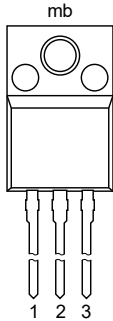



| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-----------|-----------------------------------|--|--|-----|------|-----|------------|
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 436\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $R_{GK} = 100\text{ }\Omega$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; Fig. 12 | | 200 | 1000 | - | V/ μ s |
| | | $V_{DM} = 436\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 12 | | 50 | 130 | - | V/ μ s |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------------------|---|---|
| 1 | K | cathode |  <p>TO-220F (SOT186A)</p> |  <p>sym037</p> |
| 2 | A | anode | | |
| 3 | G | gate | | |
| mb | n.c. | mounting base; isolated | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|---|---------|
| | Name | Description | Version |
| BT151X-650R | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack" | SOT186A |

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 | | - | 650 | V |
| V_{RRM} | repetitive peak reverse voltage | | - | 650 | V |
| $I_{T(AV)}$ | average on-state current | half sine wave; $T_h \leq 69^\circ\text{C}$ | - | 7.5 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_h \leq 69^\circ\text{C}$; Fig. 1; Fig. 2; Fig. 3 | - | 12 | A |
| I_{TSM} | non-repetitive peak on-state current | half sine wave; $T_{j(\text{init})} = 25^\circ\text{C}$; $t_p = 10\text{ ms}$; Fig. 4; Fig. 5 | - | 120 | A |
| | | half sine wave; $T_{j(\text{init})} = 25^\circ\text{C}$; $t_p = 8.3\text{ ms}$ | - | 132 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; SIN | - | 72 | A^2s |
| di_T/dt | rate of rise of on-state current | $I_G = 30\text{ mA}$ | - | 50 | $\text{A}/\mu\text{s}$ |
| I_{GM} | peak gate current | | - | 2 | A |
| V_{RGM} | peak reverse gate voltage | | - | 5 | V |
| 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 | $^\circ\text{C}$ |

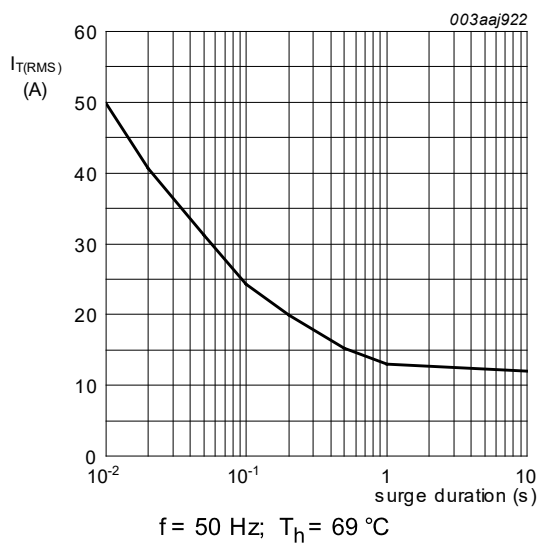


Fig. 1. RMS on-state current as a function of surge duration; maximum values

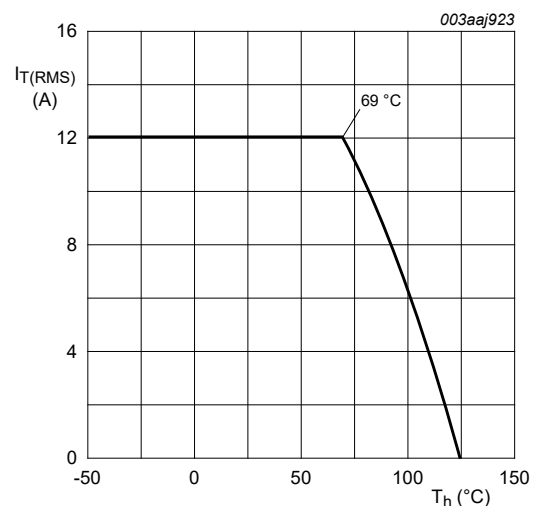


Fig. 2. RMS on-state current as a function of heatsink temperature; maximum values

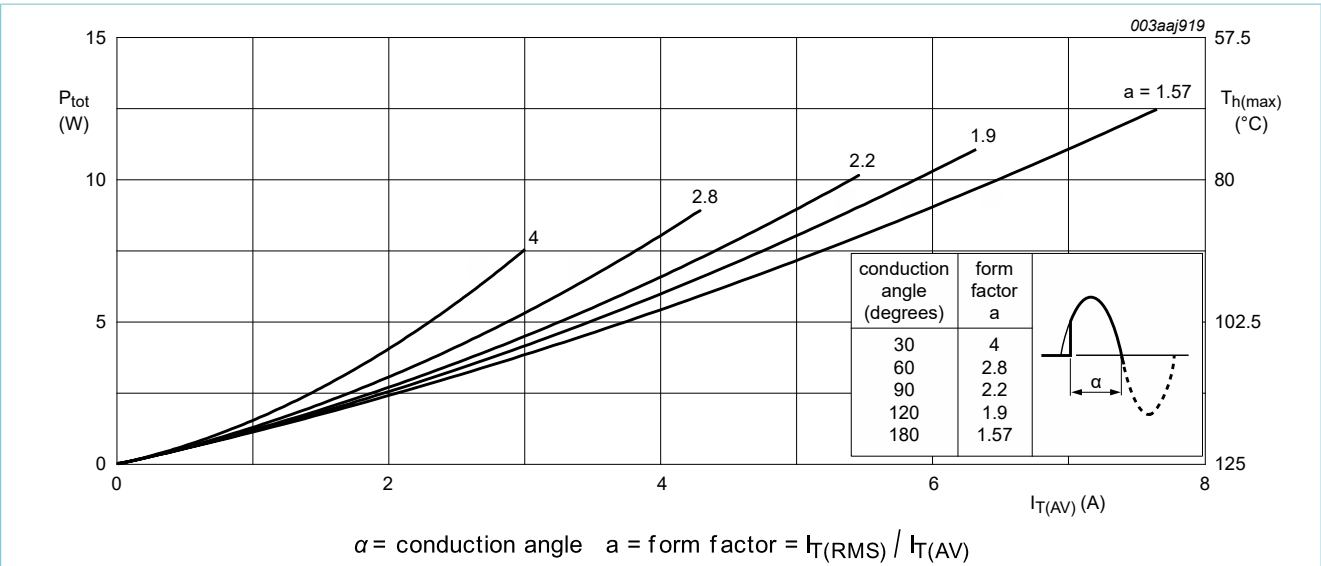


Fig. 3. Total power dissipation as a function of average on-state current; maximum values

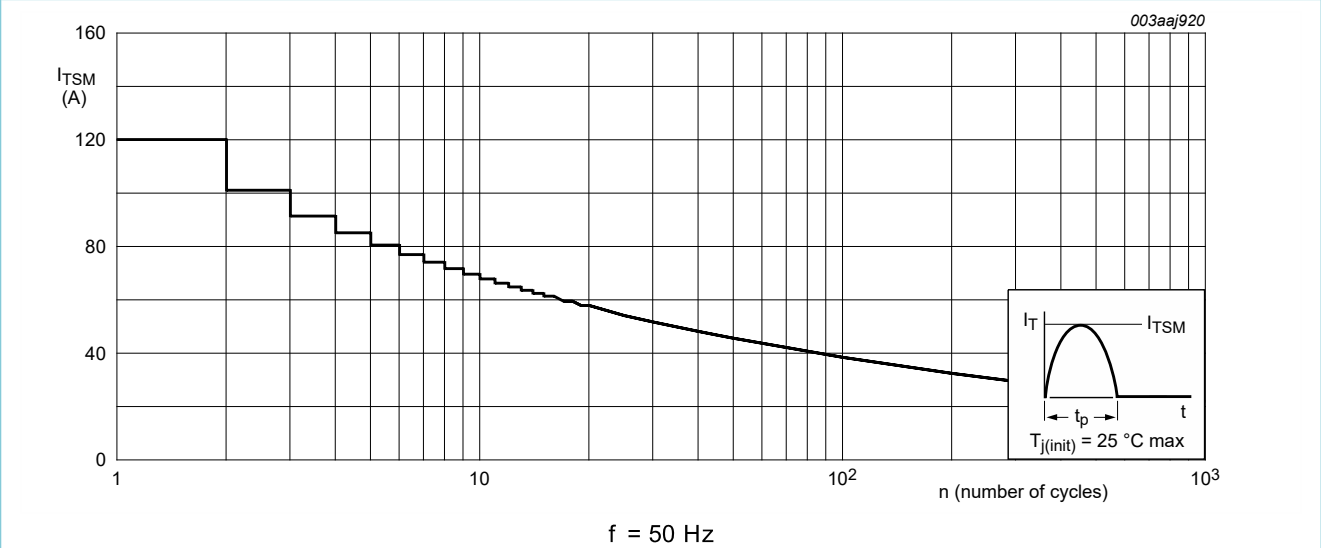
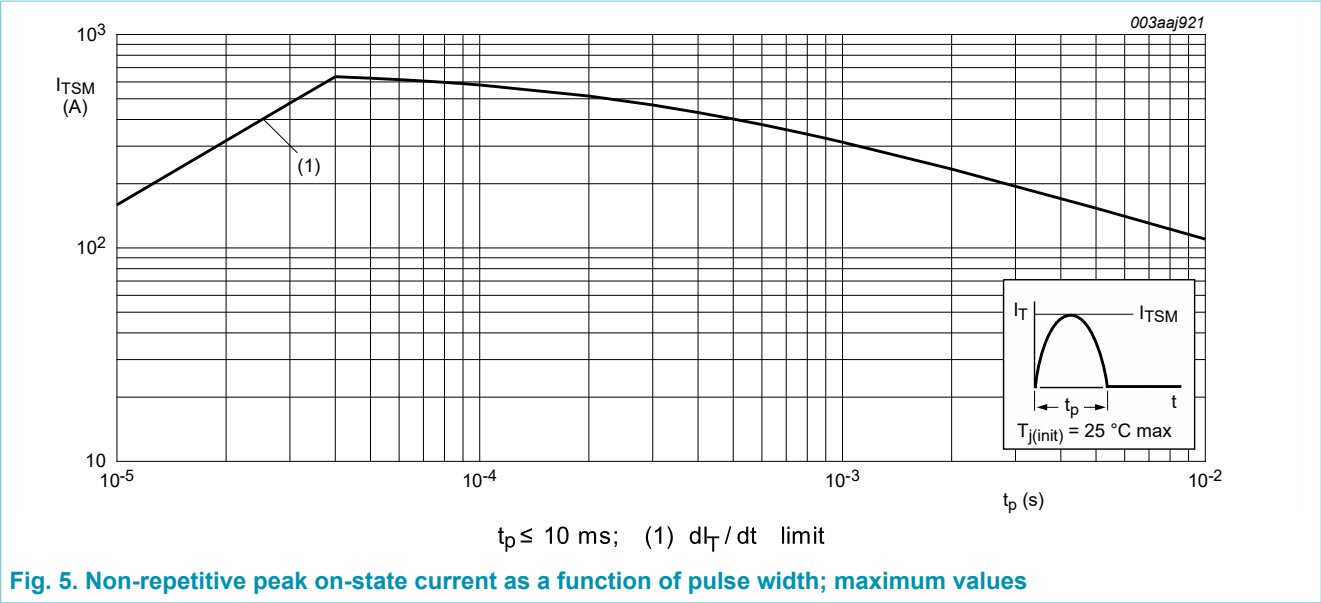


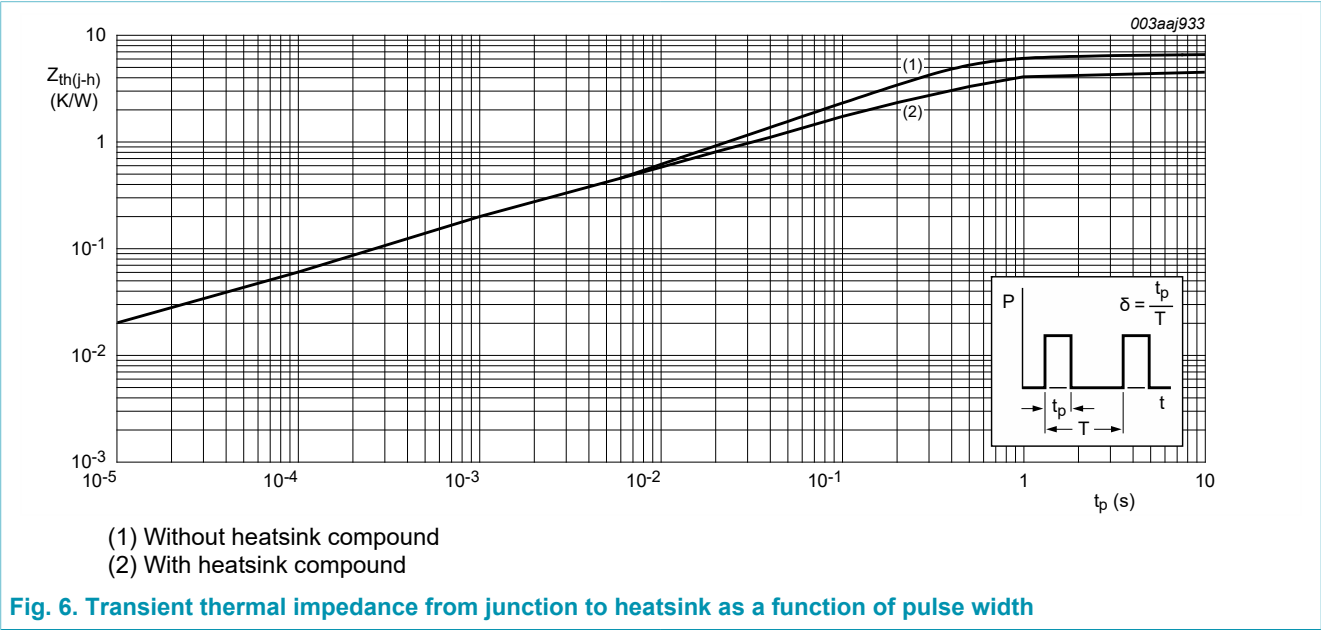
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



8. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------------|--|-----------------------------------|-----|-----|-----|------|
| R _{th(j-h)} | thermal resistance from junction to heatsink | with heatsink compound; Fig. 6 | - | - | 4.5 | K/W |
| | | without heatsink compound; Fig. 6 | - | - | 6.5 | K/W |
| R _{th(j-a)} | thermal resistance from junction to ambient free air | in free air | - | 55 | - | 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 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; T _h = 25 °C | - | - | 2500 | V |
| C _{isol} | isolation capacitance | from anode to external heatsink; f = 1 MHz; T _h = 25 °C | - | 10 | - | pF |

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-----------------------------------|---|------|------|------|------------------|
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7 | - | 2 | 15 | mA |
| I_L | latching current | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8 | - | 10 | 40 | mA |
| I_H | holding current | $V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 9 | - | 7 | 20 | mA |
| V_T | on-state voltage | $I_T = 23\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 10 | - | 1.4 | 1.75 | V |
| V_{GT} | gate trigger voltage | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 11 | - | 0.6 | 1 | V |
| | | $V_D = 650\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125\text{ }^\circ\text{C}$; Fig. 11 | 0.25 | 0.4 | - | V |
| I_D | off-state current | $V_D = 650\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$ | - | 0.1 | 0.5 | mA |
| I_R | reverse current | $V_R = 650\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$ | - | 0.1 | 0.5 | mA |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 436\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $R_{GK} = 100\text{ }\Omega$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; Fig. 12 | 200 | 1000 | - | V/ μs |
| | | $V_{DM} = 436\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 12 | 50 | 130 | - | V/ μs |
| t_{gt} | gate-controlled turn-on time | $I_{TM} = 40\text{ A}$; $V_D = 650\text{ V}$; $I_G = 100\text{ mA}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$; $T_j = 25\text{ }^\circ\text{C}$ | - | 2 | - | μs |
| t_q | commutated turn-off time | $V_{DM} = 436\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{TM} = 20\text{ A}$; $V_R = 25\text{ V}$; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$; $dV_D/dt = 50\text{ V}/\mu\text{s}$; $R_{GK(EXT)} = 100\text{ }\Omega$; ($V_{DM} = 67\%$ of V_{DRM}) | - | 70 | - | μs |

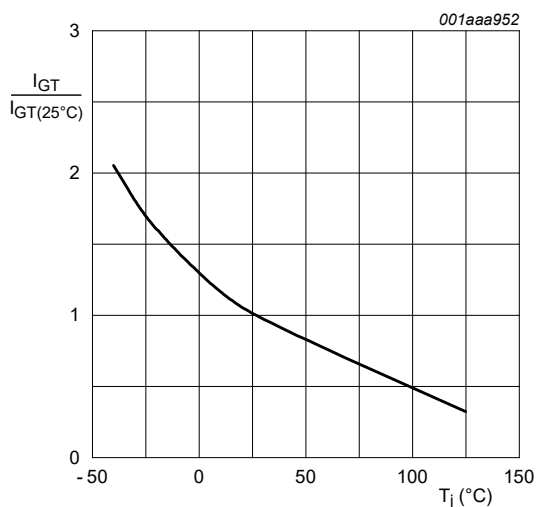


Fig. 7. Normalized gate trigger current as a function of junction temperature

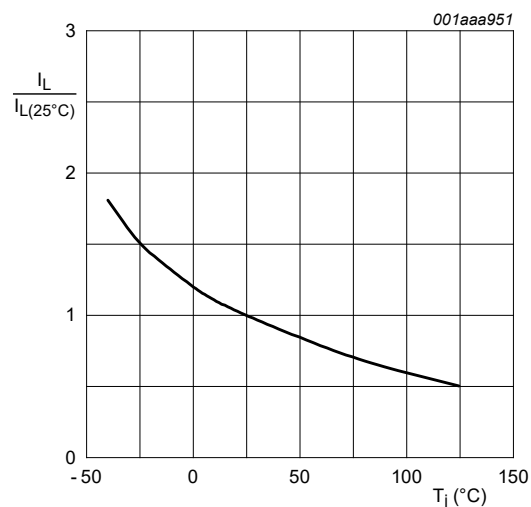


Fig. 8. Normalized latching current as a function of junction temperature

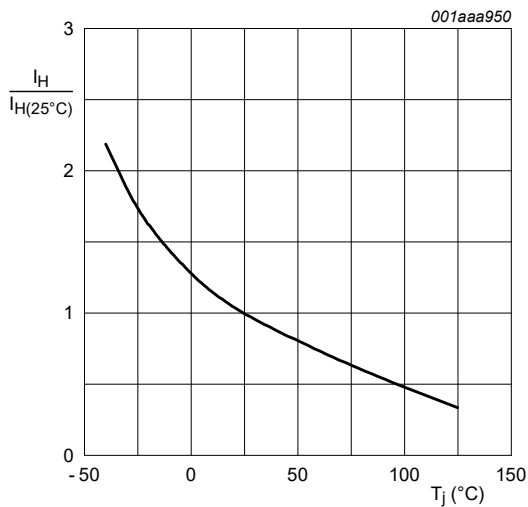
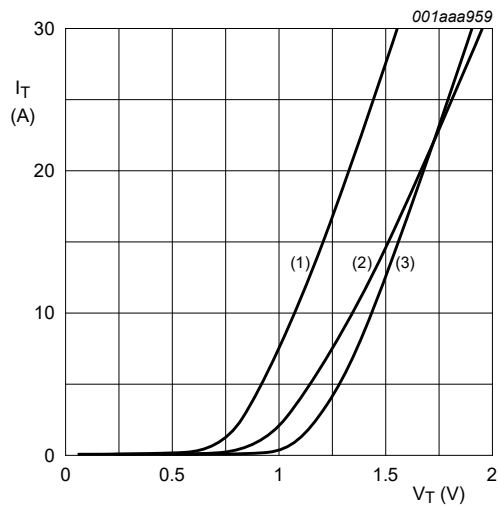


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 1.06\text{ V}$; $R_s = 0.0304\ \Omega$
 (1) $T_j = 125\ ^{\circ}\text{C}$; typical values
 (2) $T_j = 125\ ^{\circ}\text{C}$; maximum values
 (3) $T_j = 25\ ^{\circ}\text{C}$; maximum values

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

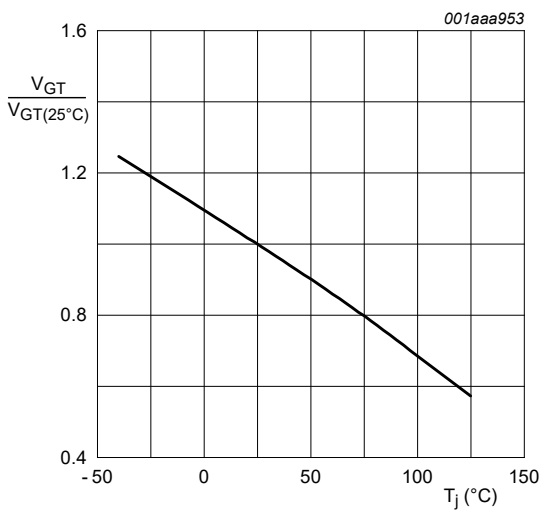
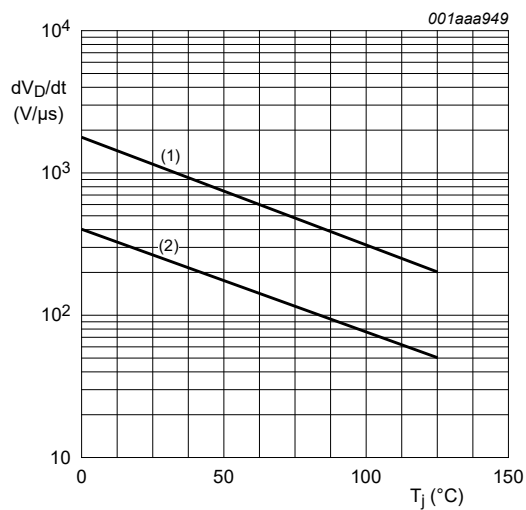


Fig. 11. Normalized gate trigger voltage as a function of junction temperature



(1) $R_{GK} = 100\ \Omega$;
 (2) gate open circuit

Fig. 12. Critical rate of rise of off-state voltage as a function of junction temperature; minimum values

11. Package outline

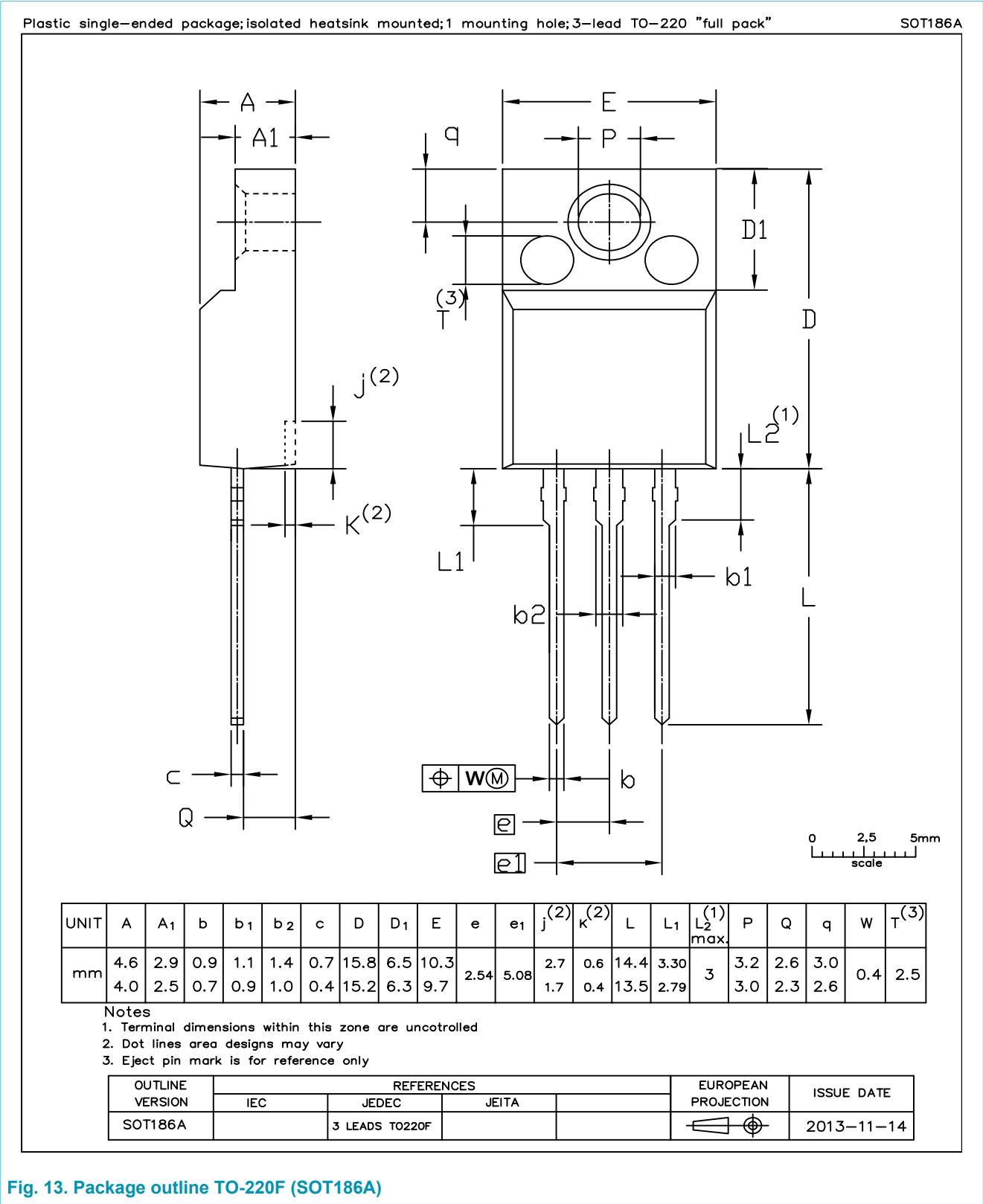


Fig. 13. Package outline TO-220F (SOT186A)

12. Legal information

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| Document status [1][2] | Product status [3] | Definition |
|--------------------------------|--------------------|---|
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