

# BT168GWF

SCR

18 March 2014

Product data sheet

## 1. General description

Planar passivated SCR with faster switching performance and sensitive gate in a SOT223 surface mounted plastic package. This SCR with enhanced commutation performance is also designed to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

## 2. Features and benefits

- Fast commutation performance for higher frequency operation
- Full wave rectified AC applications
- Sensitive gate
- Direct triggering from microcontrollers, low power drivers and logic ICs

## 3. Applications

- Earth leakage circuit breakers (ELCB/GFI)
- Ignition circuits (gas appliances, small engines and HID lighting)

## 4. Quick reference data

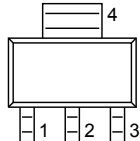

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	-	600	V
$V_{RRM}$	repetitive peak reverse voltage		-	-	600	V
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	8	A
$I_{T(AV)}$	average on-state current	half sine wave; $T_{sp} \leq 112\text{ °C}$ ; <a href="#">Fig. 1</a>	-	-	0.63	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{sp} \leq 112\text{ °C}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	1	A
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 10\text{ mA}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>	70	200	450	$\mu\text{A}$



## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 <p>SC-73 (SOT223)</p>	 <p>sym037</p>
2	A	anode		
3	G	gate		
4	mb	mb; connected to anode		

## 6. Ordering information

Table 3. Ordering information

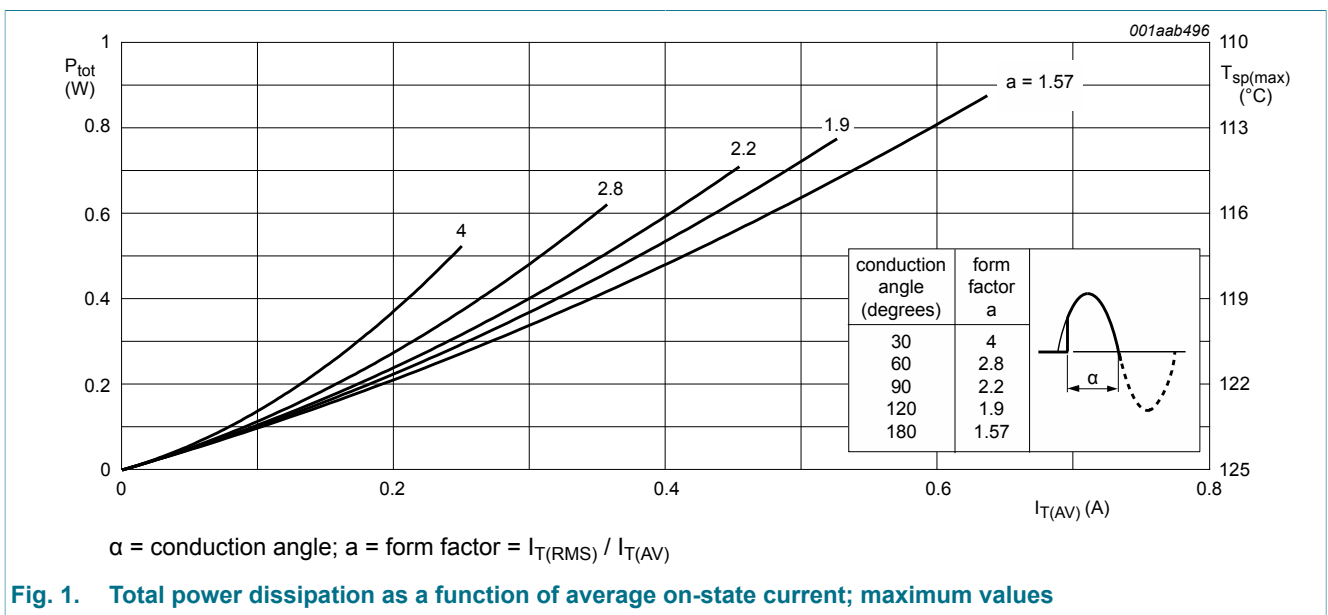
Type number	Package		
	Name	Description	Version
BT168GWF	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

## 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
$V_{RRM}$	repetitive peak reverse voltage		-	600	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{sp} \leq 112\text{ °C}$ ; <a href="#">Fig. 1</a>	-	0.63	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{sp} \leq 112\text{ °C}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	1	A
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	8	A
		half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	-	9	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; SIN	-	0.32	$A^2s$
$dl_T/dt$	rate of rise of on-state current	$I_T = 2\text{ A}$ ; $I_G = 10\text{ mA}$ ; $dl_G/dt = 100\text{ mA}/\mu s$	-	50	$A/\mu s$
$I_{GM}$	peak gate current		-	1	A
$V_{RGM}$	peak reverse gate voltage		-	5	V
$P_{GM}$	peak gate power		-	2	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.1	W
$T_{stg}$	storage temperature		-40	150	$^{\circ}C$
$T_j$	junction temperature		-	125	$^{\circ}C$



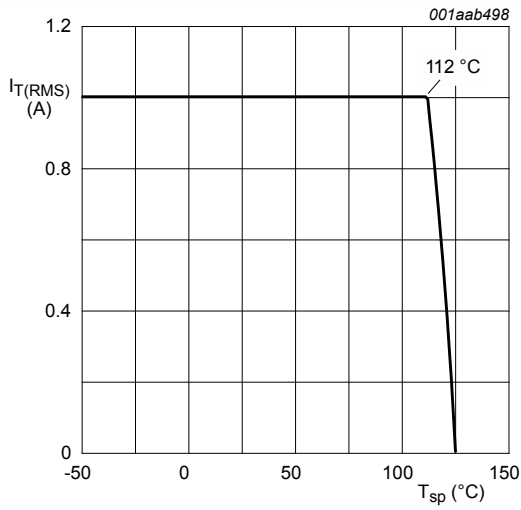
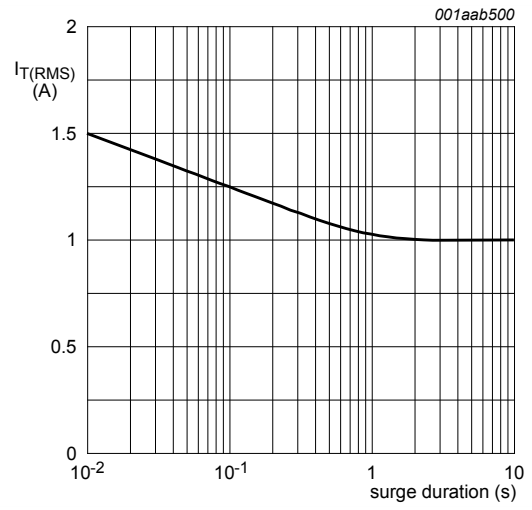
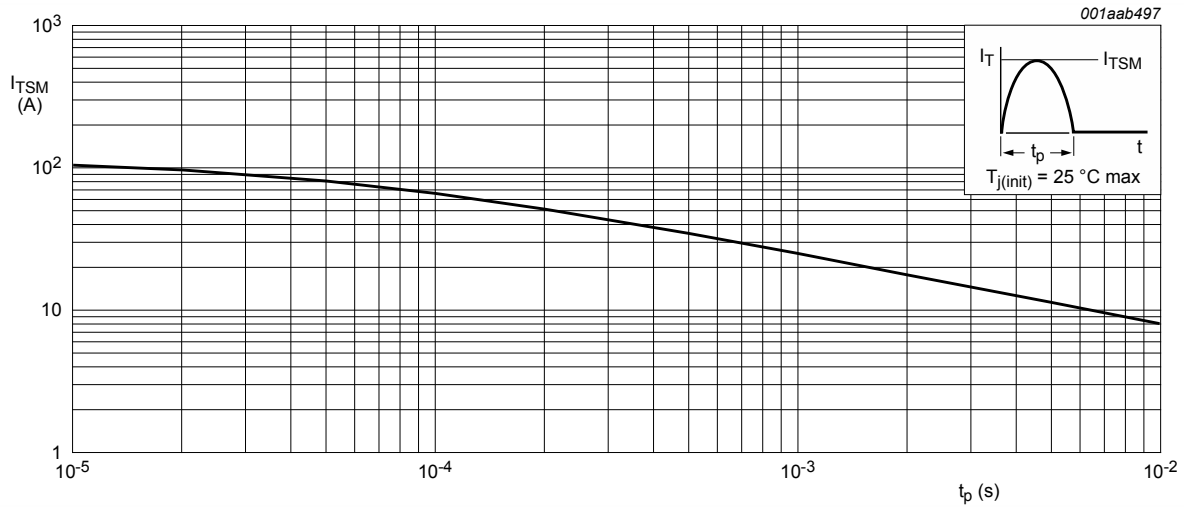


Fig. 2. RMS on-state current as a function of solder point temperature; maximum values



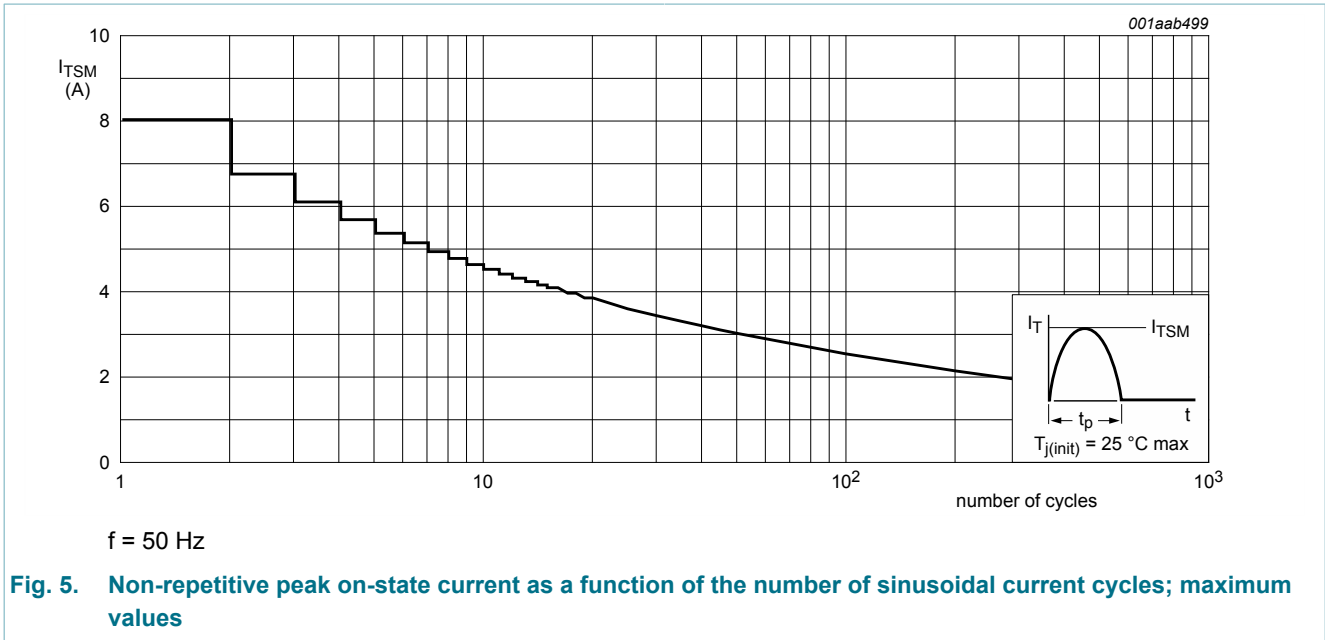
f = 50 Hz; T<sub>sp</sub> = 112 °C

Fig. 3. RMS on-state current as a function of surge duration; maximum values



t<sub>p</sub> ≤ 10 ms

Fig. 4. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values



## 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	<a href="#">Fig. 6</a>	-	-	15	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	printed-circuit board mounted; minimum footprint; <a href="#">Fig. 7</a>	-	156	-	K/W
		printed-circuit board mounted; pad area; <a href="#">Fig. 8</a>	-	70	-	K/W

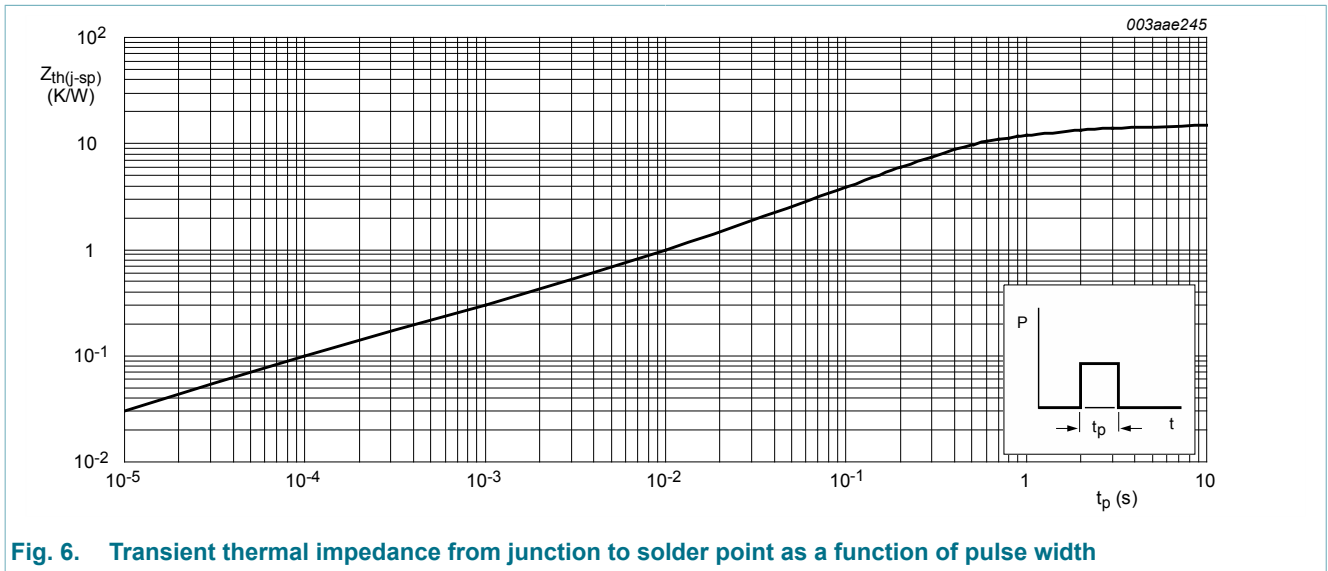
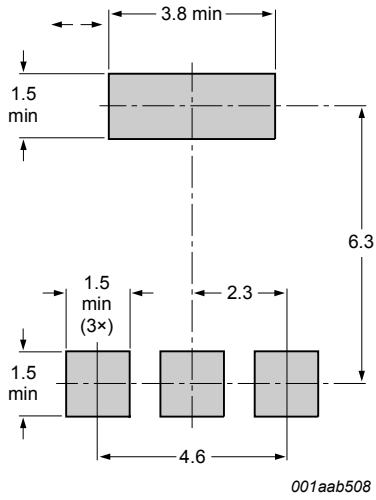
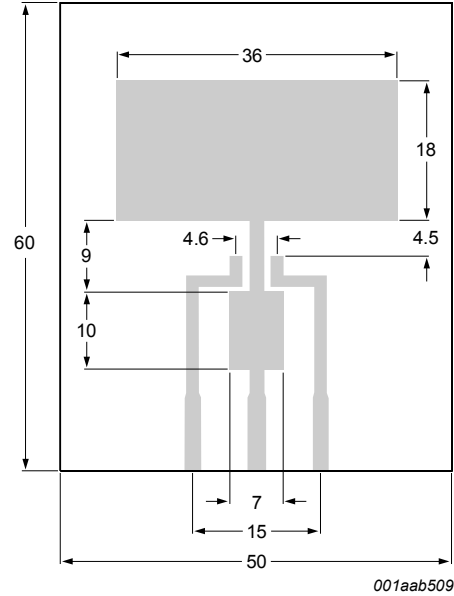


Fig. 6. Transient thermal impedance from junction to solder point as a function of pulse width



All dimensions are in mm

**Fig. 7. Minimum footprint SOT223**



All dimensions are in mm

Printed circuit board:

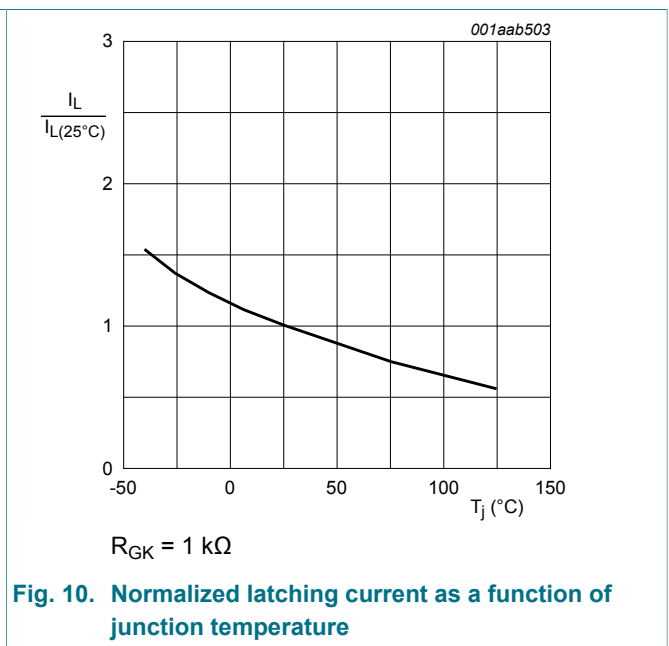
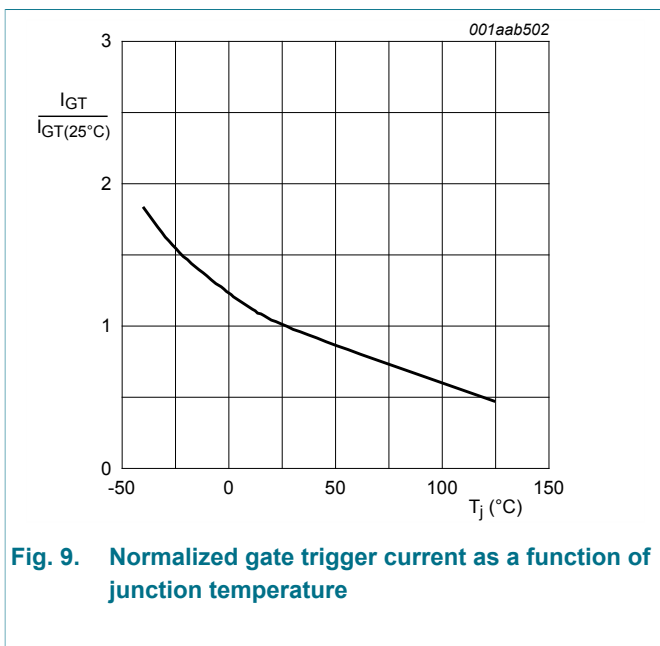
FR4 epoxy glass (1.6 mm thick), copper laminate (35 um thick)

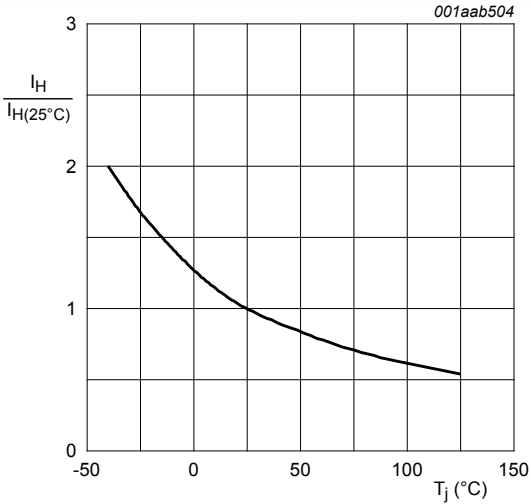
**Fig. 8. Printed circuit board pad area: SOT223**

## 9. Characteristics

Table 6. Characteristics

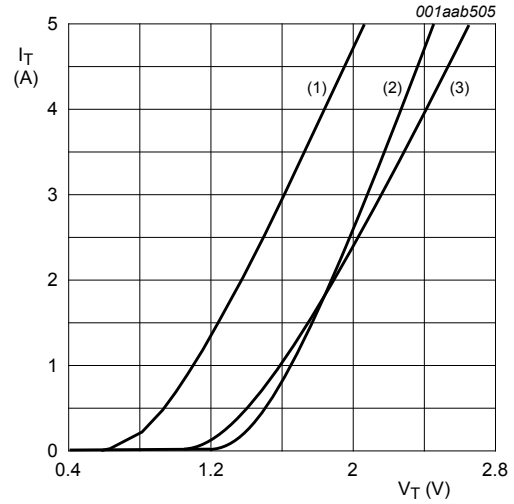
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 10\text{ mA}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>	70	200	450	$\mu\text{A}$
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.5\text{ mA}$ ; $R_{GK} = 1\text{ k}\Omega$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>	3	7.5	13	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $R_{GK} = 1\text{ k}\Omega$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>	0.5	4.1	10	mA
$V_T$	on-state voltage	$I_T = 1.2\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 12</a>	-	1.35	1.7	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 10\text{ mA}$ ; $T_j = 25\text{ }^\circ\text{C}$	-	0.5	0.8	V
		$V_D = 600\text{ V}$ ; $I_T = 10\text{ mA}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; <a href="#">Fig. 13</a>	0.2	0.3	-	V
$I_D$	off-state current	$V_D = 600\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $R_{GK} = 1\text{ k}\Omega$	-	0.05	0.1	mA
$I_R$	reverse current	$V_R = 600\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $R_{GK} = 1\text{ k}\Omega$	-	0.05	0.1	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $R_{GK} = 1\text{ k}\Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; <a href="#">Fig. 14</a>	350	800	-	$\text{V}/\mu\text{s}$
		$V_{DM} = 402\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit; <a href="#">Fig. 14</a>	-	25	-	$\text{V}/\mu\text{s}$





$R_{GK} = 1 \text{ k}\Omega$

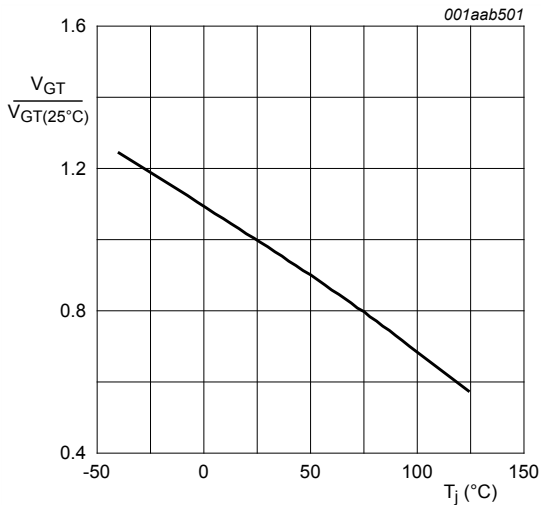
**Fig. 11. Normalized holding current as a function of junction temperature**



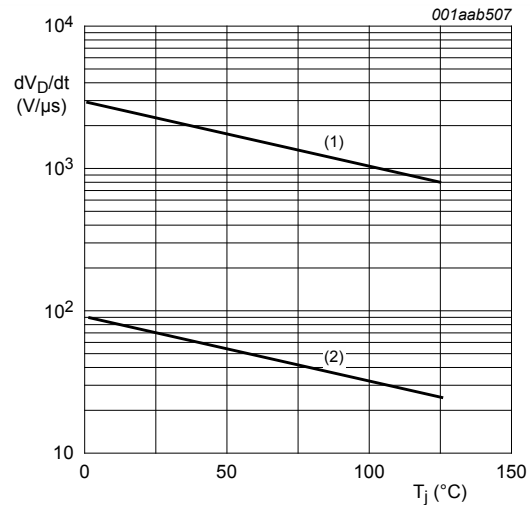
$V_o = 1.0 \text{ V}; R_s = 0.27 \Omega$

- (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. 12. On-state current as a function of on-state voltage**



**Fig. 13. Normalized gate trigger voltage as a function of junction temperature**



- (1)  $R_{GK} = 1 \text{ k}\Omega$
- (2) gate open circuit

**Fig. 14. Critical rate of rise of off-state voltage as a function of junction temperature; typical values**

### 10. Package outline

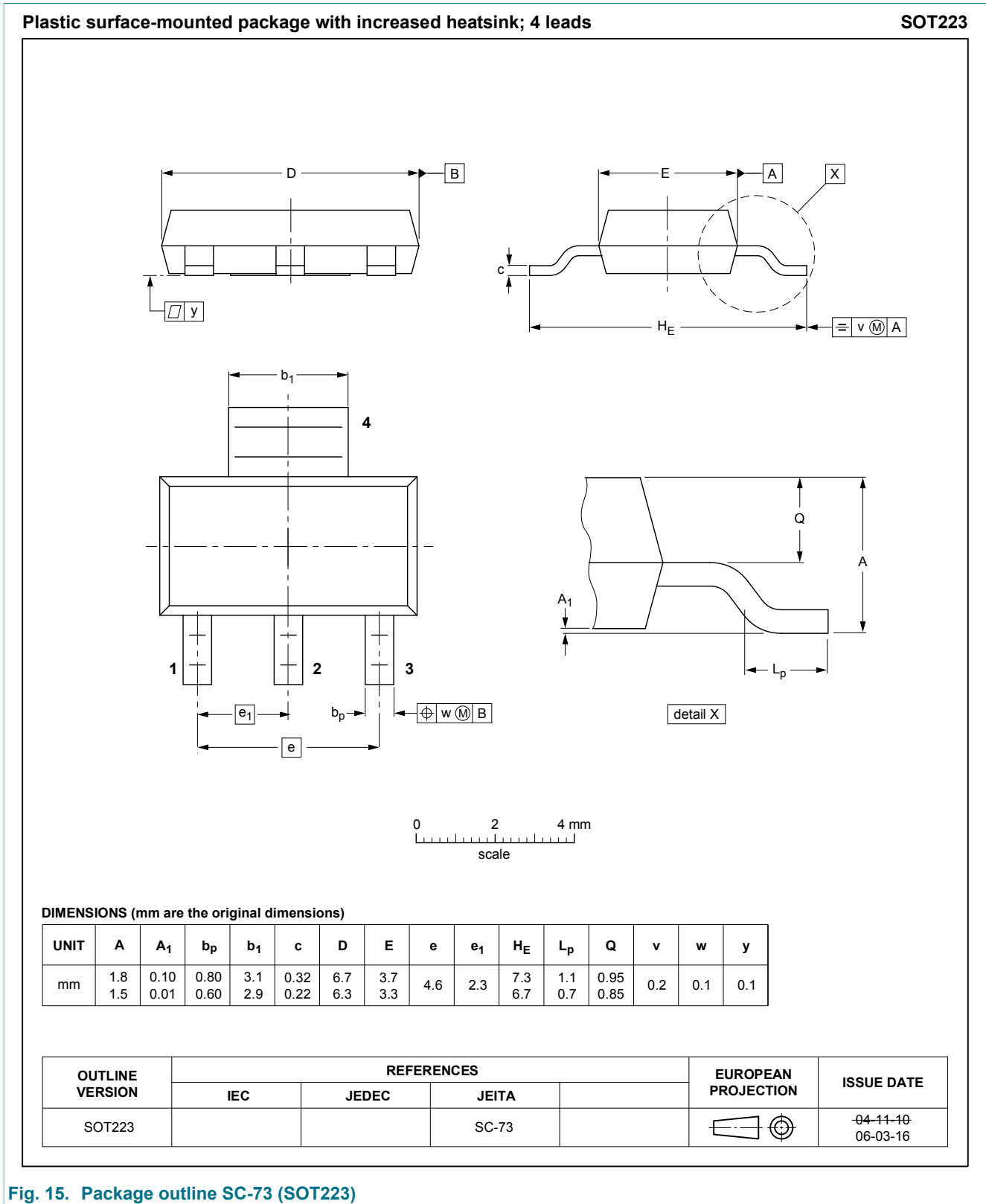


Fig. 15. Package outline SC-73 (SOT223)

### 11. Soldering

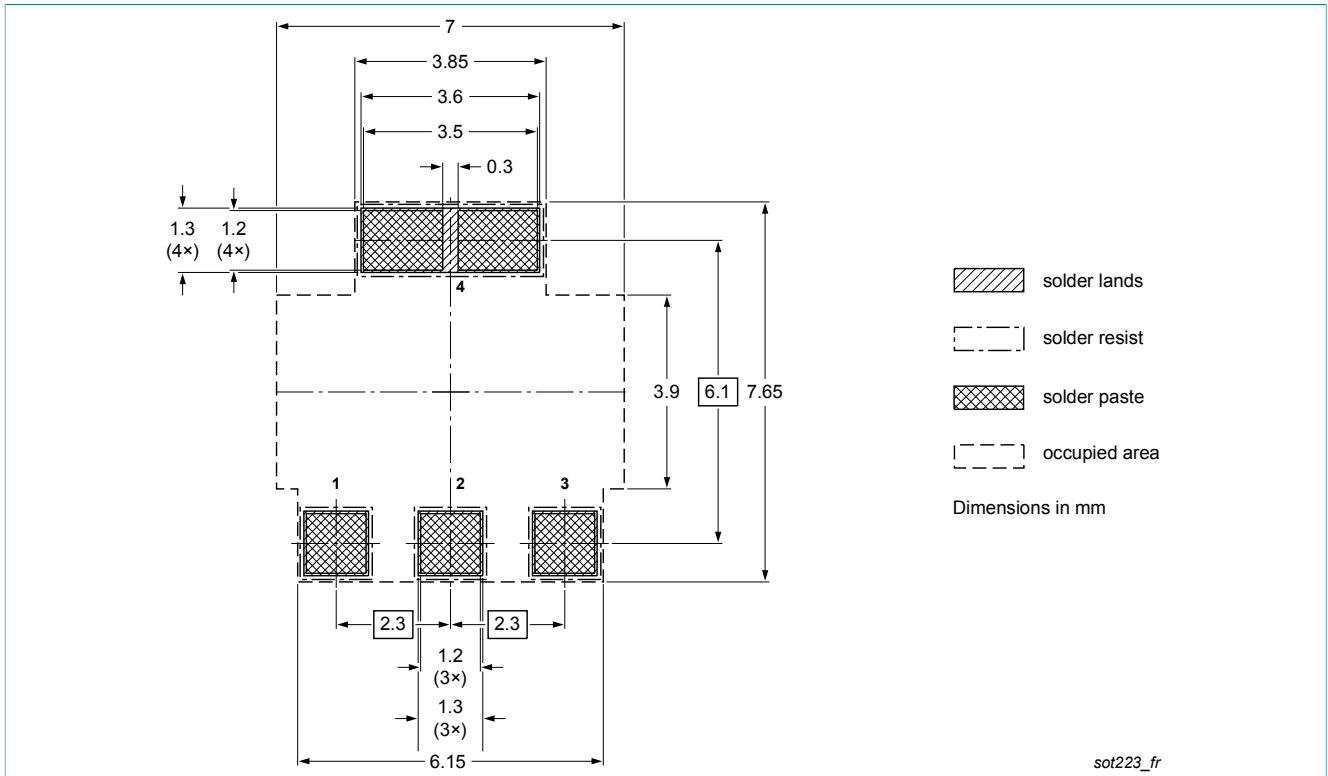


Fig. 16. Reflow soldering footprint for SC-73 (SOT223)

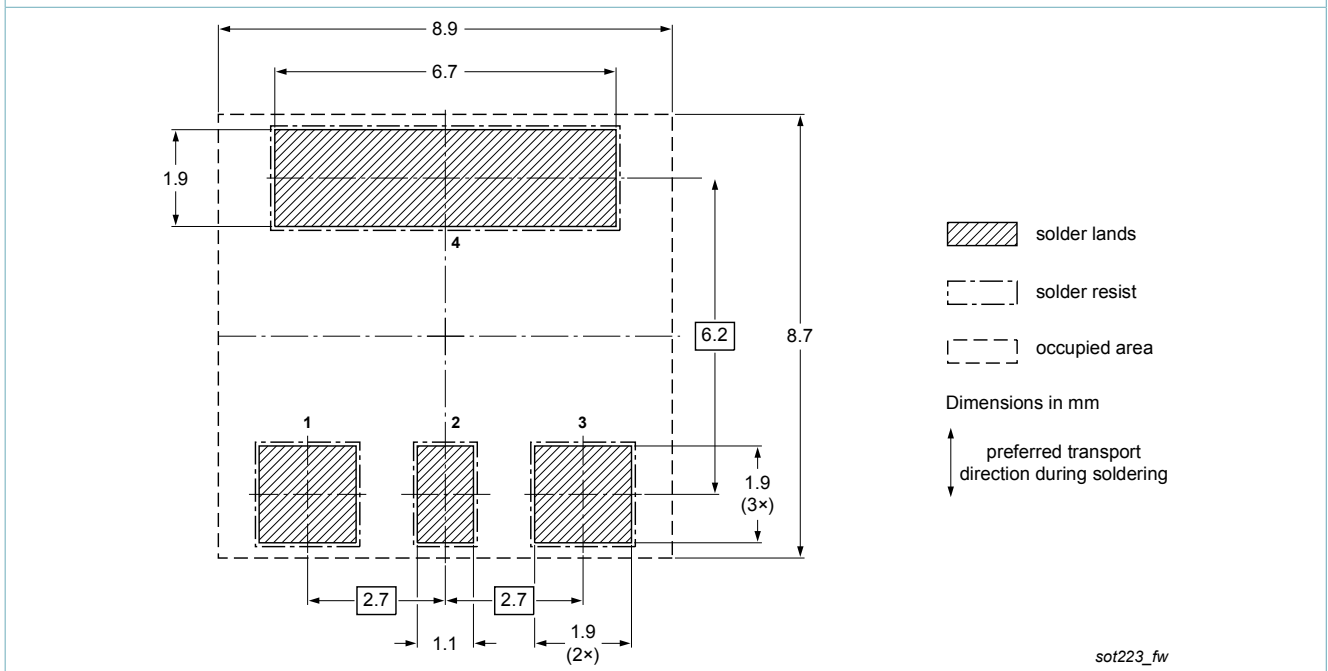


Fig. 17. Wave soldering footprint for SC-73 (SOT223)

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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.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
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## 13. Contents

1	General description .....	1
2	Features and benefits .....	1
3	Applications .....	1
4	Quick reference data .....	1
5	Pinning information .....	2
6	Ordering information .....	2
7	Limiting values .....	3
8	Thermal characteristics .....	6
9	Characteristics .....	8
10	Package outline .....	10
11	Soldering .....	11
12	Legal information .....	12
12.1	Data sheet status .....	12
12.2	Definitions .....	12
12.3	Disclaimers .....	12
12.4	Trademarks .....	13

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