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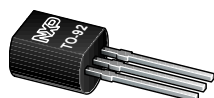
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# BT131-600E

4Q Triac

6 May 2015

Product data sheet

## 1. General description

Planar passivated sensitive gate four quadrant triac in a SOT54 plastic package. This sensitive gate "series E" triac is intended for interfacing with low power drivers including microcontrollers.

## 2. Features and benefits

- Direct interfacing to logic level ICs
- Direct interfacing with low power gate drivers and microcontrollers
- High blocking voltage capability
- Planar passivated for voltage ruggedness and reliability
- Sensitive gate in four quadrants
- Triggering in all four quadrants

## 3. Applications

- Air conditioner indoor fan control
- General purpose low power motor control
- General purpose switching and phase control

## 4. Quick reference data

Table 1. Quick reference data

| Symbol                        | Parameter                            | Conditions   | Min | Typ | Max  | Unit |
|-------------------------------|--------------------------------------|--|-----|-----|------|------|
| $V_{DRM}$                     | repetitive peak off-state voltage    |  | -   | -   | 600  | V    |
| $I_{TSM}$                     | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>   | -   | -   | 12.5 | A    |
| $I_{T(RMS)}$                  | RMS on-state current                 | full sine wave; $T_{\text{lead}} \leq 51\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | -   | -   | 1    | A    |
| <b>Static characteristics</b> |                                      |  |     |     |      |      |
| $I_{GT}$                      | gate trigger current                 | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>                             | -   | -   | 10   | mA   |
|                               |                                      | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>                             | -   | -   | 10   | mA   |
|                               |                                      | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>                             | -   | -   | 10   | mA   |



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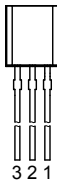
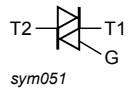
**BT131-600E**

4Q Triac

| Symbol | Parameter | Conditions  | Min | Typ | Max | Unit |
|--------|-----------|---|-----|-----|-----|------|
|        |           | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+;<br>$T_J = 25\text{ °C}$ ; <a href="#">Fig. 7</a> | -   | -   | 10  | mA   |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description     | Simplified outline  | Graphic symbol   |
|-----|--------|-----------------|---|--|
| 1   | T2     | main terminal 2 | <br><b>TO-92 (SOT54)</b> | <br><i>sym051</i> |
| 2   | G      | gate            |   |  |
| 3   | T1     | main terminal 1 |   |  |

## 6. Ordering information

Table 3. Ordering information

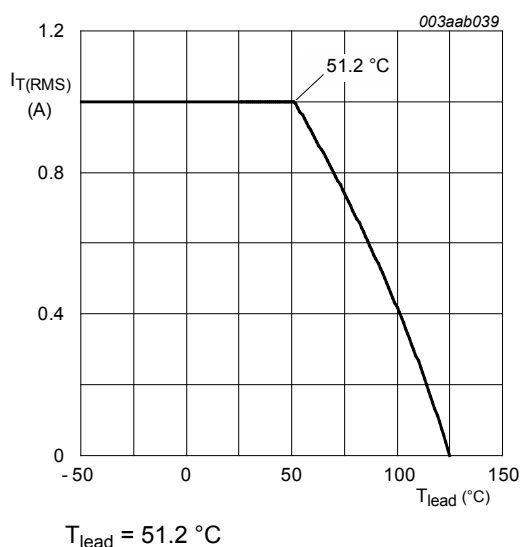
| Type number | Package |   |         |
|-------------|---------|---|---------|
|             | Name    | Description   | Version |
| BT131-600E  | TO-92   | plastic single-ended leaded (through hole) package; 3 leads | SOT54   |

## 7. Limiting values

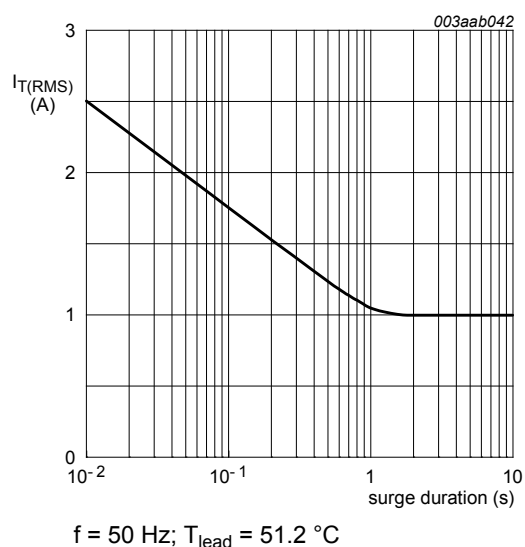
**Table 4. Limiting values**

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

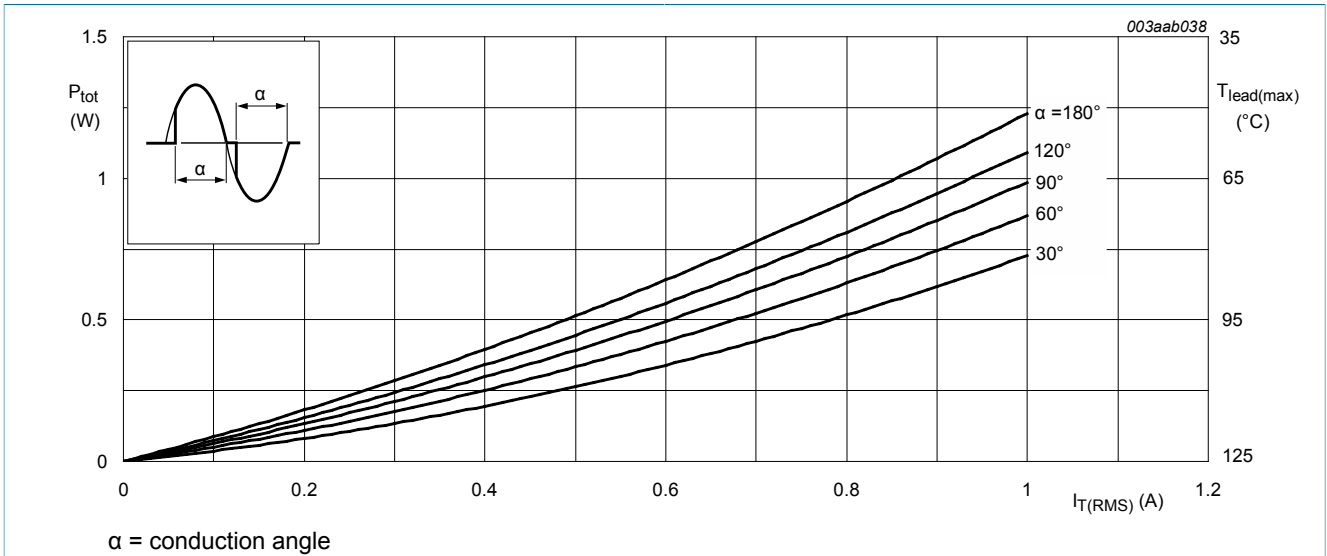
| Symbol       | Parameter                            | Conditions  | Min | Max  | Unit                   |
|--------------|--------------------------------------|---|-----|------|------------------------|
| $V_{DRM}$    | repetitive peak off-state voltage    |   | -   | 600  | V                      |
| $I_{T(RMS)}$ | RMS on-state current                 | full sine wave; $T_{lead} \leq 51\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | -   | 1    | A                      |
| $I_{TSM}$    | non-repetitive peak on-state current | full sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>   | -   | 12.5 | A                      |
|              |                                      | full sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 16.7\text{ ms}$   | -   | 13.7 | A                      |
| $I^2t$       | $I^2t$ for fusing                    | $t_p = 10\text{ ms}$ ; SIN  | -   | 0.78 | $\text{A}^2\text{s}$   |
| $di_T/dt$    | rate of rise of on-state current     | $I_G = 20\text{ mA}$ ; T2+ G+   | -   | 50   | $\text{A}/\mu\text{s}$ |
|              |                                      | $I_G = 20\text{ mA}$ ; T2+ G-   | -   | 50   | $\text{A}/\mu\text{s}$ |
|              |                                      | $I_G = 20\text{ mA}$ ; T2- G+   | -   | 10   | $\text{A}/\mu\text{s}$ |
|              |                                      | $I_G = 20\text{ mA}$ ; T2- G-   | -   | 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   | -   | 0.1  | W                      |
| $T_{stg}$    | storage temperature                  |   | -40 | 150  | $^{\circ}\text{C}$     |
| $T_j$        | junction temperature                 |   | -   | 125  | $^{\circ}\text{C}$     |



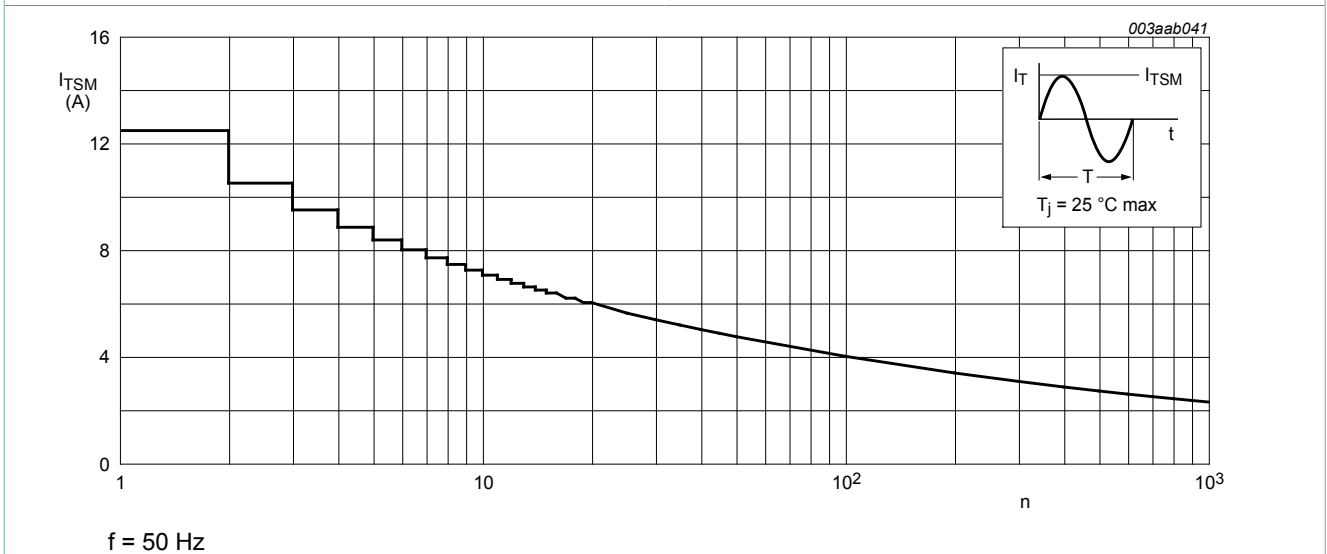
**Fig. 1. RMS on-state current as a function of lead temperature; maximum values**



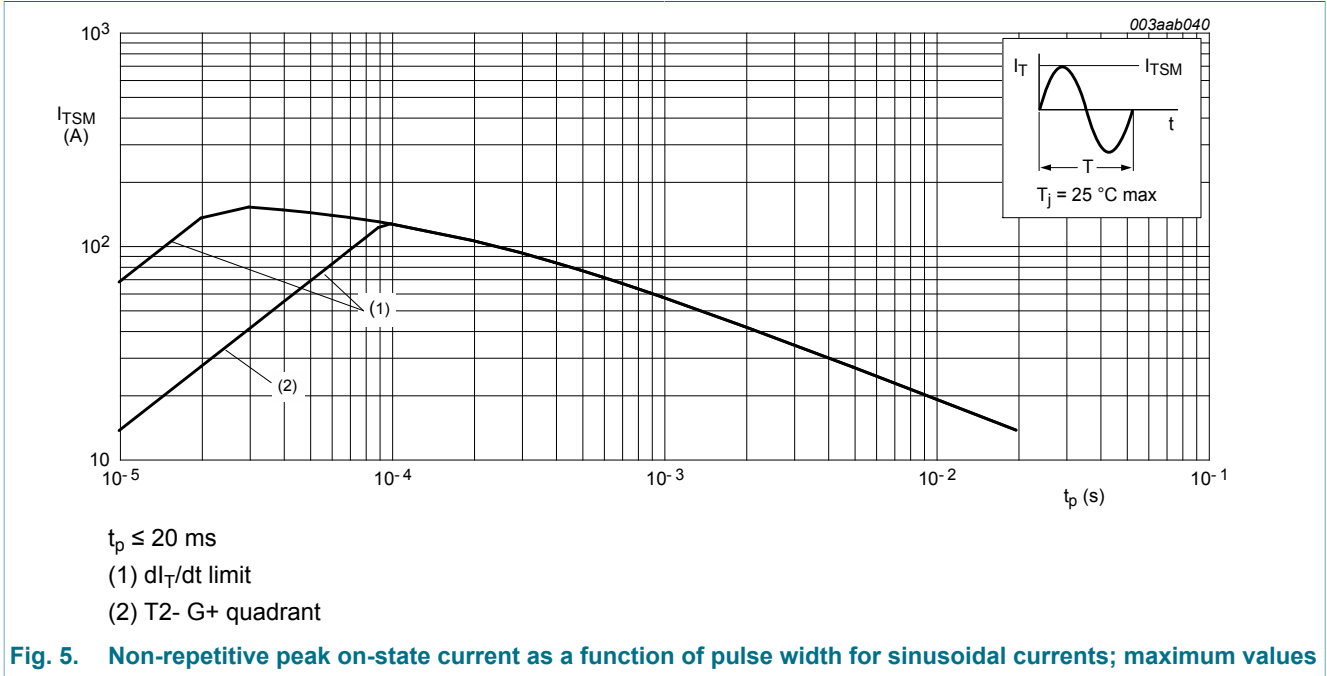
**Fig. 2. RMS on-state current as a function of surge duration; maximum values**



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



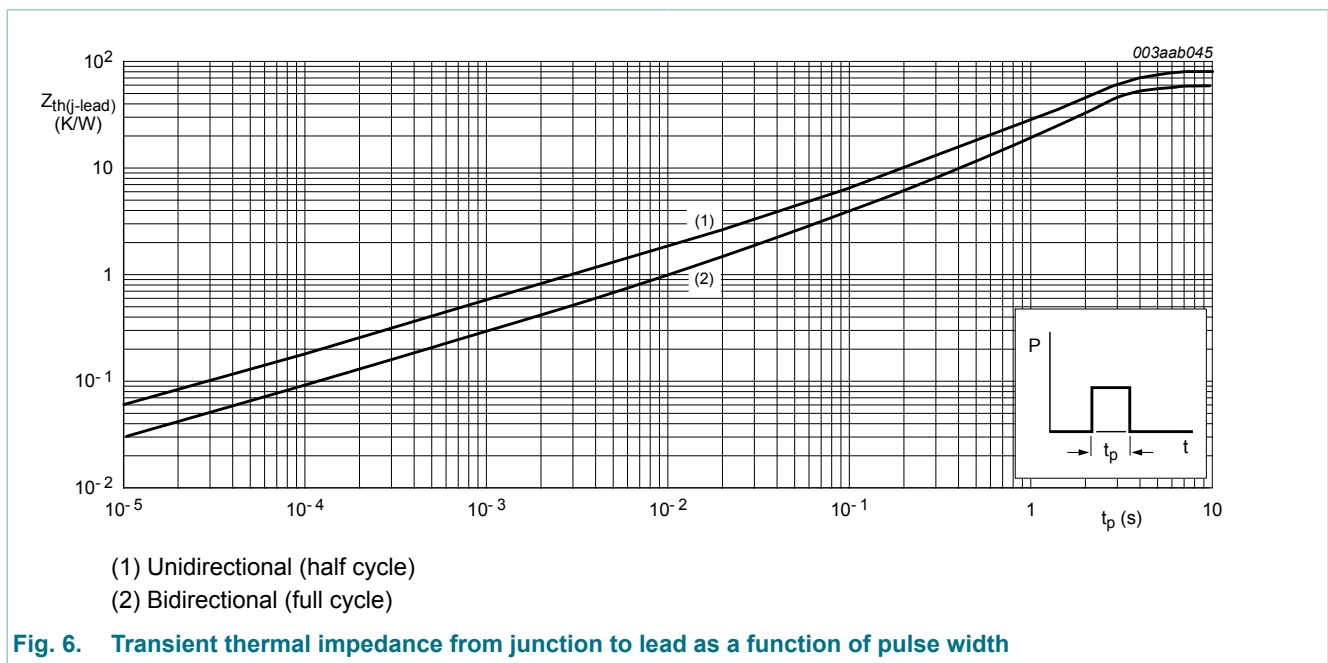
**Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values**



## 8. Thermal characteristics

**Table 5. Thermal characteristics**

| Symbol           | Parameter                                   | Conditions                                      | Min | Typ | Max | Unit |
|------------------|---|---|-----|-----|-----|------|
| $R_{th(j-lead)}$ | thermal resistance from junction to lead    | full cycle; Fig. 6                              | -   | -   | 60  | K/W  |
|                  |   | half cycle; Fig. 6                              | -   | -   | 80  | K/W  |
| $R_{th(j-a)}$    | thermal resistance from junction to ambient | printed circuit board mounted: lead length 4 mm | -   | 150 | -   | K/W  |

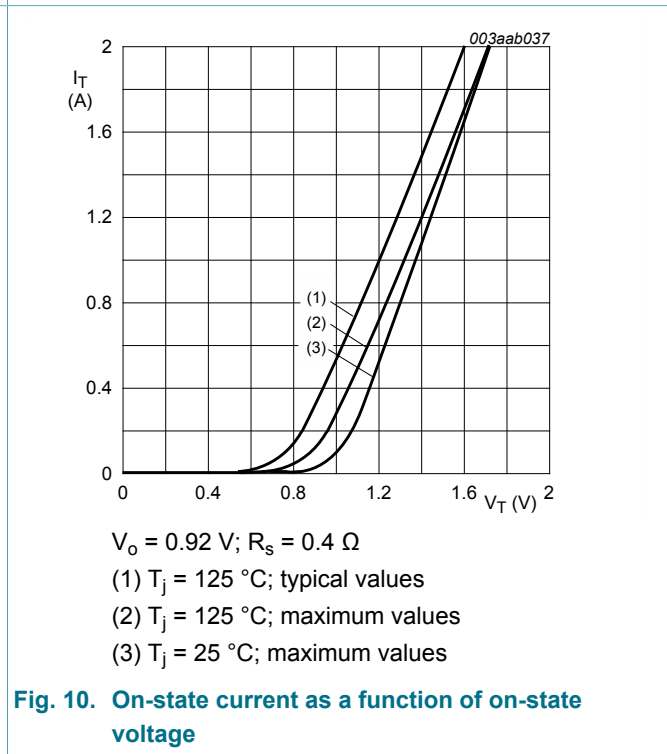
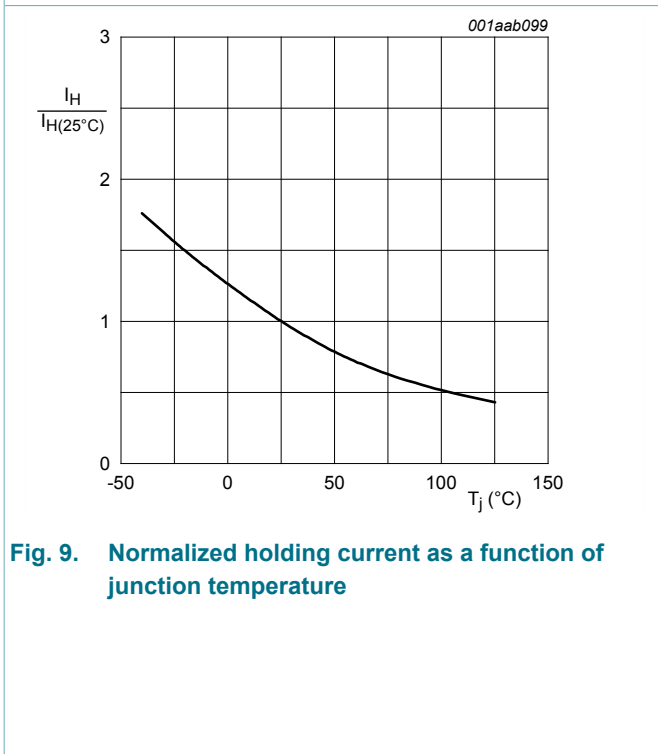
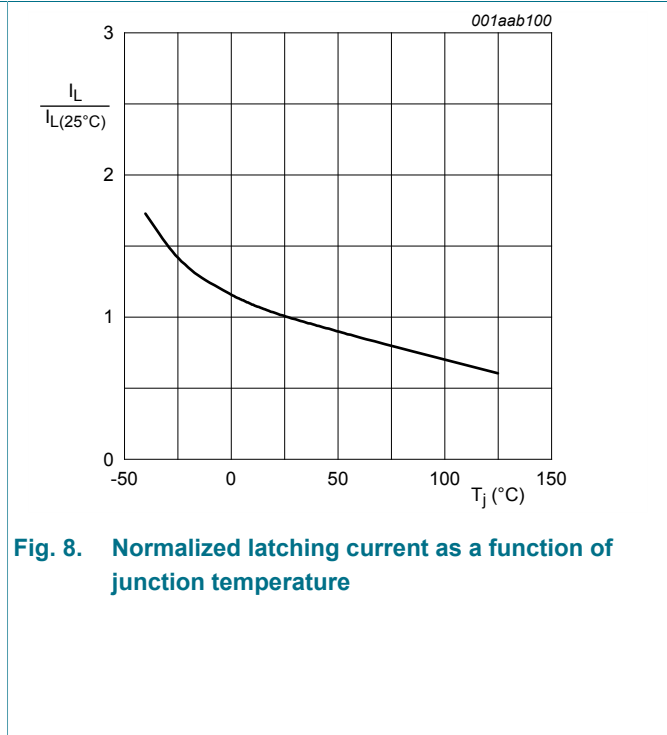
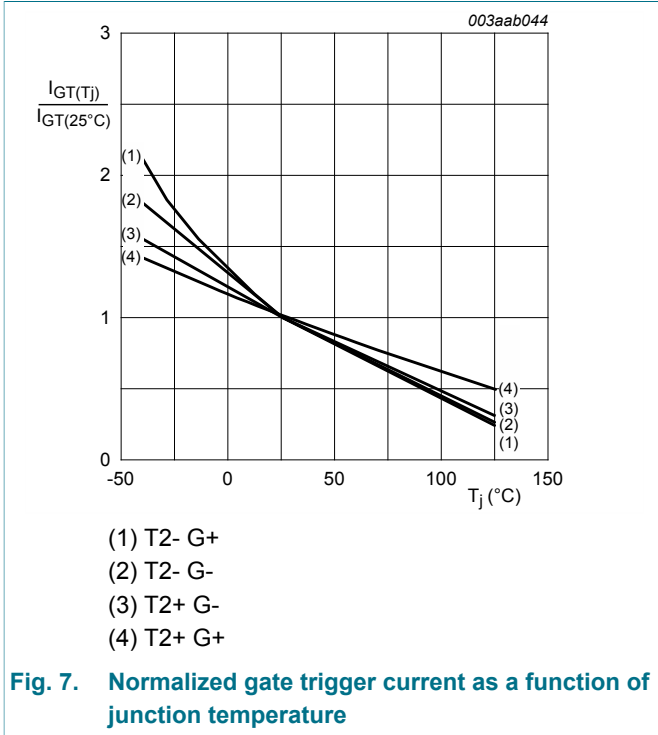


## 9. Characteristics

Table 6. Characteristics

| Symbol                         | Parameter                             | Conditions  | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------------|---|-----|-----|-----|------|
| <b>Static characteristics</b>  |                                       |   |     |     |     |      |
| I <sub>GT</sub>                | gate trigger current                  | V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.1 A; T2+ G+;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>  | -   | -   | 10  | mA   |
|                                |                                       | V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.1 A; T2+ G-;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>  | -   | -   | 10  | mA   |
|                                |                                       | V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.1 A; T2- G-;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>  | -   | -   | 10  | mA   |
|                                |                                       | V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.1 A; T2- G+;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>  | -   | -   | 10  | mA   |
| I <sub>L</sub>                 | latching current                      | V <sub>D</sub> = 12 V; I <sub>G</sub> = 0.1 A; T2+ G+;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>  | -   | -   | 15  | mA   |
|                                |                                       | V <sub>D</sub> = 12 V; I <sub>G</sub> = 0.1 A; T2+ G-;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>  | -   | -   | 25  | mA   |
|                                |                                       | V <sub>D</sub> = 12 V; I <sub>G</sub> = 0.1 A; T2- G-;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>  | -   | -   | 15  | mA   |
|                                |                                       | V <sub>D</sub> = 12 V; I <sub>G</sub> = 0.1 A; T2- G+;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>  | -   | -   | 15  | mA   |
| I <sub>H</sub>                 | holding current                       | V <sub>D</sub> = 12 V; T <sub>j</sub> = 25 °C; <a href="#">Fig. 9</a>   | -   | 1.3 | 10  | mA   |
| V <sub>T</sub>                 | on-state voltage                      | I <sub>T</sub> = 1.4 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 10</a>   | -   | 1.2 | 1.5 | V    |
| V <sub>GT</sub>                | gate trigger voltage                  | V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.1 A; T <sub>j</sub> = 25 °C;<br><a href="#">Fig. 11</a>   | -   | 0.7 | 1   | V    |
|                                |                                       | V <sub>D</sub> = 400 V; I <sub>T</sub> = 0.1 A; T <sub>j</sub> = 125 °C;<br><a href="#">Fig. 11</a>   | 0.2 | 0.3 | -   | V    |
| I <sub>D</sub>                 | off-state current                     | V <sub>D</sub> = 600 V; T <sub>j</sub> = 125 °C   | -   | 0.1 | 0.5 | mA   |
| <b>Dynamic characteristics</b> |                                       |   |     |     |     |      |
| dV <sub>D</sub> /dt            | rate of rise of off-state voltage     | V <sub>DM</sub> = 402 V; T <sub>j</sub> = 125 °C; R <sub>GT1</sub> = 1 kΩ;<br>(V <sub>DM</sub> = 67% of V <sub>DRM</sub> ); exponential waveform; gate open circuit | 50  | -   | -   | V/μs |
| dV <sub>com</sub> /dt          | rate of change of commutating voltage | V <sub>D</sub> = 400 V; T <sub>j</sub> = 125 °C; dI <sub>com</sub> /dt = 0.5 A/ms; I <sub>T</sub> = 1 A; gate open circuit  | 5   | -   | -   | V/μs |
| t <sub>gt</sub>                | gate-controlled turn-on time          | I <sub>TM</sub> = 1.5 A; V <sub>D</sub> = 600 V; I <sub>G</sub> = 0.1 A; dI <sub>G</sub> /dt = 5 A/μs   | -   | 2   | -   | μs   |





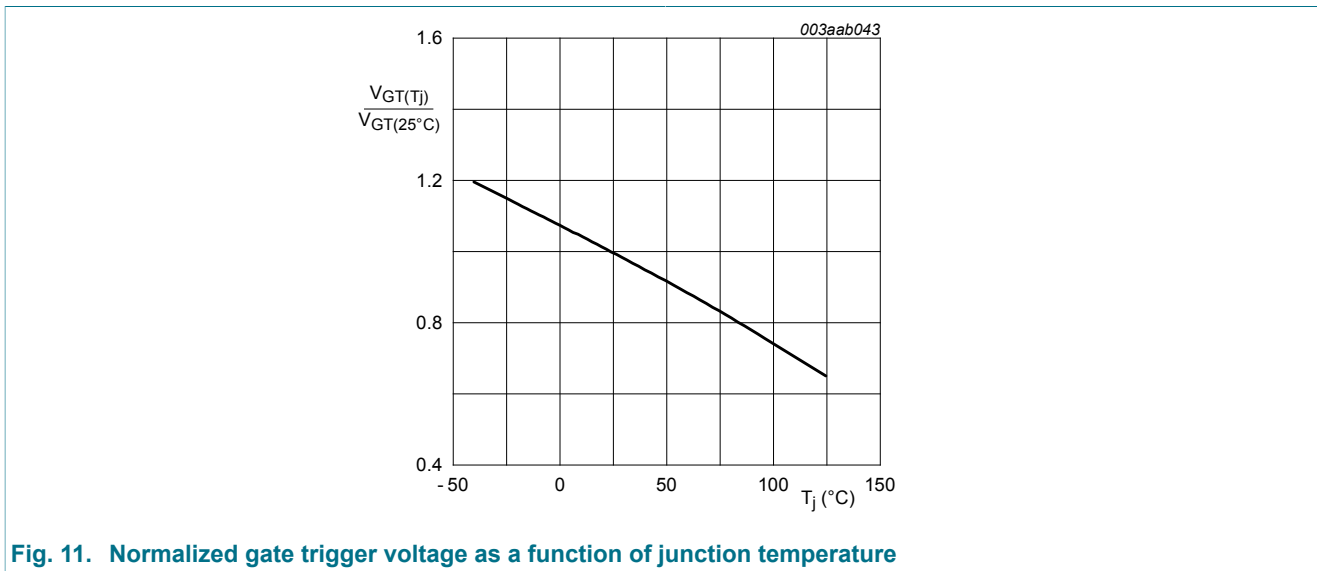
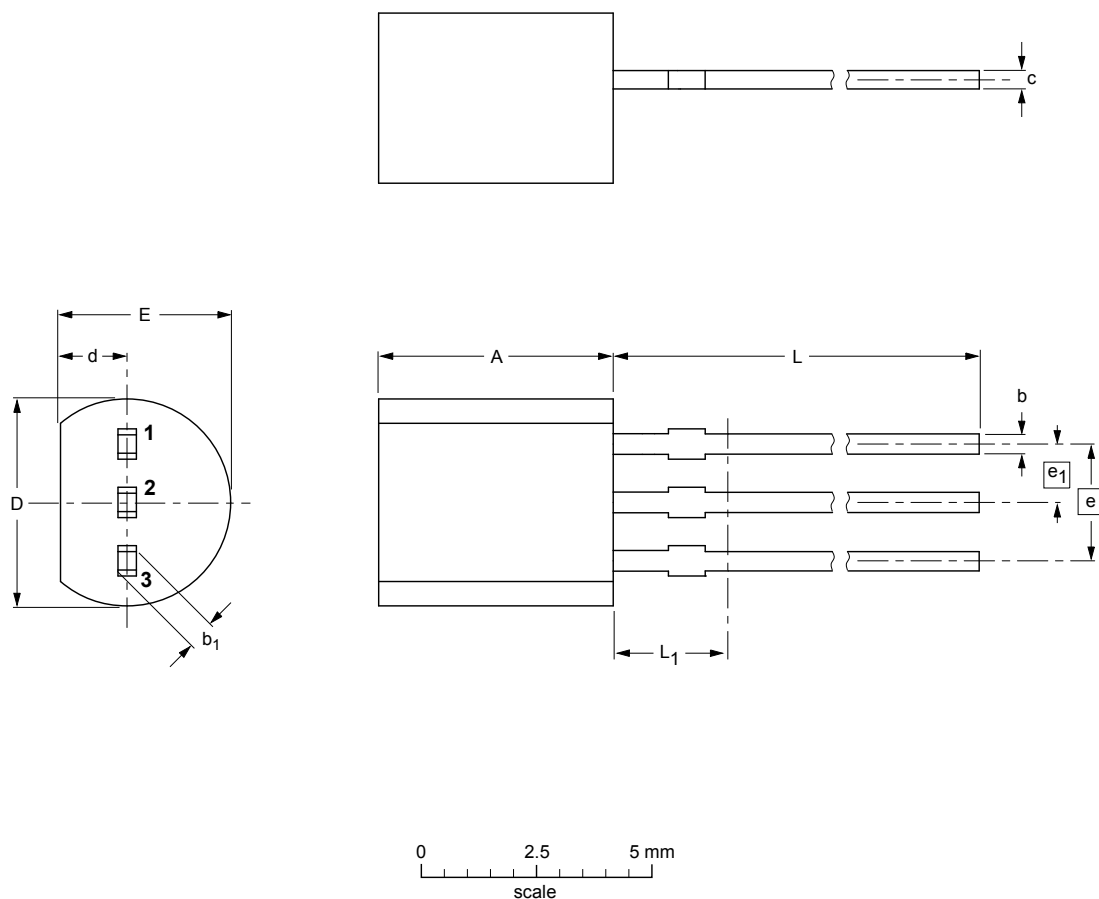


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

**10. Package outline**

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

SOT54



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

| UNIT | A          | b            | b <sub>1</sub> | c            | D          | d          | E          | e    | e <sub>1</sub> | L            | L <sub>1</sub> <sup>(1)</sup><br>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. 12. Package outline TO-92 (SOT54)**

## 11. Legal information

### 11.1 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".
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