



# BTA208S-600E

3Q Hi-Com Triac

Rev. 5 — 13 April 2011

Product data sheet

## 1. Product profile

### 1.1 General description

Planar passivated high commutation three quadrant triac in a surface-mountable plastic package. This "series E" triac balances the requirements of commutation performance and gate sensitivity. The "sensitive gate" "series E" is intended for interfacing with low power drivers including microcontrollers.

### 1.2 Features and benefits

- 3Q technology for improved noise immunity
- Direct interfacing with low power drivers and microcontrollers
- Good immunity to false turn-on by dV/dt
- High commutation capability with sensitive gate
- High voltage capability
- Planar passivated for voltage ruggedness and reliability
- Surface-mountable package
- Triggering in three quadrants only

### 1.3 Applications

- Electronic thermostats
- General purpose motor controls

### 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    |   | -   | -   | 600 | V    |
| $I_{\text{TSM}}$    | non-repetitive peak on-state current | full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$ ;<br>$t_{\text{p}} = 20\text{ ms}$ ; see <a href="#">Figure 4</a> ;<br>see <a href="#">Figure 5</a> | -   | -   | 65  | A    |
| $I_{\text{T(RMS)}}$ | RMS on-state current                 | full sine wave; $T_{\text{mb}} \leq 102\text{ °C}$ ;<br>see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a> ;<br>see <a href="#">Figure 3</a>   | -   | -   | 8   | A    |

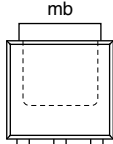



**Table 1. Quick reference data ...continued**

| 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>$T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 7</a> | -   | -   | 10  | mA   |
|                               |                      | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 7</a> | -   | -   | 10  | mA   |
|                               |                      | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 7</a> | -   | -   | 10  | mA   |

## 2. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description                       | Simplified outline   | Graphic symbol  |
|-----|--------|-----------------------------------|--|---|
| 1   | T1     | main terminal 1                   |  | <br>sym051 |
| 2   | T2     | main terminal 2                   |  |   |
| 3   | G      | gate                              |  |   |
| mb  | T2     | mounting base;<br>main terminal 2 |  |   |

**SOT428 (DPAK)**

## 3. Ordering information

**Table 3. Ordering information**

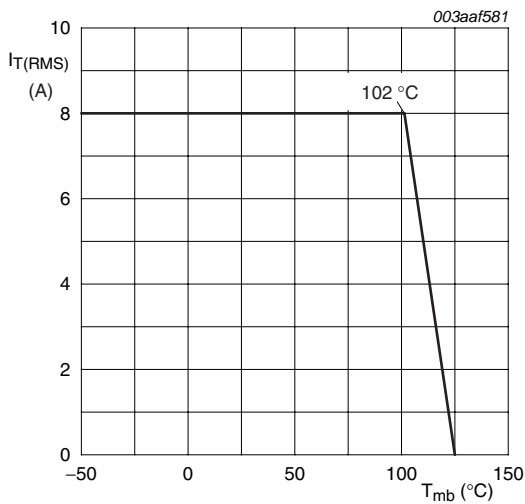
| Type number  | Package |   | Version |
|--------------|---------|---|---------|
|              | Name    | Description   |         |
| BTA208S-600E | DPAK    | plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) | SOT428  |

## 4. Limiting values

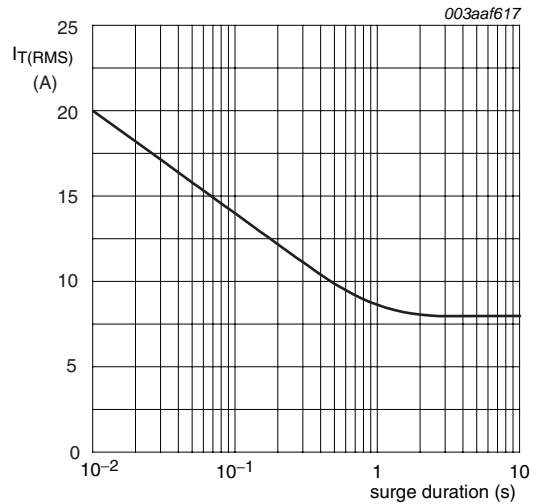
**Table 4. Limiting values**

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

| Symbol       | Parameter                            | Conditions  | Min | Max | Unit                   |
|--------------|--------------------------------------|---|-----|-----|------------------------|
| $V_{DRM}$    | repetitive peak off-state voltage    |   | -   | 600 | V                      |
| $I_{T(RMS)}$ | RMS on-state current                 | full sine wave; $T_{mb} \leq 102\text{ }^{\circ}\text{C}$ ;<br>see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a> ; see <a href="#">Figure 3</a> | -   | 8   | A                      |
| $I_{TSM}$    | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ;<br>$t_p = 20\text{ ms}$ ; see <a href="#">Figure 4</a> ; see <a href="#">Figure 5</a> | -   | 65  | A                      |
|              |                                      | full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ;<br>$t_p = 16.7\text{ ms}$   | -   | 72  | A                      |
| $I^2t$       | $I^2t$ for fusing                    | $t_p = 10\text{ ms}$ ; sine-wave pulse  | -   | 21  | $\text{A}^2\text{s}$   |
| $dl_T/dt$    | rate of rise of on-state current     | $I_T = 12\text{ A}$ ; $I_G = 0.2\text{ A}$ ; $dl_G/dt = 0.2\text{ A}/\mu\text{s}$   | -   | 100 | $\text{A}/\mu\text{s}$ |
| $I_{GM}$     | peak gate current                    |   | -   | 2   | A                      |
| $V_{GM}$     | peak gate voltage                    |   | -   | 5   | V                      |
| $P_{GM}$     | peak gate power                      |   | -   | 5   | W                      |
| $P_{G(AV)}$  | average gate power                   | over any 20 ms period   | -   | 0.5 | 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 heatsink temperature; maximum values**



$f = 50\text{ Hz}$ ;  $T_{mb} = 102\text{ }^{\circ}\text{C}$

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

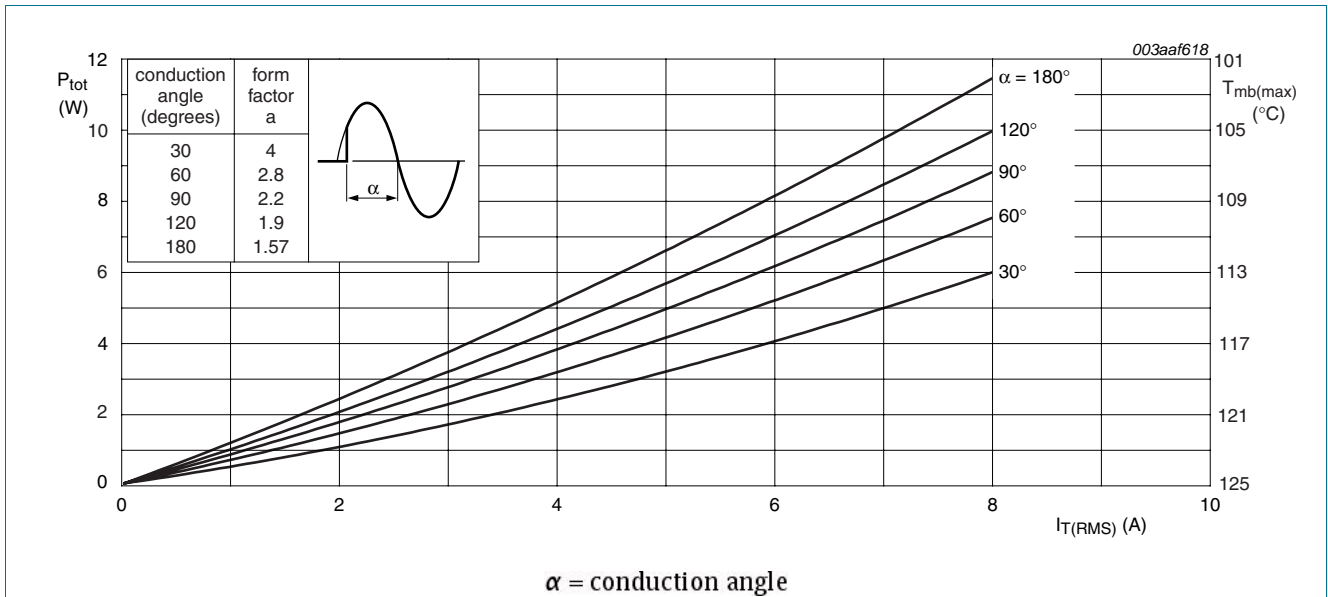


Fig 3. Total power dissipation as a function of RMS on-state current; maximum values

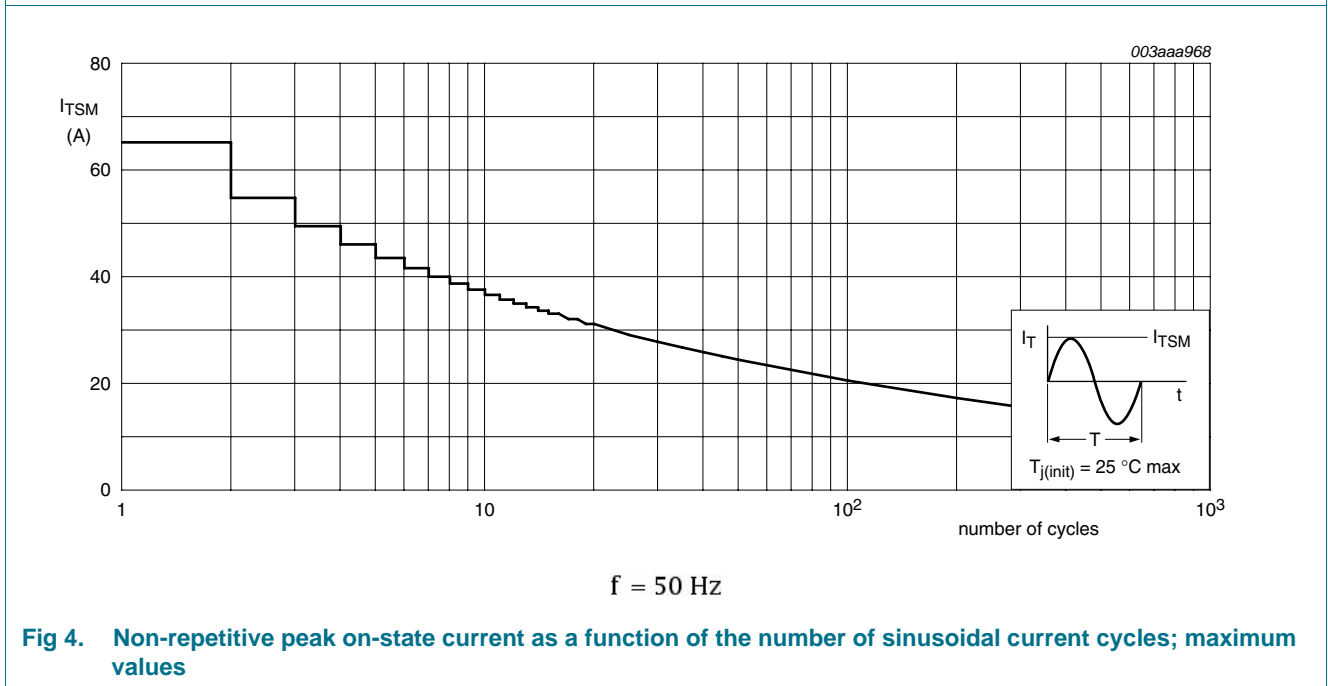
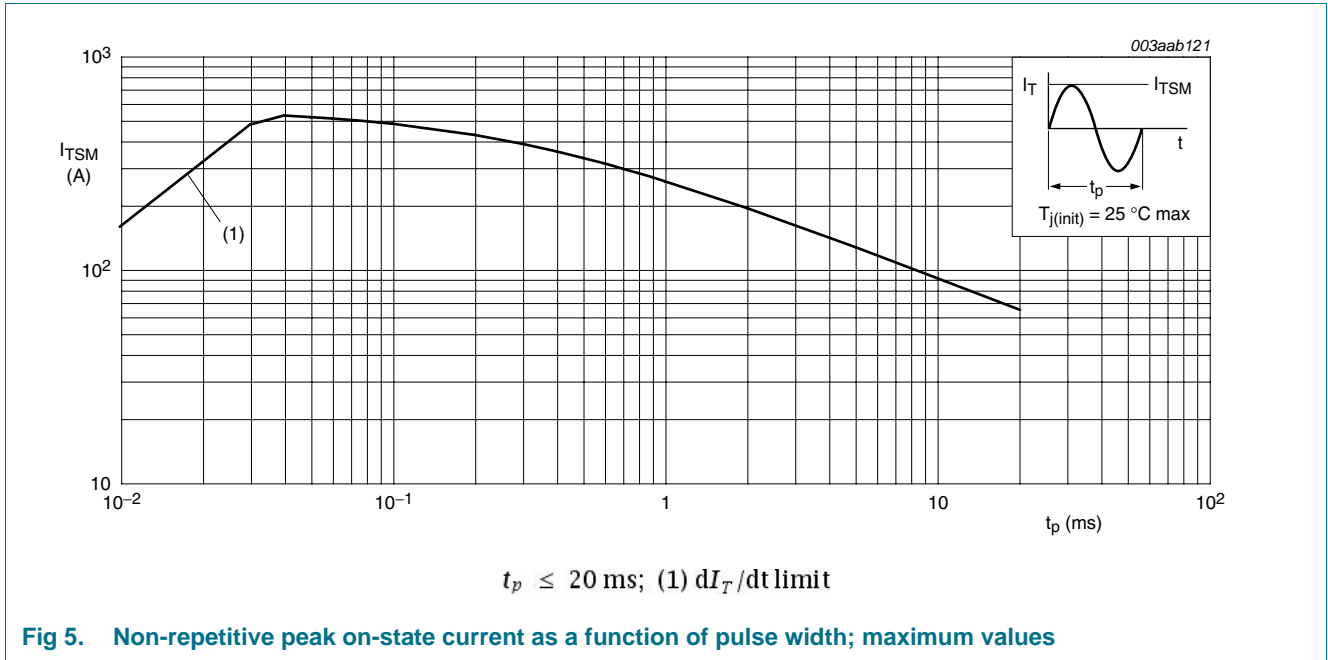


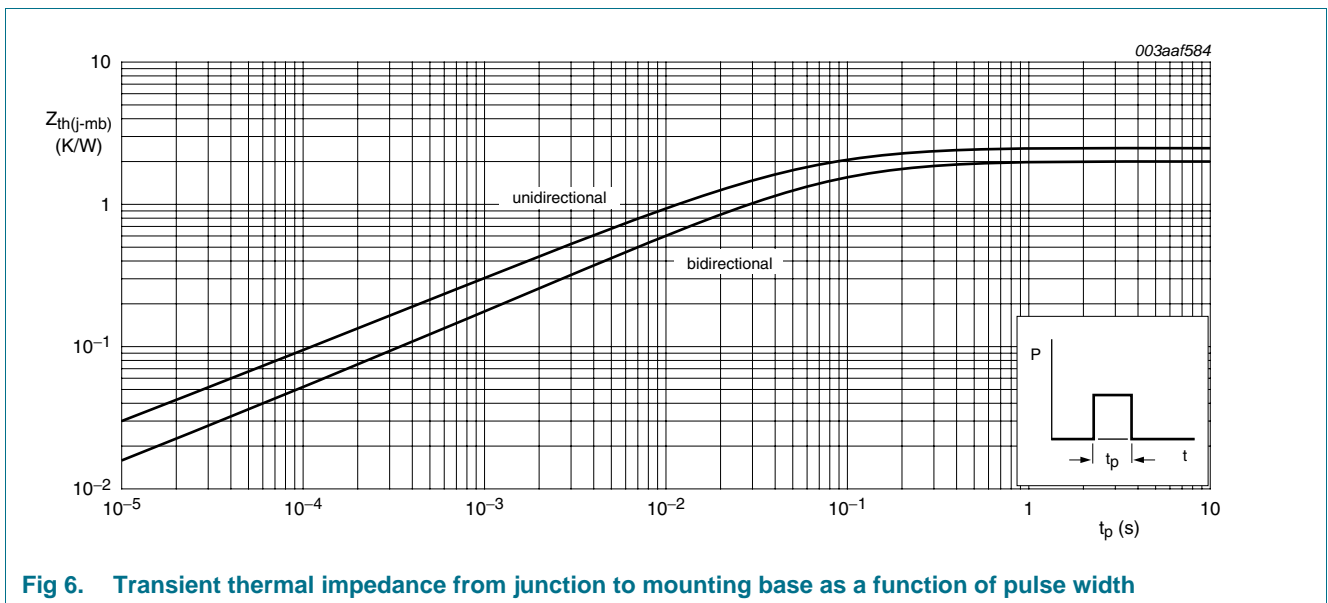
Fig 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



## 5. Thermal characteristics

**Table 5. Thermal characteristics**

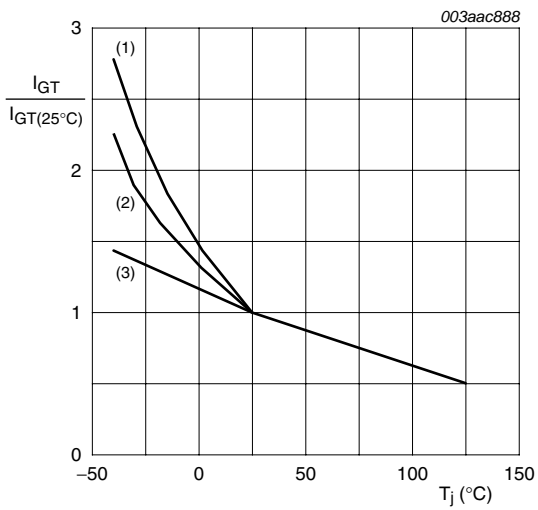
| Symbol         | Parameter   | Conditions                                       | Min | Typ | Max | Unit |
|----------------|---|--|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | full cycle; see <a href="#">Figure 6</a>         | -   | -   | 2   | K/W  |
|                |   | half cycle; see <a href="#">Figure 6</a>         | -   | -   | 2.5 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient       | in free air; printed circuit board (FR4) mounted | -   | 75  | -   | K/W  |



## 6. Characteristics

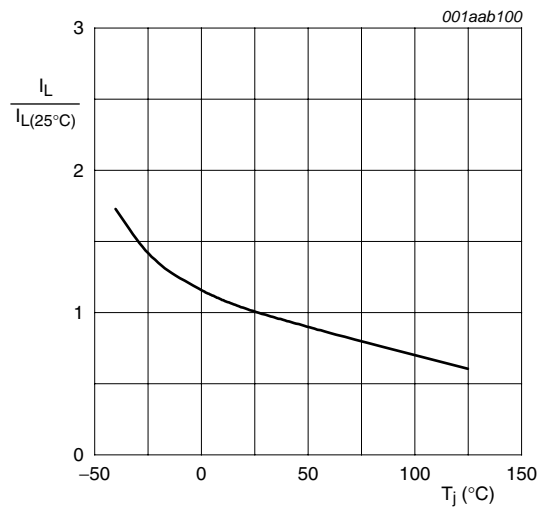
Table 6. Characteristics

| 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>$T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>   | -    | -   | 10   | mA         |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-;<br>$T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>   | -    | -   | 10   | mA         |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-;<br>$T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>   | -    | -   | 10   | mA         |
| $I_L$                          | latching current                      | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+;<br>$T_j = 25\text{ °C}$ ; see <a href="#">Figure 8</a>   | -    | -   | 25   | mA         |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-;<br>$T_j = 25\text{ °C}$ ; see <a href="#">Figure 8</a>   | -    | -   | 25   | mA         |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-;<br>$T_j = 25\text{ °C}$ ; see <a href="#">Figure 8</a>   | -    | -   | 30   | mA         |
| $I_H$                          | holding current                       | $V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 9</a>   | -    | -   | 25   | mA         |
| $V_T$                          | on-state voltage                      | $I_T = 10\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 10</a>  | -    | -   | 1.65 | V          |
| $V_{GT}$                       | gate trigger voltage                  | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ;<br>see <a href="#">Figure 11</a>  | -    | -   | 1.5  | V          |
|                                |                                       | $V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ °C}$ ;<br>see <a href="#">Figure 11</a>  | 0.25 | -   | -    | V          |
| $I_D$                          | off-state current                     | $V_D = 600\text{ V}$ ; $T_j = 125\text{ °C}$  | -    | -   | 0.5  | mA         |
| <b>Dynamic characteristics</b> |                                       |   |      |     |      |            |
| $dV_D/dt$                      | rate of rise of off-state voltage     | $V_{DM} = 402\text{ V}$ ; $T_j = 110\text{ °C}$ ; exponential waveform; gate open circuit   | 60   | -   | -    | V/ $\mu$ s |
| $dI_{com}/dt$                  | rate of change of commutating current | $V_D = 400\text{ V}$ ; $T_j = 125\text{ °C}$ ; $I_{T(RMS)} = 8\text{ A}$ ;<br>$dV_{com}/dt = 0.1\text{ V}/\mu\text{s}$ ; gate open circuit                                  | 10   | -   | -    | A/ms       |
|                                |                                       | $V_D = 400\text{ V}$ ; $T_j = 125\text{ °C}$ ; $I_{T(RMS)} = 8\text{ A}$ ;<br>$dV_{com}/dt = 10\text{ V}/\mu\text{s}$ ; gate open circuit;<br>see <a href="#">Figure 12</a> | 5    | -   | -    | A/ms       |

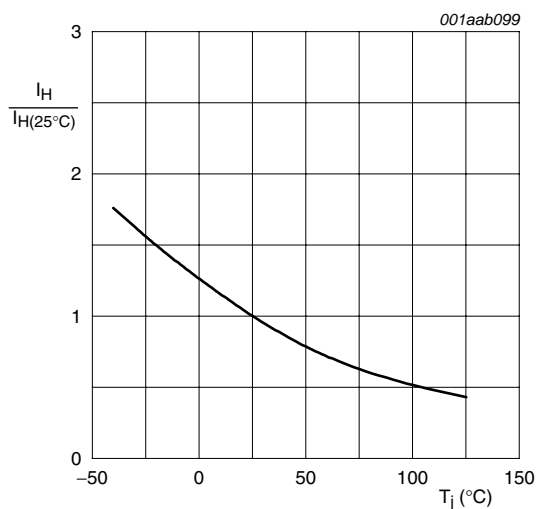


- (1) T2- G-
- (2) T2+ G-
- (3) T2+ G+

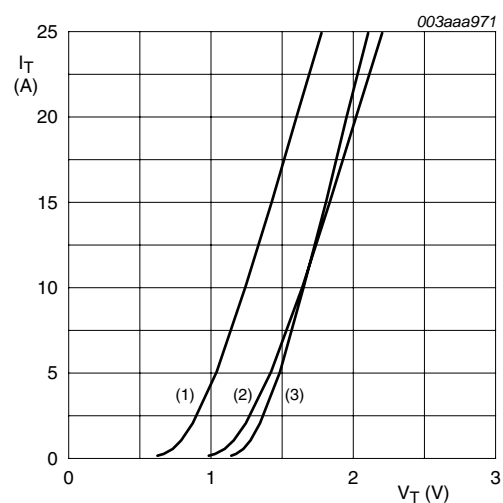
**Fig 7. Normalized gate trigger current as a function of junction temperature**



**Fig 8. Normalized latching current as a function of junction temperature**



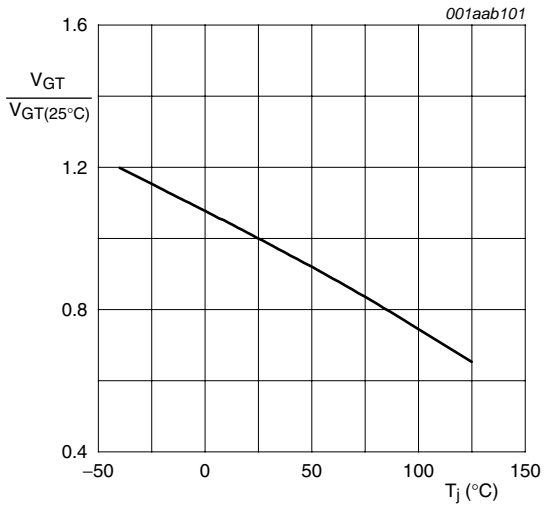
**Fig 9. Normalized holding current as a function of junction temperature**



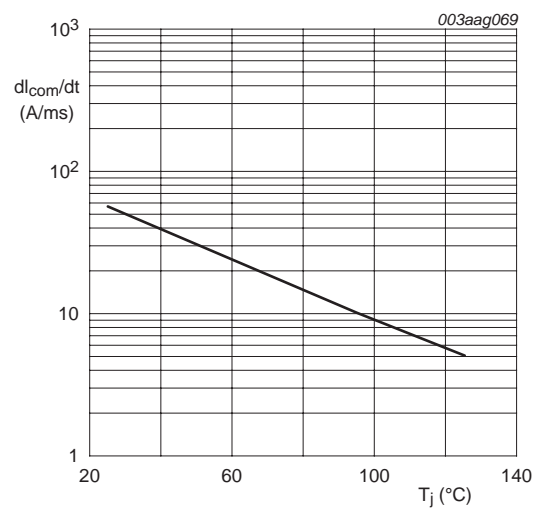
$V_o = 1.264 \text{ V}; R_s = 0.0378 \ \Omega$

- (1)  $T_j = 125 \text{ }^\circ\text{C}$ ; typical values
- (2)  $T_j = 125 \text{ }^\circ\text{C}$ ; maximum values
- (3)  $T_j = 25 \text{ }^\circ\text{C}$ ; 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**



**Fig 12. Rate of change of commutating current as a function of junction temperature; minimum values**



**7. Package outline**

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)

SOT428

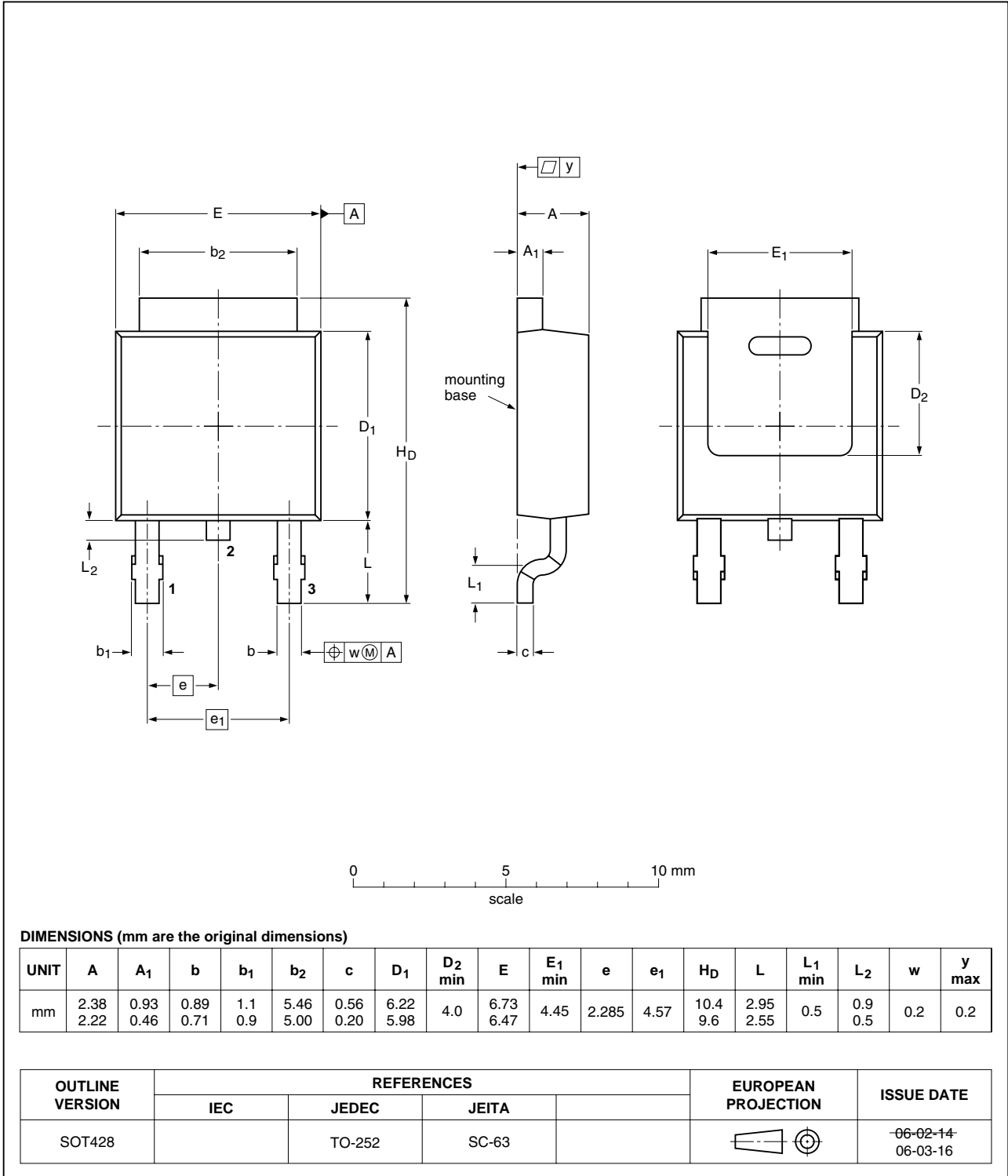


Fig 13. Package outline SOT428 (DPAK)

## 8. Revision history

Table 7. Revision history

| Document ID            | Release date | Data sheet status   | Change notice | Supersedes             |
|------------------------|--------------|---|---------------|------------------------|
| BTA208S-600E v.5       | 20110413     | Product data sheet  | -             | BTA208S_SERIES_D_E_F_4 |
| Modifications:         |              | <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• Type number BTA208S-600E separated from data sheet BTA208S_SERIES_D_E_F_4.</li></ul> |               |                        |
| BTA208S_SERIES_D_E_F_4 | 20020301     | Product specification   | -             | BTA208S_SERIES_D_E_F_3 |

## 9. Legal information

### 9.1 Data sheet status

| Document status <sup>[1]</sup> <sup>[2]</sup> | Product status <sup>[3]</sup> | 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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