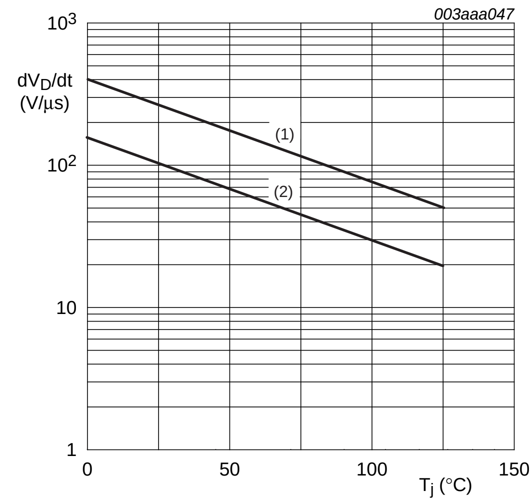



**Fig 11. Normalized holding current as a function of junction temperature**




(1) BT131-600E, BT131-800E

(2) BT131-600D, BT131-800D

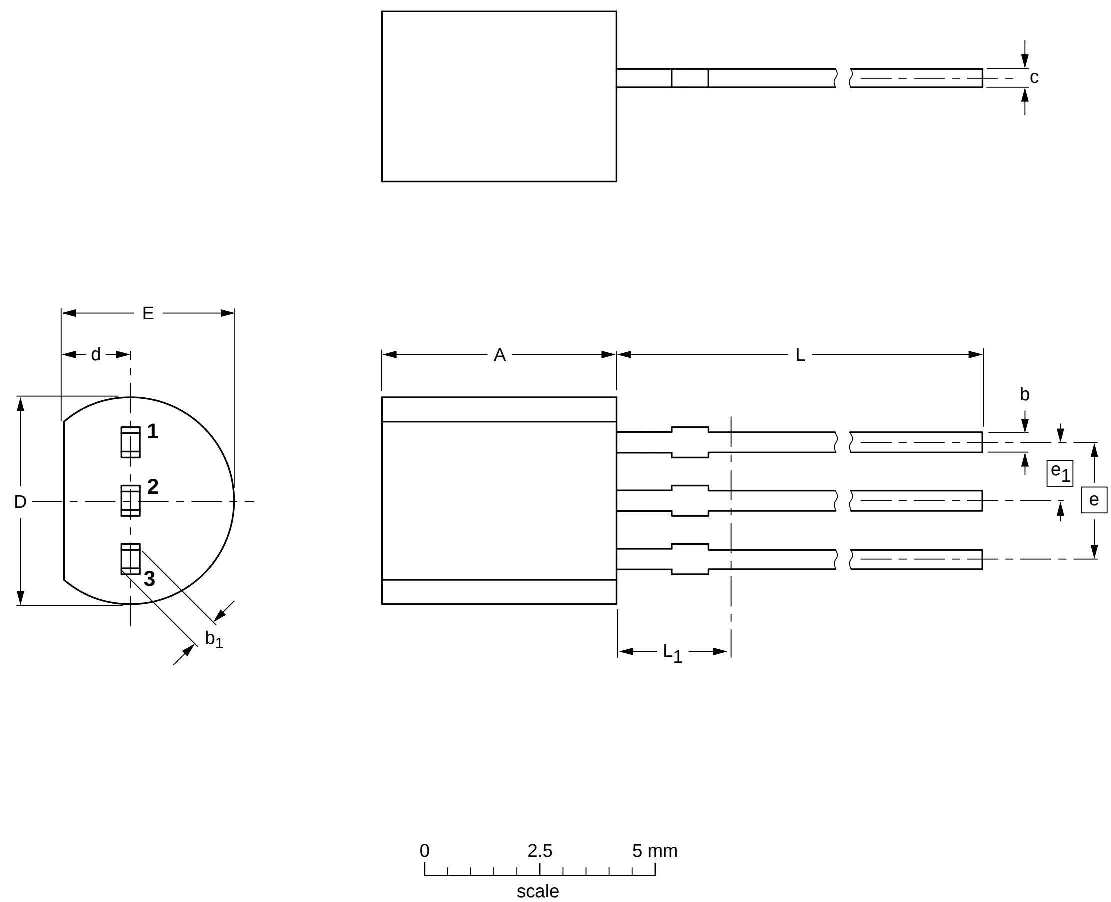
**Fig 12. Rate of rise of off-state voltage as a function of junction temperature; minimum values**

## 7. Package information

Epoxy meets requirements of UL94 V-0 at ⅛ inch.

# 8. Package outline

**Plastic single-ended leaded (through hole) package; 3 leads** **SOT54**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | b | $b_1$ | c | D | d | E | e | $e_1$ | L | $L_1^{(1)}$ max. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 5.2<br>5.0 | 0.48<br>0.40 | 0.66<br>0.55 | 0.45<br>0.38 | 4.8<br>4.4 | 1.7<br>1.4 | 4.2<br>3.6 | 2.54 | 1.27 | 14.5<br>12.7 | 2.5 |

**Note**

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT54 | | TO-92 | SC-43A | | | ~~04-06-28~~<br>04-11-16 |

**Fig 13. Package outline SOT54 (TO-92)**

## 9. Revision history

**Table 6. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BT131_SER_D_E v.3 | 20111103 | Product data sheet | - | BT131_SER_D_E v.2 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.<br>• Legal texts have been adapted to the new company name where appropriate. | | | |
| BT131_SER_D_E v.2 | 20051117 | Product data sheet | - | BT131_SER_D_E v.1 |
| BT131_SER_D_E v.1 | 20040501 | Product specification | - | - |

# 10. Legal information

## 10.1 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. |
| 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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## 12. Contents





**Date of release: 3 November 2011**
**Document identifier: BT131_SER_D_E**