



ACTT12B-800C

AC Thyristor Triac power switch

12 September 2014

Product data sheet

1. General description

AC Thyristor Triac power switch in a SOT404 (D2PAK) 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
- 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
- Less sensitive gate for high noise immunity
- 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

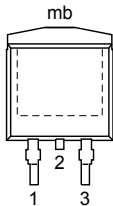
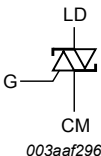
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------------|--------------------------------------|---|-----|-----|-----|--------------------|
| V_{DRM} | repetitive peak off-state voltage | | - | - | 800 | V |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5 | - | - | 120 | A |
| T_j | junction temperature | | - | - | 125 | $^{\circ}\text{C}$ |
| $I_{T(\text{RMS})}$ | RMS on-state current | full sine wave; $T_{mb} \leq 95\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | - | - | 12 | A |
| V_{PP} | peak pulse voltage | $T_j = 25\text{ }^{\circ}\text{C}$; 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 | - | - | 35 | mA |
| | | V _D = 12 V; I _T = 100 mA; LD+ G-; T _j = 25 °C; Fig. 8 | - | - | 35 | mA |
| | | V _D = 12 V; I _T = 100 mA; LD- G-; T _j = 25 °C; Fig. 8 | - | - | 35 | 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 | 3000 | - | - | 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 | 14 | - | - | 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 | | |
|--------------|---------|--|---------|
| | Name | Description | Version |
| ACTT12B-800C | D2PAK | plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) | SOT404 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|--------------|--------------|
| ACTT12B-800C | ACTT12B-800C |

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; $T_{mb} \leq 95\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | - | 12 | A |
| I_{TSM} | non-repetitive peak on-state current | full sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5 | - | 120 | A |
| | | full sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$; $t_p = 16.7\text{ ms}$ | - | 132 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; sine-wave pulse | - | 72 | A^2s |
| di_T/dt | rate of rise of on-state current | $I_T = 12\text{ A}$; $I_G = 0.2\text{ A}$; $di_G/dt = 0.2\text{ A}/\mu\text{s}$ | - | 100 | $\text{A}/\mu\text{s}$ |
| 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 | $^{\circ}\text{C}$ |
| T_j | junction temperature | | - | 125 | $^{\circ}\text{C}$ |
| V_{PP} | peak pulse voltage | $T_j = 25\text{ }^{\circ}\text{C}$; non-repetitive, off-state; Fig. 6 | - | 2 | kV |

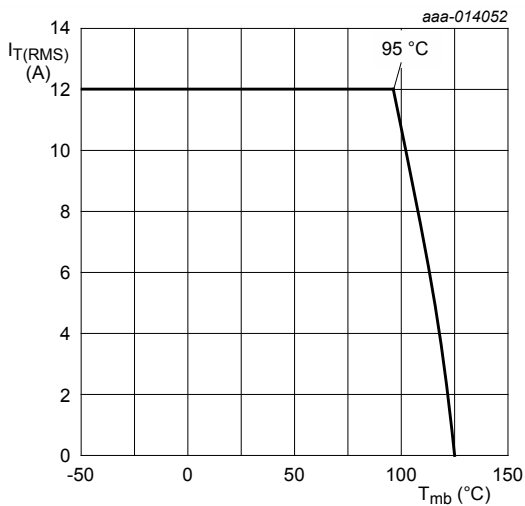
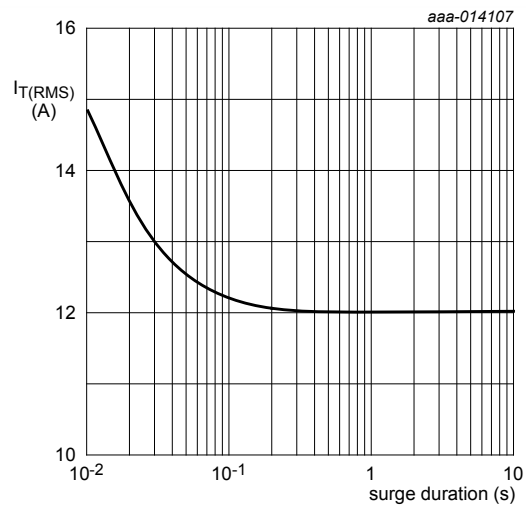


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



$f = 50\text{ Hz}$; $T_{mb} = 95\text{ }^{\circ}\text{C}$

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

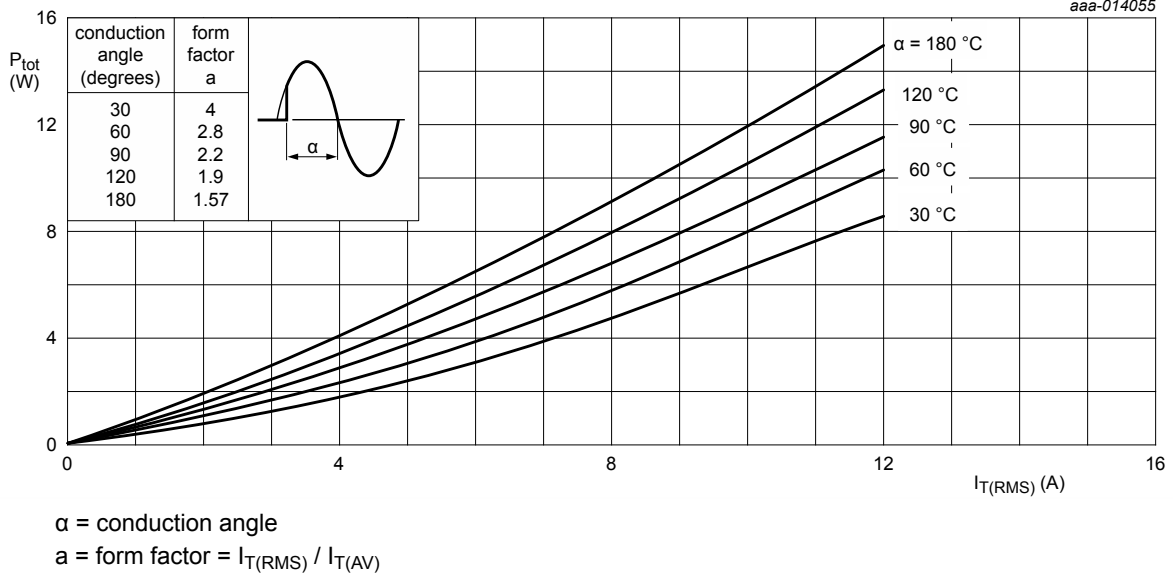


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

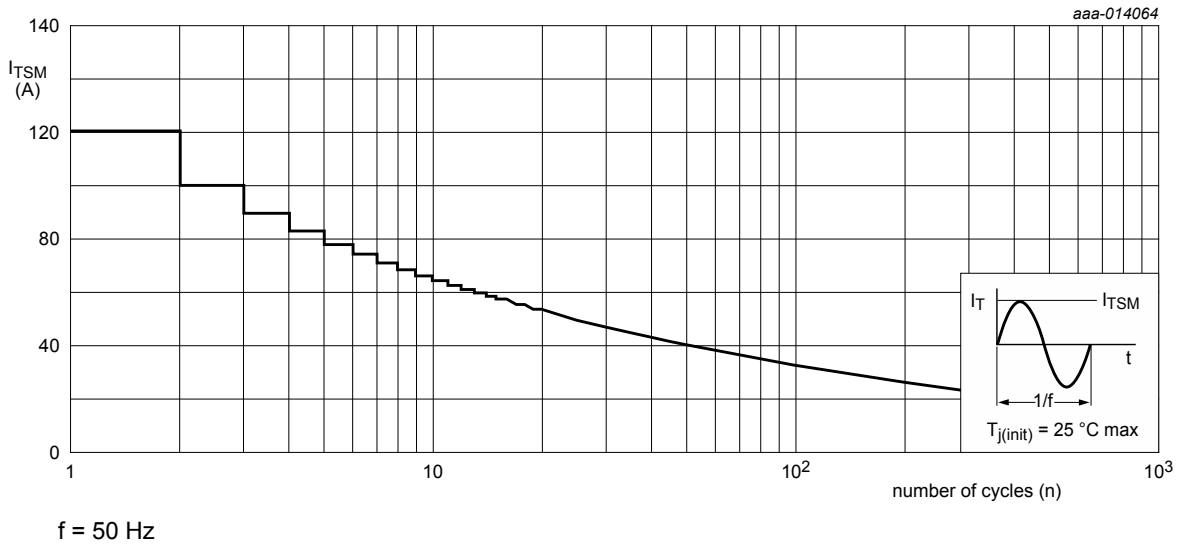


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

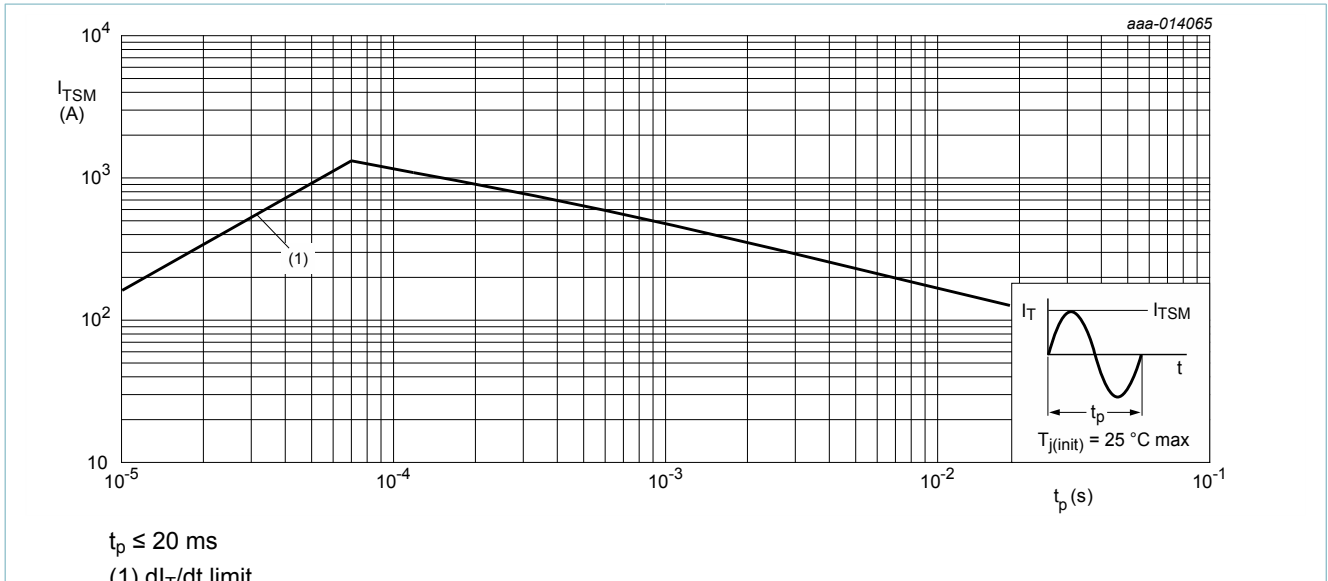


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

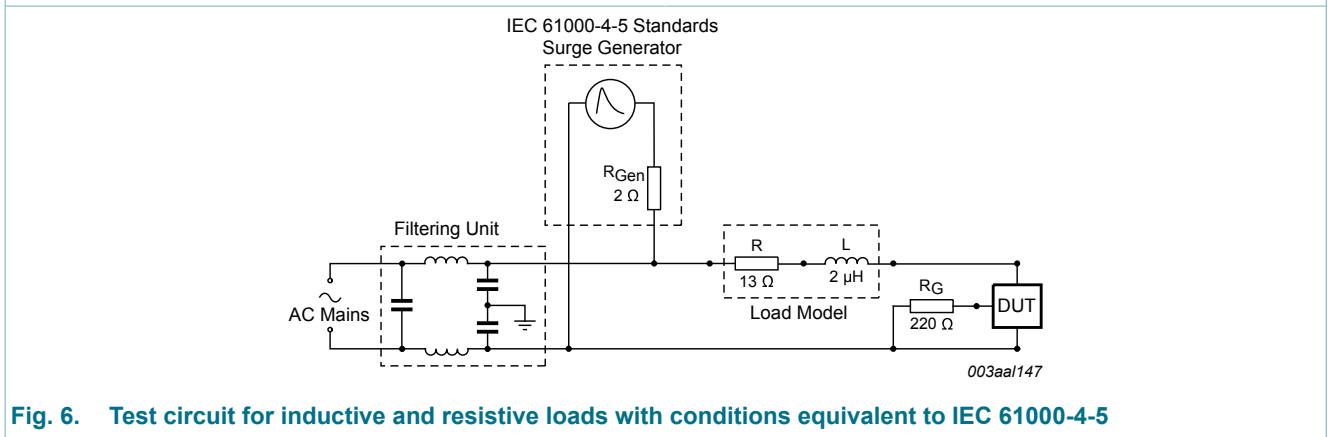


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

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; Fig. 7 | - | - | 2 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air; printed circuit board (FR4) mounted | - | 60 | - | K/W |

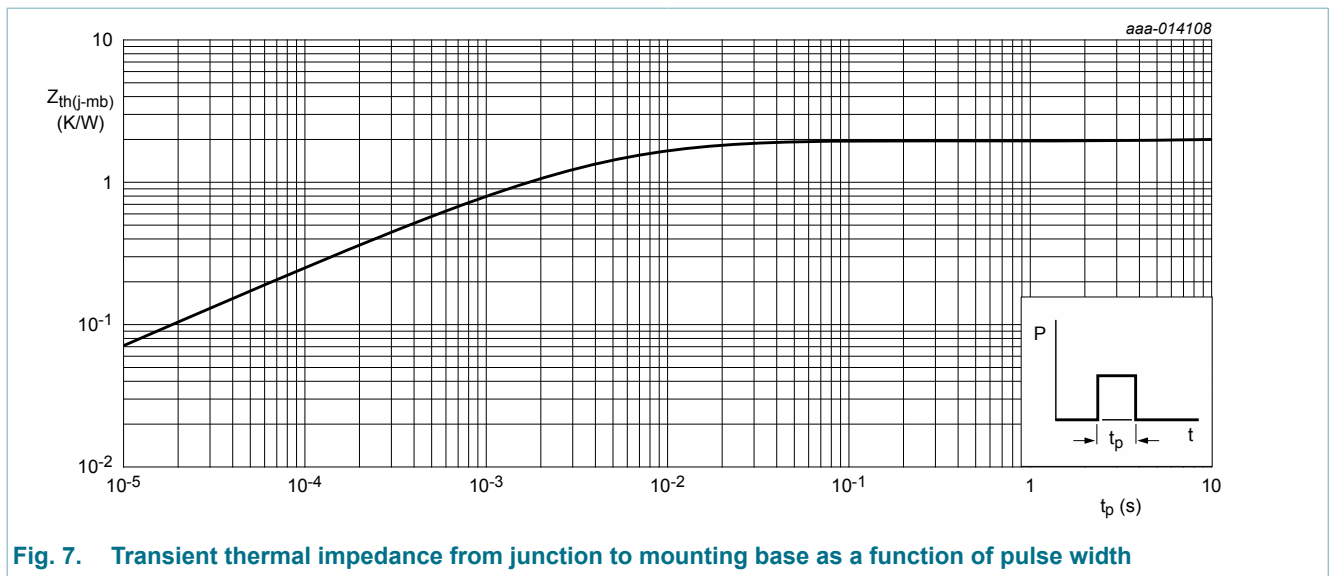


Fig. 7. Transient thermal impedance from junction to mounting base as a function of pulse width

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------------|--|------|------|-----|------|
| Static characteristics | | | | | | |
| I _{GT} | gate trigger current | V _D = 12 V; I _T = 100 mA; LD+ G+; T _j = 25 °C; Fig. 8 | - | - | 35 | mA |
| | | V _D = 12 V; I _T = 100 mA; LD+ G-; T _j = 25 °C; Fig. 8 | - | - | 35 | mA |
| | | V _D = 12 V; I _T = 100 mA; LD- G-; T _j = 25 °C; Fig. 8 | - | - | 35 | mA |
| I _L | latching current | V _D = 12 V; I _G = 100 mA; LD+ G+; T _j = 25 °C; Fig. 9 | - | - | 50 | mA |
| | | V _D = 12 V; I _G = 100 mA; LD+ G-; T _j = 25 °C; Fig. 9 | - | - | 70 | mA |
| | | V _D = 12 V; I _G = 100 mA; LD- G-; T _j = 25 °C; Fig. 9 | - | - | 50 | mA |
| I _H | holding current | V _D = 12 V; T _j = 25 °C; Fig. 10 | - | - | 50 | mA |
| V _T | on-state voltage | I _T = 17 A; T _j = 25 °C; Fig. 11 | - | 1.25 | 1.5 | 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 | 3000 | - | - | 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 | 14 | - | - | A/ms |

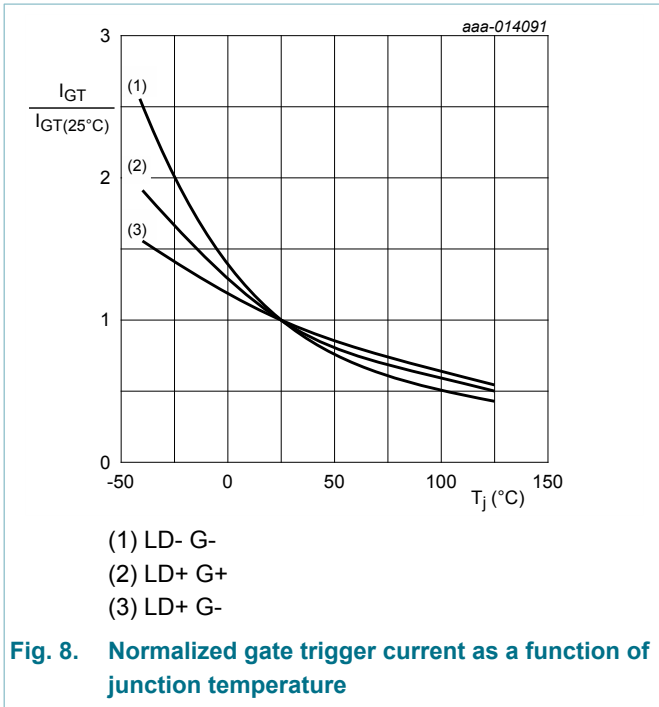


Fig. 8. Normalized gate trigger current as a function of junction temperature

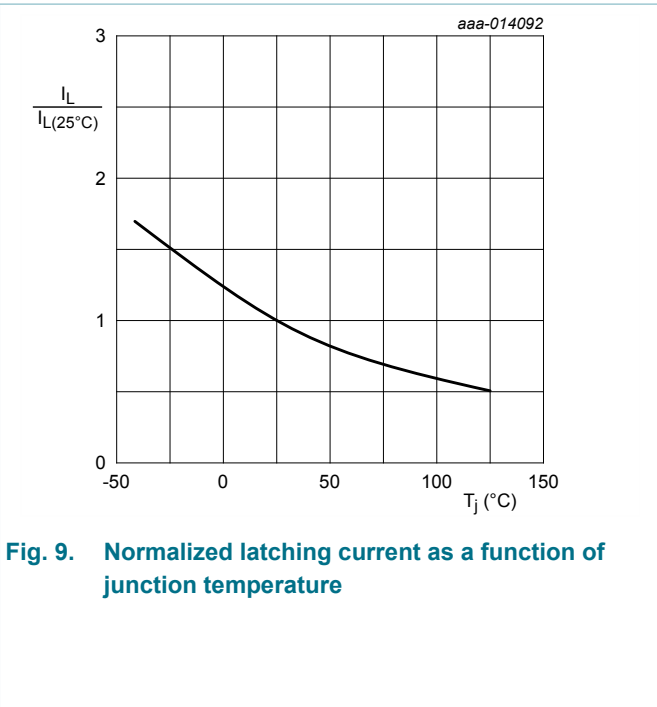


Fig. 9. Normalized latching current as a function of junction temperature

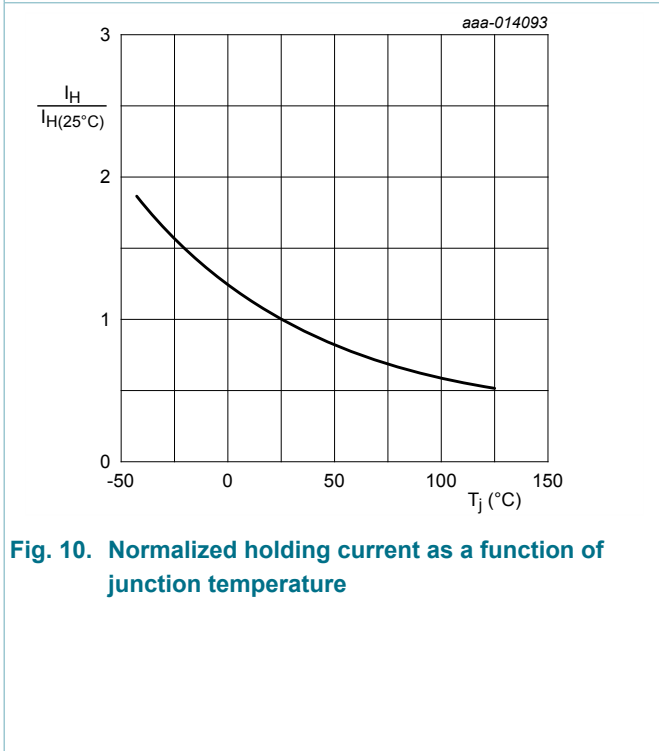


Fig. 10. Normalized holding current as a function of junction temperature

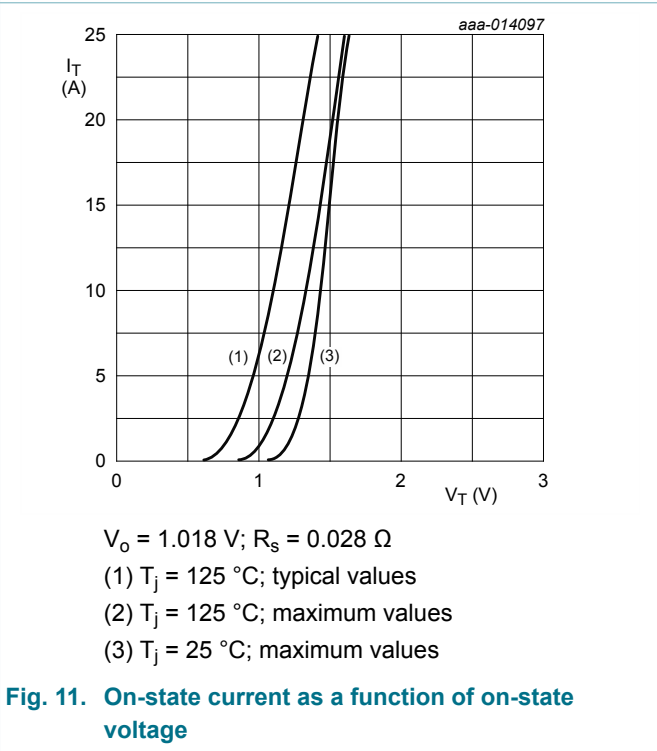


Fig. 11. On-state current as a function of on-state voltage

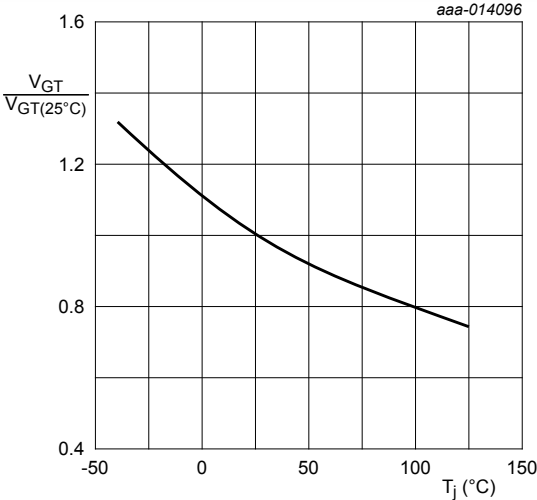
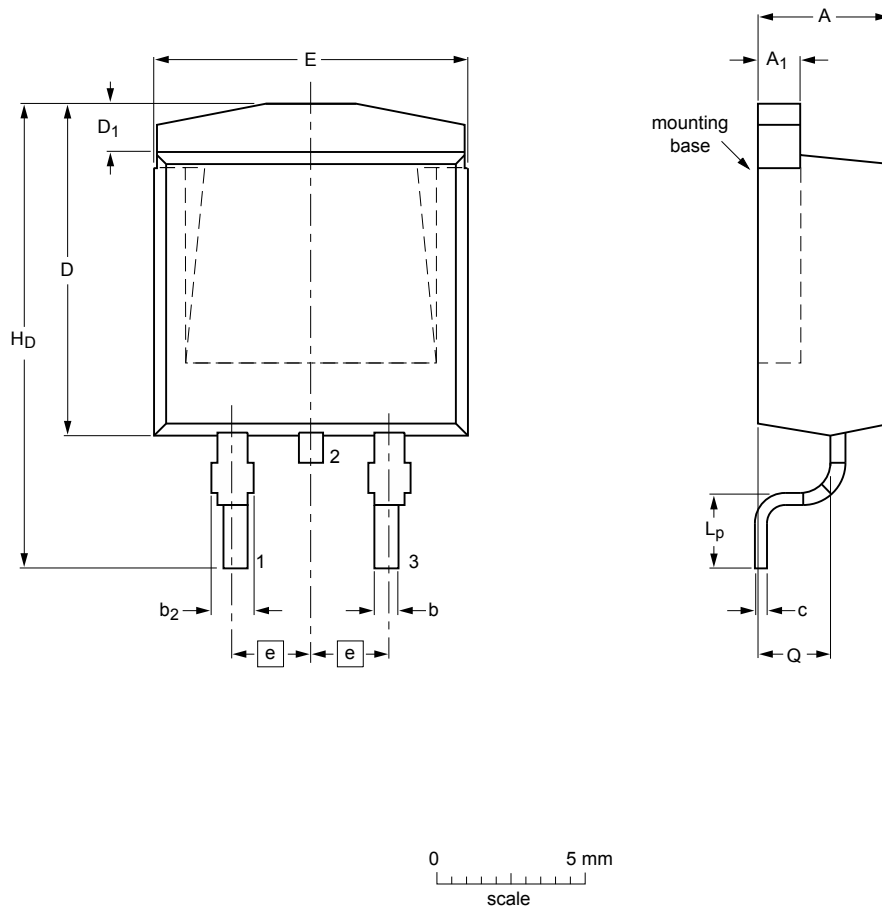


Fig. 12. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) SOT404



Dimensions (mm are the original dimensions)

| Unit | A | A ₁ | b | b ₂ | c | D | D ₁ | E | e | H _D | L _p | Q |
|------|-----|----------------|------|----------------|------|----|----------------|------|------|----------------|----------------|-----|
| max | 4.5 | 1.40 | 0.85 | 1.45 | 0.64 | 11 | 1.6 | 10.3 | | 15.8 | 2.9 | 2.6 |
| nom | | | | | | | | | 2.54 | | | |
| min | 4.1 | 1.27 | 0.60 | 1.05 | 0.46 | | 1.2 | 9.7 | | 14.8 | 2.1 | 2.2 |

sot404_po

| Outline version | References | | | European projection | Issue date |
|-----------------|------------|-------|-------|---------------------|------------------------|
| | IEC | JEDEC | JEITA | | |
| SOT404 | | | | | -06-03-16- 13-02-25 |

Fig. 13. Package outline D2PAK (SOT404)

12. Legal information

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|--------------------------------|--------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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13. 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 | Marking | 3 |
| 8 | Limiting values | 4 |
| 9 | Thermal characteristics | 7 |
| 10 | Characteristics | 8 |
| 11 | Package outline | 11 |
| 12 | Legal information | 12 |
| 12.1 | Data sheet status | 12 |
| 12.2 | Definitions | 12 |
| 12.3 | Disclaimers | 12 |
| 12.4 | Trademarks | 13 |

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 Date of release: 12 September 2014