



# ACT108-600D

## AC Thyristor power switch

20 August 2014

Product data sheet

## 1. General description

AC Thyristor power switch in a SOT54 plastic package with self-protective capabilities against low and high energy transients

## 2. Features and benefits

- Exclusive negative gate triggering
- Full cycle AC conduction
- High noise immunity
- Remote gate separates the gate driver from the effects of the load current
- Very sensitive gate for lowest gate trigger current
- Safe clamping of low energy over-voltage transients
- Self-protective turn-on during high energy voltage transients

## 3. Applications

- Fan motor circuits
- Pump motor circuits
- Lower-power highly inductive, resistive and safety loads

## 4. Quick reference data

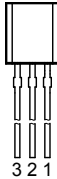
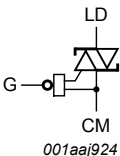
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{\text{DRM}}$	repetitive peak off-state voltage		-	-	600	V
$I_{\text{TSM}}$	non-repetitive peak on-state current	full sine wave; $T_{\text{J}(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_{\text{p}} = 20\text{ ms}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	8	A
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{lead}} \leq 71\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a>	-	-	0.8	A
$V_{\text{PP}}$	peak pulse voltage	$T_{\text{J}} = 25\text{ }^{\circ}\text{C}$ ; non-repetitive, off-state; <a href="#">Fig. 4</a>	-	-	2	kV
<b>Static characteristics</b>						
$I_{\text{GT}}$	gate trigger current	$V_{\text{D}} = 12\text{ V}$ ; $I_{\text{T}} = 100\text{ mA}$ ; LD+ G-; $T_{\text{J}} = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 6</a>	0.5	-	5	mA
		$V_{\text{D}} = 12\text{ V}$ ; $I_{\text{T}} = 100\text{ mA}$ ; LD- G-; $T_{\text{J}} = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 6</a>	0.5	-	5	mA
$V_{\text{CL}}$	clamping voltage	$I_{\text{CL}} = 0.1\text{ mA}$ ; $t_{\text{p}} = 1\text{ ms}$ ; $T_{\text{J}} \leq 125\text{ }^{\circ}\text{C}$	650	-	-	V



## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	CM	common	 <p>TO-92 (SOT54)</p>	 <p>001aaJ924</p>
2	G	gate		
3	LD	load		

## 6. Ordering information

Table 3. Ordering information

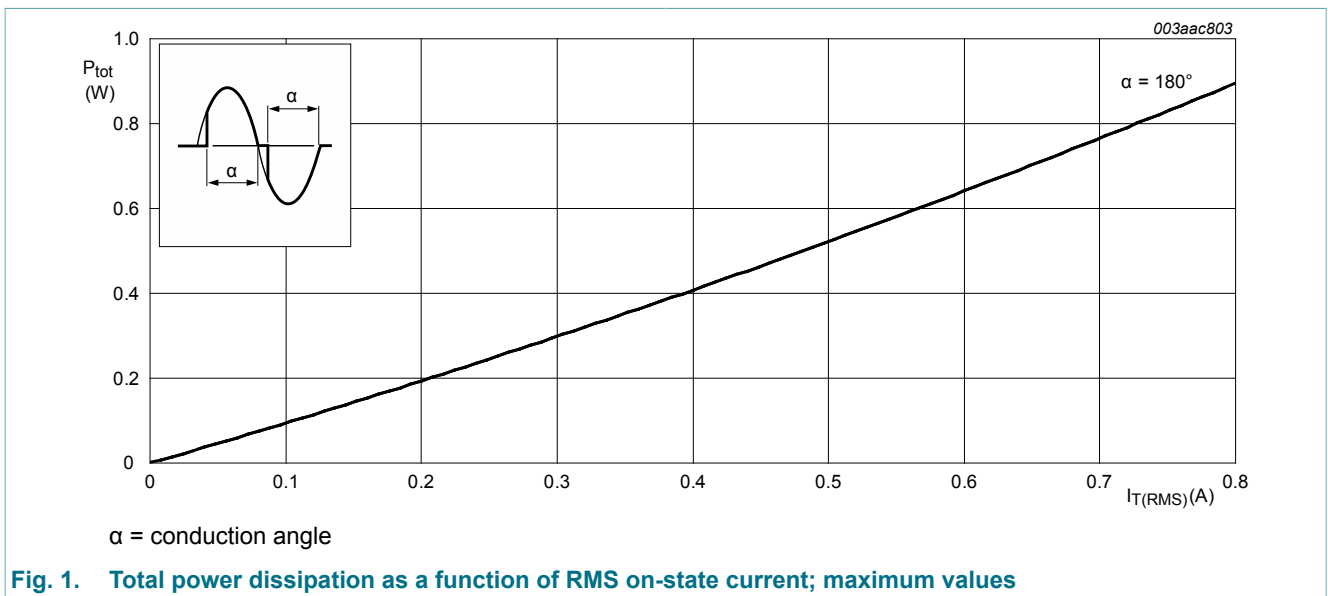
Type number	Package		
	Name	Description	Version
ACT108-600D	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54
ACT108-600D/DG	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54

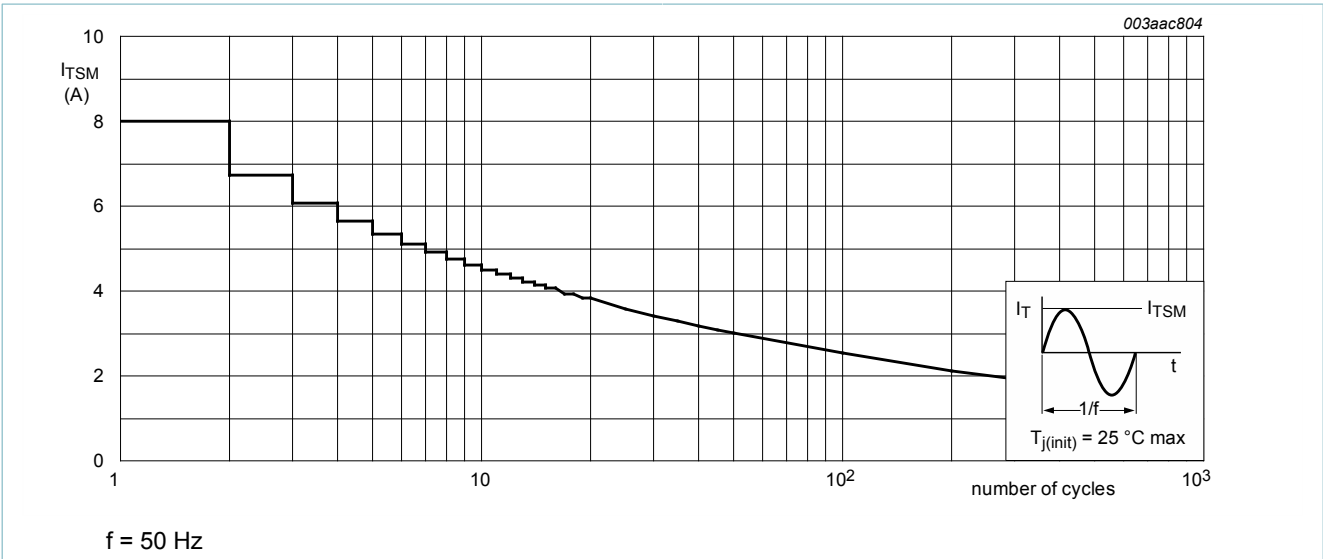
## 7. Limiting values

**Table 4. Limiting values**

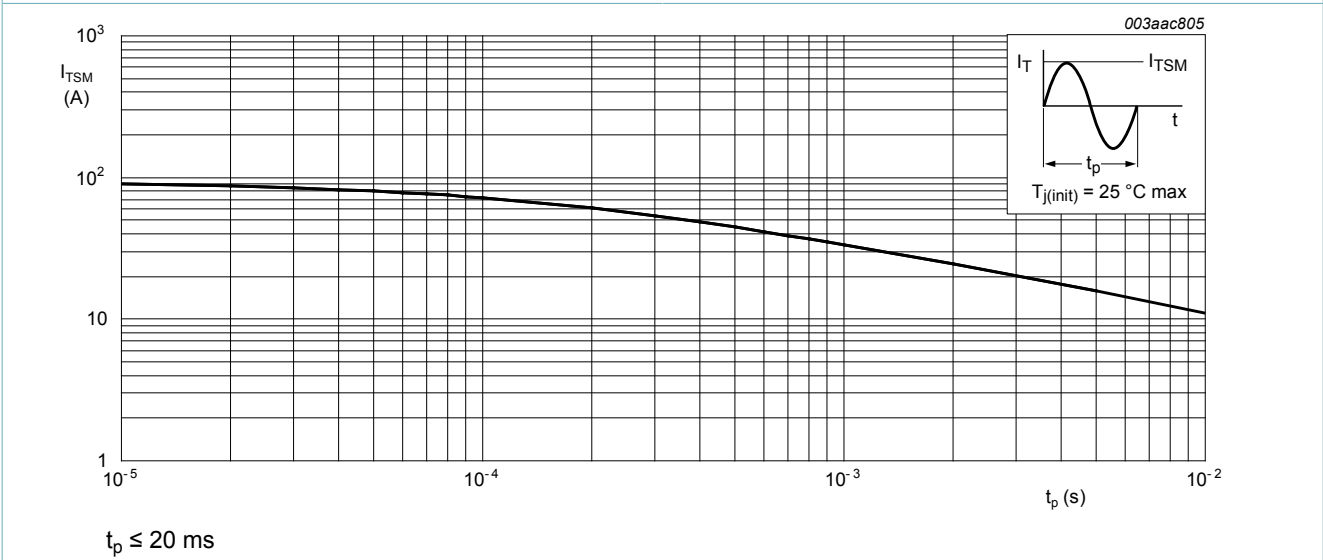
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 71\text{ }^\circ\text{C}$ ; <a href="#">Fig. 1</a>	-	0.8	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ }^\circ\text{C}$ ; $t_p = 16.7\text{ ms}$	-	8.8	A
		full sine wave; $T_{j(init)} = 25\text{ }^\circ\text{C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	8	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; SIN	-	0.32	$\text{A}^2\text{s}$
$di_T/dt$	rate of rise of on-state current	$I_T = 1\text{ A}$ ; $I_G = 10\text{ mA}$ ; $di_G/dt = 0.2\text{ A}/\mu\text{s}$	-	50	$\text{A}/\mu\text{s}$
$I_{GM}$	peak gate current	$t = 20\text{ }\mu\text{s}$	-	1	A
$V_{GM}$	peak gate voltage		-	15	V
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.1	W
$T_{stg}$	storage temperature		-40	150	$^\circ\text{C}$
$T_j$	junction temperature		-	125	$^\circ\text{C}$
$V_{PP}$	peak pulse voltage	$T_j = 25\text{ }^\circ\text{C}$ ; non-repetitive, off-state; <a href="#">Fig. 4</a>	-	2	kV

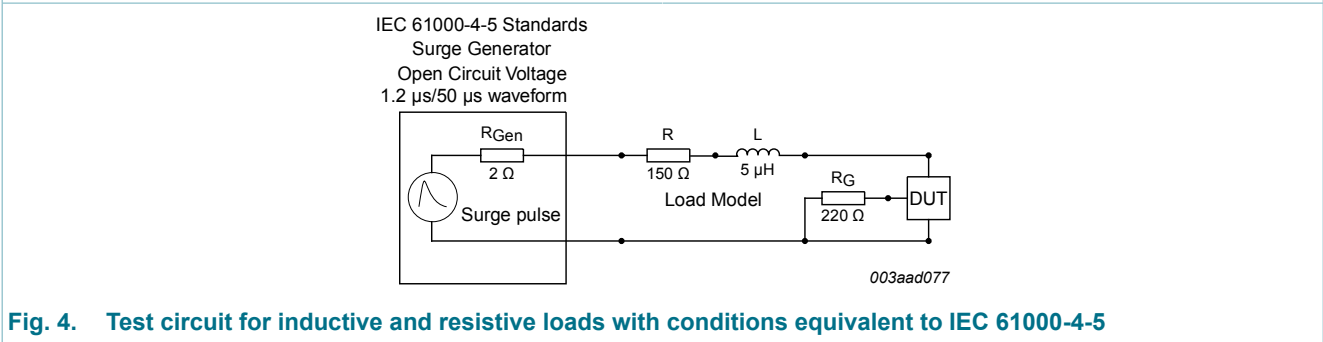




**Fig. 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values**



**Fig. 3. Non-repetitive peak on-state current as a function of pulse width; maximum values**



**Fig. 4. 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
$R_{th(j-lead)}$	thermal resistance from junction to lead	full cycle with heatsink compound; <a href="#">Fig. 5</a>	-	-	60	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	full cycle; printed-circuit board mounted; lead length 4 mm	-	150	-	K/W

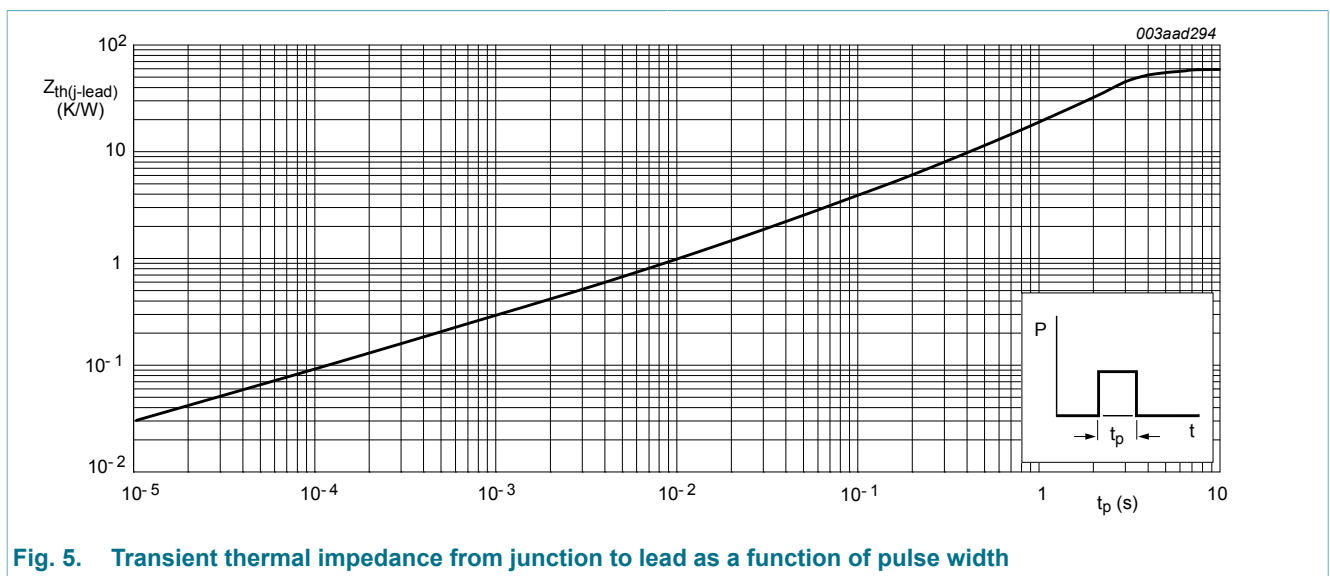
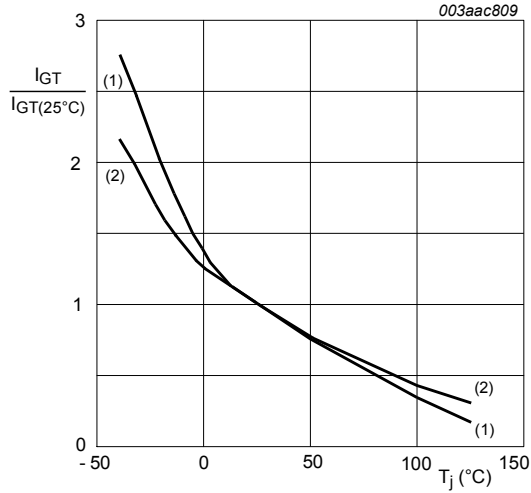


Fig. 5. Transient thermal impedance from junction to lead as a function of pulse width

## 9. Characteristics

Table 6. 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. 6</a>	0.5	-	5	mA
		V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; LD- G-; T <sub>j</sub> = 25 °C; <a href="#">Fig. 6</a>	0.5	-	5	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. 7</a>	-	-	25	mA
		V <sub>D</sub> = 12 V; I <sub>G</sub> = 100 mA; LD- G-; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>	-	-	25	mA
I <sub>H</sub>	holding current	V <sub>D</sub> = 12 V; T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>	-	-	20	mA
V <sub>T</sub>	on-state voltage	I <sub>T</sub> = 1.1 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 9</a>	-	-	1.3	V
V <sub>GT</sub>	gate trigger voltage	V <sub>D</sub> = 400 V; I <sub>T</sub> = 100 mA; T <sub>j</sub> = 125 °C	0.15	-	-	V
		V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; T <sub>j</sub> = 25 °C	-	-	0.9	V
I <sub>D</sub>	off-state current	V <sub>D</sub> = 600 V; T <sub>j</sub> = 25 °C	-	-	2	μA
		V <sub>D</sub> = 600 V; T <sub>j</sub> = 125 °C	-	-	0.2	mA
V <sub>CL</sub>	clamping voltage	I <sub>CL</sub> = 0.1 mA; t <sub>p</sub> = 1 ms; T <sub>j</sub> ≤ 125 °C	650	-	-	V
<b>Dynamic characteristics</b>						
dV <sub>D</sub> /dt	rate of rise of off-state voltage	V <sub>DM</sub> = 402 V; T <sub>j</sub> = 125 °C; (V <sub>DM</sub> = 67% of V <sub>DRM</sub> ); exponential waveform; gate open circuit; <a href="#">Fig. 10</a>	300	-	-	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> 1 A; dV <sub>com</sub> /dt = 15 V/μs; gate open circuit; <a href="#">Fig. 11</a> ; <a href="#">Fig. 12</a>	0.15	-	-	A/ms



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

Fig. 6. Normalized gate trigger current as a function of junction temperature

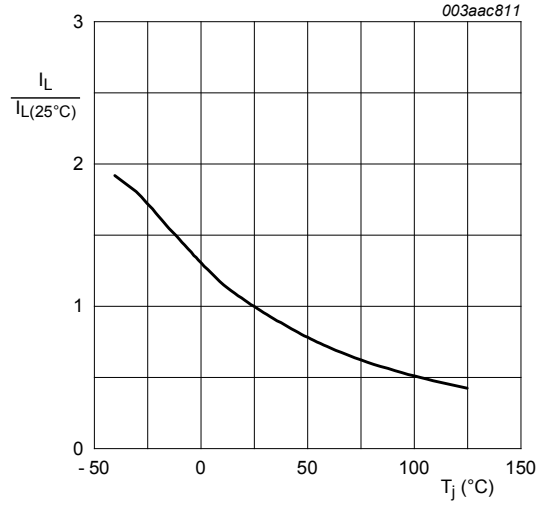


Fig. 7. Normalized latching current as a function of junction temperature

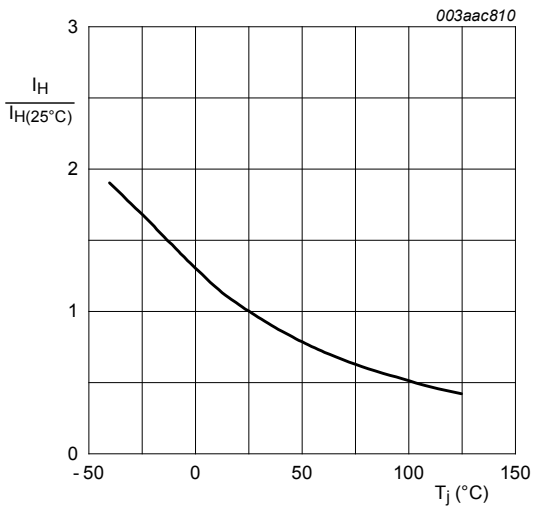
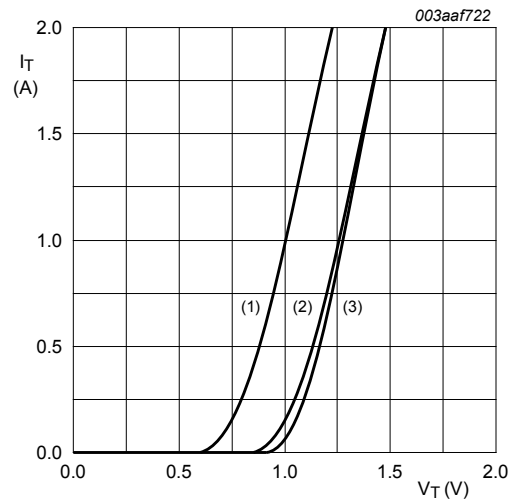


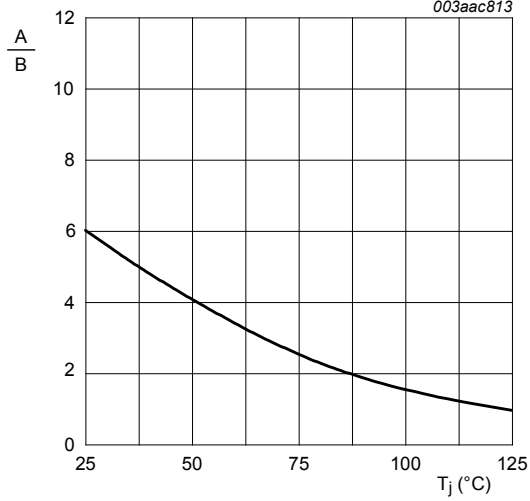
Fig. 8. Normalized holding current as a function of junction temperature



$V_o = 0.758 \text{ V}$ ;  $R_s = 0.263 \Omega$

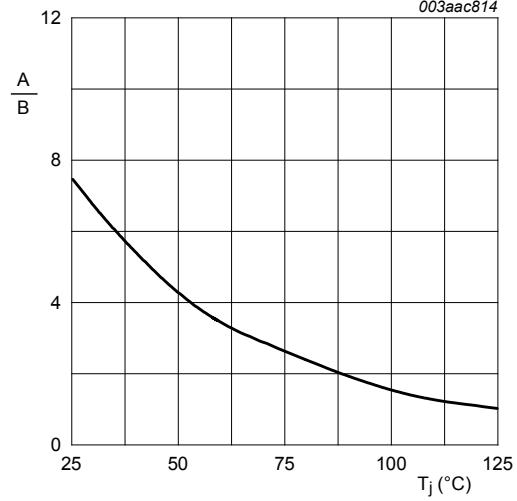
- (1)  $T_j = 125^{\circ}\text{C}$ ; typical values
- (2)  $T_j = 125^{\circ}\text{C}$ ; maximum values
- (3)  $T_j = 25^{\circ}\text{C}$ ; maximum values

Fig. 9. On-state current as a function of on-state voltage



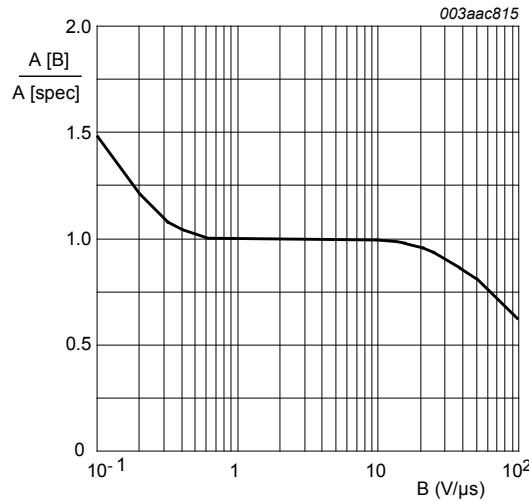
A =  $dV_D/dt$  at condition  $T_j$  °C  
 B =  $dV_D/dt$  at condition  $T_j$  [125] °C

**Fig. 10. 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. 11. Normalized critical rate of rise of commutating current as a function of junction temperature**



A [B] =  $di_{com}/dt$  at condition B,  $dV_{com}/dt$   
 A [spec] is the data sheet value for  $di_{com}/dt$   
 turn-off time is less than 20 ms

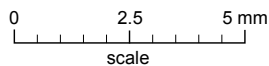
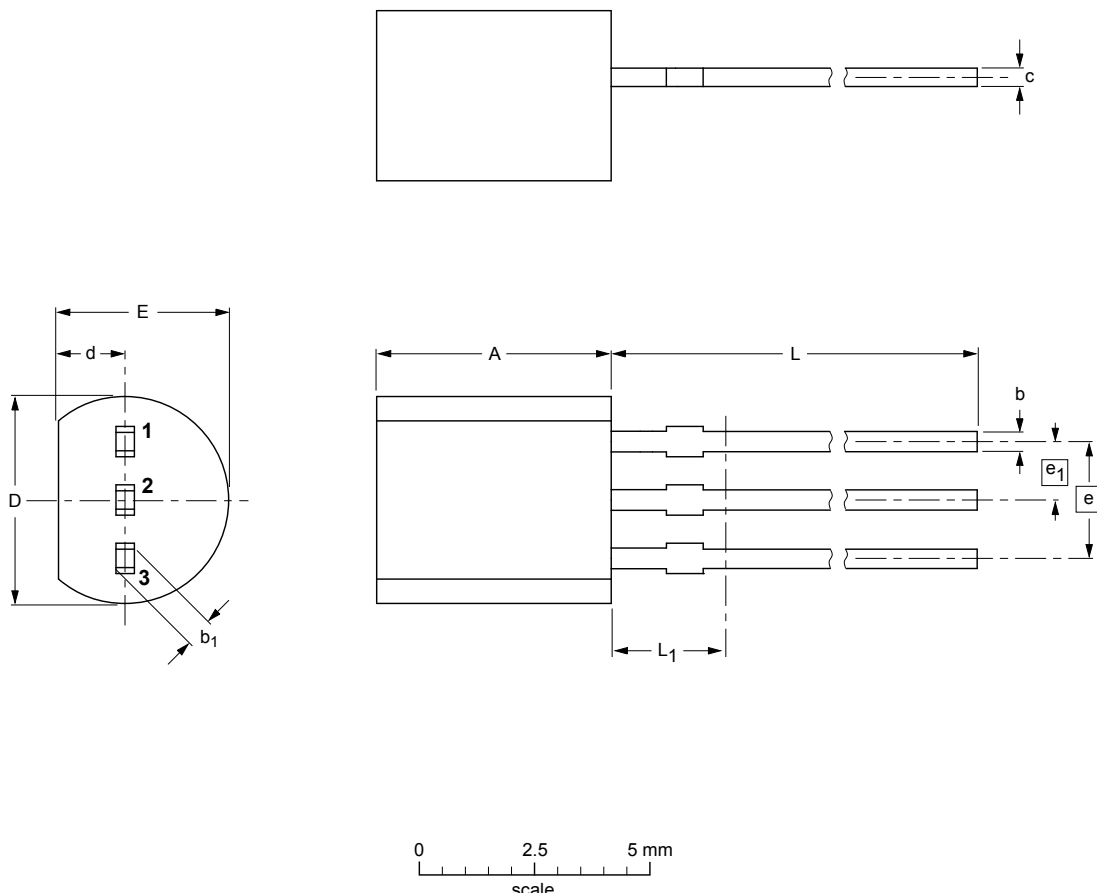
**Fig. 12. Normalized critical rate of change of commutating current as a function of critical rate of change of commutating voltage; minimum values**



### 10. Package outline

Plastic single-ended leaded (through hole) package; 3 leads

SOT54



**DIMENSIONS** (mm are the original dimensions)

UNIT	A	b	b <sub>1</sub>	c	D	d	E	e	e <sub>1</sub>	L	L <sub>1</sub> <sup>(1)</sup> max.
mm	5.2 5.0	0.48 0.40	0.66 0.55	0.45 0.38	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 12.7	2.5

**Note**

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT54		TO-92	SC-43A			-04-06-28- 04-11-16

Fig. 13. Package outline TO-92 (SOT54)

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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.
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