

# BTA2008-800E

3Q Hi-Com Triac

8 November 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Planar passivated high commutation three quadrant triac in a SOT54 (TO-92) plastic package. This "series E" triac balances the requirements of commutation performance and gate sensitivity and is intended for interfacing with low power drivers and logic ICs including microcontrollers.

### 1.2 Features and benefits

- 3Q technology for improved noise immunity
- Direct gate triggering from low power drivers and logic ICs
- High commutation capability with sensitive gate
- High voltage capability
- Planar passivated for voltage ruggedness and reliability
- Sensitive gate for easy logic level triggering
- Triggering in three quadrants only

### 1.3 Applications

- Low power motor controls
- Small inductive loads e.g. solenoids, door locks, water valves
- Small loads in large white goods

### 1.4 Quick reference data

Table 1. Quick reference data

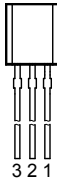
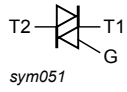
| Symbol                        | Parameter                            | Conditions                                                                                                                                                 | Min | Typ | Max | Unit |
|-------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| $V_{\text{DRM}}$              | repetitive peak off-state voltage    |                                                                                                                                                            | -   | -   | 800 | V    |
| $I_{\text{TSM}}$              | non-repetitive peak on-state current | full sine wave; $T_{\text{J}(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_{\text{p}} = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a> | -   | -   | 9   | A    |
| $I_{\text{T(RMS)}}$           | RMS on-state current                 | full sine wave; $T_{\text{lead}} \leq 70\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>               | -   | -   | 0.8 | A    |
| <b>Static characteristics</b> |                                      |                                                                                                                                                            |     |     |     |      |
| $I_{\text{GT}}$               | gate trigger current                 | $V_{\text{D}} = 12\text{ V}$ ; $I_{\text{T}} = 0.1\text{ A}$ ; T2+ G+; $T_{\text{J}} = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>                | 0.5 | -   | 10  | mA   |
|                               |                                      | $V_{\text{D}} = 12\text{ V}$ ; $I_{\text{T}} = 0.1\text{ A}$ ; T2+ G-; $T_{\text{J}} = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>                | 0.5 | -   | 10  | mA   |



| Symbol | Parameter | Conditions                                                                                                        | Min | Typ | Max | Unit |
|--------|-----------|-------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
|        |           | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a> | 0.5 | -   | 10  | mA   |

## 2. Pinning information

Table 2. Pinning information

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

## 3. Ordering information

Table 3. Ordering information

| Type number  | Package |                                                             |         |
|--------------|---------|-------------------------------------------------------------|---------|
|              | Name    | Description                                                 | Version |
| BTA2008-800E | TO-92   | plastic single-ended leaded (through hole) package; 3 leads | SOT54   |

## 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    |                                                                                                                                        | -   | 800  | V                |
| $I_{T(RMS)}$ | RMS on-state current                 | full sine wave; $T_{lead} \leq 70\text{ }^\circ\text{C}$ ; <a href="#">Fig. 1</a> ;<br><a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | -   | 0.8  | A                |
| $I_{TSM}$    | non-repetitive peak on-state current | full sine wave; $T_{j(init)} = 25\text{ }^\circ\text{C}$ ;<br>$t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>   | -   | 9    | A                |
|              |                                      | full sine wave; $T_{j(init)} = 25\text{ }^\circ\text{C}$ ;<br>$t_p = 16.7\text{ ms}$                                                   | -   | 9.9  | A                |
| $I^2t$       | $I^2t$ for fusing                    | $t_p = 10\text{ ms}$ ; SIN                                                                                                             | -   | 0.41 | A <sup>2</sup> s |
| $di_T/dt$    | rate of rise of on-state current     | $I_T = 1.5\text{ A}$ ; $I_G = 20\text{ mA}$ ; $di_G/dt = 0.2\text{ A}/\mu\text{s}$                                                     | -   | 100  | A/ $\mu\text{s}$ |
| $I_{GM}$     | peak gate current                    |                                                                                                                                        | -   | 1    | A                |
| $P_{GM}$     | peak gate power                      |                                                                                                                                        | -   | 2    | W                |
| $P_{G(AV)}$  | average gate power                   | over any 20 ms period                                                                                                                  | -   | 0.1  | W                |
| $T_{stg}$    | storage temperature                  |                                                                                                                                        | -40 | 150  | $^\circ\text{C}$ |

| Symbol | Parameter            | Conditions |  | Min | Max | Unit |
|--------|----------------------|------------|--|-----|-----|------|
| $T_j$  | junction temperature |            |  | -   | 125 | °C   |

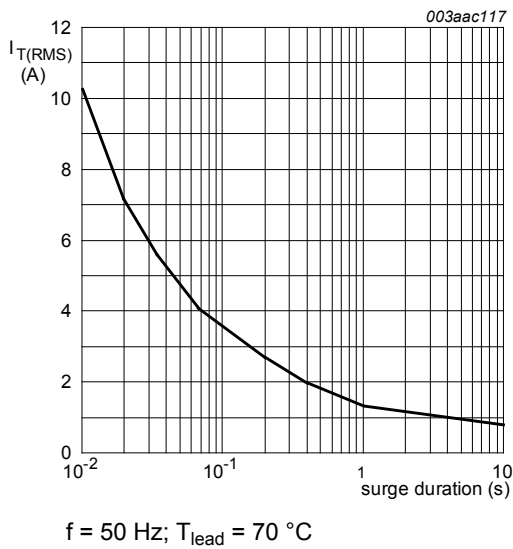


Fig. 1. RMS on-state current as a function of surge duration; maximum values

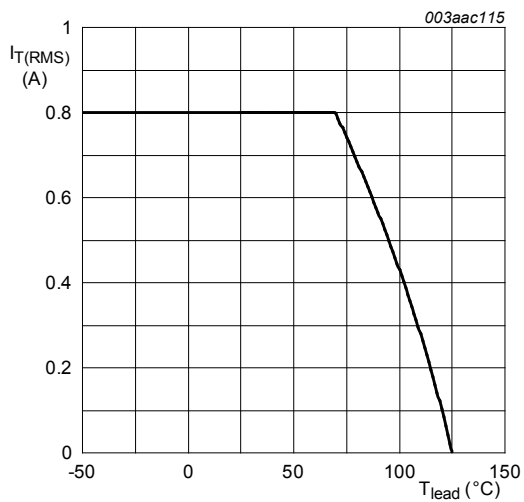


Fig. 2. RMS on-state current as a function of lead temperature; maximum values

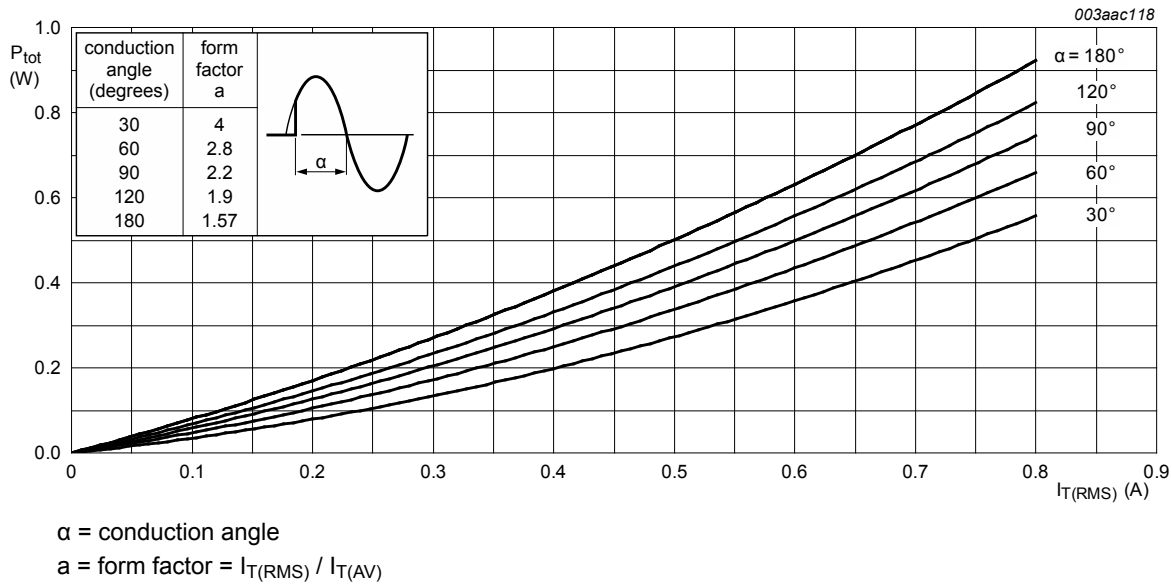


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

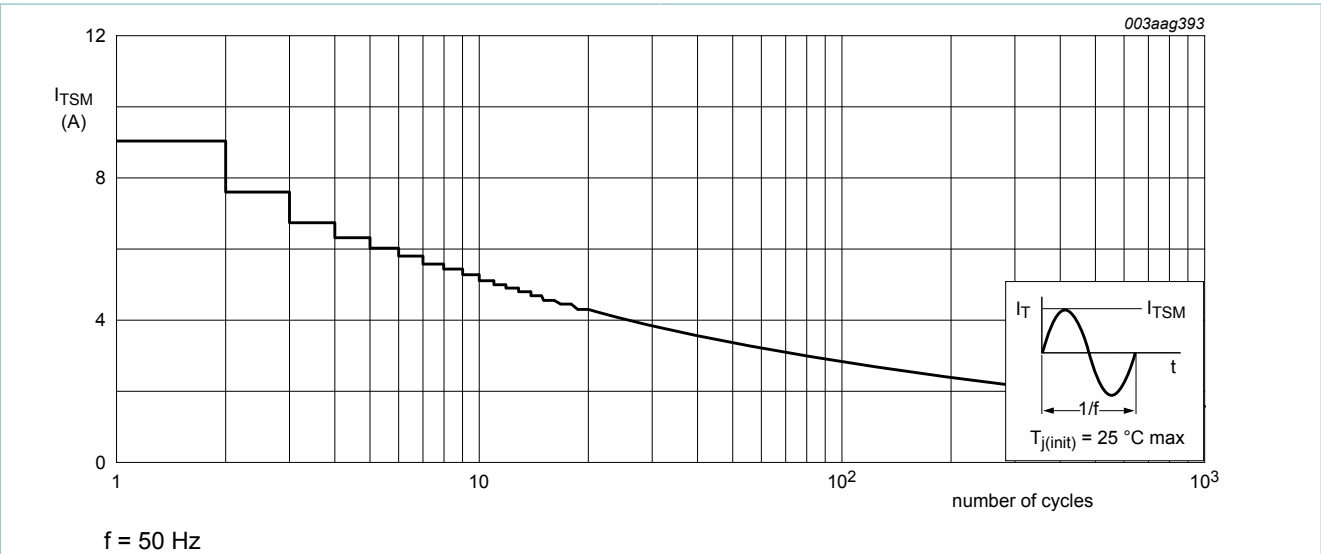


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

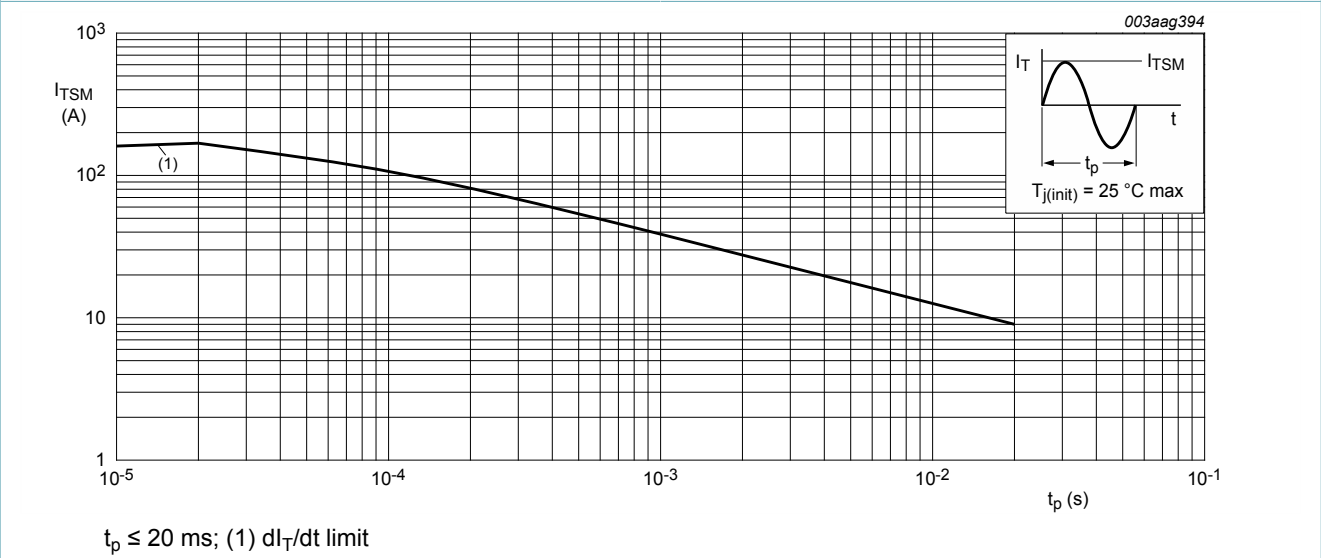


Fig. 5. Non-repetitive peak on-state current as a function of pulse duration; maximum values

## 5. 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  |
| $R_{th(j-a)}$    | thermal resistance from junction to ambient | printed circuit board mounted: lead length = 4 mm | -   | 150 | -   | K/W  |

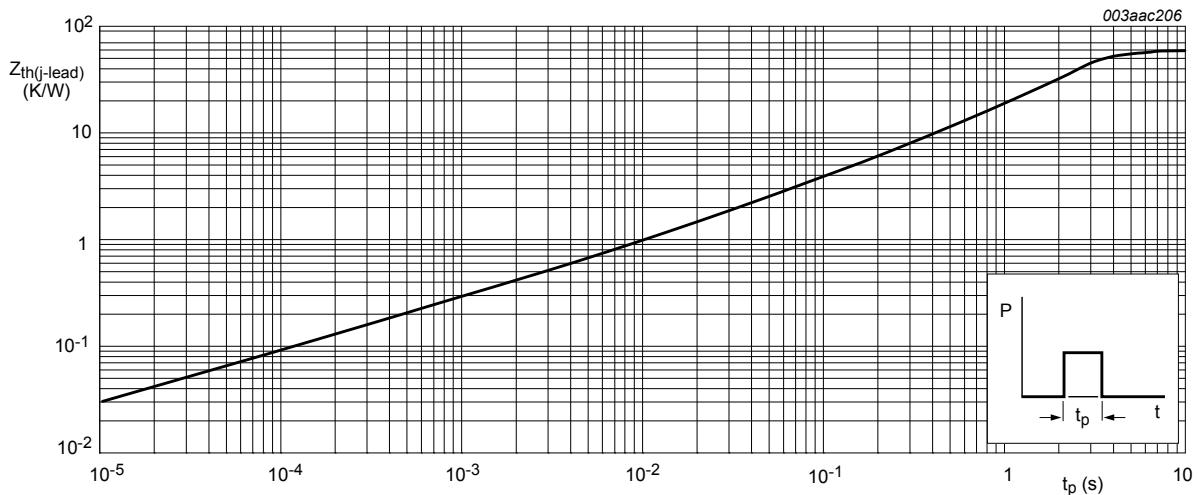


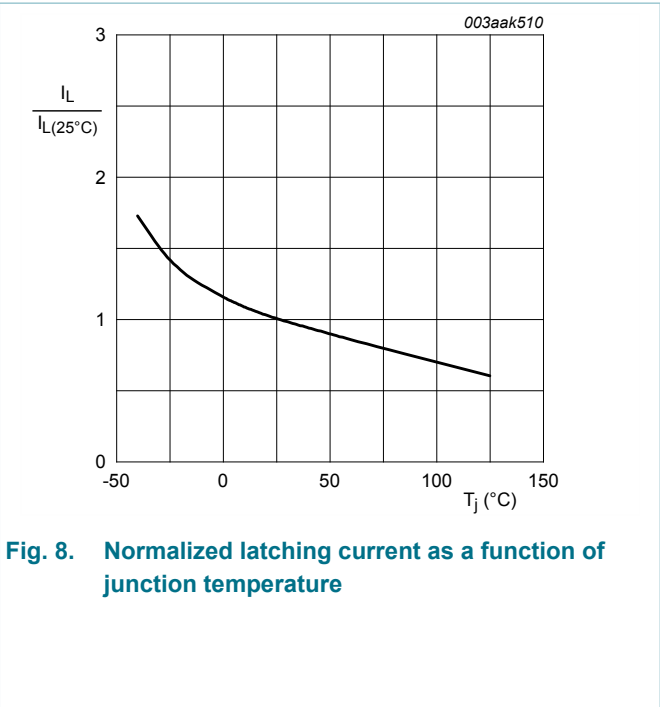
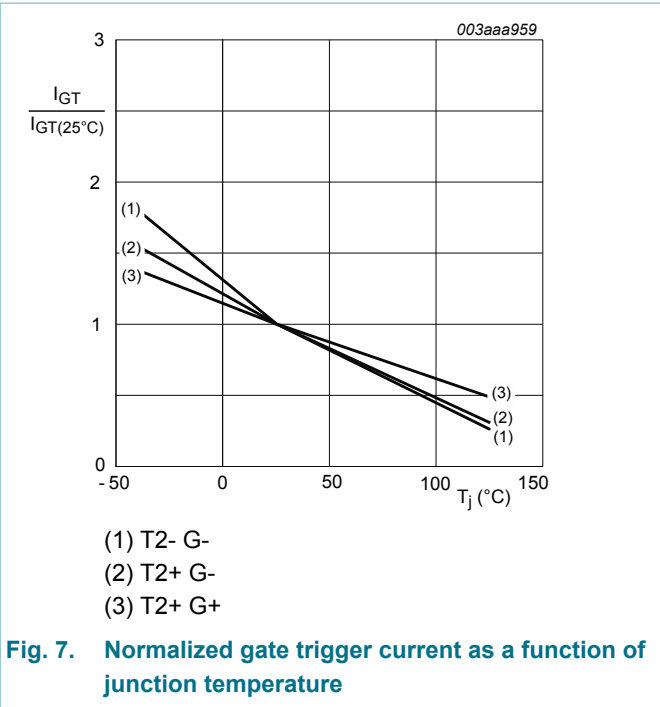
Fig. 6. Transient thermal impedance from junction to lead as a function of pulse width

## 6. Characteristics

Table 6. Characteristics

| Symbol                        | Parameter            | Conditions                                                                                                        | Min | Typ  | Max | Unit |
|-------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------|-----|------|-----|------|
| <b>Static characteristics</b> |                      |                                                                                                                   |     |      |     |      |
| $I_{GT}$                      | gate trigger current | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G+;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a> | 0.5 | -    | 10  | mA   |
|                               |                      | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a> | 0.5 | -    | 10  | mA   |
|                               |                      | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a> | 0.5 | -    | 10  | mA   |
| $I_L$                         | latching current     | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a> | -   | -    | 12  | mA   |
|                               |                      | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a> | -   | -    | 20  | mA   |
|                               |                      | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a> | -   | -    | 12  | mA   |
| $I_H$                         | holding current      | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>                                   | -   | -    | 12  | mA   |
| $V_T$                         | on-state voltage     | $I_T = 0.85\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>                                | -   | 1.35 | 1.6 | V    |
| $V_{GT}$                      | gate trigger voltage | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ;<br><a href="#">Fig. 11</a>        | -   | 0.9  | 2   | V    |
|                               |                      | $V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ }^\circ\text{C}$ ;<br><a href="#">Fig. 11</a>      | 0.2 | 0.3  | -   | V    |
| $I_D$                         | off-state current    | $V_D = 800\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$                                                          | -   | 0.1  | 0.5 | mA   |

| Symbol                  | Parameter                             | Conditions                                                                                                                                             | Min | Typ | Max | Unit                   |
|-------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------------------------|
| Dynamic characteristics |                                       |                                                                                                                                                        |     |     |     |                        |
| $dV_D/dt$               | rate of rise of off-state voltage     | $V_{DM} = 536\text{ V}$ ; $T_j = 125\text{ }^{\circ}\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit              | 600 | -   | -   | $\text{V}/\mu\text{s}$ |
| $dI_{com}/dt$           | rate of change of commutating current | $V_D = 400\text{ V}$ ; $T_j = 125\text{ }^{\circ}\text{C}$ ; $I_{T(RMS)} = 0.8\text{ A}$ ; $dV_{com}/dt = 10\text{ V}/\mu\text{s}$ ; gate open circuit | 1.6 | -   | -   | $\text{A}/\text{ms}$   |



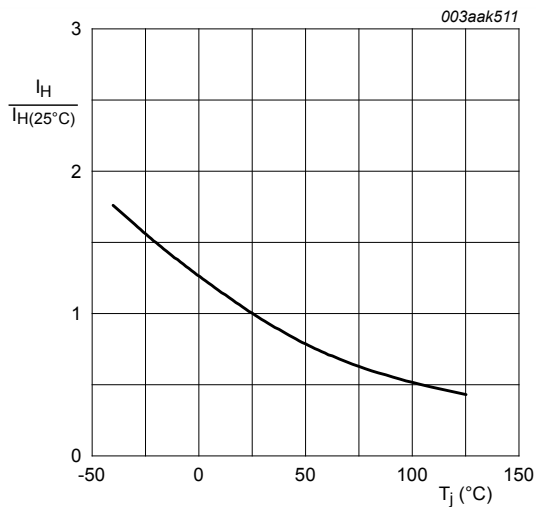
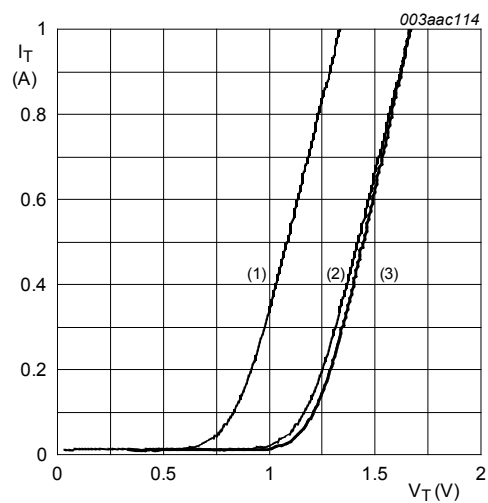


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 0.835\text{ V}; R_s = 0.50\ \Omega$   
(1)  $T_j = 125\ ^\circ\text{C}$ ; typical values  
(2)  $T_j = 125\ ^\circ\text{C}$ ; maximum values  
(3)  $T_j = 25\ ^\circ\text{C}$ ; maximum values

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

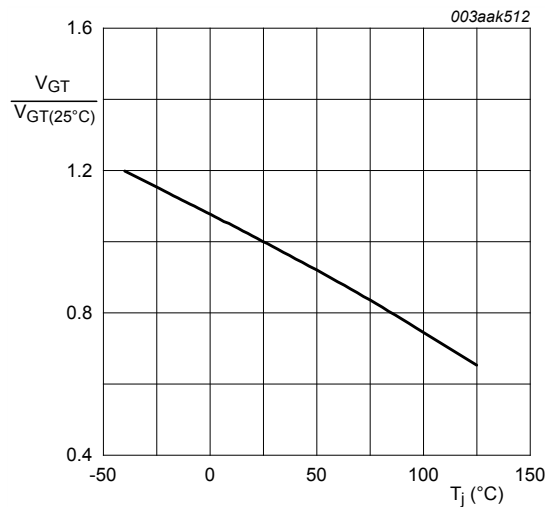
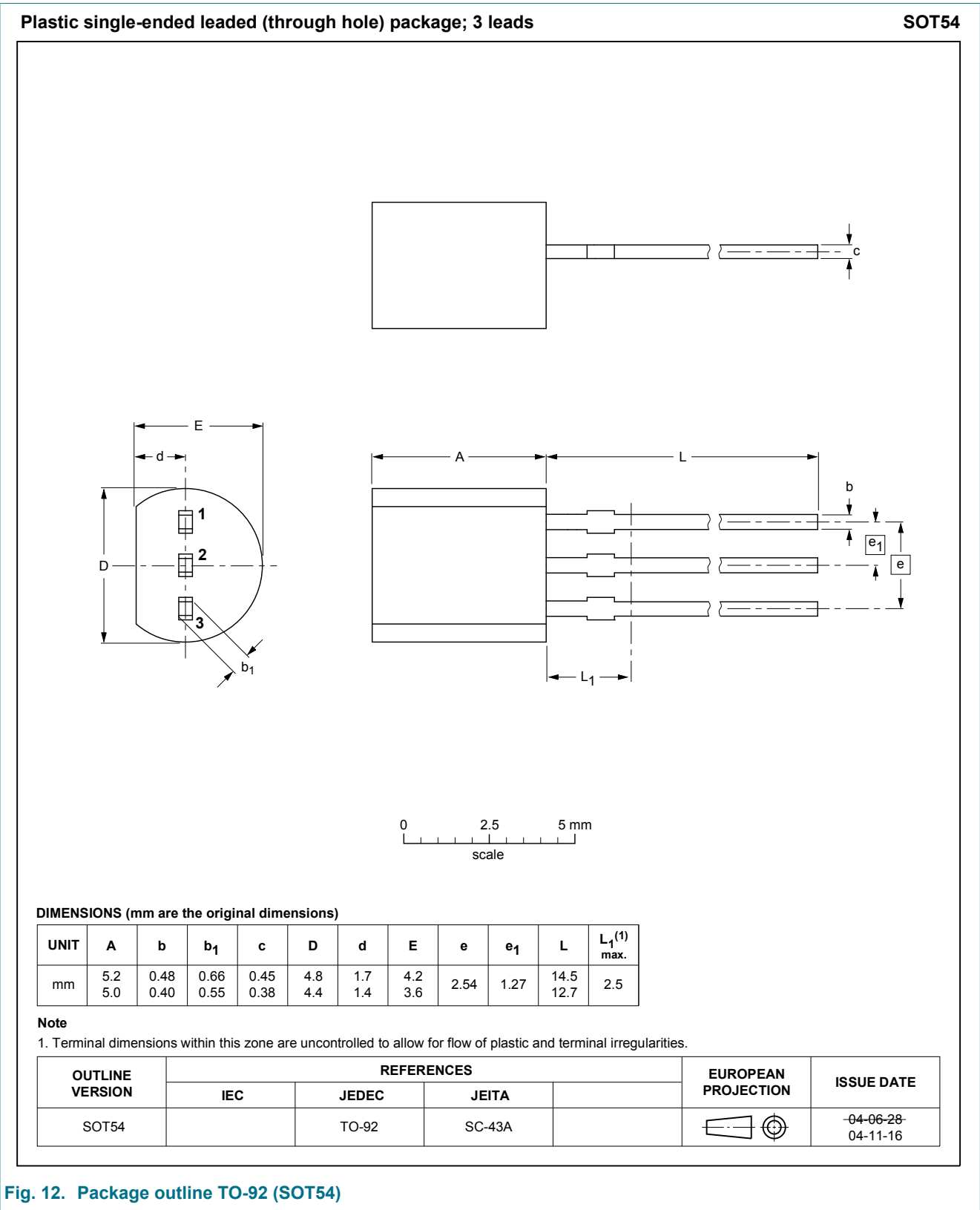


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

7. Package outline





## 8. Legal information

### 8.1 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.
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## 9. Contents

|          |                                      |          |
|----------|--------------------------------------|----------|
| <b>1</b> | <b>Product profile .....</b>         | <b>1</b> |
| 1.1      | General description .....            | 1        |
| 1.2      | Features and benefits .....          | 1        |
| 1.3      | Applications .....                   | 1        |
| 1.4      | Quick reference data .....           | 1        |
| <b>2</b> | <b>Pinning information .....</b>     | <b>2</b> |
| <b>3</b> | <b>Ordering information .....</b>    | <b>2</b> |
| <b>4</b> | <b>Limiting values .....</b>         | <b>2</b> |
| <b>5</b> | <b>Thermal characteristics .....</b> | <b>4</b> |
| <b>6</b> | <b>Characteristics .....</b>         | <b>5</b> |
| <b>7</b> | <b>Package outline .....</b>         | <b>8</b> |
| <b>8</b> | <b>Legal information .....</b>       | <b>9</b> |
| 8.1      | Data sheet status .....              | 9        |
| 8.2      | Definitions .....                    | 9        |
| 8.3      | Disclaimers .....                    | 9        |
| 8.4      | Trademarks .....                     | 10       |

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