

## 1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a SOT428 (DPAK) surface mountable plastic package intended for use in applications requiring sensitive gate, high bidirectional blocking voltage capability, 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
- Sensitive gate
- Surface mountable package

## 3. Applications

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

## 4. Quick reference data

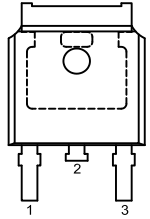

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	-	650	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 103\text{ °C}$ ; <a href="#">Fig. 1</a>	-	-	7.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 103\text{ °C}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	12	A
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	120	A
		half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	-	-	132	A
$T_j$	junction temperature		-	-	125	°C
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>	-	2	5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 436\text{ V}$ ; $T_j = 125\text{ °C}$ ; $R_{GK} = 100\text{ }\Omega$ ; exponential waveform; <a href="#">Fig. 13</a>	200	1000	-	V/ $\mu$ s

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		$V_{DM} = 436 \text{ V}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; exponential waveform; gate open circuit; <a href="#">Fig. 13</a>	50	130	-	V/ $\mu\text{s}$

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 <p style="text-align: center;"><b>DPAK (SOT428)</b></p>	 <p style="text-align: center;">sym037</p>
2	A	anode		
3	G	gate		
mb	A	mounting base; connected to anode		

## 6. Ordering information

Table 3. Ordering information

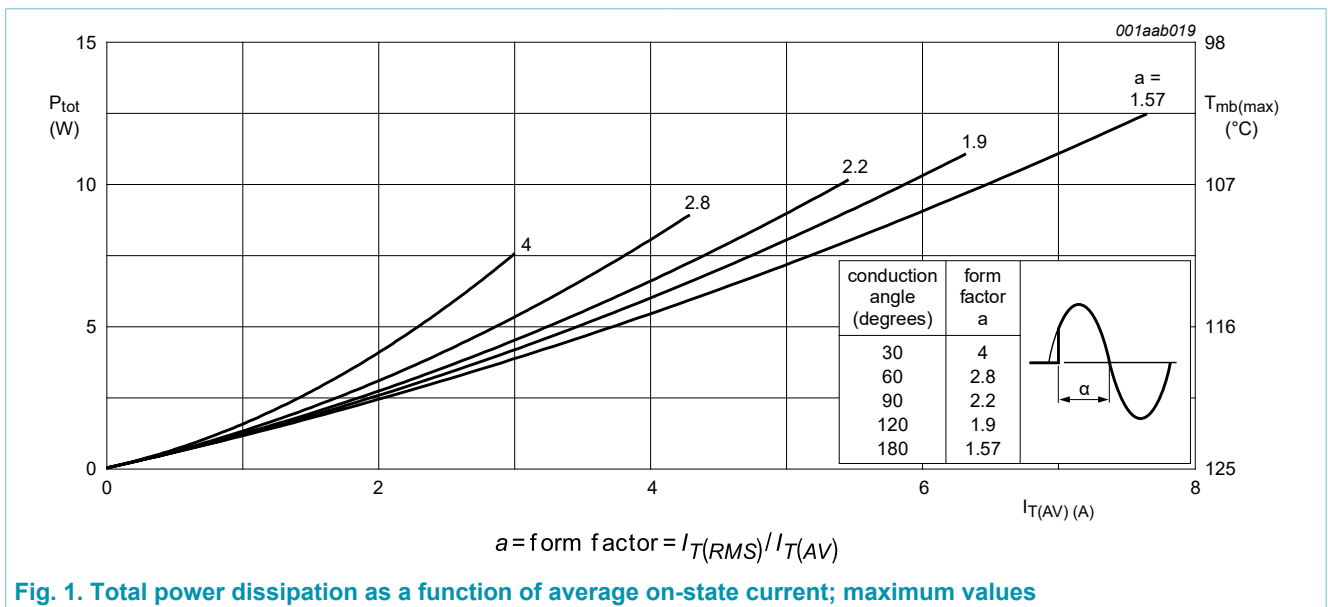
Type number	Package		Version
	Name	Description	
BT151S-650L	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

## 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; $T_{mb} \leq 103\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a>	-	7.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 103\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	12	A
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	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	$\text{A}^2\text{s}$
$di_T/dt$	rate of rise of on-state current	$I_G = 10\text{ mA}$	-	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. Total power dissipation as a function of average on-state current; maximum values**

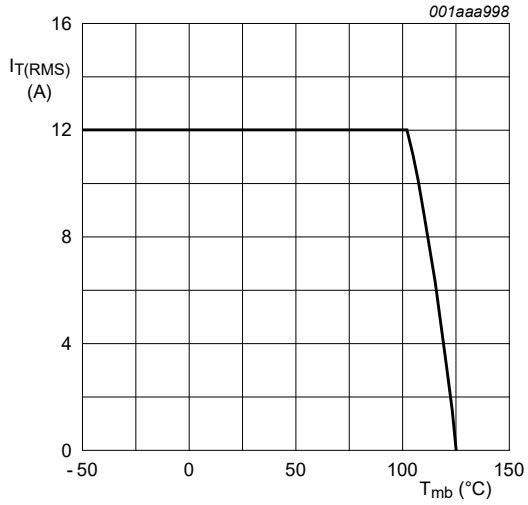
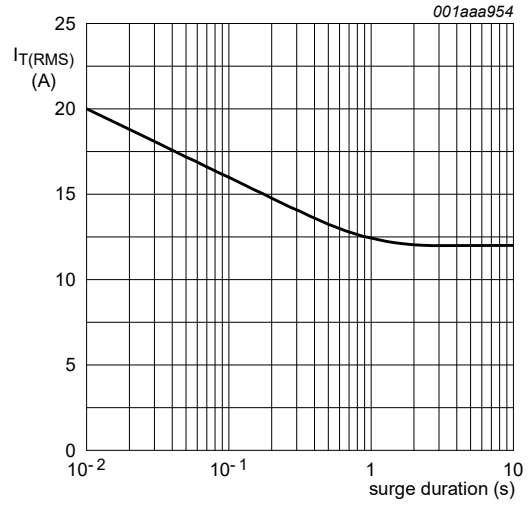


Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values



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

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

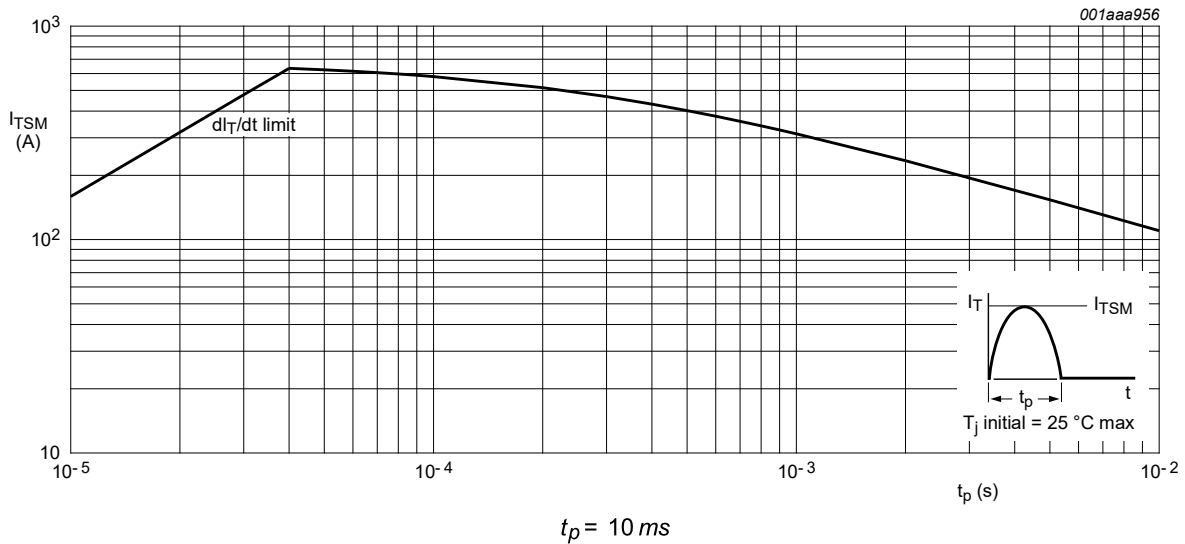
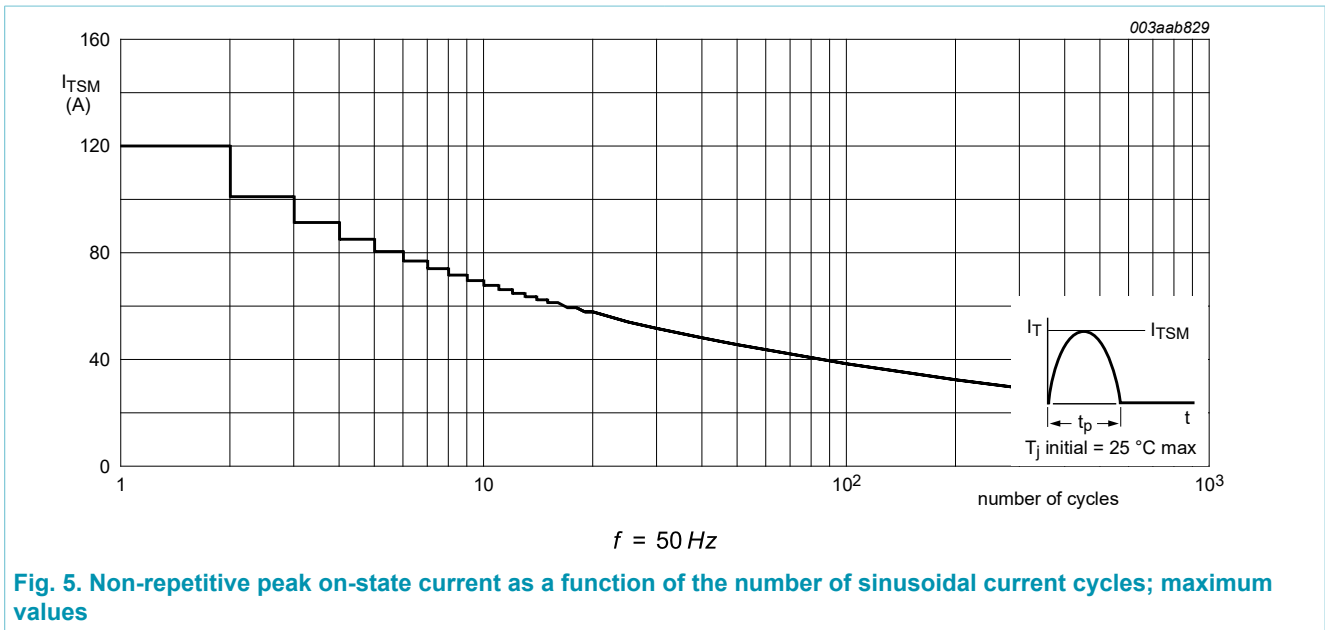


Fig. 4. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values



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

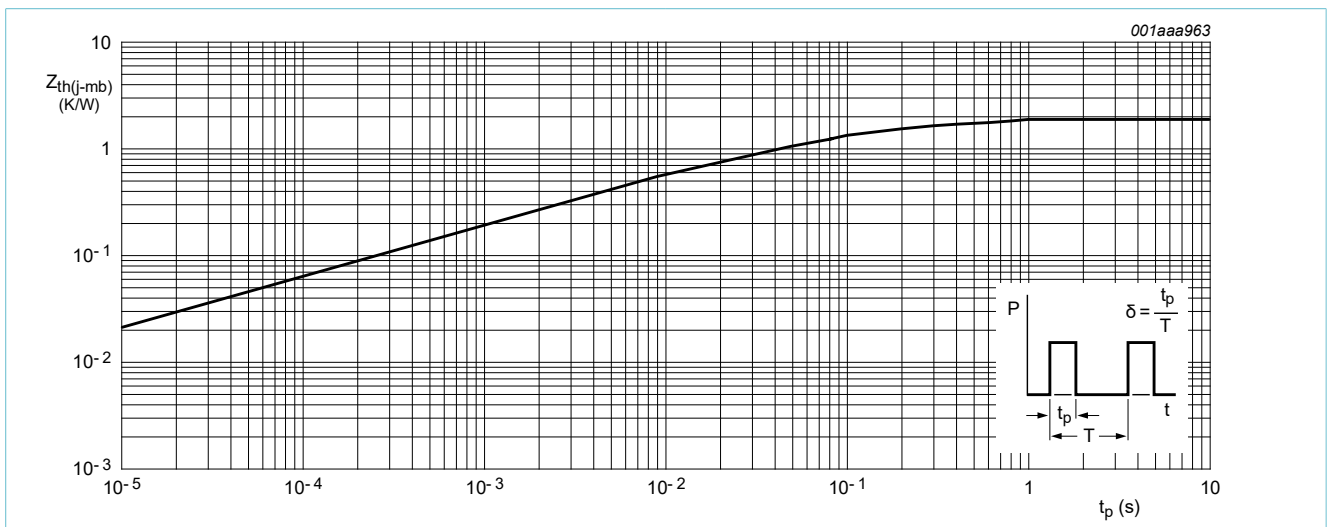


Fig. 6. Transient thermal impedance from junction to mounting base as as function of pulse width

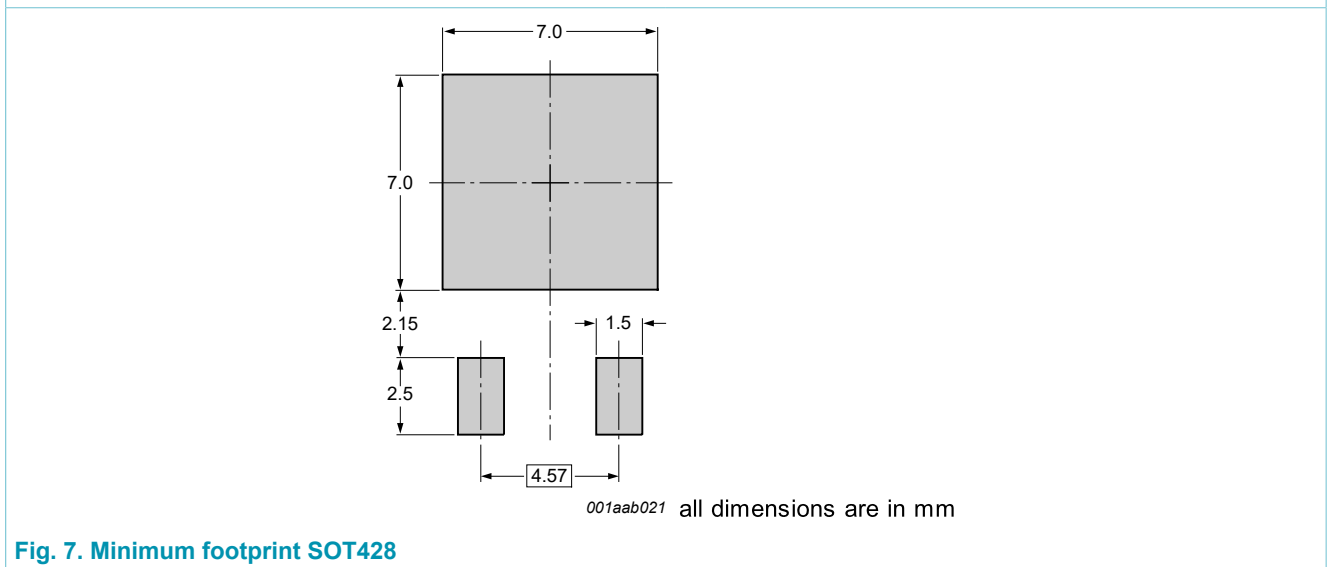


Fig. 7. Minimum footprint SOT428

## 9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>	-	2	5	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>	-	10	40	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>	-	7	20	mA
$V_T$	on-state voltage	$I_T = 23\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>	-	1.4	1.75	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 12</a>	-	0.6	1.5	V
		$V_D = 650\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; <a href="#">Fig. 12</a>	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
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 436\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $R_{GK} = 100\text{ }\Omega$ ; exponential waveform; <a href="#">Fig. 13</a>	200	1000	-	V/ $\mu\text{s}$
		$V_{DM} = 436\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; exponential waveform; gate open circuit; <a href="#">Fig. 13</a>	50	130	-	V/ $\mu\text{s}$
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 40\text{ A}$ ; $V_D = 650\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $dI_G/dt = 5\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^\circ\text{C}$	-	2	-	$\mu\text{s}$
$t_q$	commutated turn-off time	$V_{DM} = 436\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $I_{TM} = 20\text{ A}$ ; $V_R = 25\text{ V}$ ; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$ ; $dV_D/dt = 50\text{ V}/\mu\text{s}$ ; $R_{GK(ext)} = 100\text{ }\Omega$	-	70	-	$\mu\text{s}$

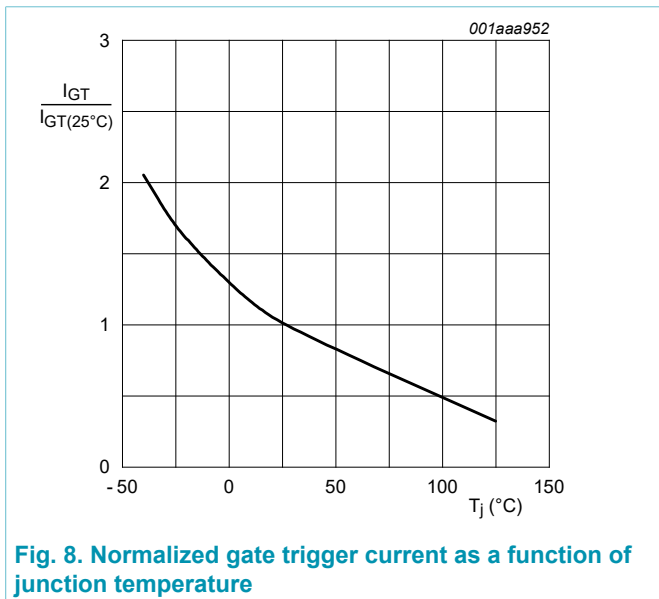


Fig. 8. Normalized gate trigger current as a function of junction temperature

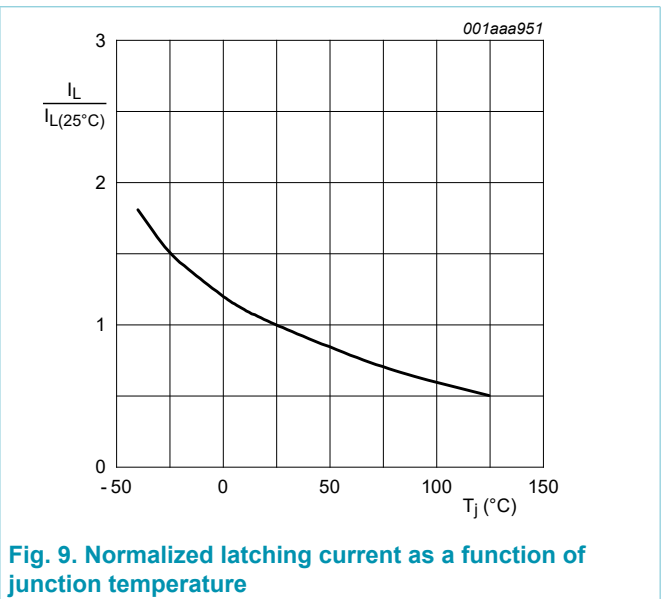


Fig. 9. Normalized latching current as a function of junction temperature

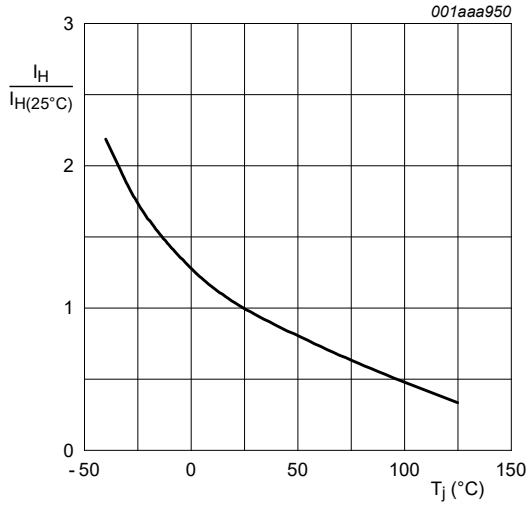
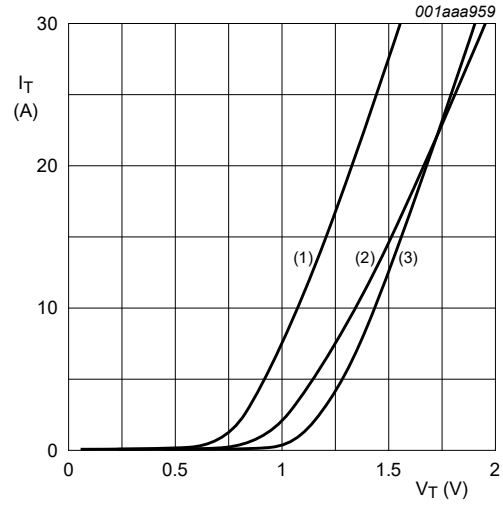


Fig. 10. Normalized holding current as a function of junction temperature



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

- (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

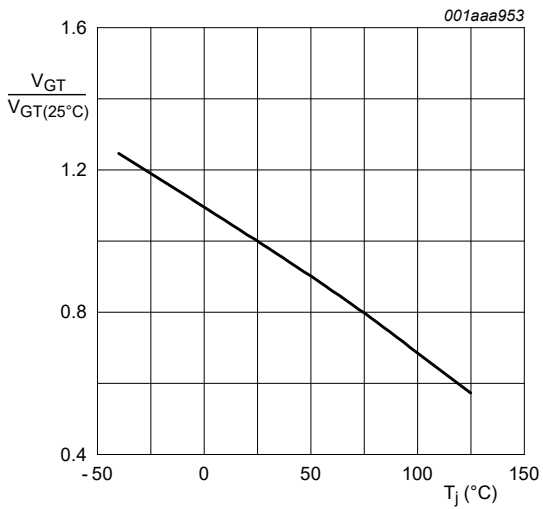
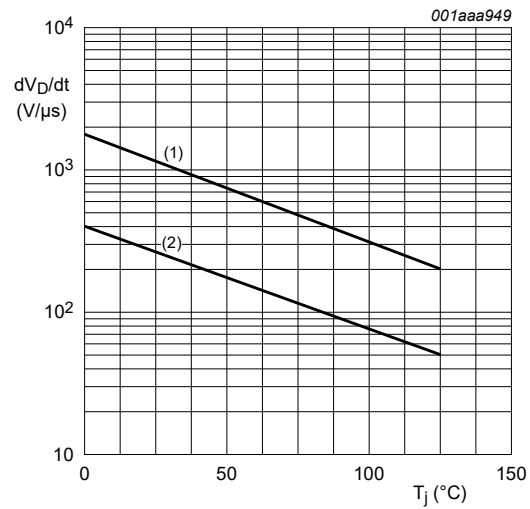


Fig. 12. Normalized gate trigger voltage as a function of junction temperature



- (1)  $R_{GK} = 100 \text{ } \Omega$ ;
- (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

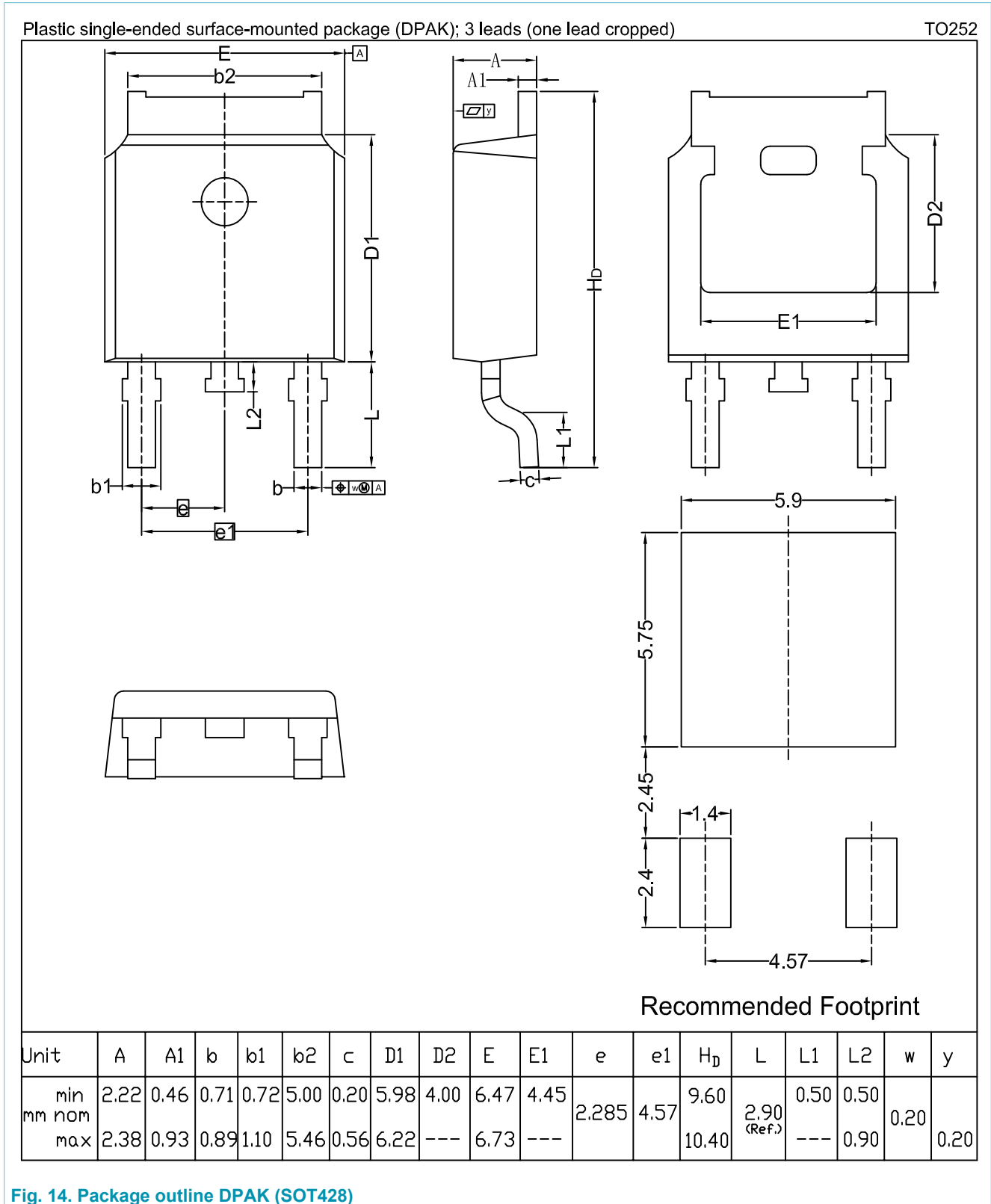


Fig. 14. Package outline DPAK (SOT428)

# 11. Legal information

## Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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Product [short] data sheet	Production	This document contains the product specification.

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