



IMPORTANT NOTICE

10 December 2015

1. Global joint venture starts operations as WeEn Semiconductors

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As from November 9th, 2015 NXP Semiconductors N.V. and Beijing JianGuang Asset Management Co. Ltd established Bipolar Power joint venture (JV), **WeEn Semiconductors**, which will be used in future Bipolar Power documents together with new contact details.

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WeEn Semiconductors



ACT108W-600E

AC Thyristor power switch

Rev. 5 — 13 July 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
- 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 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-; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$; 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 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; see Figure 14	1000	-	-	V/ μs

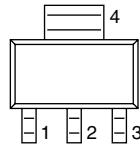
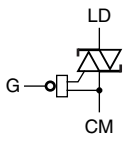


Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CL}	clamping voltage	$I_{CL} = 100 \mu A$; $t_p = 1 \text{ ms}$; $T_j \leq 125 \text{ }^\circ\text{C}$; see Figure 17	650	-	-	V
V_{PP}	peak pulse voltage	$T_j = 25 \text{ }^\circ\text{C}$; 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	 <p>SOT223 (SC-73)</p>	 <p>001aaJ924</p>
2	CM	common		
3	G	gate		
4	CM	common		

3. Ordering information

Table 3. Ordering information

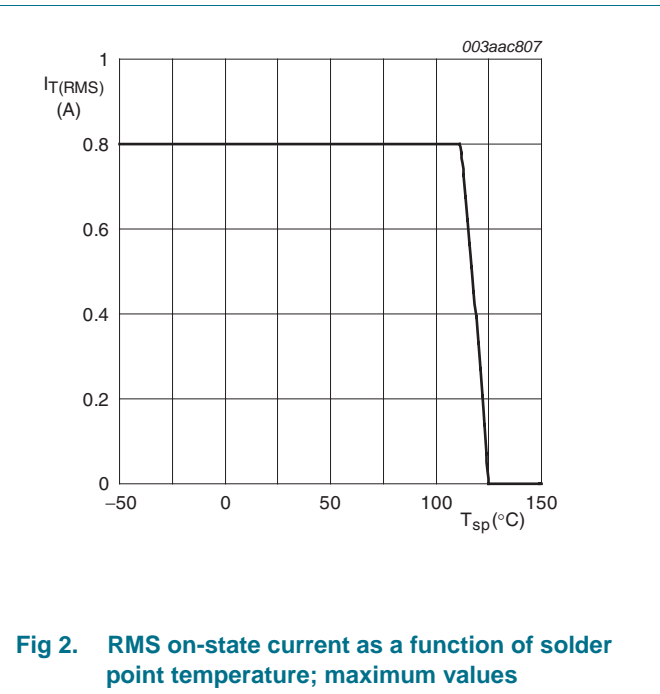
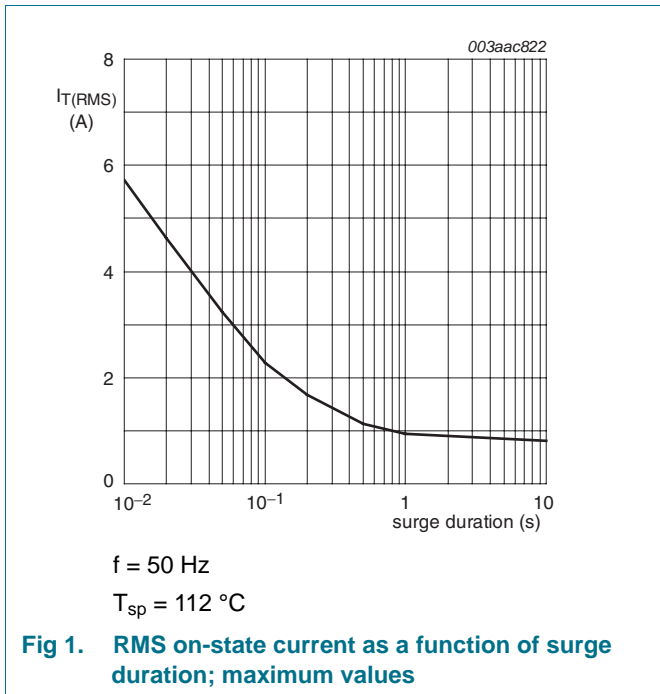
Type number	Package		Version
	Name	Description	
ACT108W-600E	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

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
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{sp} \leq 112\text{ }^{\circ}\text{C}$; see Figure 4 ; see Figure 1 ; see Figure 2	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 16.7\text{ ms}$	-	8.8	A
		full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 20\text{ ms}$; see Figure 5 ; see Figure 6	-	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	$I_T = 1\text{ A}$; $I_G = 20\text{ mA}$; $dl_G/dt = 0.2\text{ A}/\mu\text{s}$	-	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
$P_{G(AV)}$	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 3	-	2	kV



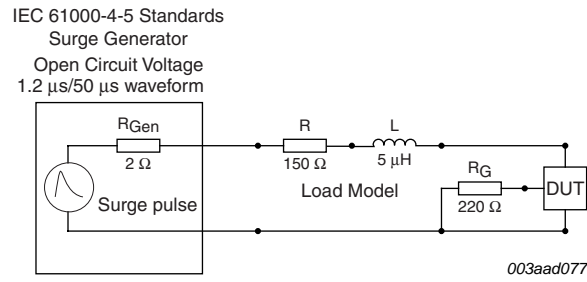


Fig 3. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

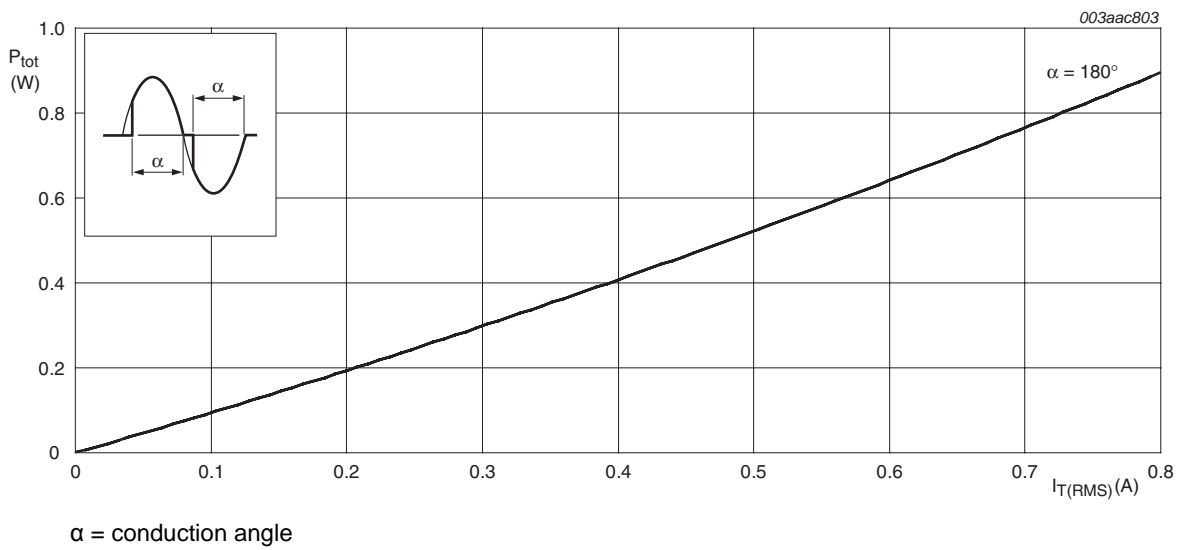


Fig 4. Total power dissipation as a function of RMS on-state current; maximum values

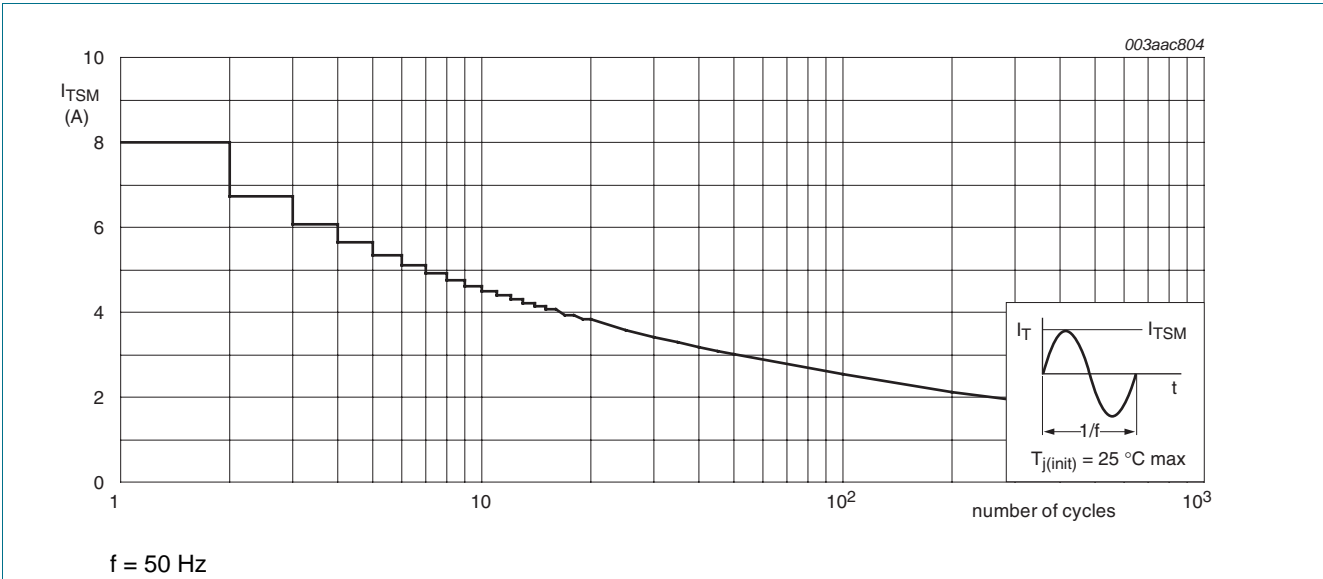


Fig 5. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

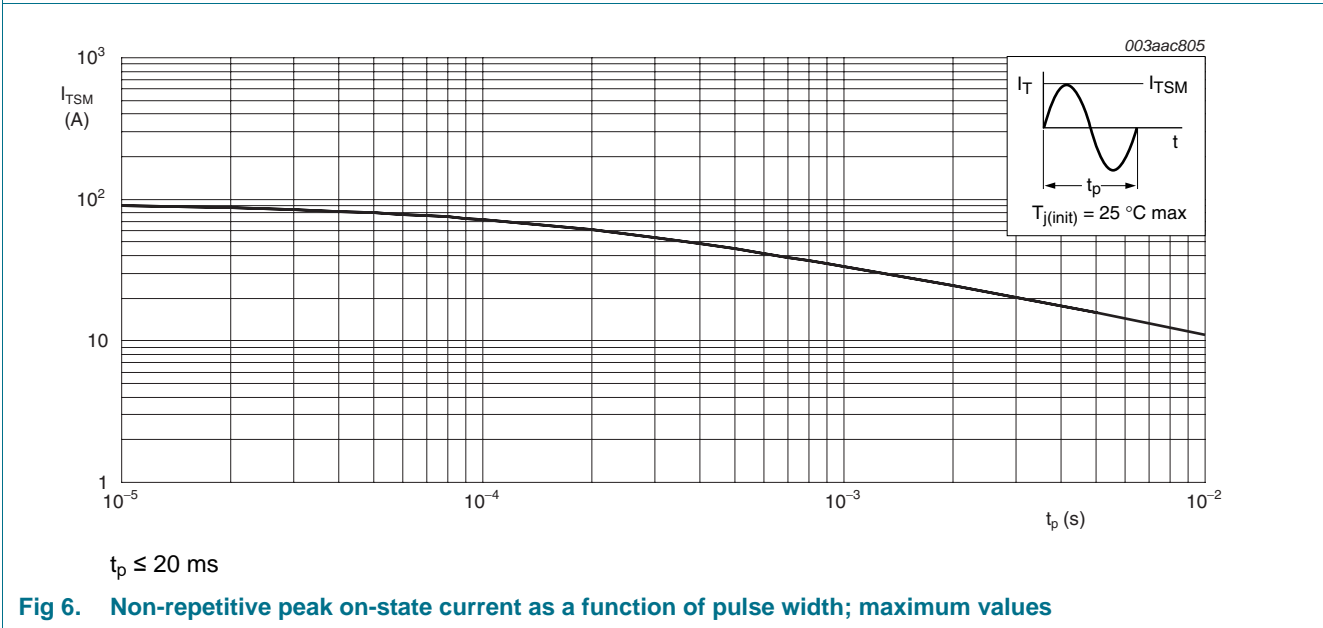
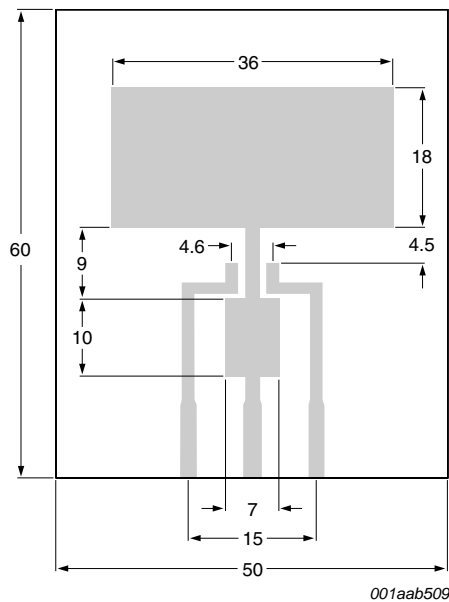


Fig 6. Non-repetitive peak on-state current as a function of pulse width; maximum values

5. Thermal characteristics

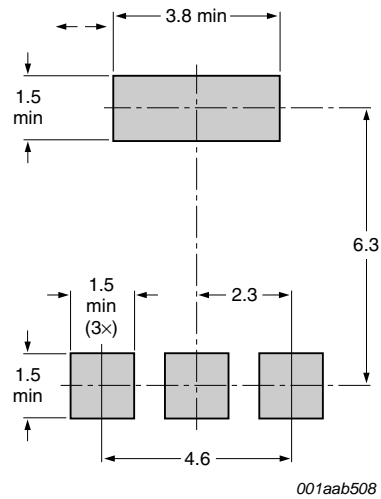
Table 5. Thermal characteristics

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

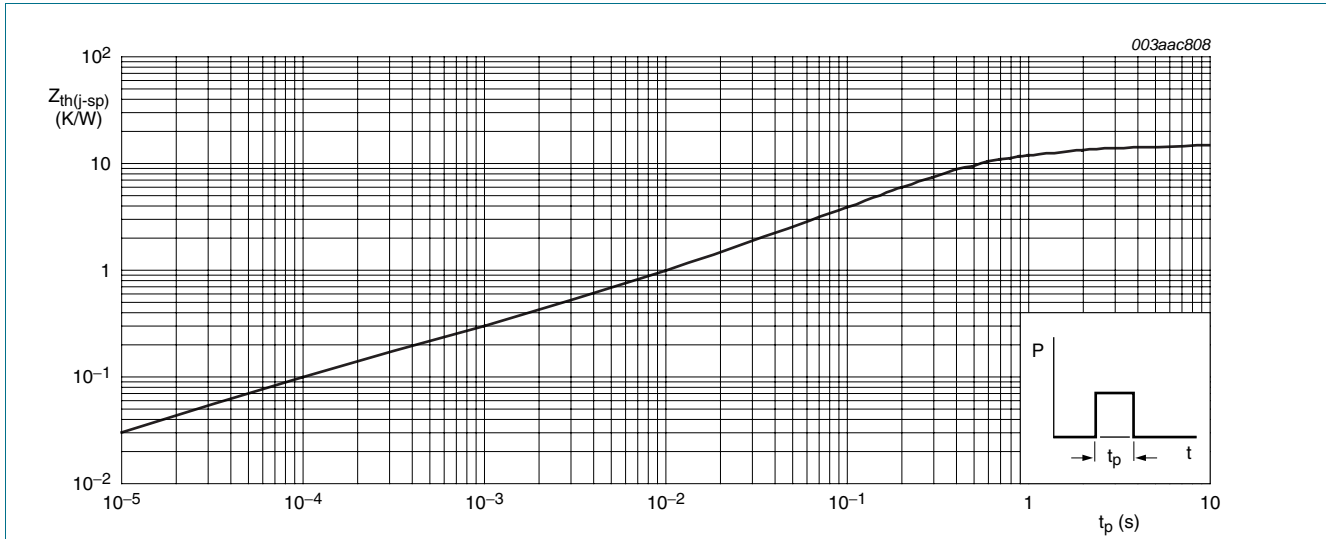
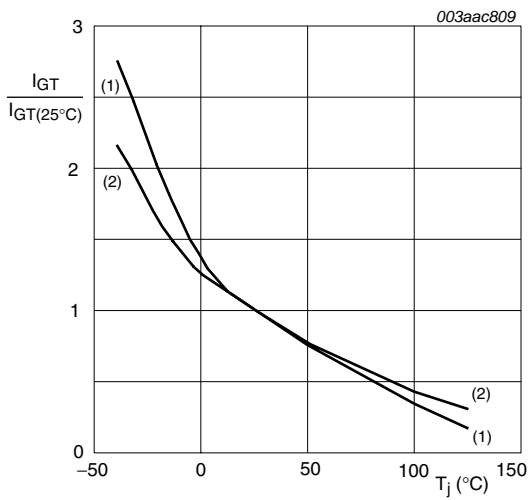


Fig 9. Transient thermal impedance from junction to solder point as a function of pulse width

6. Characteristics

Table 6. Characteristics

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



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

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

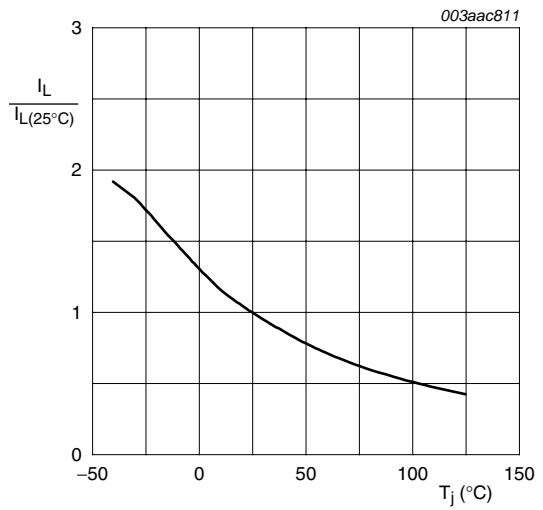


Fig 11. Normalized latching current as a function of junction temperature

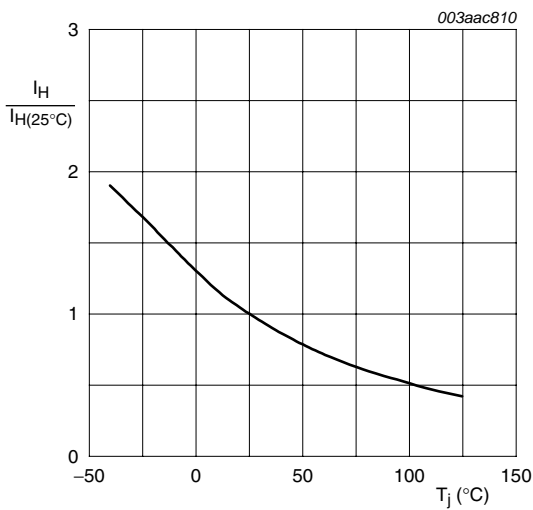
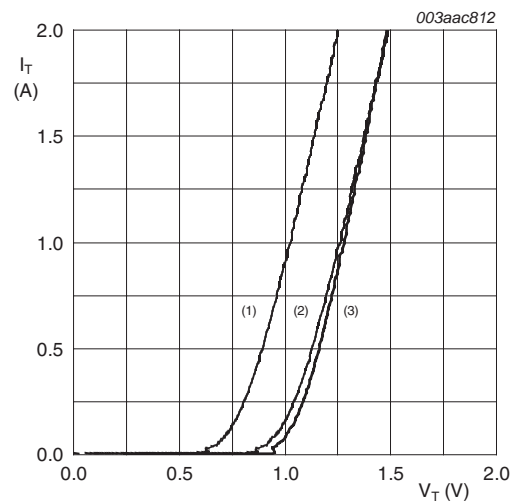


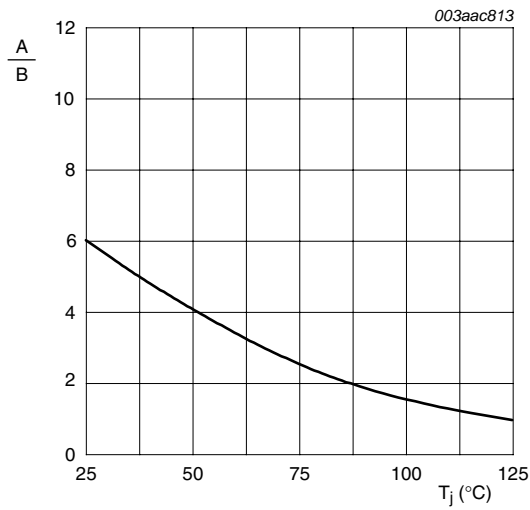
Fig 12. Normalized holding current as a function of junction temperature



$V_O = 0.758 \text{ V}$; $R_S = 0.263 \Omega$

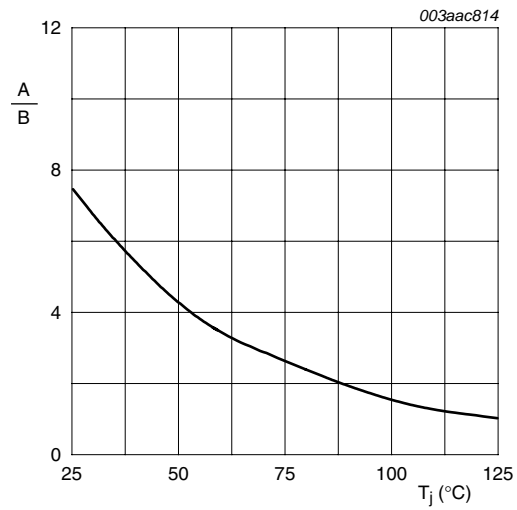
- (1) $T_j = 125^\circ\text{C}$; typical values
- (2) $T_j = 125^\circ\text{C}$; maximum values
- (3) $T_j = 25^\circ\text{C}$; maximum values

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



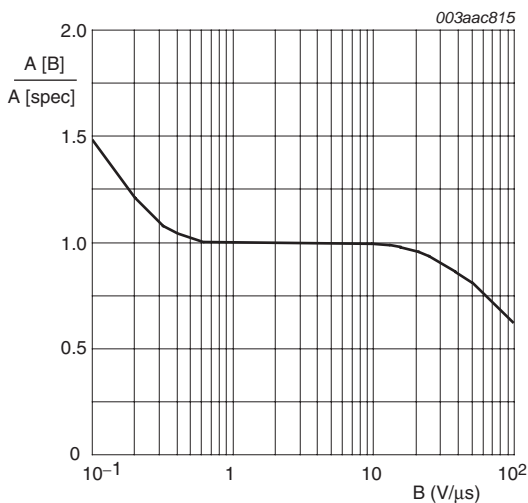
A is dV_D/dt at condition T_j °C
 B is dV_D/dt at condition T_j 125 °C

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
 $V_D = 400$ V

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



A[B] is di_{com}/dt at condition B, dV_{com}/dt
 A[spec] is the specified data sheet value of di_{com}/dt
 turn-off time < 20 ms

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

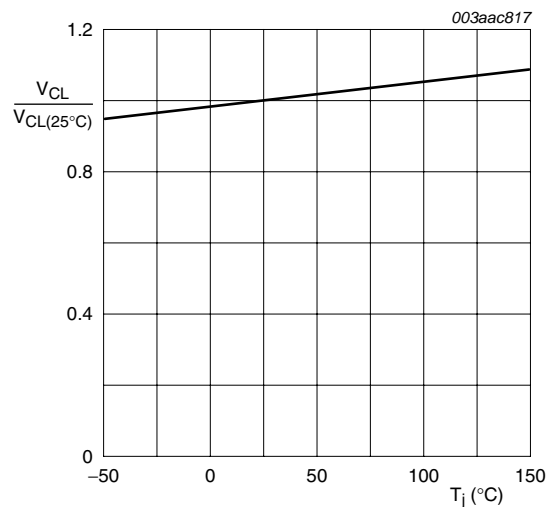


Fig 17. Normalized clamping voltage (upper limit) as a function of junction temperature; minimum values

7. Package outline

Plastic surface-mounted package with increased heatsink; 4 leads

SOT223

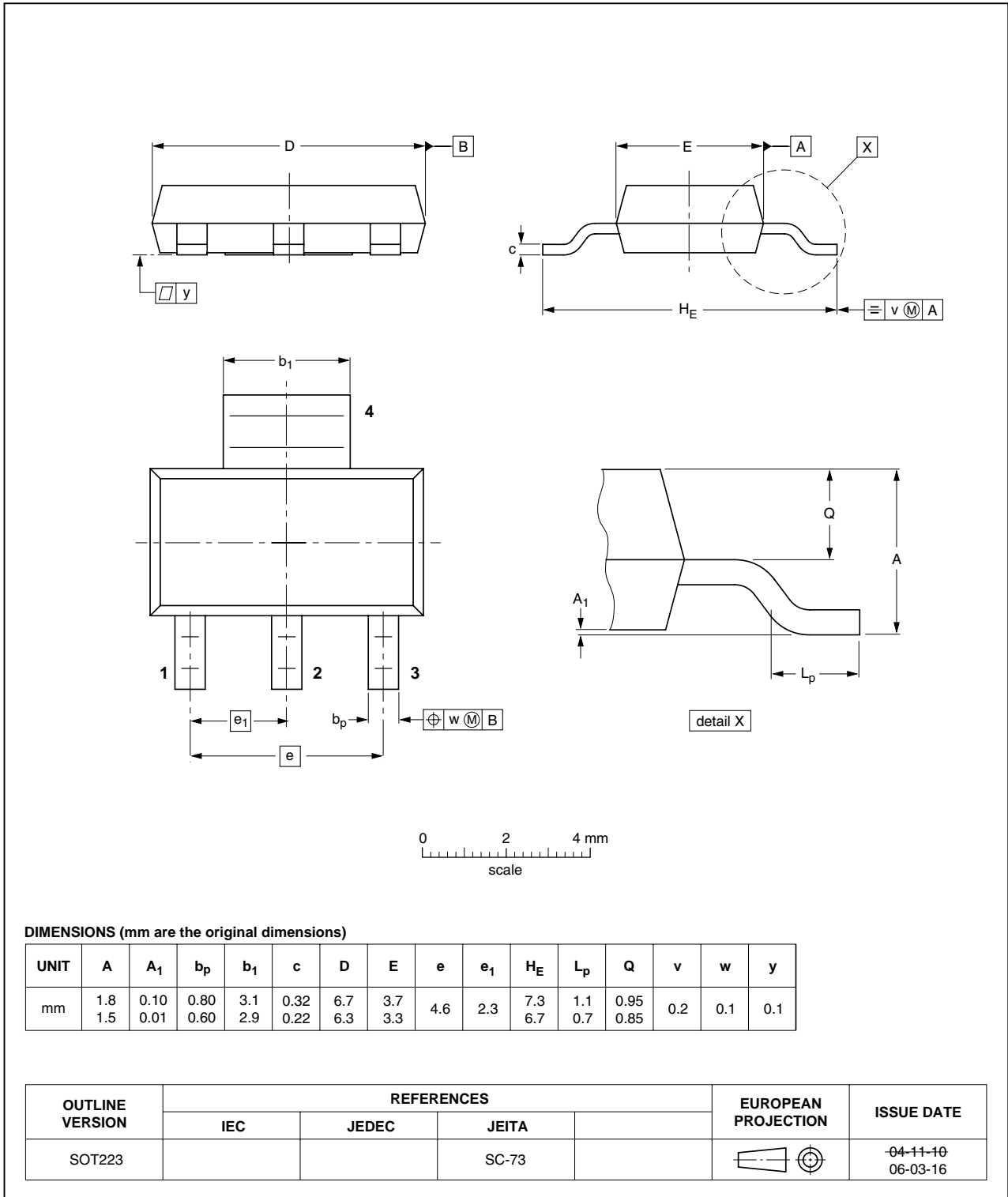


Fig 18. Package outline SOT223 (SC-73)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
ACT108W-600E v.5	20100713	Product data sheet	-	ACT108W-600E v.4
Modifications:	• Various changes to content.			
ACT108W-600E v.4	20091209	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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