



# BSP51

NPN Darlington transistor

13 July 2018

Product data sheet

## 1. General description

NPN Darlington transistor in an SOT223 plastic package.

PNP complement: BSP61

## 2. Features and benefits

- High current of 1 A
- Low voltage of 60 V
- Integrated diode and resistor
- AEC-Q101 qualified

## 3. Applications

- Industrial high gain amplification

## 4. Quick reference data

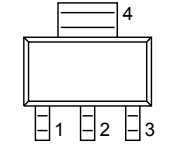
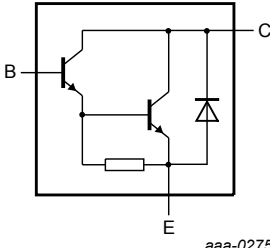
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter	-	-	80	V
$V_{CES}$	collector-emitter voltage	base short-circuited to emitter	-	-	60	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-027580</p>
2	C	collector		
3	E	emitter		
4	C	collector		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BSP51	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
BSP51	BSP51

## 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		-	80	V
$V_{CES}$	collector-emitter voltage	base short-circuited to emitter		-	60	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]	-	-	96	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	17	K/W

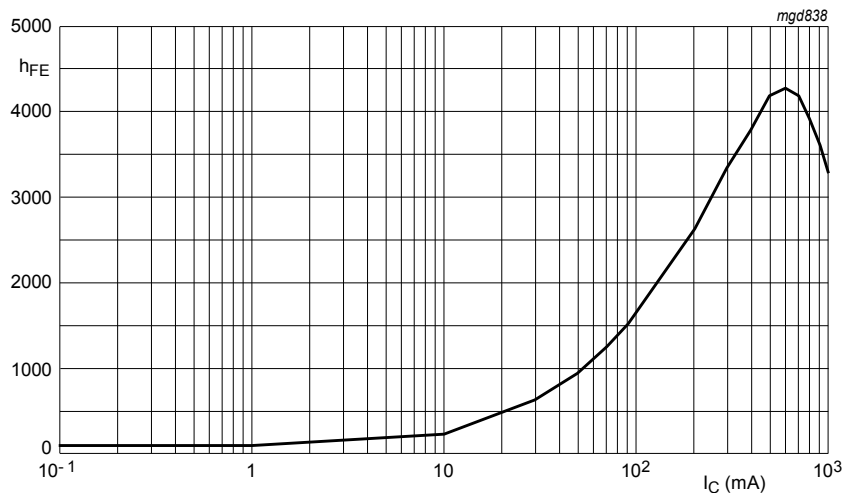
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

## 10. Characteristics

**Table 7. Characteristics**
 $T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\text{ }\mu\text{A}; I_E = 0\text{ A}$	80	-	-	V
$V_{(BR)CES}$	collector-emitter breakdown voltage	$I_C = 2\text{ mA}; V_{BE} = 0\text{ V}$	60	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_C = 0\text{ A}; I_E = 100\text{ }\mu\text{A}$	5	-	-	V
$I_{CES}$	collector-emitter cut-off current	$V_{BE} = 0\text{ V}; V_{CE} = 60\text{ V}$	-	-	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
		$I_C = 500\text{ mA}; I_B = 0.5\text{ mA}; T_j = 150\text{ }^\circ\text{C}$	-	-	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	$I_C = 500\text{ mA}; I_{B(on)} = 0.5\text{ mA};$ $I_{B(off)} = -0.5\text{ mA}$	-	500	-	ns
$t_{off}$	turn-off time		-	1300	-	ns
$f_T$	transition frequency	$V_{CE} = 5\text{ V}; I_C = 500\text{ mA}; f = 100\text{ MHz}$	-	200	-	MHz

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


 $V_{CE} = 10\text{ V}$ 
**Fig. 1. DC current gain; typical values**

### 11. Test information

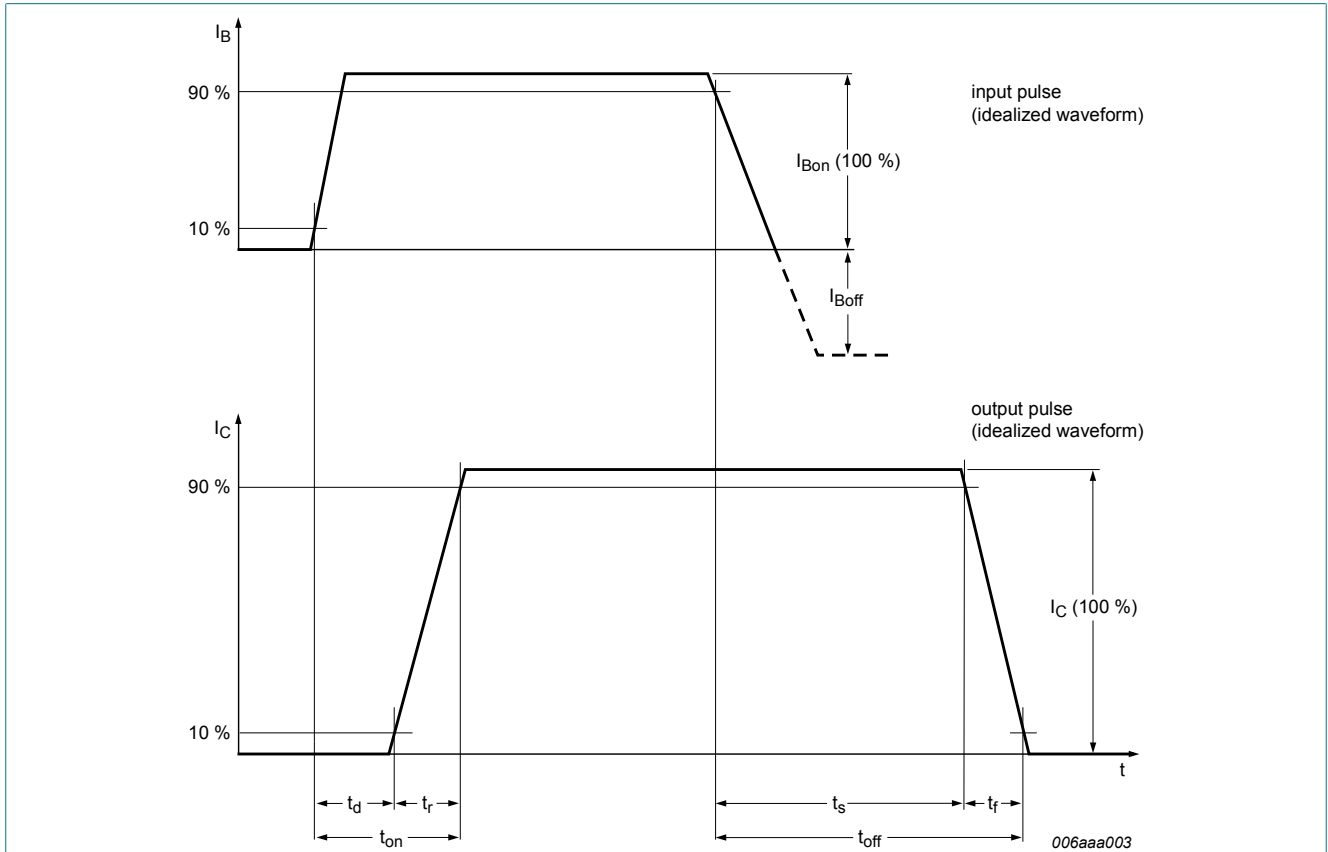


Fig. 2. Transistor switching time definition

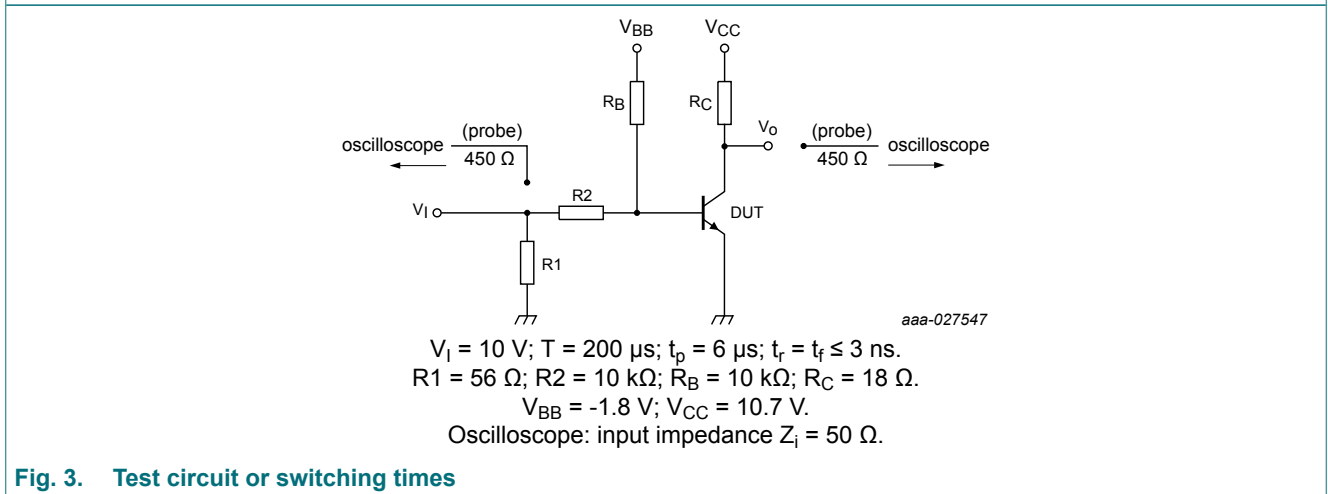


Fig. 3. Test circuit or switching times

### 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

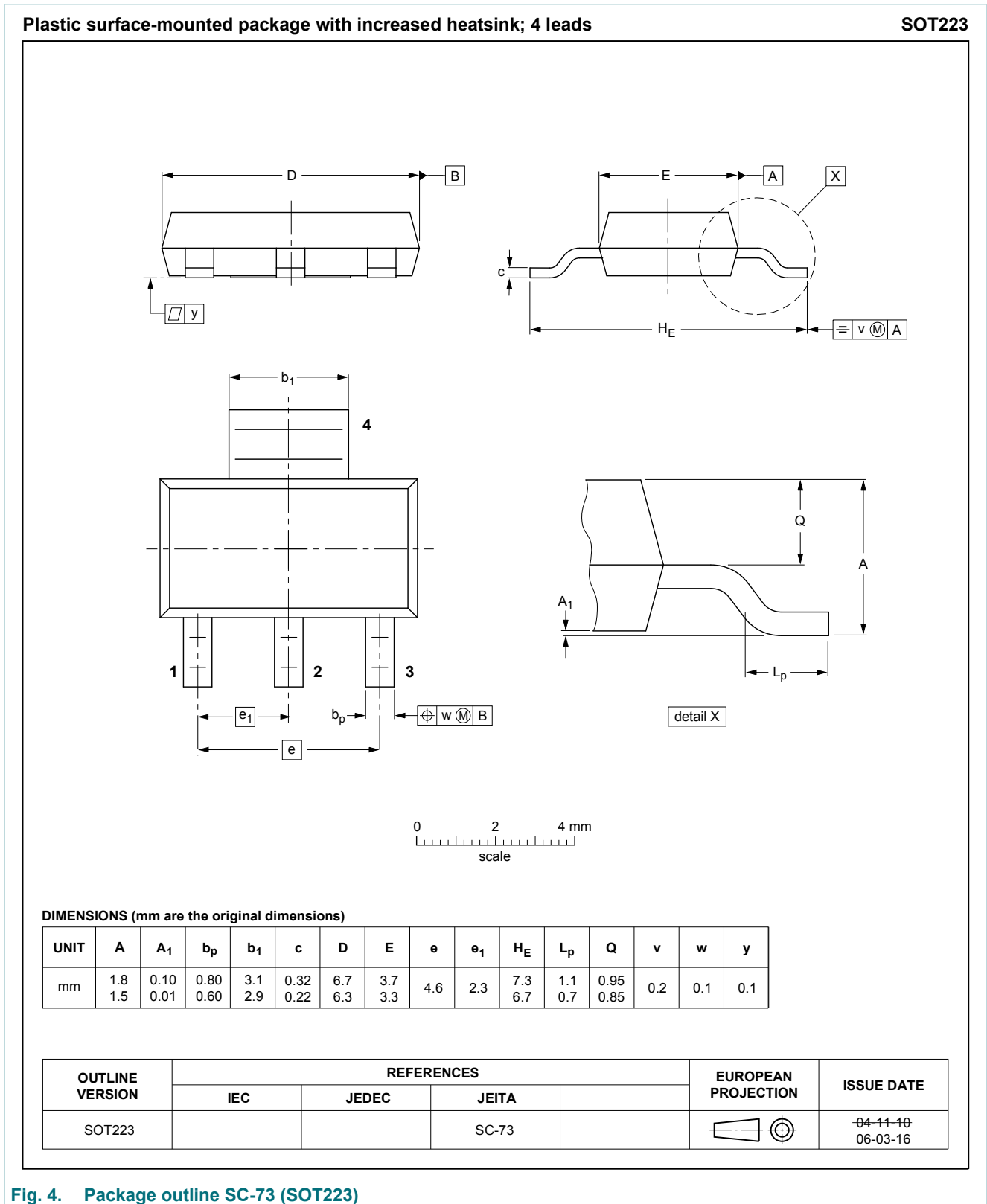


Fig. 4. Package outline SC-73 (SOT223)

### 13. Soldering

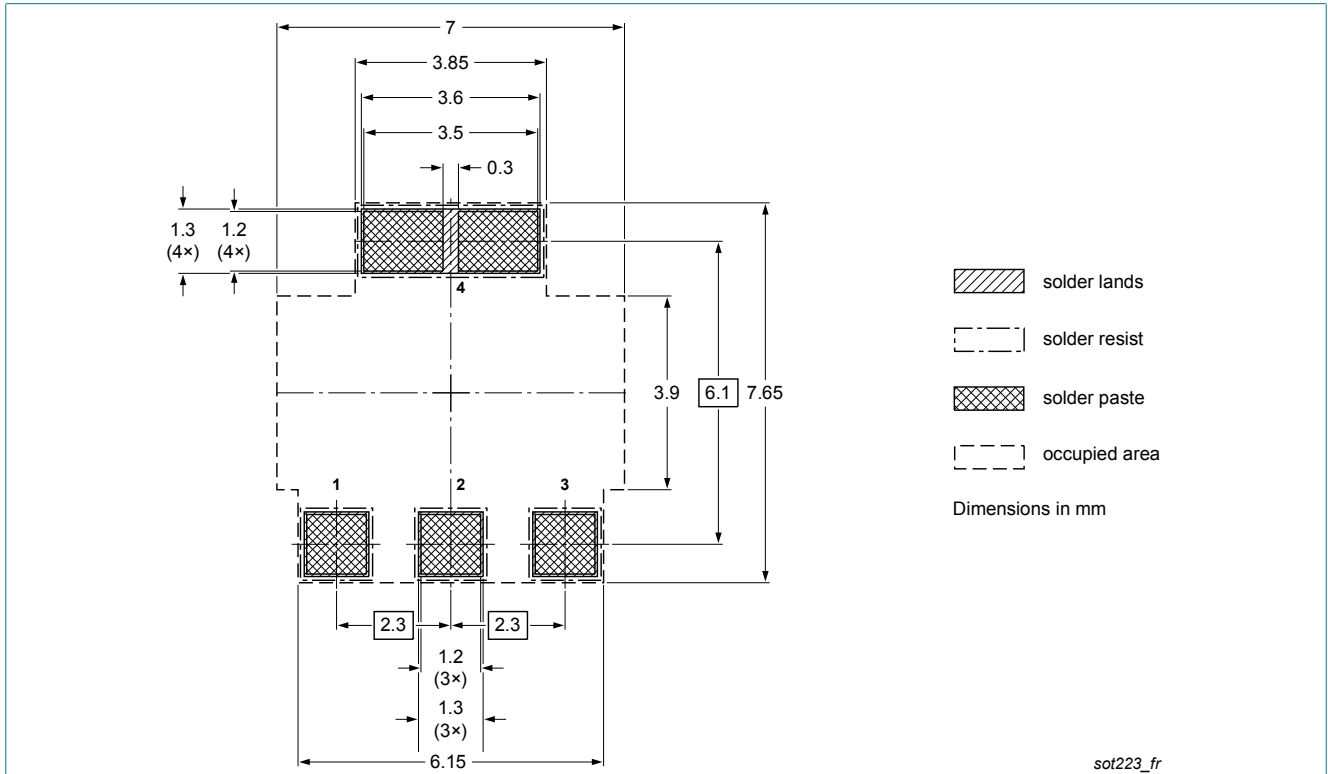


Fig. 5. Reflow soldering footprint for SC-73 (SOT223)

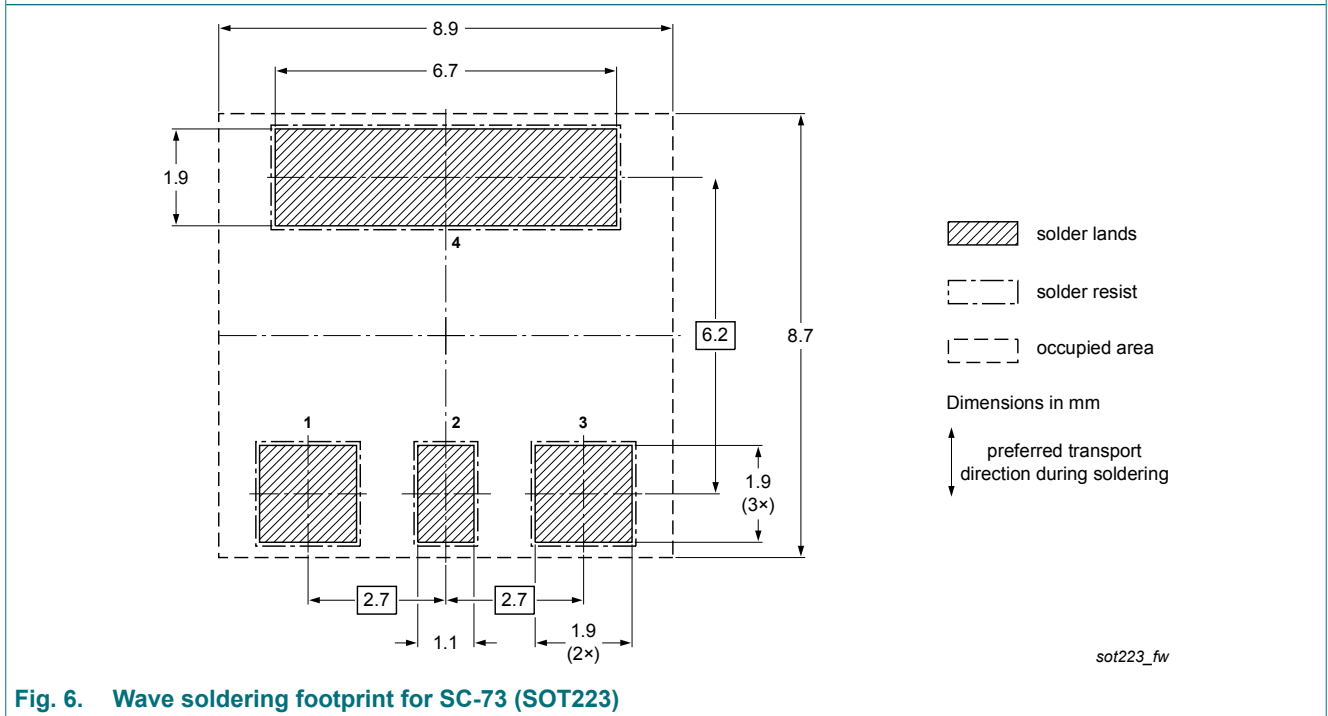


Fig. 6. Wave soldering footprint for SC-73 (SOT223)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BSP51 v.3	20180713	Product data sheet	-	BSP50_51_52 v.2
Modifications:	<ul style="list-style-type: none"> <li>The product is AEC-Q101 qualified.</li> <li>Family data sheet is transformed to single data sheet.</li> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
BSP50_51_52 v.2	19990423	Product data sheet	-	BSP50_51_52 v.1
BSP50_51_52 v.1	19970422	Product data sheet	-	-



## 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.

- [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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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