



# BSP60

PNP Darlington transistor

2 May 2018

Product data sheet

## 1. General description

PNP Darlington transistor in an SOT223 plastic package.

NPN complement: BSP50

## 2. Features and benefits

- High current of -1 A
- Low voltage of -45 V
- Integrated diode and resistor
- AEC-Q101 qualified

## 3. Applications

- Industrial switching applications such as:
  - Print hammer
  - Solenoid
  - Relay and lamp drivers

## 4. Quick reference data

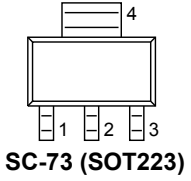
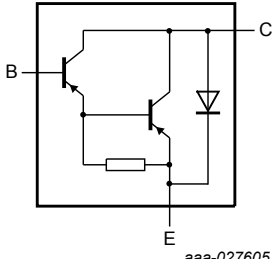
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CB0}$	collector-base voltage	open emitter	-	-	-60	V
$V_{CES}$	collector-emitter voltage	base short-circuited to emitter	-	-	-45	V
$I_C$	collector current		-	-	-1	A
$I_{CM}$	peak collector current		-	-	-2	A
$h_{FE}$	DC current gain	$V_{CE} = -10\text{ V}; I_C = -150\text{ mA}$	[1]	1000	-	-

[1] Pulse test:  $t_p \leq 300\ \mu\text{s}; \delta \leq 0.02$ .

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p>SC-73 (SOT223)</p>	 <p>aaa-027605</p>
2	C	collector		
3	E	emitter		
4	C	collector		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BSP60	SC-73	plastic, surface-mounted package with increased heatsink; 4 leads; 4.6 mm pitch; 6.5 mm x 3.5 mm x 1.65 mm body	SOT223

## 7. Marking

Table 4. Marking codes

Type number	Marking code
BSP60	BSP60

## 8. Limiting values

**Table 5. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

Symbol	Parameter	Conditions		Min	Max	Unit
$V_{CB0}$	collector-base voltage	open emitter		-	-60	V
$V_{CES}$	collector-emitter voltage	base short-circuited to emitter		-	-45	V
$V_{EBO}$	emitter-base voltage	open collector		-	-5	V
$I_C$	collector current			-	-1	A
$I_{CM}$	peak collector current			-	-2	A
$I_{Blim}$	limiting base current			-	-100	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	1.25	W
$T_j$	junction temperature			-	150	°C
$T_{amb}$	ambient temperature			-65	150	°C
$T_{stg}$	storage temperature			-65	150	°C

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

## 9. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient		[1]	-	-	98	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	17	K/W

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

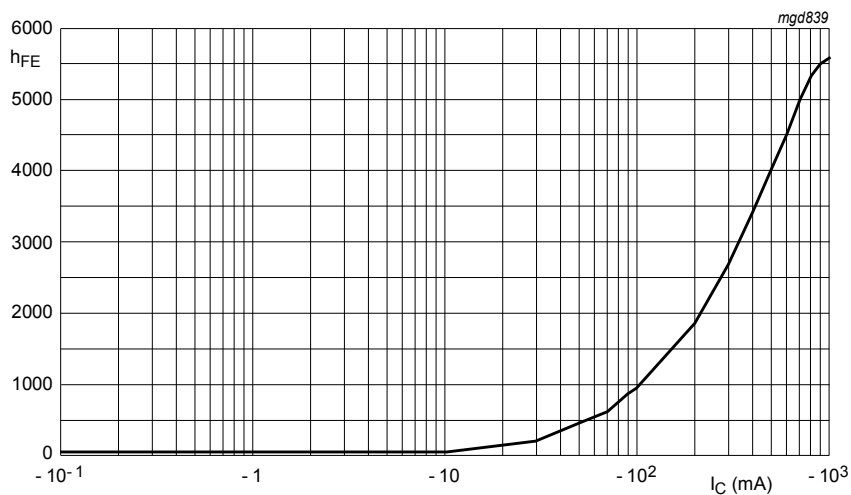
## 10. Characteristics

**Table 7. Characteristics**

$T_j = 25\text{ °C}$  unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = -100\ \mu\text{A}$ ; $I_E = 0\ \text{A}$	-60	-	-	V
$V_{(BR)CES}$	collector-emitter breakdown voltage	$I_C = -2\ \text{mA}$ ; $V_{BE} = 0\ \text{V}$	-45	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_C = 0\ \text{A}$ ; $I_E = -100\ \mu\text{A}$	-5	-	-	V
$I_{CES}$	collector-emitter cut-off current	$V_{BE} = 0\ \text{V}$ ; $V_{CE} = -45\ \text{V}$	-	-	-50	nA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -4\ \text{V}$ ; $I_C = 0\ \text{A}$	-	-	-50	nA
$h_{FE}$	DC current gain	$V_{CE} = -10\ \text{V}$ ; $I_C = -150\ \text{mA}$	[1]	1000	-	-
		$V_{CE} = -10\ \text{V}$ ; $I_C = -500\ \text{mA}$	[1]	2000	-	-
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -500\ \text{mA}$ ; $I_B = -0.5\ \text{mA}$	-	-	-1.3	V
		$I_C = -500\ \text{mA}$ ; $I_B = -0.5\ \text{mA}$ ; $T_j = 150\text{ °C}$	-	-	-1.3	V
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -500\ \text{mA}$ ; $I_B = -0.5\ \text{mA}$	-	-	-1.9	V
$t_{on}$	turn-on time	$I_C = -500\ \text{mA}$ ; $I_{B0n} = -0.5\ \text{mA}$ ; $I_{B0ff} = 0.5\ \text{mA}$	-	400	-	ns
$t_{off}$	turn-off time		-	1500	-	ns
$f_T$	transition frequency	$V_{CE} = -5\ \text{V}$ ; $I_C = -500\ \text{mA}$ ; $f = 100\ \text{MHz}$	-	200	-	MHz

[1] Pulse test:  $t_p \leq 300\ \mu\text{s}$ ;  $\delta \leq 0.02$ .



$V_{CE} = -10\ \text{V}$

**Fig. 1. DC current gain; typical values**

### 11. Test information

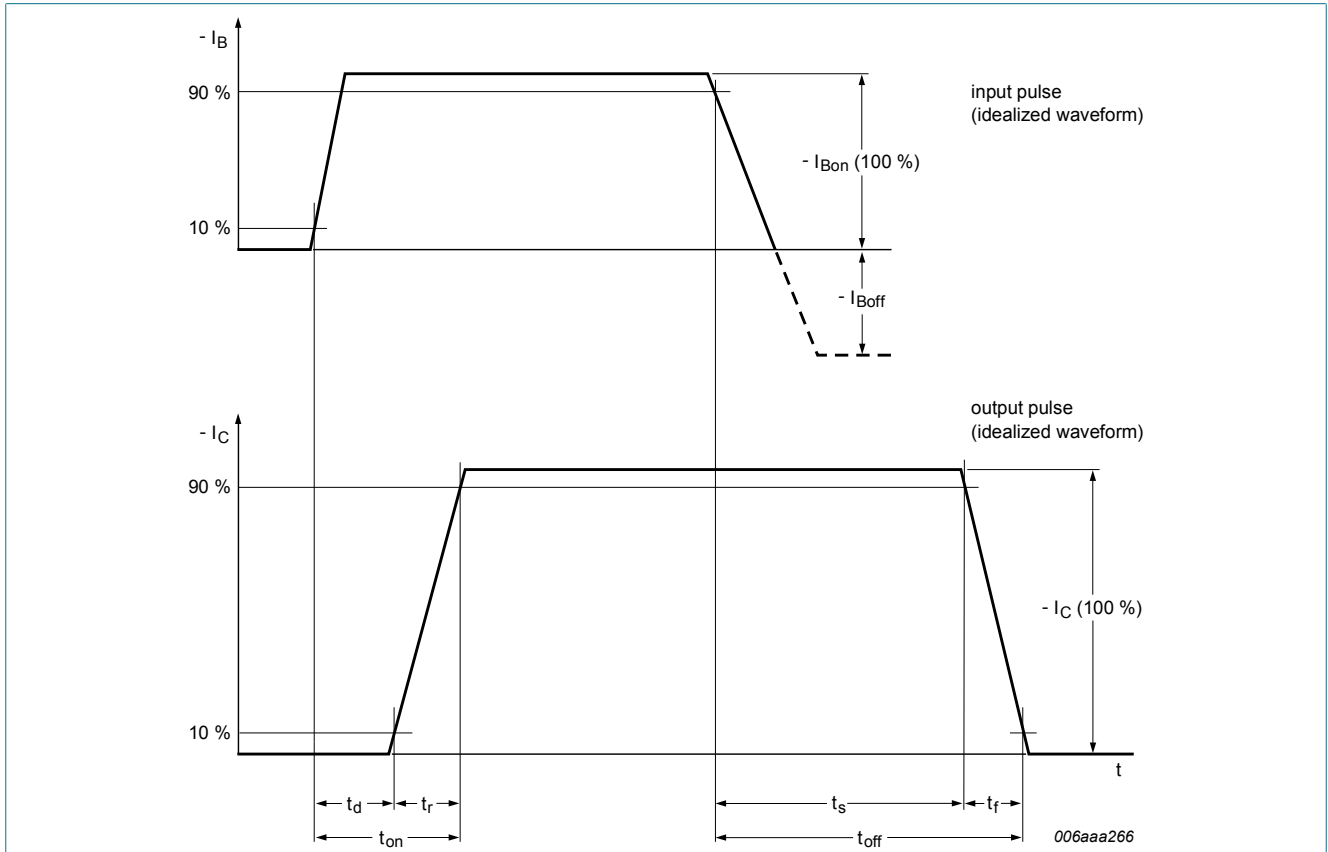


Fig. 2. Transistor switching time definition

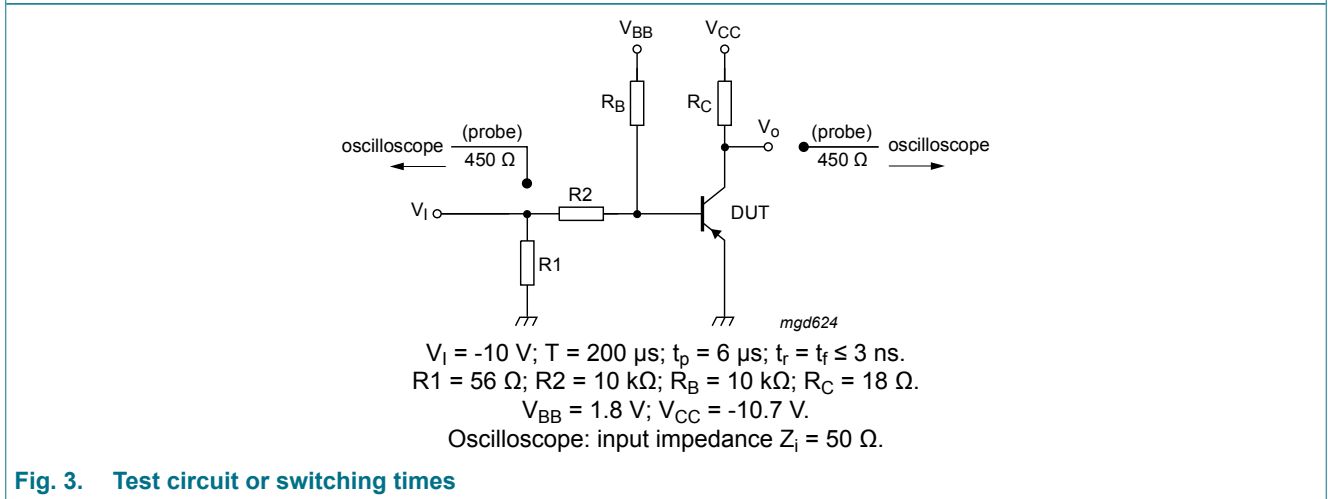


Fig. 3. Test circuit or switching times

### Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

## 12. Package outline

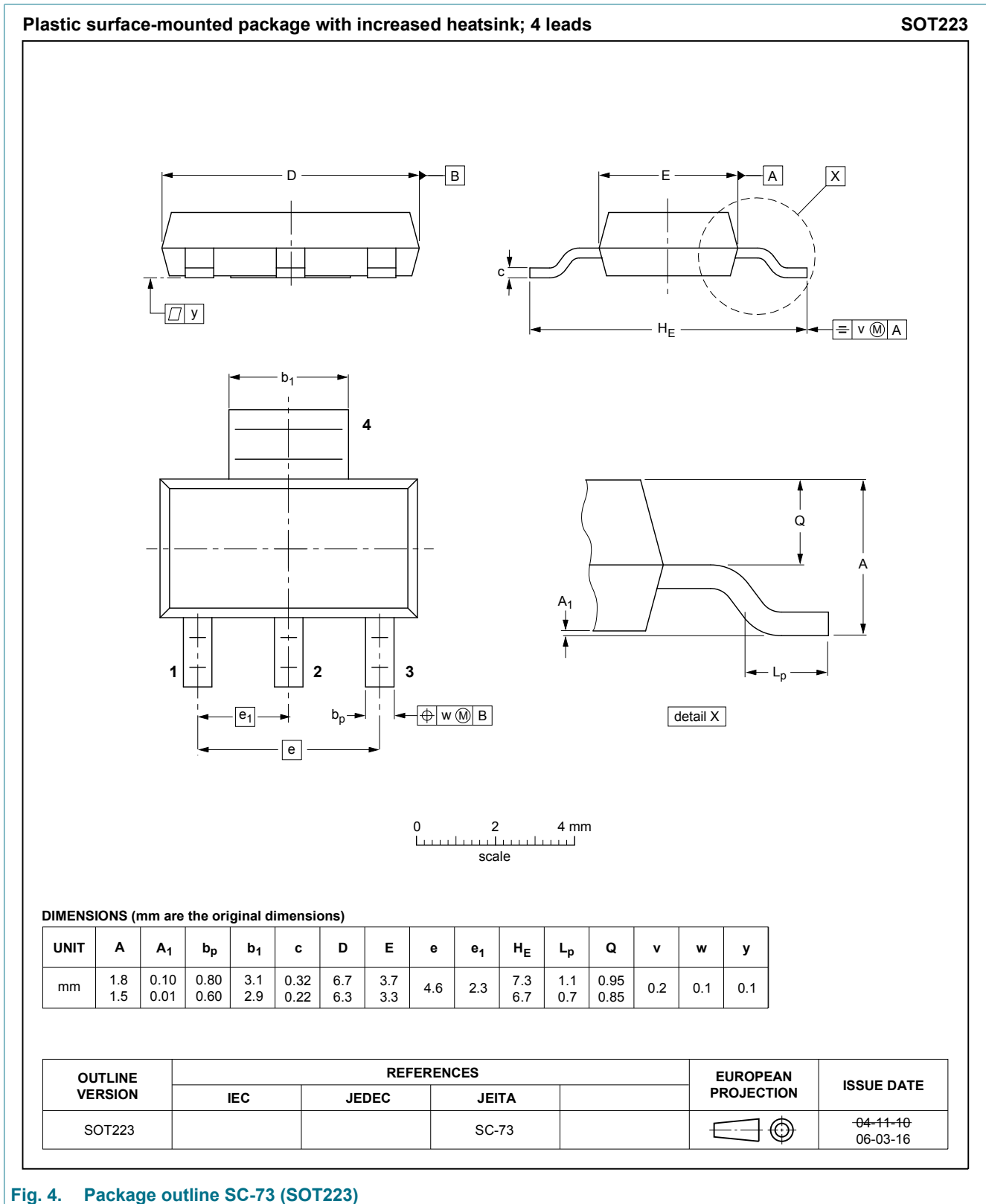


Fig. 4. Package outline SC-73 (SOT223)

### 13. Soldering

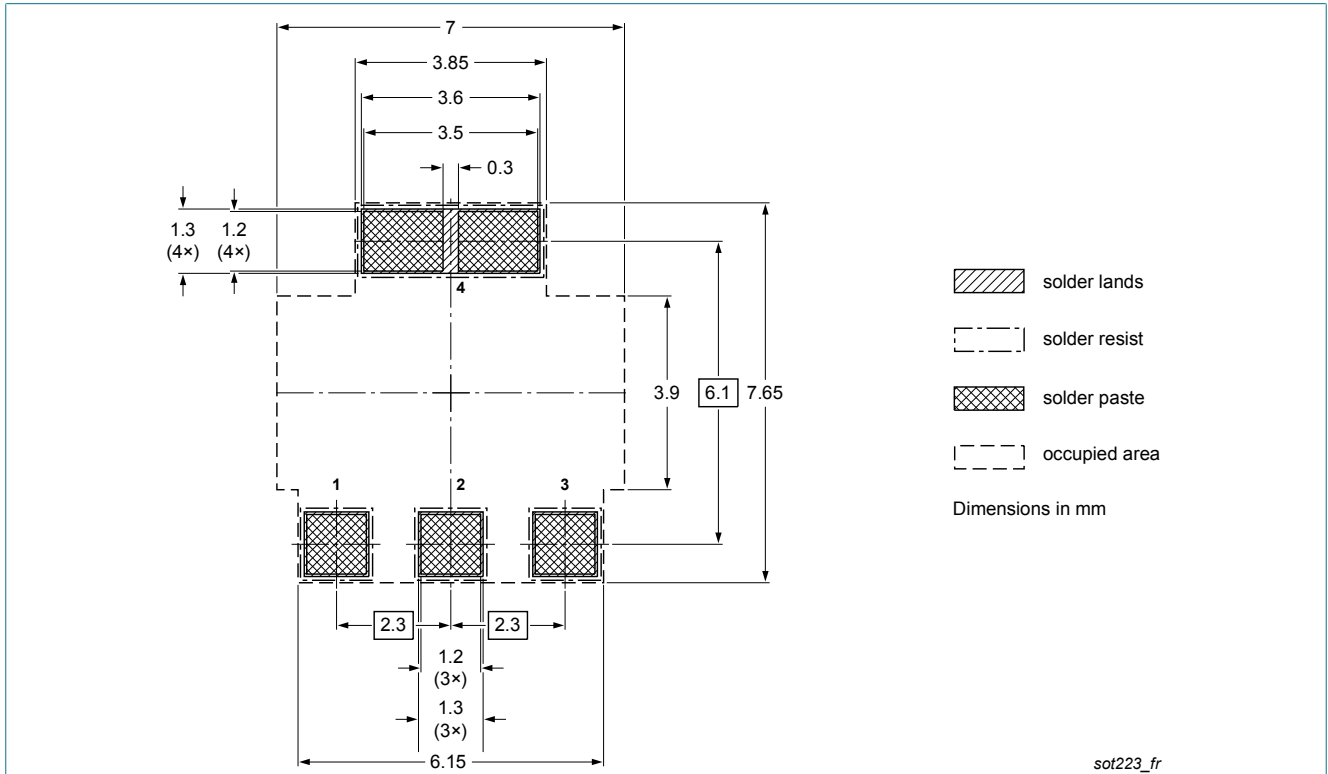


Fig. 5. Reflow soldering footprint for SC-73 (SOT223)

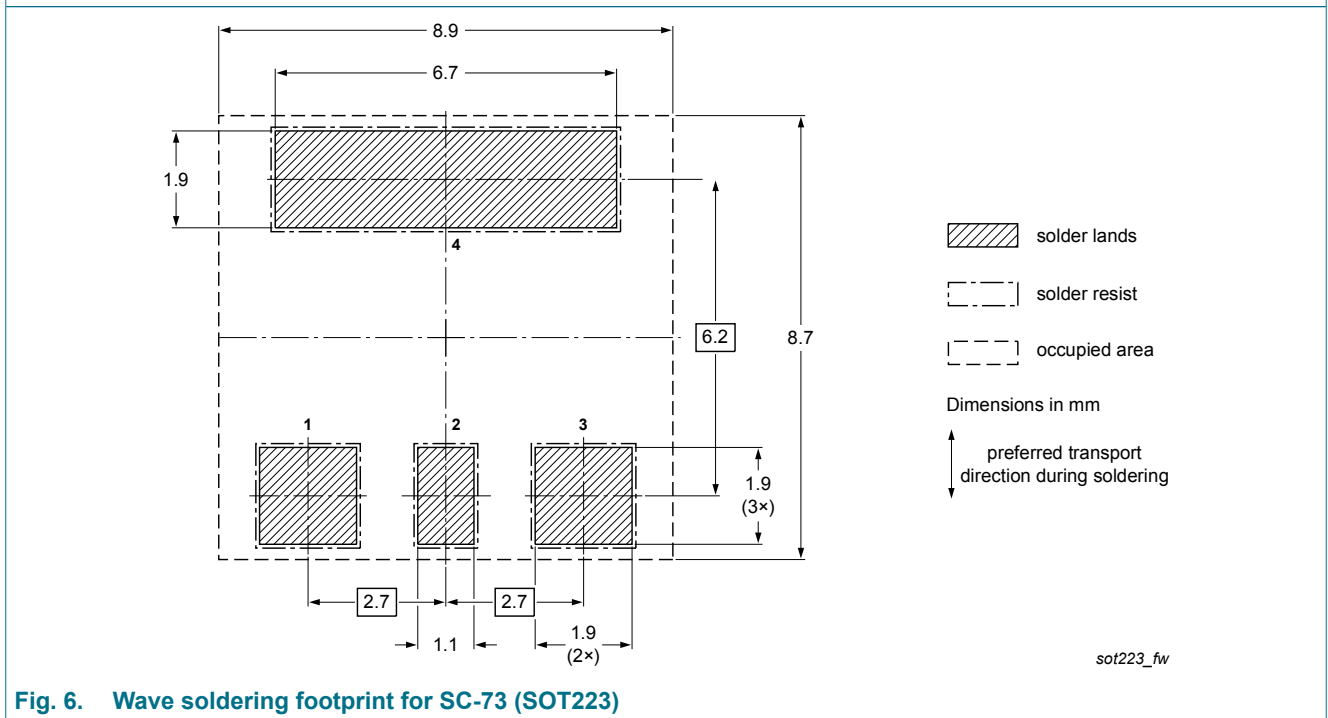


Fig. 6. Wave soldering footprint for SC-73 (SOT223)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BSP60 v.4	20180502	Product data sheet	-	BSP60 v.3
Modifications:	<ul style="list-style-type: none"><li>• <math>I_{CES}</math> values corrected.</li></ul>			
BSP60 v.3	20180216	Product data sheet	-	BSP60_61_62 v.2

## 15. Legal information

### 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.

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

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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. Marking.....	2
8. Limiting values.....	3
9. Thermal characteristics.....	3
10. Characteristics.....	4
11. Test information.....	5
12. Package outline.....	6
13. Soldering.....	7
14. Revision history.....	8
15. Legal information.....	9

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