

ACT108W-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 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
- 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
- Surface-mountable package
- 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 10	0.5	-	5	mA
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{sp}} \leq 112 \text{ }^{\circ}\text{C}$; see Figure 4 ; see Figure 1 ; 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 14	300	-	-	V/ μs

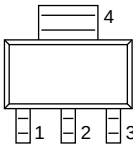
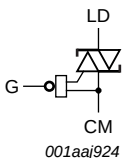


Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CL}	clamping voltage	$I_{CL} = 100\ \mu\text{A}$; $t_p = 1\ \text{ms}$; $T_j \leq 125\ ^\circ\text{C}$; see Figure 17	650	-	-	V
V_{PP}	peak pulse voltage	$T_j = 25\ ^\circ\text{C}$; non-repetitive, off-state; see Figure 3	-	-	2	kV
V_T	on-state voltage	$I_T = 1.1\ \text{A}$; 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		
4	CM	common		

SOT223 (SC-73)

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
ACT108W-600D	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 4 ; see Figure 1 ; see Figure 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 5 ; see Figure 6	-	8	A
I^2t	I^2t for fusing	$t_{\text{p}} = 10\text{ ms}$; sine-wave pulse	-	0.32	A^2s
di_{T}/dt	rate of rise of on-state current	$I_{\text{T}} = 1\text{ A}$; $I_{\text{G}} = 10\text{ mA}$; $di_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$	-	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
$P_{\text{G(AV)}}$	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 3	-	2	kV

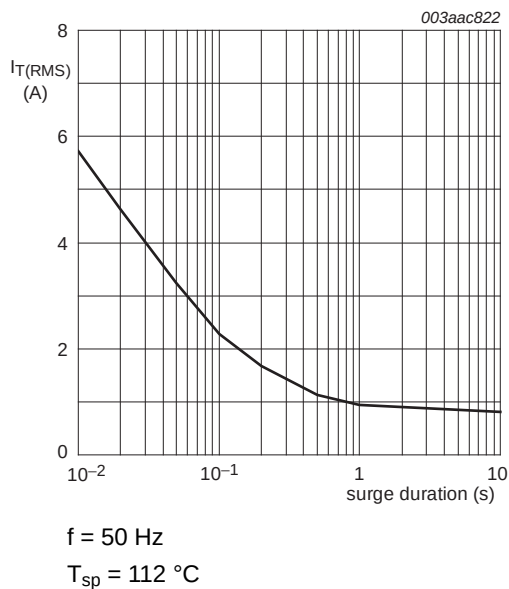


Fig 1. RMS on-state current as a function of surge duration; maximum values

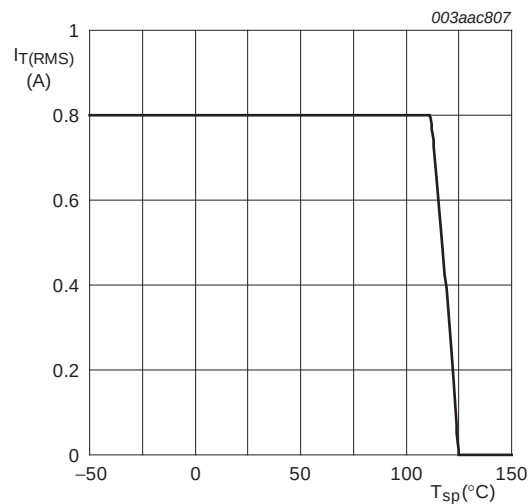


Fig 2. RMS on-state current as a function of solder point temperature; maximum values

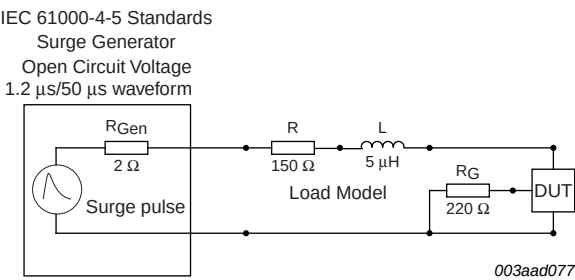


Fig 3. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

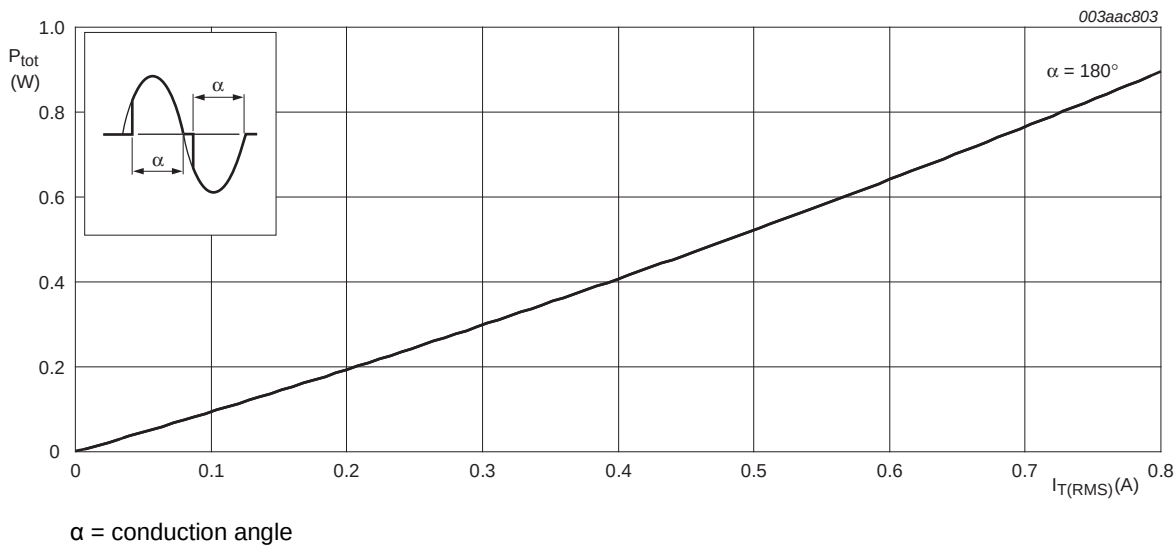


Fig 4. Total power dissipation as a function of RMS on-state current; maximum values

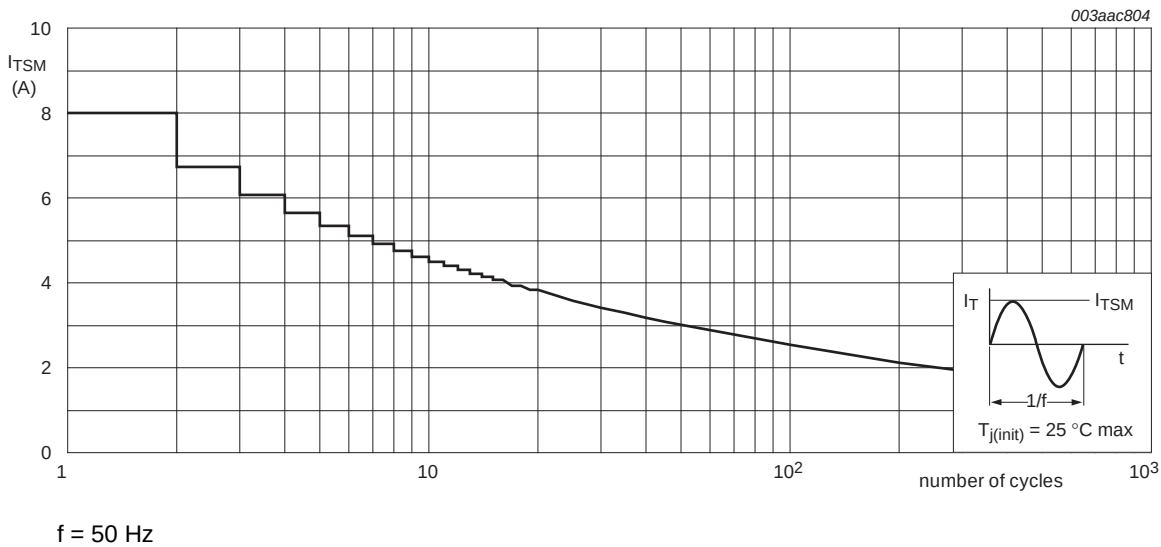
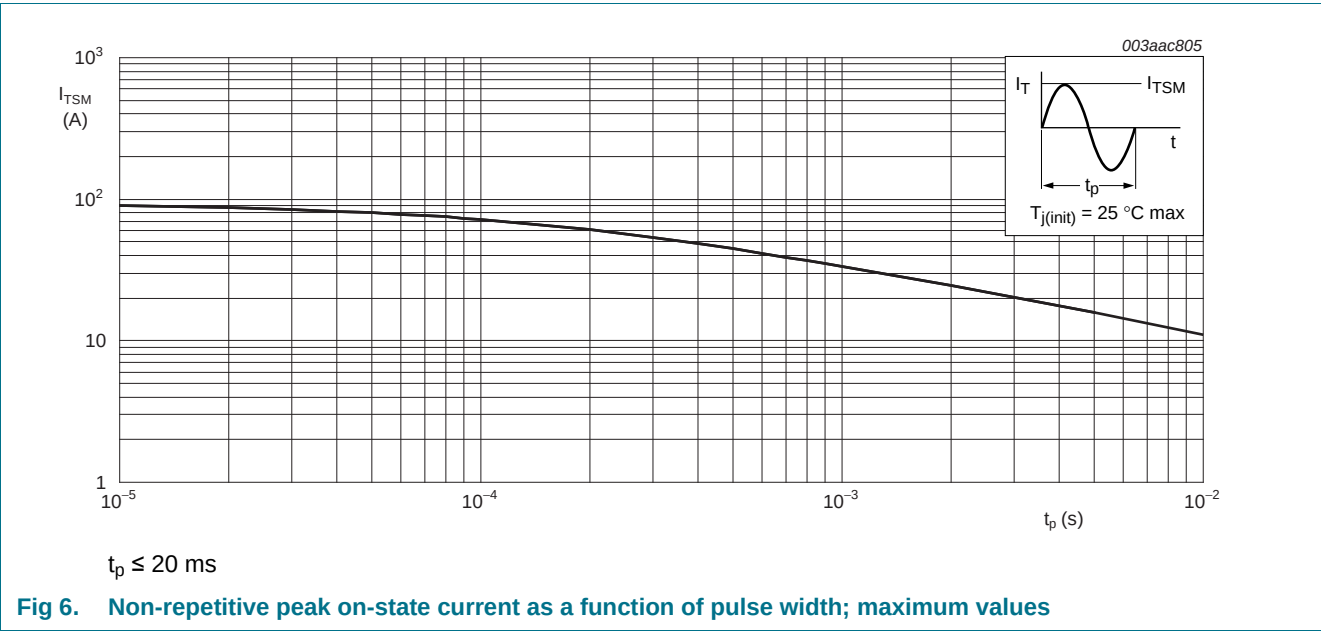


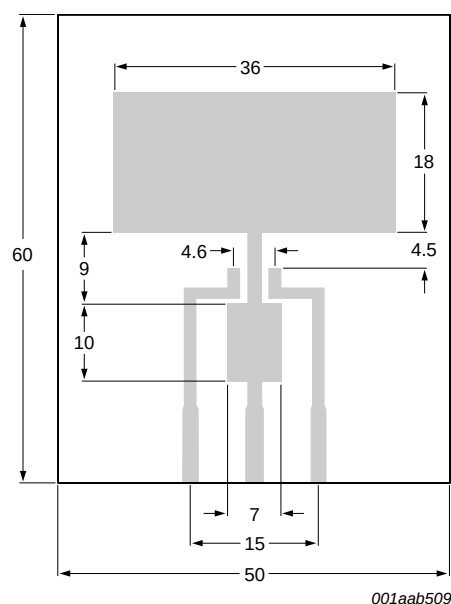
Fig 5. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



5. Thermal characteristics

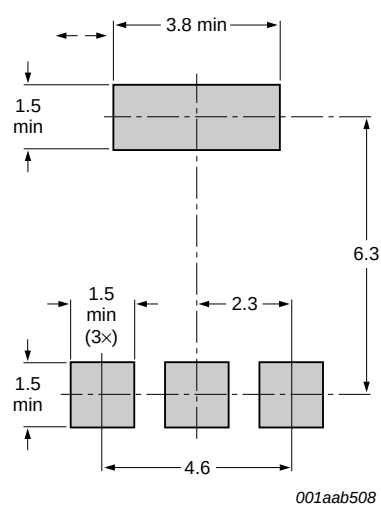
Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	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



All dimensions are in mm
Printed-circuit board:
FR4 epoxy glass (1.6 mm thick),
copper laminate (35 μ m thick).

Fig 7. Printed-circuit board pad area SOT223



All dimensions are in mm

Fig 8. Minimum footprint SOT223

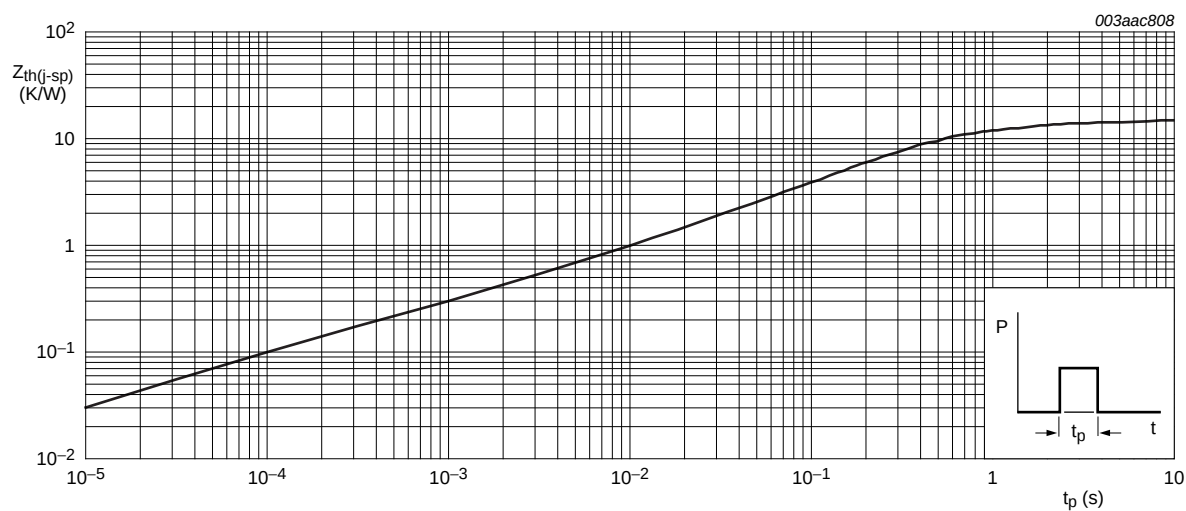
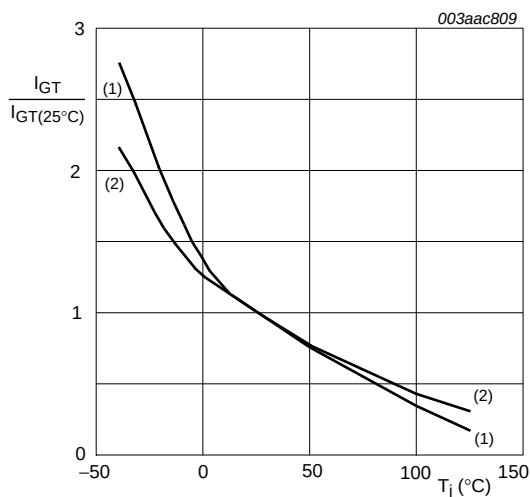


Fig 9. Transient thermal impedance from junction to solder point as a function of pulse width

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-; $T_j = 25\text{ }^\circ\text{C}$	0.5	-	5	mA
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD+ G-; $T_j = 25\text{ }^\circ\text{C}$; see Figure 10	0.5	-	5	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	-	-	25	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; see Figure 12	-	-	20	mA
V_T	on-state voltage	$I_T = 1.1\text{ A}$; see Figure 13	-	-	1.3	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 25\text{ }^\circ\text{C}$	-	-	0.9	V
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; $T_j \leq 125\text{ }^\circ\text{C}$	0.15	-	-	V
I_D	off-state current	$V_D = 600\text{ V}$; $T_j \leq 25\text{ }^\circ\text{C}$	-	-	2	μA
		$V_D = 600\text{ V}$; $T_j \leq 125\text{ }^\circ\text{C}$	-	-	0.2	mA
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; exponential waveform; see Figure 14	300	-	-	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 ; see Figure 16	0.15	-	-	A/ms
V_{CL}	clamping voltage	$I_{CL} = 100\text{ }\mu\text{A}$; $t_p = 1\text{ ms}$; $T_j \leq 125\text{ }^\circ\text{C}$; see Figure 17	650	-	-	V



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

Fig 10. Normalized gate trigger current as a function of junction temperature

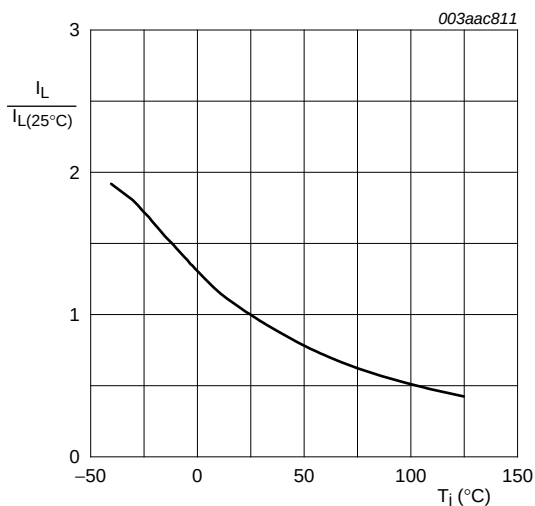


Fig 11. Normalized latching current as a function of junction temperature

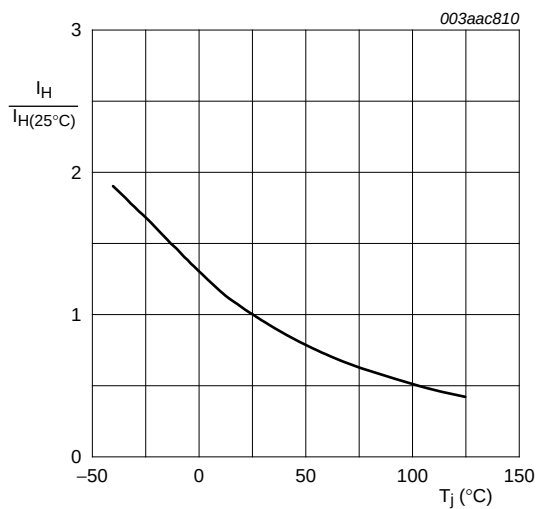
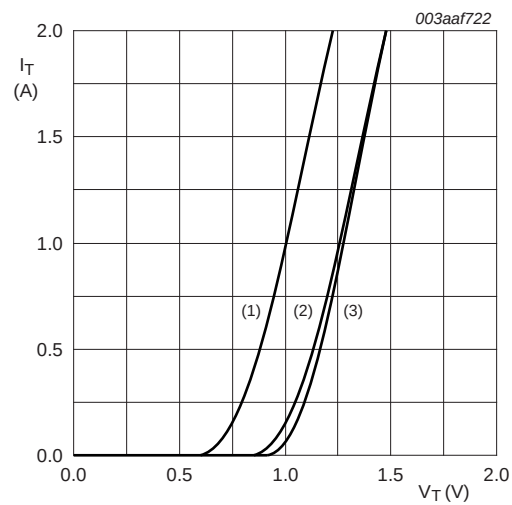
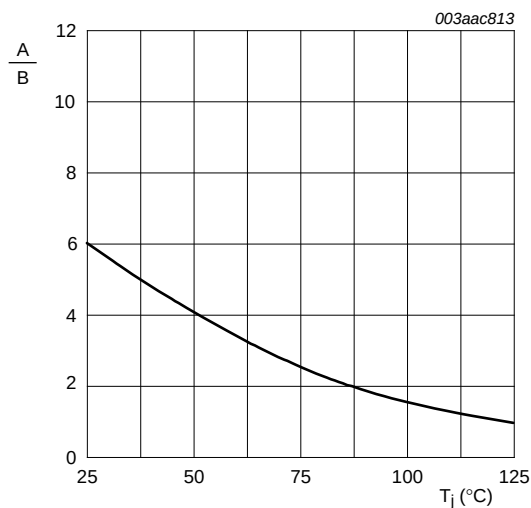


Fig 12. Normalized holding current as a function of junction temperature



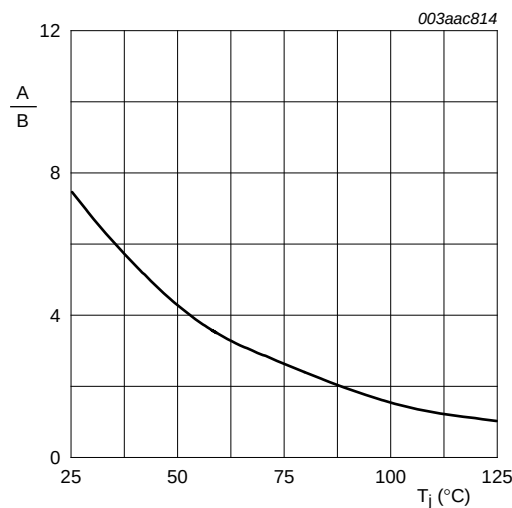
$V_o = 0.758\text{ V}$
 $R_s = 0.263\ \Omega$
(1) $T_j = 125^\circ\text{C}$; typical values
(2) $T_j = 125^\circ\text{C}$; maximum values
(3) $T_j = 25^\circ\text{C}$; maximum values

Fig 13. On-state current as a function of on-state voltage



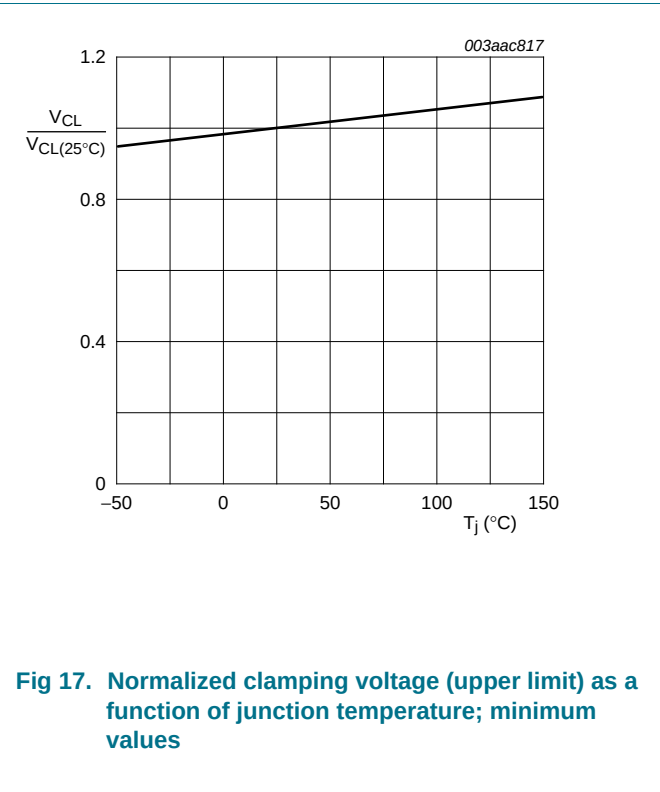
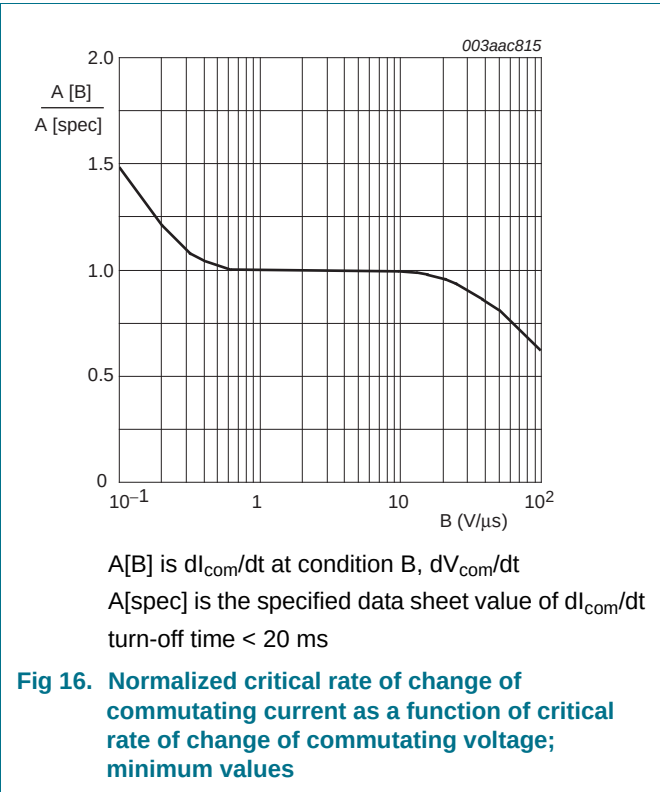
A is dV_D/dt at condition T_j °C
B is dV_D/dt at condition T_j 125 °C

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 condition T_j 125 °C
 $V_D = 400\text{ V}$

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



7. Package outline

Plastic surface-mounted package with increased heatsink; 4 leads

SOT223

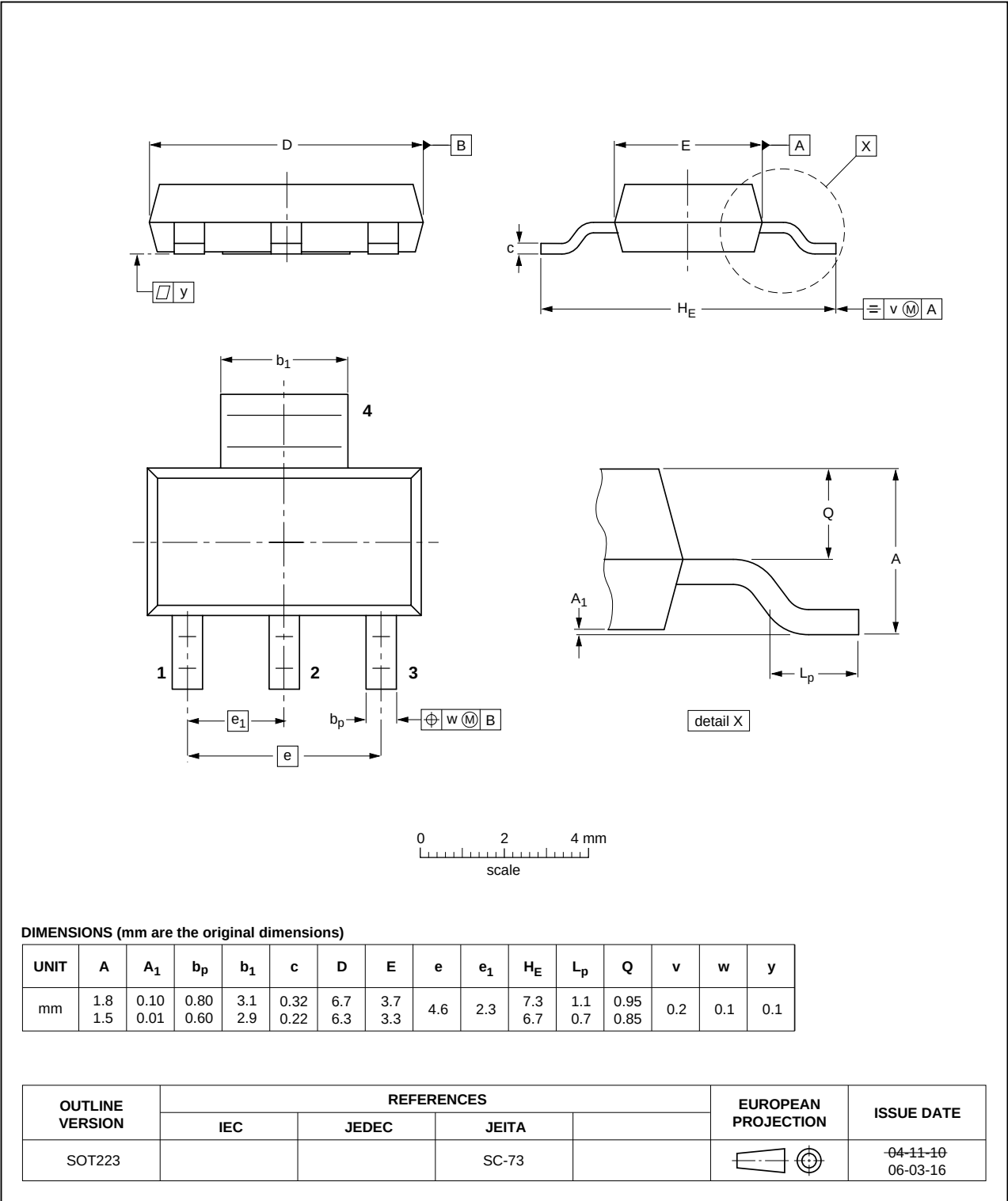


Fig 18. Package outline SOT223 (SC-73)

8. Soldering

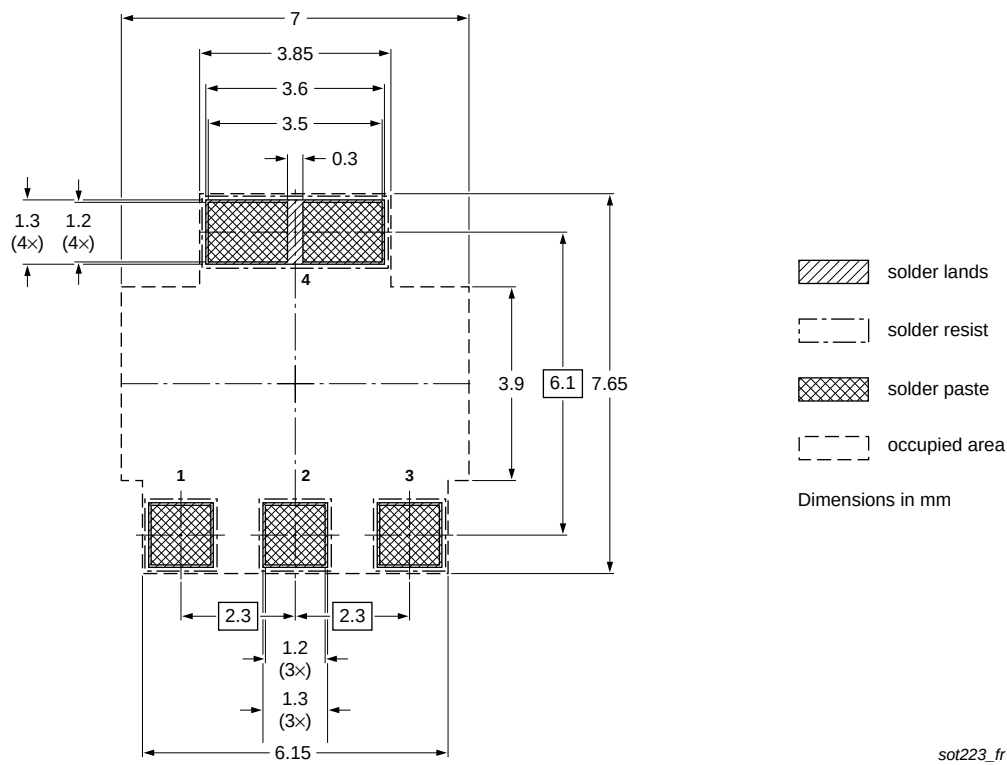


Fig 19. Reflow soldering footprint for SOT223 (SC-73)

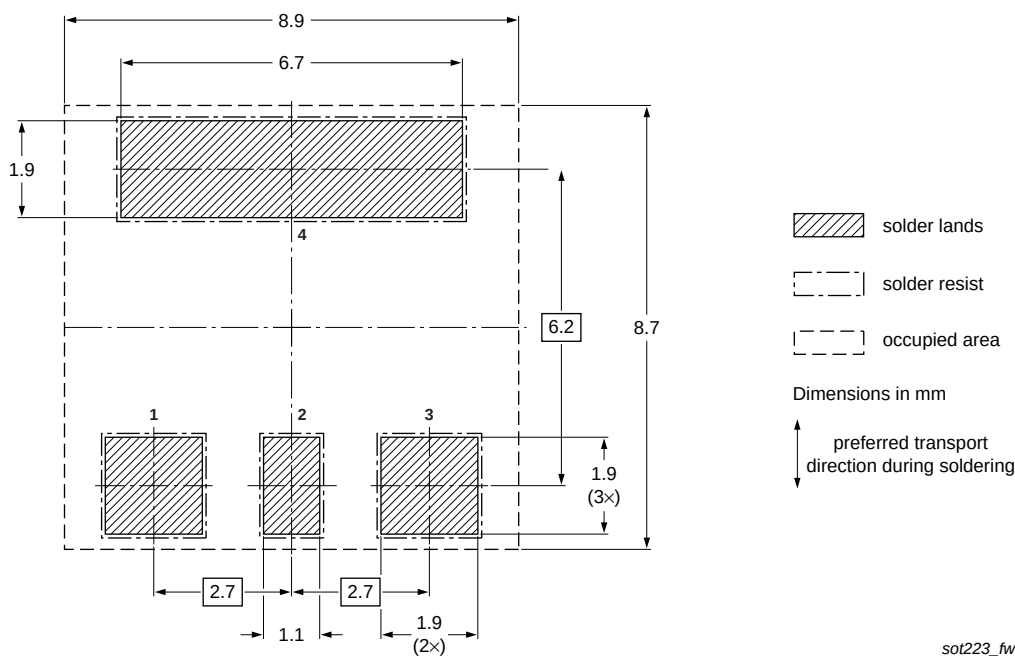


Fig 20. Wave soldering footprint for SOT223 (SC-73)

9. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
ACT108W-600D v.2	20101227	Product data sheet	-	ACT108W-600D v.1
Modifications:	• Status changed from Preliminary to Product. • Various changes to content.			
ACT108W-600D v.1	20100902	Preliminary data sheet	-	-

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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.

[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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