



# IMPORTANT NOTICE

10 December 2015

## 1. Global joint venture starts operations as WeEn Semiconductors

Dear customer,

As from November 9th, 2015 NXP Semiconductors N.V. and Beijing JianGuang Asset Management Co. Ltd established Bipolar Power joint venture (JV), **WeEn Semiconductors**, which will be used in future Bipolar Power documents together with new contact details.

In this document where the previous NXP references remain, please use the new links as shown below.

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Thank you for your cooperation and understanding,

WeEn Semiconductors





# BT137-800G0

4Q Triac

12 June 2014

Product data sheet

## 1. General description

Planar passivated four quadrant triac in a SOT78 (TO-220AB) plastic package intended for use in general purpose bidirectional switching and phase control applications.

## 2. Features and benefits

- High blocking voltage capability
- Least sensitive gate for highest noise immunity
- High minimum  $I_{GT}$  for guaranteed immunity to gate noise
- Planar passivated for voltage ruggedness and reliability
- Triggering in all four quadrants

## 3. Applications

- General purpose motor controls
- Lighting controls
- Applications where only positive gate drive is available
- Applications where gate noise or interference may occur

## 4. Quick reference data

Table 1. Quick reference data

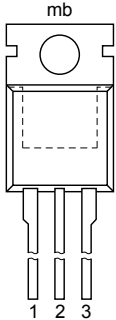
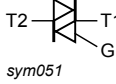
| Symbol                        | Parameter                            | Conditions  | Min | Typ | Max | Unit               |
|-------------------------------|--------------------------------------|---|-----|-----|-----|--------------------|
| $V_{DRM}$                     | repetitive peak off-state voltage    |   | -   | -   | 800 | V                  |
| $I_{TSM}$                     | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ;<br>$t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a> | -   | -   | 65  | A                  |
| $T_j$                         | junction temperature                 |   | -   | -   | 125 | $^{\circ}\text{C}$ |
| $I_{T(\text{RMS})}$           | RMS on-state current                 | full sine wave; $T_{mb} \leq 102\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ;<br><a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>       | -   | -   | 8   | A                  |
| <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>                           | 10  | -   | 50  | 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>                           | 10  | -   | 50  | mA                 |



| Symbol                         | Parameter                         | Conditions  | Min | Typ | Max | Unit             |
|--------------------------------|-----------------------------------|---|-----|-----|-----|------------------|
|                                |                                   | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; Fig. 7                                       | 10  | -   | 50  | mA               |
|                                |                                   | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+;<br>$T_j = 25\text{ }^\circ\text{C}$ ; Fig. 7                                       | 10  | -   | 100 | mA               |
| <b>Dynamic characteristics</b> |                                   |   |     |     |     |                  |
| $dV_D/dt$                      | 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 | 200 | -   | -   | V/ $\mu\text{s}$ |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                    | Simplified outline   | Graphic symbol  |
|-----|--------|--------------------------------|--|---|
| 1   | T1     | main terminal 1                |  <p>TO-220AB (SOT78)</p> |  <p>sym051</p> |
| 2   | T2     | main terminal 2                |  |   |
| 3   | G      | gate                           |  |   |
| mb  | T2     | mounting base; main terminal 2 |  |   |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package  |  | Version |
|-------------|----------|--|---------|
|             | Name     | Description  |         |
| BT137-800G0 | TO-220AB | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB | SOT78   |

## 7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| BT137-800G0 | BT137-800G0  |

## 8. Limiting values

**Table 5. 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; $T_{mb} \leq 102\text{ °C}$ ; <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; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>  | -   | 65  | A                |
|              |                                      | full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$  | -   | 71  | A                |
| $I^2t$       | $I^2t$ for fusing                    | $t_p = 10\text{ ms}$ ; sine-wave pulse   | -   | 21  | A <sup>2</sup> s |
| $di_T/dt$    | rate of rise of on-state current     | $I_T = 12\text{ A}$ ; $I_G = 0.2\text{ A}$ ; $dI_G/dt = 0.2\text{ A}/\mu\text{s}$ ; T2+ G+                             | -   | 50  | A/ $\mu\text{s}$ |
|              |                                      | $I_T = 12\text{ A}$ ; $I_G = 0.2\text{ A}$ ; $dI_G/dt = 0.2\text{ A}/\mu\text{s}$ ; T2+ G-                             | -   | 50  | A/ $\mu\text{s}$ |
|              |                                      | $I_T = 12\text{ A}$ ; $I_G = 0.2\text{ A}$ ; $dI_G/dt = 0.2\text{ A}/\mu\text{s}$ ; T2- G-                             | -   | 50  | A/ $\mu\text{s}$ |
|              |                                      | $I_T = 12\text{ A}$ ; $I_G = 0.2\text{ A}$ ; $dI_G/dt = 0.2\text{ A}/\mu\text{s}$ ; T2- G+                             | -   | 10  | 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 | °C               |
| $T_j$        | junction temperature                 |  | -   | 125 | °C               |

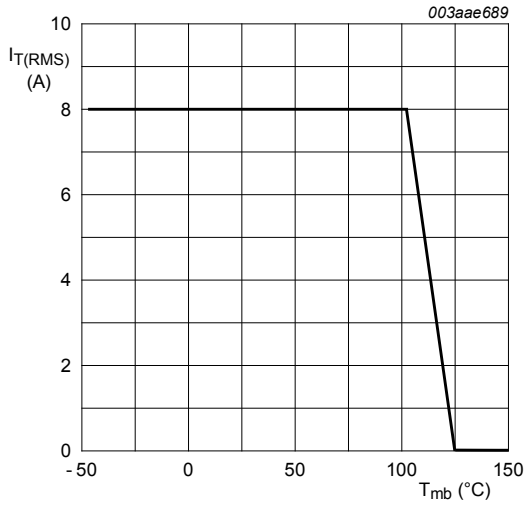
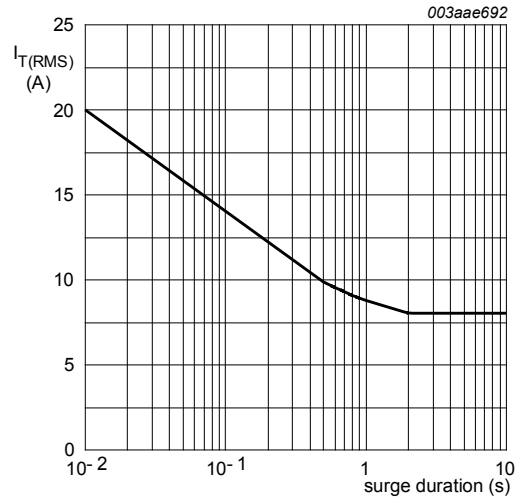
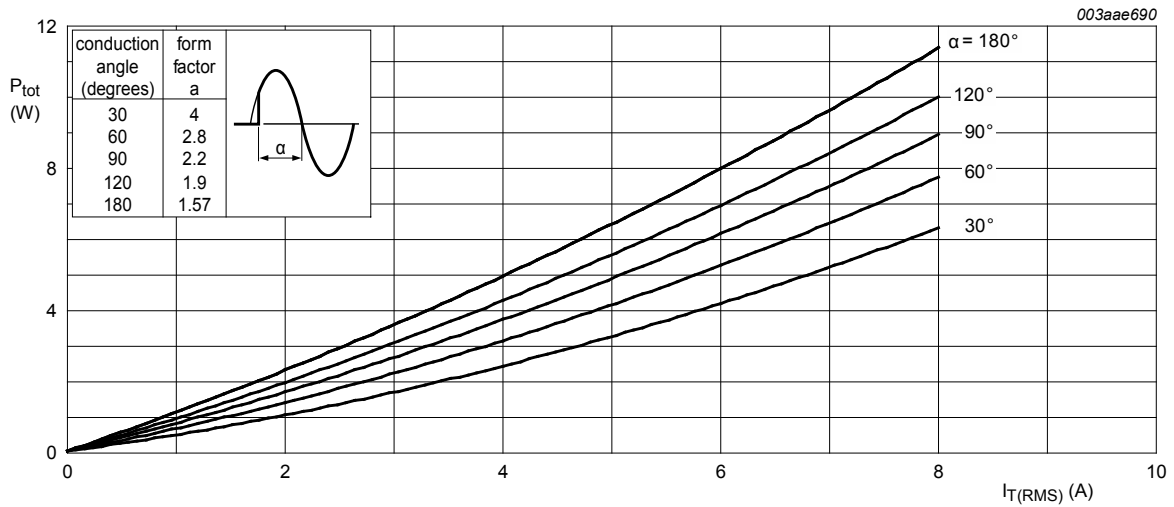


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



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

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



$\alpha$  = conduction angle  
 a = form factor =  $I_{T(RMS)}/I_{T(AV)}$

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

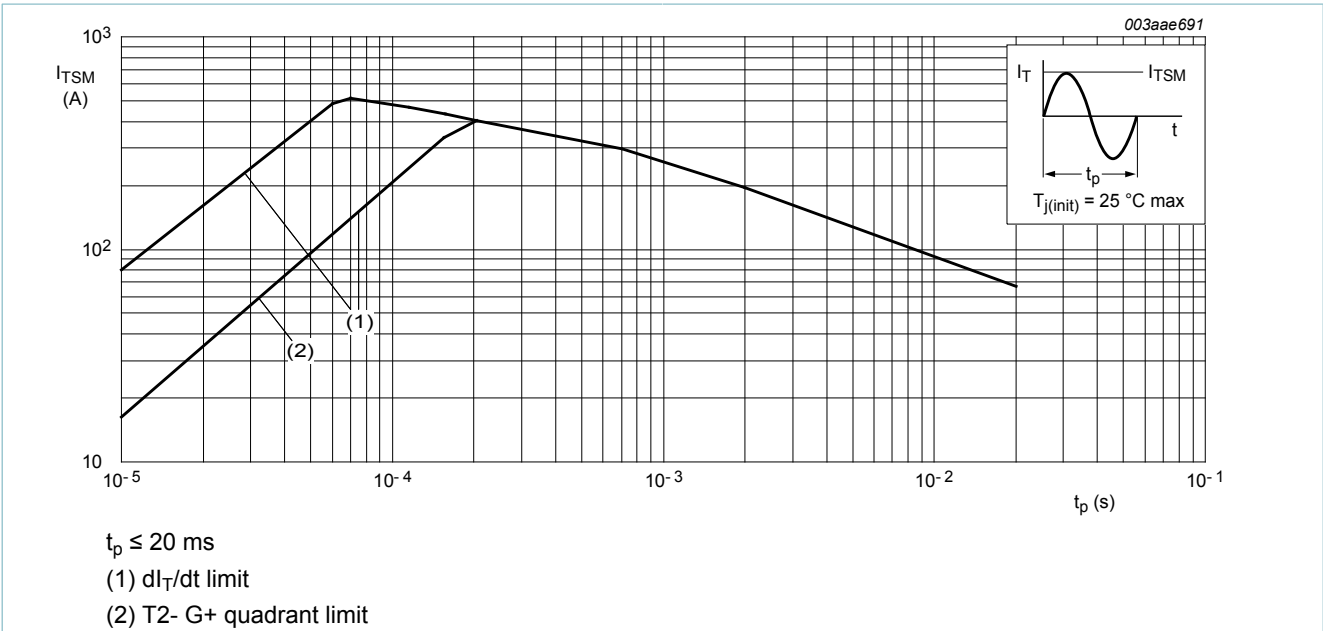


Fig. 4. Non-repetitive peak on-state current as a function of pulse width; maximum values

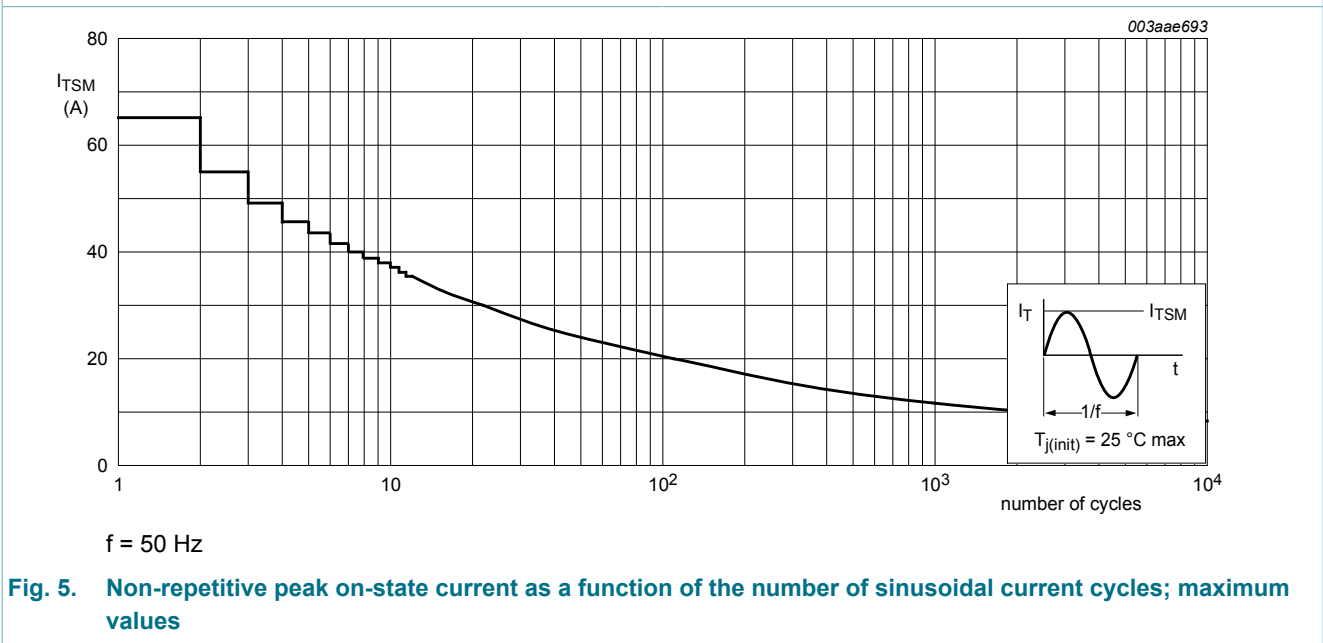


Fig. 5. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

## 9. Thermal characteristics

Table 6. 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       | in free air                        | -   | 60  | -   | K/W  |

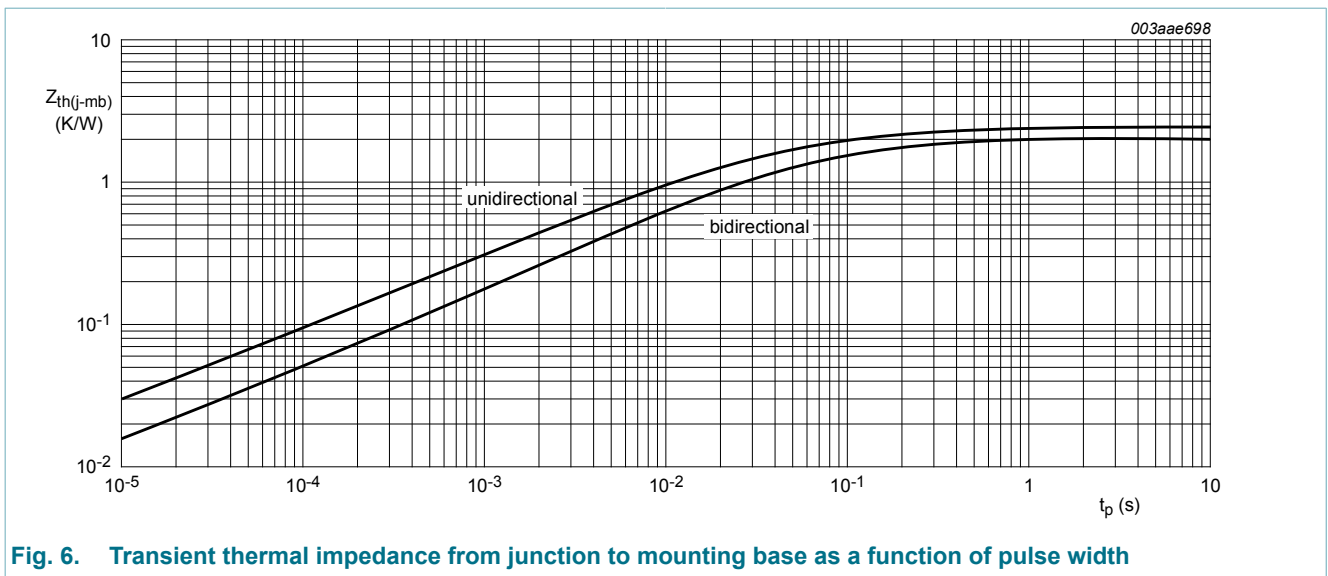


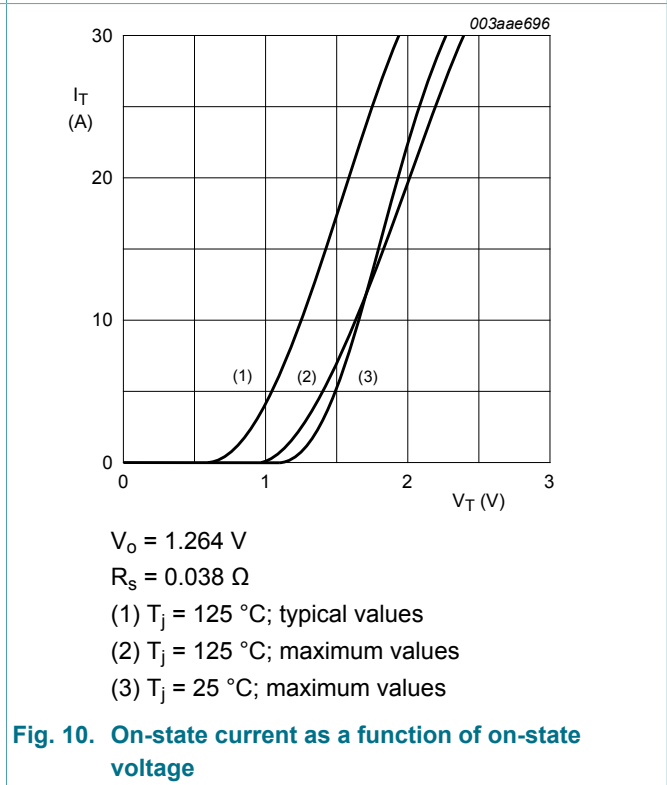
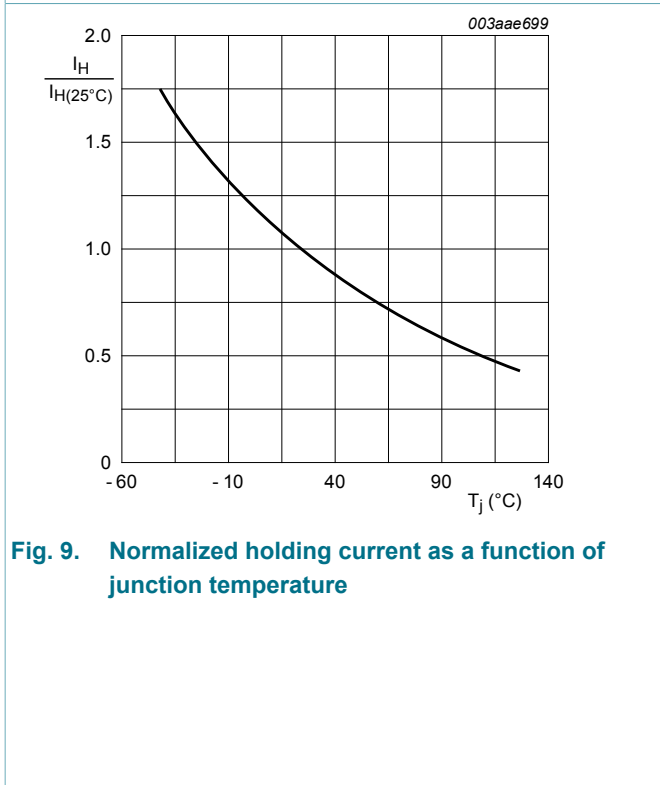
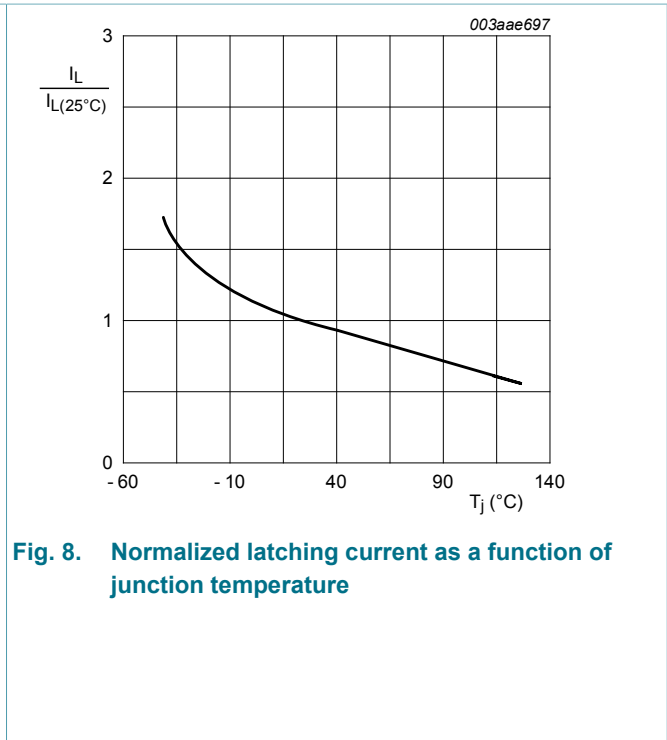
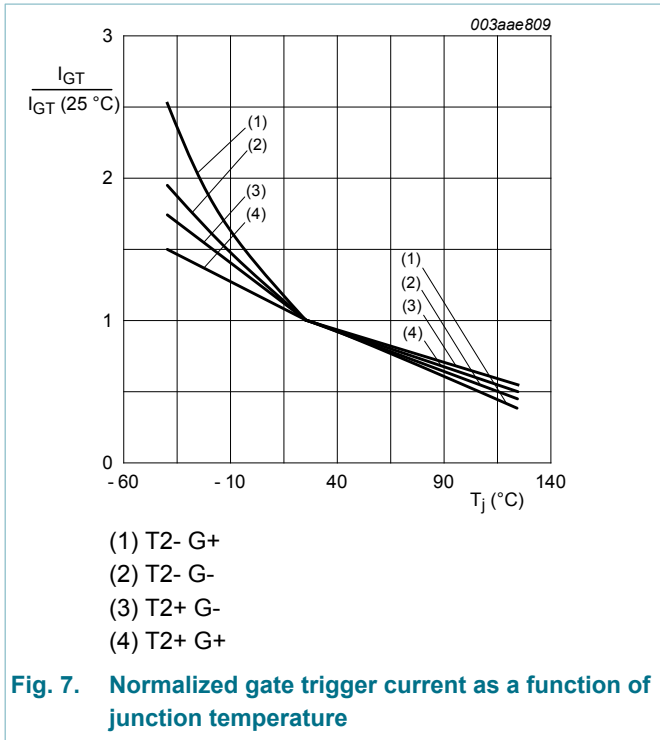
Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse width

## 10. Characteristics

Table 7. Characteristics

| Symbol                         | Parameter                             | Conditions  | Min  | Typ | Max  | Unit |
|--------------------------------|---------------------------------------|---|------|-----|------|------|
| <b>Static characteristics</b>  |                                       |   |      |     |      |      |
| I <sub>GT</sub>                | gate trigger current                  | V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.1 A; T2+ G+;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>                                | 10   | -   | 50   | mA   |
|                                |                                       | V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.1 A; T2+ G-;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>                                | 10   | -   | 50   | mA   |
|                                |                                       | V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.1 A; T2- G-;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>                                | 10   | -   | 50   | mA   |
|                                |                                       | V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.1 A; T2- G+;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>                                | 10   | -   | 100  | mA   |
| I <sub>L</sub>                 | latching current                      | V <sub>D</sub> = 12 V; I <sub>G</sub> = 0.1 A; T2+ G+;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>                                | -    | -   | 45   | mA   |
|                                |                                       | V <sub>D</sub> = 12 V; I <sub>G</sub> = 0.1 A; T2+ G-;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>                                | -    | -   | 60   | mA   |
|                                |                                       | V <sub>D</sub> = 12 V; I <sub>G</sub> = 0.1 A; T2- G-;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>                                | -    | -   | 45   | mA   |
|                                |                                       | V <sub>D</sub> = 12 V; I <sub>G</sub> = 0.1 A; T2- G+;<br>T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>                                | -    | -   | 60   | mA   |
| I <sub>H</sub>                 | holding current                       | V <sub>D</sub> = 12 V; T <sub>j</sub> = 25 °C; <a href="#">Fig. 9</a>   | -    | -   | 40   | mA   |
| V <sub>T</sub>                 | on-state voltage                      | I <sub>T</sub> = 10 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 10</a>  | -    | 1.3 | 1.65 | V    |
| V <sub>GT</sub>                | gate trigger voltage                  | V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.1 A; T <sub>j</sub> = 25 °C;<br><a href="#">Fig. 11</a>                                       | -    | 0.7 | 1    | V    |
|                                |                                       | V <sub>D</sub> = 400 V; I <sub>T</sub> = 0.1 A; T <sub>j</sub> = 125 °C;<br><a href="#">Fig. 11</a>                                     | 0.25 | 0.4 | -    | V    |
| I <sub>D</sub>                 | off-state current                     | V <sub>D</sub> = 800 V; T <sub>j</sub> = 125 °C   | -    | 0.1 | 0.5  | mA   |
| <b>Dynamic characteristics</b> |                                       |   |      |     |      |      |
| dV <sub>D</sub> /dt            | rate of rise of off-state voltage     | V <sub>DM</sub> = 536 V; T <sub>j</sub> = 125 °C; (V <sub>DM</sub> = 67% of V <sub>DRM</sub> ); exponential waveform; gate open circuit | 200  | -   | -    | V/μs |
| dV <sub>com</sub> /dt          | rate of change of commutating voltage | V <sub>D</sub> = 400 V; T <sub>j</sub> = 95 °C; dI <sub>com</sub> /dt = 3.6 A/ms; I <sub>T</sub> = 8 A; gate open circuit               | 10   | -   | -    | V/μs |
| t <sub>gt</sub>                | gate-controlled turn-on time          | I <sub>TM</sub> = 12 A; V <sub>D</sub> = 800 V; I <sub>G</sub> = 0.1 A; dI <sub>G</sub> /dt = 5 A/μs                                    | -    | 2   | -    | μs   |





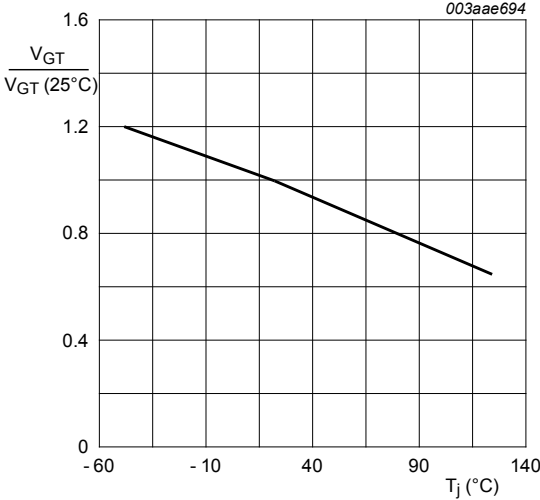


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

### 11. 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)

## 12. Legal information

### 12.1 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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## 13. Contents

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