

1. General description

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

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
- Surface-mountable package
- Very high noise immunity
- Safe clamping of low energy over-voltage transients
- Self-protective turn-on during high energy voltage transients

3. Applications

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

4. Quick reference data

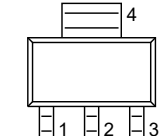
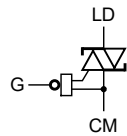
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	600	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{sp}} \leq 112\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$; $t_{\text{p}} = 16.7\text{ ms}$	-	-	8.8	A
		full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$; $t_{\text{p}} = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	-	8	A
T_{j}	junction temperature		-	-	125	°C
V_{PP}	peak pulse voltage	$T_{\text{j}} = 25\text{ °C}$; non-repetitive, off-state; Fig. 6	-	-	2	kV
Static characteristics						
I_{GT}	gate trigger current	$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 100\text{ mA}$; LD+ G-; $T_{\text{j}} = 25\text{ °C}$; Fig. 10	1	-	10	mA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD- G-; $T_j = 25\text{ }^\circ\text{C}$	1	-	10	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 12	-	9	25	mA
V_T	on-state voltage	$I_T = 1.1\text{ A}$; Fig. 13	-	-	1.3	V
V_{CL}	clamping voltage	$I_{CL} = 100\text{ }\mu\text{A}$; $t_p = 1\text{ ms}$; $T_j = 125\text{ }^\circ\text{C}$; Fig. 14	650	-	-	V
Dynamic characteristics						
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; Fig. 15	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; Fig. 16 ; Fig. 17	0.3	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	LD	load	 SC-73 (SOT223)	 001aa/924
2	CM	common		
3	G	gate		
4	CM	common		

6. Ordering information

Table 3. Ordering information

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

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 _{sp} ≤ 112 °C; Fig. 1; Fig. 2; Fig. 3	-	0.8	A
I _{TSM}	non-repetitive peak on-state current	full sine wave; T _{j(init)} = 25 °C; t _p = 16.7 ms	-	8.8	A
		full sine wave; T _{j(init)} = 25 °C; t _p = 20 ms; Fig. 4; Fig. 5	-	8	A
I ² t	I ² t for fusing	t _p = 10 ms; SIN	-	0.32	A ² s
dI _T /dt	rate of rise of on-state current	I _G = 20 mA	-	100	A/μs
I _{GM}	peak gate current	t = 20 μs	-	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	°C
T _j	junction temperature		-	125	°C
V _{PP}	peak pulse voltage	T _j = 25 °C; non-repetitive, off-state; Fig. 6	-	2	kV

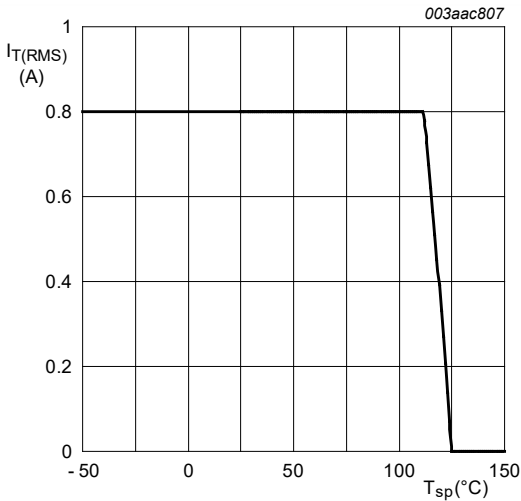
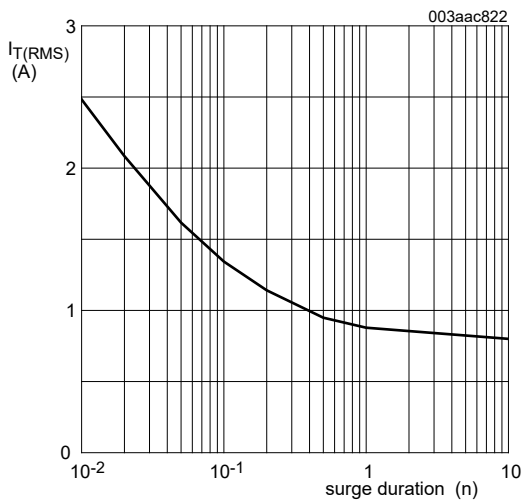


Fig. 1. RMS on-state current as a function of solder point temperature; maximum values



f = 50 Hz
T_{sp} = 112 °C

Fig. 2. RMS on-state current as a function of surge duration; maximum values

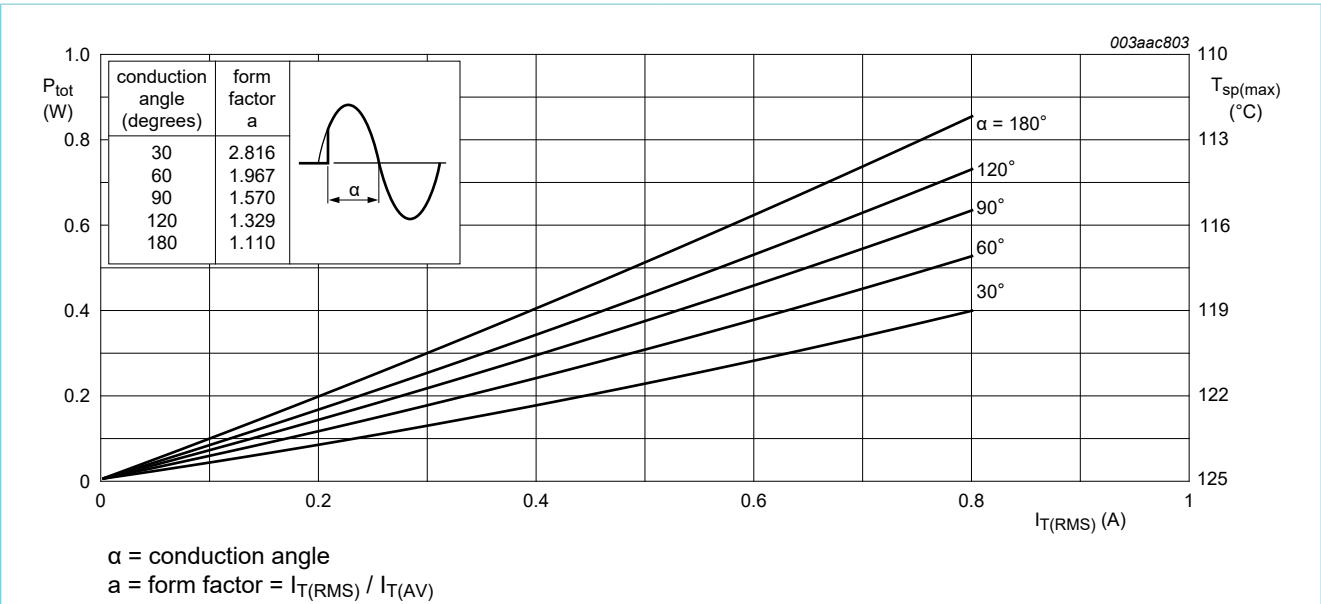


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

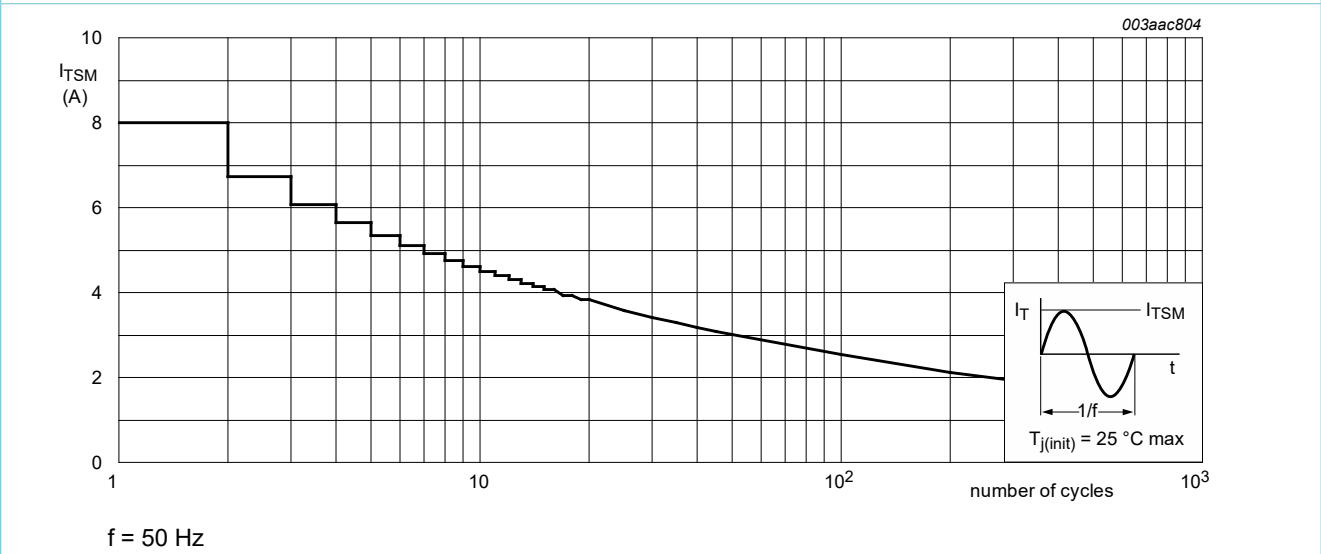


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

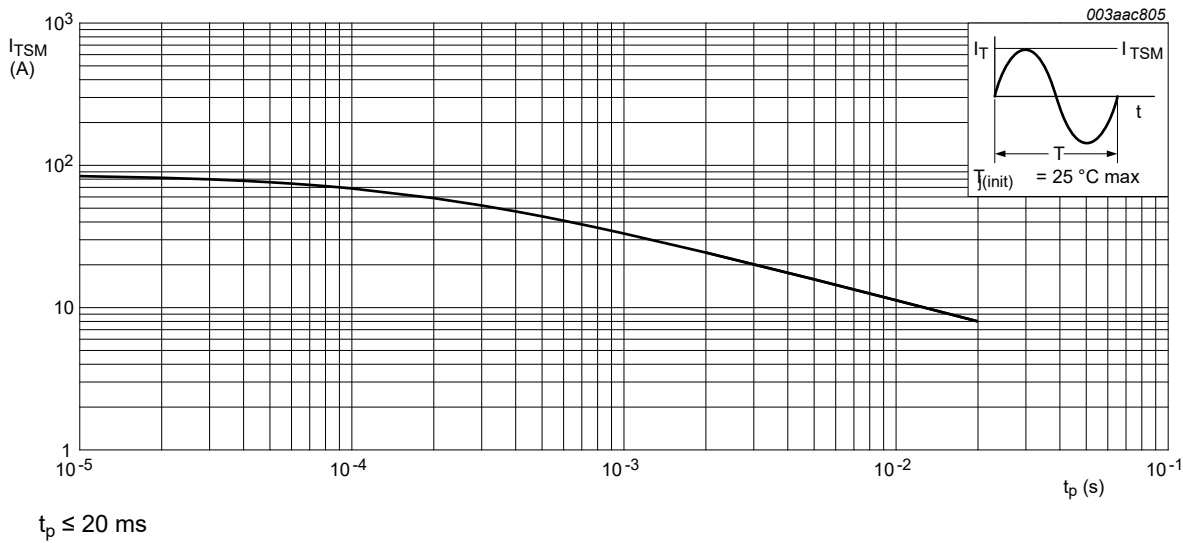


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

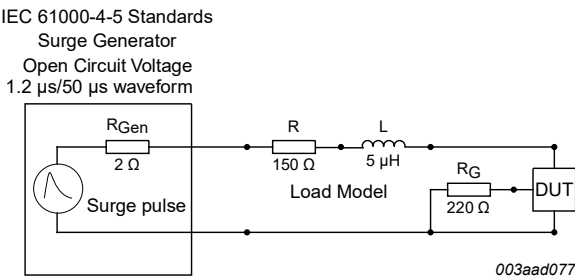


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

8. 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; Fig. 7	-	-	15	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air; printed circuit board mounted; minimum footprint; Fig. 8	-	156	-	K/W
		in free air; printed circuit board mounted; pad area; Fig. 9	-	70	-	K/W

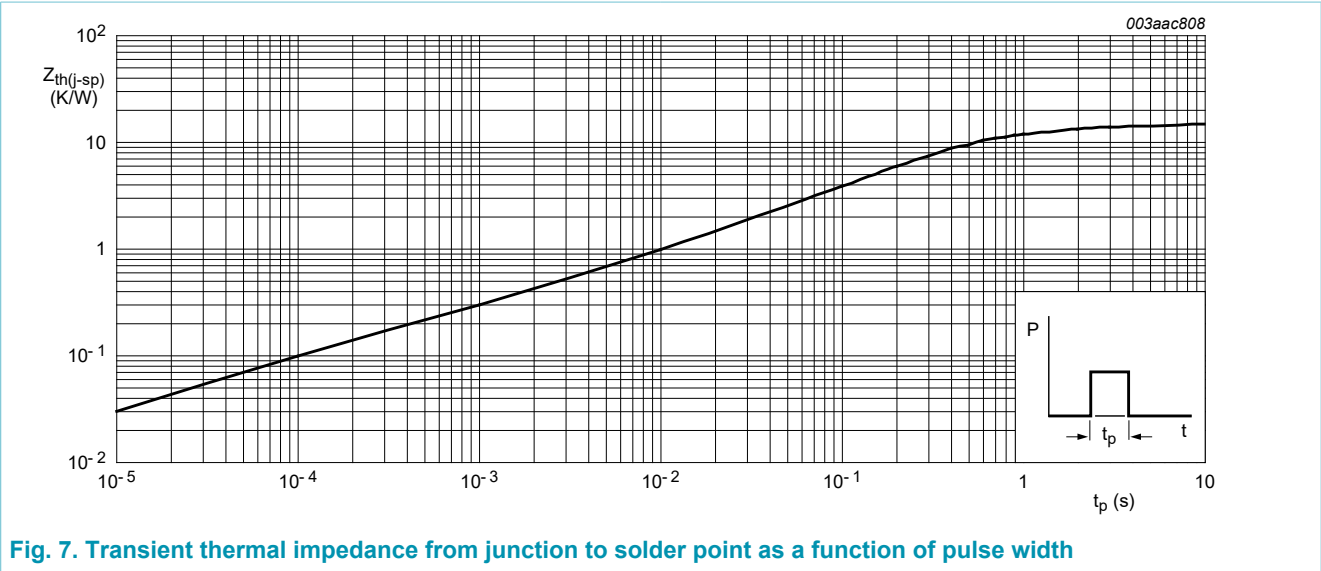
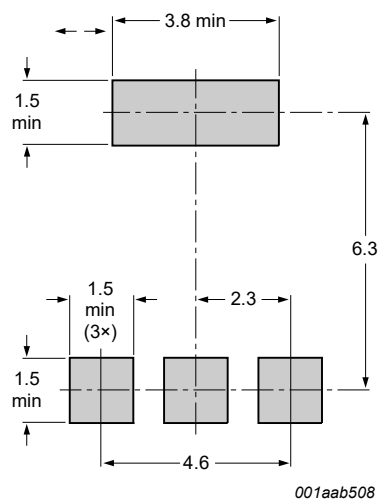
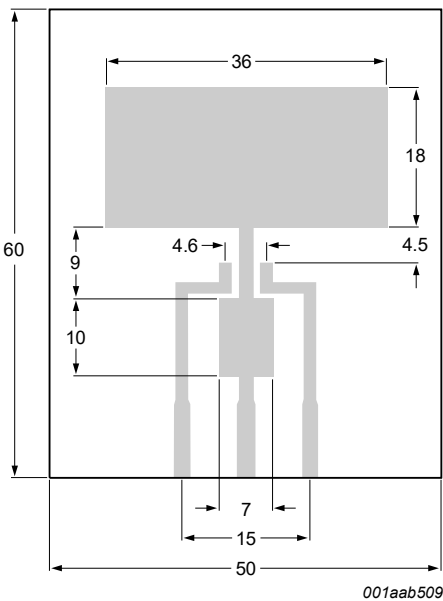


Fig. 7. Transient thermal impedance from junction to solder point as a function of pulse width



All dimensions are in mm

Fig. 8. Minimum footprint SOT223



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

Fig. 9. Printed circuit board pad area: SOT223

9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; LD+ G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 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	$V_D = 12\text{ V}$; $I_G = 12\text{ mA}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 11	-	-	30	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 12	-	9	25	mA
V_T	on-state voltage	$I_T = 1.1\text{ A}$; Fig. 13	-	-	1.3	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 125\text{ }^\circ\text{C}$	0.15	-	-	V
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 25\text{ }^\circ\text{C}$	-	-	1	V
I_D	off-state current	$V_D = 600\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$	-	-	0.2	mA
		$V_D = 600\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$	-	-	2	μA
V_{CL}	clamping voltage	$I_{CL} = 100\text{ }\mu\text{A}$; $t_p = 1\text{ ms}$; $T_j = 125\text{ }^\circ\text{C}$; Fig. 14	650	-	-	V
Dynamic characteristics						
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; Fig. 15	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; Fig. 16 ; Fig. 17	0.3	-	-	A/ms

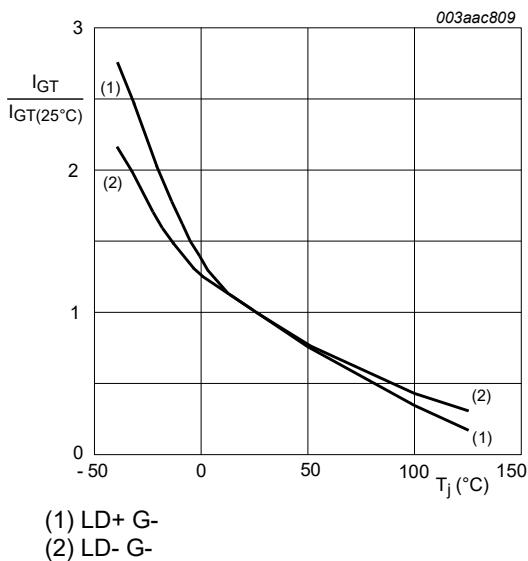


Fig. 10. Normalized gate trigger current as a function of junction temperature

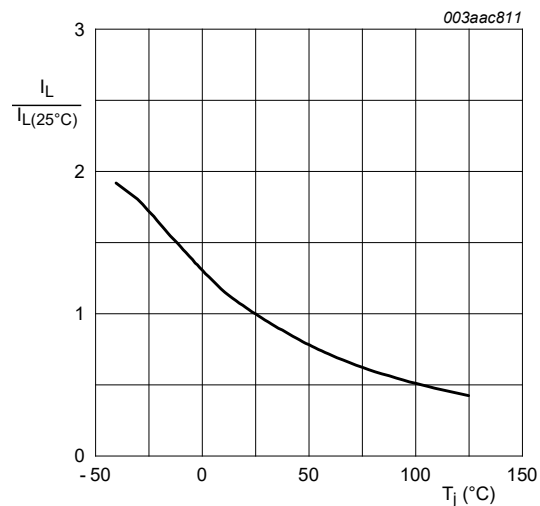


Fig. 11. Normalized latching current as a function of junction temperature

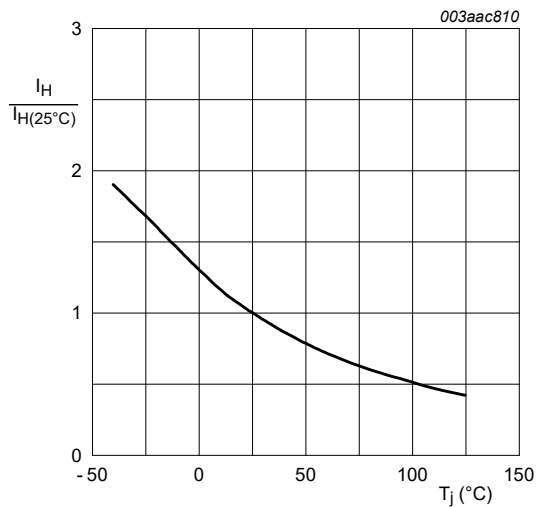
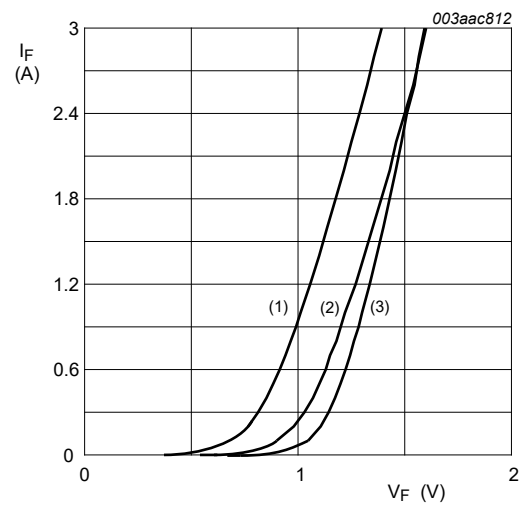


Fig. 12. Normalized holding current as a function of junction temperature



$V_O = 1.044 \text{ V}; R_S = 0.1526 \Omega$
(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

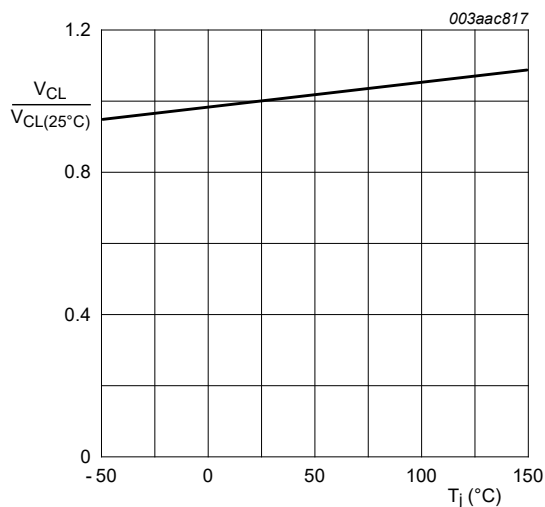
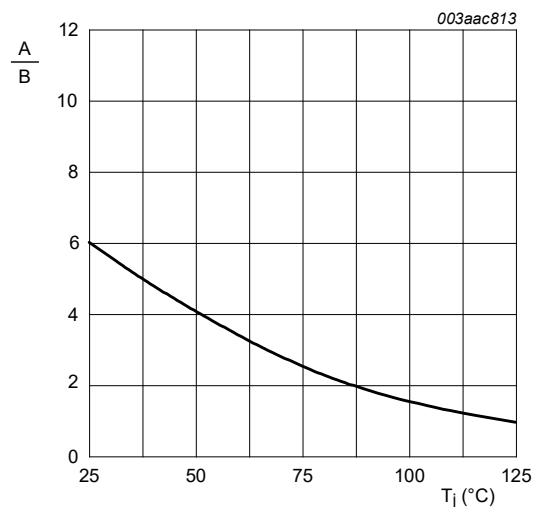
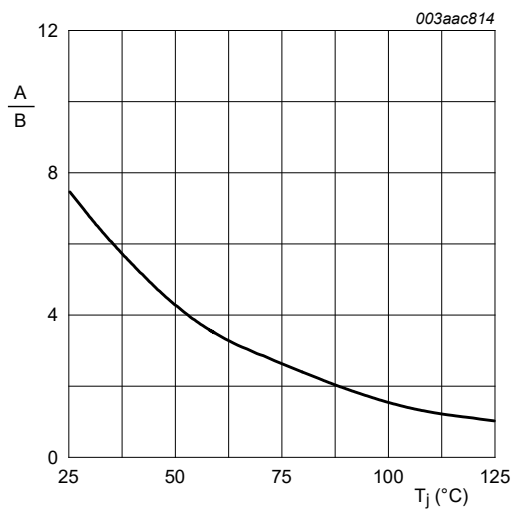


Fig. 14. Normalized clamping voltage (upper limit) as a function of junction temperature; minimum values



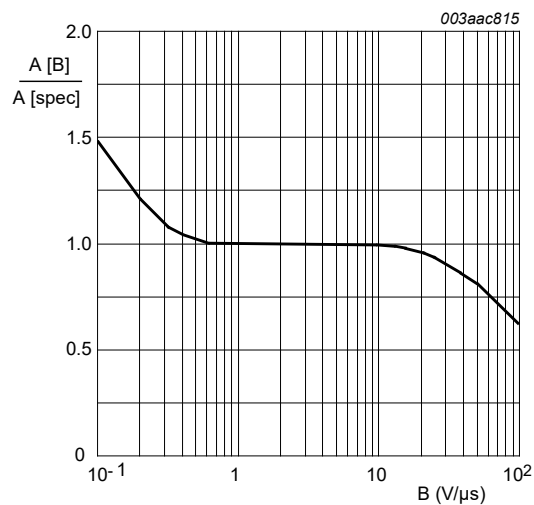
A is dV_D/dt at condition $T_j ^{\circ}\text{C}$
B is dV_D/dt at condition $T_j 125^\circ\text{C}$

Fig. 15. 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. 16. 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. 17. Normalized critical rate of change of commutating current as a function of critical rate of change of commutating voltage; minimum values

10. Package outline

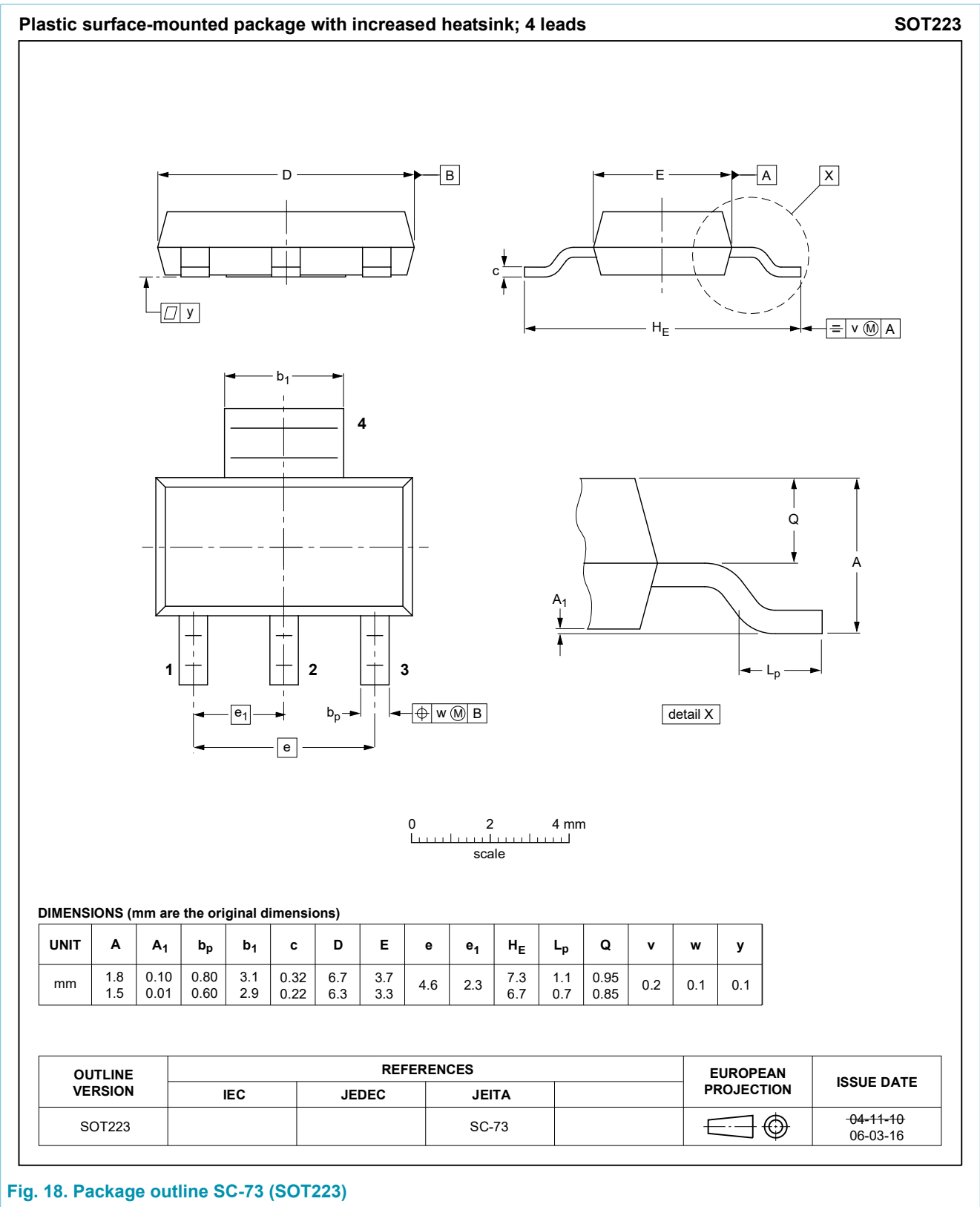
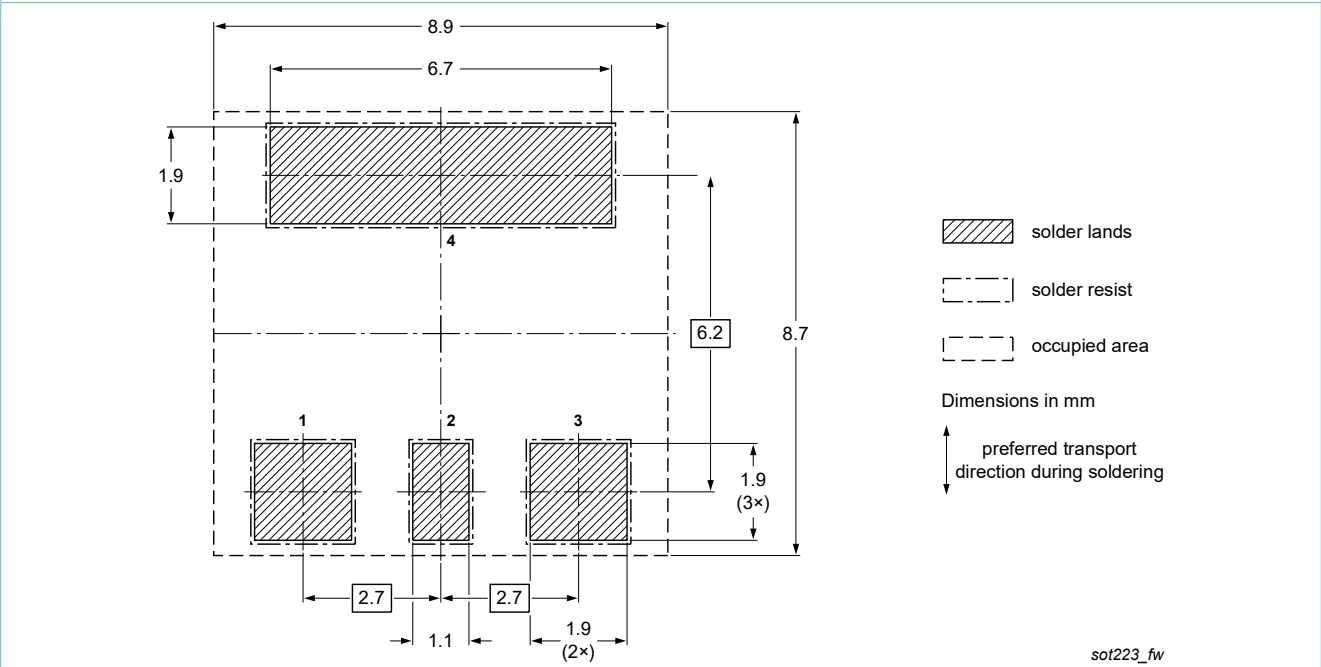
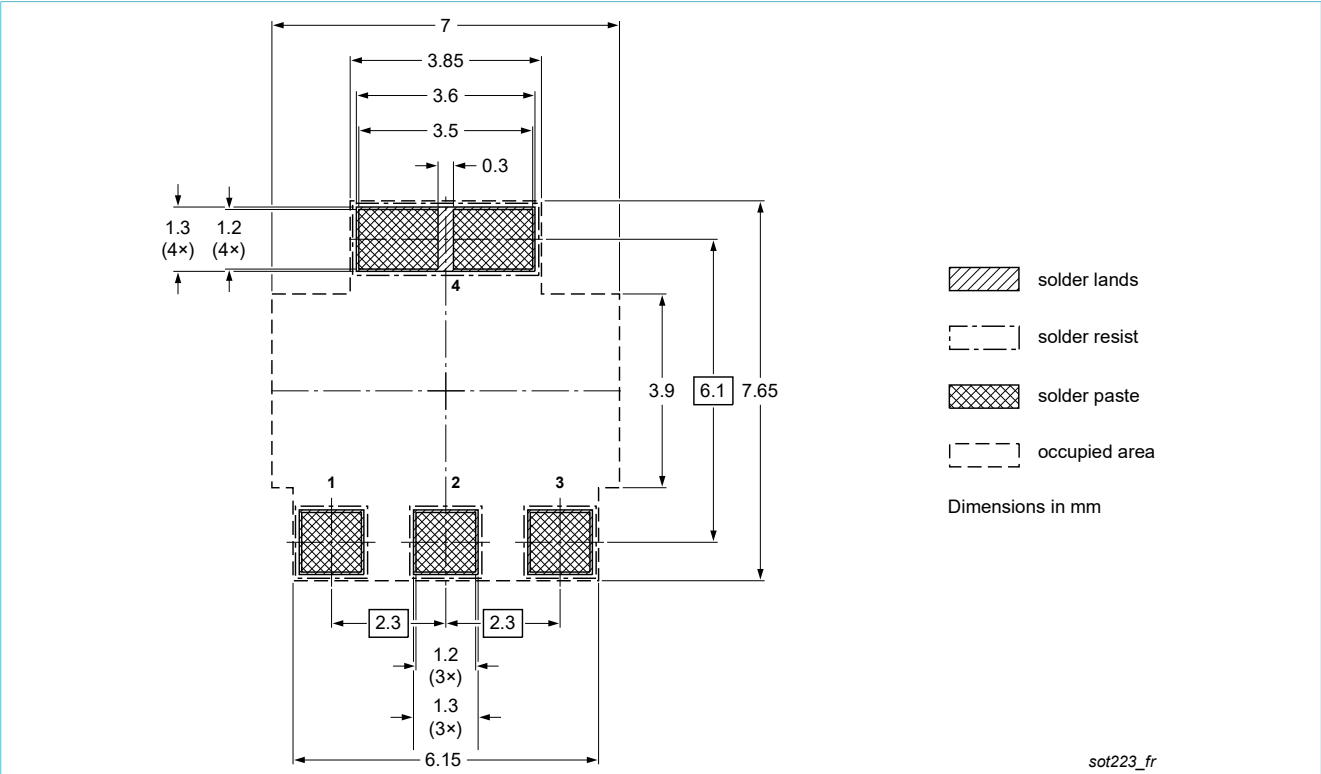


Fig. 18. Package outline SC-73 (SOT223)

11. Soldering



12. Legal information

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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.

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