

1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a TO252 (DPAK) surface mountable plastic package intended for use in applications requiring high bidirectional blocking voltage, High surge current capability and high thermal cycling performance.

2. Features and benefits

- High bidirectional blocking voltage capability
- High surge current capability
- High thermal cycling performance
- Surface mountable package

3. Applications

- Ignition circuits
- Motor control
- Protection circuits
- Voltage regulation

4. Quick reference data

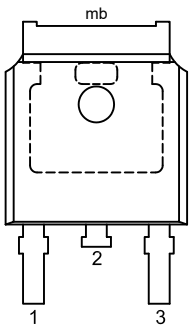

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|--------------------------------------|--|-----|------|-----|------------|
| V_{RRM} | repetitive peak reverse voltage | | - | - | 500 | V |
| $I_{T(AV)}$ | average on-state current | half sine wave; $T_{mb} \leq 103\text{ °C}$; Fig. 1 | - | - | 7.5 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{mb} \leq 103\text{ °C}$; Fig. 2 ; Fig. 3 | - | - | 12 | A |
| I_{TSM} | non-repetitive peak on-state current | half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 10\text{ ms}$; Fig. 4 ; Fig. 5 | - | - | 120 | A |
| | | half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 8.3\text{ ms}$ | - | - | 132 | A |
| T_j | junction temperature | | - | - | 125 | °C |
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 8 | - | 2 | 15 | mA |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 335\text{ V}$; $T_j = 125\text{ °C}$; $R_{GK} = 100\text{ }\Omega$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; Fig. 13 | 200 | 1000 | - | V/ μ s |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------|-----------|--|-----|-----|-----|------------|
| | | $V_{DM} = 335\text{ V}$; $T_j = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 13 | 50 | 130 | - | V/ μ s |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-----------------------------------|---|---|
| 1 | K | cathode |  <p style="text-align: center;">DPAK (TO252N)</p> |  |
| 2 | A | anode | | |
| 3 | G | gate | | |
| mb | A | mounting base; connected to anode | | |

6. Ordering information

Table 3. Ordering information

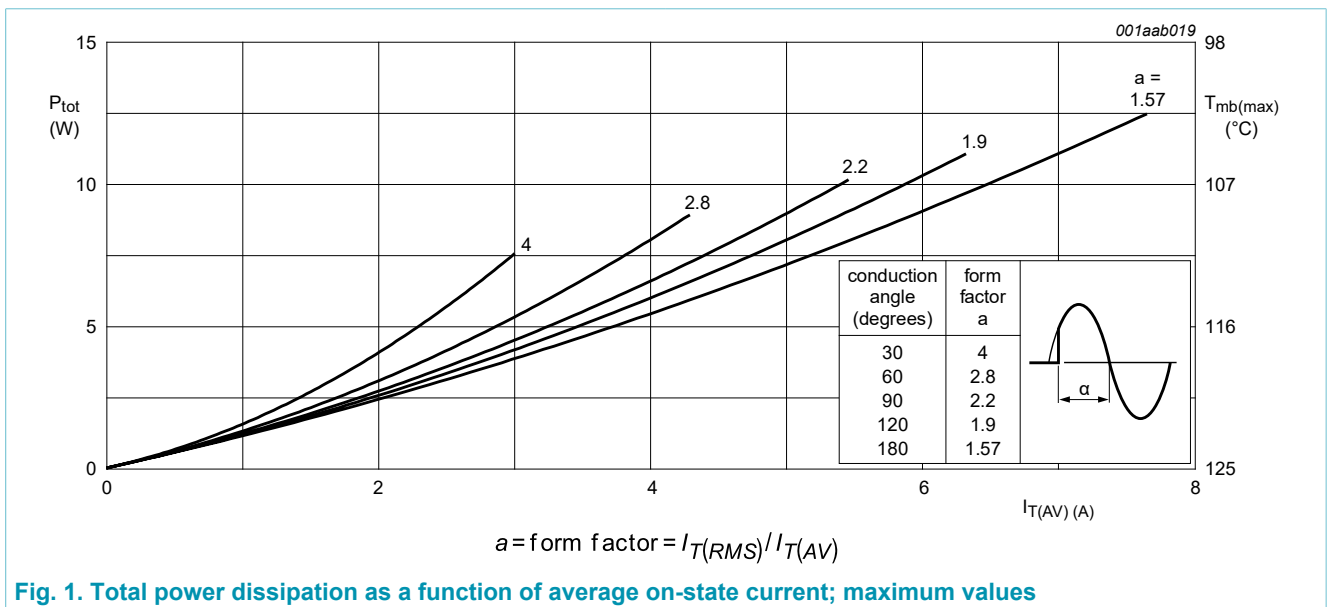
| Type number | Package | | Version |
|-------------|---------|---|---------|
| | Name | Description | |
| BT151S-500R | DPAK | plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) | TO252N |

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 | | - | 500 | V |
| V_{RRM} | repetitive peak reverse voltage | | - | 500 | V |
| $I_{T(AV)}$ | average on-state current | half sine wave; $T_{mb} \leq 103\text{ }^{\circ}\text{C}$; Fig. 1 | - | 7.5 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{mb} \leq 103\text{ }^{\circ}\text{C}$; Fig. 2 ; Fig. 3 | - | 12 | A |
| I_{TSM} | non-repetitive peak on-state current | half sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 10\text{ ms}$; Fig. 4 ; Fig. 5 | - | 120 | A |
| | | half sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 8.3\text{ ms}$ | - | 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 | $^{\circ}\text{C}$ |



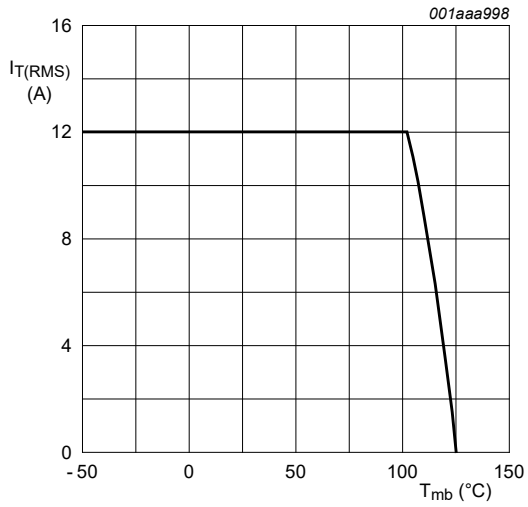
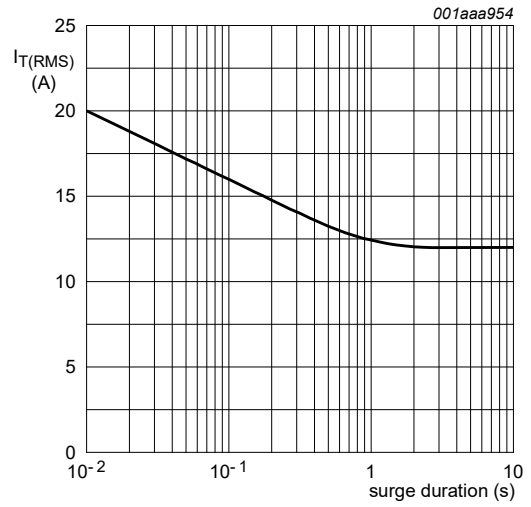
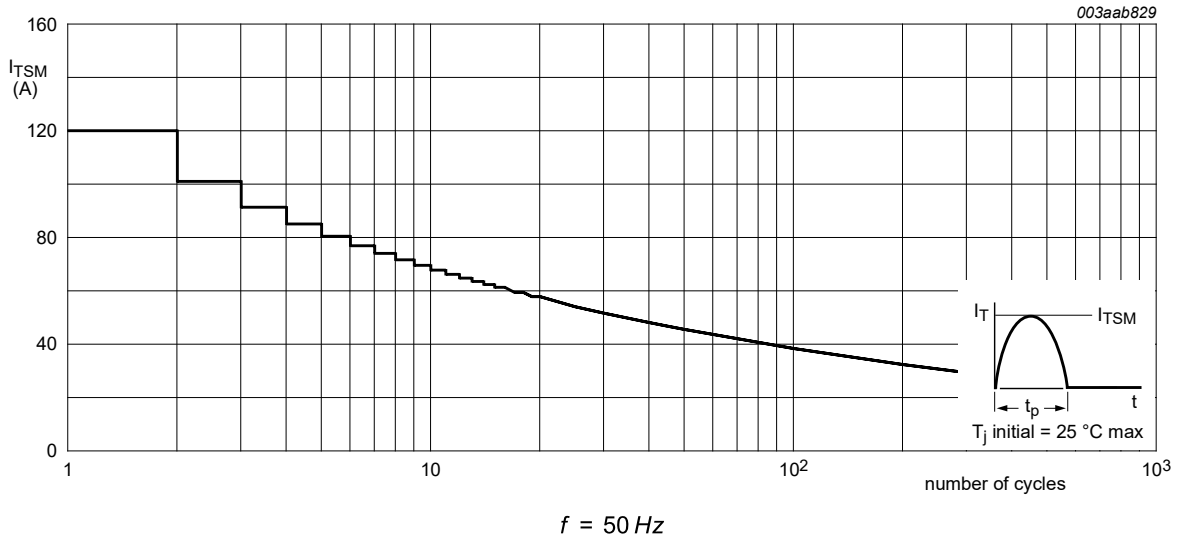


Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values



$f = 50 \text{ Hz}; T_{mb} = 103 \text{ }^\circ\text{C}$

Fig. 3. RMS on-state current as a function of surge duration; maximum values



$f = 50 \text{ Hz}$

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

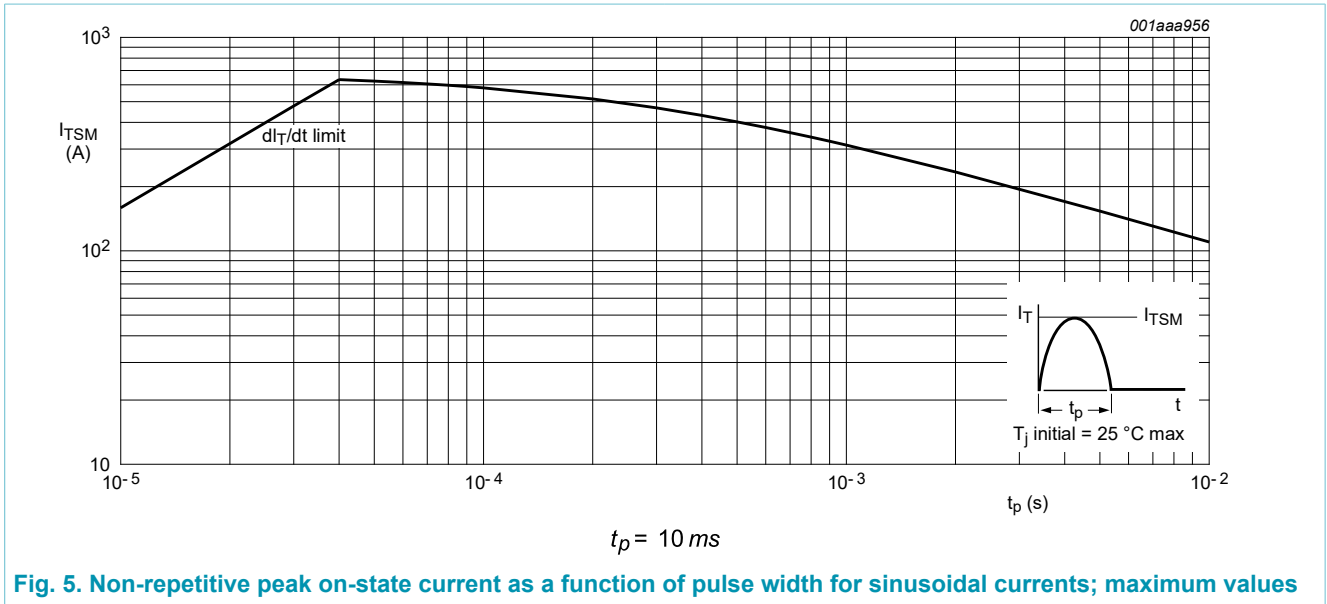


Fig. 5. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values

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 | Fig. 6 | - | - | 1.8 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | mounted on an FR4 printed-circuit board; Fig. 7 | - | 75 | - | K/W |

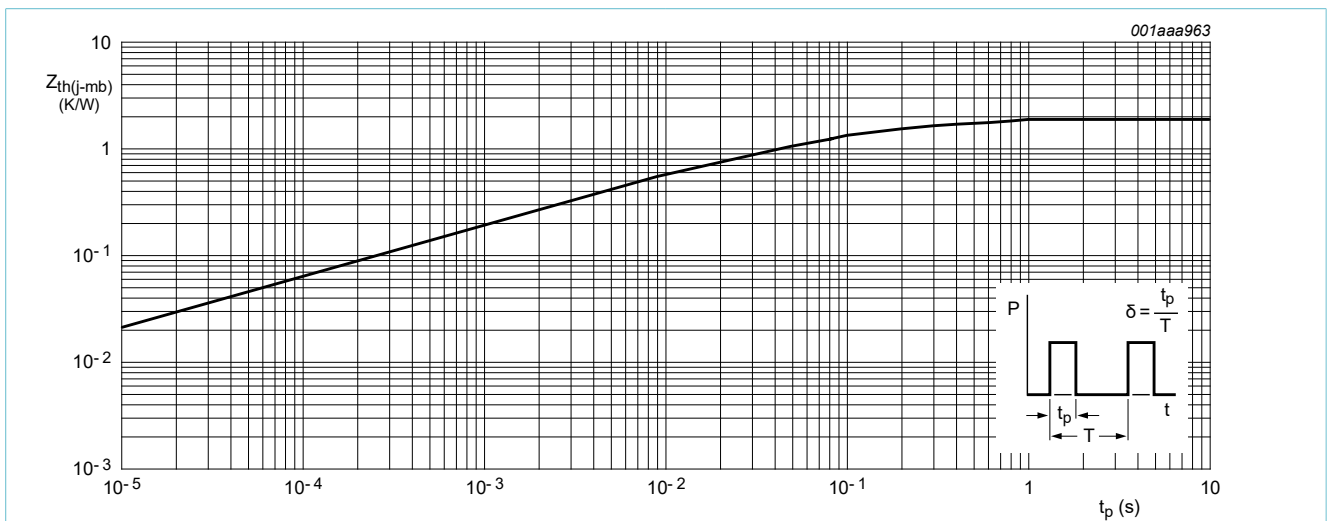


Fig. 6. Transient thermal impedance from junction to mounting base as as function of pulse width

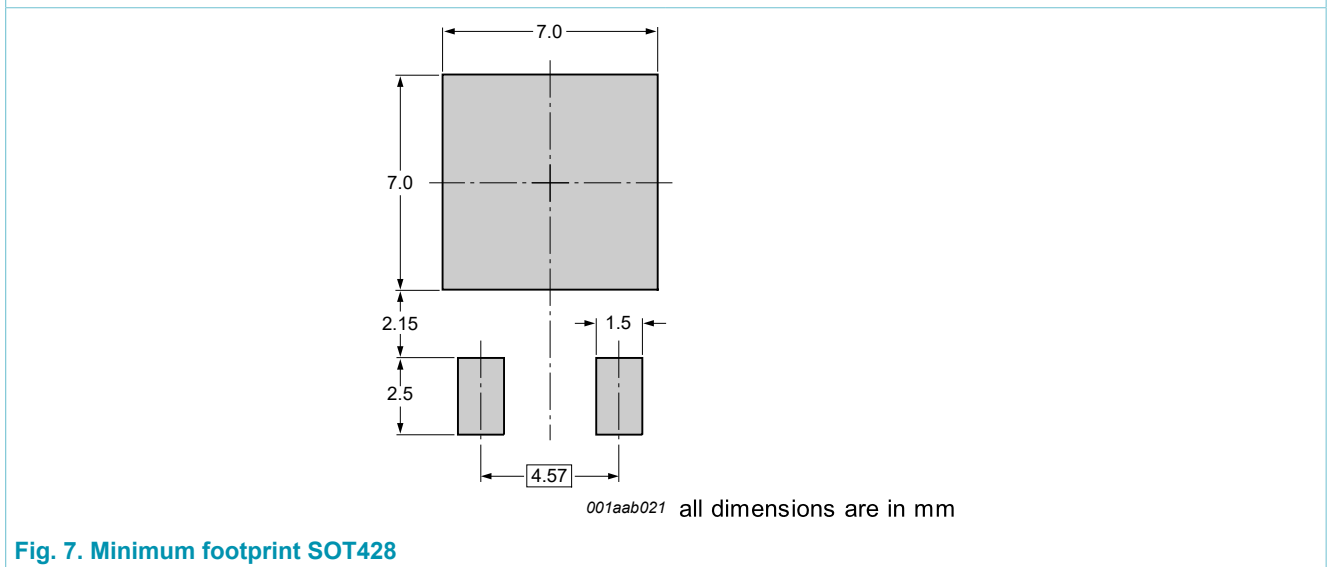


Fig. 7. Minimum footprint SOT428

9. Characteristics

Table 6. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-----------------------------------|---|------|------|------|------------|
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 8 | - | 2 | 15 | mA |
| I_L | latching current | $V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 9 | - | 10 | 40 | mA |
| I_H | holding current | $V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; Fig. 10 | - | 7 | 20 | mA |
| V_T | on-state voltage | $I_T = 23\text{ A}$; $T_j = 25\text{ °C}$; Fig. 11 | - | 1.4 | 1.75 | V |
| V_{GT} | gate trigger voltage | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 12 | - | 0.6 | 1 | V |
| | | $V_D = 500\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125\text{ °C}$; Fig. 12 | 0.25 | 0.4 | - | V |
| I_D | off-state current | $V_D = 500\text{ V}$; $T_j = 125\text{ °C}$ | - | 0.1 | 0.5 | mA |
| I_R | reverse current | $V_R = 500\text{ V}$; $T_j = 125\text{ °C}$ | - | 0.1 | 0.5 | mA |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 335\text{ V}$; $T_j = 125\text{ °C}$; $R_{GK} = 100\text{ }\Omega$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; Fig. 13 | 200 | 1000 | - | V/ μ s |
| | | $V_{DM} = 335\text{ V}$; $T_j = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 13 | 50 | 130 | - | V/ μ s |
| t_{gt} | gate-controlled turn-on time | $I_{TM} = 40\text{ A}$; $V_D = 500\text{ V}$; $I_G = 0.1\text{ A}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$; $T_j = 25\text{ °C}$ | - | 2 | - | μ s |
| t_q | commutated turn-off time | $V_{DM} = 335\text{ V}$; $T_j = 125\text{ °C}$; $I_{TM} = 20\text{ A}$; $V_R = 25\text{ V}$; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$; $dV_D/dt = 50\text{ V}/\mu\text{s}$; $R_{GK(ext)} = 100\text{ }\Omega$; ($V_{DM} = 67\%$ of V_{DRM}) | - | 70 | - | μ s |

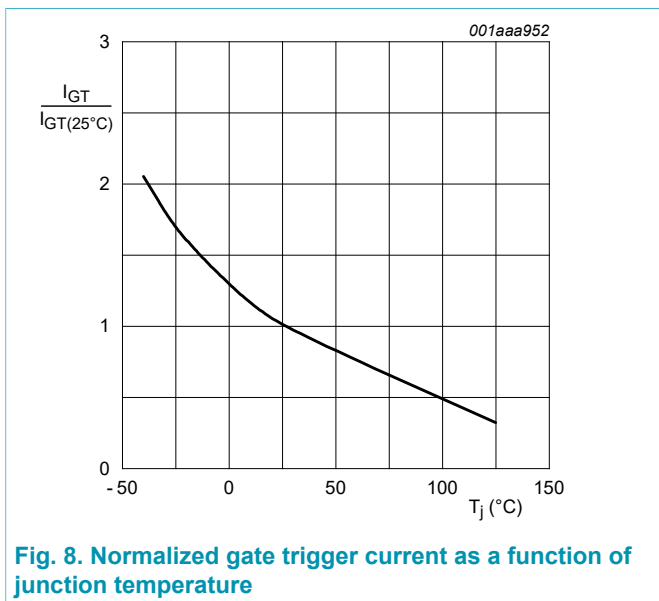


Fig. 8. Normalized gate trigger current as a function of junction temperature

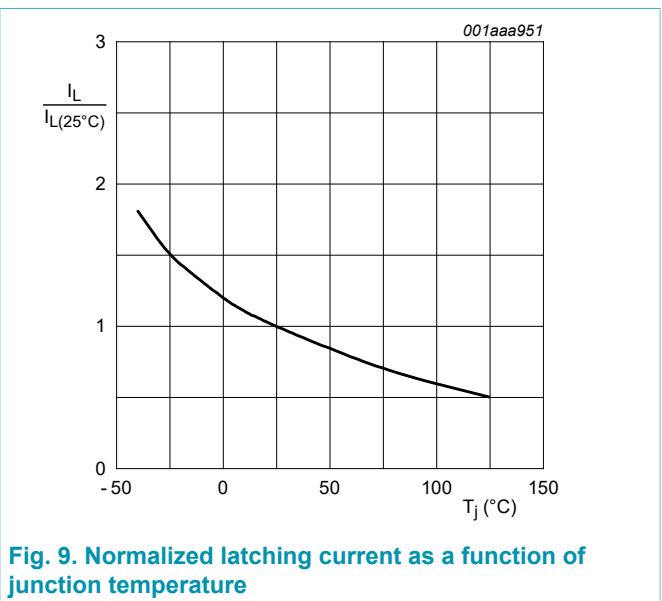


Fig. 9. Normalized latching current as a function of junction temperature

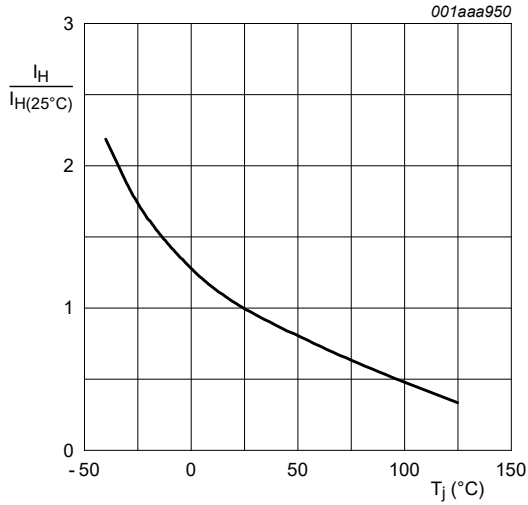


Fig. 10. Normalized holding current as a function of junction temperature



$V_o = 1.06 \text{ V}; R_s = 0.0304 \Omega$

- (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

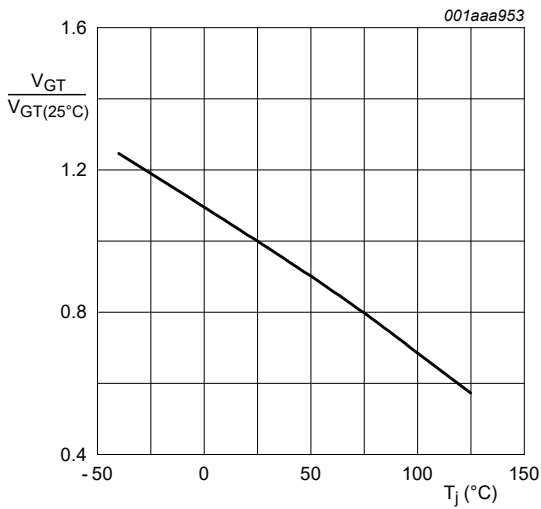


Fig. 12. Normalized gate trigger voltage as a function of junction temperature



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

Fig. 13. Critical rate of rise of off-state voltage as a function of junction temperature; minimum values

10. Package outline

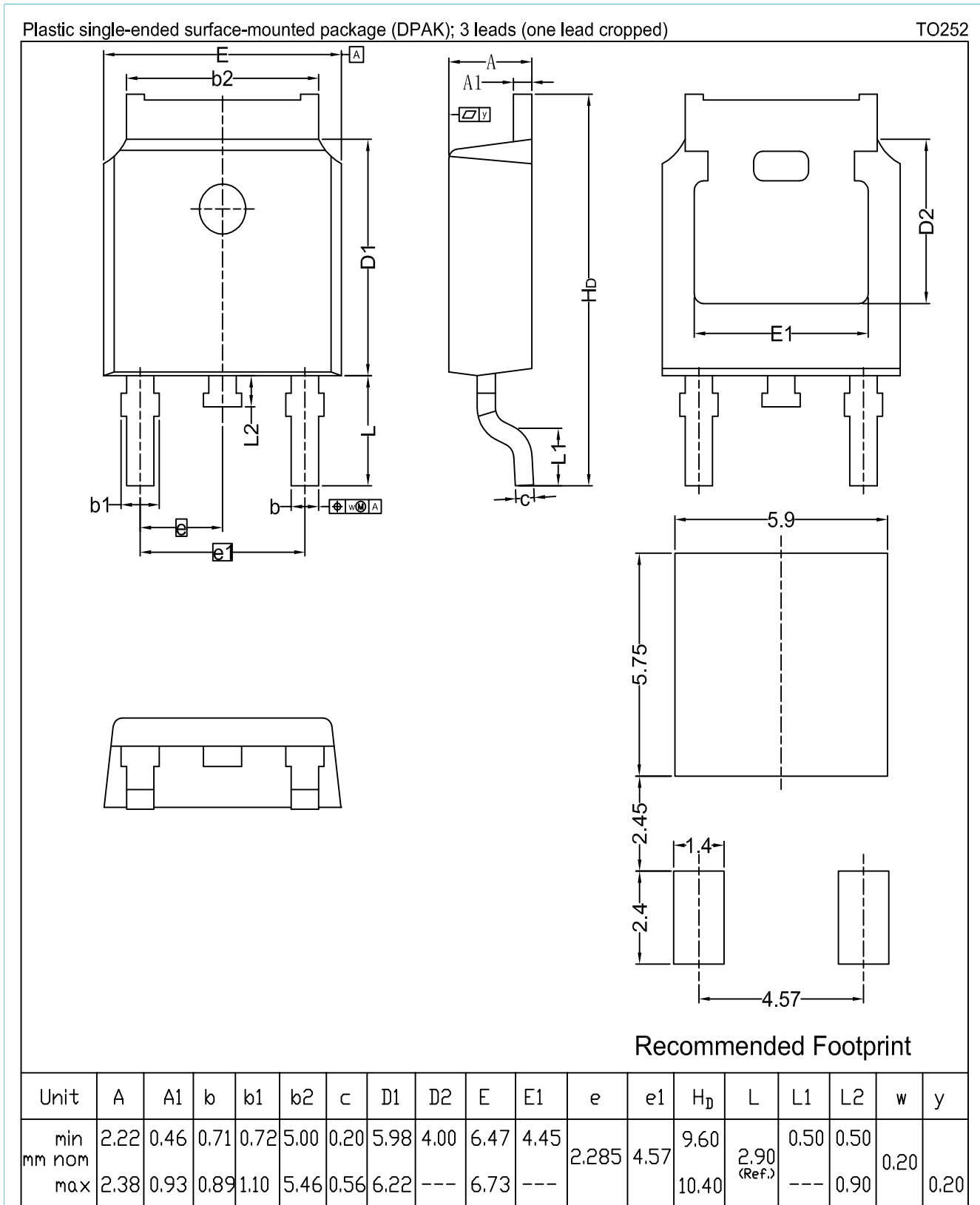


Fig. 14. Package outline DPAK (TO252N)

11. Legal information

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|--------------------------------|--------------------|---|
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- [2] The term 'short data sheet' is explained in section "Definitions".
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