

ACT108-600D

AC Thyristor power switch

Rev. 02 — 27 December 2010

Product data sheet

1. Product profile

1.1 General description

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

1.2 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
- Safe clamping of low energy over-voltage transients
- Self-protective turn-on during high energy voltage transients
- Very sensitive gate for lowest gate trigger current

1.3 Applications

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

1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	600	V
I_{GT}	gate trigger current	$V_{\text{D}} = 12 \text{ V}$; $I_{\text{T}} = 100 \text{ mA}$; LD- G-; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$	0.5	-	5	mA
		$V_{\text{D}} = 12 \text{ V}$; $I_{\text{T}} = 100 \text{ mA}$; LD+ G-; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$; see Figure 6	0.5	-	5	mA
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{lead}} \leq 71 \text{ }^{\circ}\text{C}$; see Figure 2	-	-	0.8	A
dV_{D}/dt	rate of rise of off-state voltage	$V_{\text{DM}} = 402 \text{ V}$; $T_{\text{j}} = 125 \text{ }^{\circ}\text{C}$; gate open circuit; exponential waveform; see Figure 10	300	-	-	V/ μs
V_{CL}	clamping voltage	$I_{\text{CL}} = 100 \text{ } \mu\text{A}$; $t_{\text{p}} = 1 \text{ ms}$; $T_{\text{j}} \leq 125 \text{ }^{\circ}\text{C}$; see Figure 13	650	-	-	V

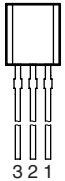
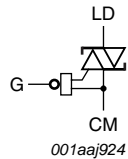


Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 25\text{ °C}$	-	-	0.9	V
V_{PP}	peak pulse voltage	$T_j = 25\text{ °C}$; non-repetitive, off-state; see Figure 1	-	-	2	kV
V_T	on-state voltage	$I_T = 1.1\text{ A}$; see Figure 9	-	-	1.3	V

2. Pinning information

Table 2. Pinning information

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

3. Ordering information

Table 3. Ordering information

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

4. 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; $T_{lead} \leq 71\text{ }^{\circ}\text{C}$; see Figure 2	-	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; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$; $t_p = 20\text{ ms}$; see Figure 3 ; see Figure 4	-	8	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; sine-wave pulse	-	0.32	A^2s
dl_T/dt	rate of rise of on-state current	$I_T = 1\text{ A}$; $I_G = 10\text{ mA}$; $dl_G/dt = 0.2\text{ A}/\mu\text{s}$	-	50	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current	$t = 20\text{ }\mu\text{s}$	-	1	A
V_{GM}	peak gate voltage	positive applied 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; see Figure 1	-	2	kV

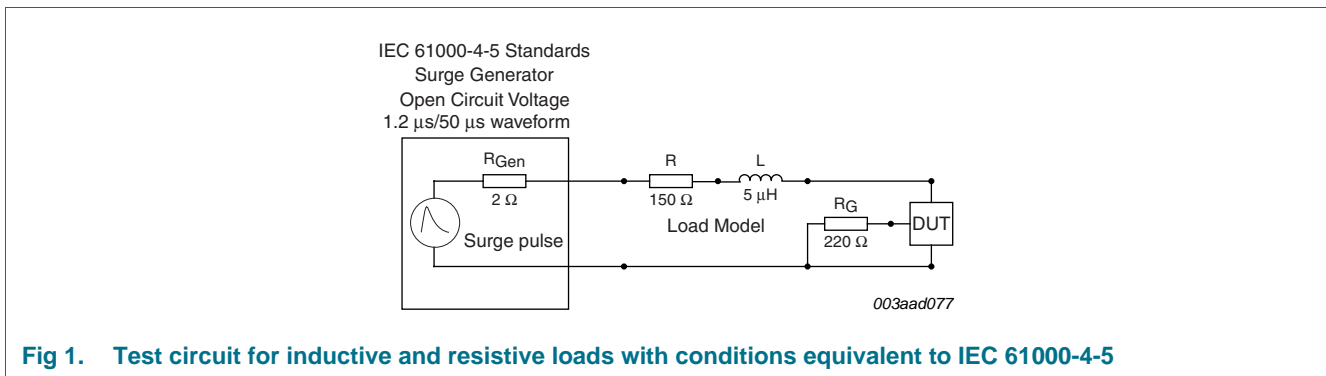


Fig 1. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

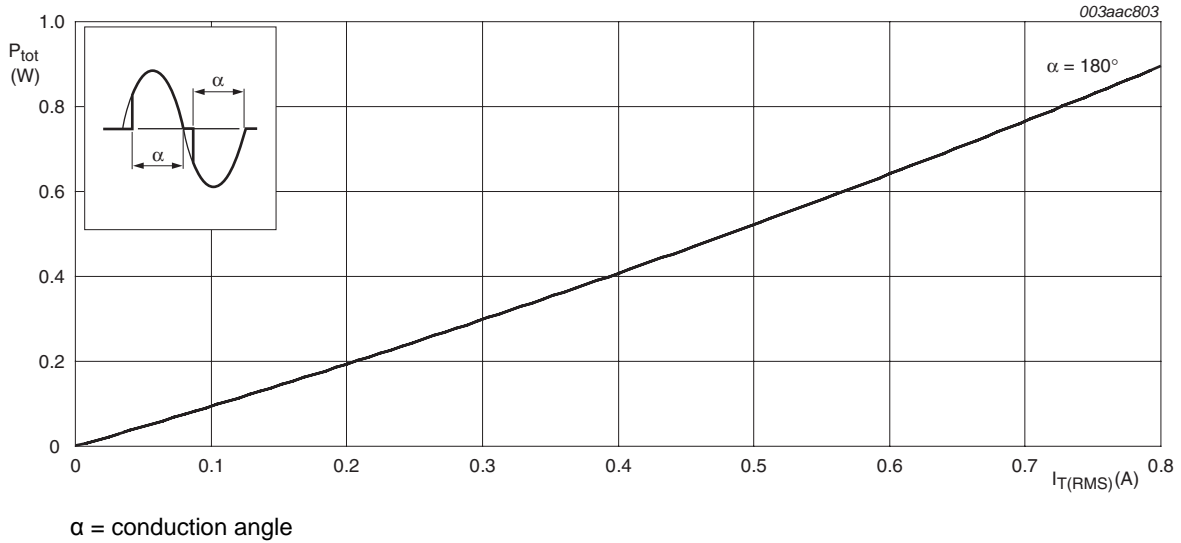


Fig 2. Total power dissipation as a function of RMS on-state current; maximum values

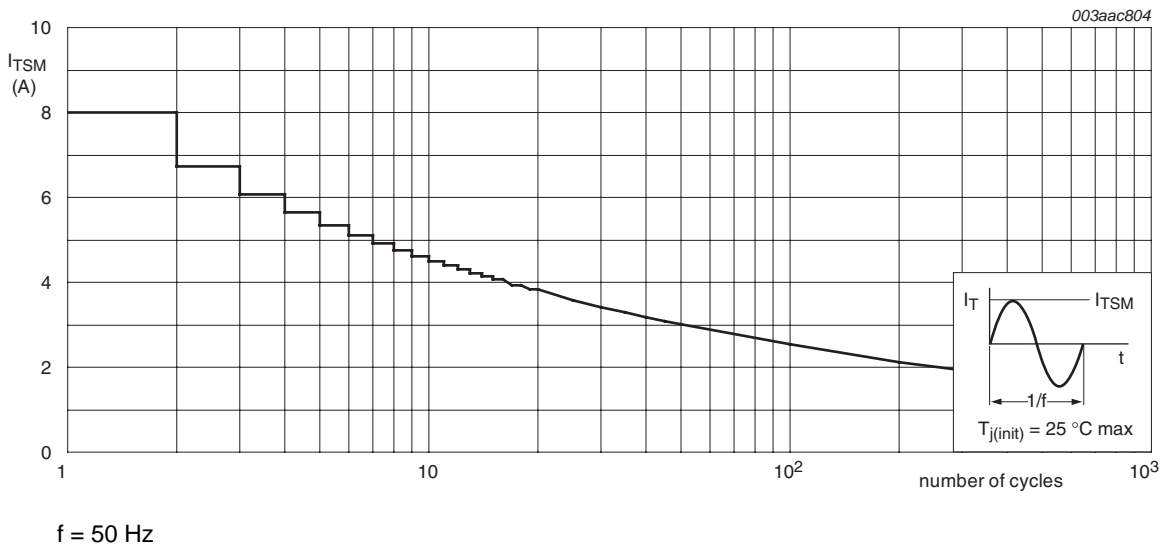
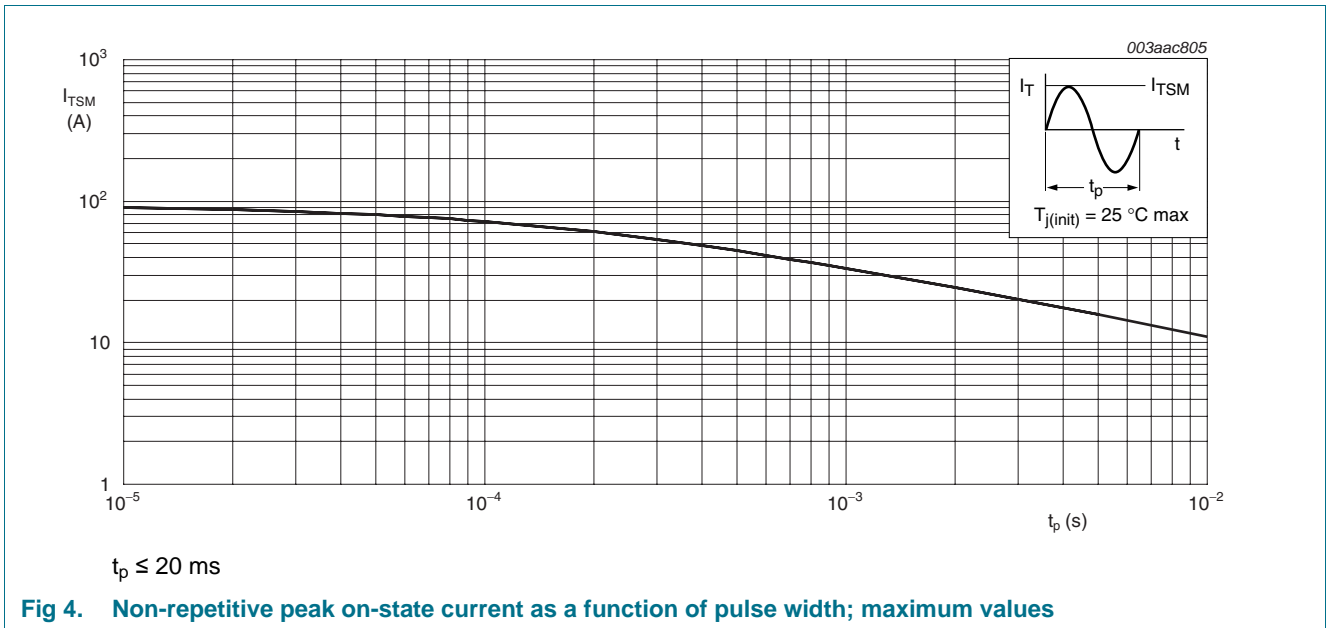


Fig 3. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



5. 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; see Figure 5	-	-	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

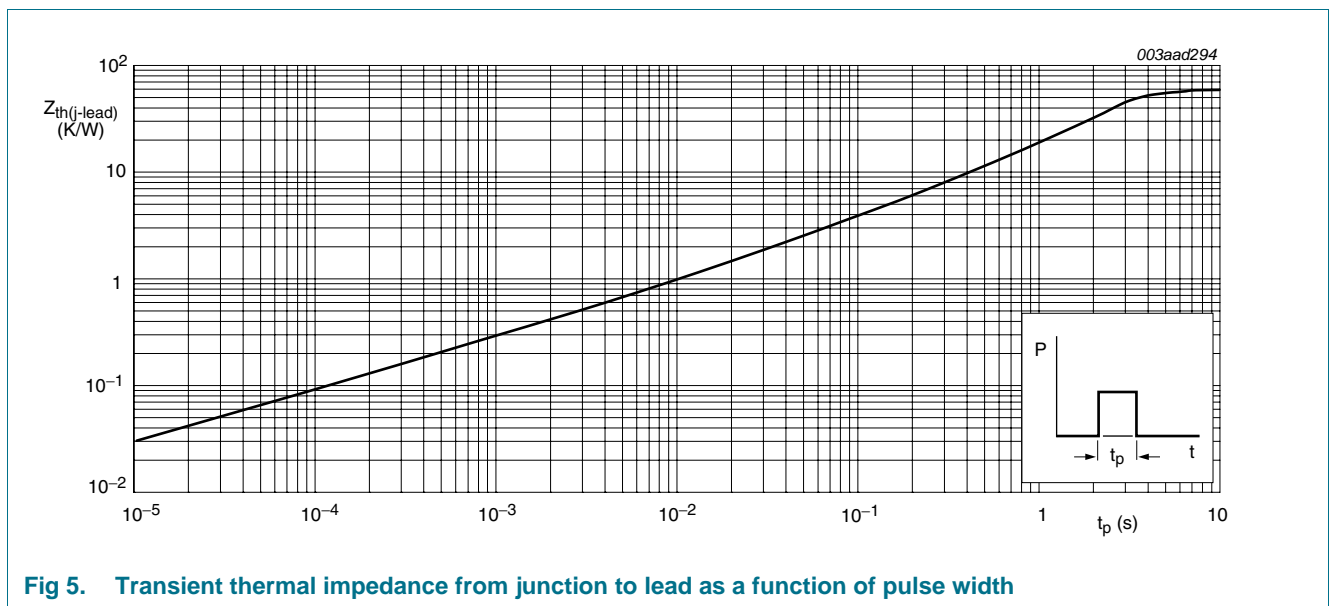
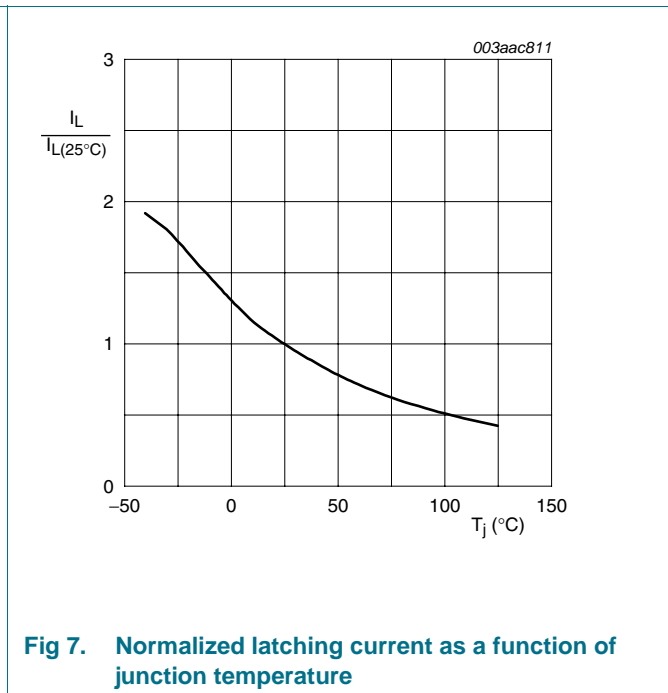
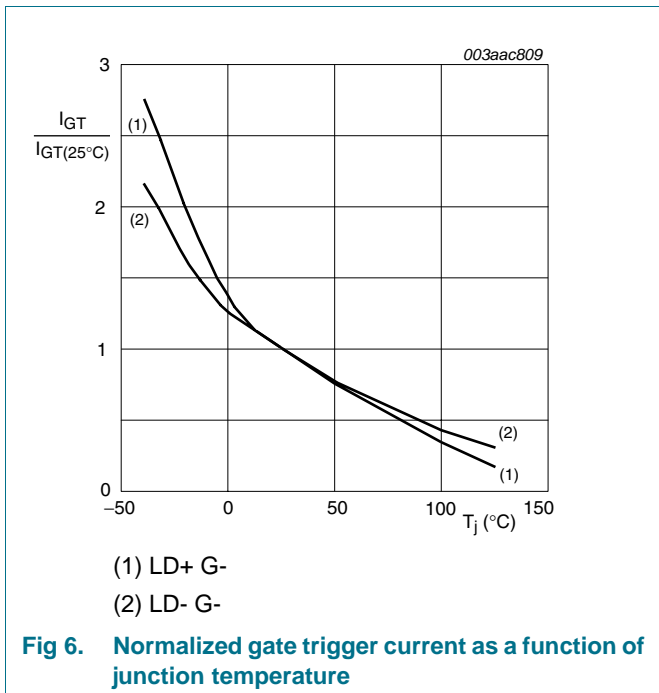


Fig 5. Transient thermal impedance from junction to lead as a function of pulse width

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{GT}	gate trigger current	V _D = 12 V; I _T = 100 mA; LD- G-; T _j = 25 °C	0.5	-	5	mA
		V _D = 12 V; I _T = 100 mA; LD+ G-; T _j = 25 °C; see Figure 6	0.5	-	5	mA
I _L	latching current	V _D = 12 V; I _G = 12 mA; T _j = 25 °C; see Figure 7	-	-	25	mA
I _H	holding current	V _D = 12 V; T _j = 25 °C; see Figure 8	-	-	20	mA
V _T	on-state voltage	I _T = 1.1 A; see Figure 9	-	-	1.3	V
V _{GT}	gate trigger voltage	V _D = 12 V; I _T = 100 mA; T _j ≤ 125 °C	0.15	-	-	V
		V _D = 12 V; I _T = 100 mA; T _j = 25 °C	-	-	0.9	V
I _D	off-state current	V _D = 600 V; T _j ≤ 25 °C	-	-	2	μA
		V _D = 600 V; T _j ≤ 125 °C	-	-	0.2	mA
dV _D /dt	rate of rise of off-state voltage	V _{DM} = 402 V; T _j = 125 °C; gate open circuit; exponential waveform; see Figure 10	300	-	-	V/μs
di _{com} /dt	rate of change of commutating current	V _D = 400 V; T _j = 125 °C; I _{T(RMS)} = 1 A; dV _{com} /dt = 15 V/μs; gate open circuit; see Figure 11 ; see Figure 12	0.15	-	-	A/ms
V _{CL}	clamping voltage	I _{CL} = 100 μA; t _p = 1 ms; T _j ≤ 125 °C; see Figure 13	650	-	-	V



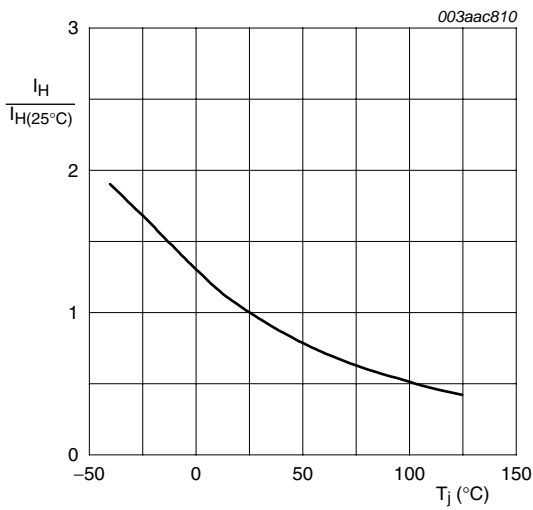
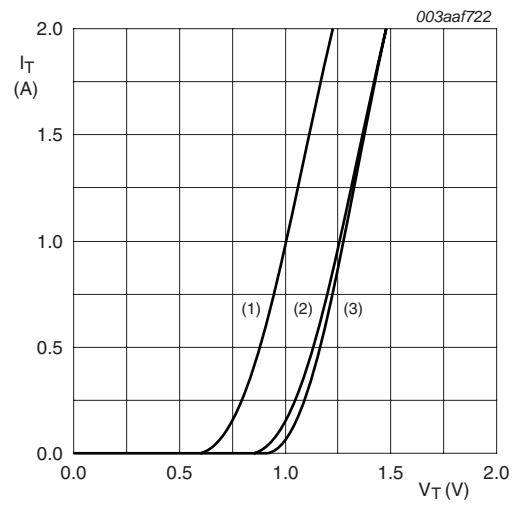
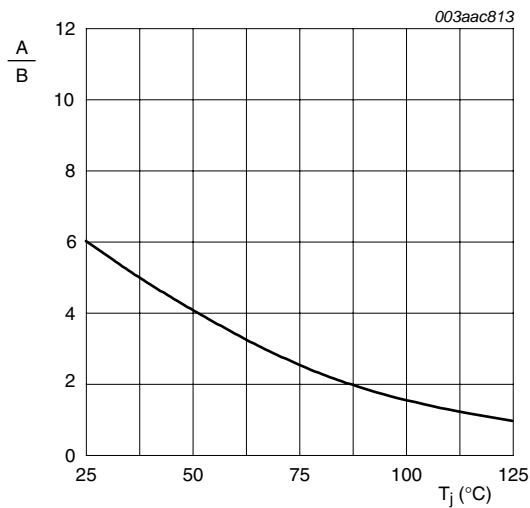


Fig 8. Normalized holding current as a function of junction temperature



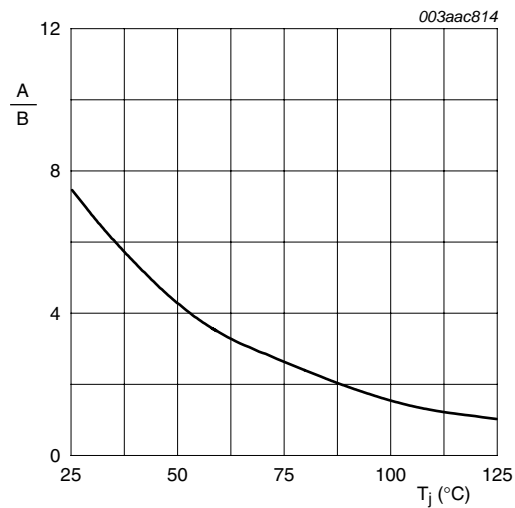
$V_o = 0.758 V$
 $R_s = 0.263 \Omega$
 (1) $T_j = 125 \text{ }^\circ\text{C}$; typical values
 (2) $T_j = 125 \text{ }^\circ\text{C}$; maximum values
 (3) $T_j = 25 \text{ }^\circ\text{C}$; maximum values

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



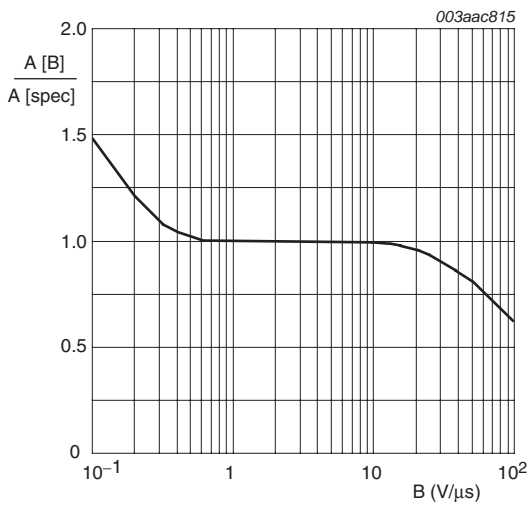
A is dV_D/dt at condition $T_j \text{ }^\circ\text{C}$
 B is dV_D/dt at condition $T_j 125 \text{ }^\circ\text{C}$

Fig 10. Normalized rate of rise of off-state voltage as a function of junction temperature



A is di_{com}/dt at condition $T_j \text{ }^\circ\text{C}$
 B is di_{com}/dt at condition $T_j 125 \text{ }^\circ\text{C}$
 $V_D = 400 V$

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



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

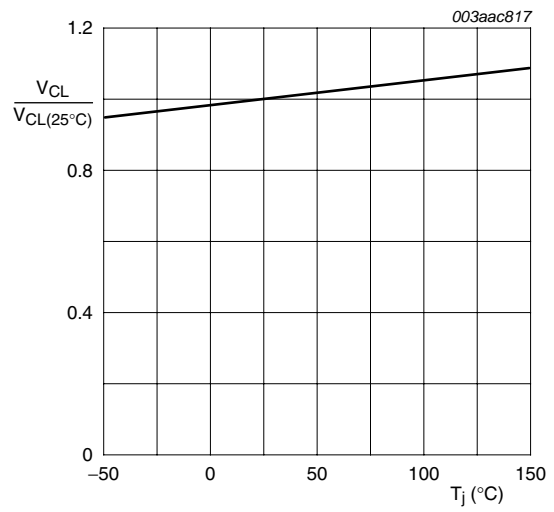


Fig 13. Normalized clamping voltage (upper limit) as a function of junction temperature; minimum values

7. Package outline

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

SOT54

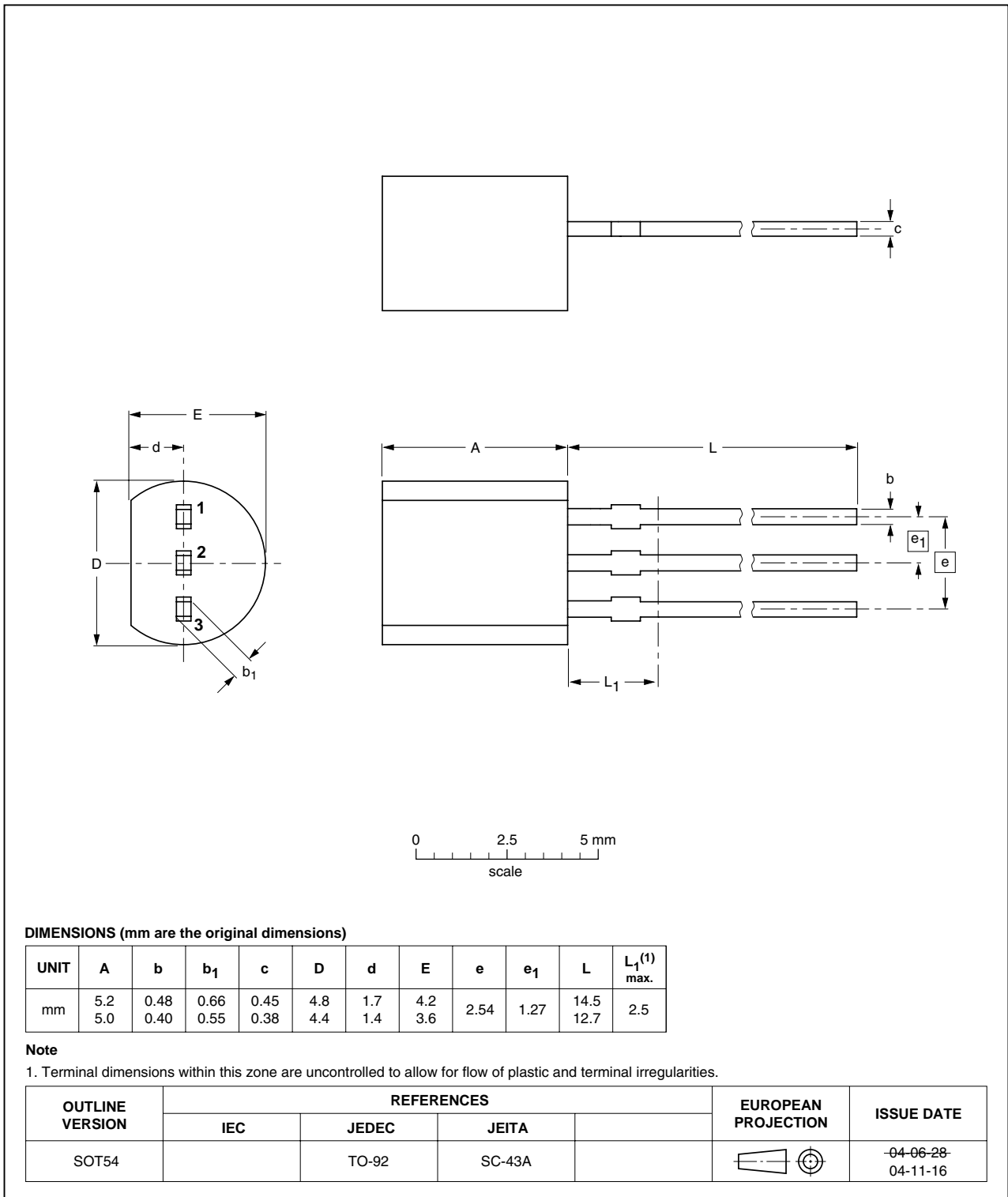


Fig 14. Package outline SOT54 (TO-92)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
ACT108-600D v.2	20101227	Product data sheet	-	ACT108-600D v.1
Modifications:	<ul style="list-style-type: none">• Status changed from preliminary to product.• Various changes to content.			
ACT108-600D v.1	20100902	Preliminary data sheet	-	-

9. Legal information

9.1 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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[1] Please consult the most recently issued document before initiating or completing a design.

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

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11. Contents

1	Product profile	1
1.1	General description	1
1.2	Features and benefits	1
1.3	Applications	1
1.4	Quick reference data	1
2	Pinning information	2
3	Ordering information	2
4	Limiting values	3
5	Thermal characteristics	6
6	Characteristics	7
7	Package outline	10
8	Revision history	11
9	Legal information	12
9.1	Data sheet status	12
9.2	Definitions	12
9.3	Disclaimers	12
9.4	Trademarks	13
10	Contact information	13

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