BT136S-800F

4Q Triac

11 October 2016 Product data sheet

1. General description

Planar passivated four quadrant triac in a SOT428 (DPAK) surface-mountable plastic package intended for use in general purpose bidirectional and phase control applications.

2. Features and benefits

- High blocking voltage capability
- Less sensitive gate for improved noise immunity
- Planar passivated for voltage ruggedness and reliability
- Surface-mountable package
- Triggering in all four quadrants

3. Applications

- General purpose motor controls
- General purpose switching

4. Quick reference data

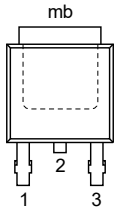
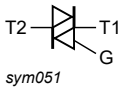
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage			-	-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq$ 107 °C; Fig. 1; Fig. 2; Fig. 3		-	-	4	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)}$ = 25 °C; t_p = 20 ms; Fig. 4; Fig. 5		-	-	25	A
		full sine wave; $T_{j(init)}$ = 25 °C; t_p = 16.7 ms		-	-	27	A
T_j	junction temperature			-	-	125	°C
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 7		-	5	25	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		-	8	25	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		-	11	25	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; Fig. 7		-	30	70	mA

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	5	15	mA
V_T	on-state voltage	I_T = 5 A; T_j = 25 °C; Fig. 10		-	1.4	1.7	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 536 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		50	250	-	V/µs
dV_{com}/dt	rate of change of commutating voltage	V_D = 400 V; T_j = 95 °C; dI_{com}/dt = 1.8 A/ms; I_T = 4 A; gate open circuit		-	50	-	V/µs

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	 DPAK (SOT428)	 *sym051*
2	T2	main terminal 2		
3	G	gate		
mb	T2	mounting base; main terminal 2		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BT136S-800F	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			-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq$ 107 °C; Fig. 1; Fig. 2; Fig. 3		-	4	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)}$ = 25 °C; t_p = 20 ms; Fig. 4; Fig. 5		-	25	A
		full sine wave; $T_{j(init)}$ = 25 °C; t_p = 16.7 ms		-	27	A
I^2t	I^2t for fusing	t_p = 10 ms; SIN		-	3.1	A²s
dI_T/dt	rate of rise of on-state current	I_G = 0.2 A		-	50	A/µs
				-	50	A/µs
		I_G = 70 mA		-	50	A/µs
		I_G = 0.2 A		-	50	A/µs
		I_G = 70 mA		-	50	A/µs
		I_G = 0.2 A		-	10	A/µs
		I_G = 140 mA		-	10	A/µs
		I_G = 70 mA		-	50	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		-	0.5	W
T_{stg}	storage temperature			-40	150	°C
T_j	junction temperature			-	125	°C

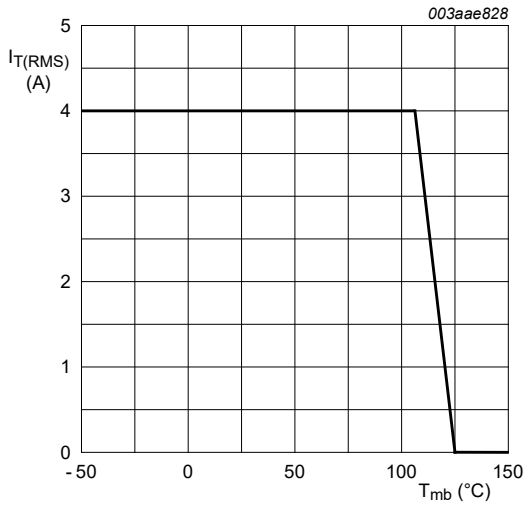
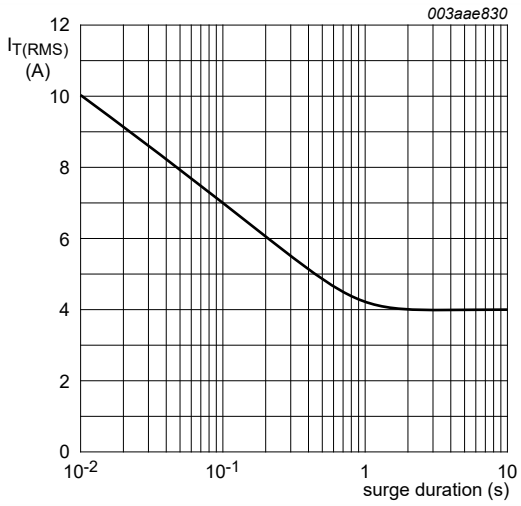
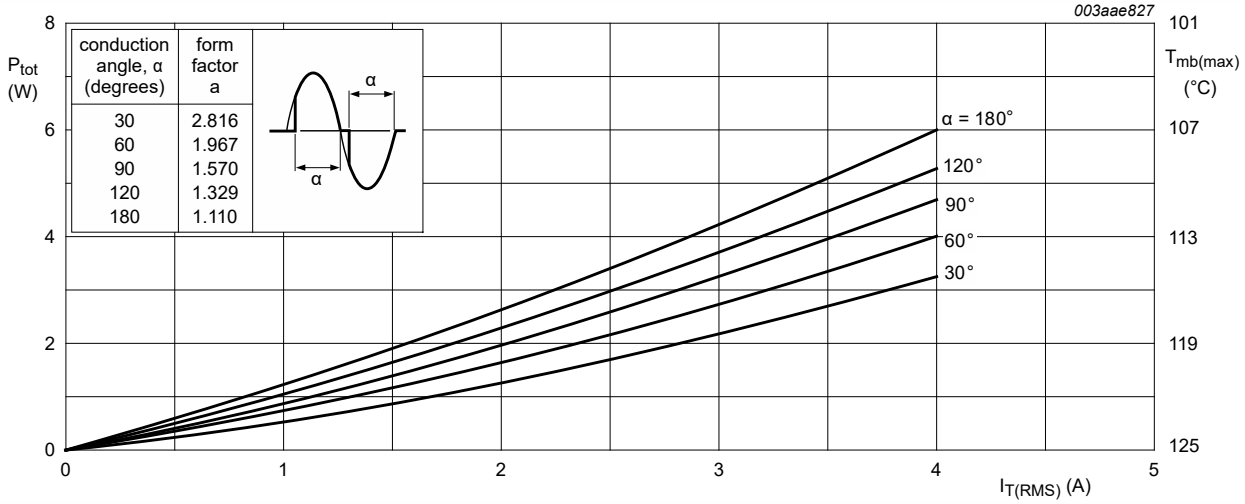


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



f = 50 Hz
$T_{mb} \leq 107$ °C

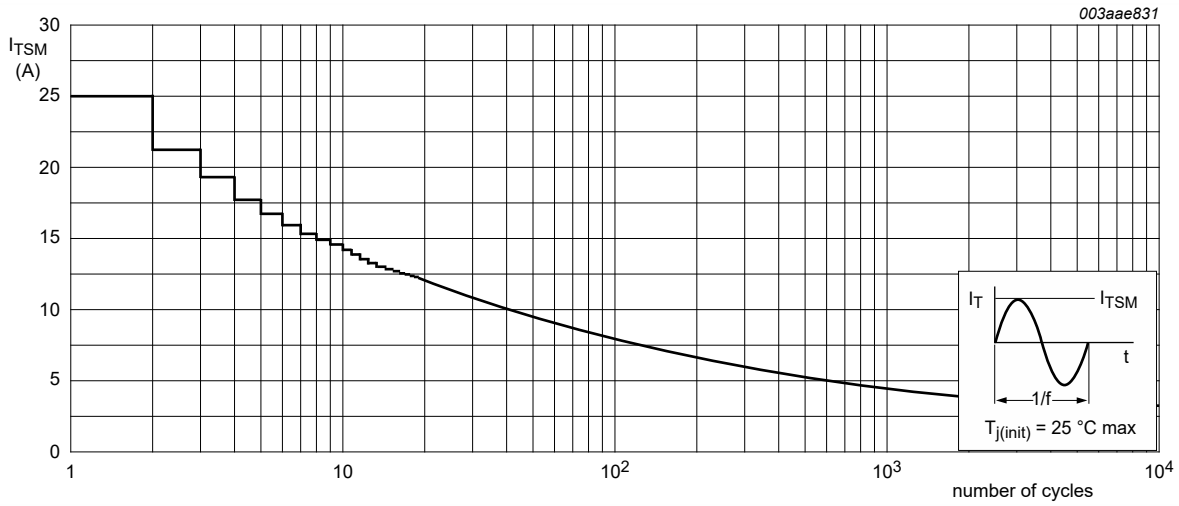
Fig. 2. RMS on-state current as a function of surge duration; maximum values



conduction angle, α (degrees)	form factor a
30	2.816
60	1.967
90	1.570
120	1.329
180	1.110

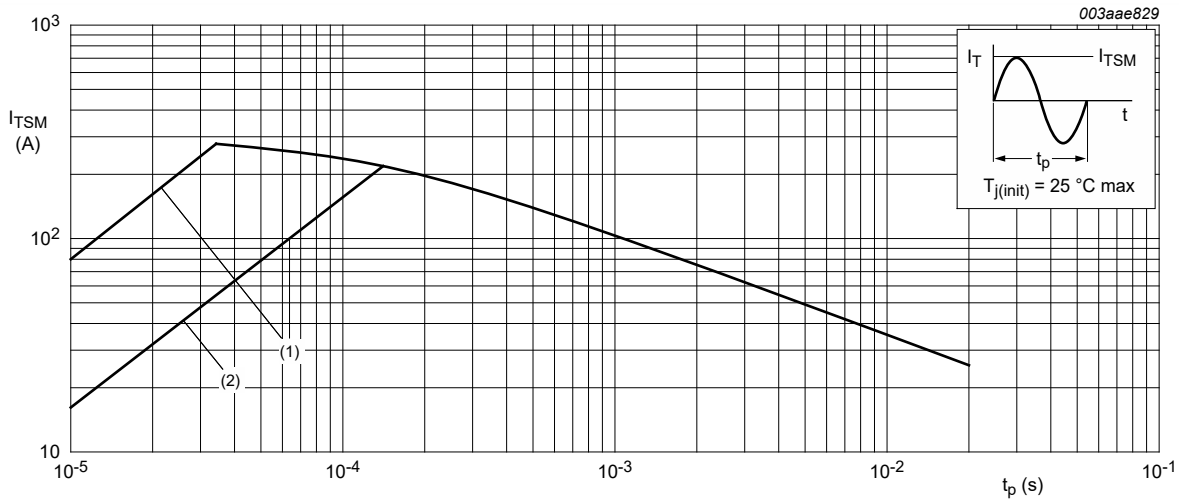
α = conduction angle
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

Fig. 3. Total power dissipation as a function of RMS 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



$t_p \leq 20$ ms
(1) dI_T/dt limit
(2) T2- G+ quadrant limit

Fig. 5. Non-repetitive peak on-state current as a function of pulse width; 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	half cycle; Fig. 6		-	-	3.7	K/W
		full cycle; Fig. 6		-	-	3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air; printed circuit board (FR4) mounted; standard footprint, single-sided copper, tin-plated		-	75	-	K/W

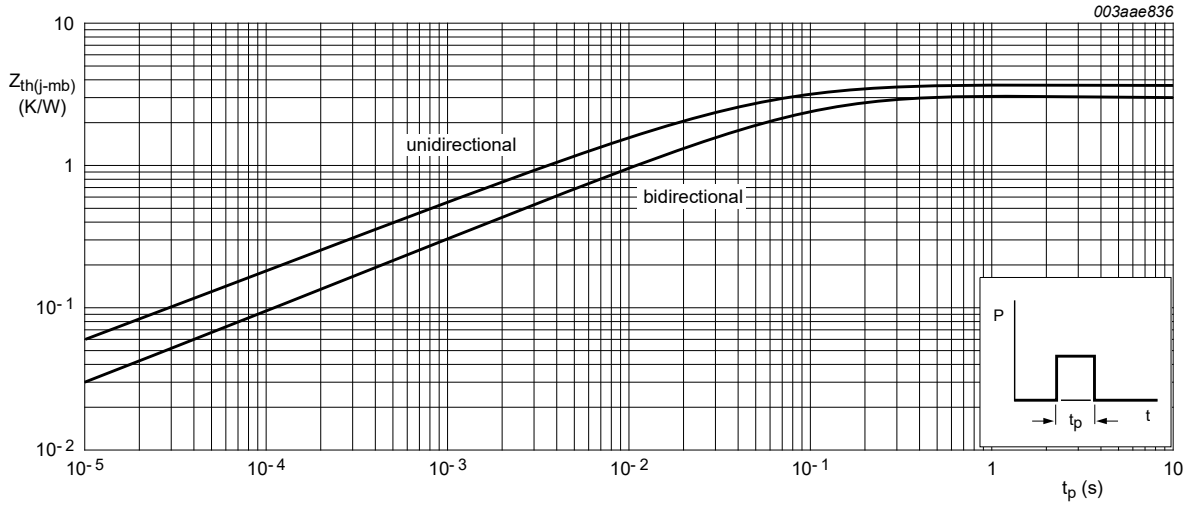
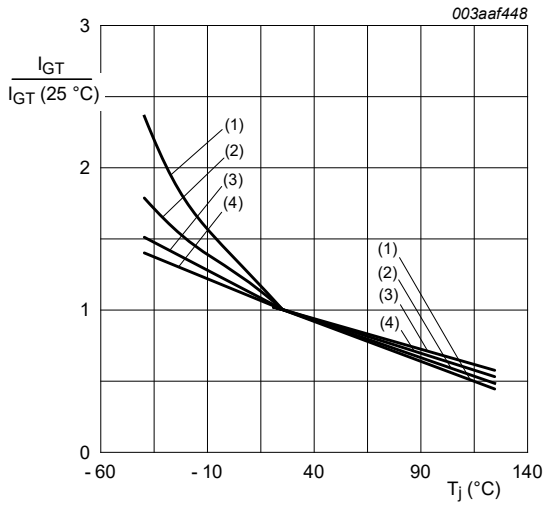


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse width

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; T2+ G+; T_j = 25 °C; Fig. 7		-	5	25	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		-	8	25	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		-	11	25	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; Fig. 7		-	30	70	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 8		-	7	20	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 8		-	16	30	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; Fig. 8		-	5	20	mA
		V_D = 12 V; I_G = 0.1 A; T2- G+; T_j = 25 °C; Fig. 8		-	7	30	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	5	15	mA
V_T	on-state voltage	I_T = 5 A; T_j = 25 °C; Fig. 10		-	1.4	1.7	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; Fig. 11		-	0.7	1	V
		V_D = 400 V; I_T = 0.1 A; T_j = 125 °C; Fig. 11		0.25	0.4	-	V
I_D	off-state current	V_D = 800 V; T_j = 125 °C		-	0.1	0.5	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 536 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		50	250	-	V/µs
dV_{com}/dt	rate of change of commutating voltage	V_D = 400 V; T_j = 95 °C; dI_{com}/dt = 1.8 A/ms; I_T = 4 A; gate open circuit		-	50	-	V/µs
t_{gt}	gate-controlled turn-on time	I_{TM} = 6 A; V_D = 800 V; I_G = 0.1 mA; dI_G/dt = 5 A/µs		-	2	-	µs



(1) T2- G+
(2) T2- G-
(3) T2+ G-
(4) T2+ G+

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

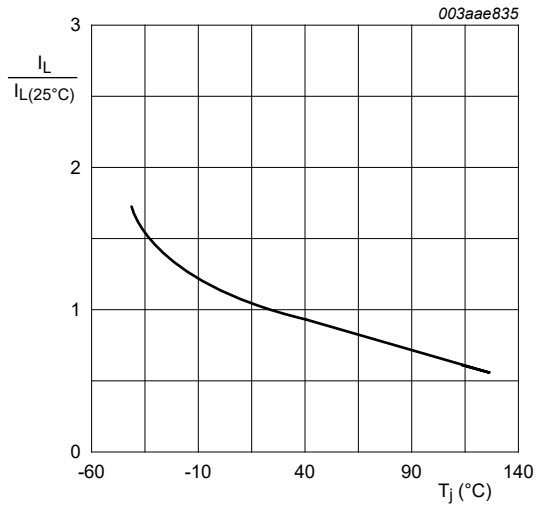


Fig. 8. Normalized latching current as a function of junction temperature

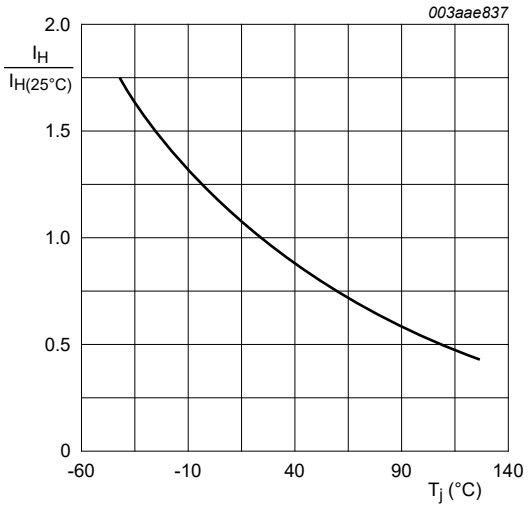
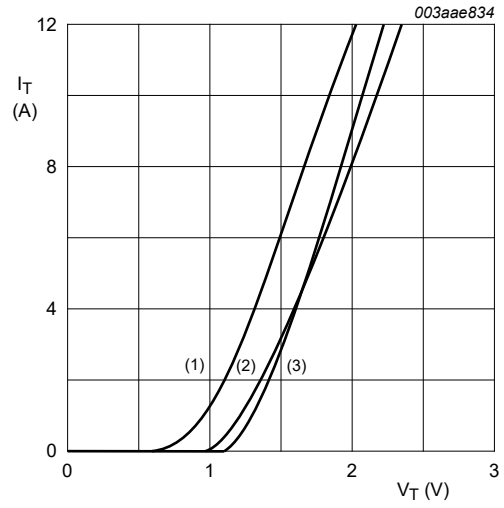


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 1.27 V
R_s = 0.091 Ω
(1) T_j = 125 °C; typical values
(2) T_j = 125 °C; maximum values
(3) T_j = 25 °C; maximum values

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

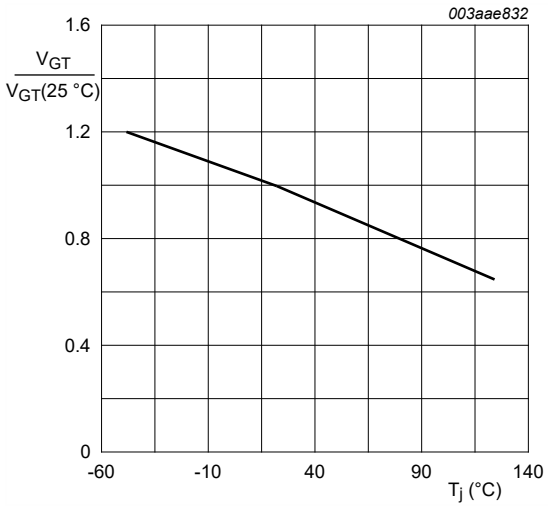
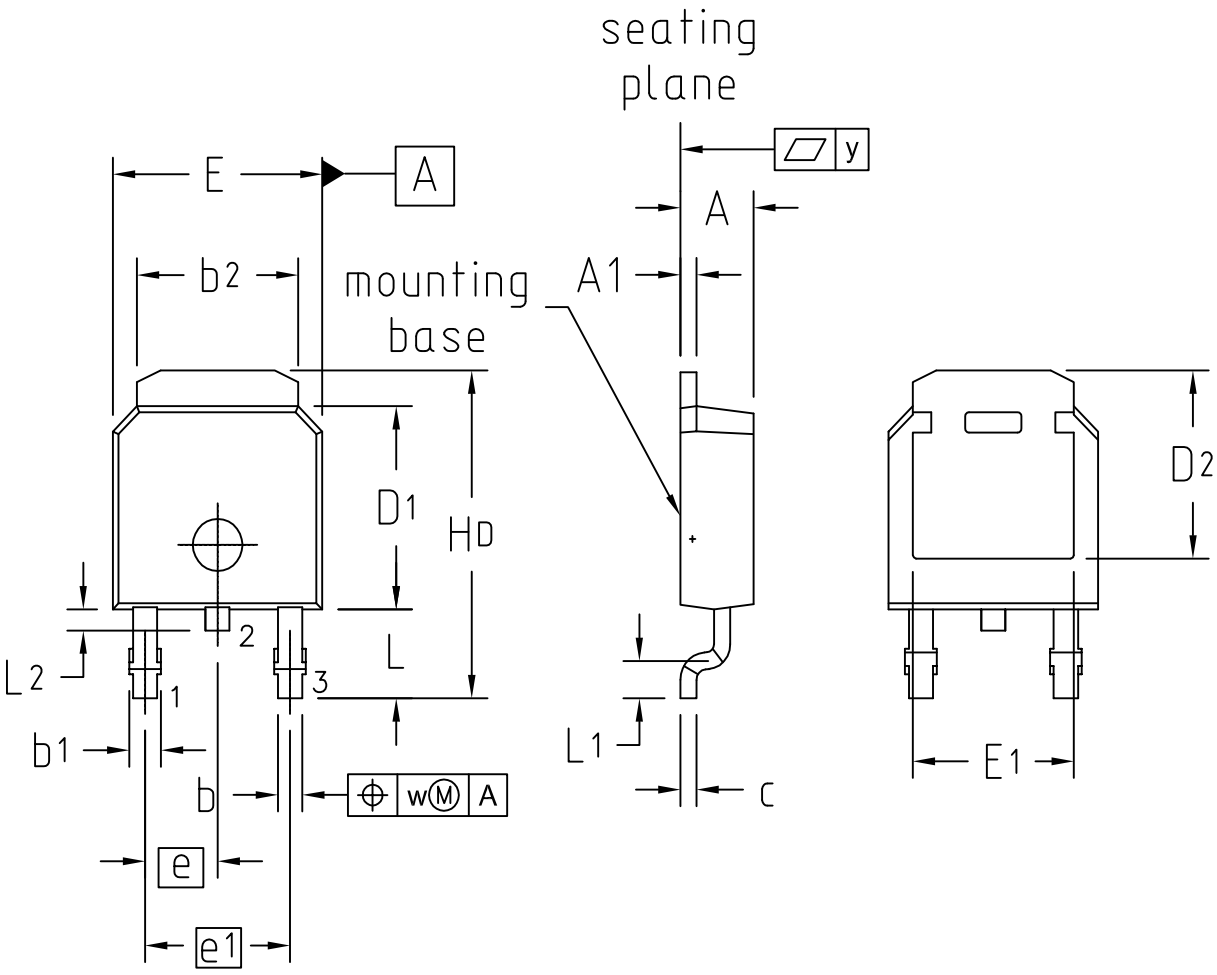


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

10. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) SOT428



UNIT	A	A_1	b	b_1	b_2	c	D_1	D_2	E	E_1	e	e_1	H_D	L	L_1	L_2	w	y
mm	2.38	0.93	0.89	1.1	5.46	0.56	6.22	4.00	6.73	4.45	2.285	4.57	10.40	2.95	0.5	0.90	0.2	0.20
	2.22	0.46	0.71	0.9	5.00	0.20	5.98	min.	6.47	min.			9.60	2.55	min.	0.50		max.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT428		TO-252				

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

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

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Date of release: 11 October 2016