

ACT108W-600E

AC Thyristor power switch

Rev. 03 — 21 October 2009

Product data sheet

1. Product profile

1.1 General description

AC Thyristor power switch in a SOT223 surface-mountable plastic package with self-protective capabilities against low and high energy transients

1.2 Features and benefits

- Common terminal on mounting base allows multiple ACTs on shared cooling pad
- Exclusive negative gate triggering
- Full cycle AC conduction
- 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
- Surface-mountable package
- Very high noise immunity

1.3 Applications

- Contactors, circuit breakers, valves, dispensers and door locks
- Fan motor circuits
- Lower-power highly inductive, resistive and safety loads
- Pump motor circuits

1.4 Quick reference data

Table 1. Quick reference

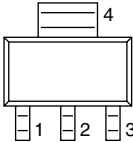
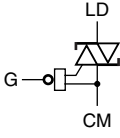
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	600	V
I_{GT}	gate trigger current	$V_{\text{D}} = 12 \text{ V}$; $I_{\text{T}} = 100 \text{ mA}$; LD+ G-; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$; see Figure 10	1	-	10	mA
		$V_{\text{D}} = 12 \text{ V}$; $I_{\text{T}} = 100 \text{ mA}$; LD- G-; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$	1	-	10	mA
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{sp}} \leq 112 \text{ }^{\circ}\text{C}$; see Figure 3 , 1 and 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; see Figure 14	1000	-	-	V/ μs

Table 1. Quick reference ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CL}	clamping voltage	I _{CL} = 100 mA; t _p = 1 ms; T _j ≤ 125 °C; see Figure 17	650	-	-	V
V _{PP}	peak pulse voltage	T _j = 25 °C; non-repetitive, off-state; see Figure 6	-	-	2	kV
V _T	on-state voltage	I _T = 1.1 A; see Figure 13	-	-	1.3	V

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	LD	load		
2	CM	common		
3	G	gate		
mb	CM	mounting base; connected to common		

SOT223 (SC-73)

001aa924

3. Ordering information

Table 3. Ordering information

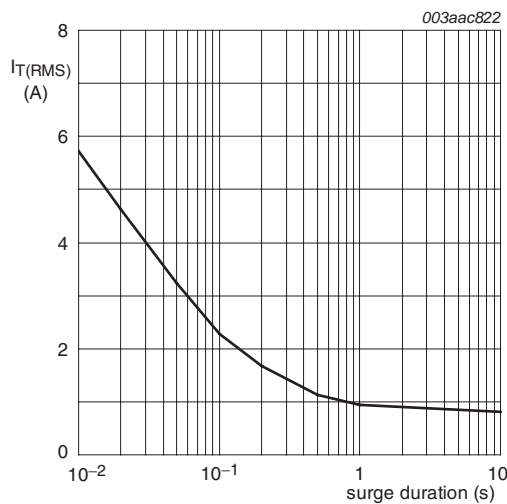
Type number	Package		Version
	Name	Description	
ACT108W-600E	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

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
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{sp}} \leq 112\text{ }^{\circ}\text{C}$; see Figure 3 , 1 and 2	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 16.7\text{ ms}$	-	8.8	A
		full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 20\text{ ms}$; see Figure 4 and 5	-	8	A
I^2t	I^2t for fusing	$t_{\text{p}} = 10\text{ ms}$; sin-wave pulse	-	0.32	A^2s
dl_{T}/dt	rate of rise of on-state current	$I_{\text{T}} = 1\text{ A}$; $I_{\text{G}} = 20\text{ mA}$; $dl_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$	-	100	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current	$t = 20\text{ }\mu\text{s}$	-	1	A
V_{GM}	peak gate voltage	positive applied gate voltage	-	15	V
$P_{\text{G(AV)}}$	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	$T_{\text{j}} = 25\text{ }^{\circ}\text{C}$; non-repetitive, off-state; see Figure 6	-	2	kV



$$f = 50\text{ Hz}; T_{\text{sp}} = 112\text{ }^{\circ}\text{C}$$

Fig 1. RMS on-state current as a function of surge duration; maximum values

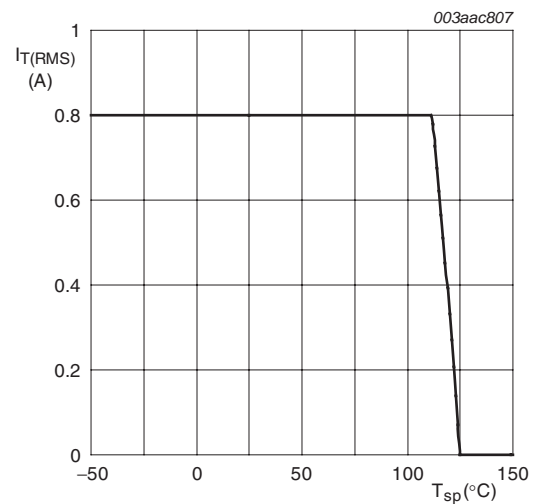


Fig 2. RMS on-state current as a function of solder point temperature; maximum values

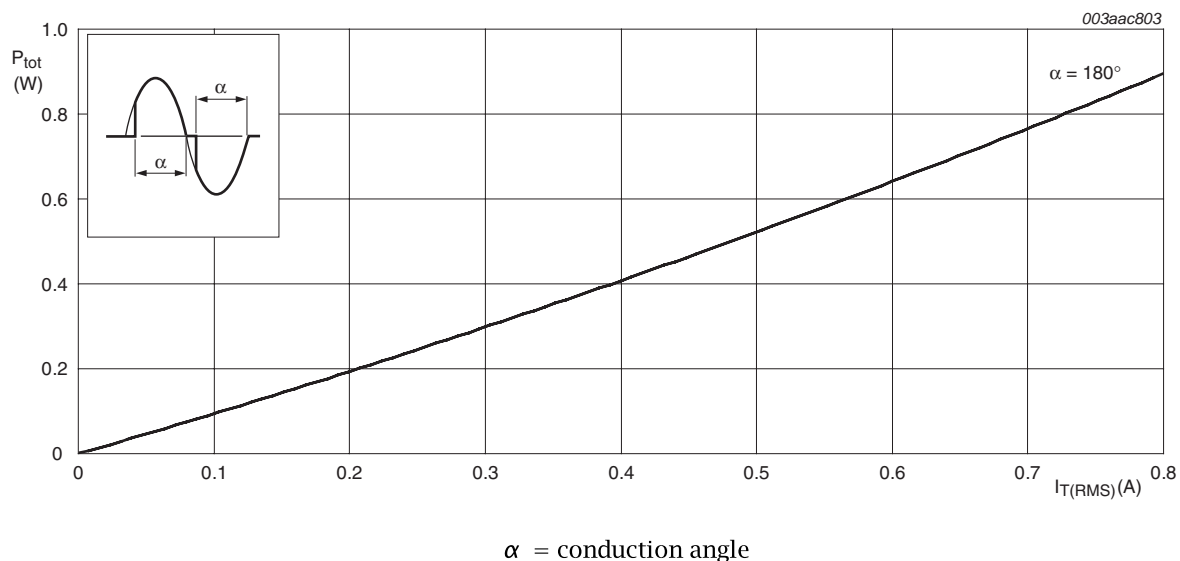


Fig 3. Total power dissipation as a function of RMS on-state current; maximum values

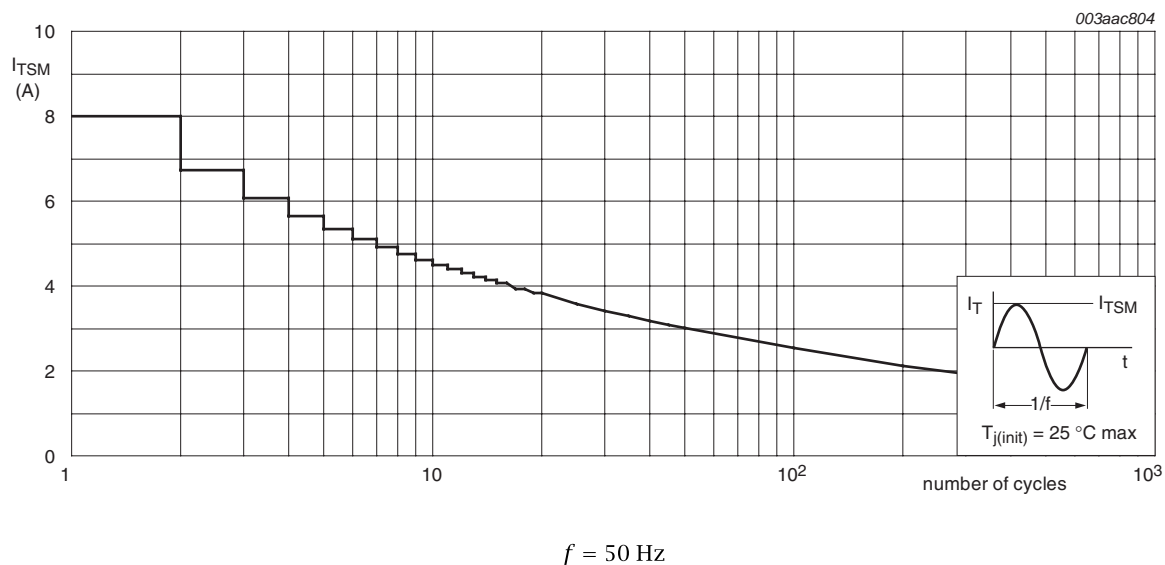


Fig 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

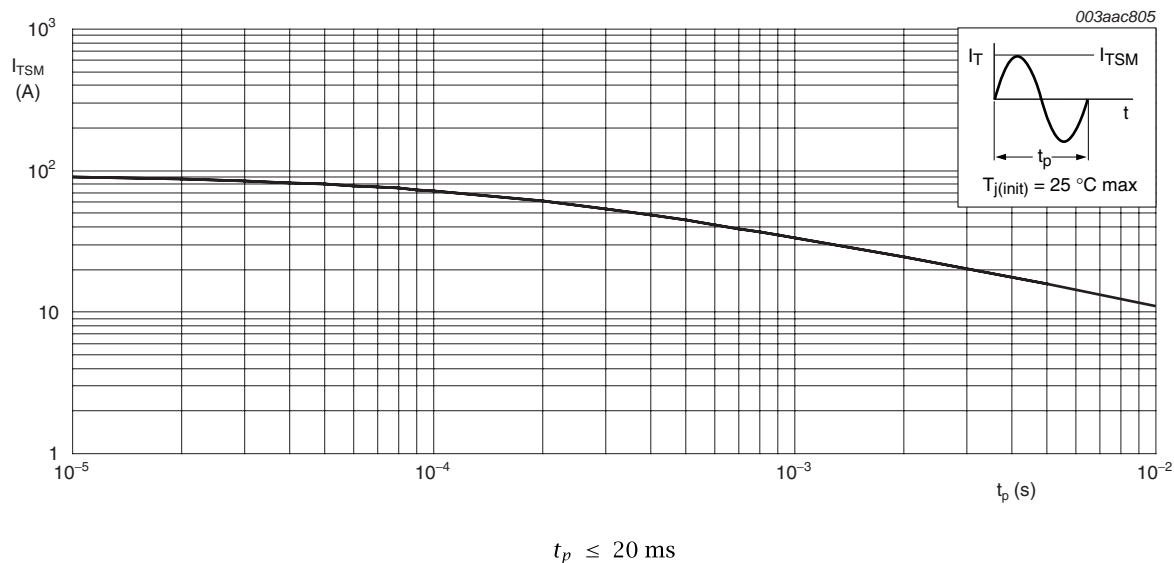


Fig 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

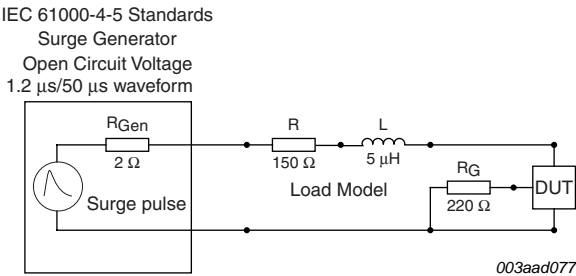
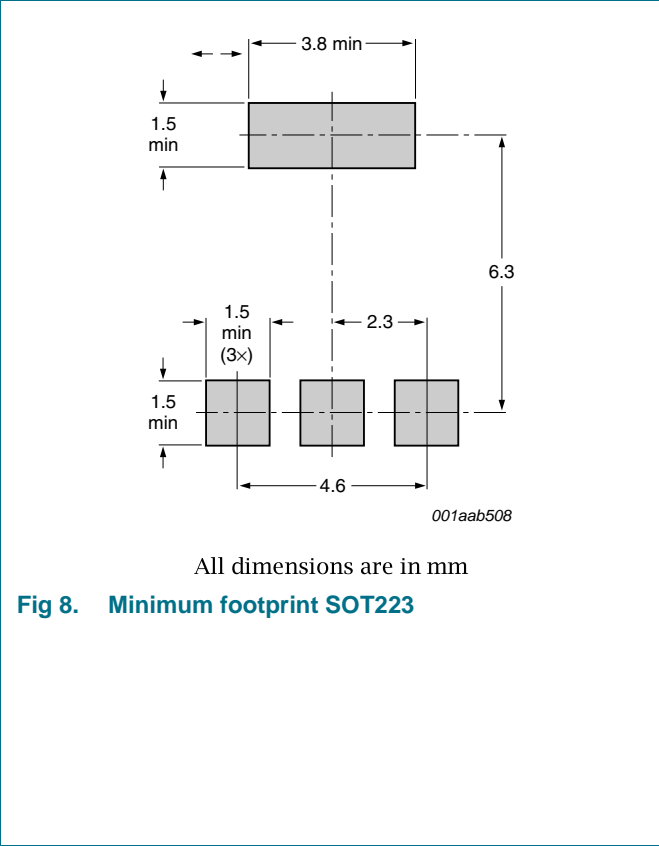
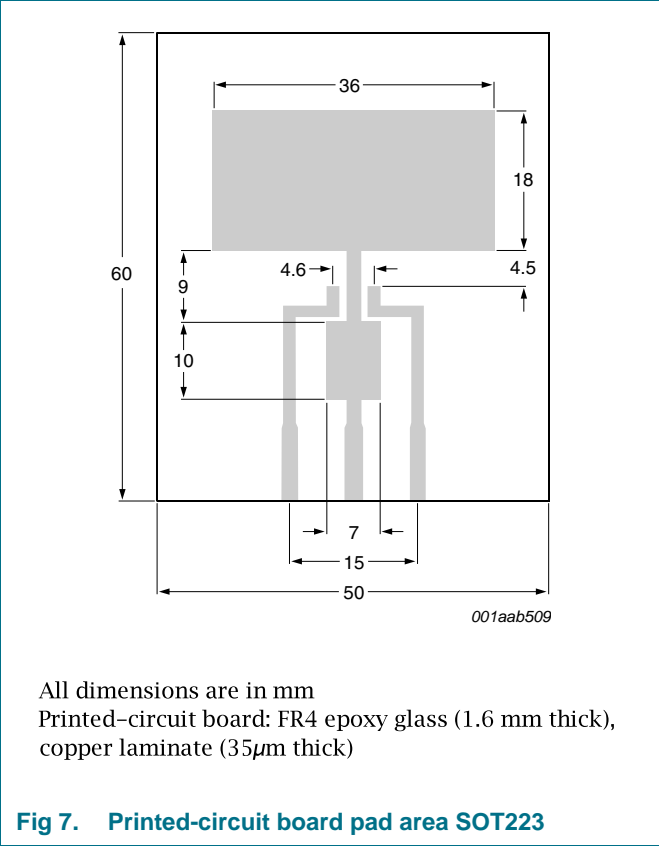


Fig 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	full cycle with heatsink compound; see Figure 9	-	-	15	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	full cycle; printed-circuit board mounted for pad area; see Figure 7	-	70	-	K/W
		full cycle; printed-circuit board mounted for minimum footprint; see Figure 8	-	156	-	K/W



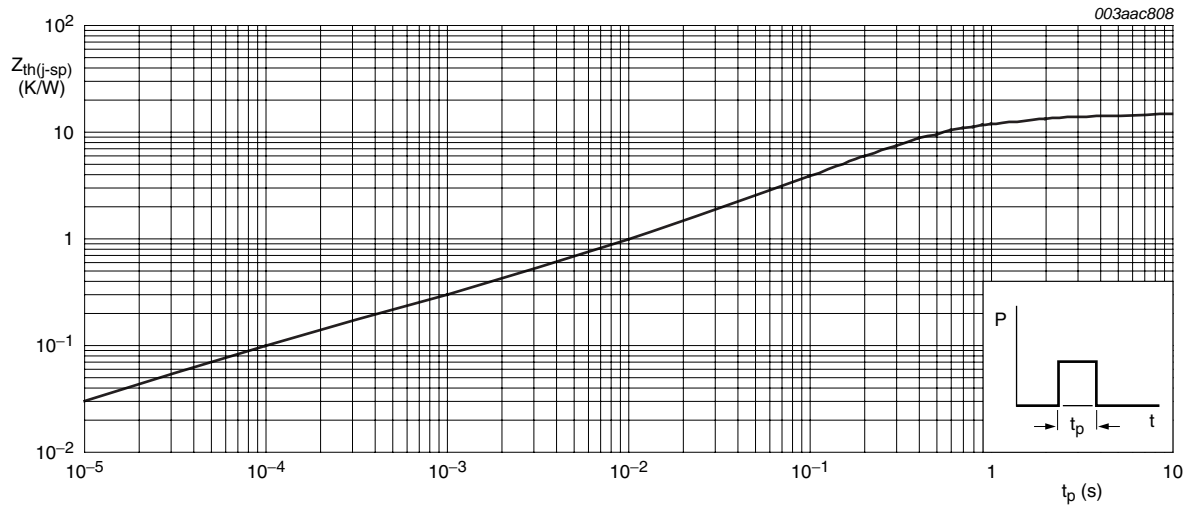
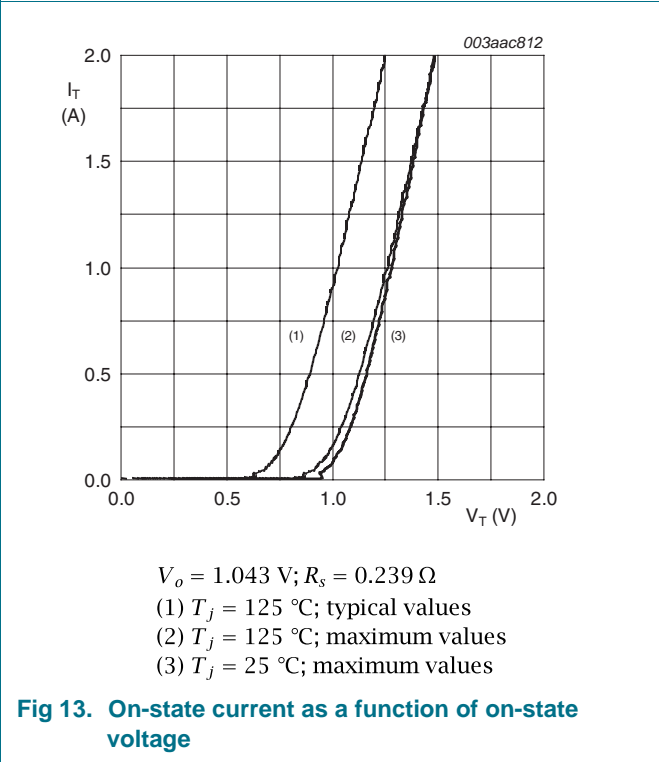
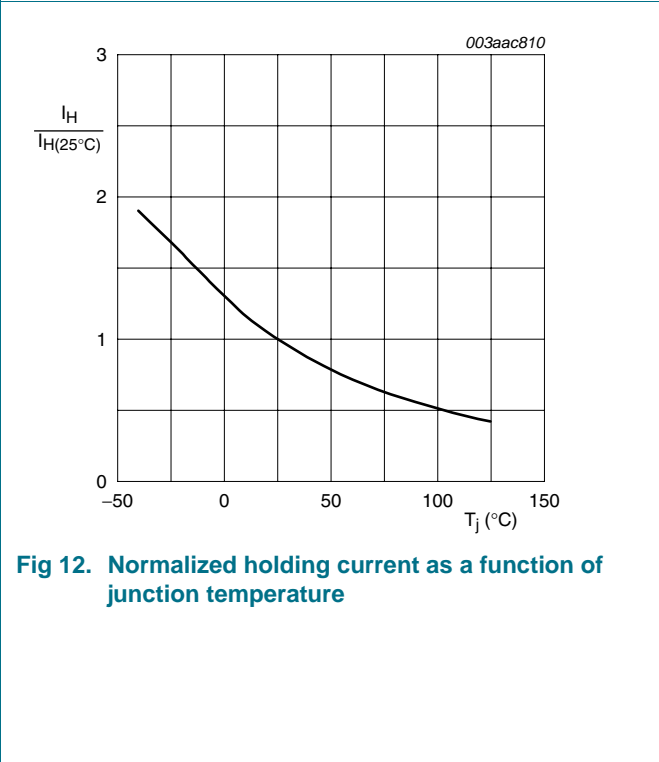
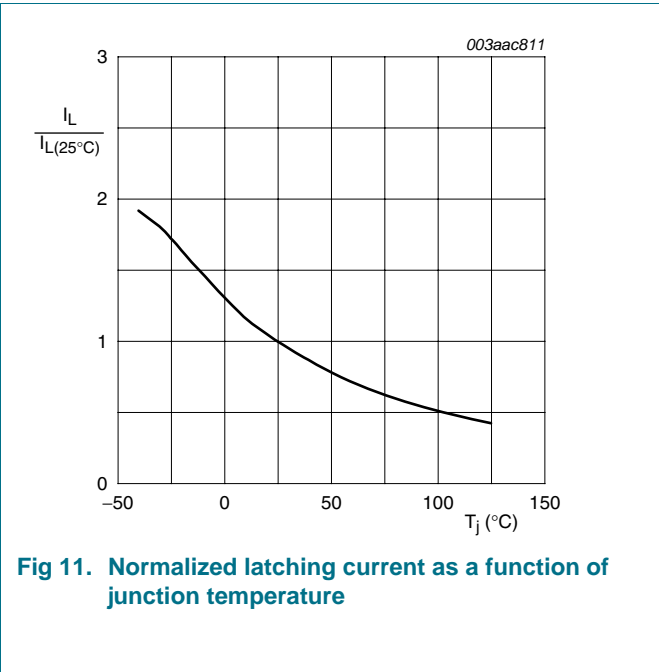
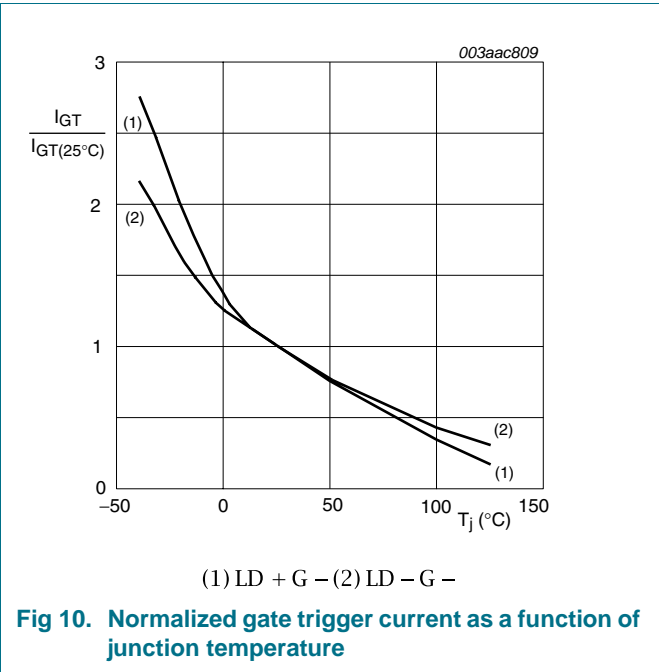


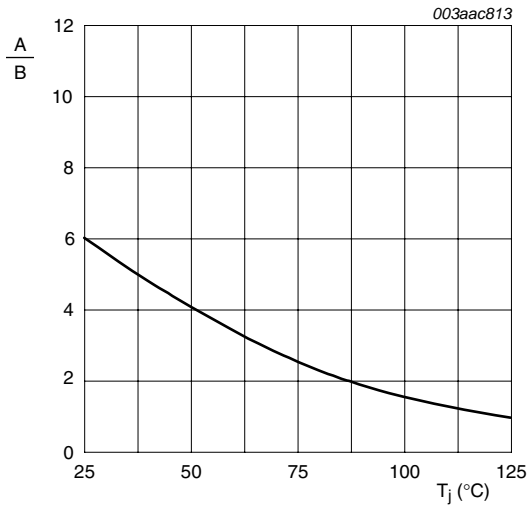
Fig 9. Transient thermal impedance from junction to solder point as a function of pulse width

6. Characteristics

Table 6. Characteristics

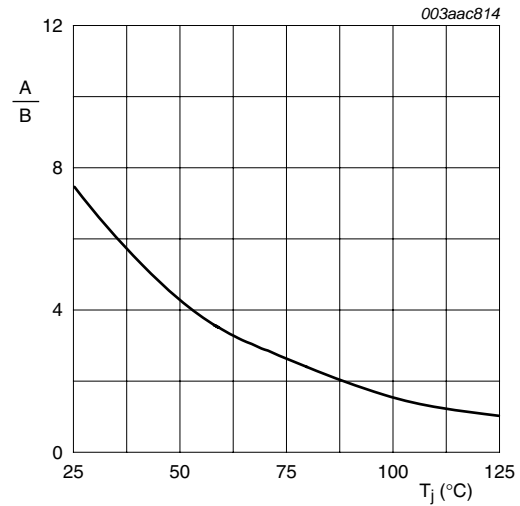
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD+ G-; $T_j = 25\text{ }^\circ\text{C}$; see Figure 10	1	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD- G-; $T_j = 25\text{ }^\circ\text{C}$	1	-	10	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 12\text{ mA}$; $T_j = 25\text{ }^\circ\text{C}$; see Figure 11	-	-	30	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; see Figure 12	-	9	25	mA
V_T	on-state voltage	$I_T = 1.1\text{ A}$; see Figure 13	-	-	1.3	V
V_{GT}	gate trigger voltage	$V_D = 600\text{ V}$; $I_T = 100\text{ mA}$; $T_j \leq 125\text{ }^\circ\text{C}$	0.15	-	-	V
		$V_D = 600\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 25\text{ }^\circ\text{C}$	-	-	1	V
I_D	off-state current	$V_D = 600\text{ V}$; $T_j \leq 125\text{ }^\circ\text{C}$	-	-	0.2	mA
		$V_D = 600\text{ V}$; $T_j \leq 25\text{ }^\circ\text{C}$	-	-	2	μA
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; gate open circuit; see Figure 14	1000	-	-	V/ μs
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{T(RMS)} = 1\text{ A}$; $dV_{com}/dt = 15\text{ V}/\mu\text{s}$; gate open circuit; see Figure 15 and 16	0.3	-	-	A/ms
V_{CL}	clamping voltage	$I_{CL} = 100\text{ mA}$; $t_p = 1\text{ ms}$; $T_j \leq 125\text{ }^\circ\text{C}$; see Figure 17	650	-	-	V





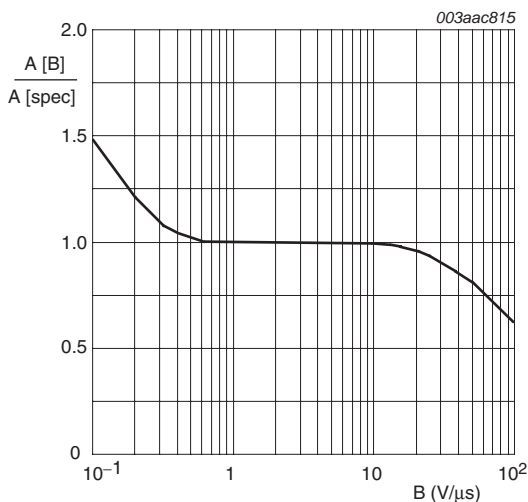
A is dV_D/dt at condition T_j °C
 B is dV_D/dt at condition $T_j = 125$ °C

Fig 14. Normalized rate of rise of off-state voltage as a function of junction temperature



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

Fig 15. Normalized critical rate of rise of commutating current as a function of junction temperature



$A[B]$ is $\frac{dI_{com}}{dt}$ at condition B, $\frac{dV_{com}}{dt}$
 A[spec] is the specified data sheet value of $\frac{dI_{com}}{dt}$

Fig 16. Normalized critical rate of change of commutating current as a function of critical rate of change of commutating voltage; minimum values

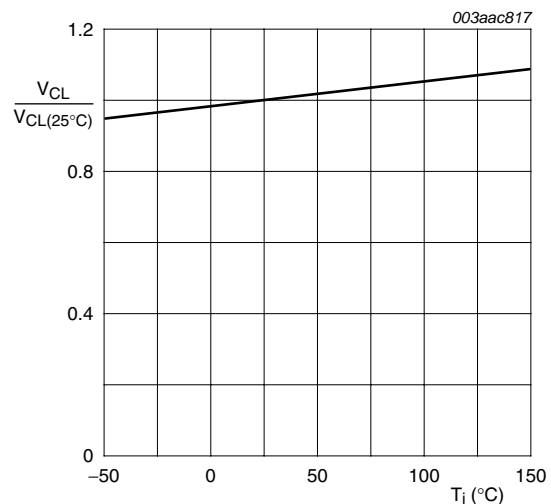


Fig 17. Normalized clamping voltage (upper limit) as a function of junction temperature; minimum values

7. Package outline

Plastic surface-mounted package with increased heatsink; 4 leads

SOT223

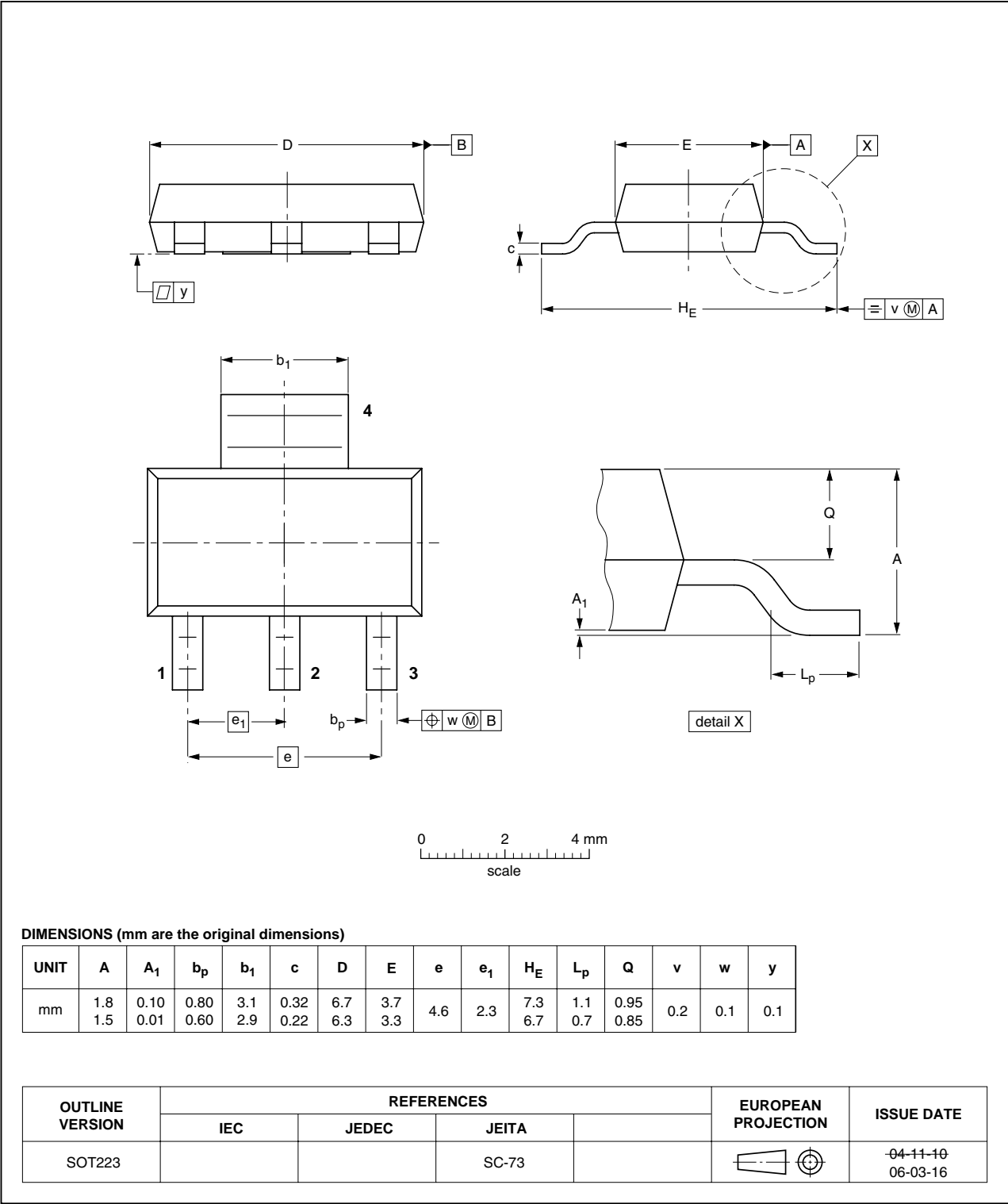


Fig 18. Package outline SOT223 (SC-73)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
ACT108W-600E_3	20091021	Product data sheet	-	ACT108W-600E_2
Modifications:		• Various changes to content.		
ACT108W-600E_2	20090526	Product data sheet	-	ACT108W-600E_1
ACT108W-600E_1	20090429	Product 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.
Product [short] data sheet	Production	This document contains the product specification.

[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 profile1

1.1 General description1

1.2 Features and benefits1

1.3 Applications1

1.4 Quick reference data1

2 Pinning information2

3 Ordering information2

4 Limiting values3

5 Thermal characteristics6

6 Characteristics7

7 Package outline10

8 Revision history11

9 Legal information12

9.1 Data sheet status12

9.2 Definitions12

9.3 Disclaimers12

9.4 Trademarks12

10 Contact information12



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