

1. General description

Passivated sensitive gate Silicon Controlled Rectifier (SCR) in a SOT428 (DPAK) surface mountable plastic package intended for use in applications requiring high bidirectional blocking voltage capability and high thermal cycling performance. These devices are intended to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

2. Features and benefits

- Direct interfacing with low power drivers and microcontrollers
- High bidirectional blocking voltage capability
- High thermal cycling performance
- Planar passivated for voltage ruggedness and reliability
- Surface mountable package
- Sensitive gate for logic level control

3. Applications

- General purpose switching and phase control
- Ignition circuits, CDI for 2- and 3-wheelers
- Motor control - e.g. small kitchen appliances
- Protection circuits for Switched-Mode Power Supplies (SMPS)
- Protection circuits in lighting ballasts

4. Quick reference data

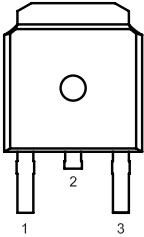

Table 1. Quick reference data

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; $T_{mb} \leq 100\text{ °C}$; Fig. 1	-	-	7.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 100\text{ °C}$; 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	-	-	90	A
		half sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 8.3\text{ ms}$	-	-	100	A
T_j	junction temperature		-	-	125	°C
Static characteristics						

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 8	20	50	200	μA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 436\text{ V}$; $T_j = 125\text{ °C}$; $R_{GK} = 100\ \Omega$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; Fig. 13	50	100	-	$\text{V}/\mu\text{s}$

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		
2	A	anode		
3	G	gate		
mb	A	mounting base; connected to anode		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BT151S-650S	TO252	BT151S-650SJ	Reel	2500	TO252N	07-Mar-2025
					TO252Q	05-Mar-2025

7. Marking

Table 4. Marking codes

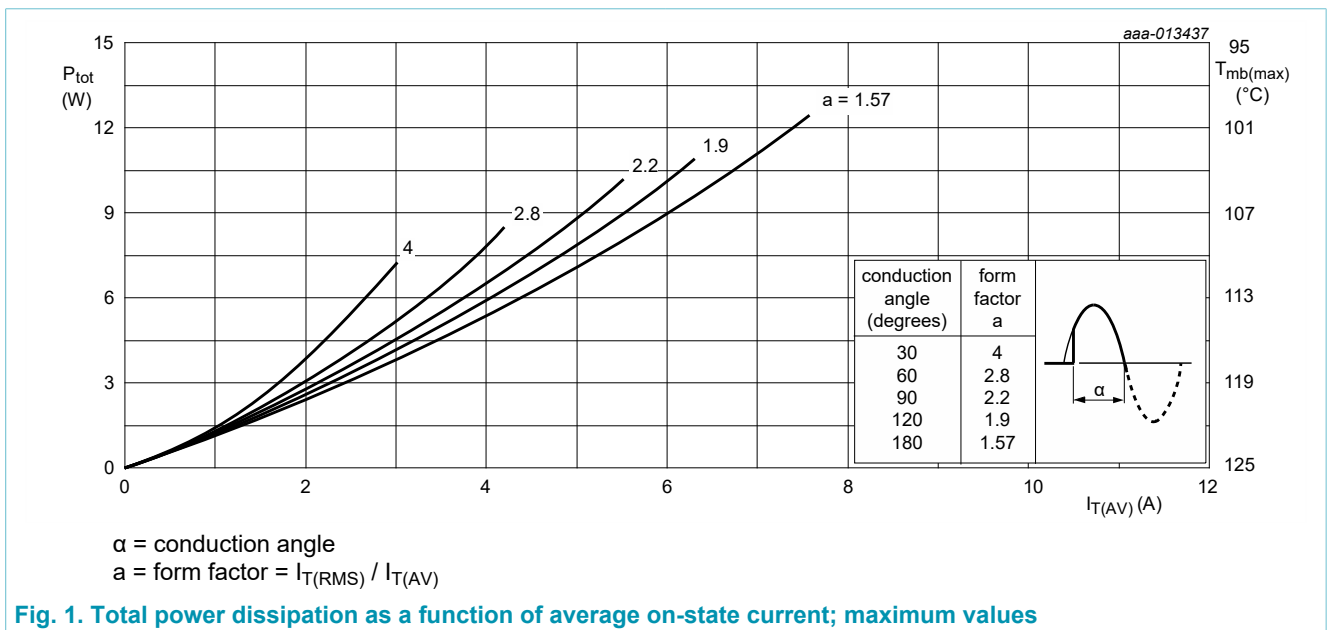
Type number	Marking codes	
	Assembly factory: N	Assembly factory: Q
BT151S-650S	BT151S 650S PJNxxxx xx	BT151S 650S PJQxxxx xx

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		-	650	V
V_{RRM}	repetitive peak reverse voltage		-	650	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 100\text{ }^{\circ}\text{C}$; Fig. 1	-	7.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 100\text{ }^{\circ}\text{C}$; 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	-	90	A
		half sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 8.3\text{ ms}$	-	100	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; SIN	-	41	A^2s
di_T/dt	rate of rise of on-state current	$I_G = 50\text{ mA}$	-	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	$^{\circ}\text{C}$



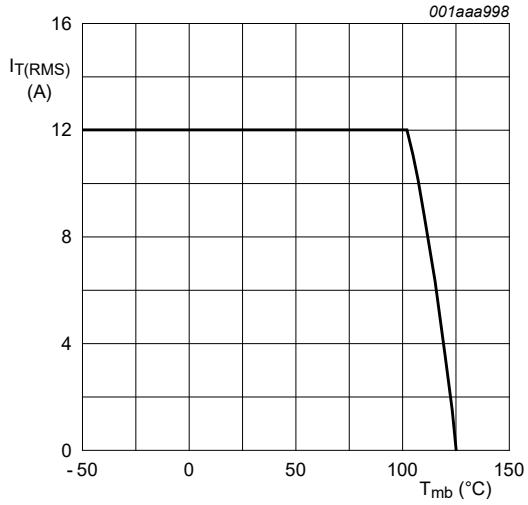
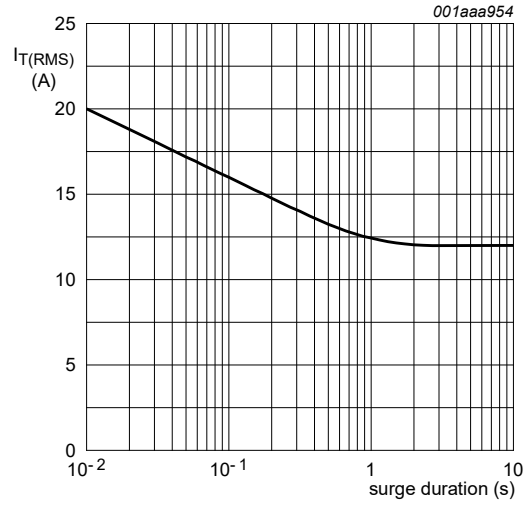
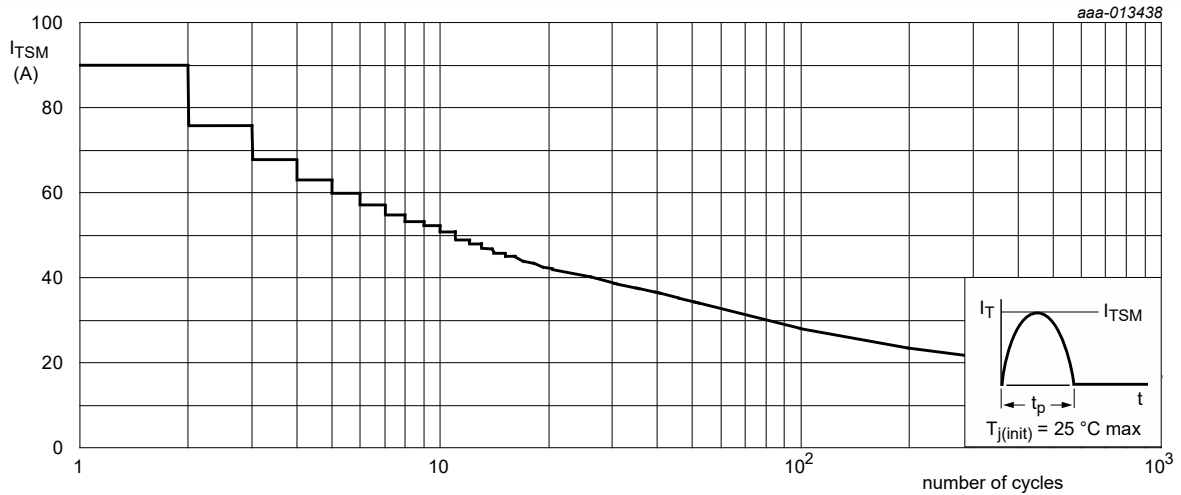


Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values



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

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

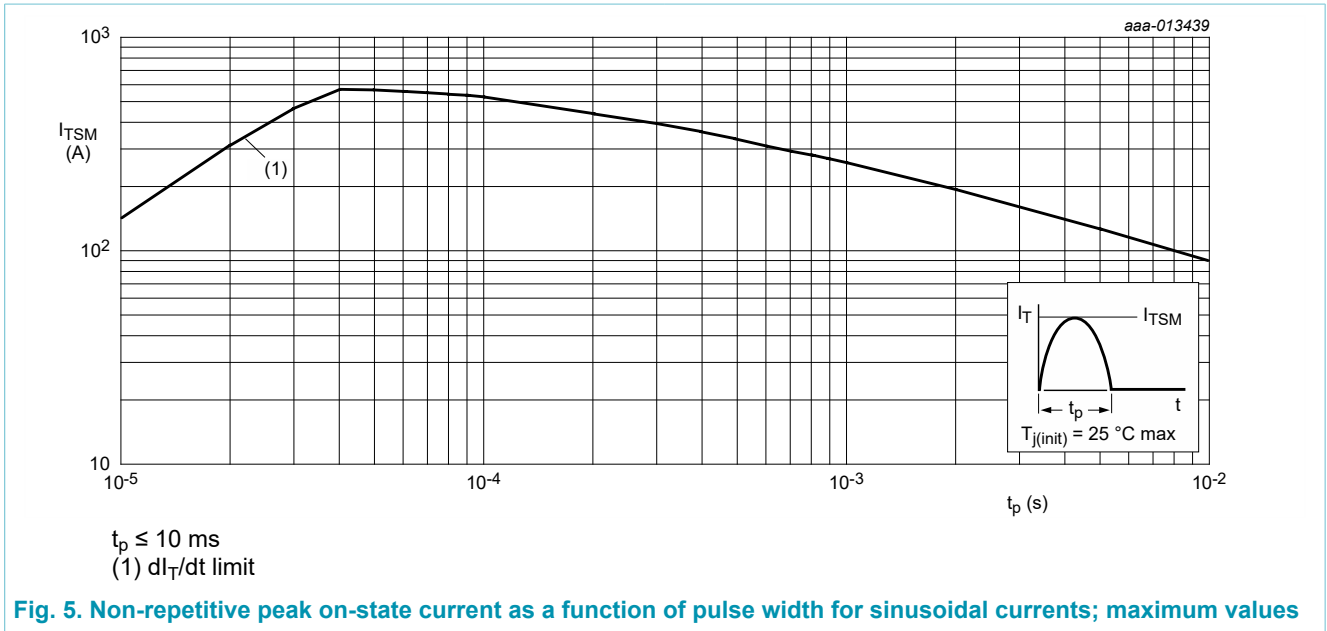


Fig. 5. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values

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	Fig. 6	-	-	2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	mounted on an FR4 printed-circuit board; Fig. 7	-	7	-	K/W

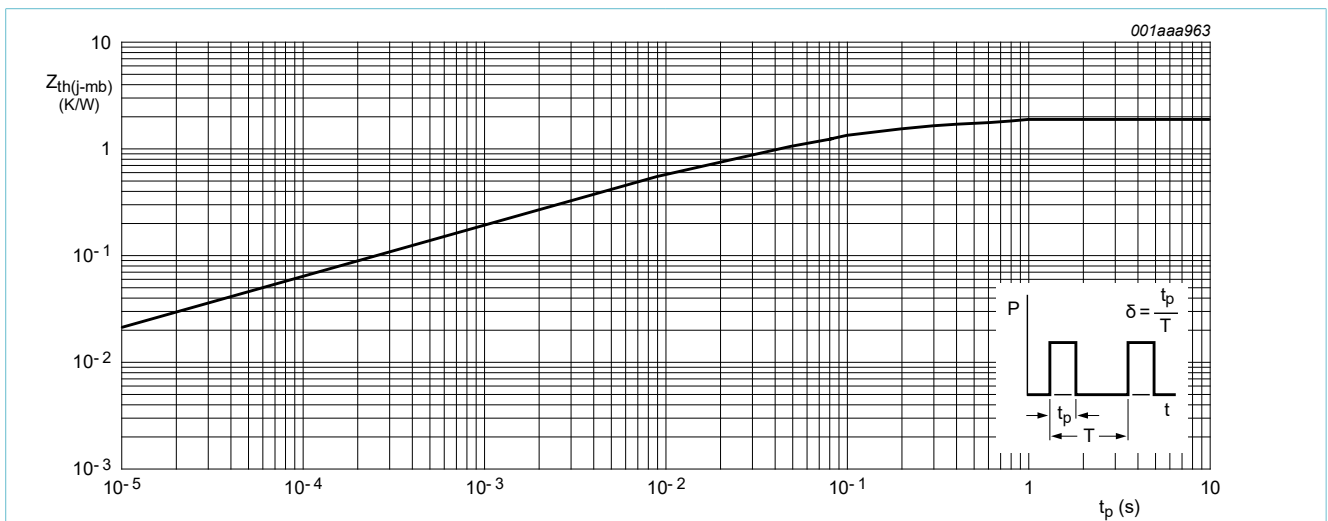


Fig. 6. Transient thermal impedance from junction to mounting base as as function of pulse width

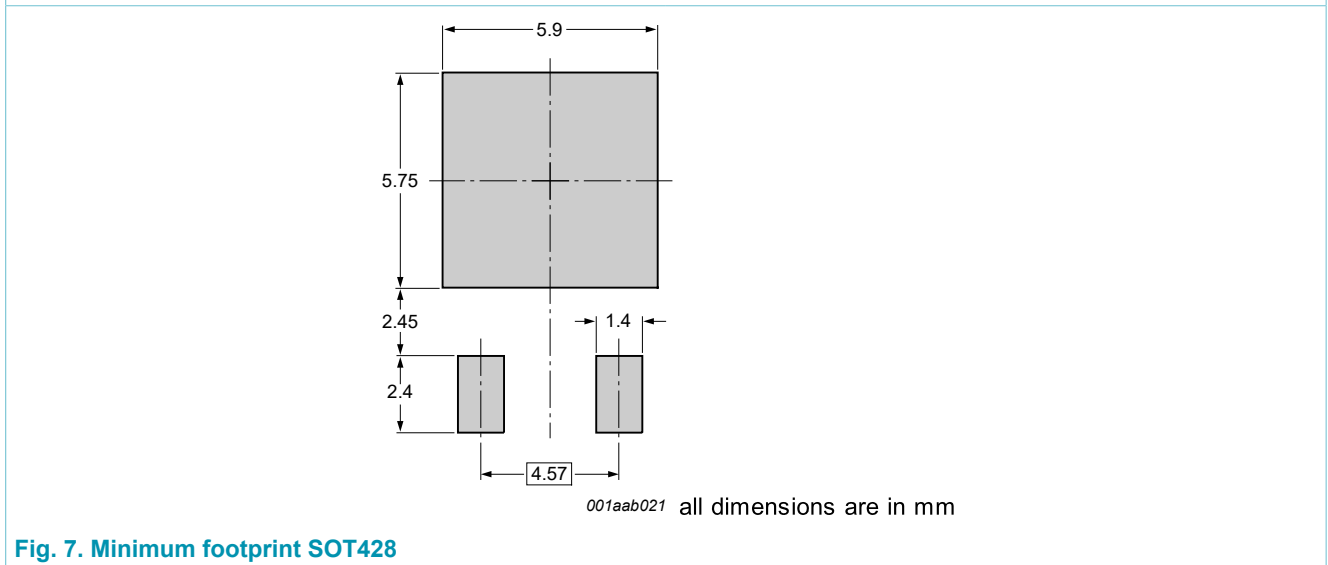
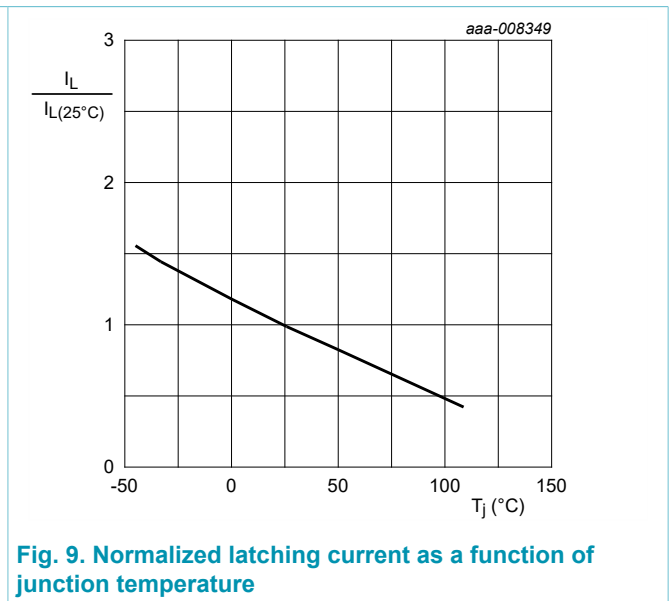
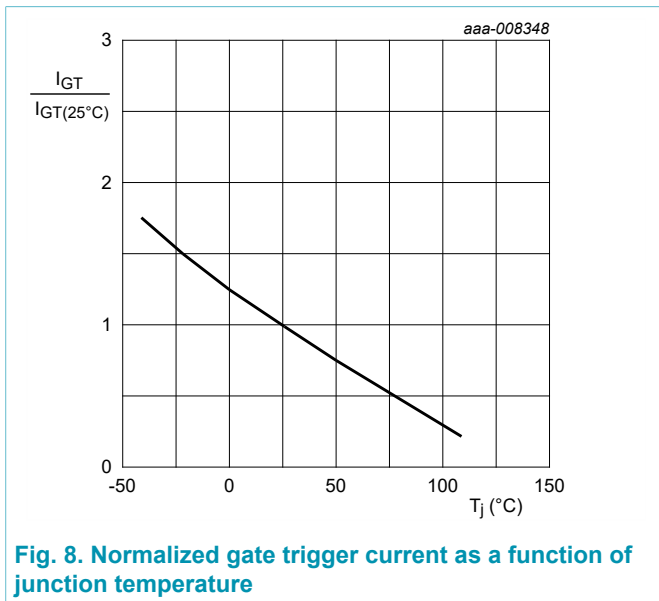


Fig. 7. Minimum footprint SOT428

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 8	20	50	200	μA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 9	-	0.4	10	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; Fig. 10	-	0.3	6	mA
V_T	on-state voltage	$I_T = 20\text{ A}$; $T_j = 25\text{ °C}$; Fig. 11	-	1.3	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
		$V_D = 650\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 110\text{ °C}$; Fig. 12	0.1	0.2	-	V
I_D	off-state current	$V_D = 650\text{ V}$; $T_j = 125\text{ °C}$	-	0.1	0.5	mA
I_R	reverse current	$V_R = 650\text{ V}$; $T_j = 125\text{ °C}$	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 436\text{ V}$; $T_j = 125\text{ °C}$; $R_{GK} = 100\ \Omega$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; Fig. 13	50	100	-	$\text{V}/\mu\text{s}$



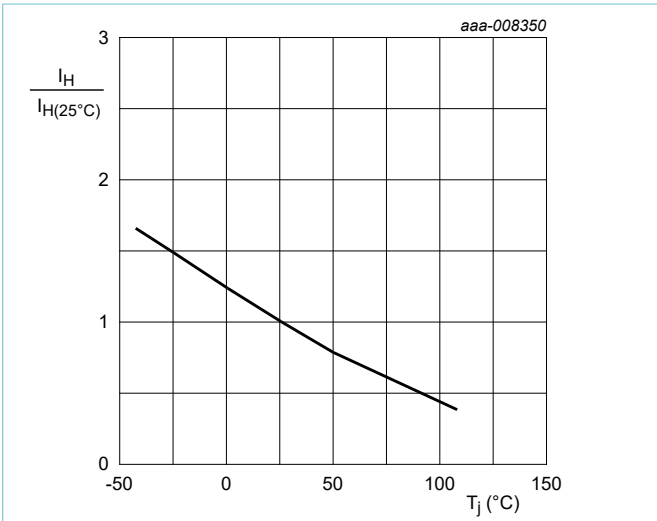
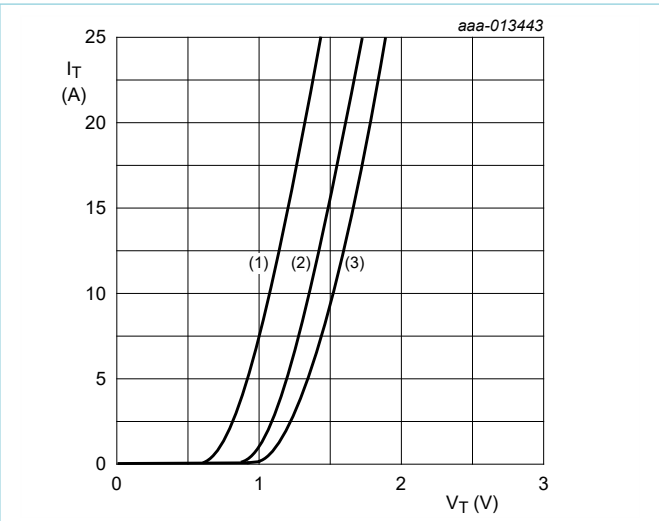


Fig. 10. Normalized holding current as a function of junction temperature



$V_o = 1.075 \text{ V}; R_s = 0.028 \Omega$
 (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. 11. On-state current as a function of on-state voltage

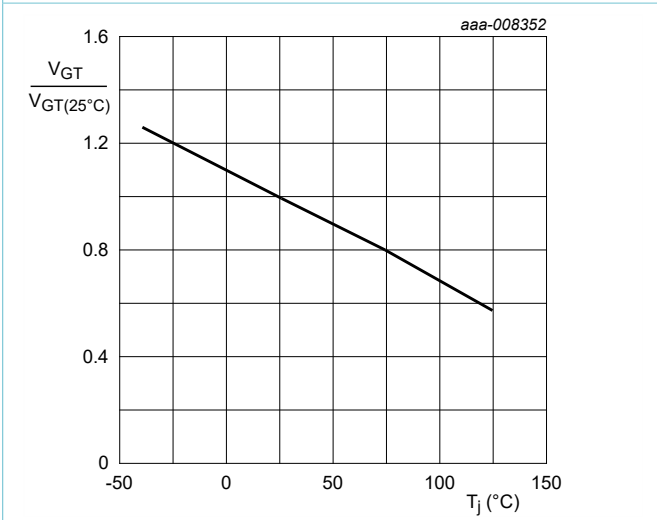
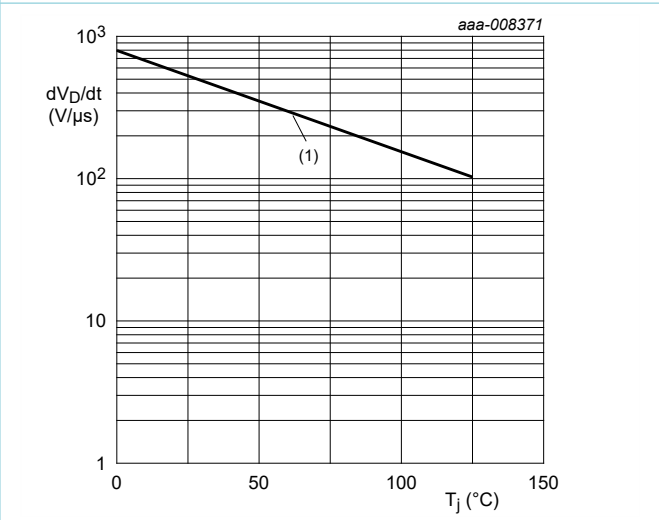


Fig. 12. Normalized gate trigger voltage as a function of junction temperature



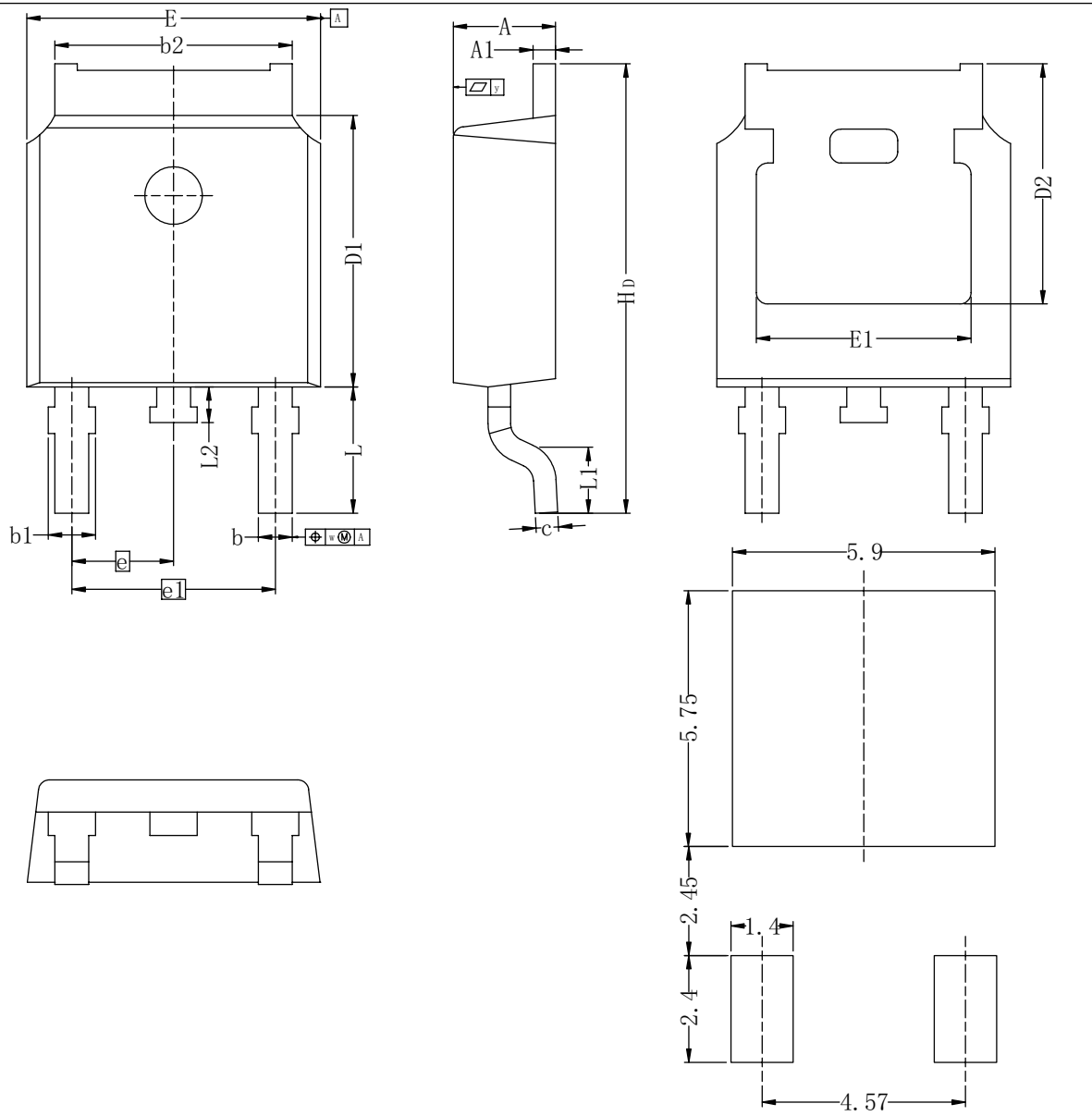
(1) $R_{GK} = 100 \Omega$

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

10. Package outline

Assembly factory: N

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



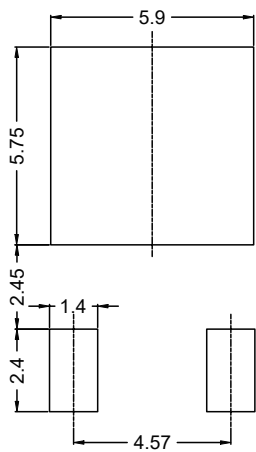
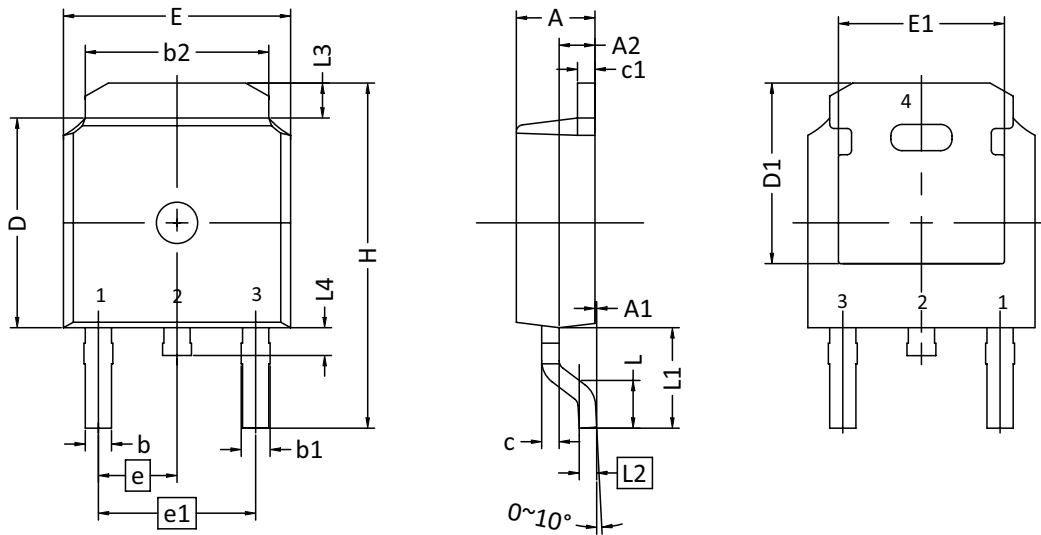
Recommended Footprint

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	
nom																		
max	2.38	0.93	0.89	1.10	5.46	0.56	6.22	---	6.73	---			10.40	---	0.90			0.20

Assembly factory: Q

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

TO252



Recommended Footprint

SYMBOLS	DIMENSION IN MM		
	MIN	NOM	MAX
A	2.184	2.286	2.400
A1	0.000	---	0.200
A2	0.889	1.041	1.170
b	0.635	0.762	0.889
b1	0.680	0.840	1.143
b2	4.953	5.340	5.500
c	0.450	0.508	0.610
c1	0.450	0.508	0.630
D	5.969	6.096	6.223
D1	5.210	5.249	5.380
E	6.350	6.604	6.800
E1	4.318	4.826	4.920
e	2.286BSC		
e1	4.572BSC		
H	9.398	10.033	10.500
L	1.270	1.520	2.032
L1	2.921REF		
L2	0.408	0.508	0.608
L3	0.889	1.016	1.270
L4	0.600	---	1.016

12. 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.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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