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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
- High voltage capability
- 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

3. Applications

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

4. Quick reference data

Table 1. Quick reference data

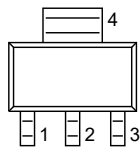
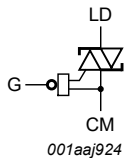
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{sp} \leq 112\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	-	13	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$	-	-	14.3	A
T_j	junction temperature		-	-	125	°C
V_{PP}	peak pulse voltage	$T_j = 25\text{ °C}$; non-repetitive, off-state; ten pulses on each voltage polarity; 20s or more between successive pulses; Fig. 6	-	-	2.5	kV

Static 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; Fig. 10	1	-	10	mA
		V _D = 12 V; I _T = 100 mA; LD- G-; T _j = 25 °C; Fig. 10	1	-	10	mA
I _H	holding current	V _D = 12 V; T _j = 25 °C; Fig. 12	-	-	20	mA
V _T	on-state voltage	I _T = 1.1 A; T _j = 25 °C; Fig. 13	-	-	1.3	V
V _{CL}	clamping voltage	I _{CL} = 0.1 mA; t _p = 1 ms; T _j = 25 °C	850	-	-	V
Dynamic characteristics						
dV _D /dt	rate of rise of off-state voltage	V _{DM} = 536 V; T _j = 125 °C; (V _{DM} = 67% of V _{DRM}); exponential waveform; gate open circuit; Fig. 15	500	-	-	V/μs
di _{com} /dt	rate of change of commutating current	V _D = 400 V; T _j = 125 °C; I _{T(RMS)} = 0.8 A; dV _{com} /dt = 20 V/μs; (snubberless condition); gate open circuit; Fig. 16 ; Fig. 17	0.5	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	LD	load	 <p>SC-73 (SOT223)</p>	 <p>001aa924</p>
2	CM	common		
3	G	gate		
4	CM	common		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
ACT108W-800E	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		-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{sp} \leq 112\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	13	A
		full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 16.7\text{ ms}$	-	14.3	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; sine-wave pulse	-	0.84	A^2s
di_T/dt	rate of rise of on-state current	$I_G = 20\text{ mA}$	-	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; ten pulses on each voltage polarity; 20s or more between successive pulses; Fig. 6	-	2.5	kV

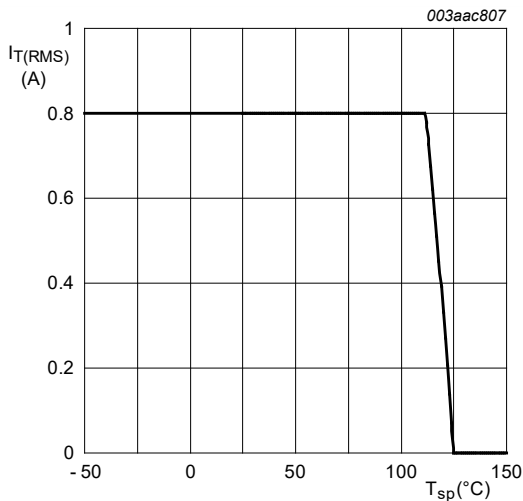
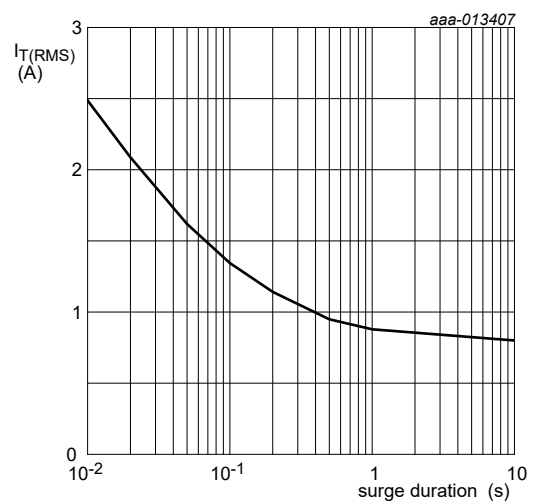
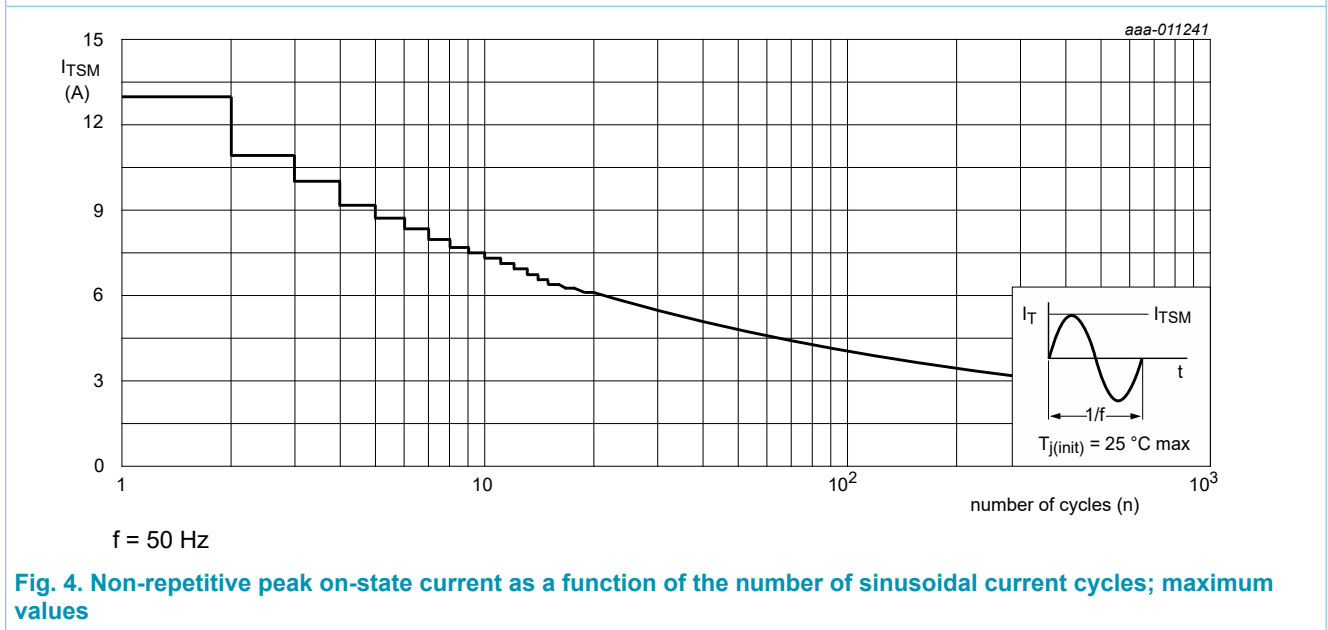
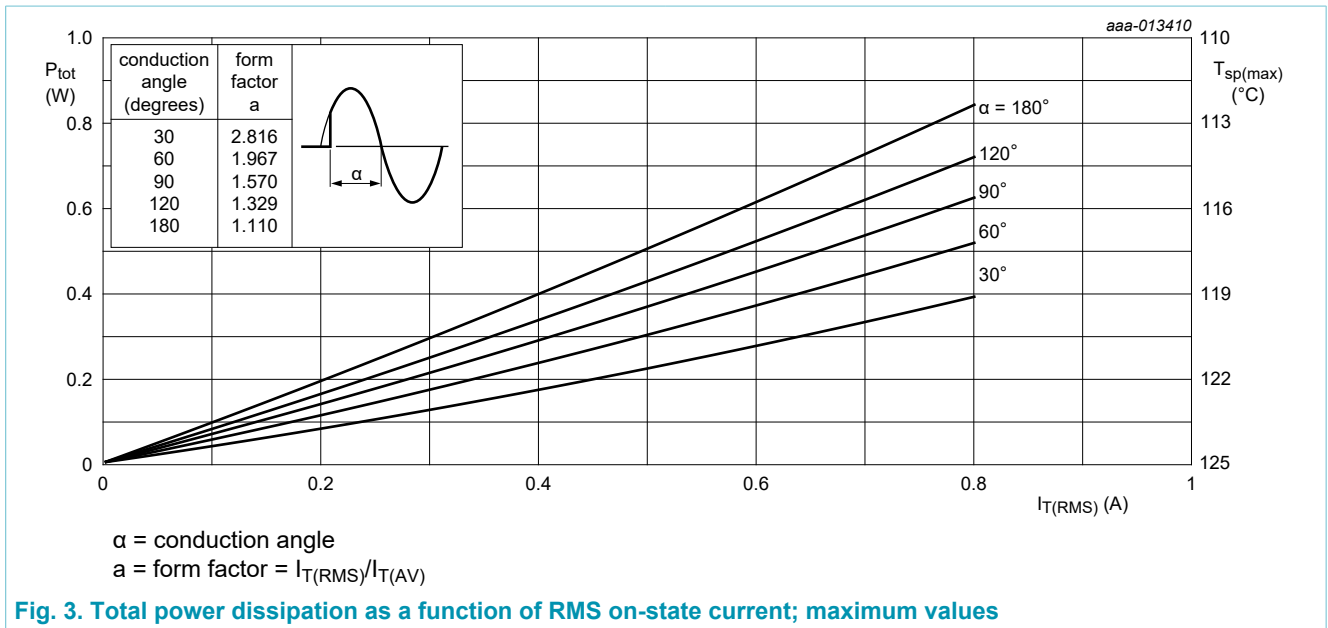


Fig. 1. RMS on-state current as a function of solder point temperature; maximum values



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

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



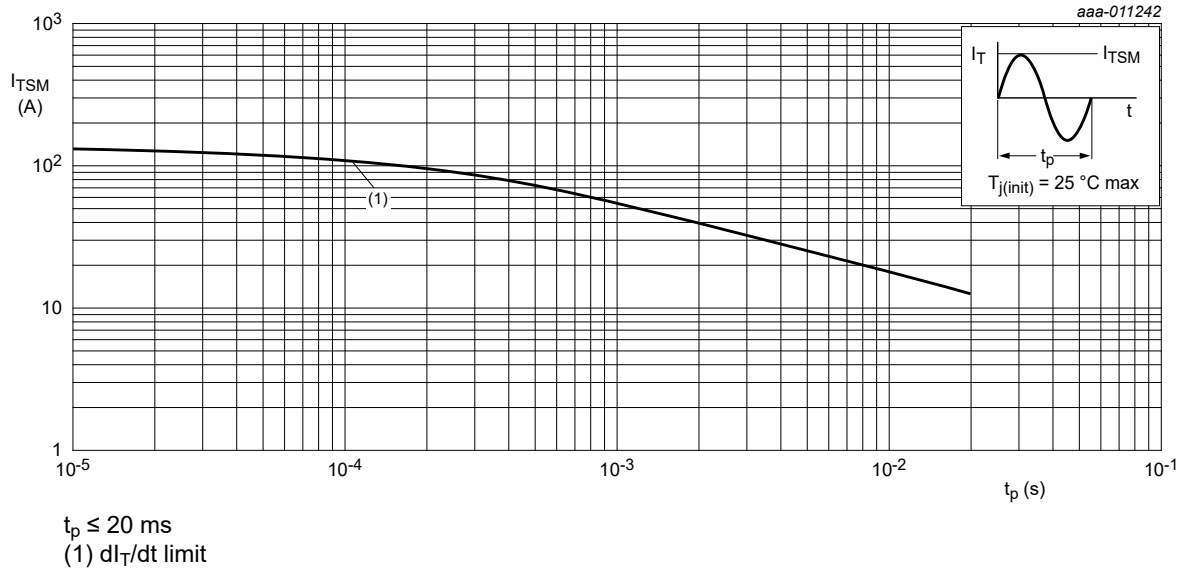


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

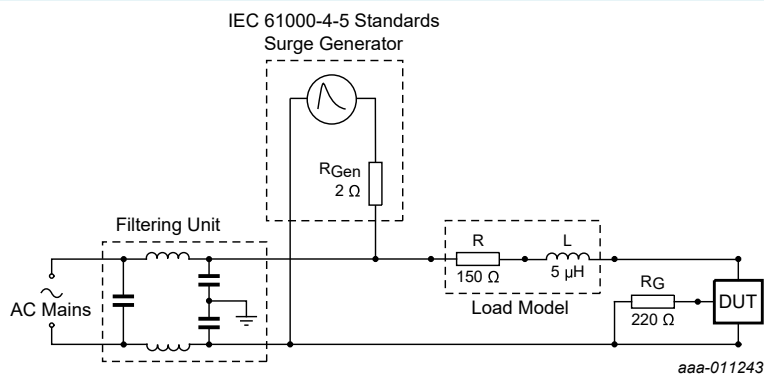


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

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

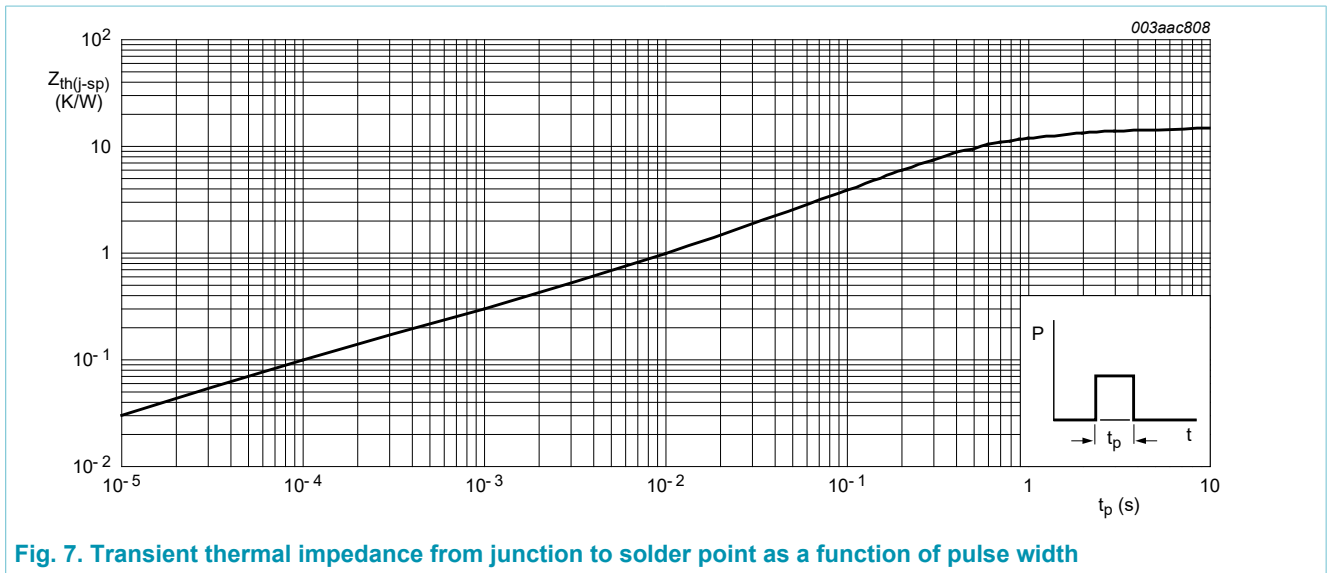
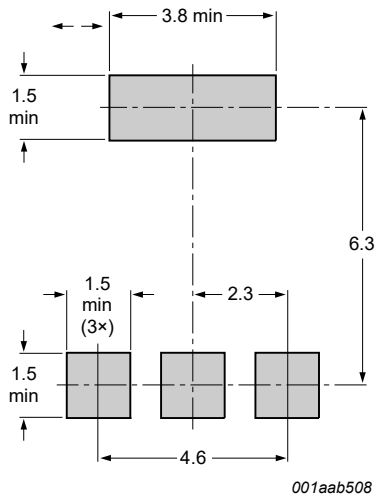
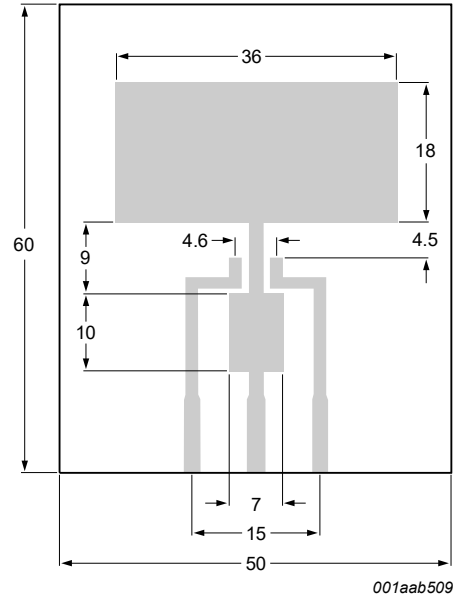


Fig. 7. Transient thermal impedance from junction to solder point as a function of pulse width



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-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 10	1	-	10	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 100\text{ mA}$; LD+ G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 11	-	-	25	mA
		$V_D = 12\text{ V}$; $I_G = 100\text{ mA}$; LD- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 11	-	-	20	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 12	-	-	20	mA
V_T	on-state voltage	$I_T = 1.1\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 13	-	-	1.3	V
V_{GT}	gate trigger voltage	$V_D = 400\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 125\text{ }^\circ\text{C}$; Fig. 14	0.15	-	-	V
		$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 14	-	-	1	V
I_D	off-state current	$V_D = 800\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$	-	-	2	μA
		$V_D = 800\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$	-	-	0.2	mA
V_{CL}	clamping voltage	$I_{CL} = 0.1\text{ mA}$; $t_p = 1\text{ ms}$; $T_j = 25\text{ }^\circ\text{C}$	850	-	-	V
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 15	500	-	-	V/ μs
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{T(RMS)} = 0.8\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit; Fig. 16 ; Fig. 17	0.5	-	-	A/ms

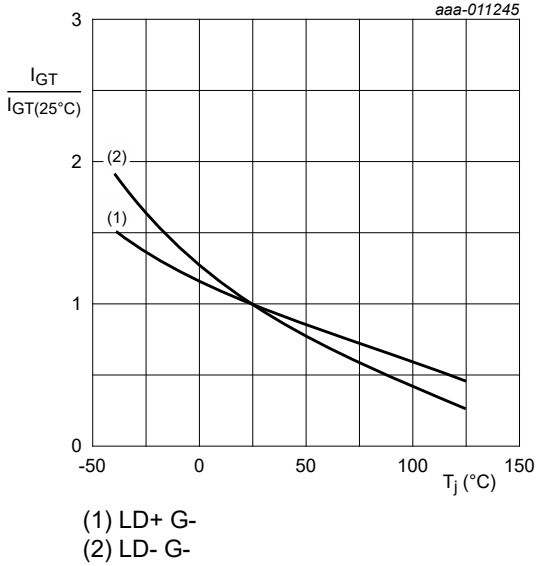


Fig. 10. Normalized gate trigger current as a function of junction temperature

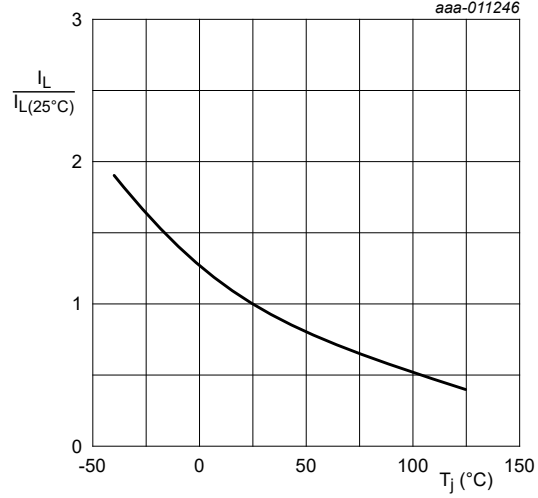


Fig. 11. Normalized latching current as a function of junction temperature

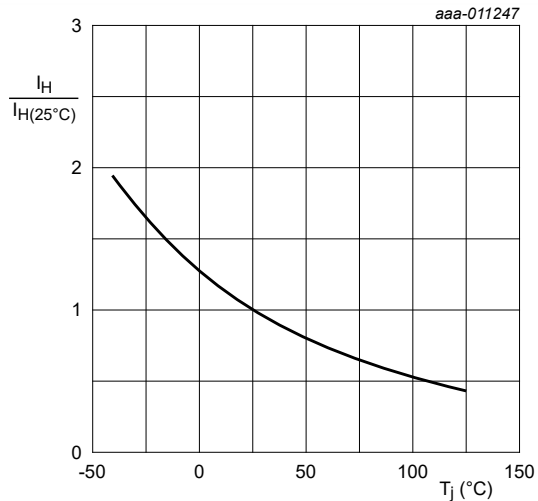
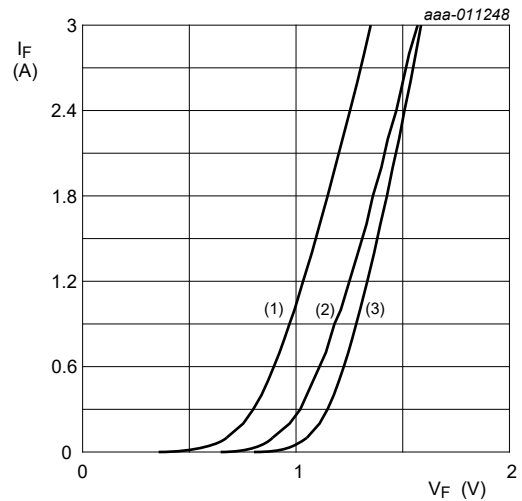


Fig. 12. Normalized holding current as a function of junction temperature



$V_o = 1.031 \text{ V}; R_s = 0.1488 \Omega$
 (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. 13. On-state current as a function of on-state voltage

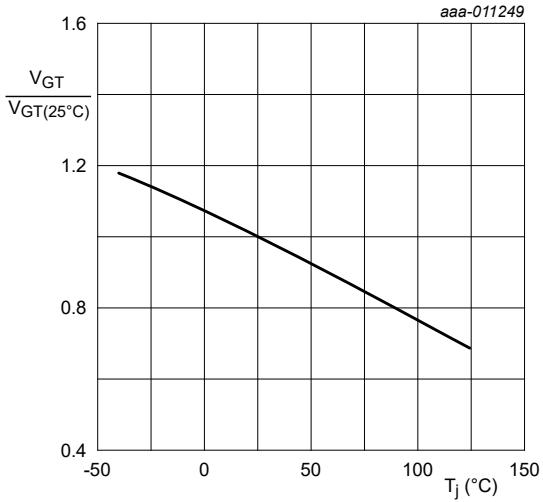
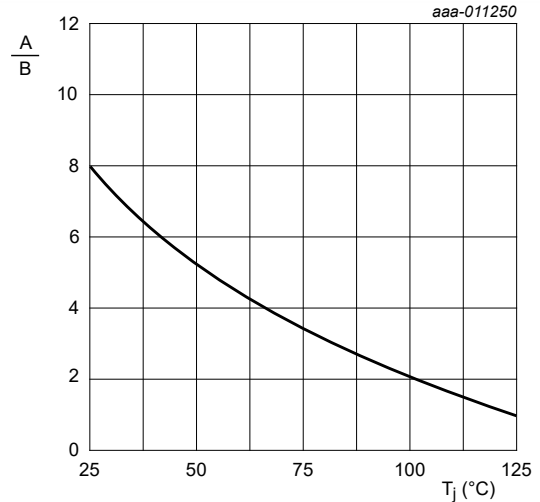
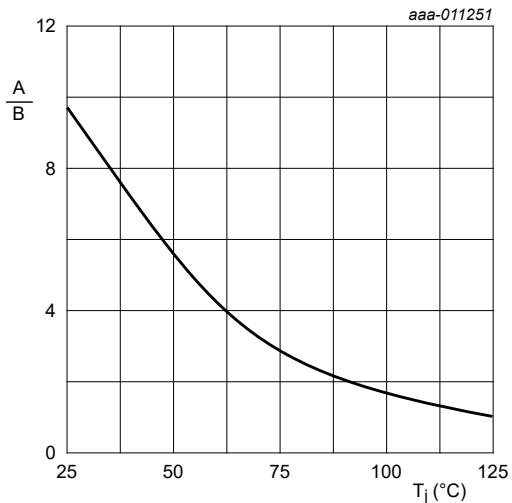


Fig. 14. Normalized gate trigger voltage as a function of junction temperature



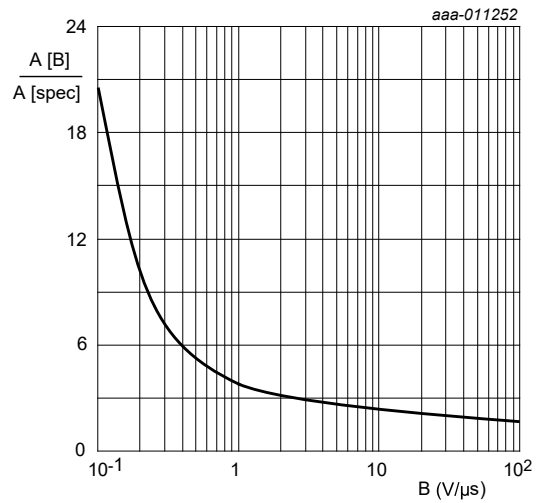
A = dV_D/dt at condition T_j °C
 B = dV_D/dt at condition T_j [125] °C

Fig. 15. Normalized rate of rise of off-state voltage as a function of junction temperature



A = di_{com}/dt at condition T_j °C
 B = 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] = di_{com}/dt at condition B, dV_{com}/dt
 A [spec] is the data sheet value for di_{com}/dt
 turn-off time is less than 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

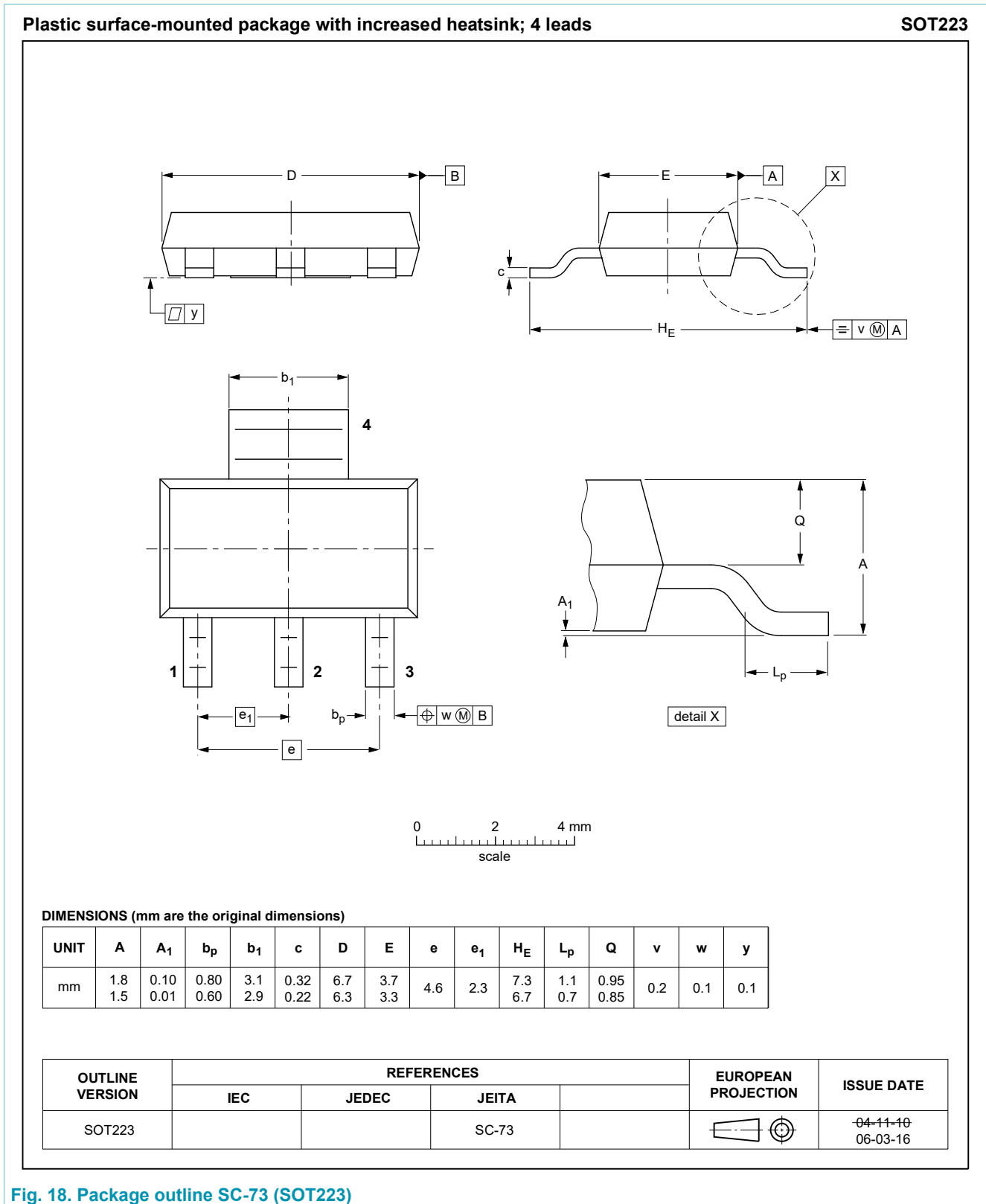


Fig. 18. Package outline SC-73 (SOT223)

11. Soldering

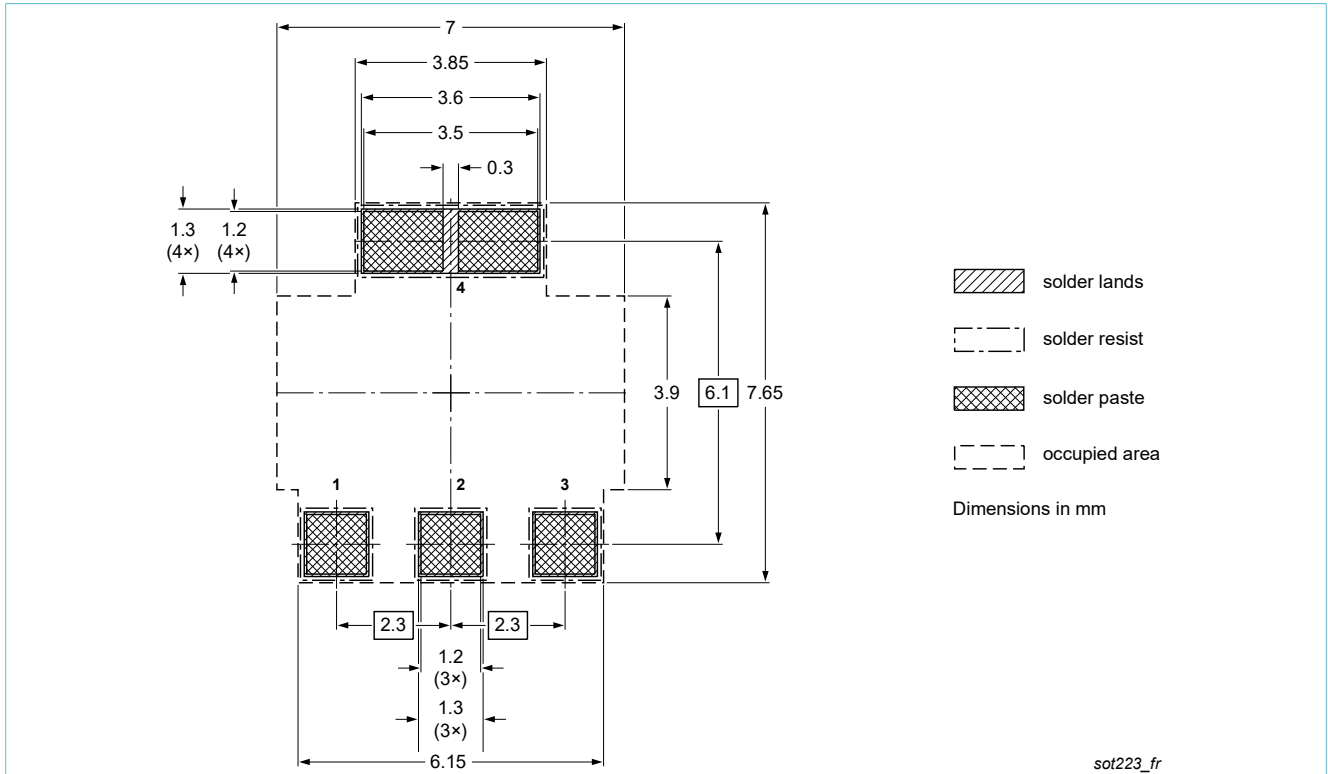


Fig. 19. Reflow soldering footprint for SC-73 (SOT223)

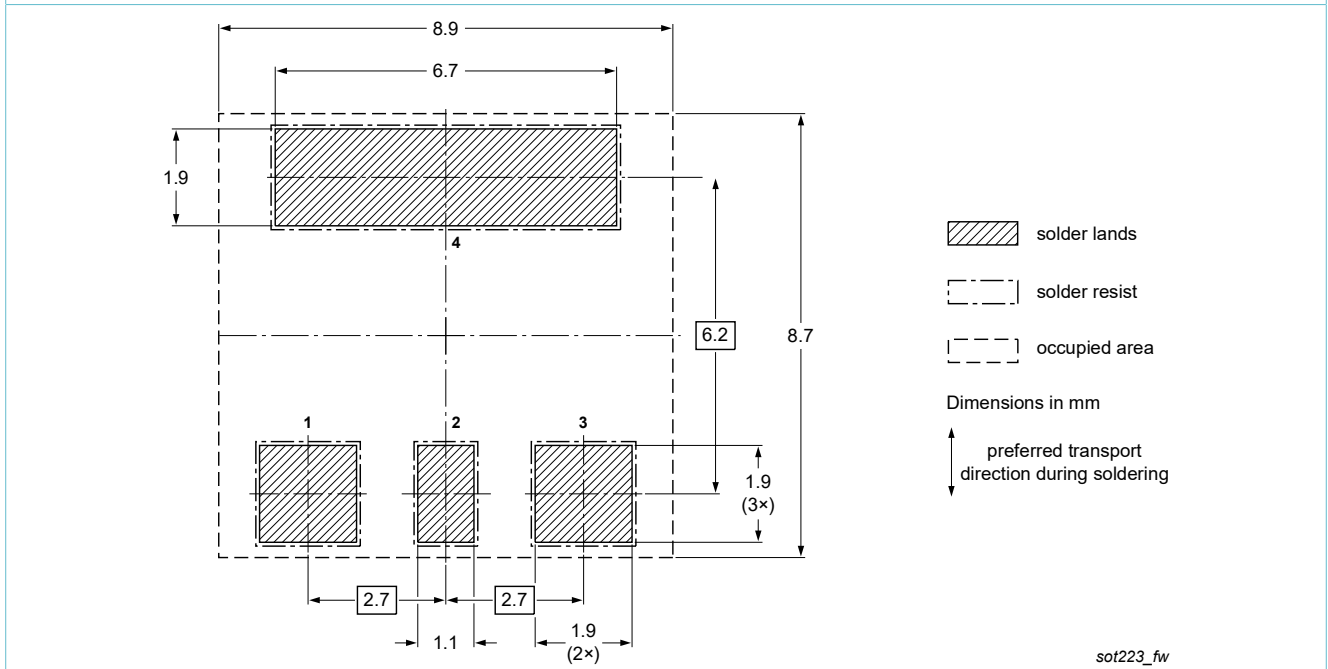


Fig. 20. Wave soldering footprint for SC-73 (SOT223)

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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.
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