

## 1. General description

Planar passivated high commutation three quadrant triac in a SOT428 (DPAK) surface mountable plastic package. This "series F" triac balances the requirements of commutation performance and gate sensitivity and is intended for interfacing with low power drivers and logic ICs including microcontrollers in higher noise environments.

## 2. Features and benefits

- 3Q technology for improved noise immunity
- Direct triggering from low power drivers and logic ICs
- High commutation capability
- High voltage capability
- Intermediate sensitivity for maximum noise immunity and logic level triggering
- Planar passivated for voltage ruggedness and reliability
- Surface mountable package
- Triggering in three quadrants only

## 3. Applications

- Electronic thermostats
- General purpose motor controls

## 4. Quick reference data

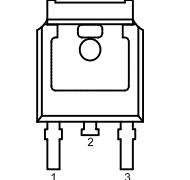
Table 1. Quick reference data

| Symbol                        | Parameter                            | Conditions   | Min | Typ | Max | Unit             |
|-------------------------------|--------------------------------------|--|-----|-----|-----|------------------|
| $V_{DRM}$                     | repetitive peak off-state voltage    |  | -   | -   | 600 | V                |
| $I_{T(RMS)}$                  | RMS on-state current                 | full sine wave; $T_{mb} \leq 102^\circ\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>       | -   | -   | 8   | A                |
| $I_{TSM}$                     | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25^\circ\text{C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a> | -   | -   | 65  | A                |
|                               |                                      | full sine wave; $T_{j(\text{init})} = 25^\circ\text{C}$ ; $t_p = 16.7\text{ ms}$   | -   | -   | 72  | A                |
| $T_j$                         | junction temperature                 |  | -   | -   | 125 | $^\circ\text{C}$ |
| <b>Static characteristics</b> |                                      |  |     |     |     |                  |
| $I_{GT}$                      | gate trigger current                 | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G+; $T_j = 25^\circ\text{C}$ ; <a href="#">Fig. 7</a>                           | -   | -   | 25  | mA               |
|                               |                                      | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25^\circ\text{C}$ ; <a href="#">Fig. 7</a>                           | -   | -   | 25  | mA               |

| Symbol                         | Parameter                             | Conditions  |  | Min | Typ | Max  | Unit       |
|--------------------------------|---------------------------------------|---|--|-----|-----|------|------------|
|                                |                                       | $V_D = 12 \text{ V}$ ; $I_T = 0.1 \text{ A}$ ; T2- G-; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>   |  | -   | -   | 25   | mA         |
| $I_H$                          | holding current                       | $V_D = 12 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>   |  | -   | -   | 30   | mA         |
| $V_T$                          | on-state voltage                      | $I_T = 10 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>  |  | -   | -   | 1.65 | V          |
| <b>Dynamic characteristics</b> |                                       |   |  |     |     |      |            |
| $dV_D/dt$                      | rate of rise of off-state voltage     | $V_{DM} = 402 \text{ V}$ ; $T_j = 110 \text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit                                       |  | 70  | -   | -    | V/ $\mu$ s |
| $dI_{com}/dt$                  | rate of change of commutating current | $V_D = 400 \text{ V}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 8 \text{ A}$ ; $dV_{com}/dt = 10 \text{ V}/\mu\text{s}$ ; gate open circuit; <a href="#">Fig. 12</a> |  | 14  | -   | -    | A/ms       |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                    | Simplified outline  | Graphic symbol   |
|-----|--------|--------------------------------|---|--|
| 1   | T1     | main terminal 1                |   |  |
| 2   | T2     | main terminal 2                |   |  |
| 3   | G      | gate                           |   |  |
| mb  | T2     | mounting base; main terminal 2 | <br>DPAK (SOT428) | <br>sym051 |

## 6. Ordering information

Table 3. Ordering information

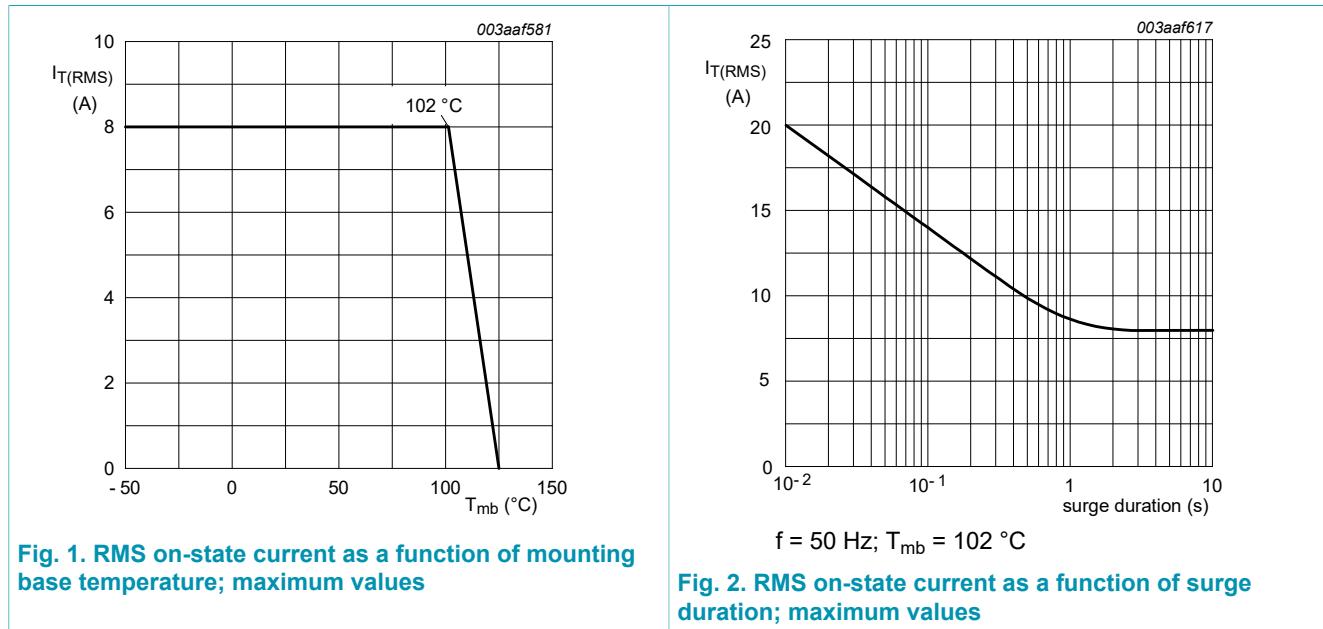
| Type number  | Package |   |  | Version |
|--------------|---------|---|--|---------|
|              | Name    | Description   |  |         |
| BTA208S-600F | DPAK    | plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) |  | SOT428  |

## 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; $T_{mb} \leq 102^\circ\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>       |  | -   | 8   | A                      |
| $I_{TSM}$    | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25^\circ\text{C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a> |  | -   | 65  | A                      |
|              |                                      | full sine wave; $T_{j(\text{init})} = 25^\circ\text{C}$ ; $t_p = 16.7\text{ ms}$   |  | -   | 72  | A                      |
| $I^2t$       | $I^2t$ for fusing                    | $t_p = 10\text{ ms}$ ; SIN   |  | -   | 21  | $\text{A}^2\text{s}$   |
| $dI_T/dt$    | rate of rise of on-state current     | $I_G = 50\text{ mA}$   |  | -   | 100 | $\text{A}/\mu\text{s}$ |
| $I_{GM}$     | peak gate current                    |  |  | -   | 2   | A                      |
| $P_{GM}$     | peak gate power                      |  |  | -   | 5   | W                      |
| $P_{G(AV)}$  | average gate power                   | over any 20 ms period  |  | -   | 0.5 | W                      |
| $T_{stg}$    | storage temperature                  |  |  | -40 | 150 | $^\circ\text{C}$       |
| $T_j$        | junction temperature                 |  |  | -   | 125 | $^\circ\text{C}$       |



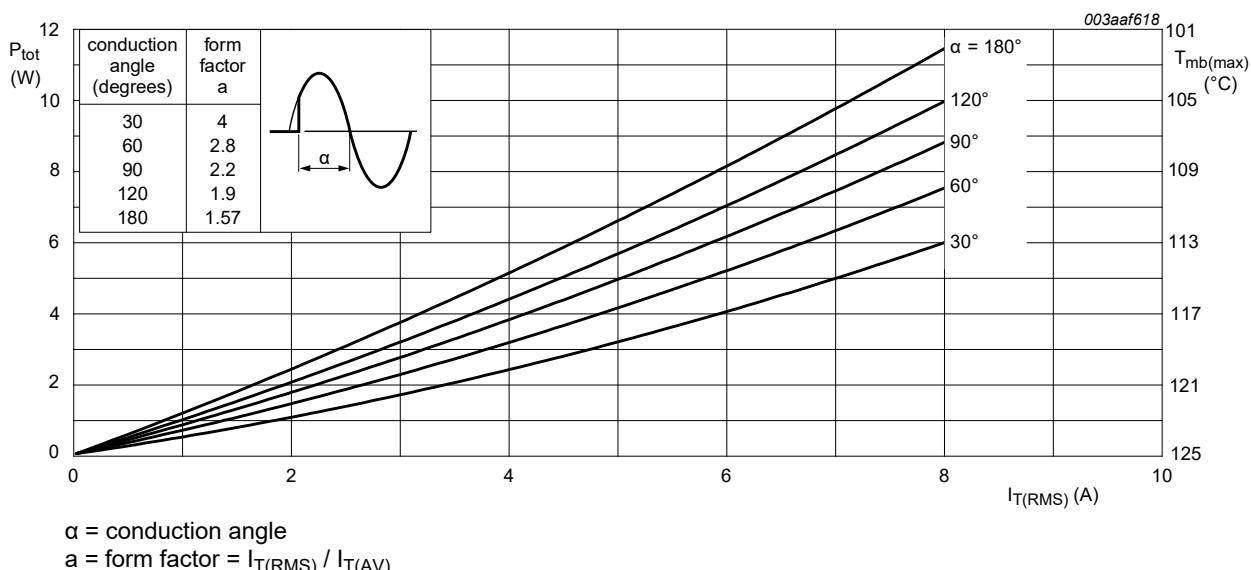


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

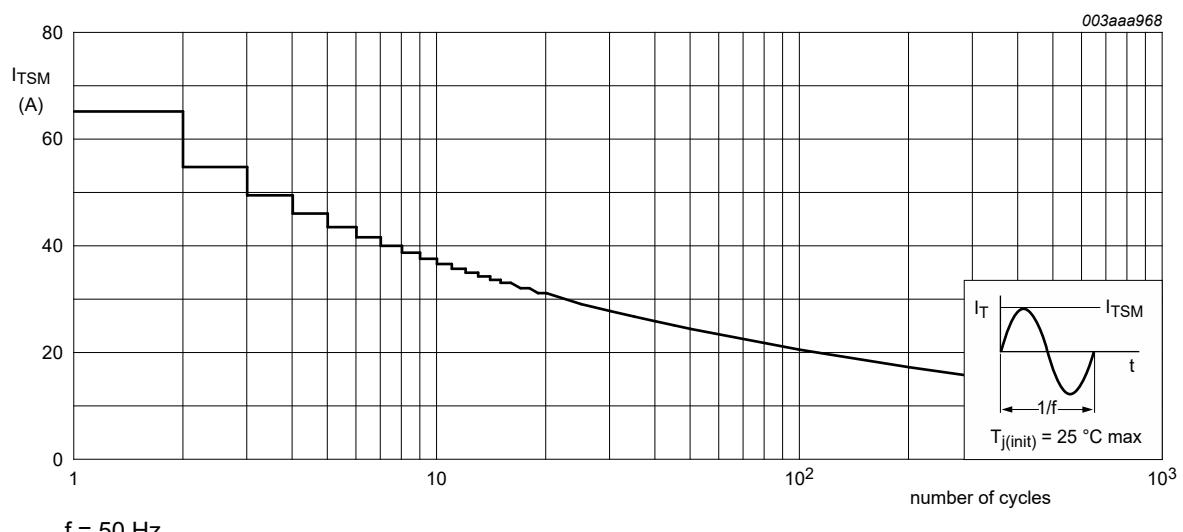


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

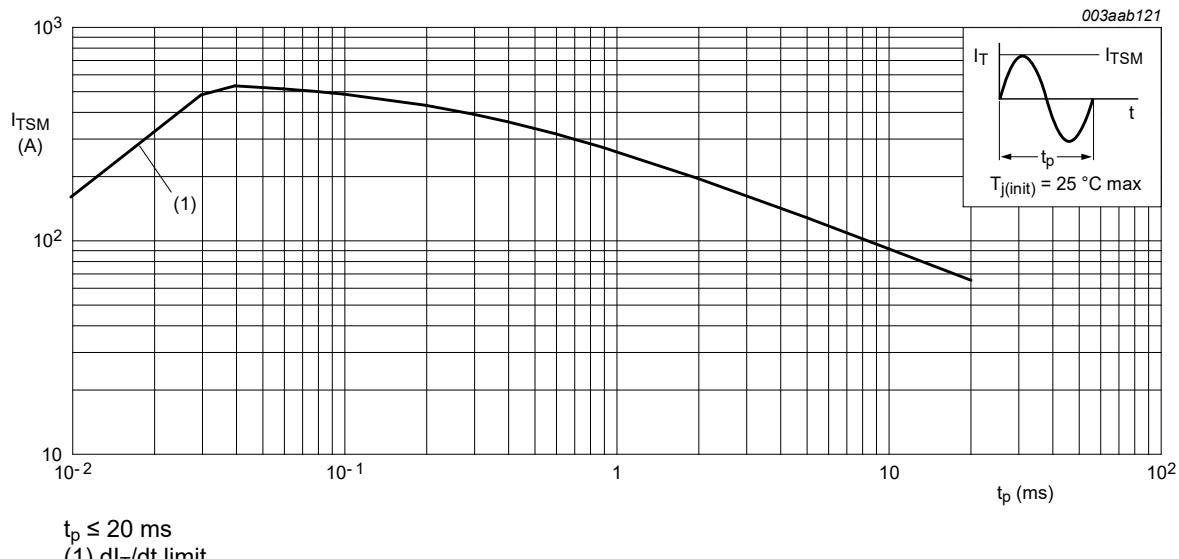


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

## 8. 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; <a href="#">Fig. 6</a>  | -   | -   | 2   | K/W  |
|                |  | half cycle; <a href="#">Fig. 6</a>  | -   | -   | 2.4 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient free air | printed circuit board (FR4) mounted | -   | 75  | -   | K/W  |

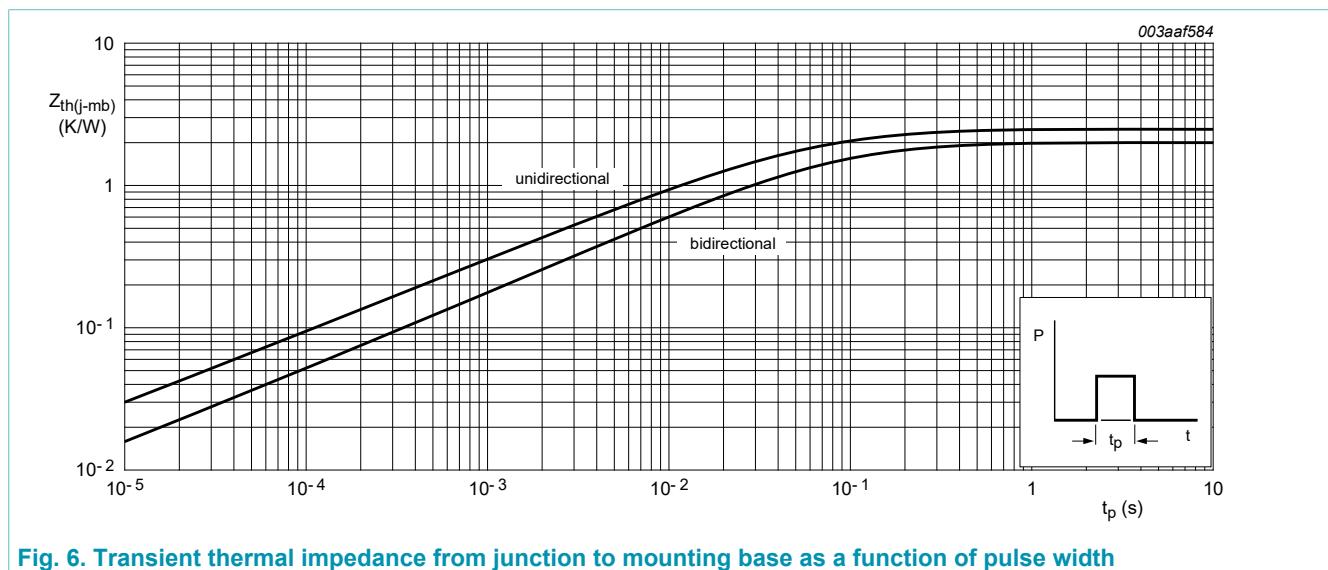


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse width

## 9. 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>   |  | -    | -   | 25   | 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>   |  | -    | -   | 25   | 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>   |  | -    | -   | 25   | 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>   |  | -    | -   | 30   | 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>   |  | -    | -   | 40   | 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>   |  | -    | -   | 40   | mA   |
| $I_H$                          | holding current                       | $V_D = 12 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>   |  | -    | -   | 30   | mA   |
| $V_T$                          | on-state voltage                      | $I_T = 10 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>  |  | -    | -   | 1.65 | V    |
| $V_{GT}$                       | gate trigger voltage                  | $V_D = 12 \text{ V}$ ; $I_T = 0.1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ;<br><a href="#">Fig. 11</a>   |  | -    | 0.7 | 1    | 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>   |  | 0.25 | 0.4 | -    | V    |
| $I_D$                          | off-state current                     | $V_D = 600 \text{ V}$ ; $T_j = 125 \text{ }^\circ\text{C}$  |  | -    | -   | 0.5  | mA   |
| <b>Dynamic characteristics</b> |                                       |   |  |      |     |      |      |
| $dV_D/dt$                      | rate of rise of off-state voltage     | $V_{DM} = 402 \text{ V}$ ; $T_j = 110 \text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit   |  | 70   | -   | -    | V/μs |
| $dI_{com}/dt$                  | rate of change of commutating current | $V_D = 400 \text{ V}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 8 \text{ A}$ ;<br>$dV_{com}/dt = 10 \text{ V/}\mu\text{s}$ ; gate open circuit;<br><a href="#">Fig. 12</a> |  | 14   | -   | -    | A/ms |

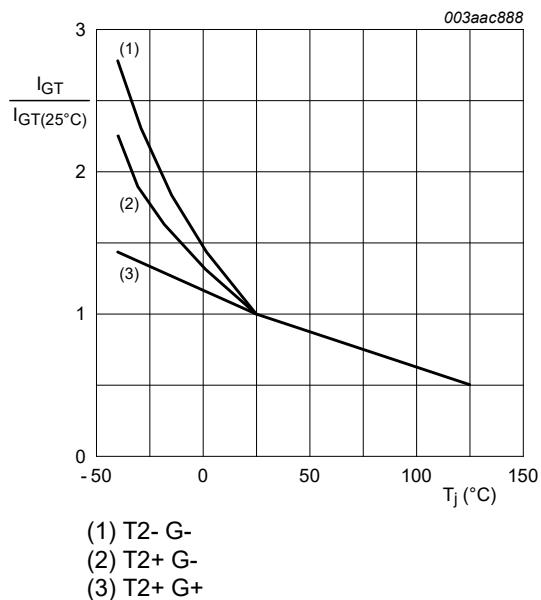


Fig. 7. Normalized gate trigger current as a function of junction temperature

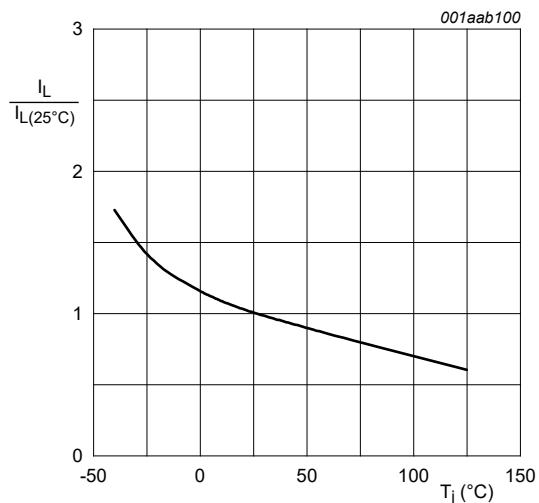


Fig. 8. Normalized latching current as a function of junction temperature

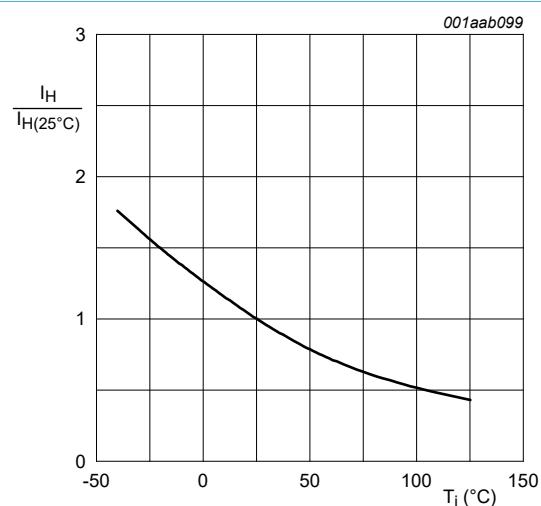


Fig. 9. Normalized holding current as a function of junction temperature

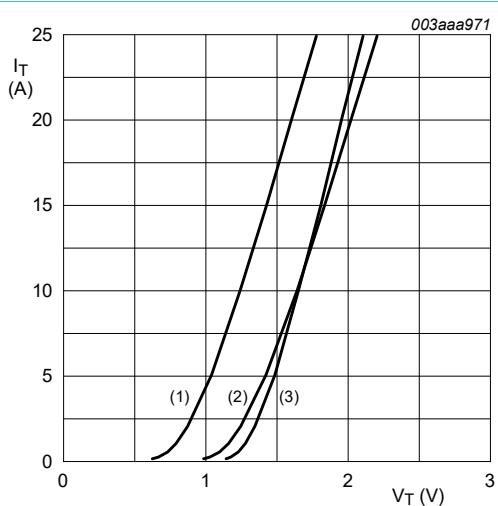


Fig. 10. On-state current as a function of on-state voltage

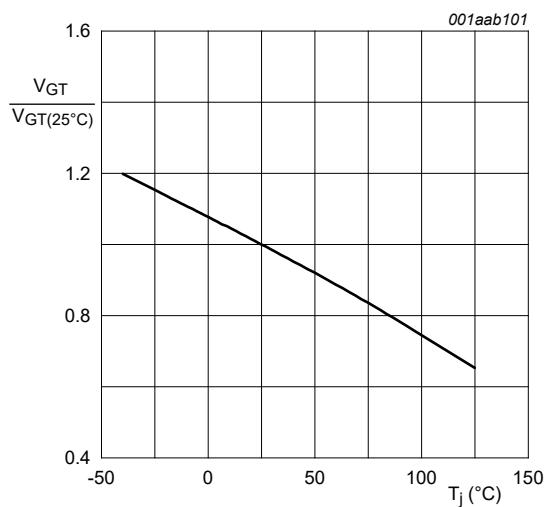


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

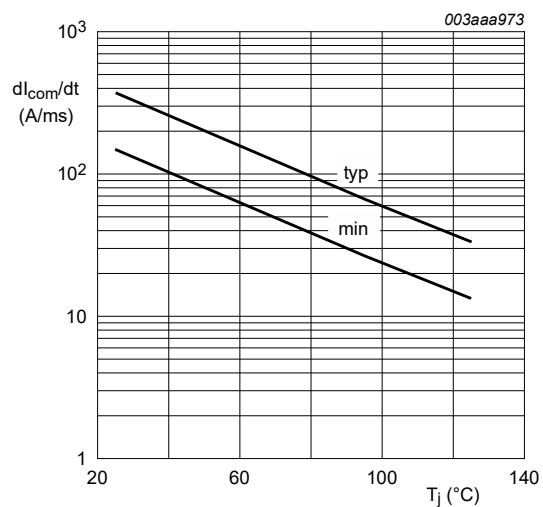
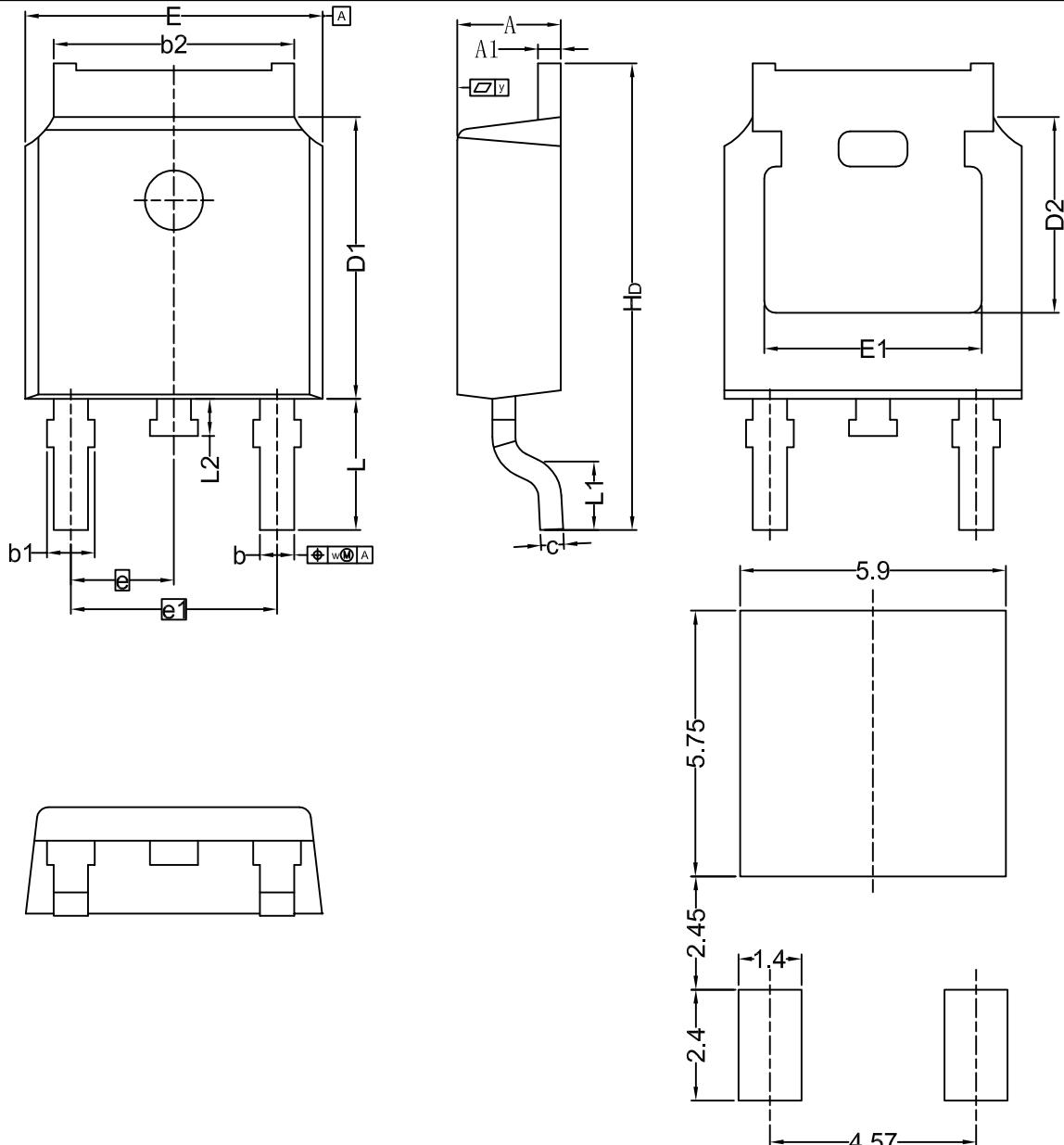


Fig. 12. Rate of change of commutating current as a function of junction temperature; typical and minimum values

## 10. Package outline

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

TO252



Recommended Footprint

| Unit | A    | A1   | b    | b1   | b2   | c    | D1   | D2   | E    | E1   | e     | e1   | H <sub>D</sub> | L      | L1   | L2   | w    | y    |
|------|------|------|------|------|------|------|------|------|------|------|-------|------|----------------|--------|------|------|------|------|
| min  | 2.22 | 0.46 | 0.71 | 0.72 | 5.00 | 0.20 | 5.98 | 4.00 | 6.47 | 4.45 | 2.285 | 4.57 | 9.60           | 2.90   | 0.50 | 0.50 | 0.20 |      |
| nom  | 2.38 | 0.93 | 0.89 | 1.10 | 5.46 | 0.56 | 6.22 | ---  | 6.73 | ---  |       |      | 10.40          | (Ref.) | ---  | 0.90 |      | 0.20 |
| max  |      |      |      |      |      |      |      |      |      |      |       |      |                |        |      |      |      | 0.20 |

Fig. 13. Package outline DPAK (SOT428)

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| Document status [1][2]         | Product status [3] | Definition  |
|--------------------------------|--------------------|---|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 22 August 2017