



ACTT6-800E

AC Thyristor Triac power switch

Rev. 2 — 12 June 2012

Product data sheet

1. Product profile

1.1 General description

AC Thyristor Triac power switch in a SOT78 (TO-220AB) plastic package with self-protective clamping capabilities against low and high energy transients.

1.2 Features and benefits

- Clamping structure ensuring safe high over-voltage withstand capability
- Direct interfacing with low power drivers and microcontrollers
- Full cycle AC conduction
- Over-voltage withstand capability to IEC 61000-4-5
- Pin compatible with standard triacs
- Planar passivated for voltage ruggedness and reliability
- Protective self turn-on capability for high energy transients
- Safe clamping capability for low energy over-voltage transients
- Sensitive gate for easy logic level triggering
- Triggering in three quadrants only
- Very high immunity to false turn-on by dV/dt

1.3 Applications

- AC fan, pump and compressor controls
- Large and small appliances (White Goods)
- Highly inductive, resistive and safety loads
- Reversing induction motor controls

1.4 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; $T_{\text{j(init)}} = 25\text{ °C}$; $t_{\text{p}} = 20\text{ ms}$; see Figure 5 ; see Figure 6 | - | - | 51 | A |
| T_{j} | junction temperature | | - | - | 125 | °C |
| $I_{\text{T(RMS)}}$ | RMS on-state current | full sine wave; $T_{\text{mb}} \leq 108\text{ °C}$; see Figure 1 ; see Figure 2 ; see Figure 4 | - | - | 6 | A |
| V_{PP} | peak pulse voltage | $T_{\text{j}} = 25\text{ °C}$; non-repetitive, off-state; see Figure 3 | - | - | 2 | kV |

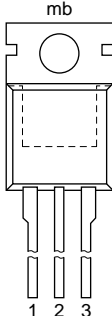
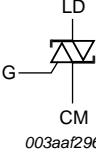


Table 1. Quick reference data ...continued

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------------|--|-----|-----|-----|------|
| Static characteristics | | | | | | |
| I _{GT} | gate trigger current | V _D = 12 V; I _T = 100 mA; LD+ G+; T _j = 25 °C; see Figure 8 | - | - | 10 | mA |
| | | V _D = 12 V; I _T = 100 mA; LD+ G-; T _j = 25 °C; see Figure 8 | - | - | 10 | mA |
| | | V _D = 12 V; I _T = 100 mA; LD- G-; T _j = 25 °C; see Figure 8 | - | - | 10 | mA |
| V _{CL} | clamping voltage | I _{CL} = 0.1 mA; t _p = 1 ms; T _j = 25 °C | 850 | - | - | V |
| Dynamic characteristics | | | | | | |
| dV _D /dt | rate of rise of off-state voltage | V _{DM} = 536 V; T _j = 125 °C; (V _{DM} = 67% of V _{DRM}); exponential waveform; gate open circuit; see Figure 13 | 500 | - | - | V/μs |
| dI _{com} /dt | rate of change of commutating current | V _D = 400 V; T _j = 125 °C; I _{T(RMS)} = 6 A; dV _{com} /dt = 1 V/μs; gate open circuit; see Figure 14 ; see Figure 15 | 10 | - | - | A/ms |

2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|---------------------|---|---|
| 1 | CM | common |  |  |
| 2 | LD | load | | |
| 3 | G | gate | | |
| mb | LD | mounting base; load | | |

SOT78 (TO-220AB)

3. Ordering information

Table 3. Ordering information

| Type number | Package | | Version |
|-------------|----------|--|---------|
| | Name | Description | |
| ACTT6-800E | TO-220AB | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB | SOT78 |

4. 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 |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{mb} \leq 108\text{ °C}$; see Figure 1 ; see Figure 2 ; see Figure 4 | - | 6 | A |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$ | - | 56 | A |
| | | full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 20\text{ ms}$; see Figure 5 ; see Figure 6 | - | 51 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; sine-wave pulse | - | 13 | A ² s |
| dl_T/dt | rate of rise of on-state current | $I_T = 9\text{ A}$; $I_G = 0.2\text{ A}$; $dl_G/dt = 0.2\text{ A}/\mu\text{s}$ | - | 100 | A/ μs |
| I_{GM} | peak gate current | $t = 20\text{ }\mu\text{s}$ | - | 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 |
| V_{PP} | peak pulse voltage | $T_j = 25\text{ °C}$; non-repetitive, off-state; see Figure 3 | - | 2 | kV |

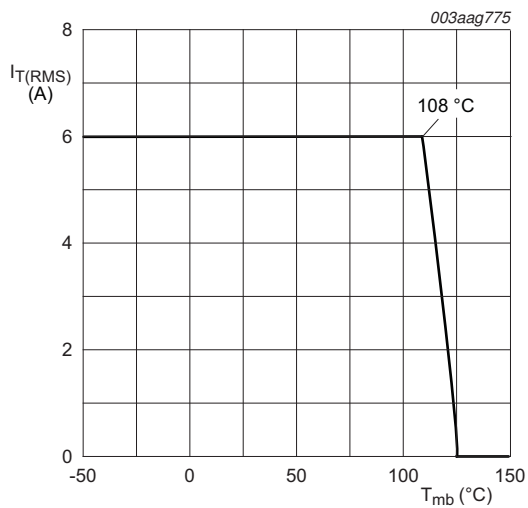


Fig 1. RMS on-state current as a function of mounting base temperature; maximum values

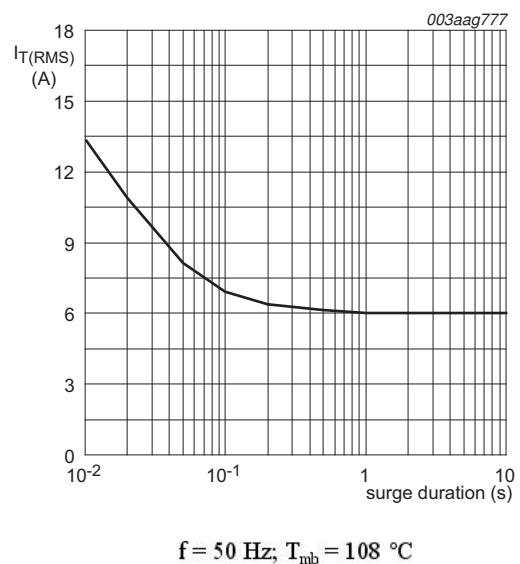


Fig 2. RMS on-state current as a function of surge duration; maximum values

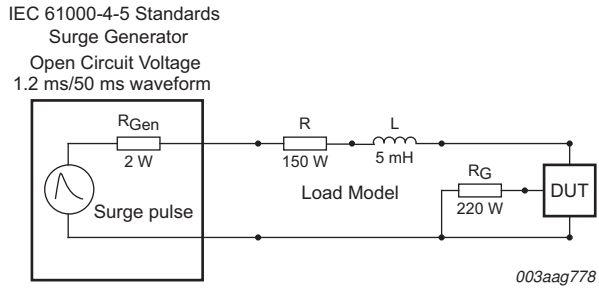


Fig 3. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

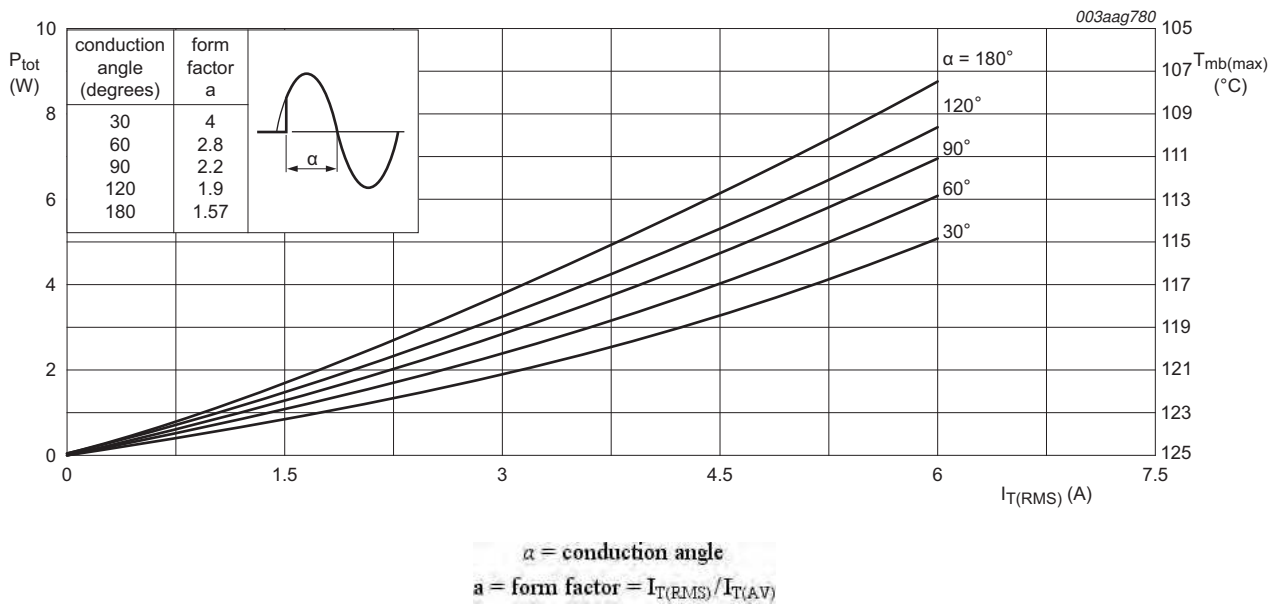


Fig 4. Total power dissipation as a function of RMS on-state current; maximum values

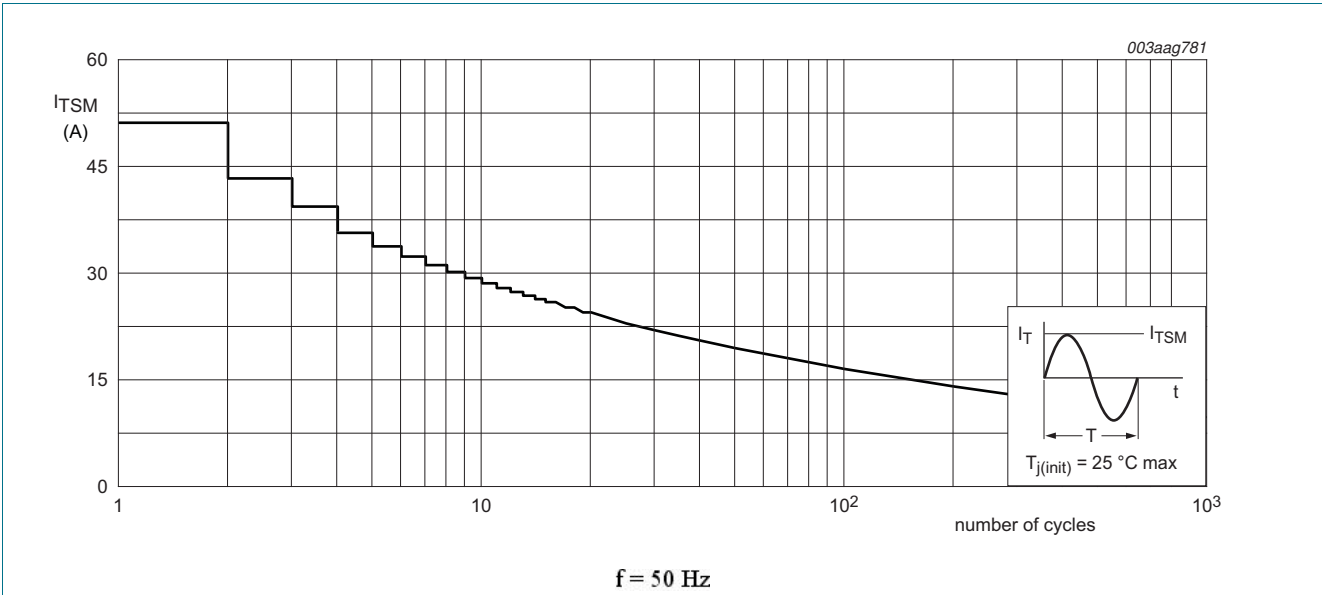


Fig 5. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

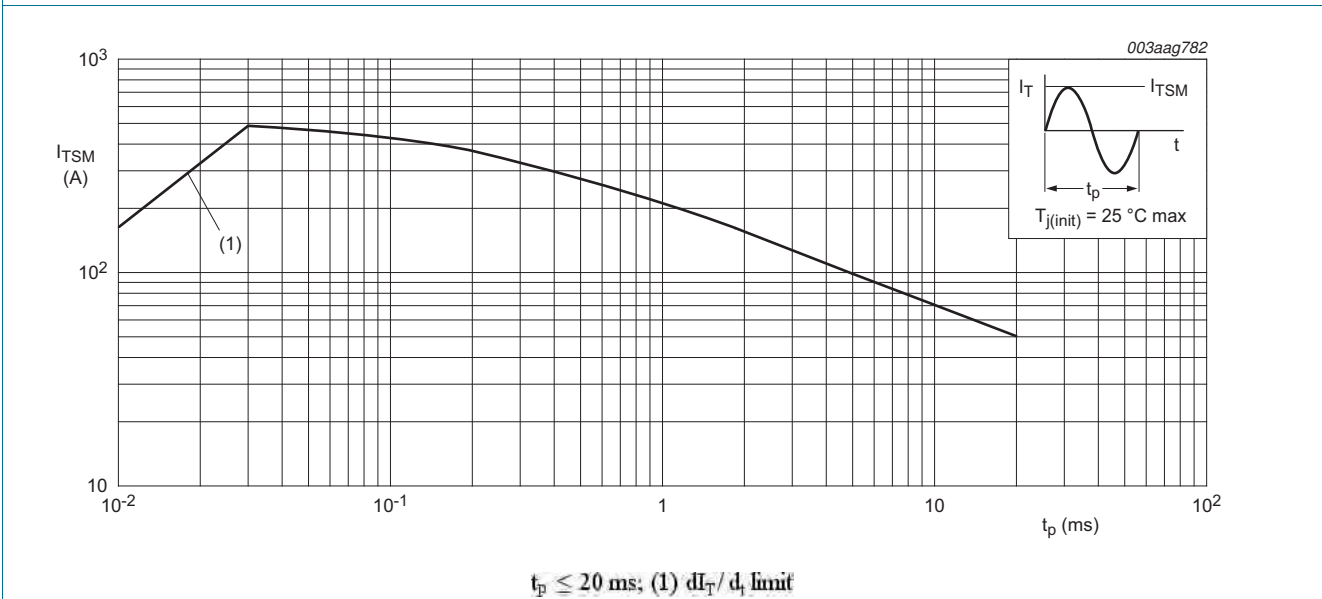
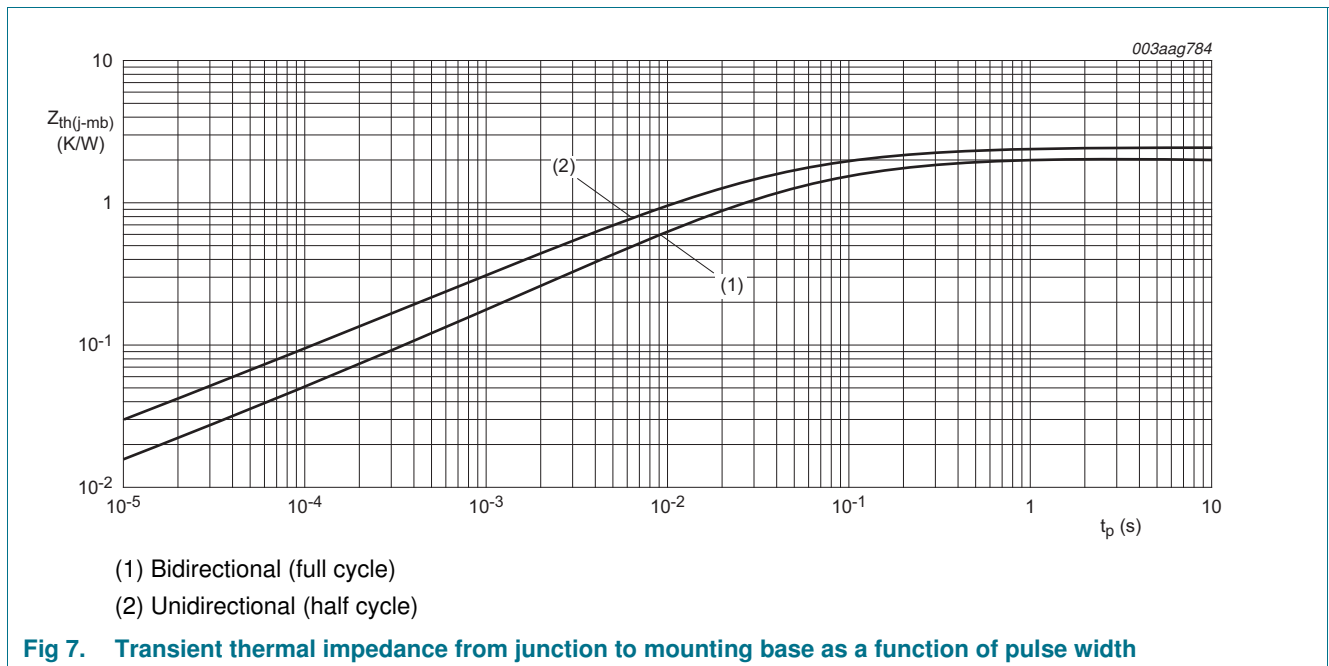


Fig 6. Non-repetitive peak on-state current as a function of pulse width; maximum values

5. Thermal characteristics

Table 5. Thermal characteristics

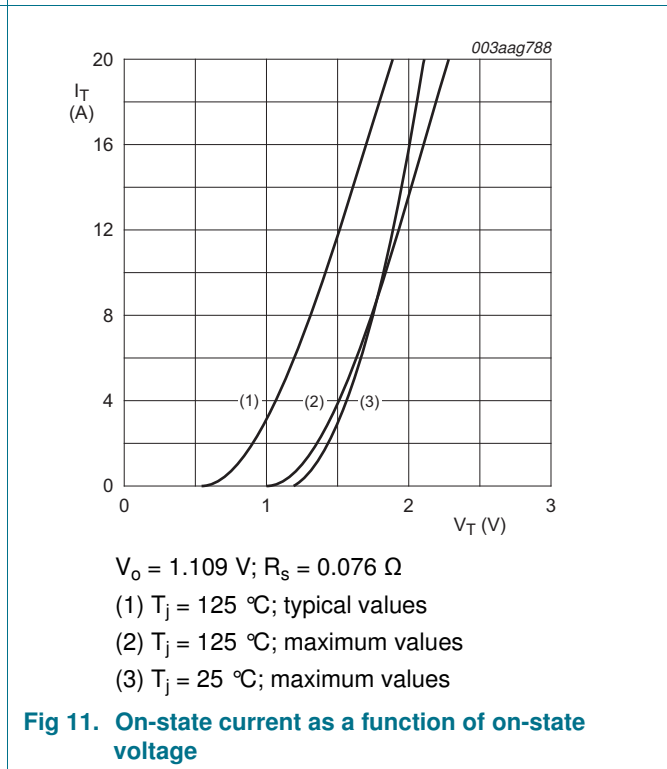
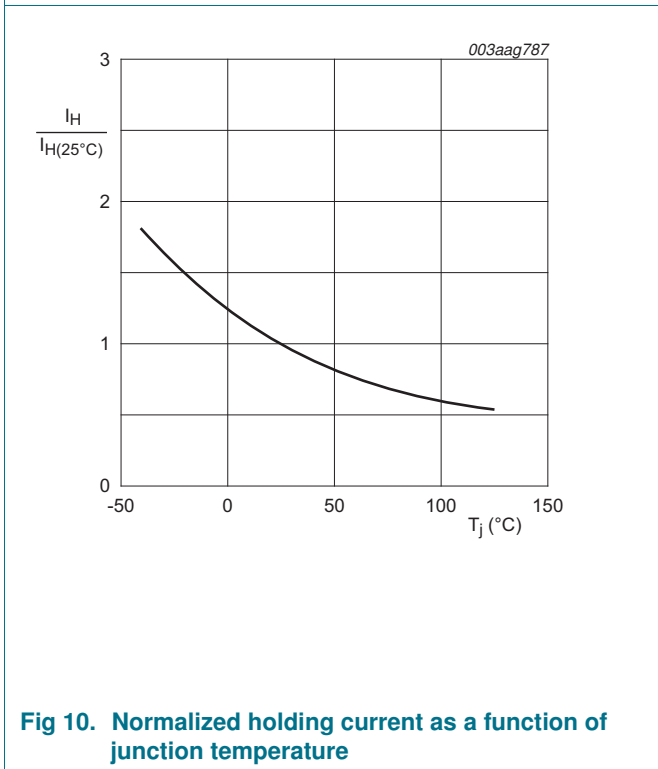
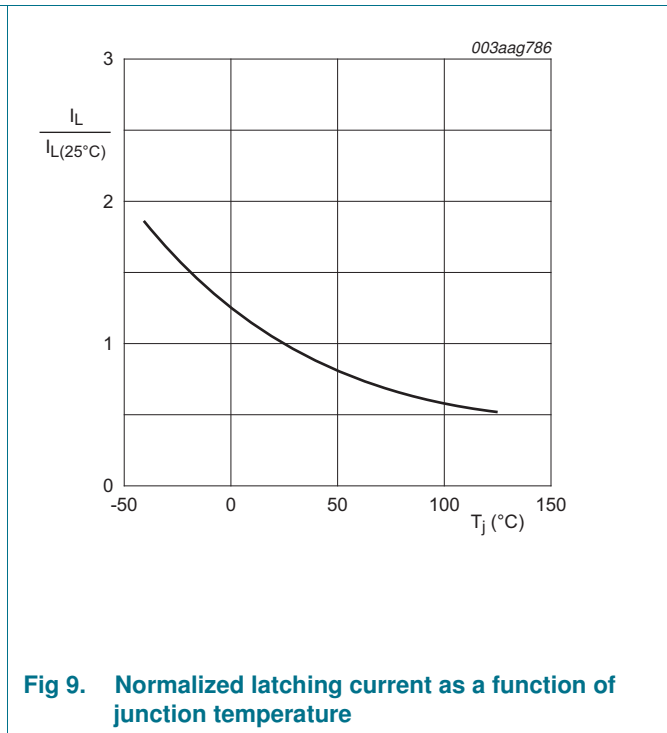
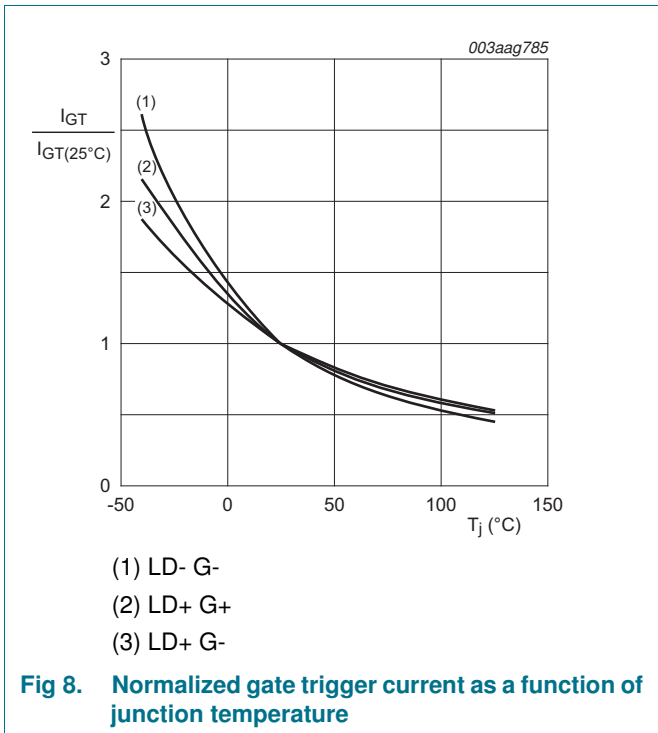
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|---|--|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | half cycle; see Figure 7 | - | - | 2.4 | K/W |
| | | full cycle; see Figure 7 | - | - | 2 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 60 | - | K/W |



6. Characteristics

Table 6. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------------|--|-----|------|-----|------------------|
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD+ G+; $T_j = 25\text{ °C}$; see Figure 8 | - | - | 10 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD+ G-; $T_j = 25\text{ °C}$; see Figure 8 | - | - | 10 | mA |
| | | $V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD- G-; $T_j = 25\text{ °C}$; see Figure 8 | - | - | 10 | mA |
| I_L | latching current | $V_D = 12\text{ V}$; $I_G = 100\text{ mA}$; LD+ G+; $T_j = 25\text{ °C}$; see Figure 9 | - | - | 30 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 100\text{ mA}$; LD+ G-; $T_j = 25\text{ °C}$; see Figure 9 | - | - | 40 | mA |
| | | $V_D = 12\text{ V}$; $I_G = 100\text{ mA}$; LD- G-; $T_j = 25\text{ °C}$; see Figure 9 | - | - | 30 | mA |
| I_H | holding current | $V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; see Figure 10 | - | - | 25 | mA |
| V_T | on-state voltage | $I_T = 8\text{ A}$; $T_j = 25\text{ °C}$; see Figure 11 | - | - | 1.7 | V |
| V_{GT} | gate trigger voltage | $V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 25\text{ °C}$; see Figure 12 | - | 0.8 | 1.5 | V |
| | | $V_D = 400\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 125\text{ °C}$; see Figure 12 | 0.2 | 0.45 | - | V |
| I_D | off-state current | $V_D = 800\text{ V}$; $T_j = 25\text{ °C}$ | - | - | 10 | μA |
| | | $V_D = 800\text{ V}$; $T_j = 125\text{ °C}$ | - | - | 0.5 | mA |
| V_{CL} | clamping voltage | $I_{CL} = 0.1\text{ mA}$; $t_p = 1\text{ ms}$; $T_j = 25\text{ °C}$ | 850 | - | - | V |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 536\text{ V}$; $T_j = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; see Figure 13 | 500 | - | - | V/ μs |
| dI_{com}/dt | rate of change of commutating current | $V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $I_{T(RMS)} = 6\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit; see Figure 14 ; see Figure 15 | 3.5 | - | - | A/ms |
| | | $V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $I_{T(RMS)} = 6\text{ A}$; $dV_{com}/dt = 10\text{ V}/\mu\text{s}$; gate open circuit; see Figure 14 ; see Figure 15 | 5 | - | - | A/ms |
| | | $V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $I_{T(RMS)} = 6\text{ A}$; $dV_{com}/dt = 1\text{ V}/\mu\text{s}$; gate open circuit; see Figure 14 ; see Figure 15 | 10 | - | - | A/ms |



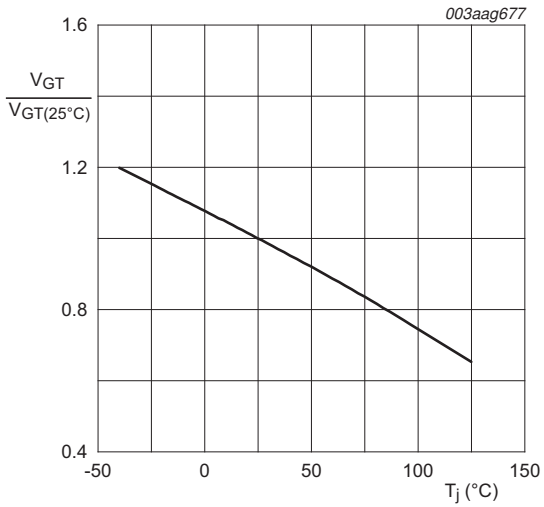
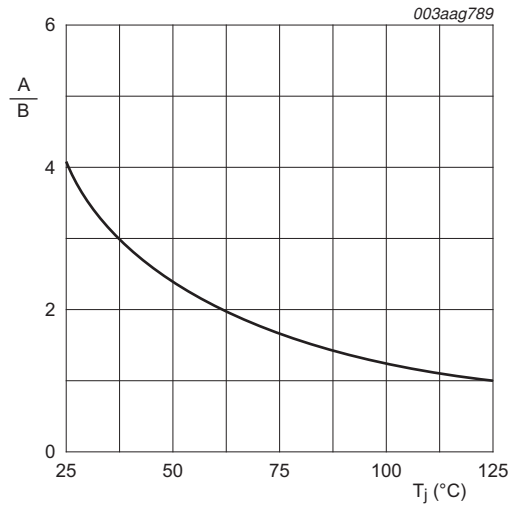
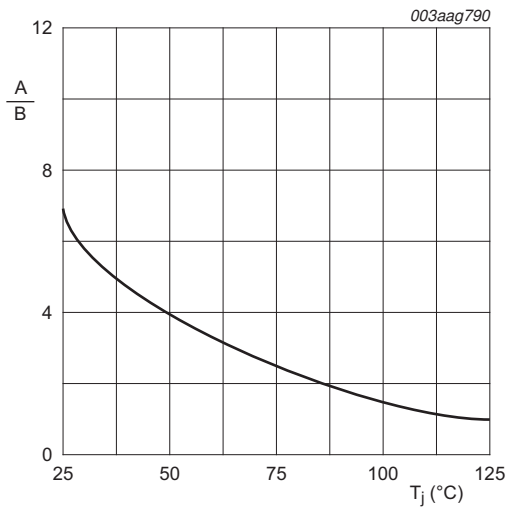


Fig 12. Normalized gate trigger voltage as a function of junction temperature



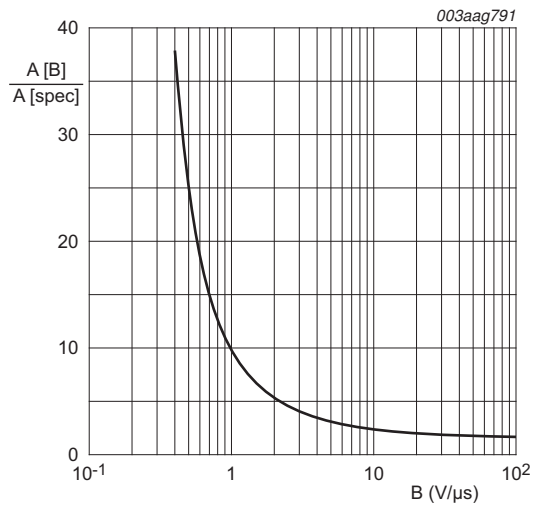
A is dV_D/dt at condition T_j °C
 B is dV_D/dt at condition T_j 125 °C

Fig 13. Normalized rate of rise of off-state voltage as a function of junction temperature



A is di_{com}/dt at condition T_j °C
 B is di_{com}/dt at condition T_j 125 °C
 $V_D = 400$ V

Fig 14. Normalized critical rate of rise of commutating current as a function of junction temperature



A[B] is di_{com}/dt at condition B, dV_{com}/dt
 A[spec] is the specified data sheet value of di_{com}/dt
 turn-off time < 20 ms

Fig 15. Normalized critical rate of change of commutating current as a function of critical rate of change of commutating voltage; minimum values

7. Package outline

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

SOT78

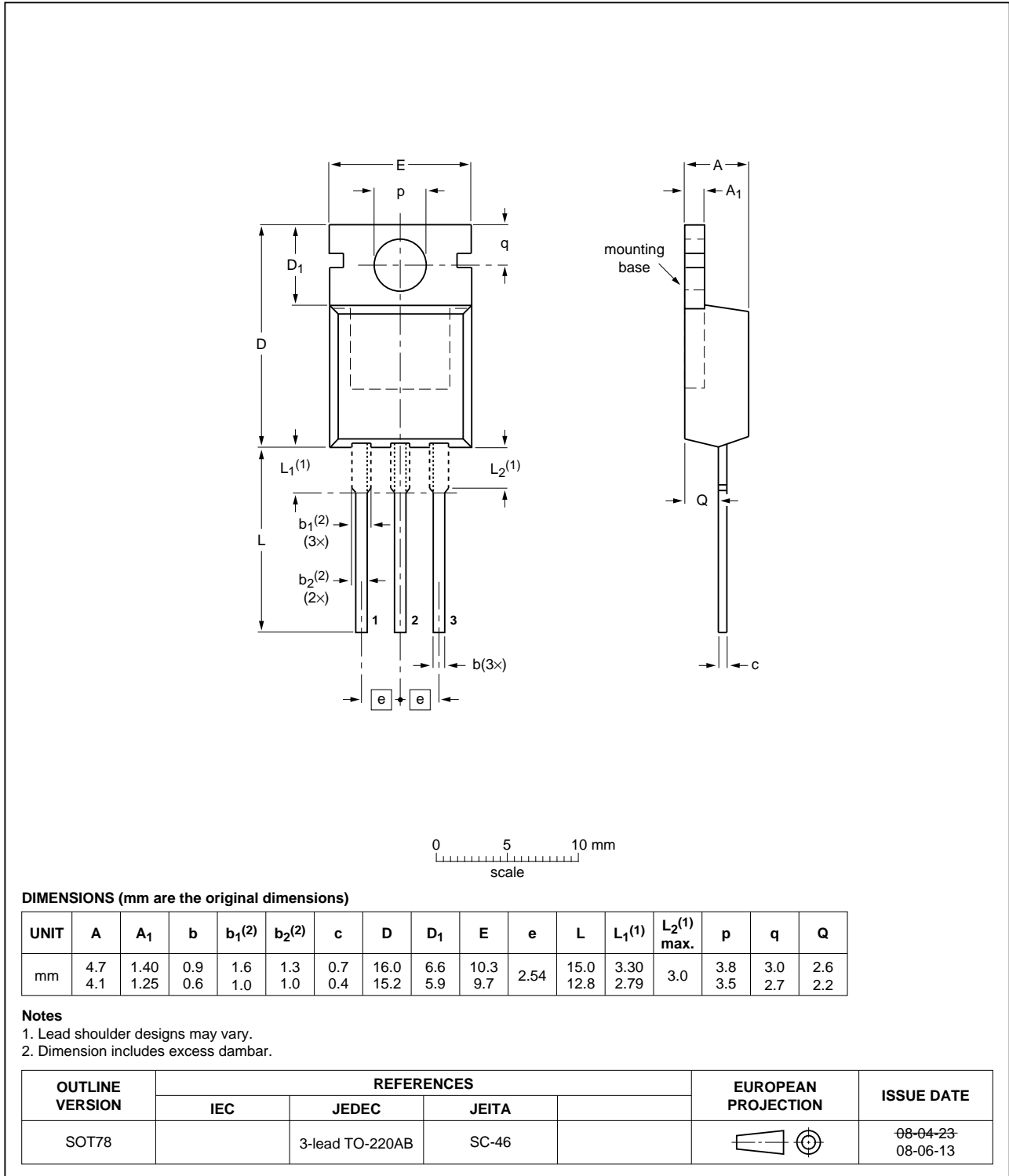


Fig 16. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|-------------------------------|--------------------|---------------|----------------|
| ACTT6-800E v.2 | 20120612 | Product data sheet | - | ACTT6-800E v.1 |
| Modifications: | • Various changes to content. | | | |
| ACTT6-800E v.1 | 20111026 | Product data sheet | - | - |

9. Legal information

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| Document status ^{[1] [2]} | Product status ^[3] | Definition |
|------------------------------------|-------------------------------|---|
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[1] Please consult the most recently issued document before initiating or completing a design.

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