

1. General description

AC Thyristor Triac power switch in a SOT404 (D2PAK) surface mountable plastic package with self-protective clamping capabilities against low and high energy transients.

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
- Surface mountable package
- Triggering in three quadrants only
- Very high immunity to false turn-on by dV/dt

3. Applications

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

4. Quick reference data

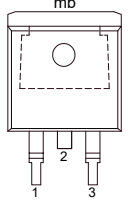
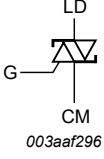
Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------|--------------------------------------|--|-----|-----|-----|------|
| V_{DRM} | repetitive peak off-state voltage | | - | - | 800 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{mb} \leq 108\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | - | - | 6 | A |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$ | - | - | 56 | A |
| | | full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5 | - | - | 51 | A |
| T_j | junction temperature | | - | - | 125 | °C |
| V_{PP} | peak pulse voltage | $T_j = 25\text{ °C}$; non-repetitive, off-state; Fig. 6 | - | - | 2 | kV |

| 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; Fig. 8 | - | - | 10 | mA |
| | | V _D = 12 V; I _T = 100 mA; LD+ G-; T _j = 25 °C; Fig. 8 | - | - | 10 | mA |
| | | V _D = 12 V; I _T = 100 mA; LD- G-; T _j = 25 °C; Fig. 8 | - | - | 10 | mA |
| I _H | holding current | V _D = 12 V; T _j = 25 °C; Fig. 10 | - | - | 25 | mA |
| V _T | on-state voltage | I _T = 8 A; T _j = 25 °C; Fig. 11 | - | - | 1.7 | V |
| 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; Fig. 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 = 20 V/μs; (snubberless condition); gate open circuit; Fig. 14 ; Fig. 15 | 3.5 | - | - | A/ms |
| | | V _D = 400 V; T _j = 125 °C; I _{T(RMS)} = 6 A; dV _{com} /dt = 10 V/μs; gate open circuit; Fig. 14 ; Fig. 15 | 5 | - | - | A/ms |
| | | V _D = 400 V; T _j = 125 °C; I _{T(RMS)} = 6 A; dV _{com} /dt = 1 V/μs; gate open circuit; Fig. 14 ; Fig. 15 | 10 | - | - | A/ms |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|---------------------|---|--|
| 1 | CM | common |  <p>D2PAK (SOT404)</p> |  <p>003aaf296</p> |
| 2 | LD | load | | |
| 3 | G | gate | | |
| mb | LD | mounting base; load | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | Version |
|-------------|---------|--|---------|
| | Name | Description | |
| ACTT6B-800E | D2PAK | plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) | SOT404 |

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 |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{mb} \leq 108\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | - | 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; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5 | - | 51 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; sine-wave pulse | - | 13 | A ² s |
| di_T/dt | rate of rise of on-state current | $I_G = 20\text{ mA}$ | - | 100 | A/ μ s |
| I_{GM} | peak gate current | $t = 20\text{ }\mu$ 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; Fig. 6 | - | 2 | kV |

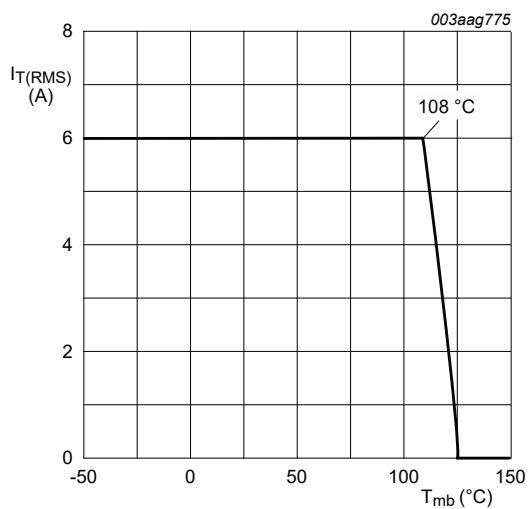


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values

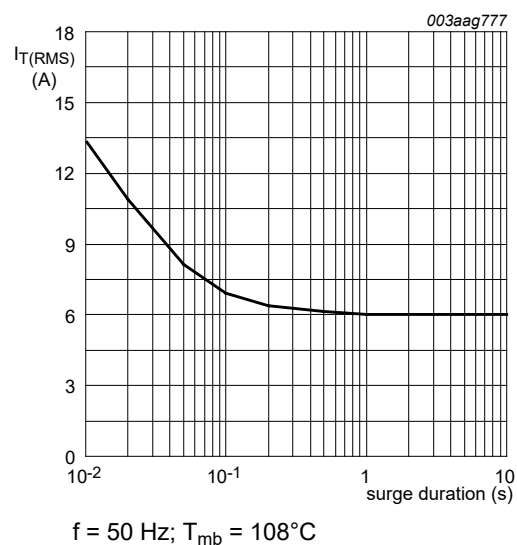


Fig. 2. RMS on-state current as a function of surge duration; maximum values

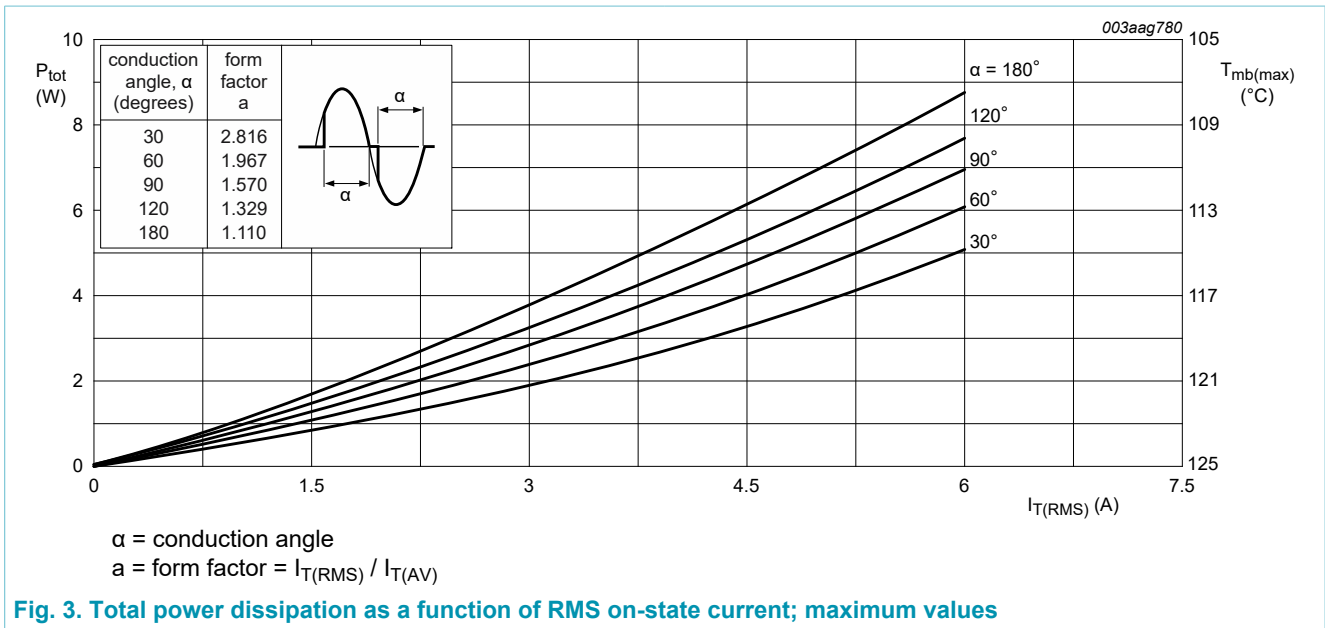


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

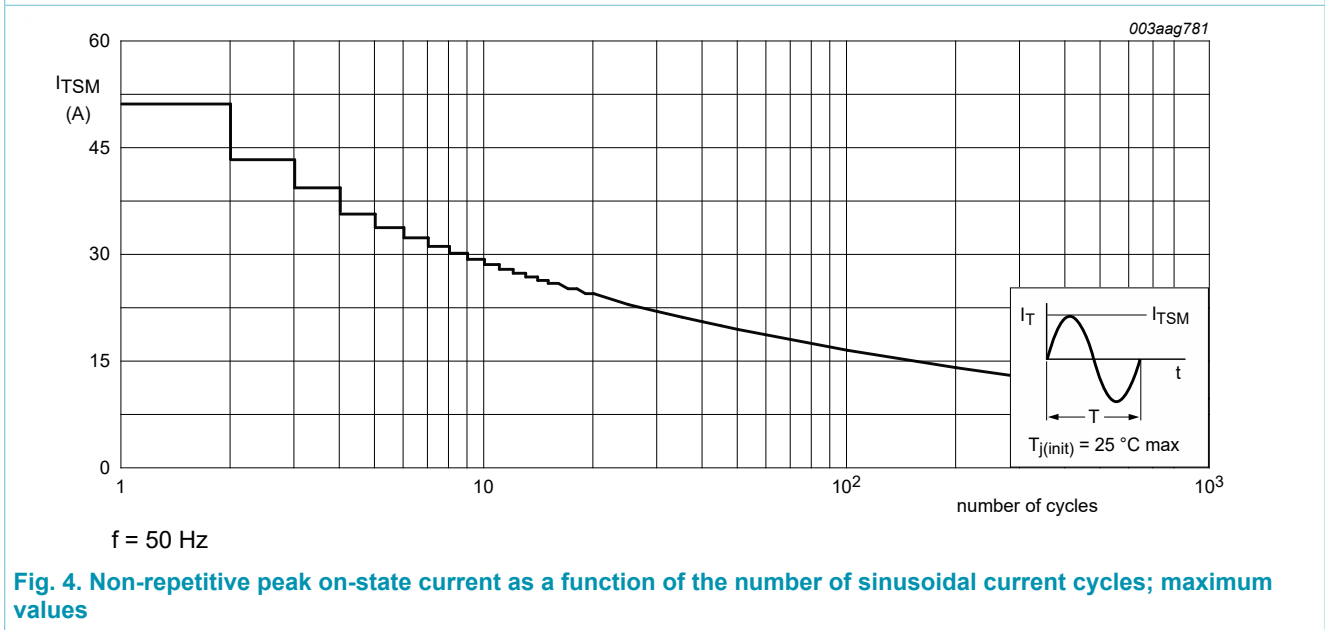


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

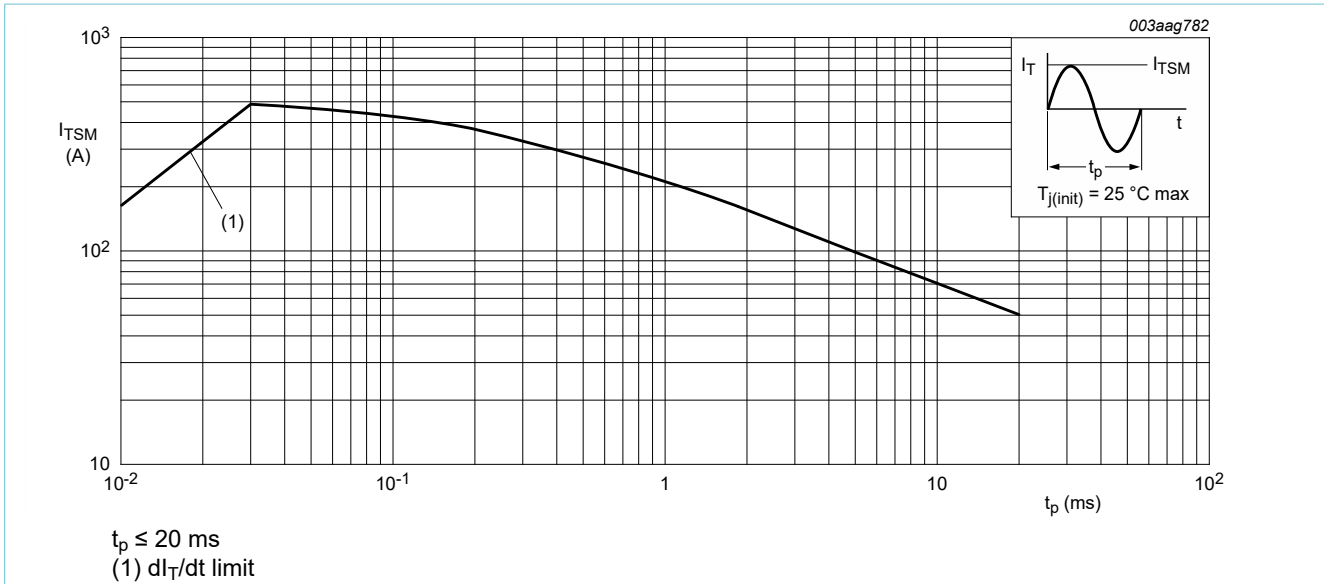


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

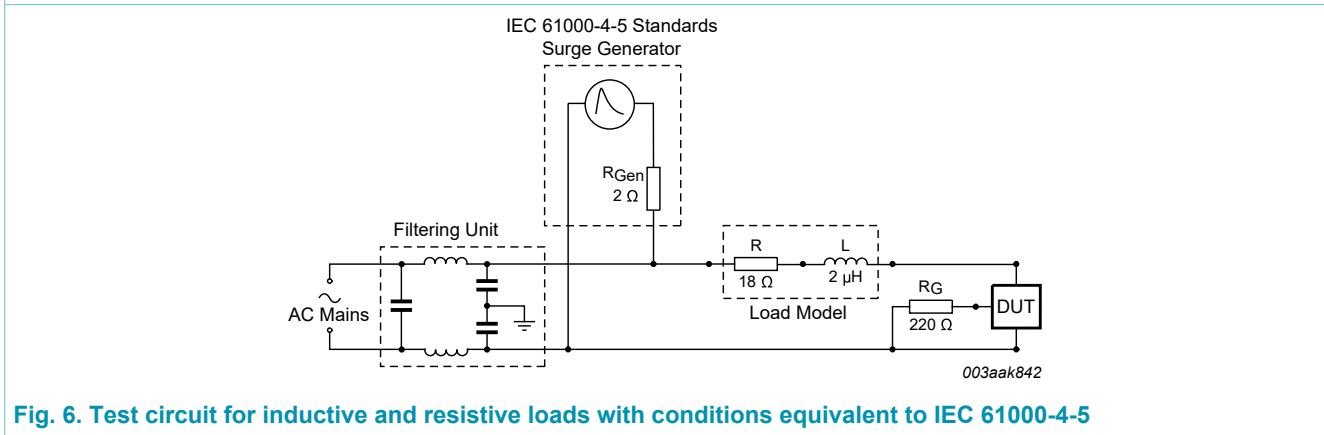
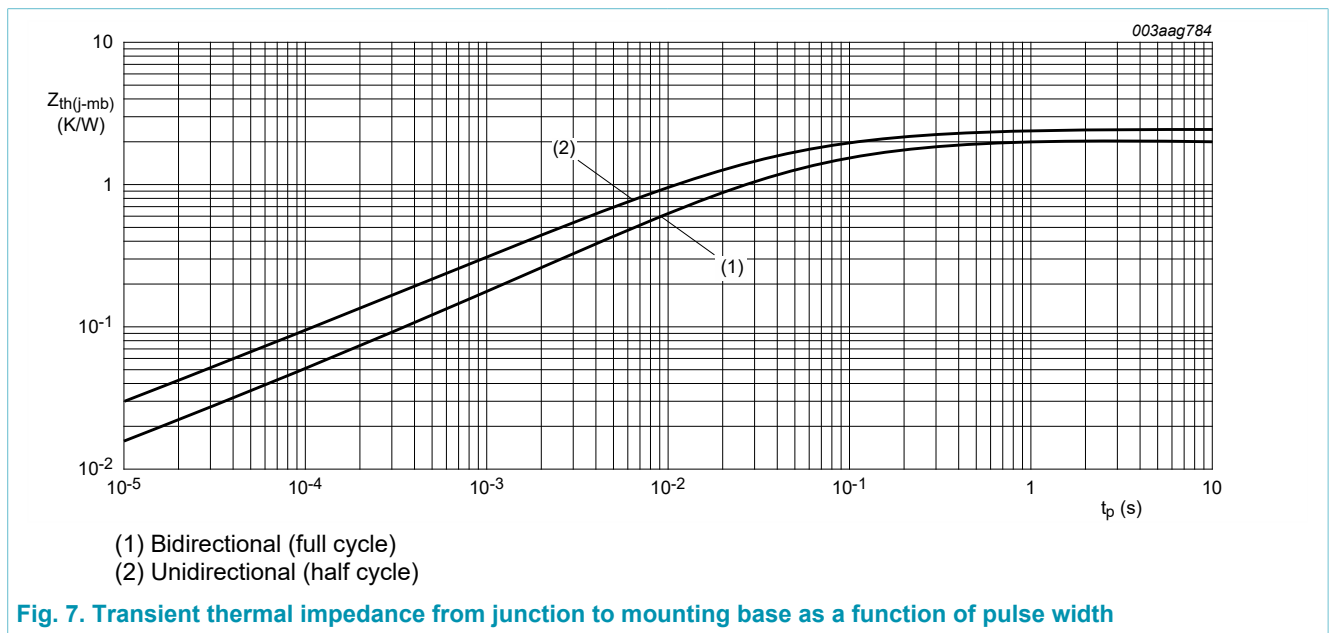


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

8. Thermal characteristics

Table 5. Thermal characteristics

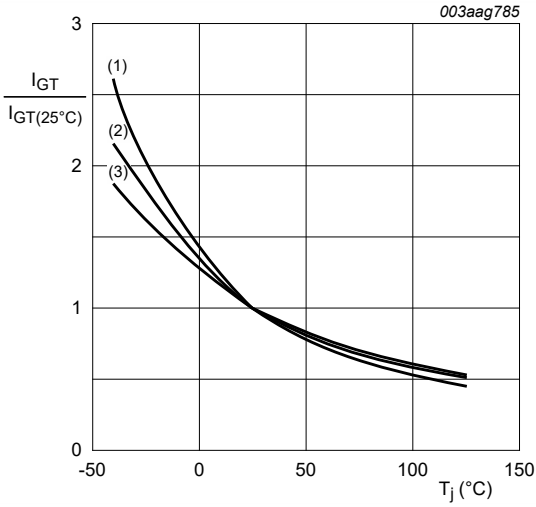
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|--|-------------------------------------|-----|-----|-----|------|
| R _{th(j-mb)} | thermal resistance from junction to mounting base | half cycle; Fig. 7 | - | - | 2.4 | K/W |
| | | full cycle; Fig. 7 | - | - | 2 | K/W |
| R _{th(j-a)} | thermal resistance from junction to ambient free air | printed circuit board (FR4) mounted | - | 55 | - | K/W |



9. Characteristics

Table 6. Characteristics

| 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; Fig. 8 | - | - | 10 | mA |
| | | V _D = 12 V; I _T = 100 mA; LD+ G-; T _j = 25 °C; Fig. 8 | - | - | 10 | mA |
| | | V _D = 12 V; I _T = 100 mA; LD- G-; T _j = 25 °C; Fig. 8 | - | - | 10 | mA |
| I _L | latching current | V _D = 12 V; I _G = 100 mA; LD+ G+; T _j = 25 °C; Fig. 9 | - | - | 30 | mA |
| | | V _D = 12 V; I _G = 100 mA; LD+ G-; T _j = 25 °C; Fig. 9 | - | - | 40 | mA |
| | | V _D = 12 V; I _G = 100 mA; LD- G-; T _j = 25 °C; Fig. 9 | - | - | 30 | mA |
| I _H | holding current | V _D = 12 V; T _j = 25 °C; Fig. 10 | - | - | 25 | mA |
| V _T | on-state voltage | I _T = 8 A; T _j = 25 °C; Fig. 11 | - | - | 1.7 | V |
| V _{GT} | gate trigger voltage | V _D = 12 V; I _T = 100 mA; T _j = 25 °C; Fig. 12 | - | 0.8 | 1 | V |
| | | V _D = 400 V; I _T = 100 mA; T _j = 125 °C; Fig. 12 | 0.2 | 0.45 | - | V |
| I _D | off-state current | V _D = 800 V; T _j = 25 °C | - | - | 10 | μA |
| | | V _D = 800 V; T _j = 125 °C | - | - | 0.5 | 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; Fig. 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 = 20 V/μs; (snubberless condition); gate open circuit; Fig. 14 ; Fig. 15 | 3.5 | - | - | A/ms |
| | | V _D = 400 V; T _j = 125 °C; I _{T(RMS)} = 6 A; dV _{com} /dt = 10 V/μs; gate open circuit; Fig. 14 ; Fig. 15 | 5 | - | - | A/ms |
| | | V _D = 400 V; T _j = 125 °C; I _{T(RMS)} = 6 A; dV _{com} /dt = 1 V/μs; gate open circuit; Fig. 14 ; Fig. 15 | 10 | - | - | A/ms |



- (1) LD- G-
- (2) LD+ G+
- (3) LD+ G-

Fig. 8. Normalized gate trigger current as a function of junction temperature

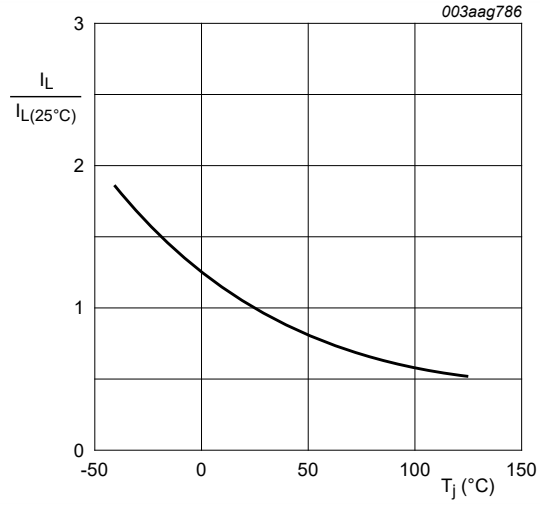


Fig. 9. Normalized latching current as a function of junction temperature

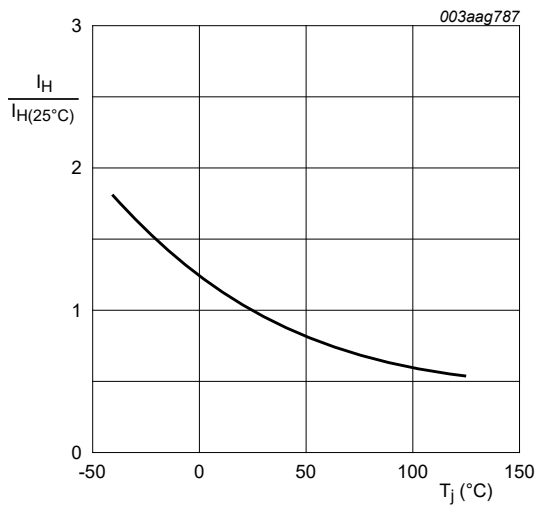
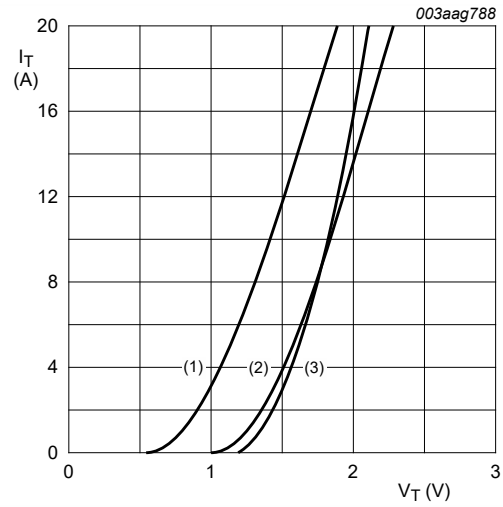


Fig. 10. Normalized holding current as a function of junction temperature



$V_o = 1.109 \text{ V}; R_s = 0.076 \Omega$

- (1) $T_j = 125 \text{ }^\circ\text{C}$; typical values
- (2) $T_j = 125 \text{ }^\circ\text{C}$; maximum values
- (3) $T_j = 25 \text{ }^\circ\text{C}$; maximum values

Fig. 11. On-state current as a function of on-state voltage

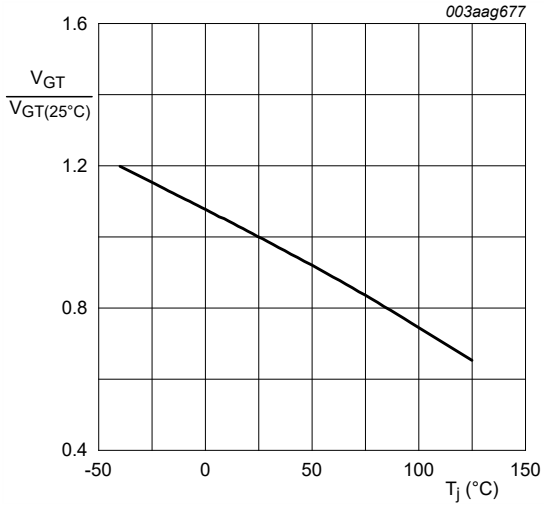
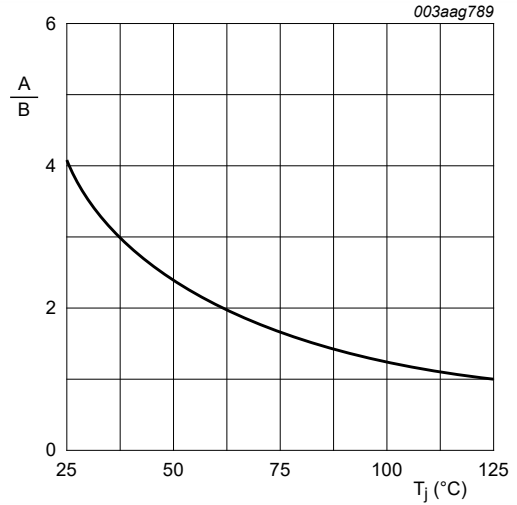
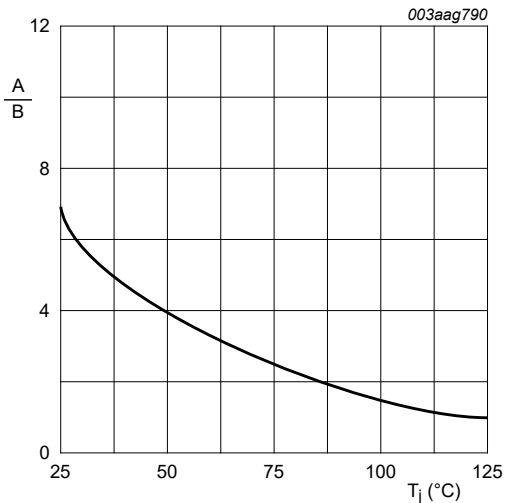


Fig. 12. Normalized gate trigger voltage as a function of junction temperature



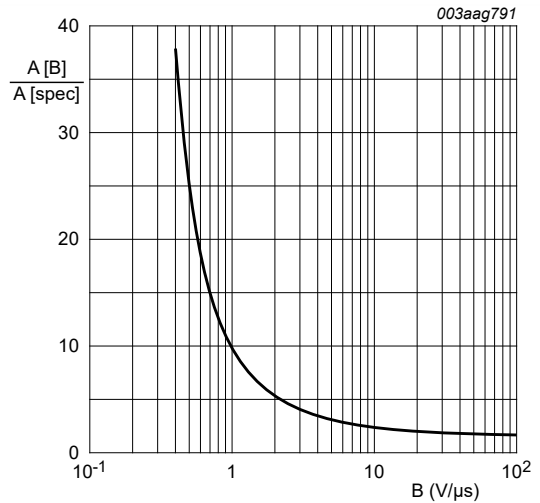
A = dV_D/dt at condition T_j °C
 B = dV_D/dt at condition T_j [125] °C

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



A = di_{com}/dt at condition T_j °C
 B = 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

10. Package outline

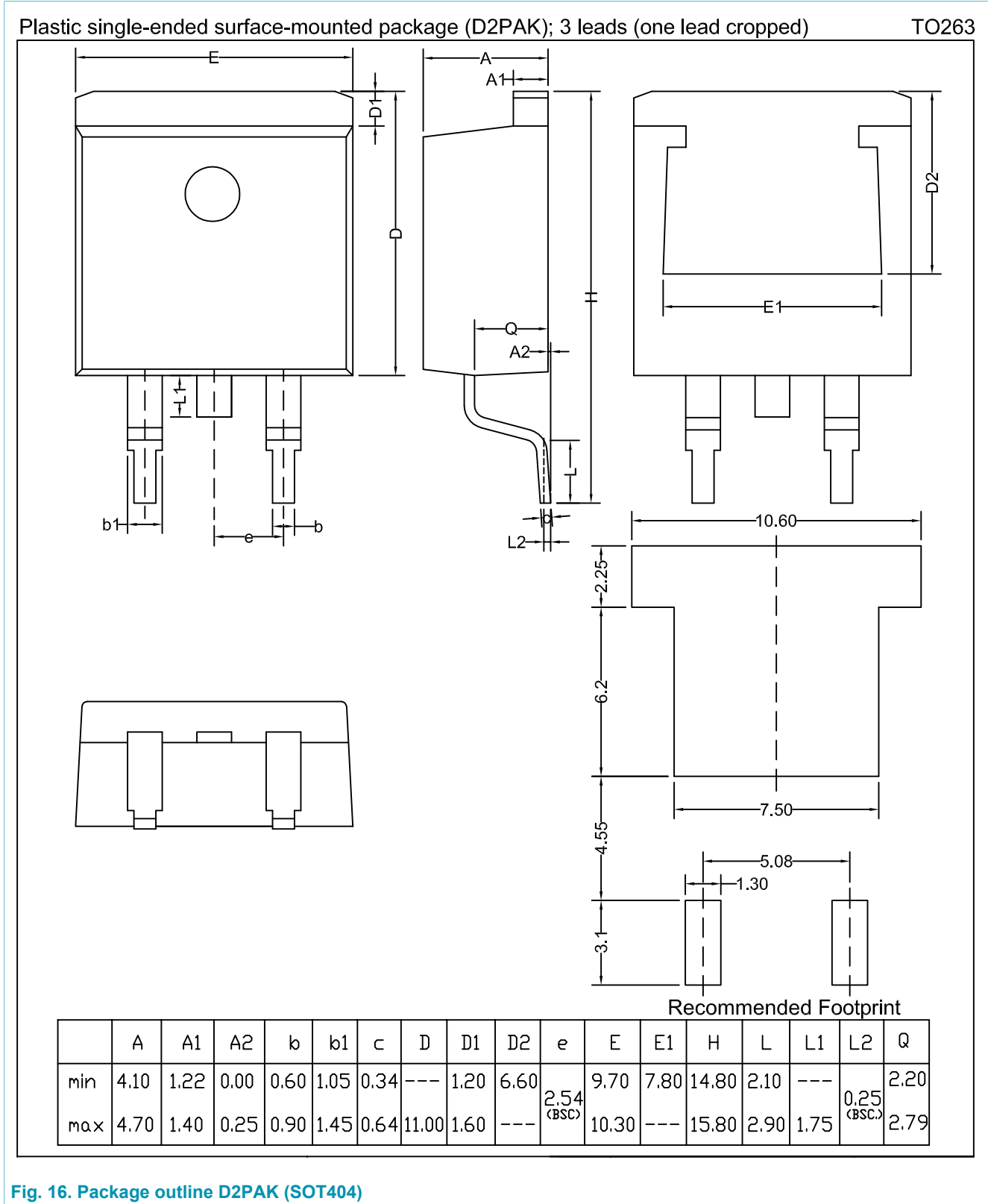


Fig. 16. Package outline D2PAK (SOT404)

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|--------------------------------|--------------------|---|
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12. Contents

| | |
|---------------------------------|----|
| 1. General description..... | 1 |
| 2. Features and benefits..... | 1 |
| 3. Applications..... | 1 |
| 4. Quick reference data..... | 1 |
| 5. Pinning information..... | 2 |
| 6. Ordering information..... | 2 |
| 7. Limiting values..... | 3 |
| 8. Thermal characteristics..... | 6 |
| 9. Characteristics..... | 7 |
| 10. Package outline..... | 10 |
| 11. Legal information..... | 11 |

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