



# ACTT12B-800C

## AC Thyristor Triac power switch

12 September 2014

Product data sheet

### 1. General description

AC Thyristor Triac power switch in a SOT404 (D2PAK) 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
- 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
- Less sensitive gate for high noise immunity
- 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

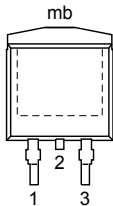
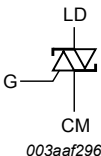
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	-	800	V
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	120	A
$T_j$	junction temperature		-	-	125	$^{\circ}\text{C}$
$I_{T(\text{RMS})}$	RMS on-state current	full sine wave; $T_{mb} \leq 95\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	12	A
$V_{PP}$	peak pulse voltage	$T_j = 25\text{ }^{\circ}\text{C}$ ; non-repetitive, off-state; <a href="#">Fig. 6</a>	-	-	2	kV



Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
I <sub>GT</sub>	gate trigger current	V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; LD+ G+; T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>	-	-	35	mA
		V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; LD+ G-; T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>	-	-	35	mA
		V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; LD- G-; T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>	-	-	35	mA
V <sub>CL</sub>	clamping voltage	I <sub>CL</sub> = 0.1 mA; t <sub>p</sub> = 1 ms; T <sub>j</sub> = 25 °C	850	-	-	V
<b>Dynamic characteristics</b>						
dV <sub>D</sub> /dt	rate of rise of off-state voltage	V <sub>DM</sub> = 536 V; T <sub>j</sub> = 125 °C; (V <sub>DM</sub> = 67% of V <sub>DRM</sub> ); exponential waveform; gate open circuit	3000	-	-	V/μs
di <sub>com</sub> /dt	rate of change of commutating current	V <sub>D</sub> = 400 V; T <sub>j</sub> = 125 °C; I <sub>T(RMS)</sub> = 12 A; dV <sub>com</sub> /dt = 20 V/μs; (snubberless condition); gate open circuit	14	-	-	A/ms

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	CM	common	 <p><b>D2PAK (SOT404)</b></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
ACTT12B-800C	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

## 7. Marking

Table 4. Marking codes

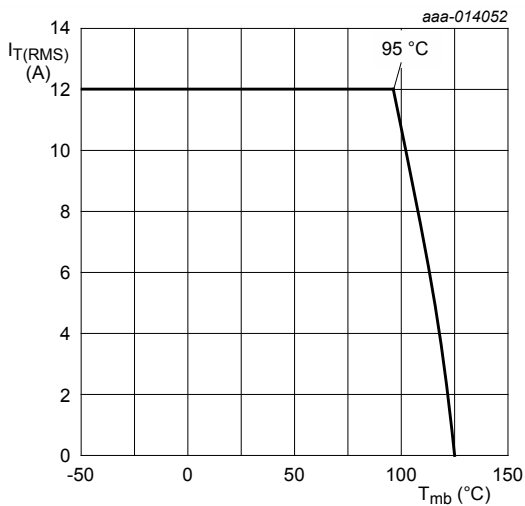
Type number	Marking code
ACTT12B-800C	ACTT12B-800C

## 8. Limiting values

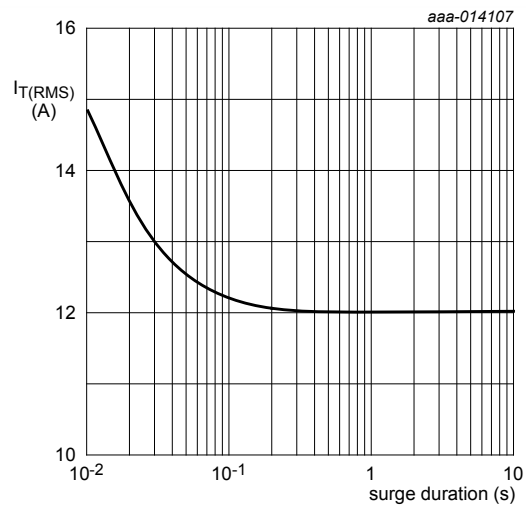
**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 95\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	12	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	120	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$	-	132	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; sine-wave pulse	-	72	$A^2s$
$di_T/dt$	rate of rise of on-state current	$I_T = 12\text{ A}$ ; $I_G = 0.2\text{ A}$ ; $di_G/dt = 0.2\text{ A}/\mu s$	-	100	$A/\mu s$
$I_{GM}$	peak gate current	$t = 20\text{ }\mu s$	-	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	$^{\circ}C$
$T_j$	junction temperature		-	125	$^{\circ}C$
$V_{PP}$	peak pulse voltage	$T_j = 25\text{ °C}$ ; non-repetitive, off-state; <a href="#">Fig. 6</a>	-	2	kV



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



$f = 50\text{ Hz}$ ;  $T_{mb} = 95\text{ }^{\circ}C$

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

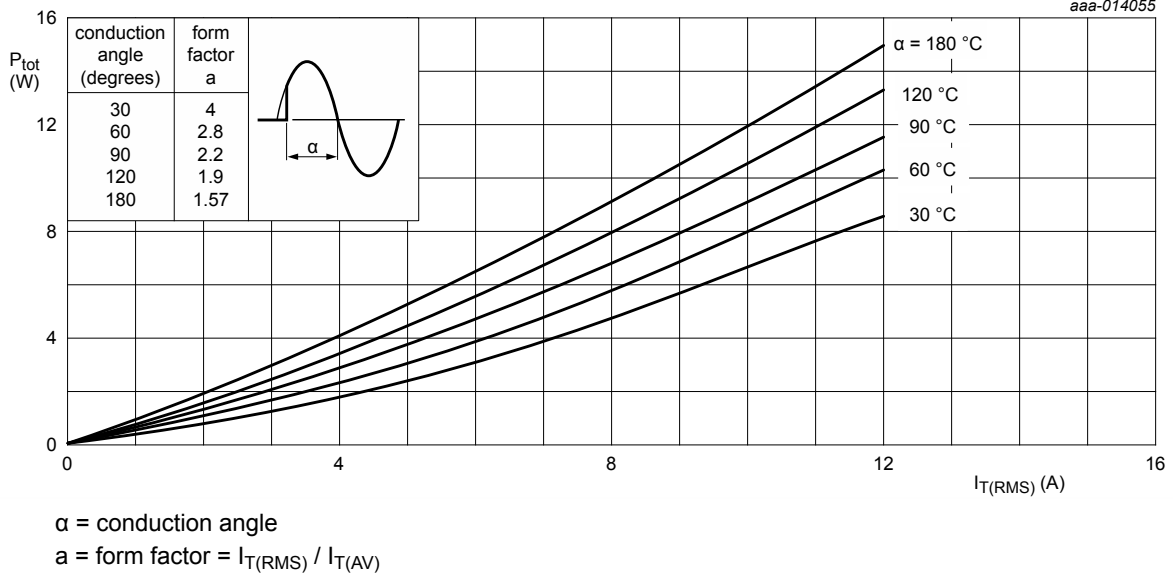


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

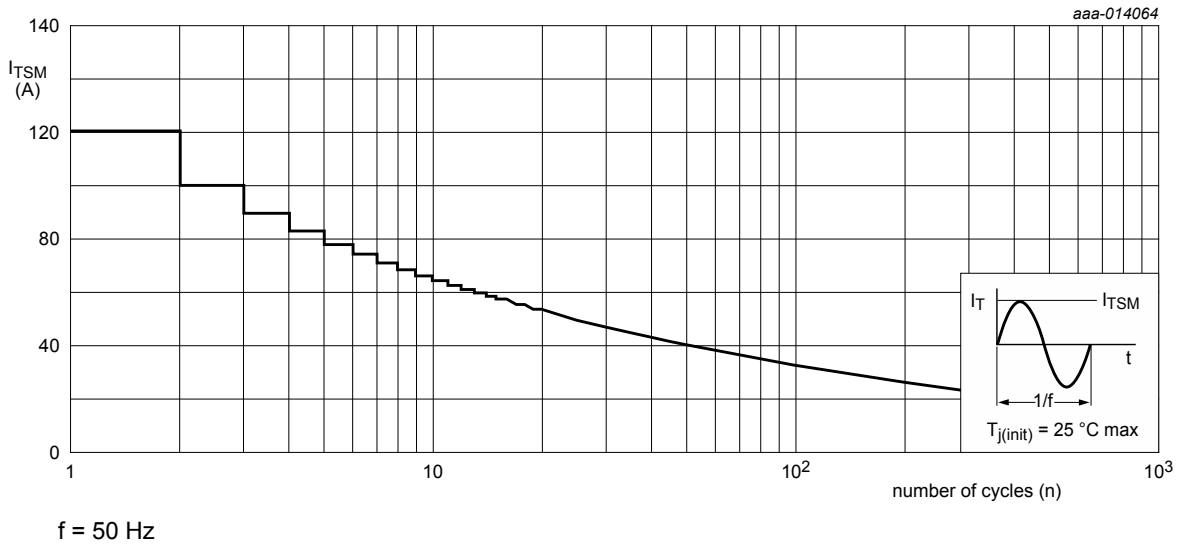


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

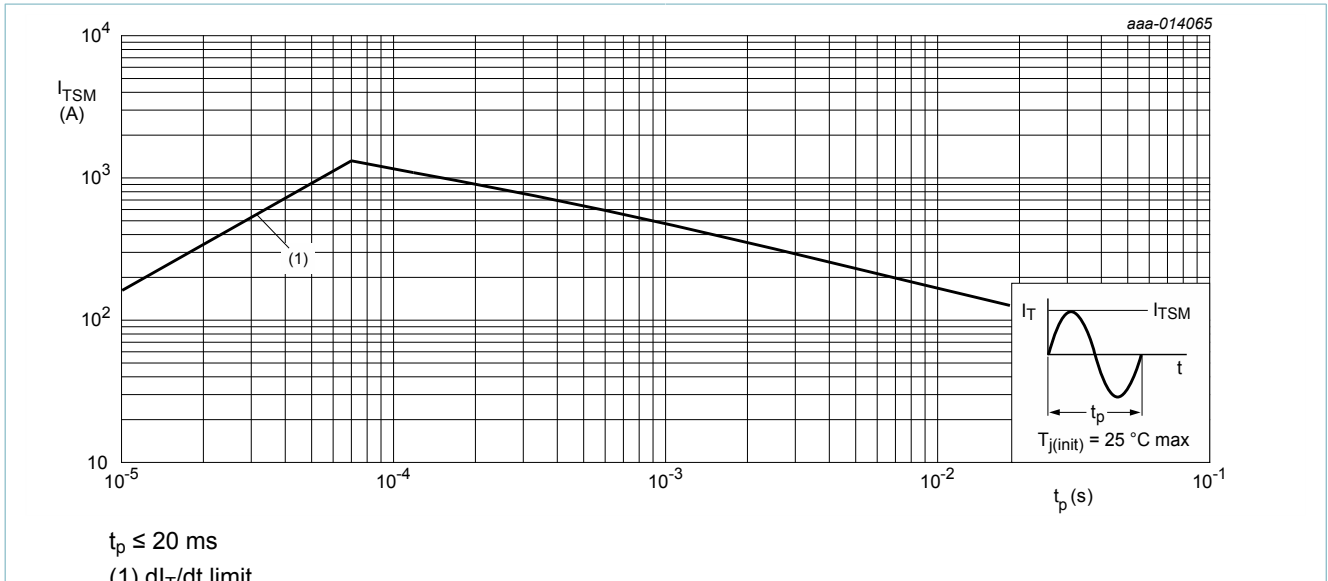


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

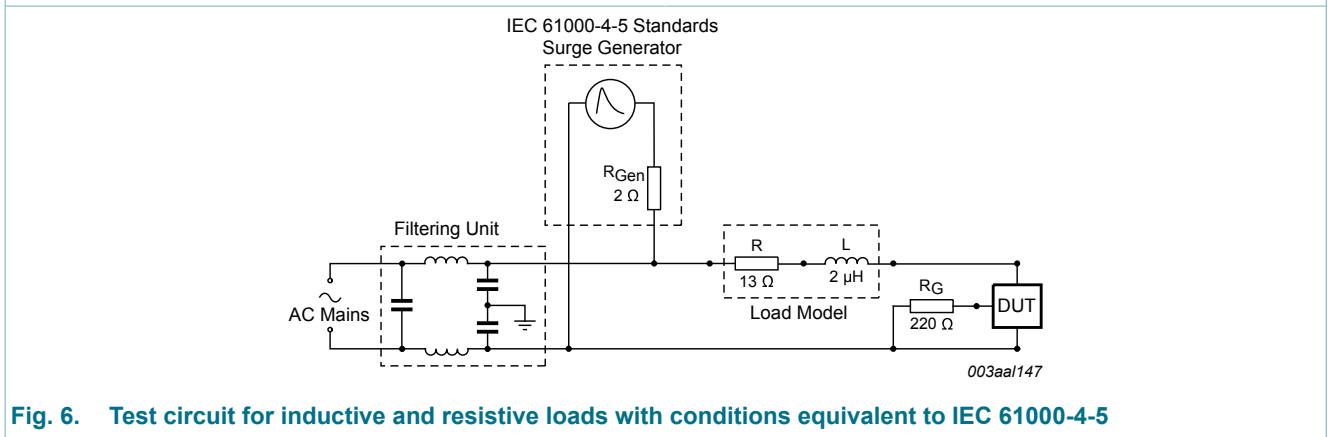


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

## 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	full cycle; <a href="#">Fig. 7</a>	-	-	2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air; printed circuit board (FR4) mounted	-	60	-	K/W

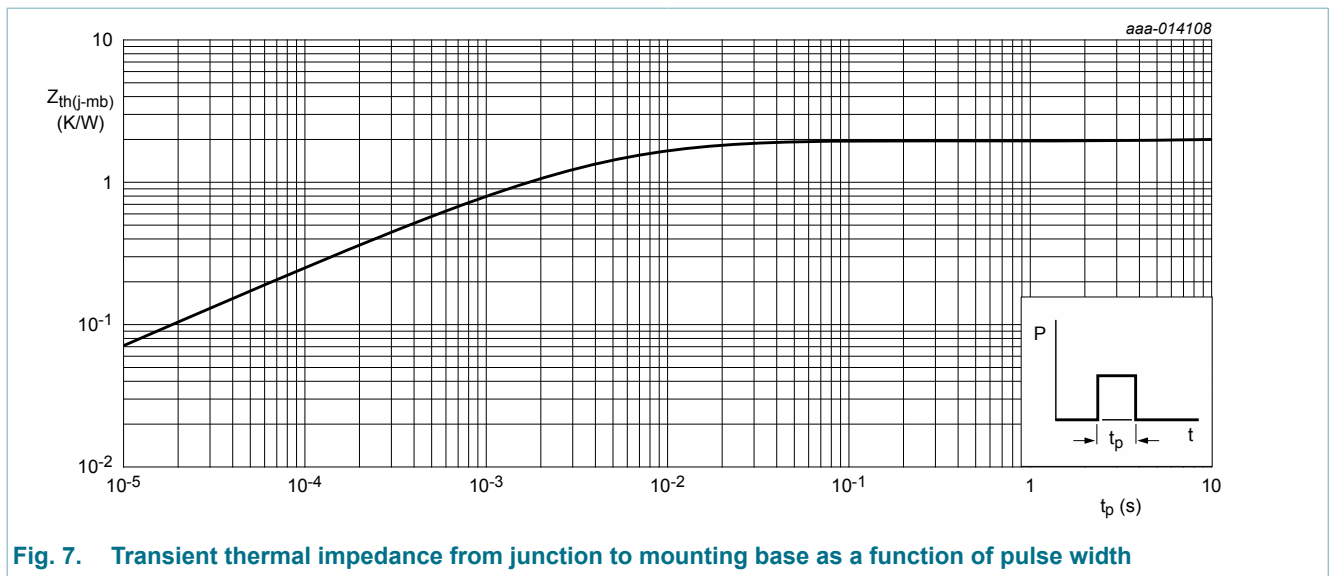


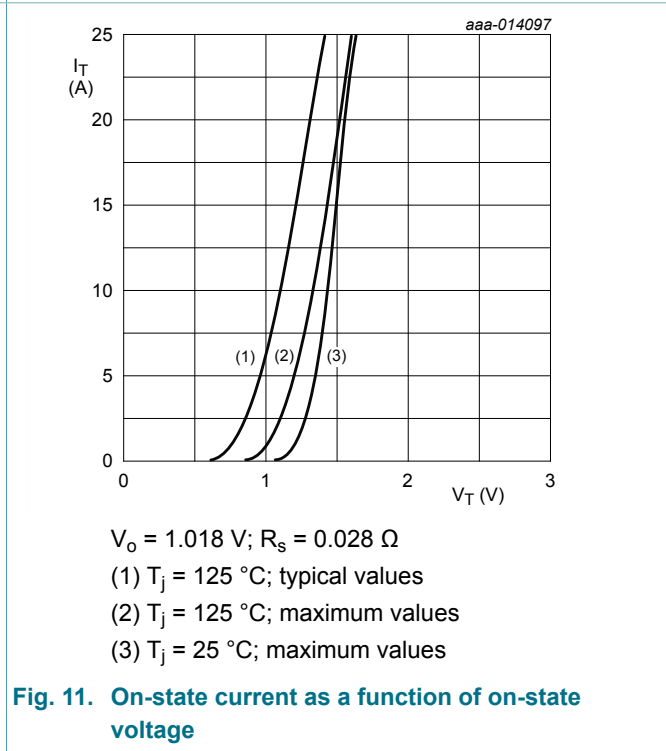
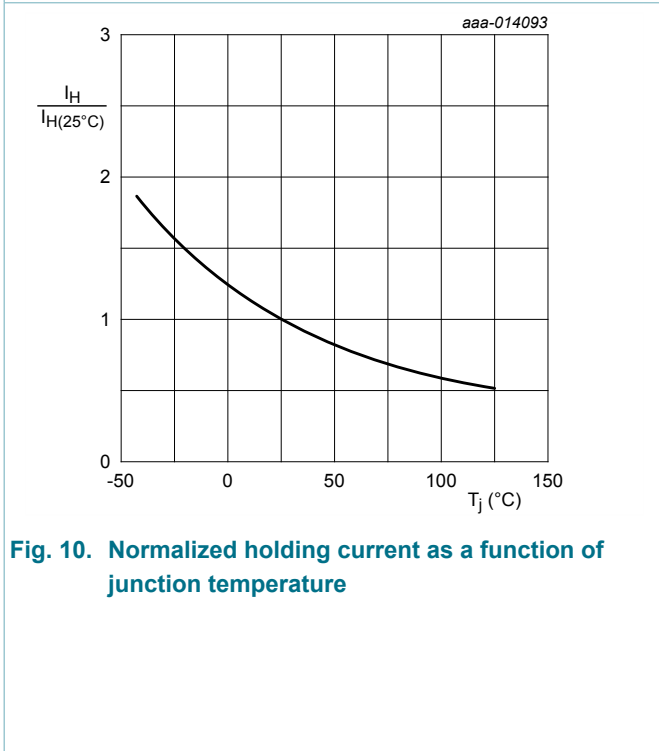
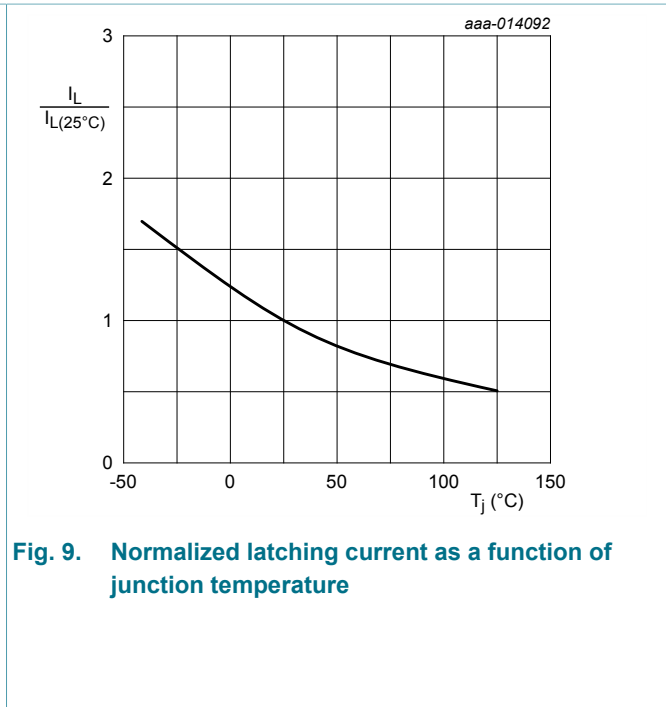
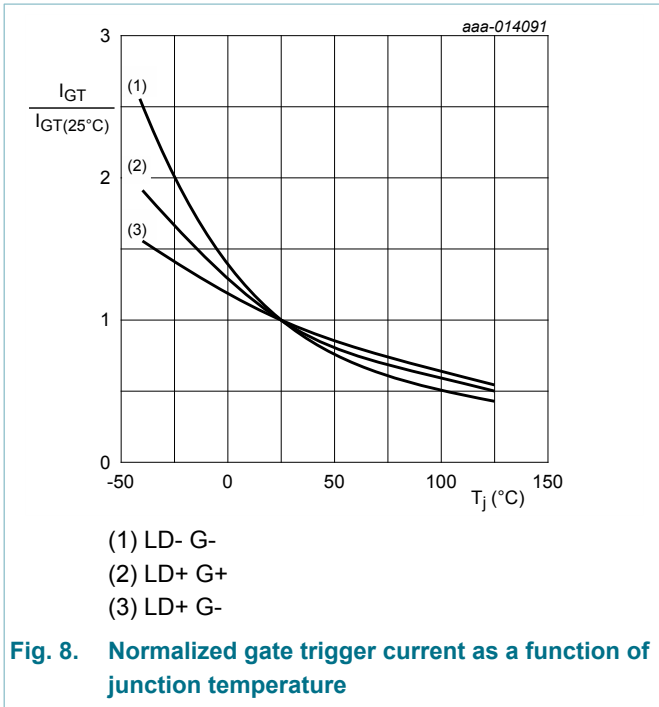
Fig. 7. Transient thermal impedance from junction to mounting base as a function of pulse width

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
I <sub>GT</sub>	gate trigger current	V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; LD+ G+; T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>	-	-	35	mA
		V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; LD+ G-; T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>	-	-	35	mA
		V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; LD- G-; T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>	-	-	35	mA
I <sub>L</sub>	latching current	V <sub>D</sub> = 12 V; I <sub>G</sub> = 100 mA; LD+ G+; T <sub>j</sub> = 25 °C; <a href="#">Fig. 9</a>	-	-	50	mA
		V <sub>D</sub> = 12 V; I <sub>G</sub> = 100 mA; LD+ G-; T <sub>j</sub> = 25 °C; <a href="#">Fig. 9</a>	-	-	70	mA
		V <sub>D</sub> = 12 V; I <sub>G</sub> = 100 mA; LD- G-; T <sub>j</sub> = 25 °C; <a href="#">Fig. 9</a>	-	-	50	mA
I <sub>H</sub>	holding current	V <sub>D</sub> = 12 V; T <sub>j</sub> = 25 °C; <a href="#">Fig. 10</a>	-	-	50	mA
V <sub>T</sub>	on-state voltage	I <sub>T</sub> = 17 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 11</a>	-	1.25	1.5	V
V <sub>GT</sub>	gate trigger voltage	V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; T <sub>j</sub> = 25 °C; <a href="#">Fig. 12</a>	-	0.8	1	V
		V <sub>D</sub> = 400 V; I <sub>T</sub> = 100 mA; T <sub>j</sub> = 125 °C; <a href="#">Fig. 12</a>	0.2	0.45	-	V
I <sub>D</sub>	off-state current	V <sub>D</sub> = 800 V; T <sub>j</sub> = 25 °C	-	-	10	μA
		V <sub>D</sub> = 800 V; T <sub>j</sub> = 125 °C	-	-	0.5	mA
V <sub>CL</sub>	clamping voltage	I <sub>CL</sub> = 0.1 mA; t <sub>p</sub> = 1 ms; T <sub>j</sub> = 25 °C	850	-	-	V
<b>Dynamic characteristics</b>						
dV <sub>D</sub> /dt	rate of rise of off-state voltage	V <sub>DM</sub> = 536 V; T <sub>j</sub> = 125 °C; (V <sub>DM</sub> = 67% of V <sub>DRM</sub> ); exponential waveform; gate open circuit	3000	-	-	V/μs
di <sub>com</sub> /dt	rate of change of commutating current	V <sub>D</sub> = 400 V; T <sub>j</sub> = 125 °C; I <sub>T(RMS)</sub> = 12 A; dV <sub>com</sub> /dt = 20 V/μs; (snubberless condition); gate open circuit	14	-	-	A/ms





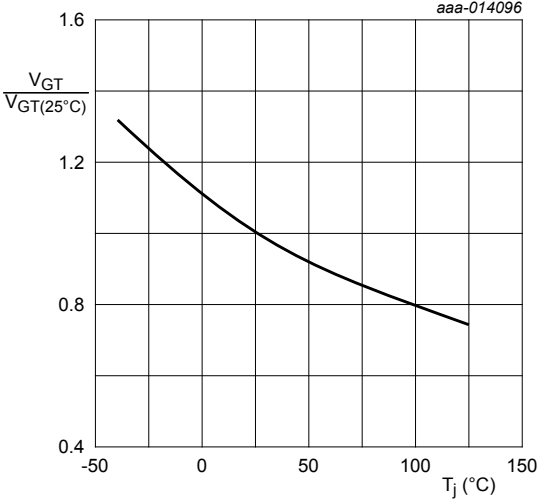
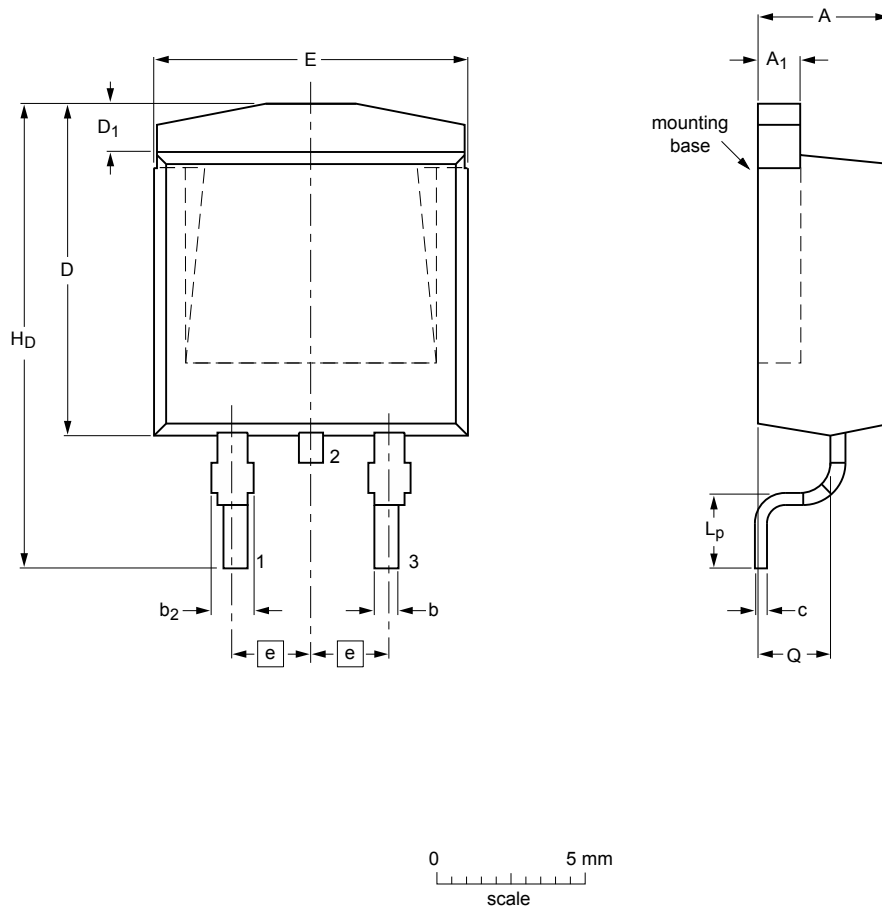


Fig. 12. Normalized gate trigger voltage as a function of junction temperature

### 11. Package outline

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) SOT404



Dimensions (mm are the original dimensions)

Unit	A	A <sub>1</sub>	b	b <sub>2</sub>	c	D	D <sub>1</sub>	E	e	H <sub>D</sub>	L <sub>p</sub>	Q
max	4.5	1.40	0.85	1.45	0.64	11	1.6	10.3		15.8	2.9	2.6
nom									2.54			
min	4.1	1.27	0.60	1.05	0.46		1.2	9.7		14.8	2.1	2.2

sot404\_po

Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOT404					-06-03-16- 13-02-25

Fig. 13. Package outline D2PAK (SOT404)

## 12. Legal information

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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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