ACTT4S-800E

AC Thyristor Triac power switch

14 August 2017 — Product data sheet

1. General description

Planar passivated AC Thyristor Triac power switch in a SOT428 (DPAK) surface mountable plastic package with self-protective clamping capabilities against low and high energy transients.

2. Features and benefits

- Clamping structure ensuring safe high over-voltage withstand capability
- Direct interfacing with low power drivers and microcontrollers
- Full cycle AC conduction
- Over-voltage withstand capability to IEC 61000-4-5
- Pin compatible with standard triacs
- Planar passivated for voltage ruggedness and reliability
- Protective self turn-on capability for high energy transients
- Safe clamping capability for low energy over-voltage transients
- Sensitive gate for easy logic level triggering
- Surface mountable package
- Triggering in three quadrants only
- Very high immunity to false turn-on by dV/dt

3. Applications

- AC fan, pump and compressor controls
- Highly inductive, resistive and safety loads
- Large and small appliances (White Goods)
- Reversing induction motor controls

4. Quick reference data

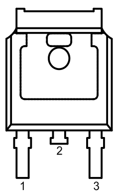
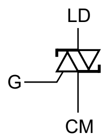
Table 1. Quick reference data

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; $T_{mb} \leq$ 108 °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		-	-	35	A
		full sine wave; $T_{j(init)}$ = 25 °C; t_p = 16.7 ms		-	-	39	A
T_j	junction temperature			-	-	125	°C
V_{PP}	peak pulse voltage	T_j = 25 °C; non-repetitive, off-state; Fig. 6		-	-	2	kV

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 100 mA; LD+ G+; T_j = 25 °C; Fig. 8		-	-	10	mA
		V_D = 12 V; I_T = 100 mA; LD+ G-; T_j = 25 °C; Fig. 8		-	-	10	mA
		V_D = 12 V; I_T = 100 mA; LD- G-; T_j = 25 °C; Fig. 8		-	-	10	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 10		-	-	20	mA
V_T	on-state voltage	I_T = 6 A; T_j = 25 °C; Fig. 11		-	-	1.7	V
V_{CL}	clamping voltage	I_{CL} = 0.1 mA; t_p = 1 ms; T_j = 25 °C		850	-	-	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; Fig. 13		500	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 4 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit; Fig. 14; Fig. 15		4	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 4 A; dV_{com}/dt = 10 V/µs; gate open circuit; Fig. 14; Fig. 15		5	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 4 A; dV_{com}/dt = 1 V/µs; gate open circuit; Fig. 14; Fig. 15		8	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	CM	common	 **DPAK (SOT428)**	 *003aaf296*
2	LD	load		
3	G	gate		
mb	LD	mounting base; load		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
ACTT4S-800E	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; $T_{mb} \leq$ 108 °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		-	35	A
		full sine wave; $T_{j(init)}$ = 25 °C; t_p = 16.7 ms		-	39	A
I^2t	I^2t for fusing	t_p = 10 ms; sine-wave pulse		-	6	A²s
dI_T/dt	rate of rise of on-state current	I_G = 20 mA		-	100	A/µs
I_{GM}	peak gate current	t = 20 µs		-	2	A
P_{GM}	peak gate power			-	5	W
$P_{G(AV)}$	average gate power	over any 20 ms period		-	0.5	W
T_j	junction temperature			-	125	°C
V_{PP}	peak pulse voltage	T_j = 25 °C; non-repetitive, off-state; Fig. 6		-	2	kV

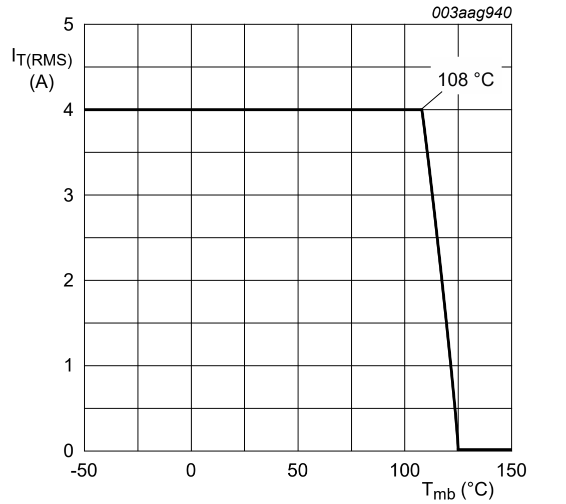
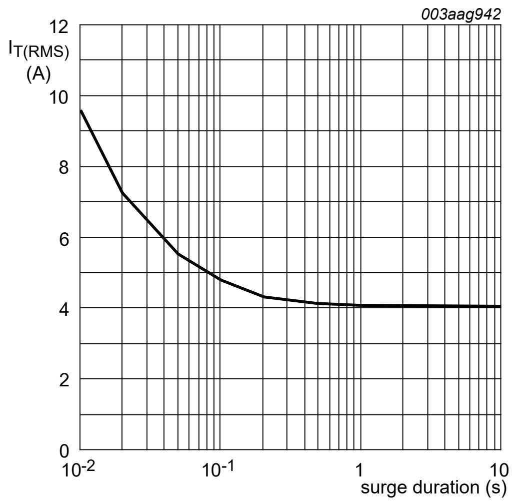
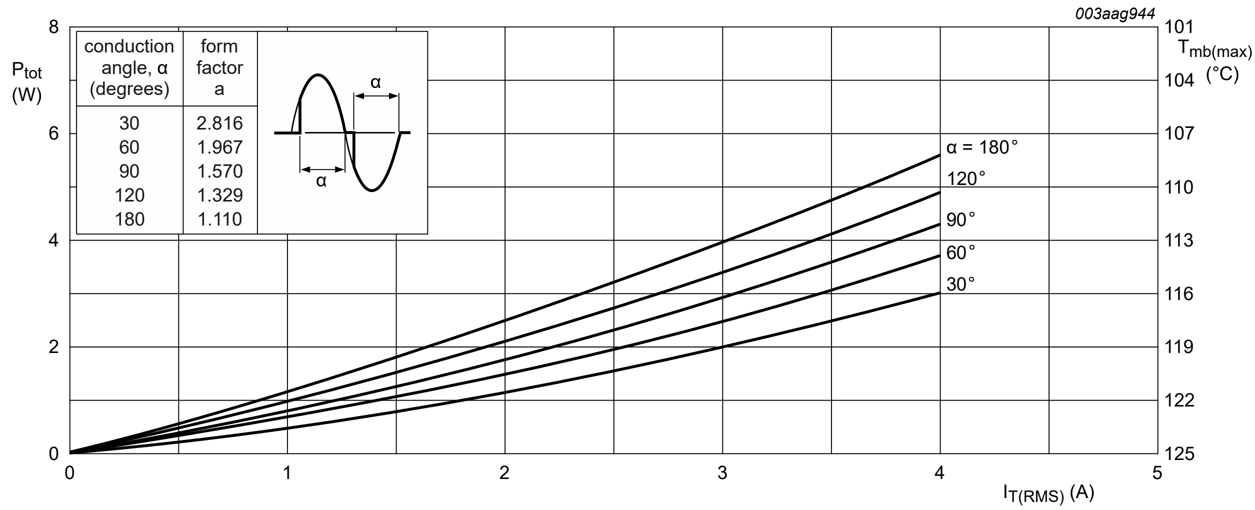


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



f = 50 Hz; T_{mb} = 108 °C

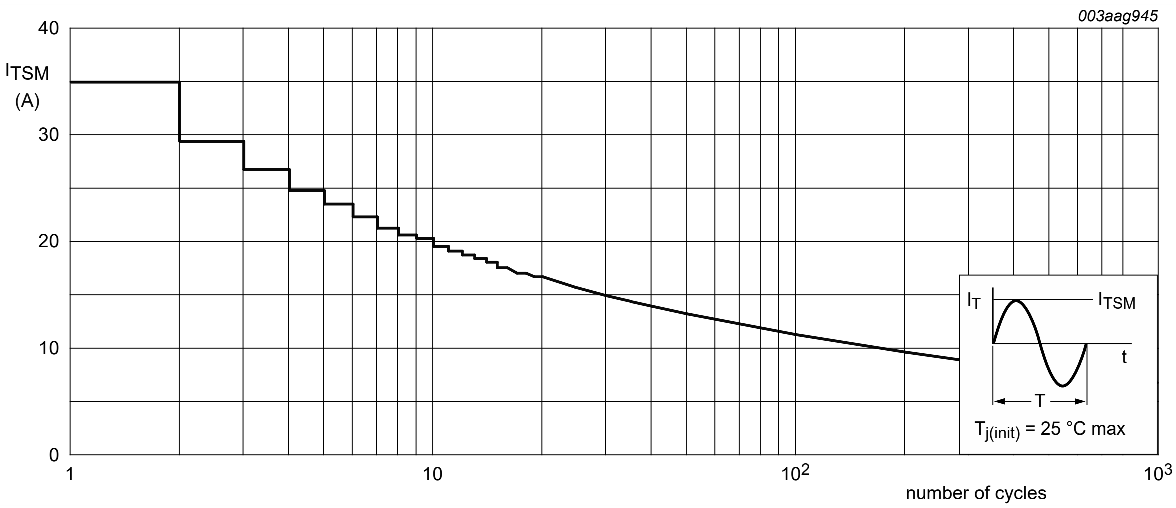
Fig. 2. RMS on-state current as a function of surge duration; maximum values



α = conduction angle

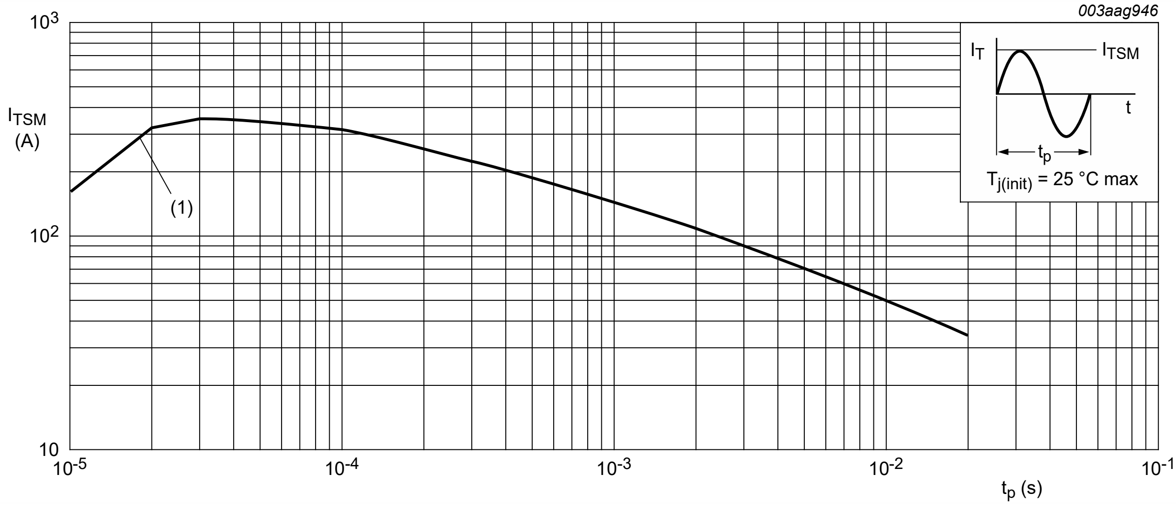
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

Fig. 3. 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

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

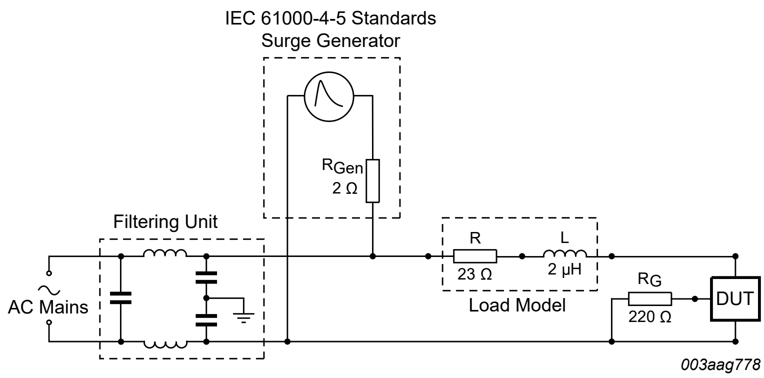
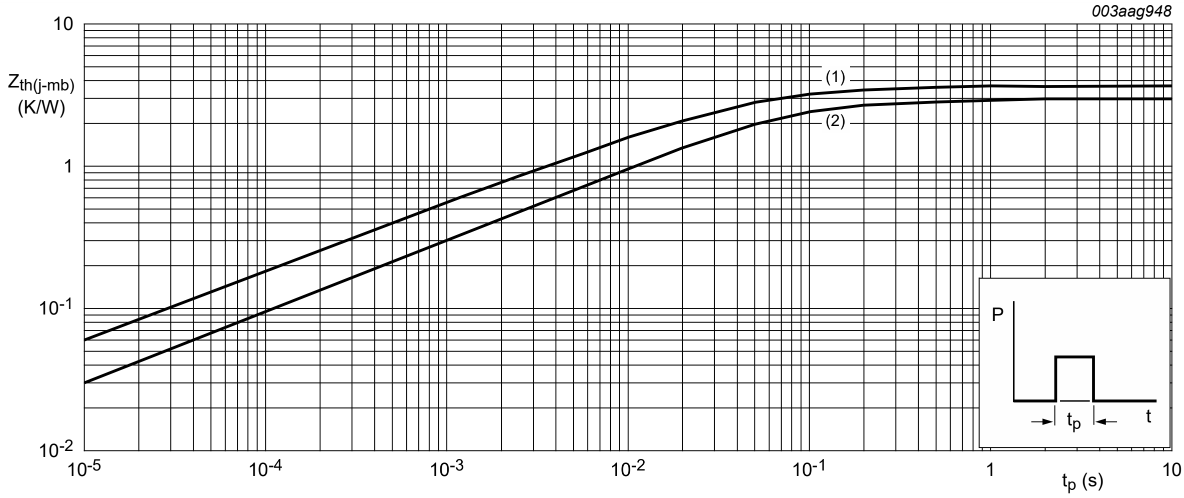


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

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	full cycle; Fig. 7		-	-	3	K/W
		half cycle; Fig. 7		-	-	3.7	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	75	-	K/W



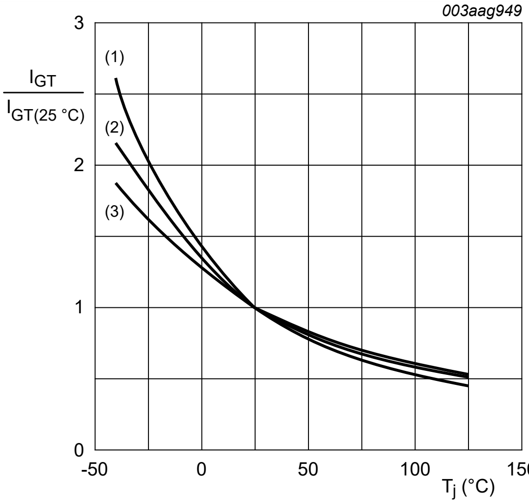
(1) Unidirectional (half cycle)
(2) Bidirectional (full cycle)

Fig. 7. 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 = 100 mA; LD+ G+; T_j = 25 °C; Fig. 8		-	-	10	mA
		V_D = 12 V; I_T = 100 mA; LD+ G-; T_j = 25 °C; Fig. 8		-	-	10	mA
		V_D = 12 V; I_T = 100 mA; LD- G-; T_j = 25 °C; Fig. 8		-	-	10	mA
I_L	latching current	V_D = 12 V; I_G = 100 mA; LD+ G+; T_j = 25 °C; Fig. 9		-	-	30	mA
		V_D = 12 V; I_G = 100 mA; LD+ G-; T_j = 25 °C; Fig. 9		-	-	40	mA
		V_D = 12 V; I_G = 100 mA; LD- G-; T_j = 25 °C; Fig. 9		-	-	30	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 10		-	-	20	mA
V_T	on-state voltage	I_T = 6 A; T_j = 25 °C; Fig. 11		-	-	1.7	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 100 mA; T_j = 25 °C; Fig. 12		-	0.8	1	V
		V_D = 400 V; I_T = 100 mA; T_j = 125 °C; Fig. 12		0.2	0.45	-	V
I_D	off-state current	V_D = 800 V; T_j = 25 °C		-	-	10	µA
		V_D = 800 V; T_j = 125 °C		-	-	0.5	mA
V_{CL}	clamping voltage	I_{CL} = 0.1 mA; t_p = 1 ms; T_j = 25 °C		850	-	-	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; Fig. 13		500	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 4 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit; Fig. 14; Fig. 15		4	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 4 A; dV_{com}/dt = 10 V/µs; gate open circuit; Fig. 14; Fig. 15		5	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 4 A; dV_{com}/dt = 1 V/µs; gate open circuit; Fig. 14; Fig. 15		8	-	-	A/ms



(1) LD- G-
(2) LD+ G+
(3) LD+ G-

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

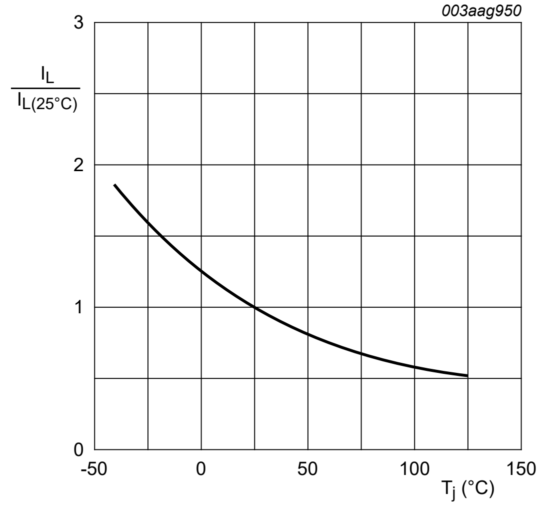


Fig. 9. Normalized latching current as a function of junction temperature

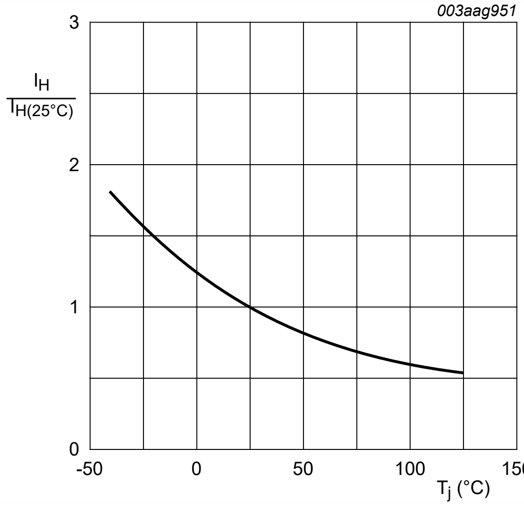
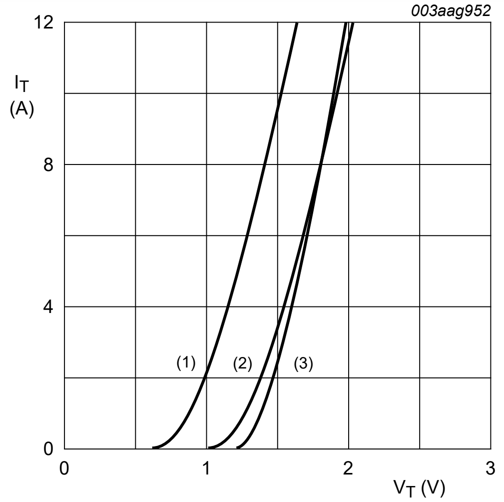


Fig. 10. Normalized holding current as a function of junction temperature



V_o = 1.242 V; R_s = 0.074 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

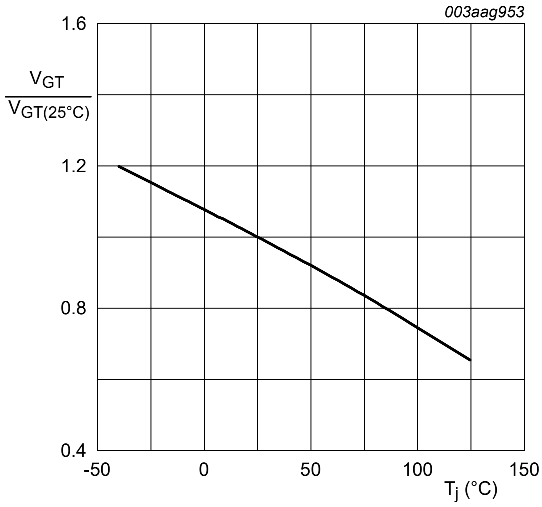
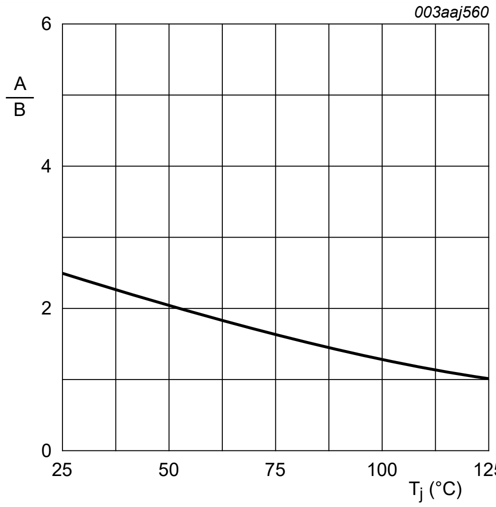
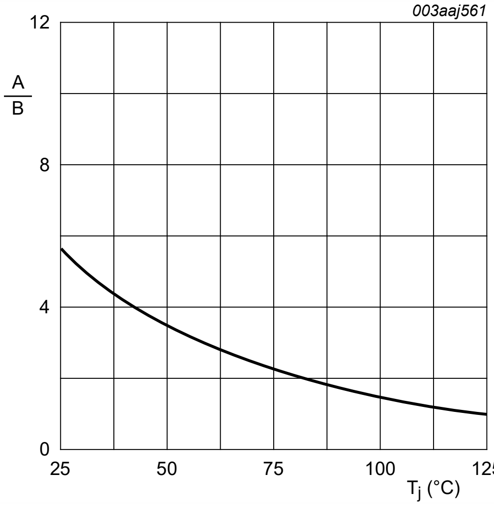


Fig. 12. Normalized gate trigger voltage as a function of junction temperature



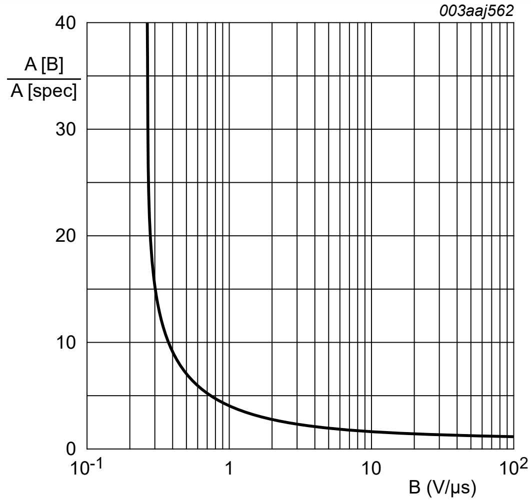
A = dV_D/dt at condition T_j °C
B = dV_D/dt at condition T_j [125] °C

Fig. 13. Normalized rate of rise of off-state voltage as a function of junction temperature



A = dI_{com}/dt at condition T_j °C
B = dI_{com}/dt at condition T_j [125] °C
V_D = 400 V

Fig. 14. Normalized critical rate of rise of commutating current as a function of junction temperature

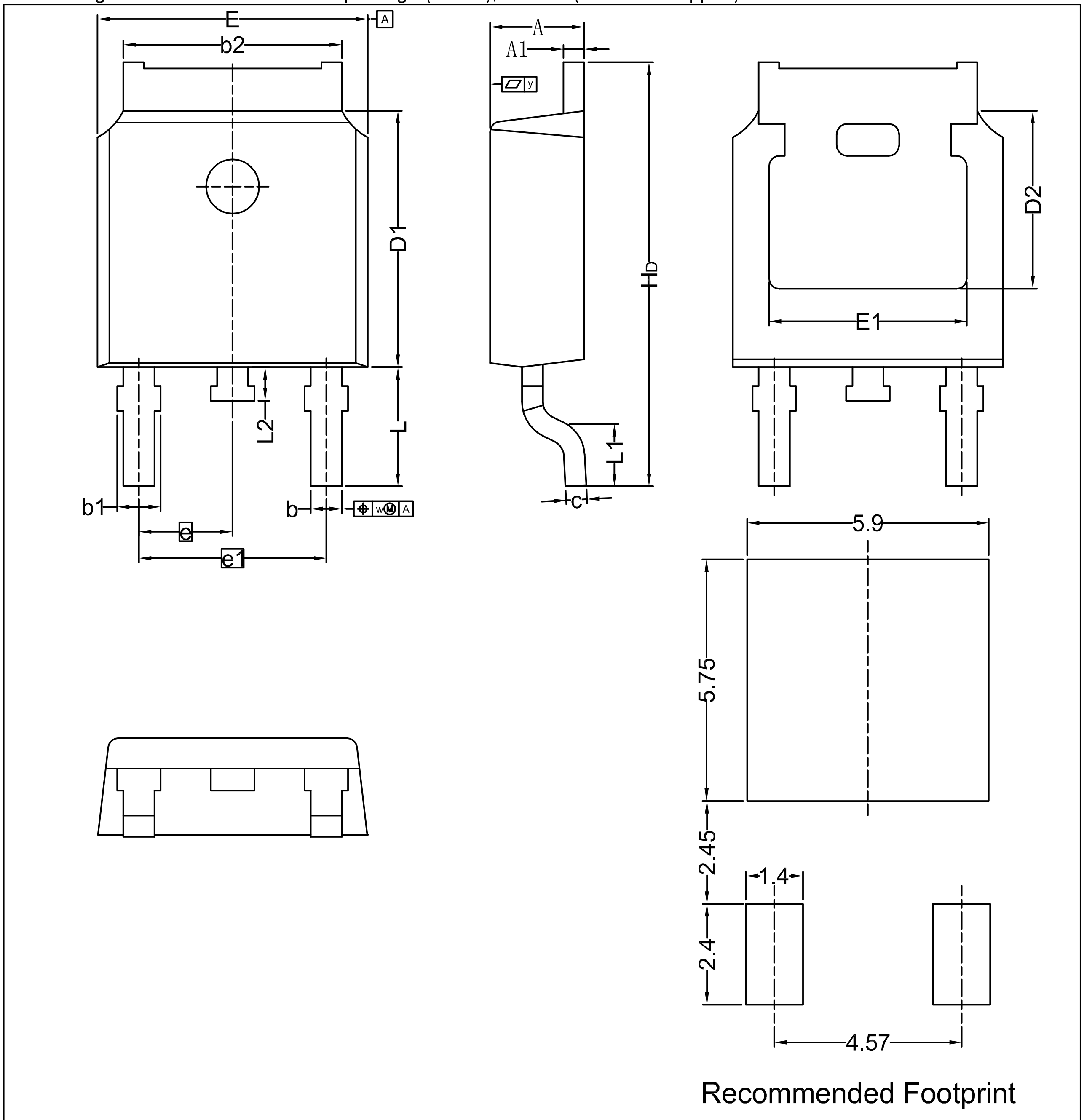


A [B] is dI_{com}/dt at condition B, dV_{com}/dt
A [spec] is the specified data sheet value of dI_{com}/dt
turn-off time < 20 ms

Fig. 15. Normalized critical rate of change of commutating current as a function of critical rate of change of commutating voltage; minimum values

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
mm	min	2.22	0.46	0.71	0.72	5.00	0.20	5.98	4.00	6.47	4.45			9.60		0.50	0.50		
	nom											2.285	4.57		2.90 (Ref.)			0.20	
	max	2.38	0.93	0.89	1.10	5.46	0.56	6.22	---	6.73	---			10.40		---	0.90		0.20

Fig. 16. Package outline DPAK (SOT428)

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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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12. Contents

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Date of release: 14 August 2017

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(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

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