



OT413

3Q Hi-Com Triac

14 July 2014

Product data sheet

1. General description

Planar passivated high commutation three quadrant triac in a SOT78D (TO-220AB) internally insulated plastic package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series B" triac will commute the full RMS current at the maximum rated junction temperature without the aid of a snubber. This device has high T_j operating capability and an internally isolated mounting base.

2. Features and benefits

- 3Q technology for improved noise immunity
- High commutation capability with maximum false trigger immunity
- High surge capability
- High $T_{j(max)}$
- Isolated mounting base with 2500 V (RMS) isolation
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only
- Very high immunity to false turn-on by dV/dt

3. Applications

- Electronic thermostats (heating and cooling)
- High power motor controls
- Rectifier-fed DC inductive loads e.g. DC motors and solenoids

4. Quick reference data

Table 1. Quick reference data

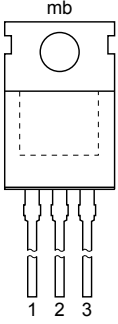

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------|--------------------------------------|---|-----|-----|-----|--------------------|
| V_{DRM} | repetitive peak off-state voltage | | - | - | 600 | V |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5 | - | - | 140 | A |
| T_j | junction temperature | | - | - | 150 | $^{\circ}\text{C}$ |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{mb} \leq 116\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | - | - | 12 | A |



| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|----------------------|--|-----|-----|-----|------|
| Static characteristics | | | | | | |
| I _{GT} | gate trigger current | V _D = 12 V; I _T = 0.1 A; T2+ G+; T _j = 25 °C; Fig. 7 | 2 | - | 50 | mA |
| | | V _D = 12 V; I _T = 0.1 A; T2+ G-; T _j = 25 °C; Fig. 7 | 2 | - | 50 | mA |
| | | V _D = 12 V; I _T = 0.1 A; T2- G-; T _j = 25 °C; Fig. 7 | 2 | - | 50 | mA |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------------------|---|---|
| 1 | T1 | main terminal 1 |  <p>TO-220AB (SOT78D)</p> |  <p>sym051</p> |
| 2 | T2 | main terminal 2 | | |
| 3 | G | gate | | |
| mb | n.c. | mounting base; isolated | | |

6. Ordering information

Table 3. Ordering information

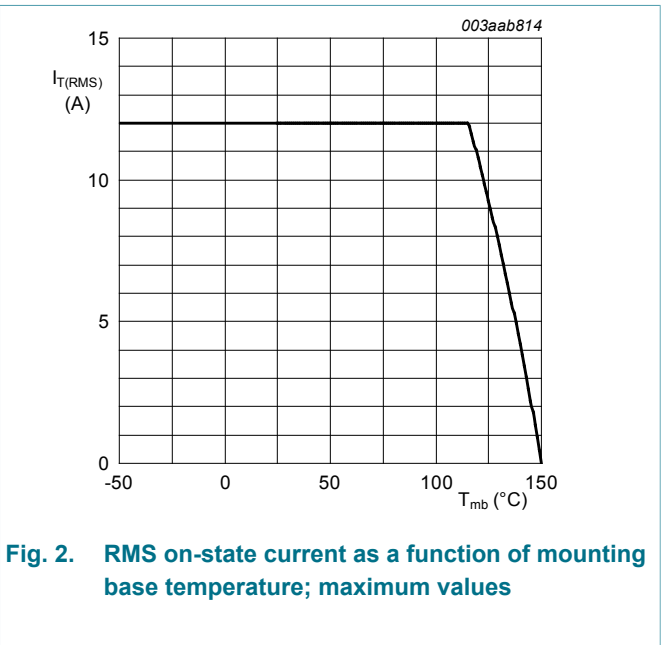
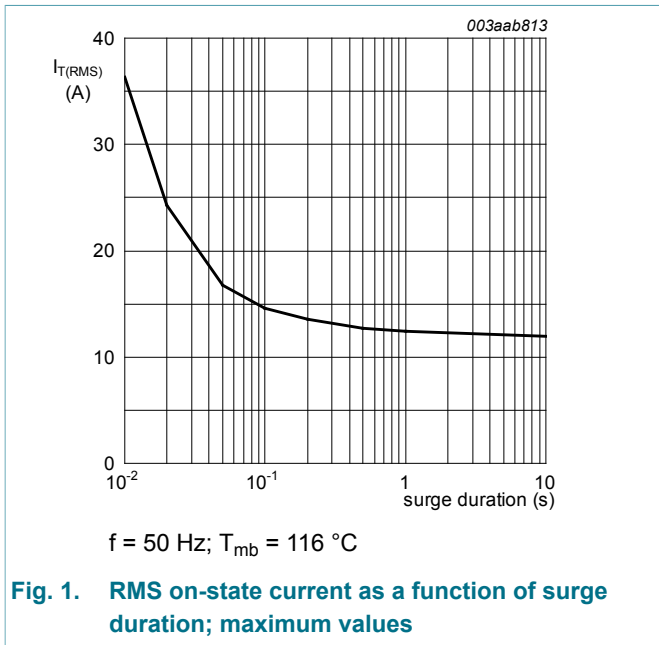
| Type number | Package | | Version |
|-------------|----------|---|---------|
| | Name | Description | |
| OT413 | TO-220AB | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 | SOT78D |

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; $T_{mb} \leq 116\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | - | 12 | A |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5 | - | 140 | A |
| | | full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$ | - | 153 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; SIN | - | 98 | A^2s |
| di_T/dt | rate of rise of on-state current | $I_T = 20\text{ A}$; $I_G = 0.2\text{ A}$; $di_G/dt = 0.2\text{ A}/\mu s$ | - | 100 | $A/\mu s$ |
| I_{GM} | peak gate current | | - | 2 | A |
| $P_{G(AV)}$ | average gate power | over any 20 ms period | - | 0.5 | W |
| T_{stg} | storage temperature | | -40 | 150 | $^{\circ}C$ |
| T_j | junction temperature | | - | 150 | $^{\circ}C$ |



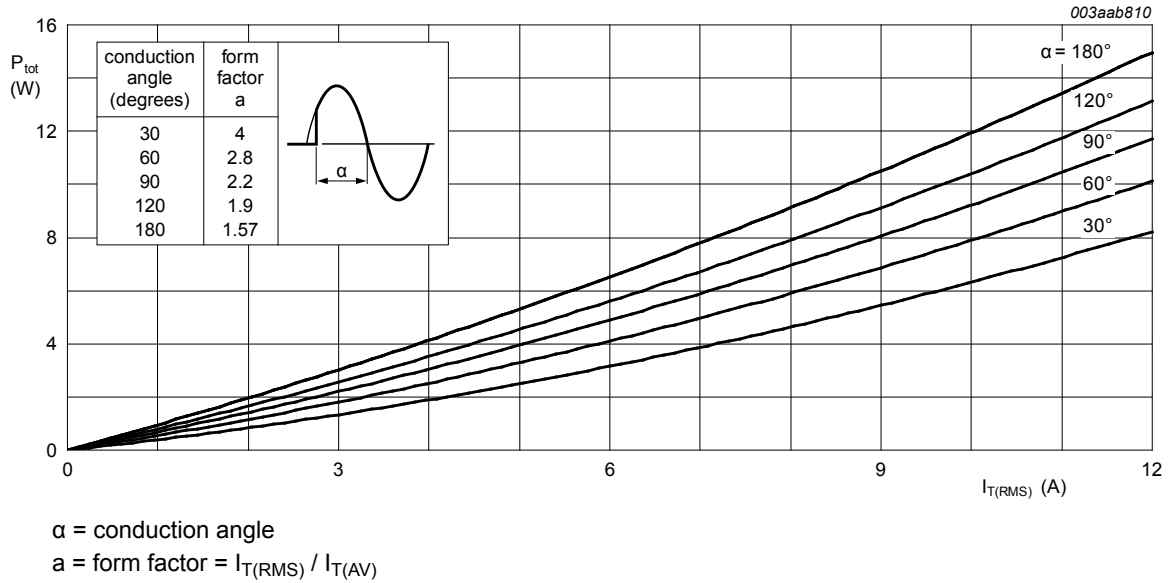


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

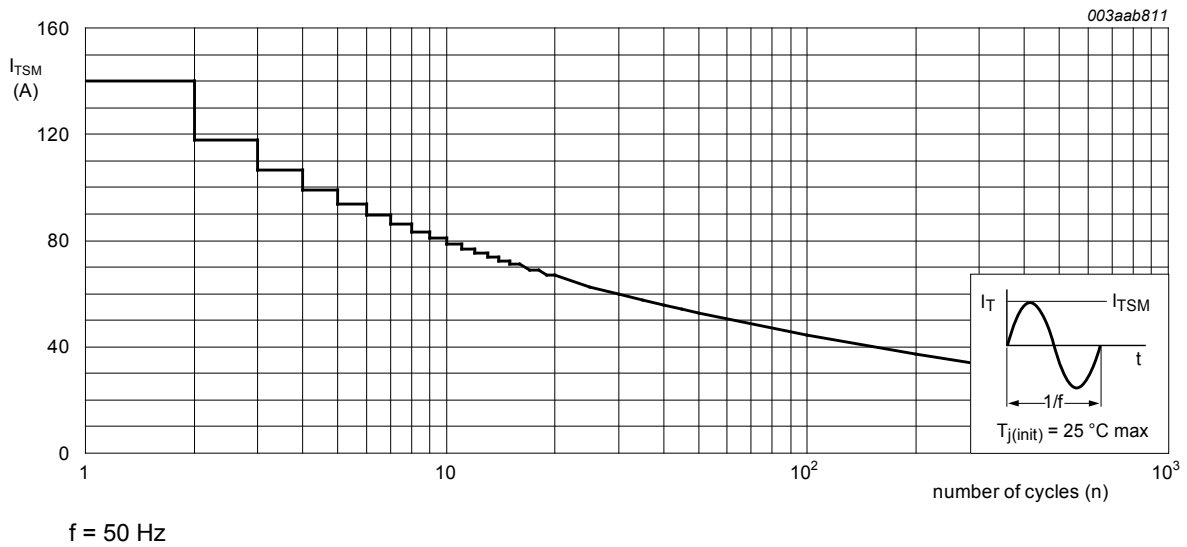
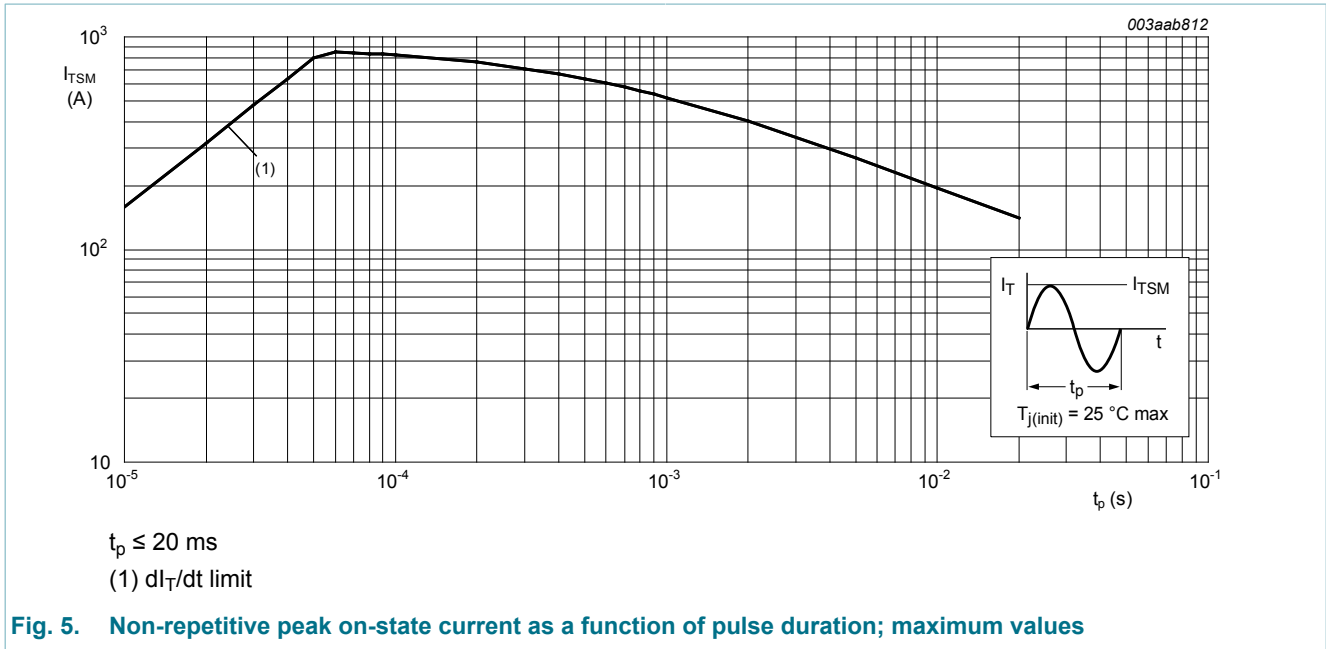


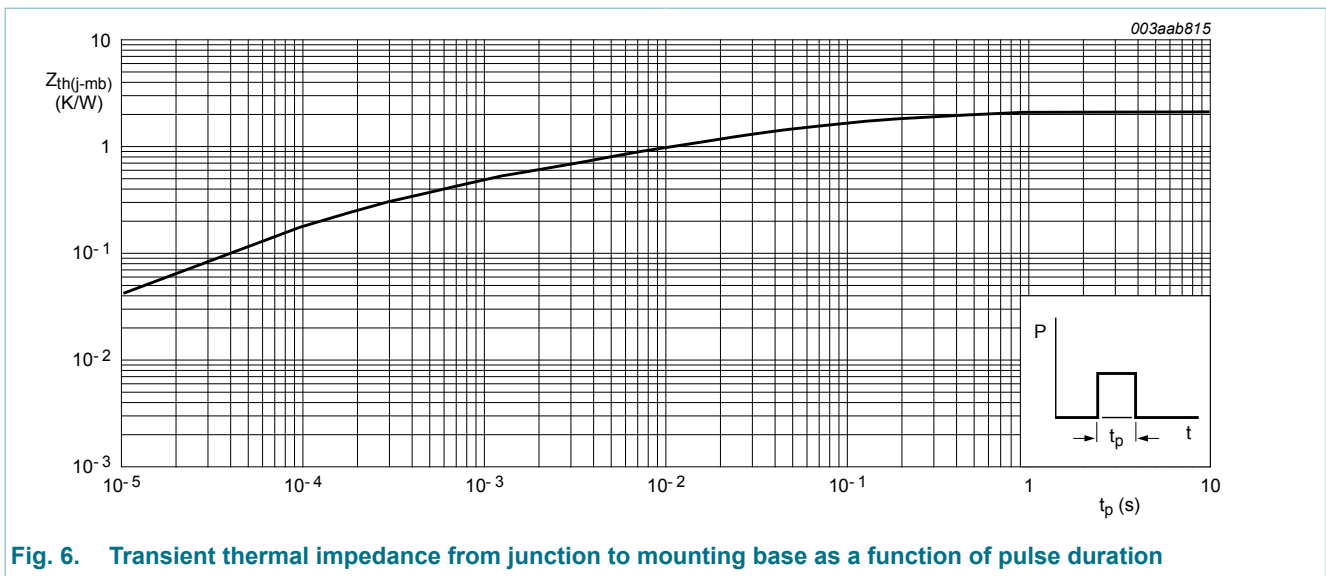
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



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; Fig. 6 | - | - | 2.1 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 60 | - | K/W |



9. Isolation characteristics

Table 6. Isolation characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------|-----------------------|---|-----|-----|------|------|
| $V_{isol(RMS)}$ | RMS isolation voltage | from all terminals to external heatsink; sinusoidal waveform; clean and dust free; $50\text{ Hz} \leq f \leq 60\text{ Hz}$; $RH \leq 65\%$; $T_{mb} = 25\text{ }^\circ\text{C}$ | - | - | 2500 | V |
| C_{isol} | isolation capacitance | from main terminal 2 to external heatsink; $f = 1\text{ MHz}$; $T_{mb} = 25\text{ }^\circ\text{C}$ | - | 10 | - | pF |

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------------|--|------|-----|-----|------|
| Static characteristics | | | | | | |
| I _{GT} | gate trigger current | V _D = 12 V; I _T = 0.1 A; T2+ G+; T _j = 25 °C; Fig. 7 | 2 | - | 50 | mA |
| | | V _D = 12 V; I _T = 0.1 A; T2+ G-; T _j = 25 °C; Fig. 7 | 2 | - | 50 | mA |
| | | V _D = 12 V; I _T = 0.1 A; T2- G-; T _j = 25 °C; Fig. 7 | 2 | - | 50 | mA |
| I _L | latching current | V _D = 12 V; I _G = 0.1 A; T2+ G+; T _j = 25 °C; Fig. 8 | - | - | 60 | mA |
| | | V _D = 12 V; I _G = 0.1 A; T2+ G-; T _j = 25 °C; Fig. 8 | - | - | 90 | mA |
| | | V _D = 12 V; I _G = 0.1 A; T2- G-; T _j = 25 °C; Fig. 8 | - | - | 60 | mA |
| I _H | holding current | V _D = 12 V; T _j = 25 °C; Fig. 9 | - | - | 60 | mA |
| V _T | on-state voltage | I _T = 18 A; T _j = 25 °C; Fig. 10 | - | 1.3 | 1.5 | V |
| V _{GT} | gate trigger voltage | V _D = 12 V; I _T = 0.1 A; T _j = 25 °C; Fig. 11 | - | 0.8 | 1 | V |
| | | V _D = 400 V; I _T = 0.1 A; T _j = 150 °C; Fig. 11 | 0.25 | 0.4 | - | V |
| I _D | off-state current | V _D = 600 V; T _j = 125 °C | - | 0.1 | 0.5 | mA |
| | | V _D = 600 V; T _j = 150 °C | - | 0.4 | 2 | mA |
| Dynamic characteristics | | | | | | |
| dV _D /dt | rate of rise of off-state voltage | V _{DM} = 402 V; T _j = 125 °C; (V _{DM} = 67% of V _{DRM}); exponential waveform; gate open circuit | 1000 | - | - | V/μs |
| | | V _{DM} = 402 V; T _j = 150 °C; (V _{DM} = 67% of V _{DRM}); exponential waveform; gate open circuit | 600 | - | - | V/μs |
| dI _{com} /dt | rate of change of commutating current | V _D = 400 V; T _j = 125 °C; I _{T(RMS)} = 12 A; dV _{com} /dt = 20 V/μs; (snubberless condition); gate open circuit | 20 | - | - | A/ms |
| | | V _D = 400 V; T _j = 150 °C; I _{T(RMS)} = 12 A; dV _{com} /dt = 20 V/μs; (snubberless condition); gate open circuit | 8 | - | - | A/ms |

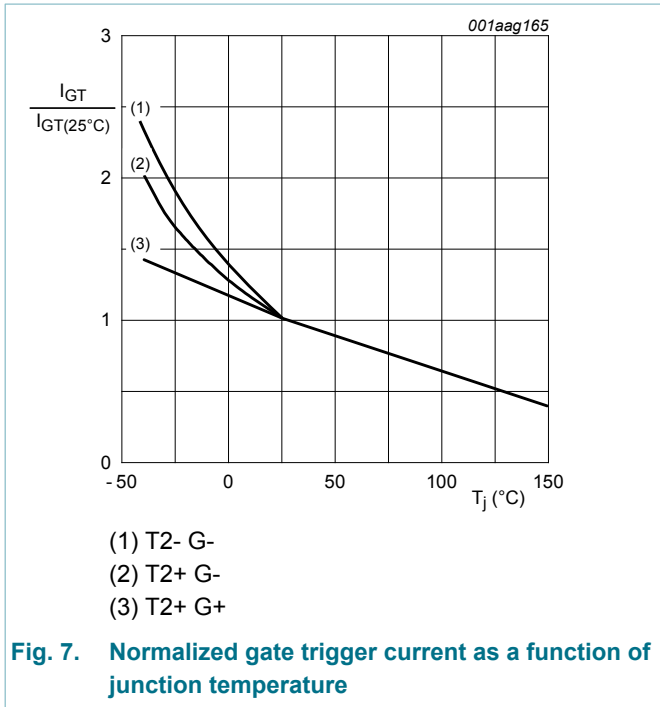


Fig. 7. Normalized gate trigger current as a function of junction temperature

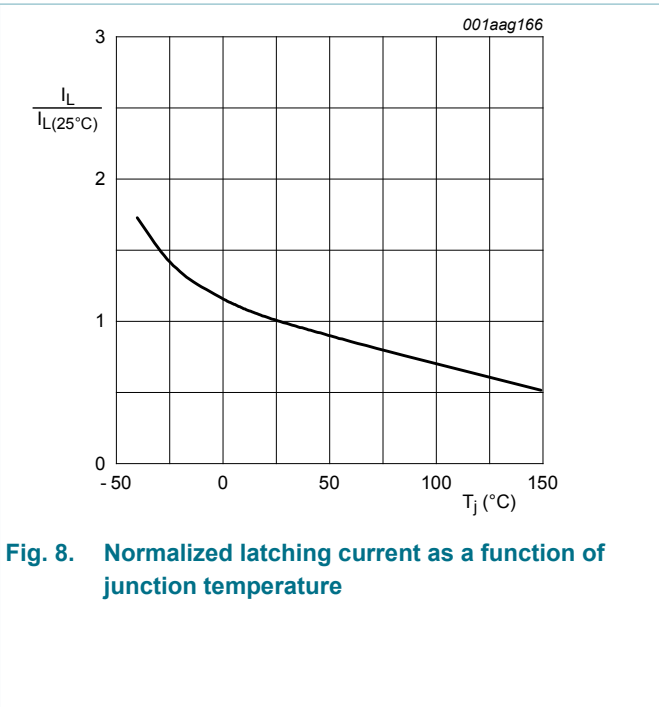


Fig. 8. Normalized latching current as a function of junction temperature

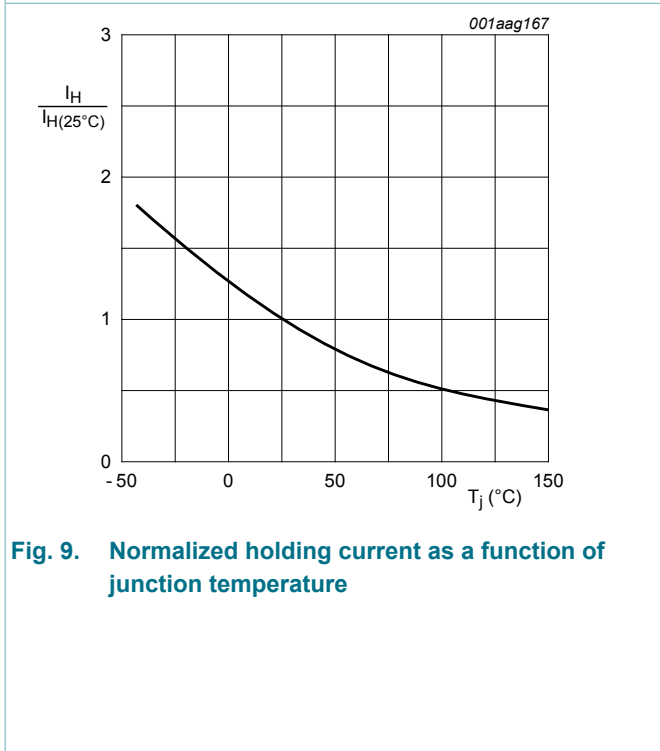


Fig. 9. Normalized holding current as a function of junction temperature

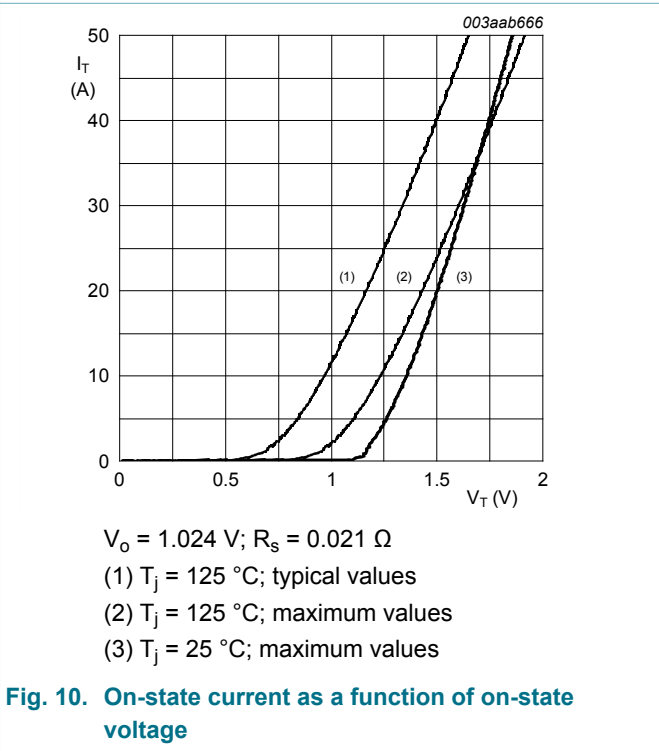
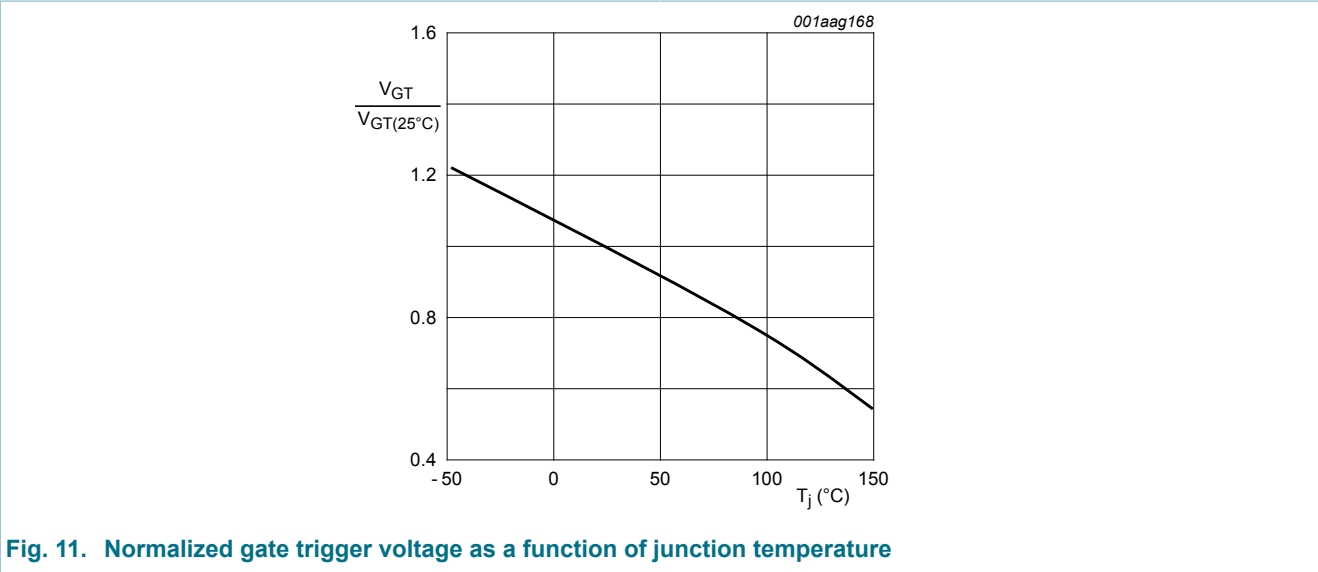


Fig. 10. On-state current as a function of on-state voltage



11. Package outline

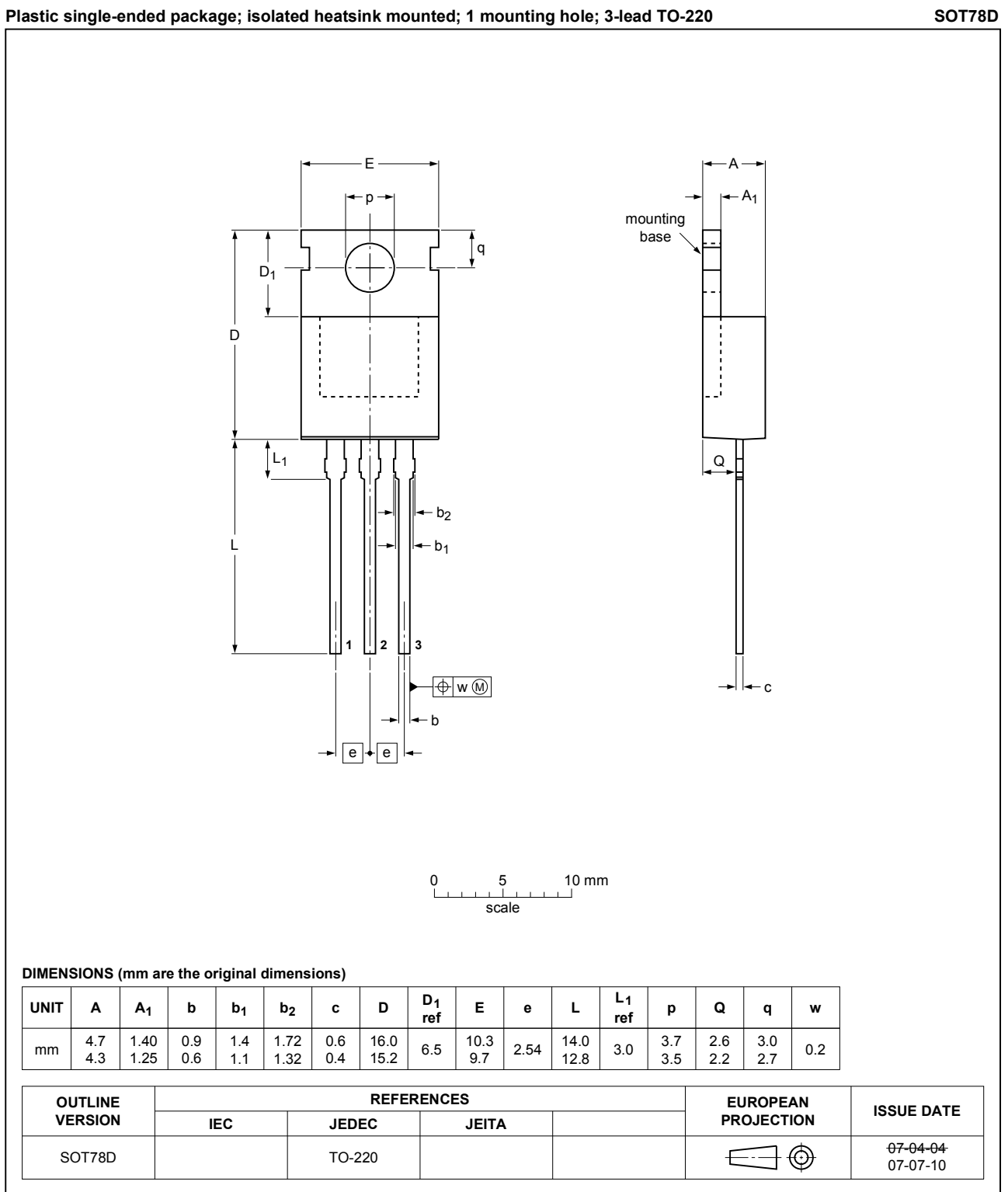


Fig. 12. Package outline TO-220AB (SOT78D)

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|--------------------------------|--------------------|---|
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Date of release: 14 July 2014