# BT151S-500L

## SCR

11 June 2018 **Product data sheet**

## 1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a SOT428 (DPAK) surface mountable plastic package intended for use in applications requiring high bidirectional blocking voltage capability, high surge current capability and high thermal cycling performance.

## 2. Features and benefits

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

## 3. Applications

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

## 4. Quick reference data

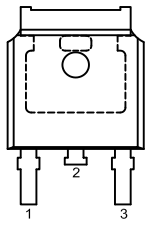
**Table 1. Quick reference data**

| 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 °C; Fig. 1 | | - | - | 7.5 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{mb} \leq$ 103 °C; Fig. 2; Fig. 3 | | - | - | 12 | A |
| $I_{TSM}$ | non-repetitive peak on-state current | half sine wave; $T_{j(init)}$ = 25 °C; $t_p$ = 10 ms; Fig. 4; Fig. 5 | | - | - | 120 | A |
| | | half sine wave; $T_{j(init)}$ = 25 °C; $t_p$ = 8.3 ms | | - | - | 132 | A |
| $T_j$ | junction temperature | | | - | - | 125 | °C |
| **Static characteristics** | | | | | | | |
| $I_{GT}$ | gate trigger current | $V_D$ = 12 V; $I_T$ = 0.1 A; $T_j$ = 25 °C; Fig. 8 | | - | 2 | 5 | mA |
| **Dynamic characteristics** | | | | | | | |

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 335 V; $T_j$ = 125 °C; $R_{GK}$ = 100 Ω; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; Fig. 13 | | 200 | 1000 | - | V/µs |

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K | cathode |   DPAK (SOT428) |   |
| 2 | A | anode | | |
| 3 | G | gate | | |
| mb | A | mounting base; connected to anode | | |

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BT151S-500L | DPAK | plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) | SOT428 |


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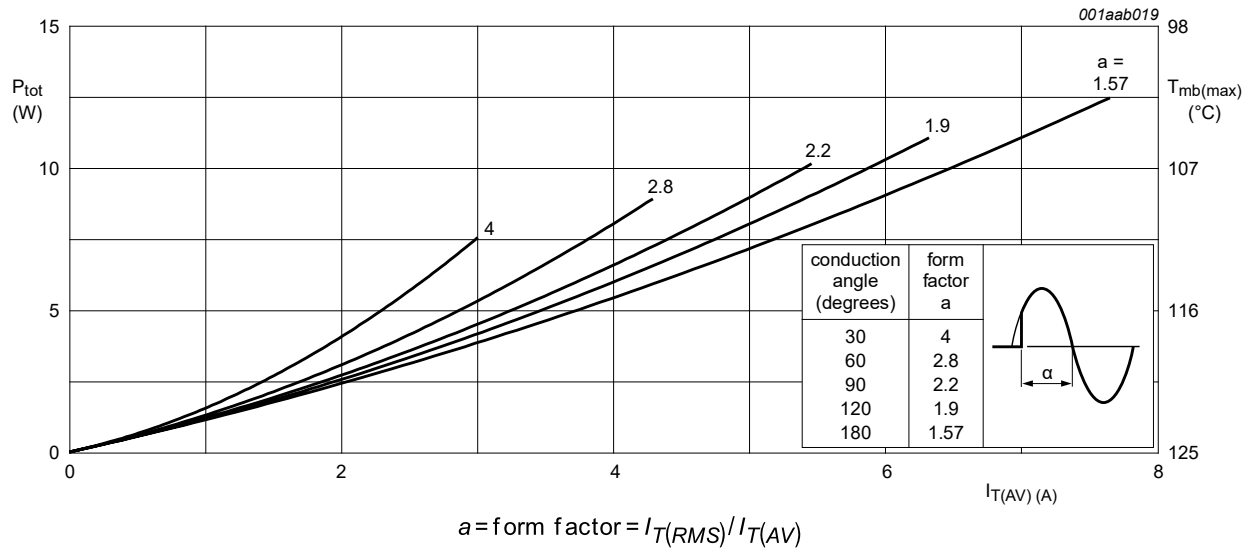
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# 7. Limiting values

**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; $T_{mb} \leq 103$ °C; Fig. 1 | | - | 7.5 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{mb} \leq 103$ °C; Fig. 2; Fig. 3 | | - | 12 | A |
| $I_{TSM}$ | non-repetitive peak on-state current | half sine wave; $T_{j(init)} = 25$ °C; $t_p = 10$ ms; Fig. 4; Fig. 5 | | - | 120 | A |
| | | half sine wave; $T_{j(init)} = 25$ °C; $t_p = 8.3$ ms | | - | 132 | A |
| $I^2t$ | $I^2t$ for fusing | $t_p = 10$ ms; SIN | | - | 72 | $A^2s$ |
| $dI_T/dt$ | rate of rise of on-state current | $I_G = 10$ mA | | - | 50 | A/µs |
| $I_{GM}$ | 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 | °C |
| $T_j$ | junction temperature | | | - | 125 | °C |




$a = \text{form factor} = I_{T(RMS)} / I_{T(AV)}$

**Fig. 1. Total power dissipation as a function of average on-state current; maximum values**


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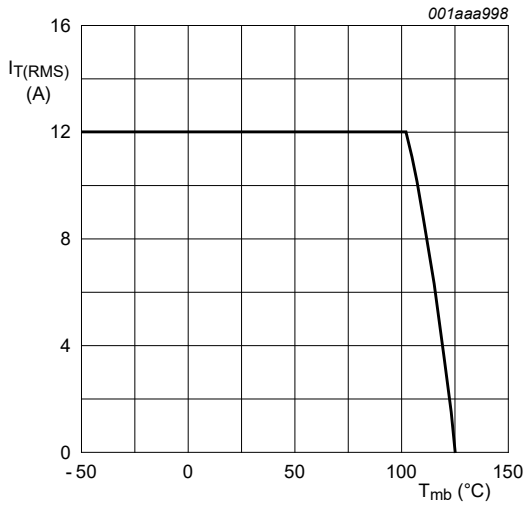
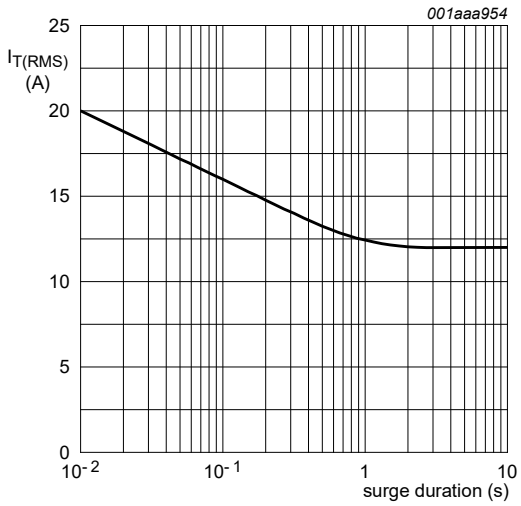
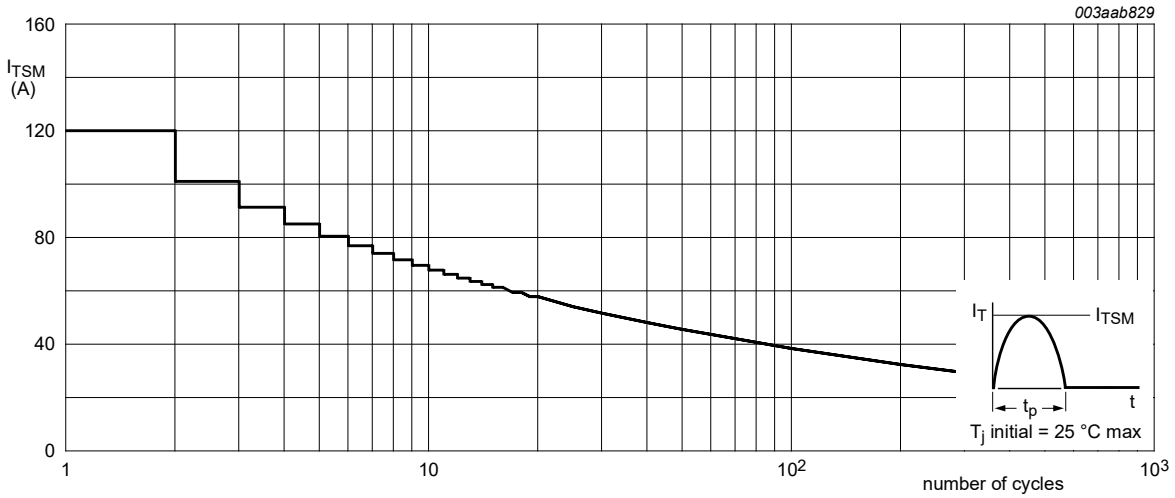



**Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values**




f = 50 Hz; $T_{mb}$ = 103 °C

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

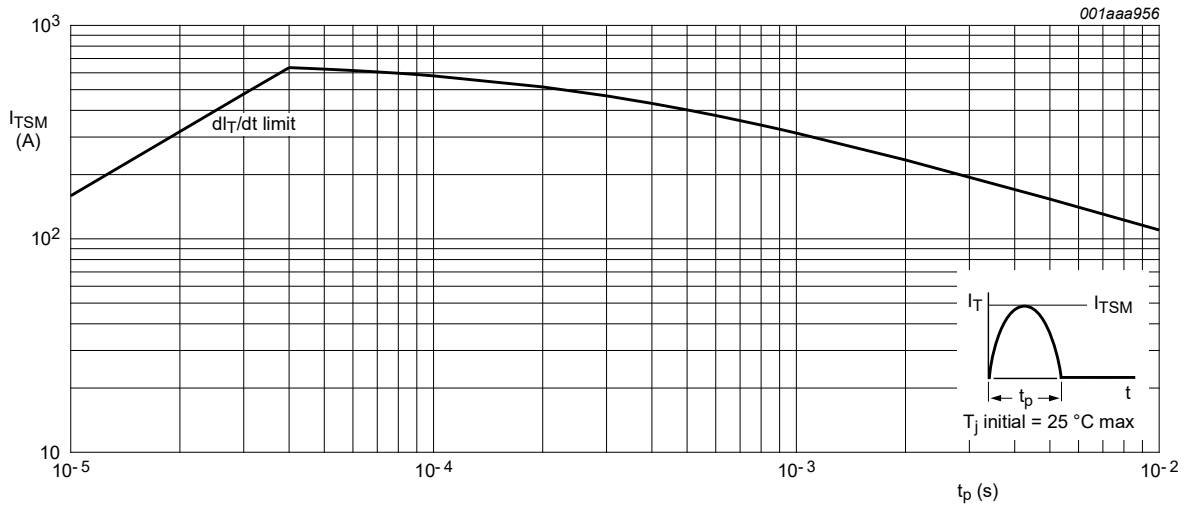



*f* = 50 *Hz*

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


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$t_p = 10\,ms$

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


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# 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 |

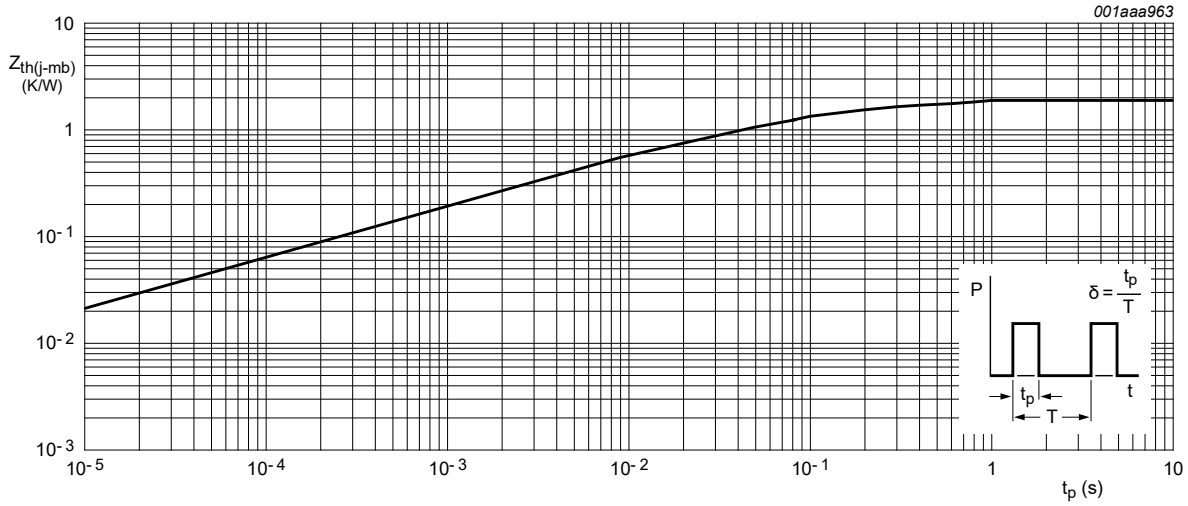
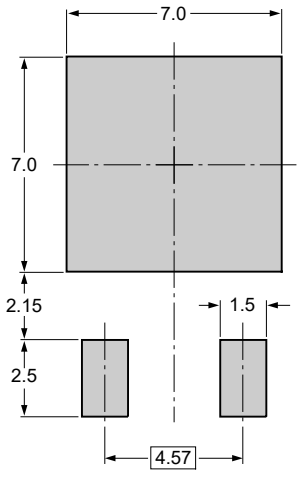



**Fig. 6. Transient thermal impedance from junction to mounting base as as function of pulse width**




001aab021 all dimensions are in mm

**Fig. 7. Minimum footprint SOT428**


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# 9. Characteristics

**Table 6. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | | |
| $I_{GT}$ | gate trigger current | $V_D$ = 12 V; $I_T$ = 0.1 A; $T_j$ = 25 °C; Fig. 8 | | - | 2 | 5 | mA |
| $I_L$ | latching current | $V_D$ = 12 V; $I_G$ = 0.1 A; $T_j$ = 25 °C; Fig. 9 | | - | 10 | 40 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 10 | | - | 7 | 20 | mA |
| $V_T$ | on-state voltage | $I_T$ = 23 A; $T_j$ = 25 °C; Fig. 11 | | - | 1.4 | 1.75 | V |
| $V_{GT}$ | gate trigger voltage | $V_D$ = 12 V; $I_T$ = 0.1 A; $T_j$ = 25 °C; Fig. 12 | | - | 0.6 | 1.5 | V |
| | | $V_D$ = 500 V; $I_T$ = 0.1 A; $T_j$ = 125 °C; Fig. 12 | | 0.25 | 0.4 | - | V |
| $I_D$ | off-state current | $V_D$ = 500 V; $T_j$ = 125 °C | | - | 0.1 | 0.5 | mA |
| $I_R$ | reverse current | $V_R$ = 500 V; $T_j$ = 125 °C | | - | 0.1 | 0.5 | mA |
| **Dynamic characteristics** | | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 335 V; $T_j$ = 125 °C; $R_{GK}$ = 100 Ω; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; Fig. 13 | | 200 | 1000 | - | V/µs |
| | | $V_{DM}$ = 335 V; $T_j$ = 125 °C; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; gate open circuit; Fig. 13 | | 50 | 130 | - | V/µs |
| $t_{gt}$ | gate-controlled turn-on time | $I_{TM}$ = 40 A; $V_D$ = 500 V; $I_G$ = 0.1 A; $dI_G/dt$ = 5 A/µs; $T_j$ = 25 °C | | - | 2 | - | µs |
| $t_q$ | commutated turn-off time | $V_{DM}$ = 335 V; $T_j$ = 125 °C; $I_{TM}$ = 20 A; $V_R$ = 25 V; $(dI_T/dt)_M$ = 30 A/µs; $dV_D/dt$ = 50 V/µs; $R_{GK(ext)}$ = 100 Ω; ($V_{DM}$ = 67% of $V_{DRM}$) | | - | 70 | - | µs |

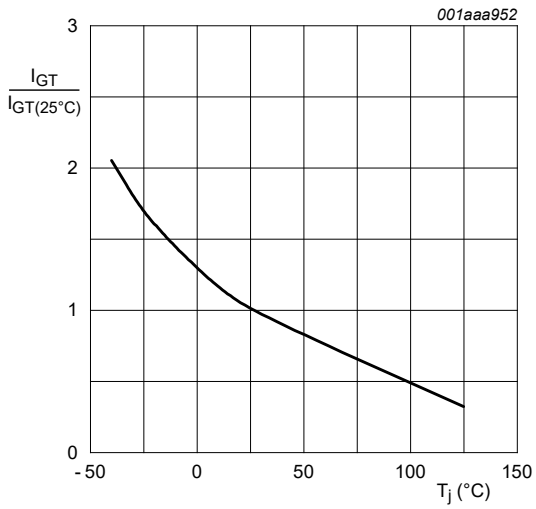



**Fig. 8. Normalized gate trigger current as a function of junction temperature**

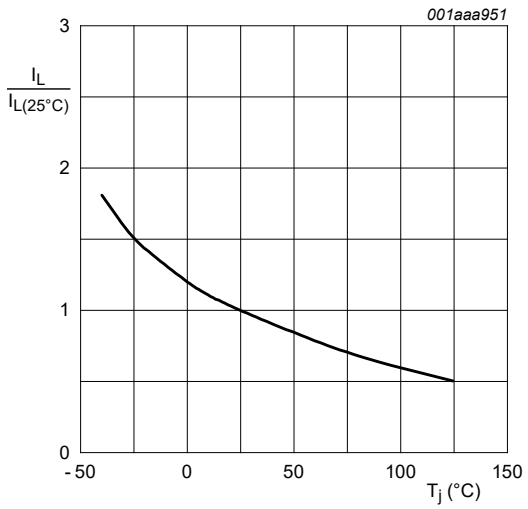



**Fig. 9. Normalized latching current as a function of junction temperature**


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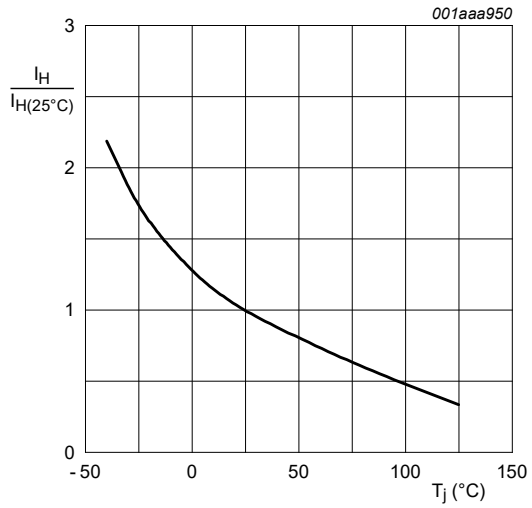
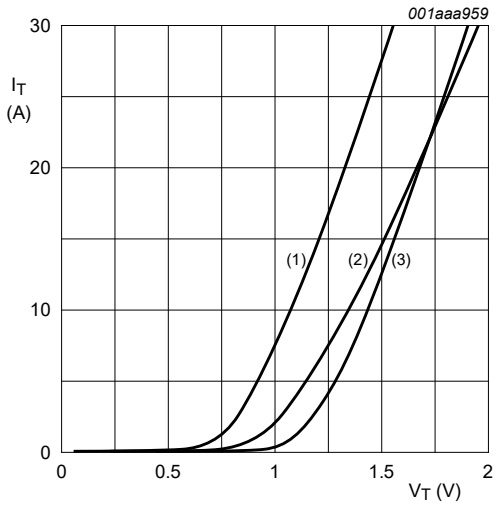



**Fig. 10. Normalized holding current as a function of junction temperature**




$V_o$ = 1.06 V; $R_s$ = 0.0304 Ω
(1) $T_j$ = 125 °C; typical values
(2) $T_j$ = 125 °C; maximum values
(3) $T_j$ = 25 °C; maximum values

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

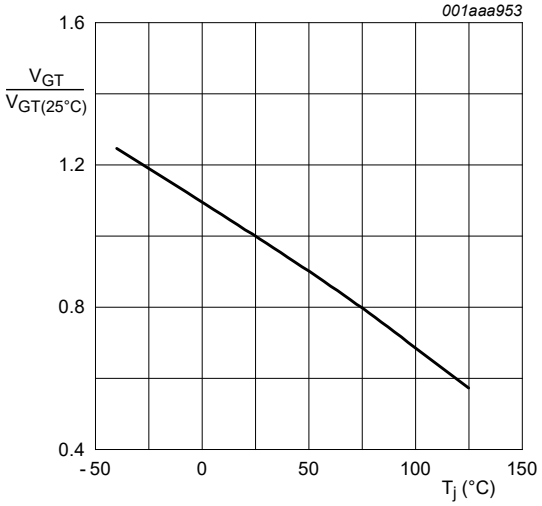
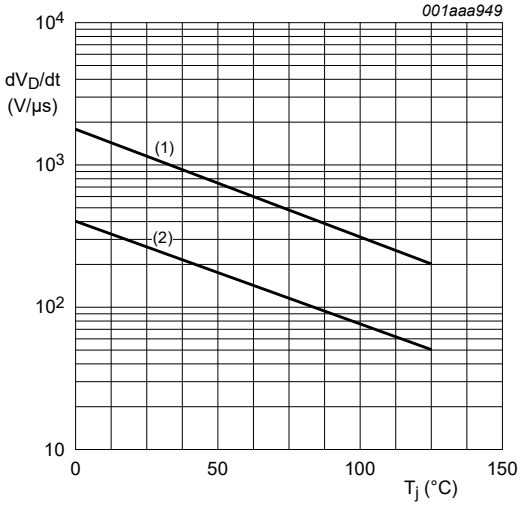



**Fig. 12. Normalized gate trigger voltage as a function of junction temperature**




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

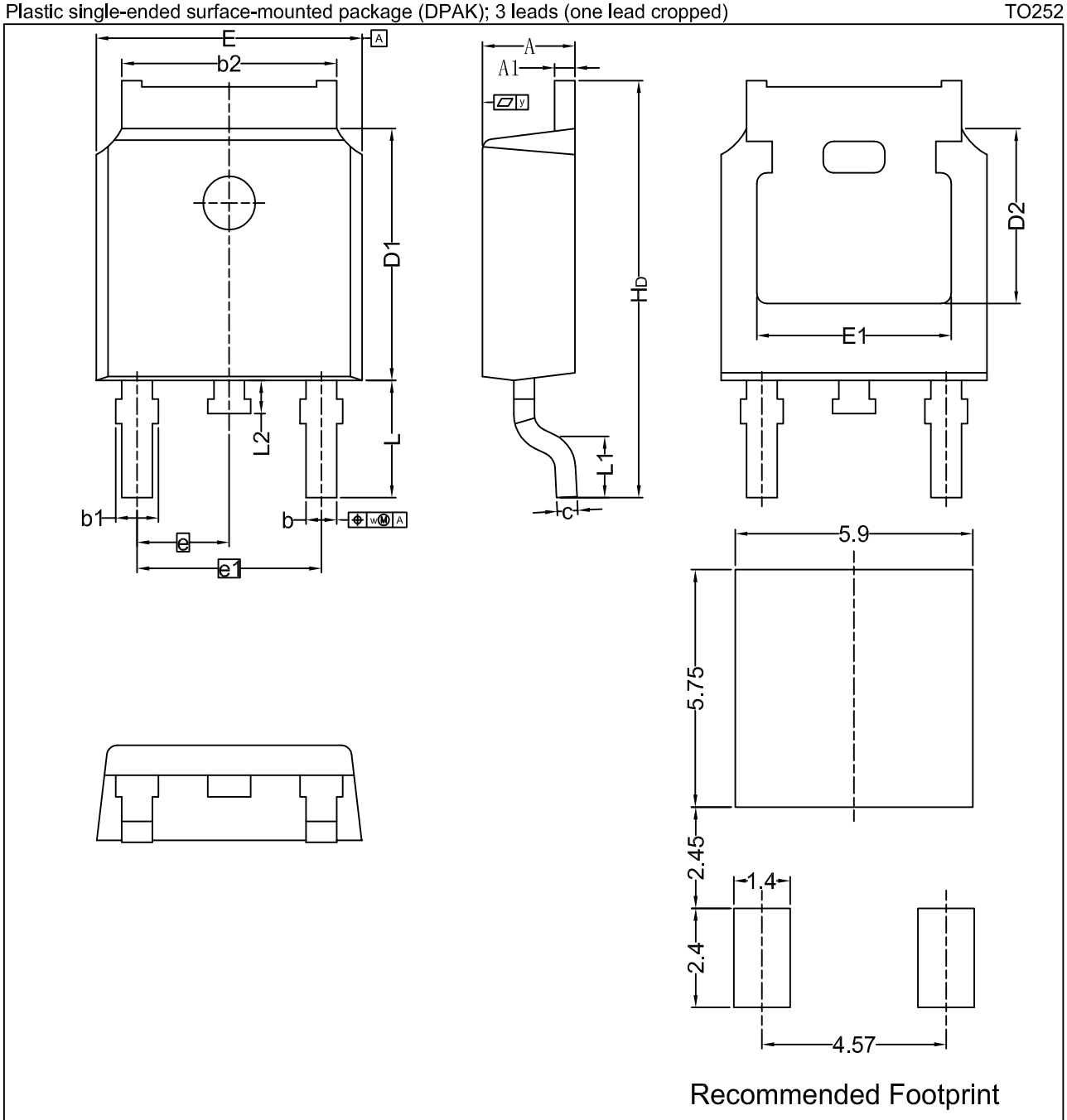
**Fig. 13. Critical rate of rise of off-state voltage as a function of junction temperature; minimum values**


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## 10. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) TO252




| Unit | A | A1 | b | b1 | b2 | c | D1 | D2 | E | E1 | e | e1 | $H_D$ | L | L1 | L2 | w | y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | 2.22 | 0.46 | 0.71 | 0.72 | 5.00 | 0.20 | 5.98 | 4.00 | 6.47 | 4.45 | 2.285 | 4.57 | 9.60 | 2.90 (Ref.) | 0.50 | 0.50 | 0.20 | 0.20 |
| mm nom | | | | | | | | | | | | | | | | | | |
| max | 2.38 | 0.93 | 0.89 | 1.10 | 5.46 | 0.56 | 6.22 | --- | 6.73 | --- | | | 10.40 | | --- | 0.90 | | |

**Fig. 14. Package outline DPAK (SOT428)**


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