

## 1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a SOT78 (TO-220AB) plastic package intended for use in applications requiring very high inrush current capability, high thermal cycling performance and high junction temperature capability ( $T_{j(max)} = 150\text{ °C}$ ).

## 2. Features and benefits

- High bidirectional blocking voltage capability
- High junction operating temperature capability
- High thermal cycling performance
- Planar passivated for voltage ruggedness and reliability
- Very high current surge capability

## 3. Applications

- Capacitive Discharge Ignition (CDI)
- Crowbar protection
- Inrush protection
- Motor control
- Voltage regulation

## 4. Quick reference data

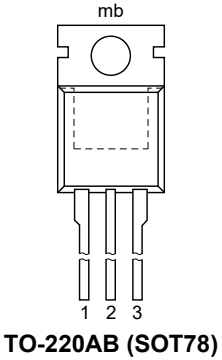
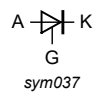
Table 1. Quick reference data

| Symbol                         | Parameter                            | Conditions  | Min | Typ | Max  | Unit |
|--------------------------------|--------------------------------------|---|-----|-----|------|------|
| $V_{RRM}$                      | repetitive peak reverse voltage      |   | -   | -   | 800  | V    |
| $I_{T(AV)}$                    | average on-state current             | half sine wave; $T_{mb} \leq 129\text{ °C}$ ; <a href="#">Fig. 1</a>  | -   | -   | 12.7 | A    |
| $I_{T(RMS)}$                   | RMS on-state current                 | half sine wave; $T_{mb} \leq 129\text{ °C}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>                         | -   | -   | 20   | A    |
| $I_{TSM}$                      | non-repetitive peak on-state current | half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a> | -   | -   | 210  | A    |
|                                |                                      | half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$  | -   | -   | 231  | A    |
| $T_j$                          | junction temperature                 |   | -   | -   | 150  | °C   |
| <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>                            | -   | 4.5 | 32   | mA   |
| <b>Dynamic characteristics</b> |                                      |   |     |     |      |      |

| Symbol              | Parameter                         | Conditions  | Min  | Typ | Max | Unit |
|---------------------|-----------------------------------|---|------|-----|-----|------|
| dV <sub>D</sub> /dt | rate of rise of off-state voltage | V <sub>DM</sub> = 402 V; T <sub>j</sub> = 150 °C; exponential waveform; gate open circuit   | 1000 | -   | -   | V/μs |
|                     |                                   | V <sub>DM</sub> = 536 V; T <sub>j</sub> = 150 °C; (V <sub>DM</sub> = 67% of V <sub>DRM</sub> ); exponential waveform; gate open circuit | 500  | -   | -   | V/μs |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                       | Simplified outline   | Graphic symbol  |
|-----|--------|-----------------------------------|--|---|
| 1   | K      | cathode                           |  <p>mb</p> <p>1 2 3</p> <p><b>TO-220AB (SOT78)</b></p> |  <p>A K<br/>G<br/>sym037</p> |
| 2   | A      | anode                             |  |   |
| 3   | G      | gate                              |  |   |
| mb  | A      | mounting base; connected to anode |  |   |

## 6. Ordering information

Table 3. Ordering information

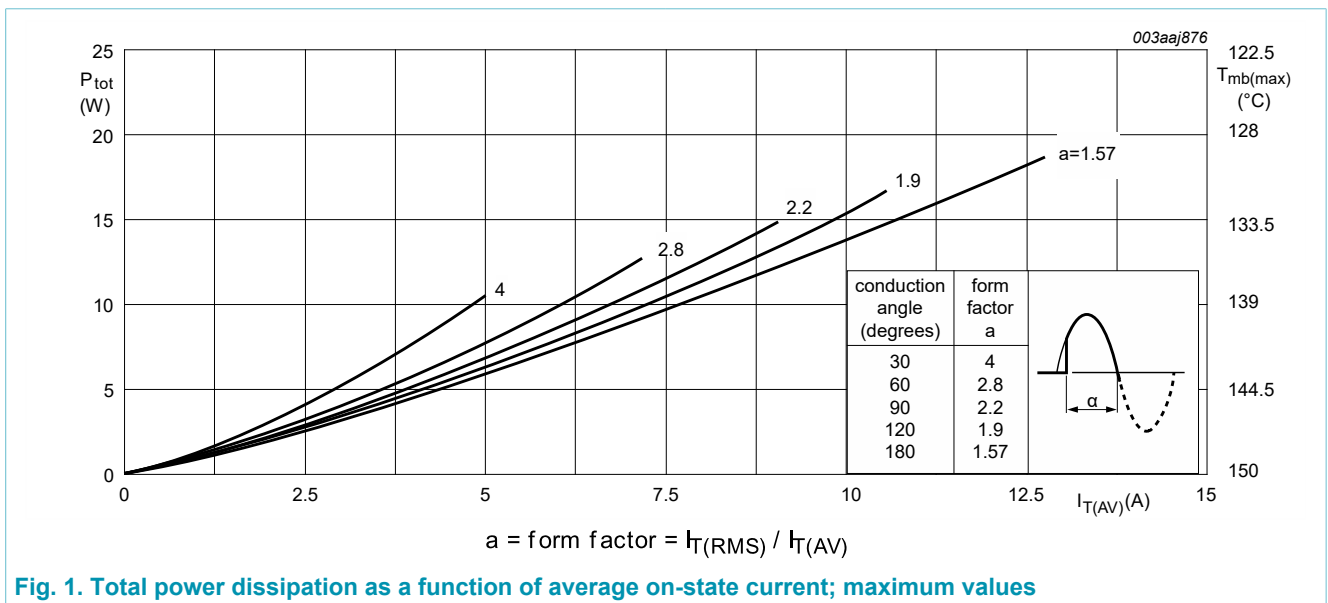
| Type number | Package  |  |         |
|-------------|----------|--|---------|
|             | Name     | Description  | Version |
| TYN20-800T  | TO-220AB | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB | SOT78   |

## 7. Limiting values

**Table 4. Limiting values**

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

| Symbol       | Parameter                            | Conditions   | Min | Max   | 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; $T_{mb} \leq 129\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a>   | -   | 12.7  | A                      |
| $I_{T(RMS)}$ | RMS on-state current                 | half sine wave; $T_{mb} \leq 129\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>                                | -   | 20    | A                      |
| $I_{TSM}$    | non-repetitive peak on-state current | half sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a> | -   | 210   | A                      |
|              |                                      | half sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 8.3\text{ ms}$  | -   | 231   | A                      |
| $I^2t$       | $I^2t$ for fusing                    | $t_p = 10\text{ ms}$ ; sine-wave pulse   | -   | 220.5 | $\text{A}^2\text{s}$   |
| $di_T/dt$    | rate of rise of on-state current     | $I_G = 70\text{ mA}$   | -   | 100   | $\text{A}/\mu\text{s}$ |
| $I_{GM}$     | peak gate current                    |  | -   | 5     | A                      |
| $V_{RGM}$    | peak reverse gate voltage            |  | -   | 5     | V                      |
| $P_{GM}$     | peak gate power                      |  | -   | 20    | W                      |
| $P_{G(AV)}$  | average gate power                   | over any 20 ms period  | -   | 1     | W                      |
| $T_{stg}$    | storage temperature                  |  | -40 | 150   | $^{\circ}\text{C}$     |
| $T_j$        | junction temperature                 |  | -   | 150   | $^{\circ}\text{C}$     |



**Fig. 1. Total power dissipation as a function of average on-state current; maximum values**

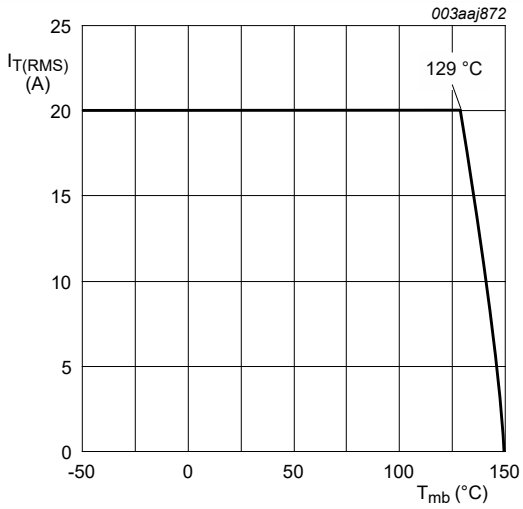


Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values

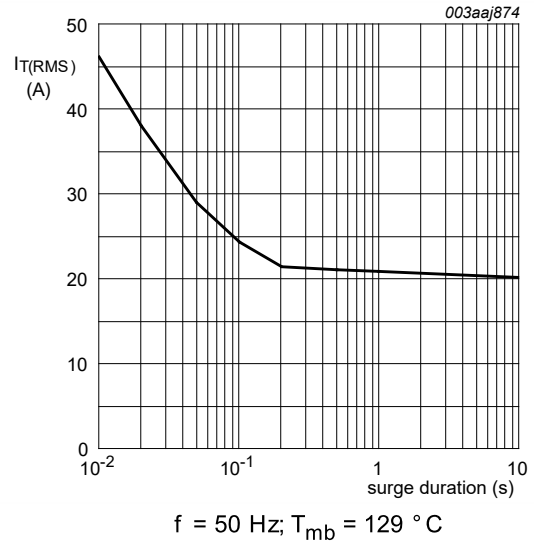


Fig. 3. RMS on-state current as a function of surge duration; maximum values

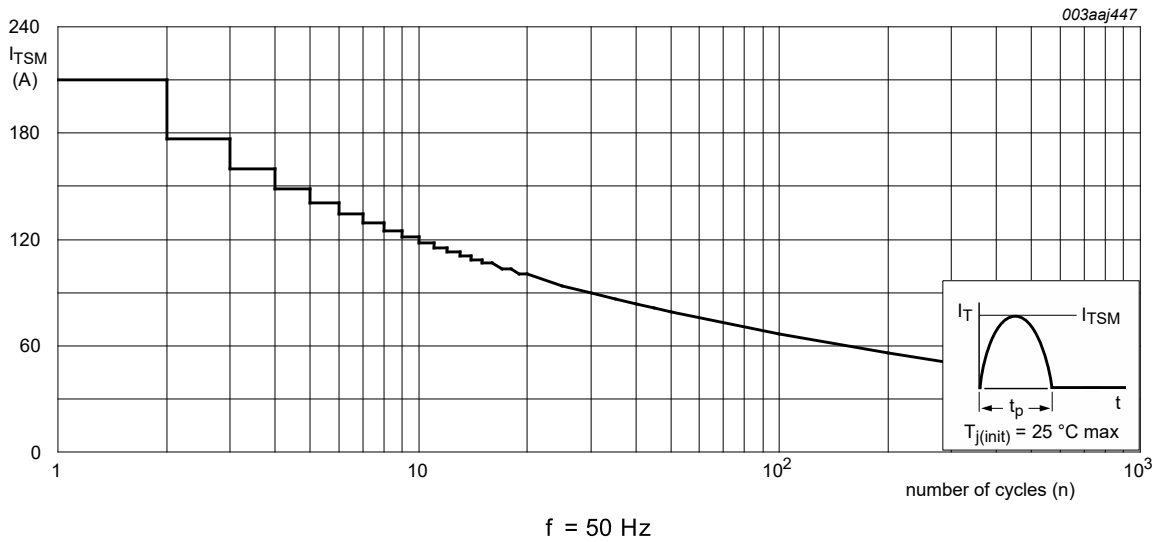
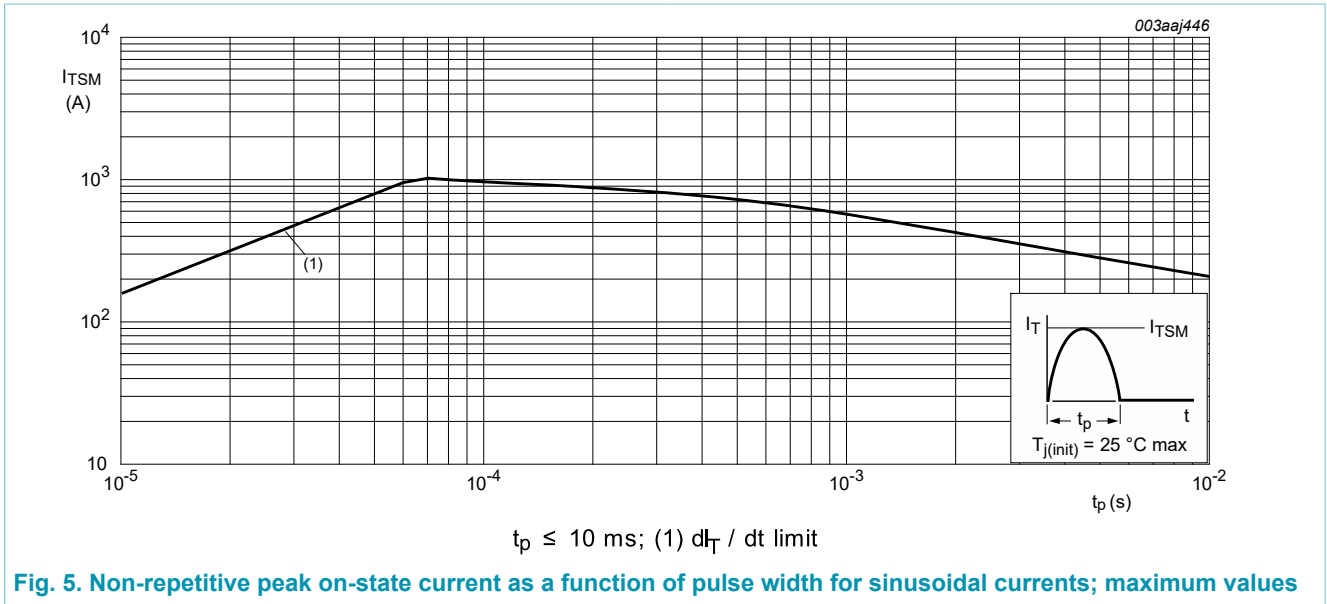


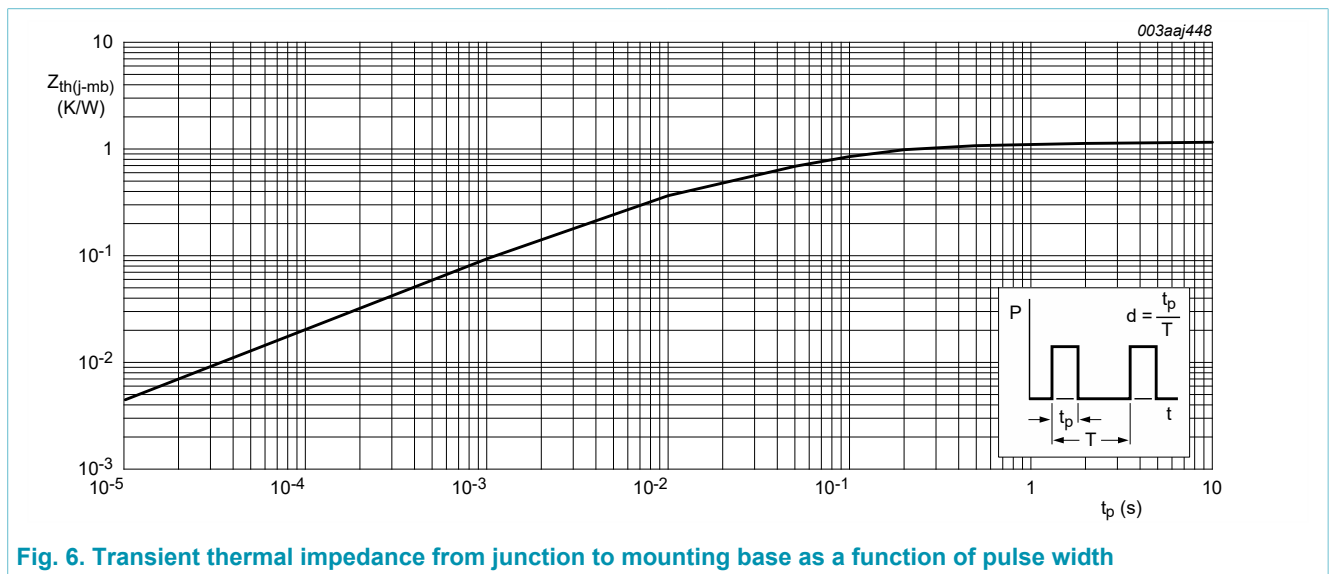
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



## 8. Thermal characteristics

Table 5. Thermal characteristics

| Symbol         | Parameter  | Conditions             | Min | Typ | Max | Unit |
|----------------|--|------------------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base    | <a href="#">Fig. 6</a> | -   | -   | 1.1 | 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              | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>   | -    | 4.5 | 32  | mA               |
| $I_L$                          | latching current                  | $V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>   | -    | 21  | 60  | mA               |
| $I_H$                          | holding current                   | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>  | -    | 16  | 40  | mA               |
| $V_T$                          | on-state voltage                  | $I_T = 32\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>   | -    | 1.2 | 1.5 | V                |
| $V_{GT}$                       | gate trigger voltage              | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>  | -    | 0.7 | 1.3 | V                |
|                                |                                   | $V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>  | 0.2  | 0.4 | -   | V                |
| $I_D$                          | off-state current                 | $V_D = 800\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$   | -    | 0.2 | 1   | mA               |
| $I_R$                          | reverse current                   | $V_R = 800\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$   | -    | 0.2 | 1   | mA               |
| <b>Dynamic characteristics</b> |                                   |  |      |     |     |                  |
| $dV_D/dt$                      | rate of rise of off-state voltage | $V_{DM} = 402\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; exponential waveform; gate open circuit  | 1000 | -   | -   | V/ $\mu\text{s}$ |
|                                |                                   | $V_{DM} = 536\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit  | 500  | -   | -   | V/ $\mu\text{s}$ |
| $t_{gt}$                       | gate-controlled turn-on time      | $I_{TM} = 40\text{ A}$ ; $V_D = 800\text{ V}$ ; $I_G = 100\text{ mA}$ ; $dI_G/dt = 5\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^\circ\text{C}$  | -    | -   | 2   | $\mu\text{s}$    |
| $t_q$                          | commutated turn-off time          | $V_{DM} = 536\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $I_{TM} = 20\text{ A}$ ; $V_R = 25\text{ V}$ ; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$ ; $dV_D/dt = 50\text{ V}/\mu\text{s}$ ; $R_{GK(ext)} = 100\text{ }\Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit | -    | 70  | -   | $\mu\text{s}$    |

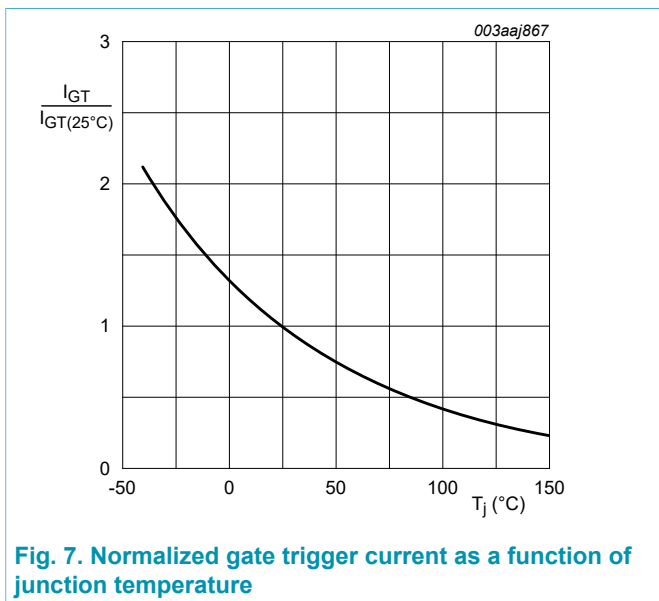


Fig. 7. Normalized gate trigger current as a function of junction temperature

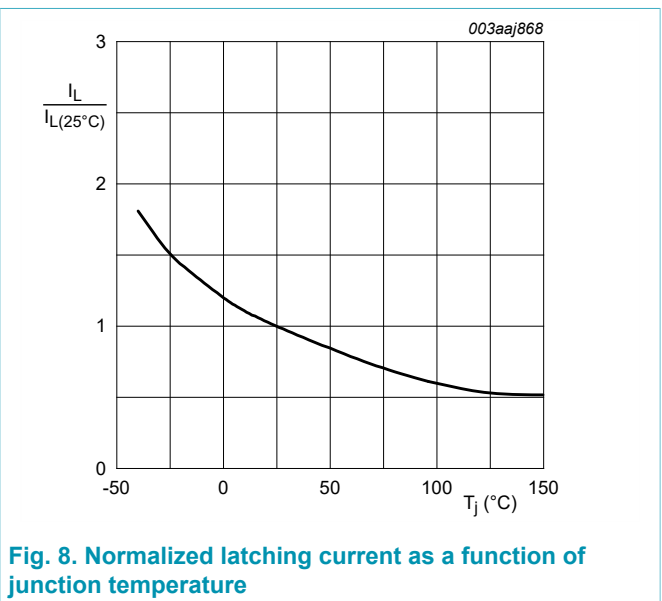


Fig. 8. Normalized latching current as a function of junction temperature

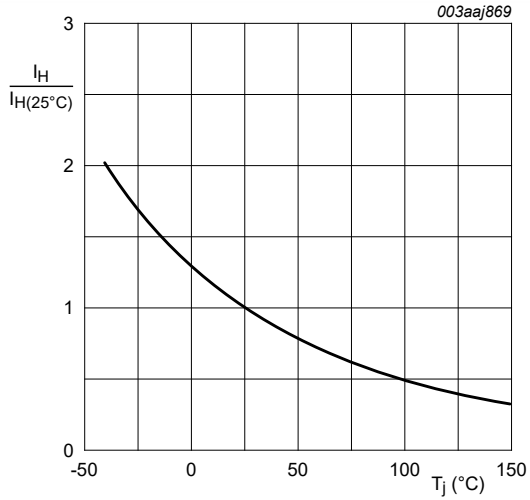
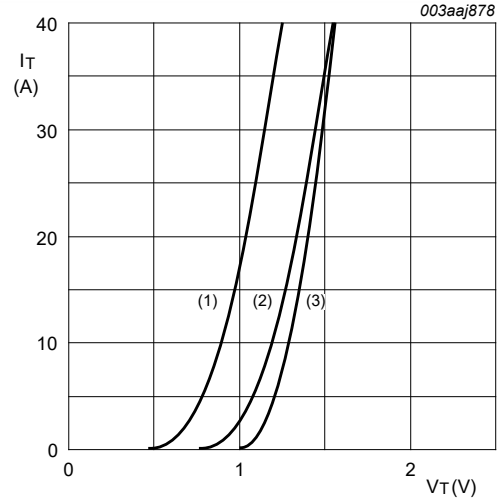


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 1.0485 \text{ V}; R_s = 0.0133 \Omega$

- (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

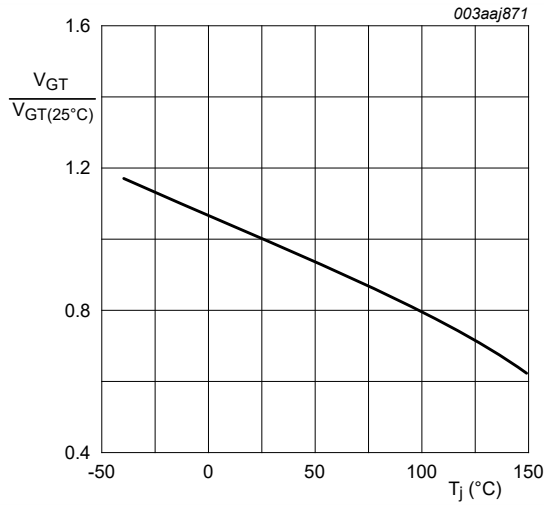


Fig. 11. Normalized gate trigger voltage as a function of junction temperature



### 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> (2) | b <sub>2</sub> (2) | c          | D            | D <sub>1</sub> | E           | e    | L            | L <sub>1</sub> (1) | L <sub>2</sub> (1) 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. |
| 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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For sales office addresses, please send an email to: [salesaddresses@ween-semi.com](mailto:salesaddresses@ween-semi.com)  
Date of release: 23 July 2018

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