BT151S-650LTF

SCR

Rev.01 - 16 December 2025

Product data sheet

1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a TO252(DPAK) plastic package intended for use in applications requiring good bidirectional blocking voltage and high surge current capability and high junction temperature capability ($T_{j(max)}$ = 150 °C).

2. Features and benefits

- High junction operating temperature capability ($T_{j(max)}$ = 150 °C)
- High bidirectional blocking voltage capability
- Very high current surge capability
- High thermal cycling performance
- Planar passivated for voltage ruggedness and reliability

3. Applications

- Capacitive Discharge Ignition (CDI)
- Crowbar protection
- Inrush protection
- Motor control
- Voltage regulation

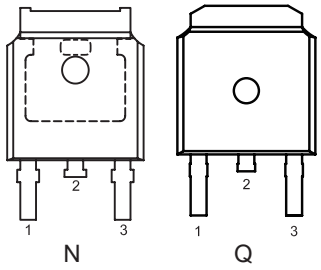
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
V_{DRM}	repetitive peak off-state voltage			650			V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 127$ °C; Fig. 3		7.5			A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 127$ °C; Fig. 1; Fig. 2		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	operating junction temperature			-40 to 150			°C
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. 7		1.5	-	5	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	20	mA
V_T	on-state voltage	I_T = 12 A; T_j = 25 °C; Fig. 10		-	-	1.5	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 436 V; T_j = 150 °C; R_{GK} = 100 Ω; (V_{DM} = 67% of V_{DRM}); exponential waveform		500	-	-	V/µs
		V_{DM} = 436 V; T_j = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		200	-	-	V/µs

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-650LTF	TO252	BT151S-650LTFJ	Reel	2500	TO252N	04-Nov-2016
					TO252Q	05-Mar-2025

7. Marking

Table 4. Marking codes

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

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Notes	Values	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; $T_{mb} \leq 127$ °C; Fig. 3		7.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 127$ °C; Fig. 1; Fig. 2		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; sine wave		72	A^2s
dI_T/dt	rate of rise of on-state current	$I_G = 10$ mA		150	A/µs
I_{GM}	peak gate current			2	A
P_{GM}	peak gate power			5	W
$P_{G(AV)}$	average gate power	over any 20 ms period		1	W
T_{stg}	storage temperature			-40 to 150	°C
T_j	operating junction temperature			-40 to 150	°C

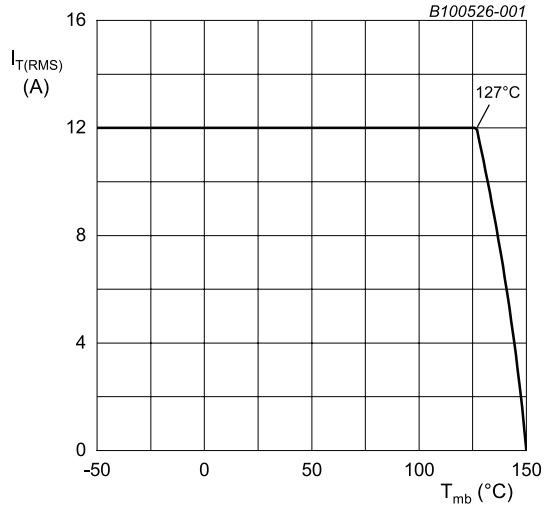
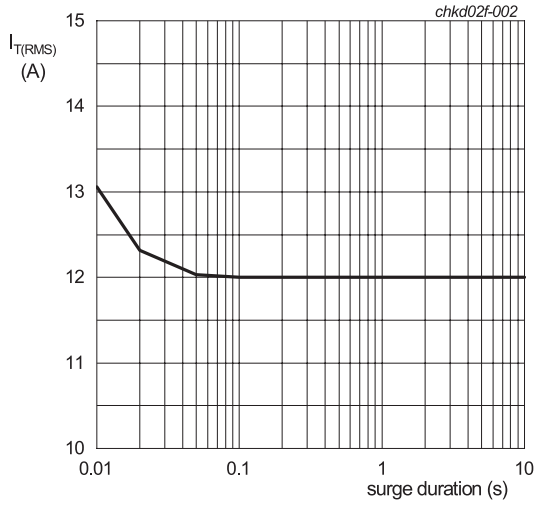
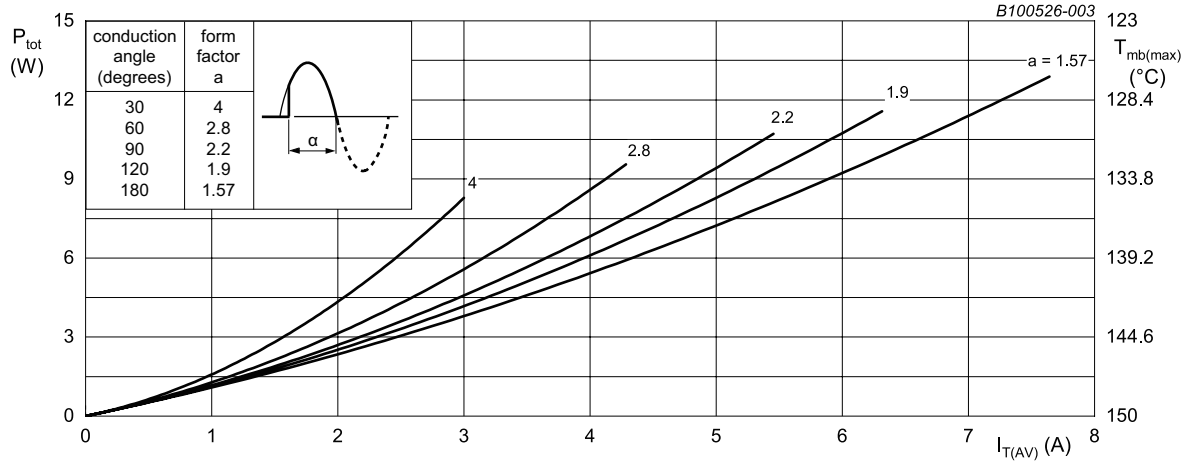


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



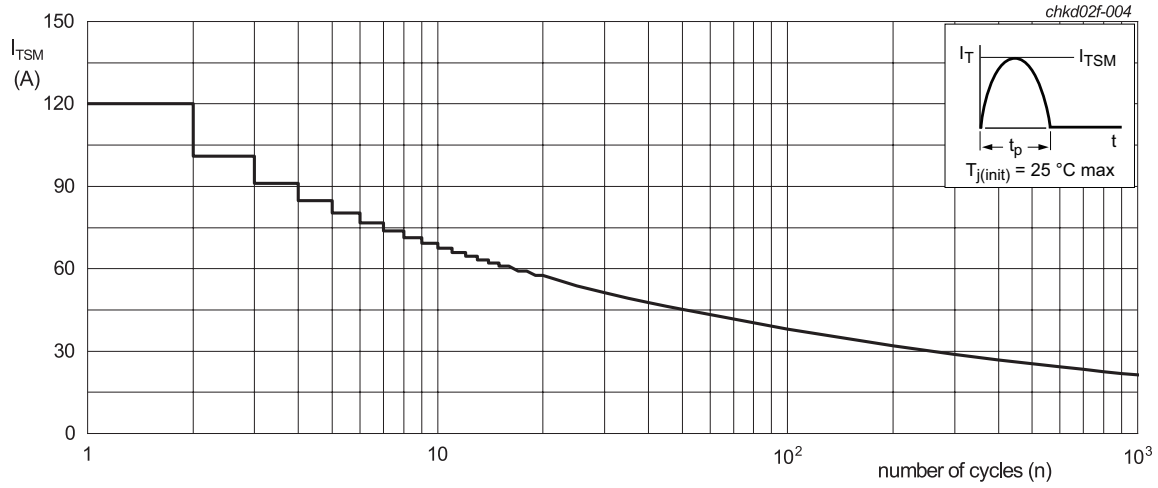
f = 50 Hz; T_{mb} = 127 °C

Fig. 2. RMS on-state current as a function of surge duration; maximum values



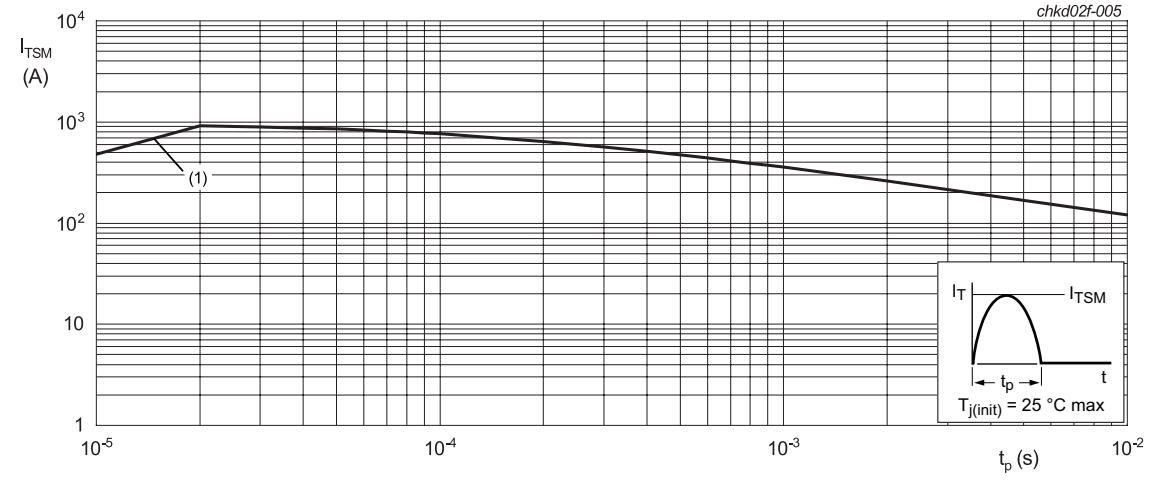
α = conduction angle
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

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



$t_p \leq 10$ ms ;
(1) dI_T/dt limit

Fig. 5. Non-repetitive peak on-state current as a function of pulse width; 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		-	-	1.8	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air; printed circuit board (FR4) mounted		-	50	-	K/W

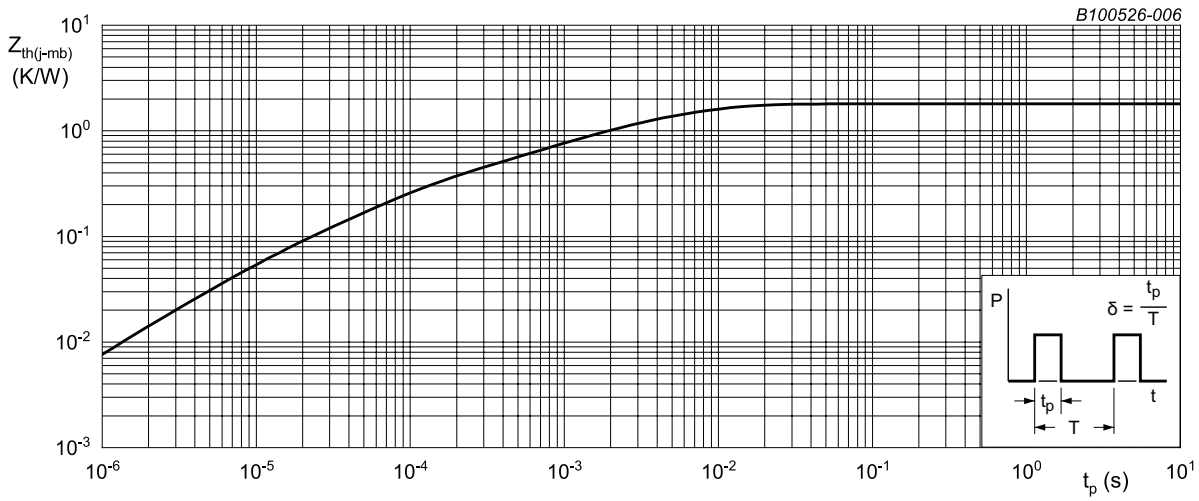


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 8. 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. 7		1.5	-	5	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T_j = 25 °C; Fig. 8		-	-	40	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	20	mA
V_T	on-state voltage	I_T = 12 A; T_j = 25 °C; Fig. 10		-	-	1.5	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; Fig. 11		-	0.8	1	V
		V_D = 400 V; I_T = 0.1 A; T_j = 150 °C		0.25	0.45	-	V
V_{GR}	gate reverse voltage	I_{RG} = 100 mA		10	-	-	V
I_D	off-state current	V_D = 650 V; T_j = 25 °C		-	-	10	µA
		V_D = 650 V; T_j = 150 °C		-	-	2	mA
I_R	reverse current	V_R = 650 V; T_j = 25 °C		-	-	10	µA
		V_R = 650 V; T_j = 150 °C		-	-	2	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 436 V; T_j = 150 °C; R_{GK} = 100 Ω; (V_{DM} = 67% of V_{DRM}); exponential waveform		500	-	-	V/µs
		V_{DM} = 436 V; T_j = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		200	-	-	V/µs
t_{gt}	gate-controlled turn-on time	I_{TM} = 12 A; V_D = 600 V; I_G = 20 mA; $(dI_G/dt)_M$ = 5 A/µs; T_j = 25 °C			2	-	µs
t_q	commutated turn-off time	I_{TM} = 2 A; t_p = 50 µs; dV_D/dt = 5 V/µs; dI/dt = 30 A/µs			-	12	µs

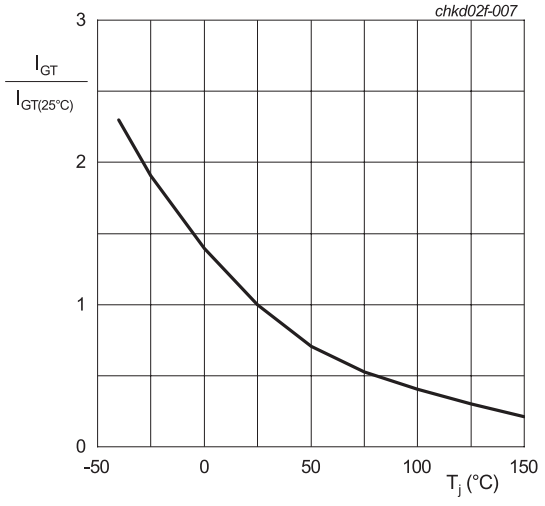


Fig. 7. Normalized gate trigger current as a function of junction temperature

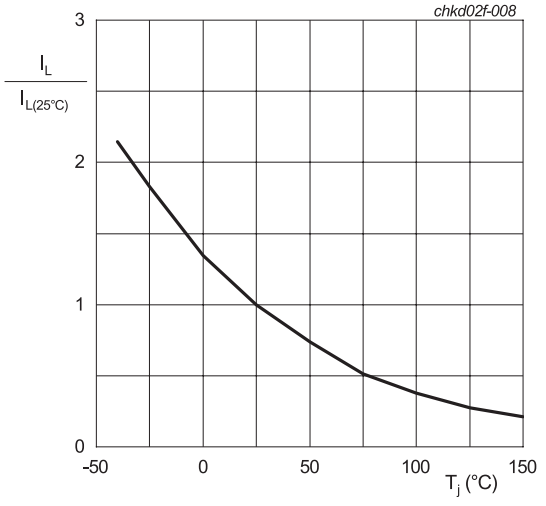


Fig. 8. Normalized latching current as a function of junction temperature

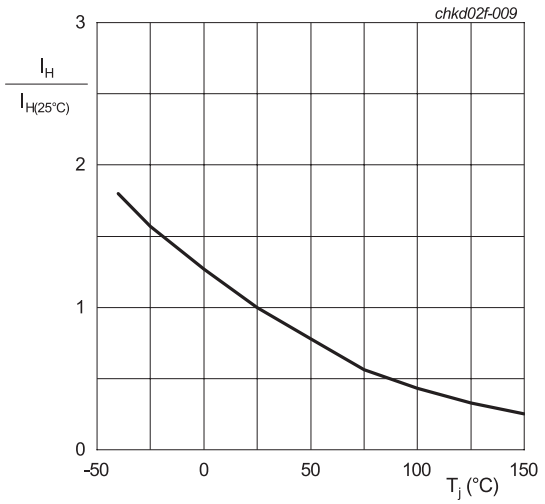
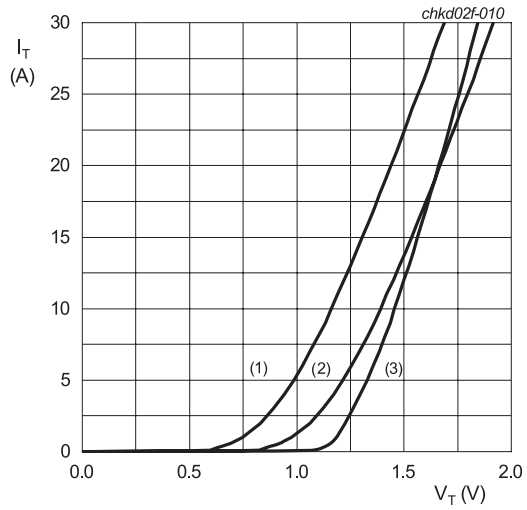


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 0.993 V; R_s = 0.0368 Ω
(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values

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

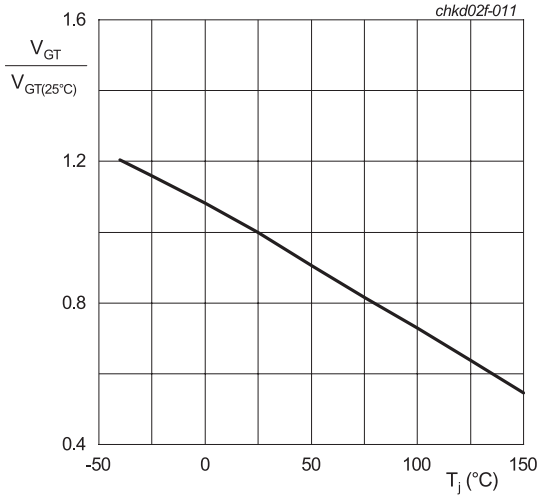
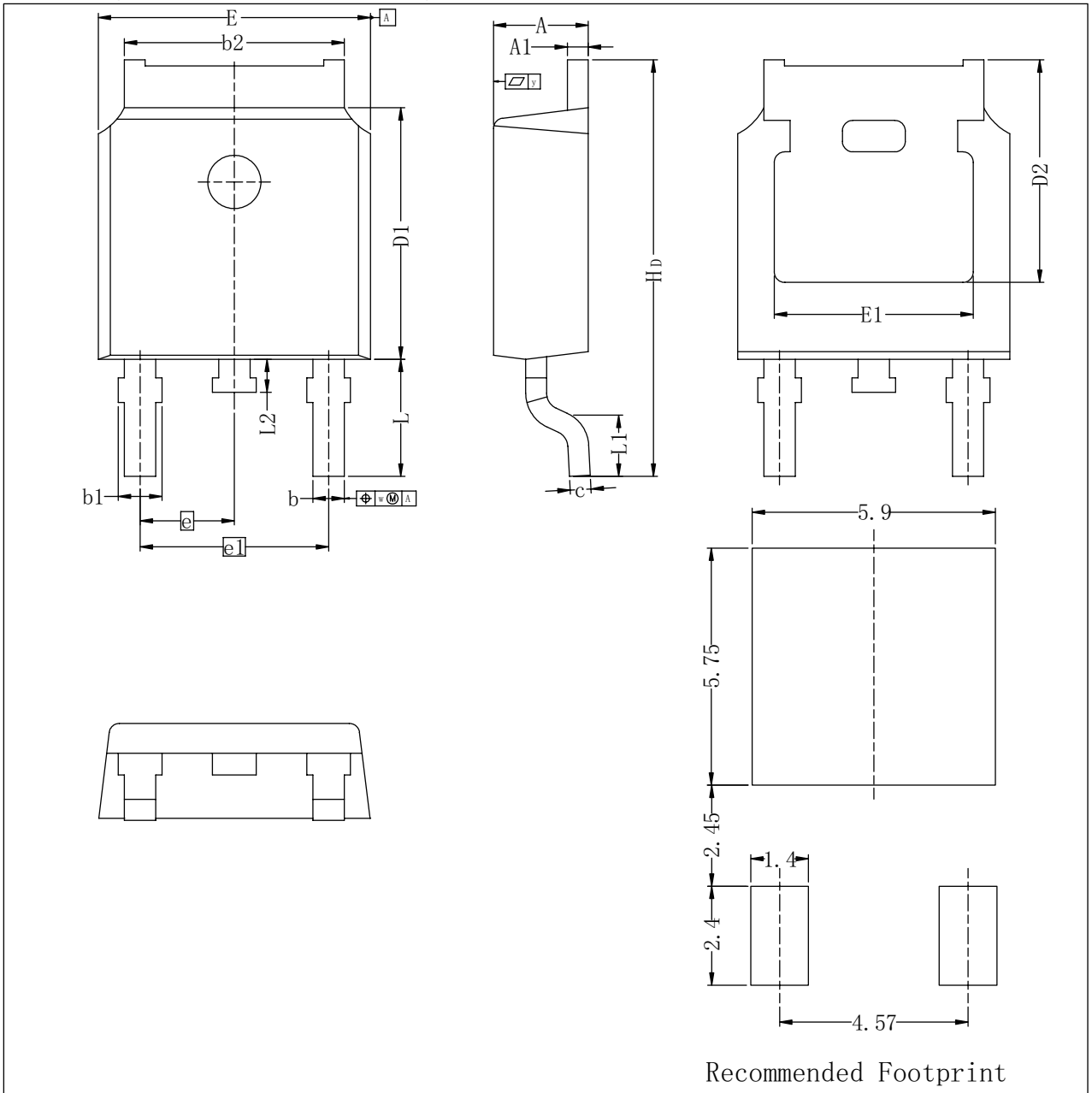


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

Assembly factory: N

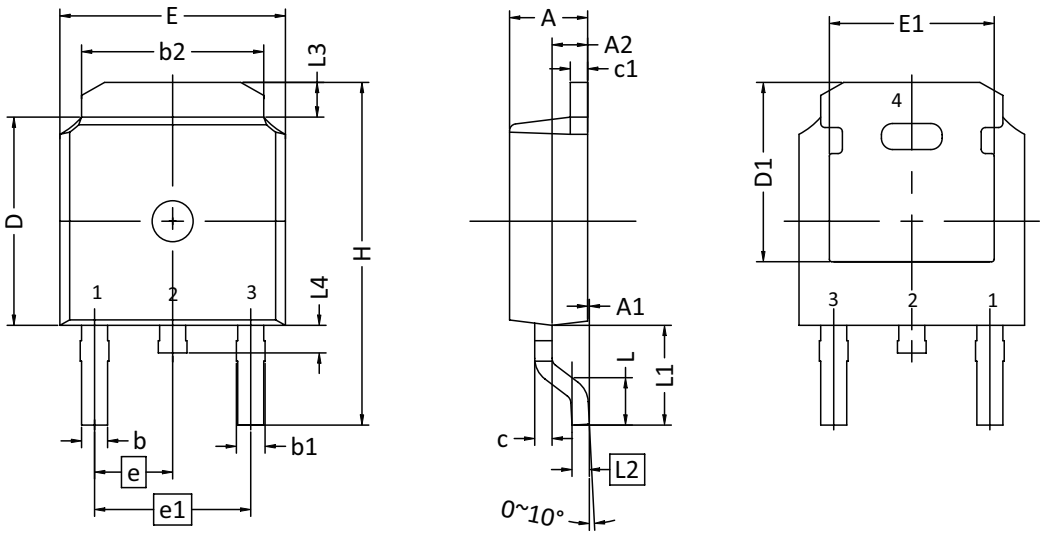
Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)

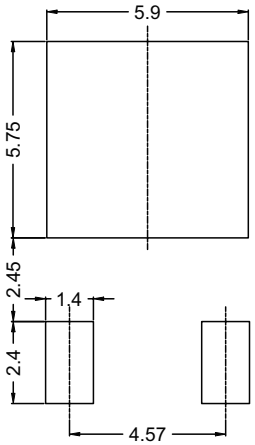


Unit	A	A1	b	b1	b2	c	D1	D2	E	E1	e	e1	H_D	L	L1	L2	w	y
min	2.22	0.46	0.71	0.72	5.00	0.20	5.98	4.00	6.47	4.45	2.285	4.57	9.60	2.90 (Ref.)	0.50	0.50	0.20	
mm nom	2.38	0.93	0.89	1.10	5.46	0.56	6.22	---	6.73	---			10.40		---	0.90		0.20
max																		

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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13. Contents

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