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ACTT4S-800E

AC Thyristor Triac power switch

20 August 2014

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_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	-	35	A
T_j	junction temperature		-	-	125	°C
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 108\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	4	A



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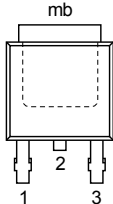
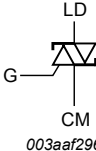
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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{PP}	peak pulse voltage	$T_j = 25\text{ }^{\circ}\text{C}$; non-repetitive, off-state; Fig. 6	-	-	2	kV
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD+ G+; $T_j = 25\text{ }^{\circ}\text{C}$; Fig. 8	-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD+ G-; $T_j = 25\text{ }^{\circ}\text{C}$; Fig. 8	-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD- G-; $T_j = 25\text{ }^{\circ}\text{C}$; Fig. 8	-	-	10	mA
V_{CL}	clamping voltage	$I_{CL} = 0.1\text{ mA}$; $t_p = 1\text{ ms}$; $T_j = 25\text{ }^{\circ}\text{C}$	850	-	-	V
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$; $T_j = 125\text{ }^{\circ}\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 13	500	-	-	V/ μs
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_j = 125\text{ }^{\circ}\text{C}$; $I_{T(RMS)} = 4\text{ A}$; $dV_{com}/dt = 1\text{ V}/\mu\text{s}$; 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	 <p>DPAK (SOT428)</p>	 <p>003aaf296</p>
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

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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
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{mb}} \leq 108\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	4	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	35	A
		full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 16.7\text{ ms}$	-	39	A
I^2t	I^2t for fusing	$t_{\text{p}} = 10\text{ ms}$; sine-wave pulse	-	6	A^2s
dI_{T}/dt	rate of rise of on-state current	$I_{\text{T}} = 6\text{ A}$; $I_{\text{G}} = 0.2\text{ A}$; $dI_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$	-	100	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current	$t = 20\text{ }\mu\text{s}$	-	2	A
P_{GM}	peak gate power		-	5	W
$P_{\text{G(AV)}}$	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	$^{\circ}\text{C}$
V_{PP}	peak pulse voltage	$T_{\text{j}} = 25\text{ }^{\circ}\text{C}$; non-repetitive, off-state; Fig. 6	-	2	kV

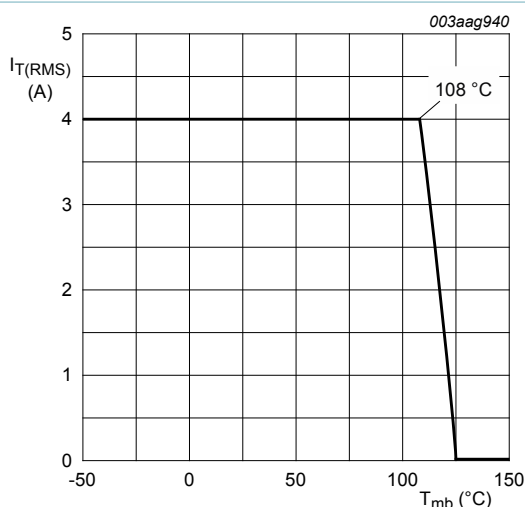
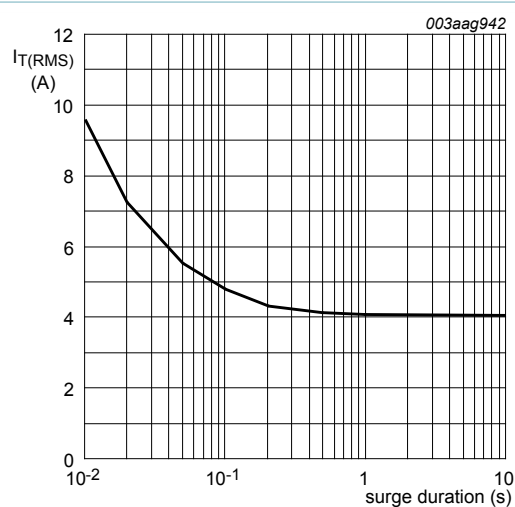


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



$f = 50\text{ Hz}$; $T_{\text{mb}} = 108\text{ }^{\circ}\text{C}$

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

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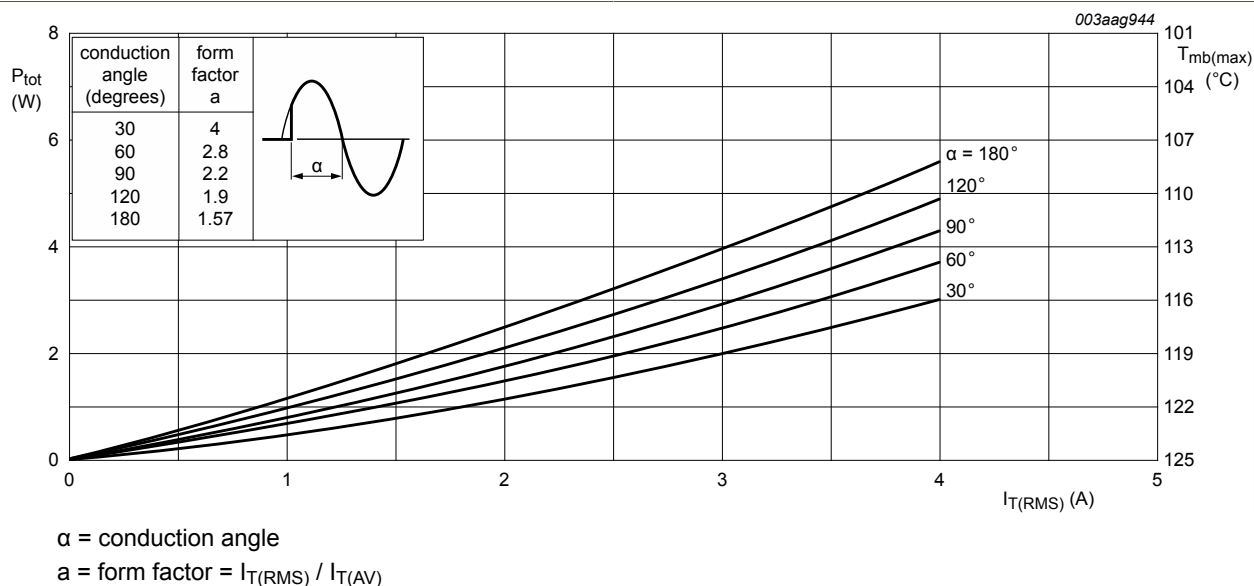


Fig. 3. power dissipation as a function of RMS on-state current; maximum values

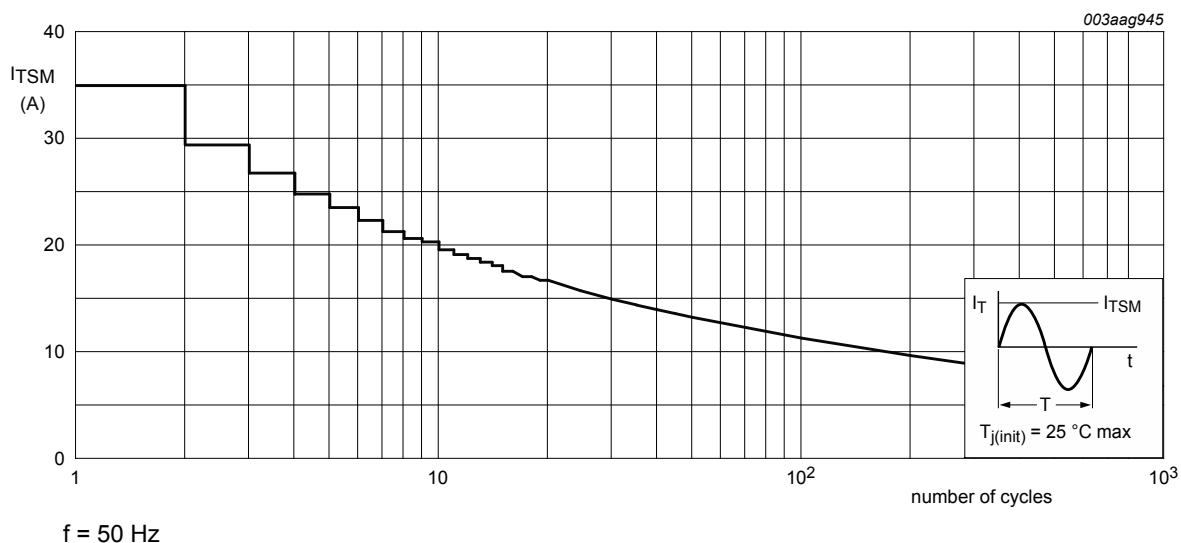


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

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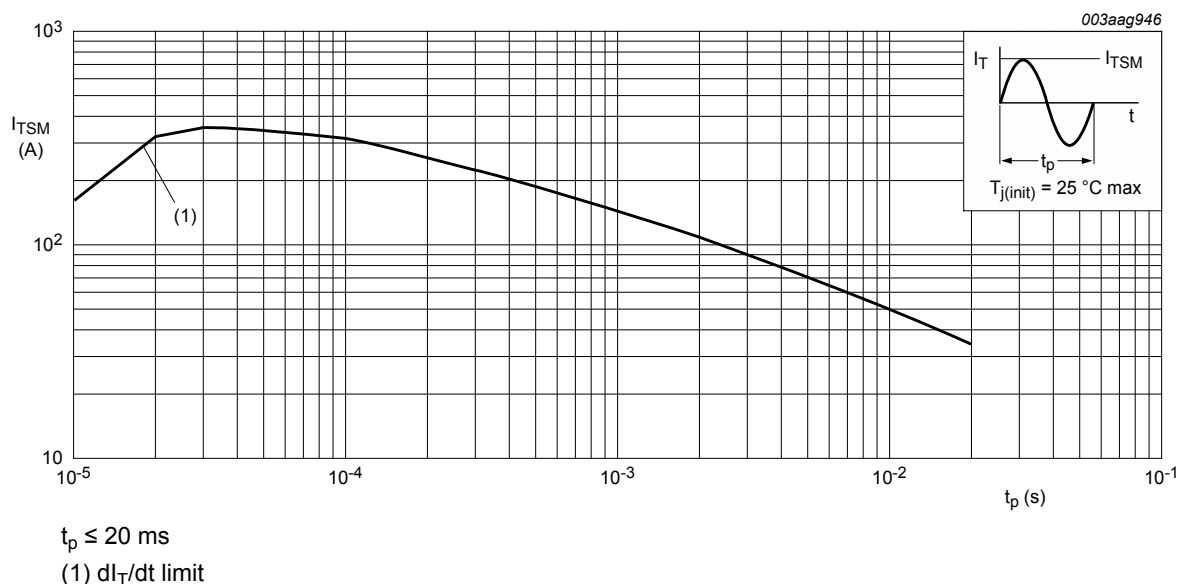


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

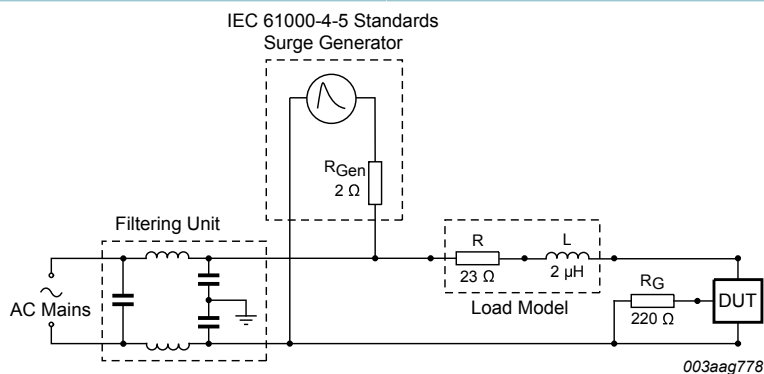


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

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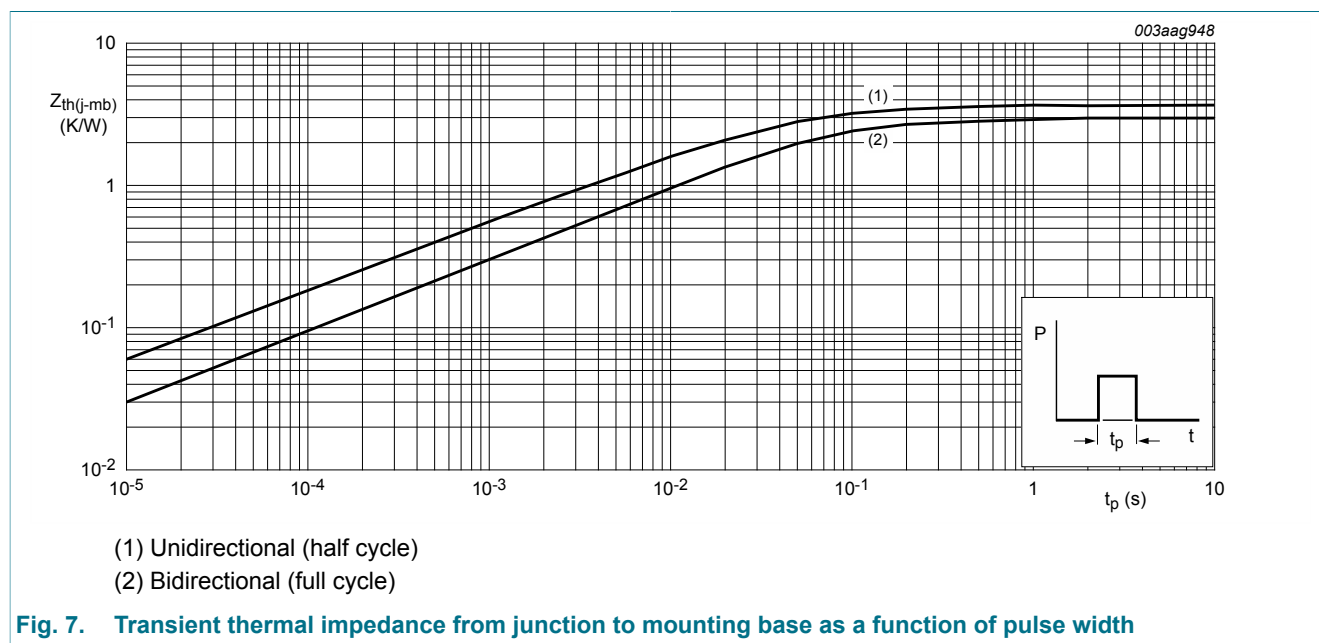
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8. Thermal characteristics

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	in free air	-	75	-	K/W



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9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD+ G+; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8	-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD+ G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8	-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8	-	-	10	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 100\text{ mA}$; LD+ G+; $T_j = 25\text{ }^\circ\text{C}$; Fig. 9	-	-	30	mA
		$V_D = 12\text{ V}$; $I_G = 100\text{ mA}$; LD+ G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 9	-	-	40	mA
		$V_D = 12\text{ V}$; $I_G = 100\text{ mA}$; LD- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 9	-	-	30	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 10	-	-	20	mA
V_T	on-state voltage	$I_T = 6\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 11	-	-	1.7	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 12	-	0.8	1	V
		$V_D = 400\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 125\text{ }^\circ\text{C}$; Fig. 12	0.2	0.45	-	V
I_D	off-state current	$V_D = 800\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$	-	-	10	μA
		$V_D = 800\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$	-	-	0.5	mA
V_{CL}	clamping voltage	$I_{CL} = 0.1\text{ mA}$; $t_p = 1\text{ ms}$; $T_j = 25\text{ }^\circ\text{C}$	850	-	-	V
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 13	500	-	-	V/ μs
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{T(RMS)} = 4\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit; Fig. 14 ; Fig. 15	4	-	-	A/ms
		$V_D = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{T(RMS)} = 4\text{ A}$; $dV_{com}/dt = 10\text{ V}/\mu\text{s}$; gate open circuit; Fig. 14 ; Fig. 15	5	-	-	A/ms
		$V_D = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{T(RMS)} = 4\text{ A}$; $dV_{com}/dt = 1\text{ V}/\mu\text{s}$; gate open circuit; Fig. 14 ; Fig. 15	8	-	-	A/ms

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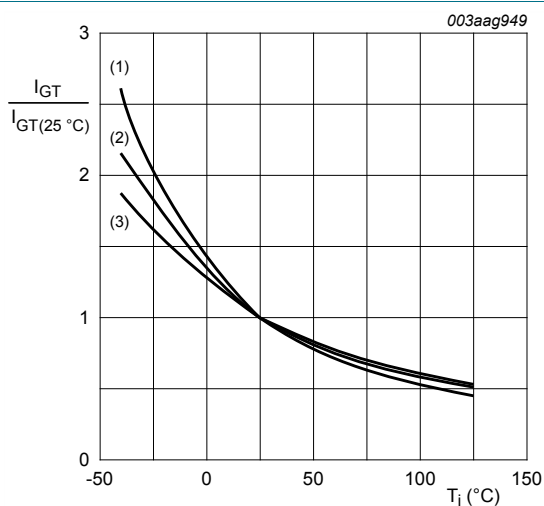


Fig. 8. Normalized gate trigger current as a function of junction temperature

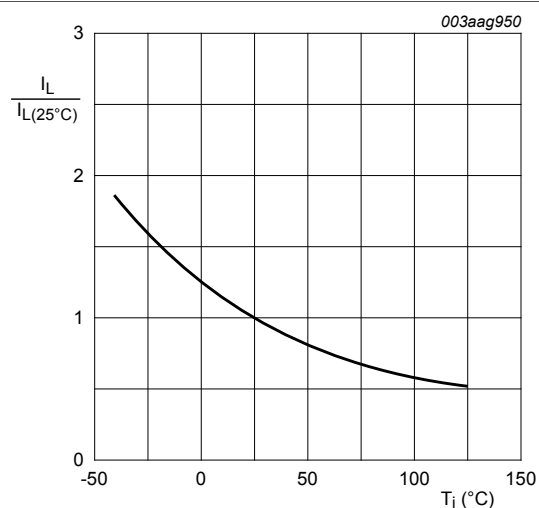


Fig. 9. Normalized latching current as a function of junction temperature

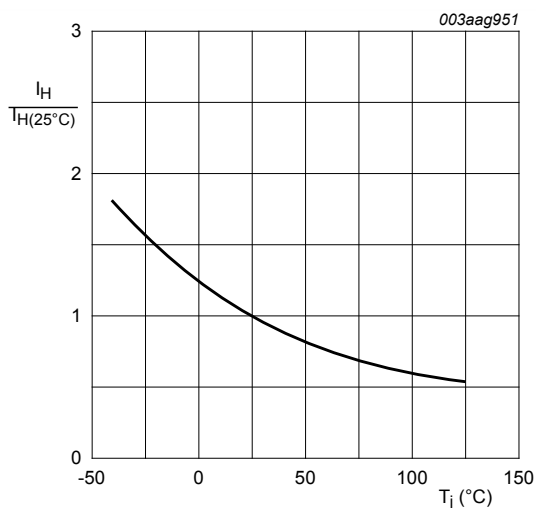
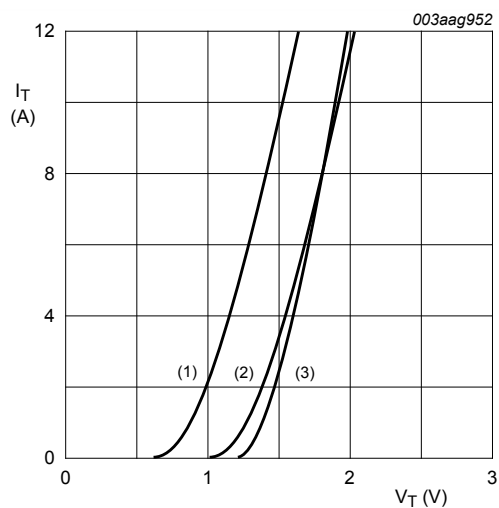


Fig. 10. Normalized holding current as a function of junction temperature



$V_o = 1.242 \text{ V}$; $R_s = 0.074 \Omega$

(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

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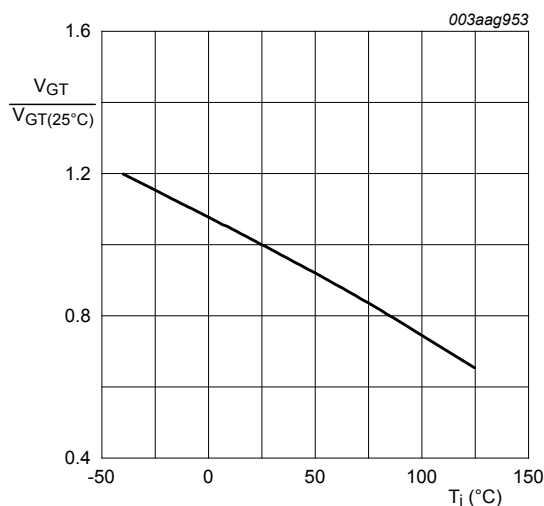
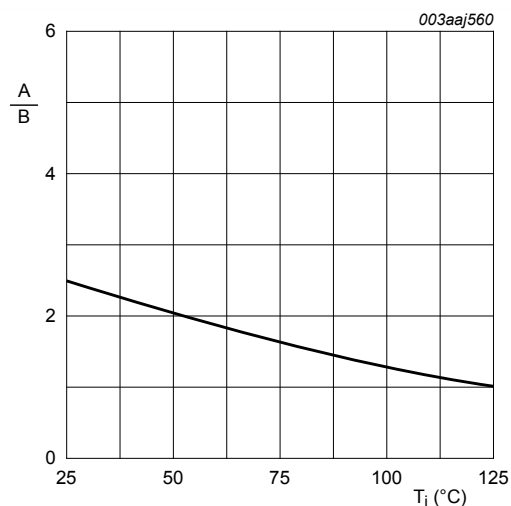
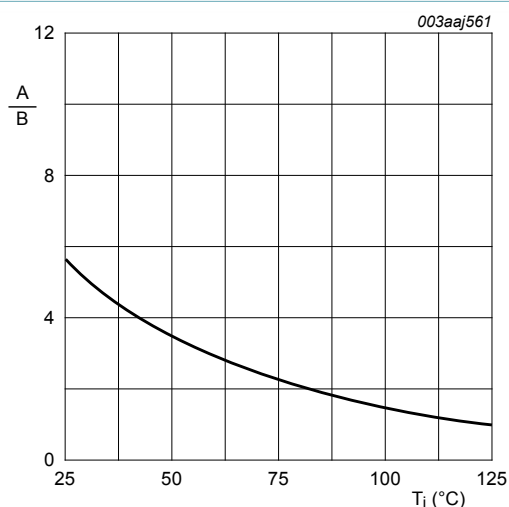


Fig. 12. Normalized gate trigger voltage as a function of junction temperature



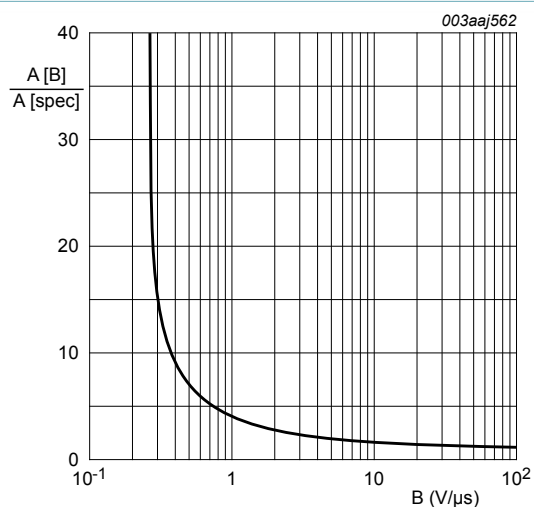
A = dV_D/dt at condition T_j °C
B = dV_D/dt at condition T_j [125] °C

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

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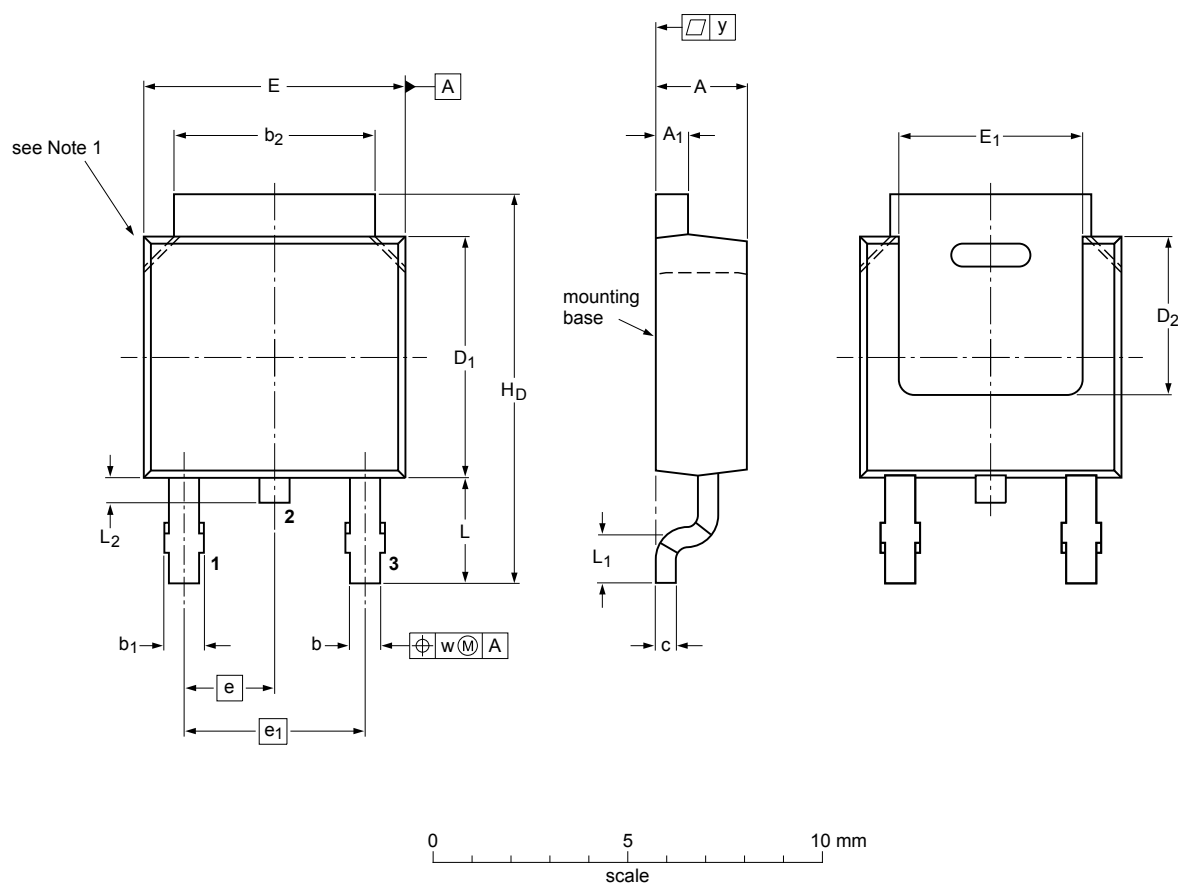
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10. Package outline

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

SOT428



Dimensions (mm are the original dimensions)

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
max	2.38	0.93	0.89	1.1	5.46	0.56	6.22		6.73				10.4	2.95		0.9		0.2
nom											2.285	4.57					0.2	
min	2.22	0.46	0.71	0.9	5.00	0.20	5.98	4.0	6.47	4.45			9.6	2.55	0.5	0.5		

Note

1. Plastic body may have 45° chamfer.

sot428_po


Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT428		TO-252	SC-63			-06-03-16- 14-06-10

Fig. 16. Package outline DPAK (SOT428)

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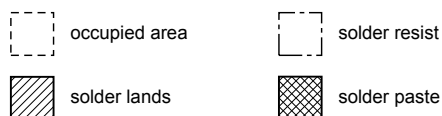
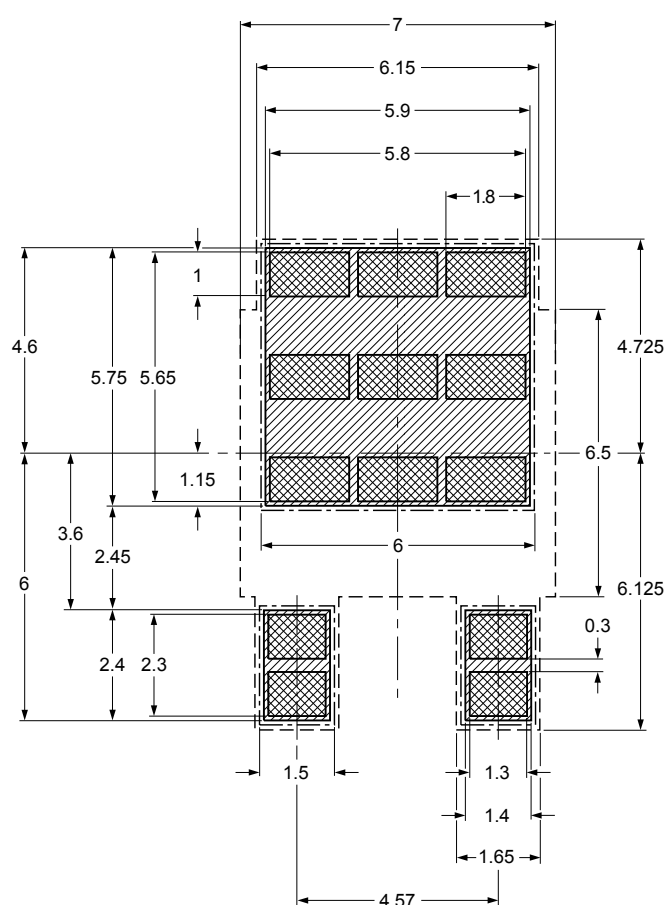
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11. Soldering

Footprint information for reflow soldering of DPAK (SOT428) package

SOT428



Dimensions in mm

Issue date ~~14-03-12~~
14-03-17

sot428_fr

Fig. 17. Reflow soldering footprint for DPAK (SOT428)

12. Legal information

12.1 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.
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