

## 1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a SOT78 (TO-220AB) plastic package intended for use in applications requiring high bidirectional blocking voltage capability, high current inrush capability and high thermal cycling performance.

## 2. Features and benefits

- AC power control
- High bidirectional blocking voltage capability
- High thermal cycling performance
- Planar passivated for voltage ruggedness and reliability
- High junction operating temperature capability ( $T_{j(max)} = 150\text{ °C}$ )
- Package meets UL94V0 flammability requirement
- Package is RoHS compliant
- IEC 61000-4-4 fast transient

## 3. Applications

- Capacitive Discharge Ignition (CDI)
- Crowbar protection
- Inrush protection
- Motor control
- Voltage regulation
- High junction operating temperature capability ( $T_{j(max)} = 150\text{ °C}$ )

## 4. Quick reference data

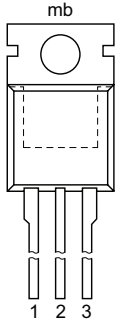

Table 1. Quick reference data

| Symbol                         | Parameter                            | Conditions  | Values | Unit |
|--------------------------------|--------------------------------------|---|--------|------|
| <b>Absolute maximum rating</b> |                                      |   |        |      |
| $V_{DRM}$                      | repetitive peak off-state voltage    |   | 800    | V    |
| $I_{T(RMS)}$                   | RMS on-state current                 | half sine wave; $T_{mb} \leq 128\text{ °C}$ ;<br><a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | 25     | A    |
| $I_{TSM}$                      | non-repetitive peak on-state current | half sine wave; $T_{j(init)} = 25\text{ °C}$ ;<br>$t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>  | 300    | A    |
|                                |                                      | half sine wave; $T_{j(init)} = 25\text{ °C}$ ;<br>$t_p = 8.3\text{ ms}$   | 330    | A    |
| $T_j$                          | junction temperature                 |   | 150    | °C   |

| Symbol                         | Parameter                         | Conditions  | Min | Typ  | Max  | Unit       |
|--------------------------------|-----------------------------------|---|-----|------|------|------------|
| <b>Static characteristics</b>  |                                   |   |     |      |      |            |
| $I_{GT}$                       | gate trigger current              | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>                                  | 1.5 | -    | 10   | mA         |
| $I_H$                          | holding current                   | $V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>   | -   | -    | 60   | mA         |
| $V_T$                          | on-state voltage                  | $I_T = 30\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 10</a>  | -   | 1.10 | 1.50 | V          |
| <b>Dynamic characteristics</b> |                                   |   |     |      |      |            |
| $dV_D/dt$                      | rate of rise of off-state voltage | $V_{DM} = 536\text{ V}$ ; $T_j = 150\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit | 80  | -    | -    | V/ $\mu$ s |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                     | Simplified outline  | Graphic symbol  |
|-----|--------|---------------------------------|---|---|
| 1   | K      | cathode                         |  |  |
| 2   | A      | anode                           |   |   |
| 3   | G      | gate                            |   |   |
| mb  | A      | mounting base; connect to anode |   |   |

## 6. Ordering information

Table 3. Ordering information

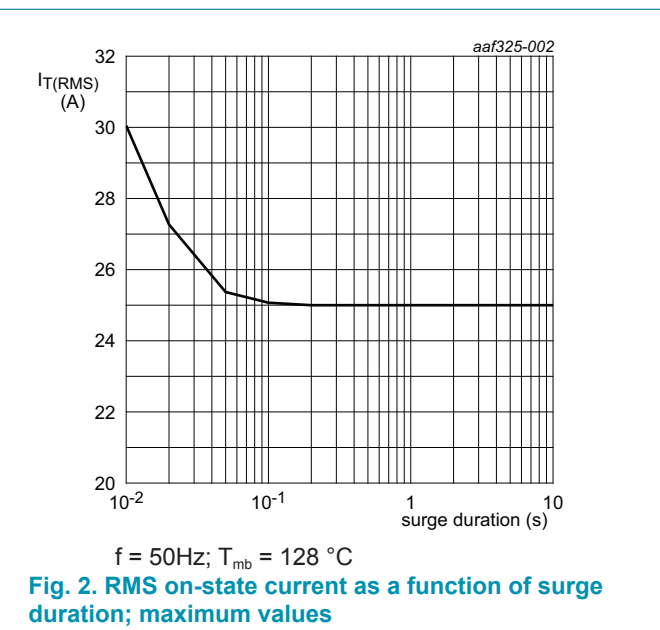
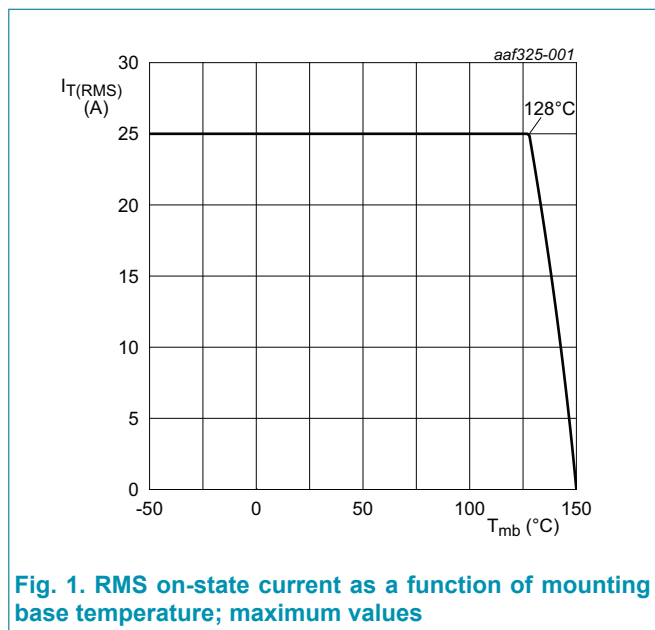
| Type number | Package  |  | Version |
|-------------|----------|--|---------|
|             | Name     | Description  |         |
| BT145-800RT | TO-220AB | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB | SOT78   |

## 7. Limiting values

**Table 4. Limiting values**

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

| Symbol       | Parameter                            | Conditions  | Values     | Unit                   |
|--------------|--------------------------------------|---|------------|------------------------|
| $V_{DRM}$    | repetitive peak off-state voltage    |   | 800        | V                      |
| $V_{RRM}$    | repetitive peak reverse voltage      |   | 800        | V                      |
| $I_{T(AV)}$  | average on-state current             | half sine wave; $T_{mb} \leq 128^\circ\text{C}$ ;   | 16         | A                      |
| $I_{T(RMS)}$ | RMS on-state current                 | half sine wave; $T_{mb} \leq 128^\circ\text{C}$ ;<br><a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>       | 25         | A                      |
| $I_{TSM}$    | non-repetitive peak on-state current | half sine wave; $T_{j(\text{init})} = 25^\circ\text{C}$ ; $t_p = 10\text{ ms}$ ;<br><a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a> | 300        | A                      |
|              |                                      | half sine wave; $T_{j(\text{init})} = 25^\circ\text{C}$ ;<br>$t_p = 8.3\text{ ms}$  | 330        | A                      |
| $I^2t$       | $I^2t$ for fusing                    | $t_p = 10\text{ms}$ ; sine wave   | 450        | $\text{A}^2\text{s}$   |
| $di_T/dt$    | rate of rise of on-state current     | $I_G = 20\text{mA}$   | 200        | $\text{A}/\mu\text{s}$ |
| $I_{GM}$     | peak gate current                    |   | 5          | A                      |
| $V_{GM}$     | peak gate voltage                    |   | 5          | V                      |
| $P_{GM}$     | peak gate power                      |   | 20         | W                      |
| $P_{G(AV)}$  | average gate power                   | over any 20 ms period   | 0.5        | W                      |
| $T_{stg}$    | storage temperature                  |   | -40 to 150 | $^\circ\text{C}$       |
| $T_j$        | junction temperature                 |   | 150        | $^\circ\text{C}$       |



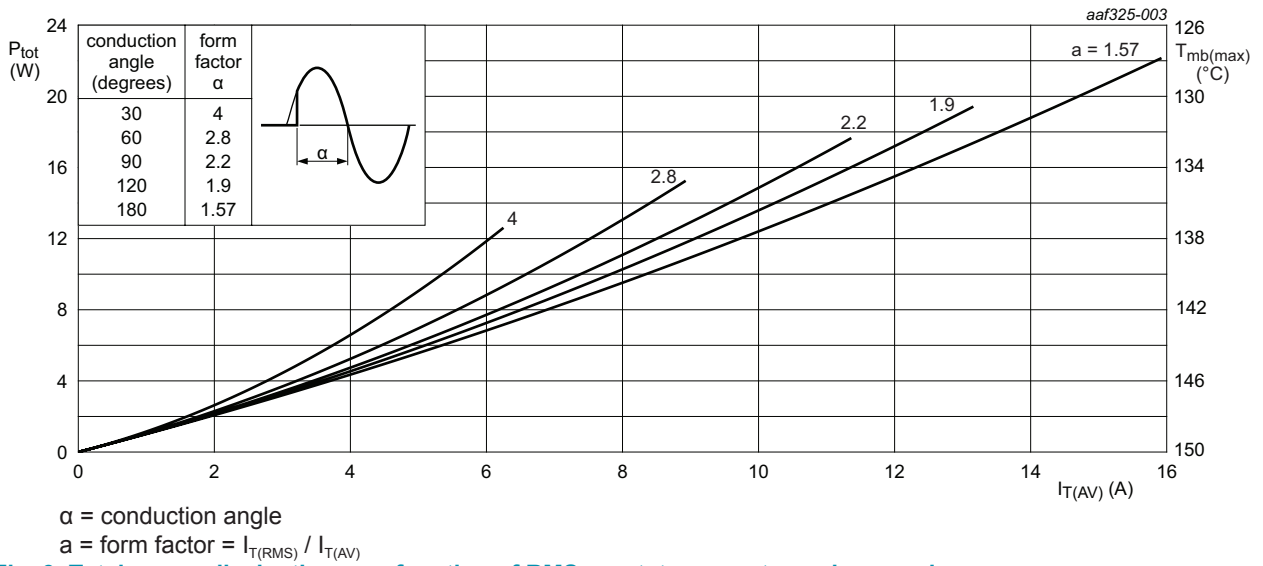


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

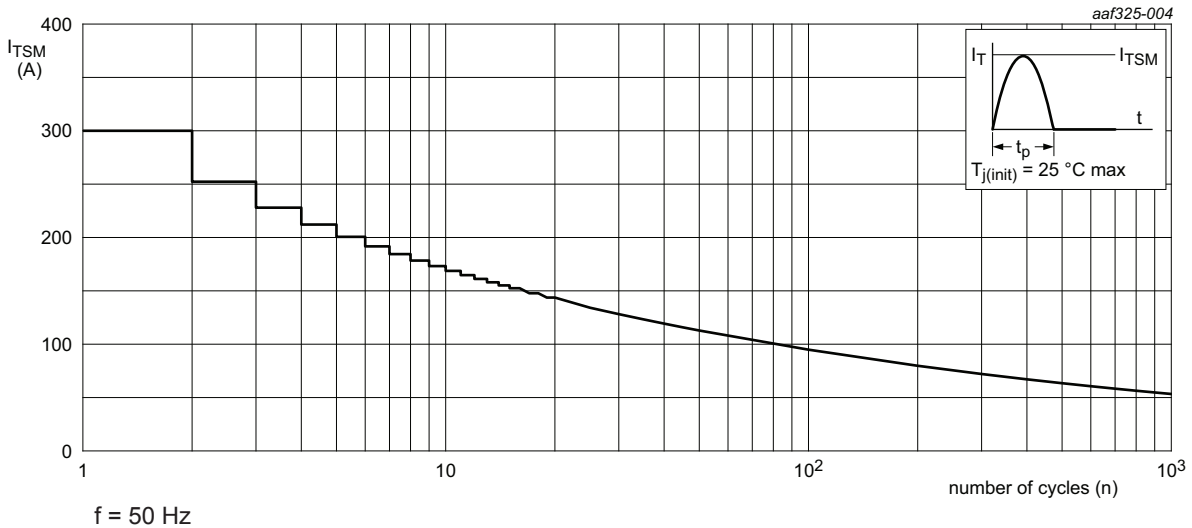


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

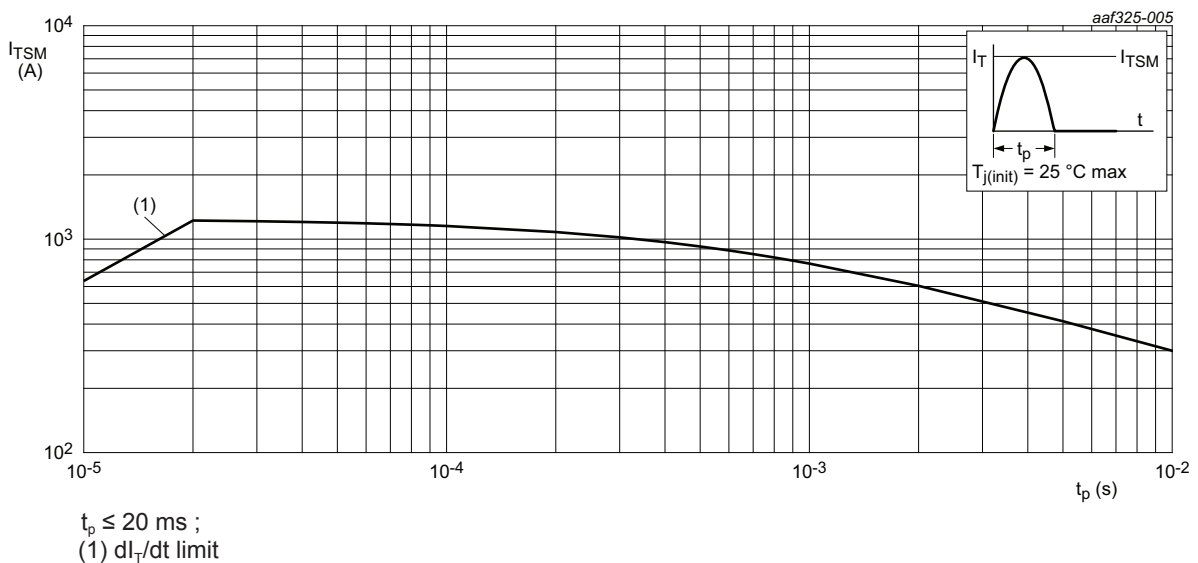
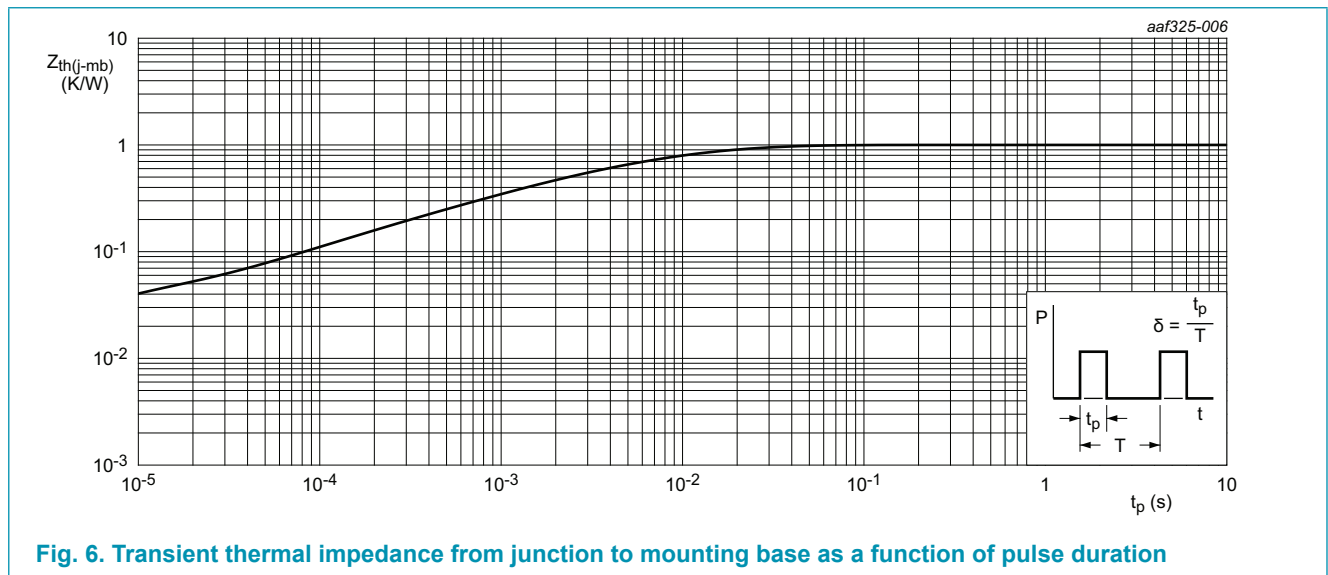


Fig. 5. Total power dissipation as a function of RMS on-state current; maximum values

## 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    | <a href="#">Fig. 6</a> | -   | -   | 1   | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient free air | in free air            | -   | 60  | -   | K/W  |



## 9. Characteristics

Table 6. Characteristics

| Symbol                         | Parameter                         | Conditions   | Min  | Typ  | Max  | Unit       |
|--------------------------------|-----------------------------------|--|------|------|------|------------|
| <b>Static characteristics</b>  |                                   |  |      |      |      |            |
| $I_{GT}$                       | gate trigger current              | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_J = 25\text{ °C}$ ; <a href="#">Fig. 7</a>   | 1.5  | -    | 10   | mA         |
| $I_L$                          | latching current                  | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_J = 25\text{ °C}$ ; <a href="#">Fig. 8</a>   | -    | -    | 80   | mA         |
| $I_H$                          | holding current                   | $V_D = 12\text{ V}$ ; $T_J = 25\text{ °C}$ ; <a href="#">Fig. 9</a>  | -    | -    | 60   | mA         |
| $V_T$                          | on-state voltage                  | $I_T = 30\text{ A}$ ; $T_J = 25\text{ °C}$ ; <a href="#">Fig. 10</a>   | -    | 1.10 | 1.50 | V          |
| $V_{GT}$                       | gate trigger voltage              | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_J = 25\text{ °C}$ ; <a href="#">Fig. 11</a>  | -    | 0.6  | 1    | V          |
|                                |                                   | $V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_J = 125\text{ °C}$ ; <a href="#">Fig. 11</a>  | 0.25 | 0.4  | -    | V          |
| $I_D$                          | off-state current                 | $V_D = 800\text{ V}$ ; $T_J = 150\text{ °C}$   | -    | -    | 2    | mA         |
| $I_R$                          | reverse current                   | $V_D = 800\text{ V}$ ; $T_J = 150\text{ °C}$   | -    | -    | 2    | mA         |
| <b>Dynamic characteristics</b> |                                   |  |      |      |      |            |
| $dV_D/dt$                      | rate of rise of off-state voltage | $V_{DM} = 536\text{ V}$ ; $T_J = 150\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit  | 80   | -    | -    | V/ $\mu$ s |
| $t_{gt}$                       | gate-controlled turn-on time      | $I_{TM} = 40\text{ A}$ ; $V_D = 800\text{ V}$ ; $I_G = 0.1\text{ mA}$ ; $dI_G/dt = 5\text{ A}/\mu\text{s}$ ; $T_J = 25\text{ °C}$  | -    | 2    | -    | $\mu$ s    |
| $t_q$                          | commutated turn-off time          | $V_{DM} = 536\text{ V}$ ; $T_J = 125\text{ °C}$ ; $I_{TM} = 50\text{ A}$ ; $V_R = 25\text{ V}$ ; $dI_T/dt = 30\text{ A}/\mu\text{s}$ ; $dV_D/dt = 50\text{ V}/\mu\text{s}$ | -    | 70   | -    | $\mu$ s    |

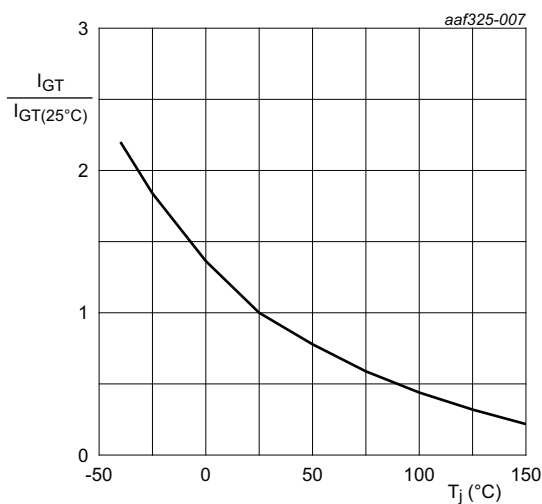


Fig. 7. Normalized gate trigger current as a function of junction temperature

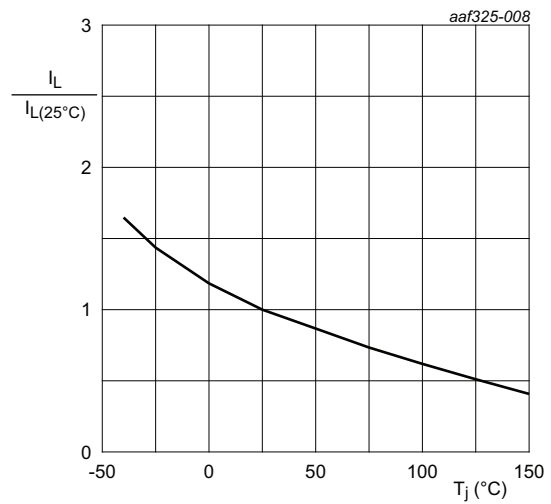


Fig. 8. Normalized latching current as a function of junction temperature

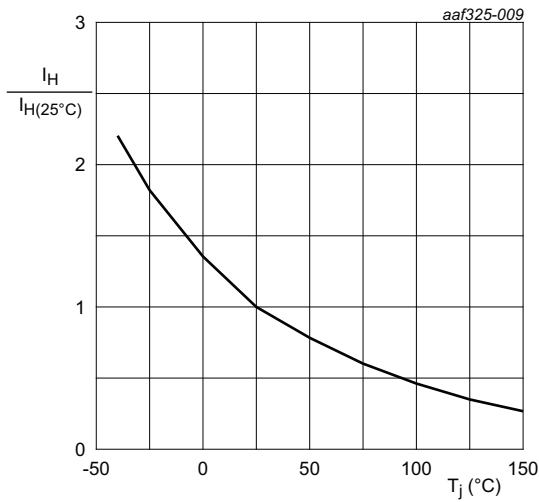
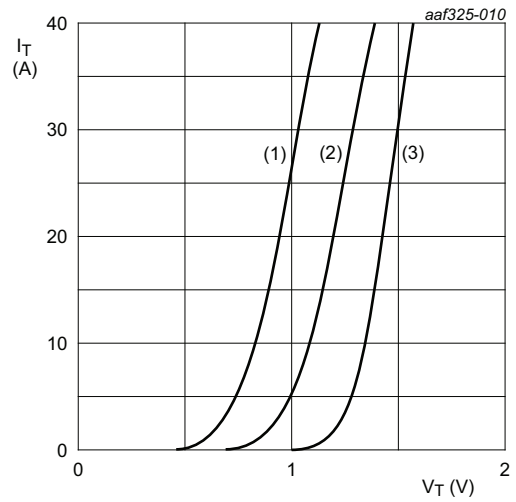


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 0.987 \text{ V}$ ;  $R_s = 0.0103 \ \Omega$   
 (1)  $T_j = 150 \text{ }^\circ\text{C}$ ; typical values  
 (2)  $T_j = 150 \text{ }^\circ\text{C}$ ; maximum values  
 (3)  $T_j = 25 \text{ }^\circ\text{C}$ ; maximum values

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

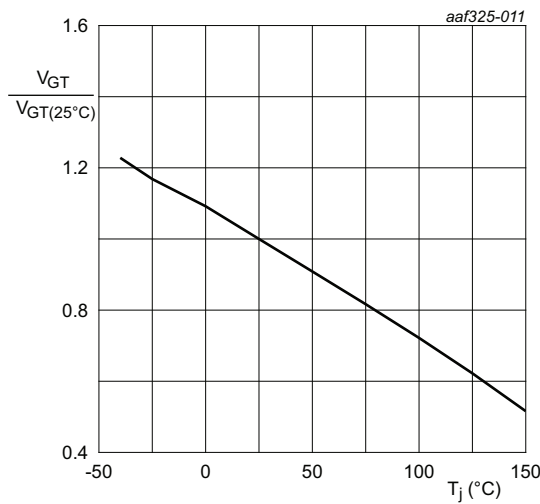
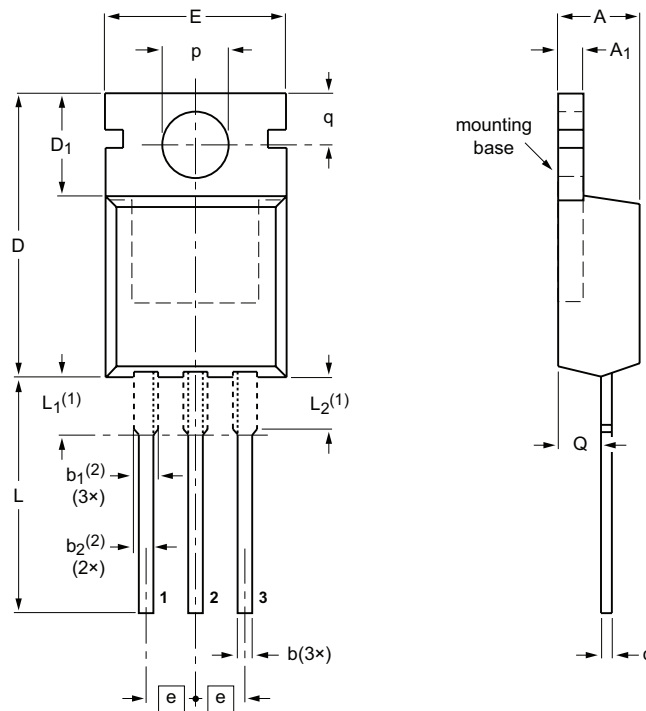


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

### 10. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

SOT78



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

| UNIT | A          | A <sub>1</sub> | b          | b <sub>1</sub> ( <sup>2</sup> ) | b <sub>2</sub> ( <sup>2</sup> ) | c          | D            | D <sub>1</sub> | E           | e    | L            | L <sub>1</sub> ( <sup>1</sup> ) | L <sub>2</sub> ( <sup>1</sup> ) max. | p          | q          | Q          |
|------|------------|----------------|------------|---------------------------------|---------------------------------|------------|--------------|----------------|-------------|------|--------------|---------------------------------|--------------------------------------|------------|------------|------------|
| mm   | 4.7<br>4.1 | 1.40<br>1.25   | 0.9<br>0.6 | 1.6<br>1.0                      | 1.3<br>1.0                      | 0.7<br>0.4 | 16.0<br>15.2 | 6.6<br>5.9     | 10.3<br>9.7 | 2.54 | 15.0<br>12.8 | 3.30<br>2.79                    | 3.0                                  | 3.8<br>3.5 | 3.0<br>2.7 | 2.6<br>2.2 |

**Notes**

- 1. Lead shoulder designs may vary.
- 2. Dimension includes excess dambar.

| OUTLINE VERSION | REFERENCES |                 |       |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|-----------------|-------|--|---------------------|----------------------|
|                 | IEC        | JEDEC           | JEITA |  |                     |                      |
| SOT78           |            | 3-lead TO-220AB | SC-46 |  |                     | 08-04-23<br>08-06-13 |

Fig. 12. Package outline TO-220AB (SOT78)



## 11. Legal information

### 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. |
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- [1] Please consult the most recently issued document before initiating or completing a design.
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Date of release: 24 April 2017

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