



# BSP51-Q

NPN Darlington transistor

24 May 2023

Product data sheet

## 1. General description

NPN Darlington transistor in an SOT223 Surface-Mounted Device (SMD) plastic package.

PNP complement: BSP61

## 2. Features and benefits

- High current of 1 A
- Low voltage of 60 V
- Integrated diode and resistor
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 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
<a href="#">BSP51-Q</a>	SC-73	plastic, surface-mounted package with increased heatsink; 4 leads; 2.3 mm pitch; 6.5 mm x 3.5 mm x 1.65 mm body	<a href="#">SOT223</a>

## 7. Marking

Table 4. Marking codes

Type number	Marking code
BSP51-Q	BSP51

## 8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	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>.

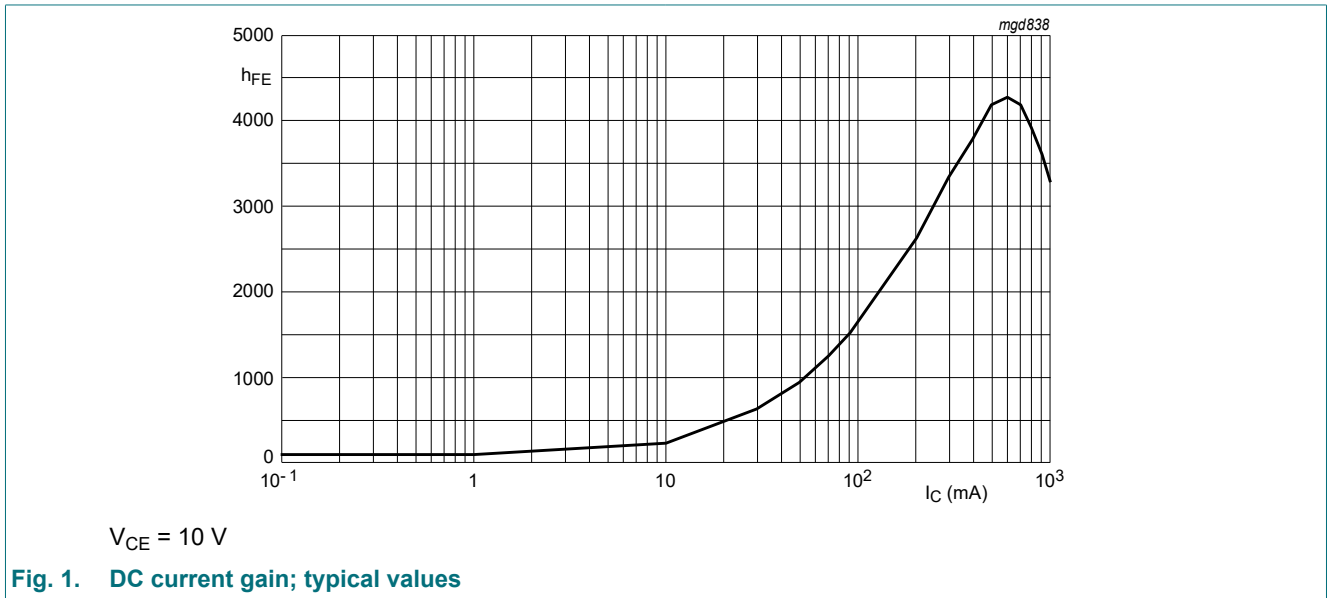
## 10. Characteristics

**Table 7. Characteristics**

$T_j = 25\text{ °C}$  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	$V_{CE} = 60\text{ V}; V_{BE} = 0\text{ V}$	-	-	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	$I_C = 500\text{ mA}; I_{Bon} = 0.5\text{ mA};$ $I_{Boff} = -0.5\text{ mA}$	-	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:  $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$ .



### 11. Test information

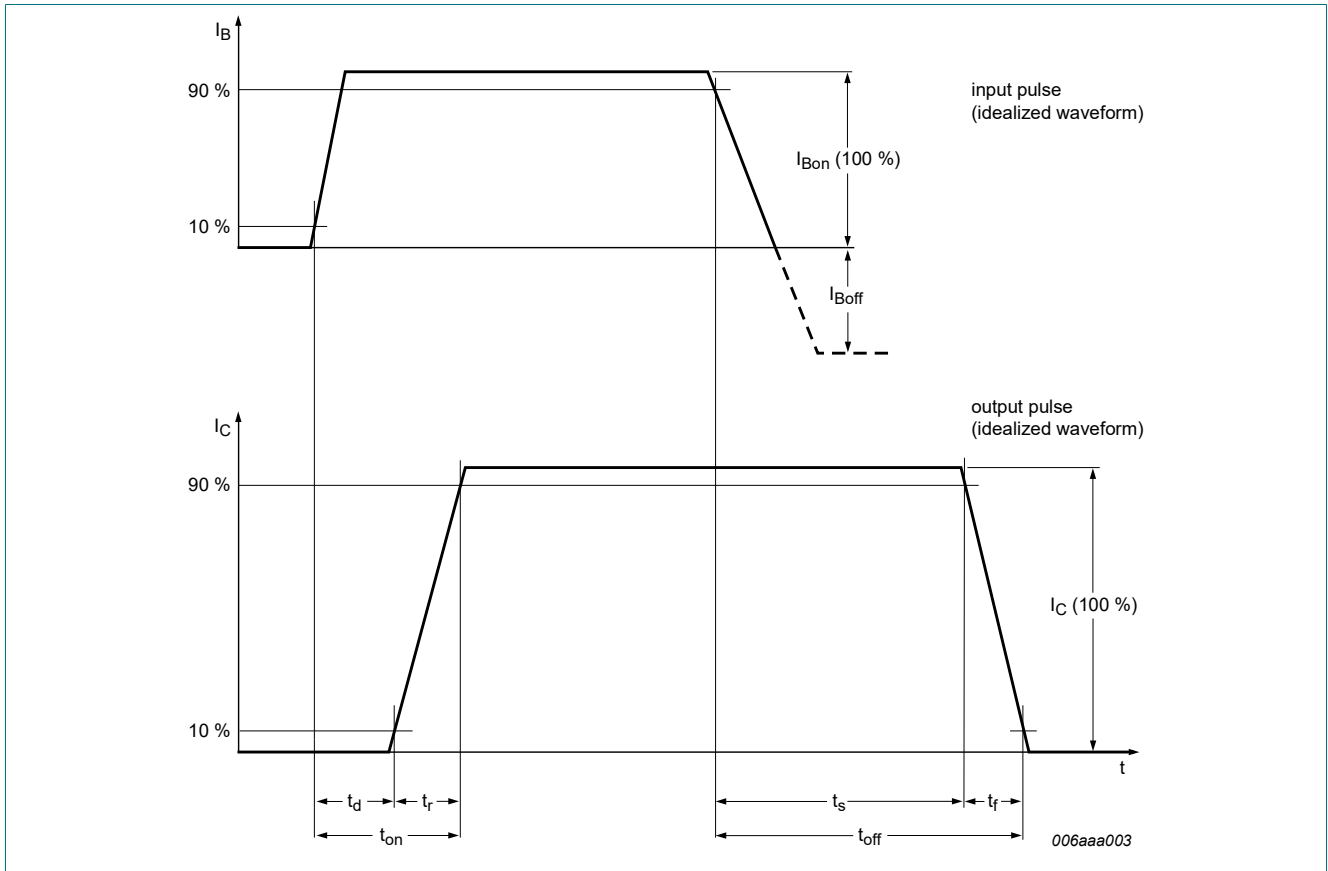


Fig. 2. Transistor switching time definition

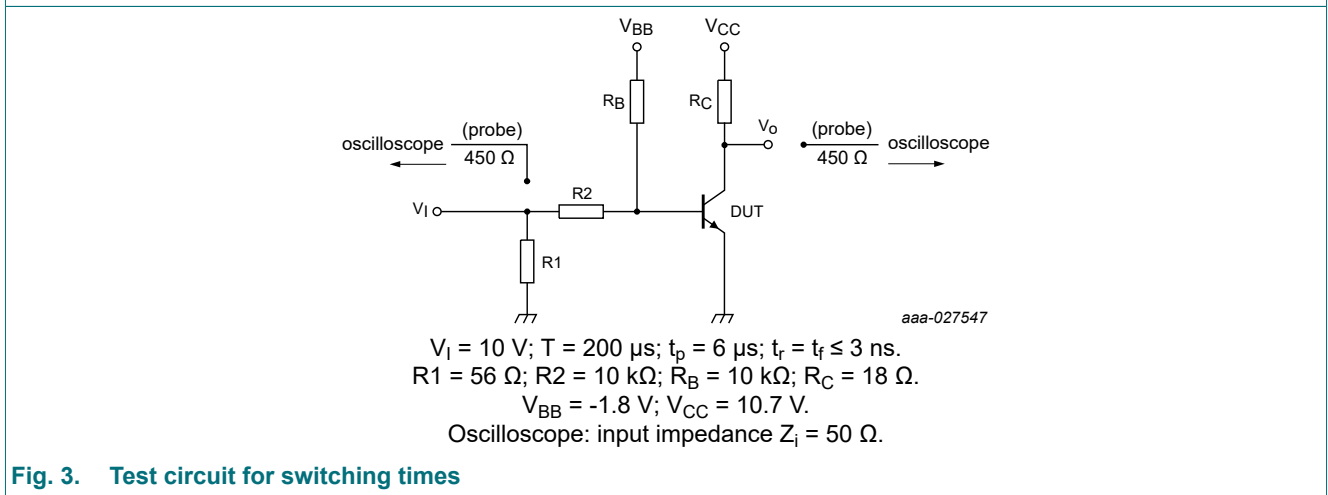


Fig. 3. Test circuit for switching times

### 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

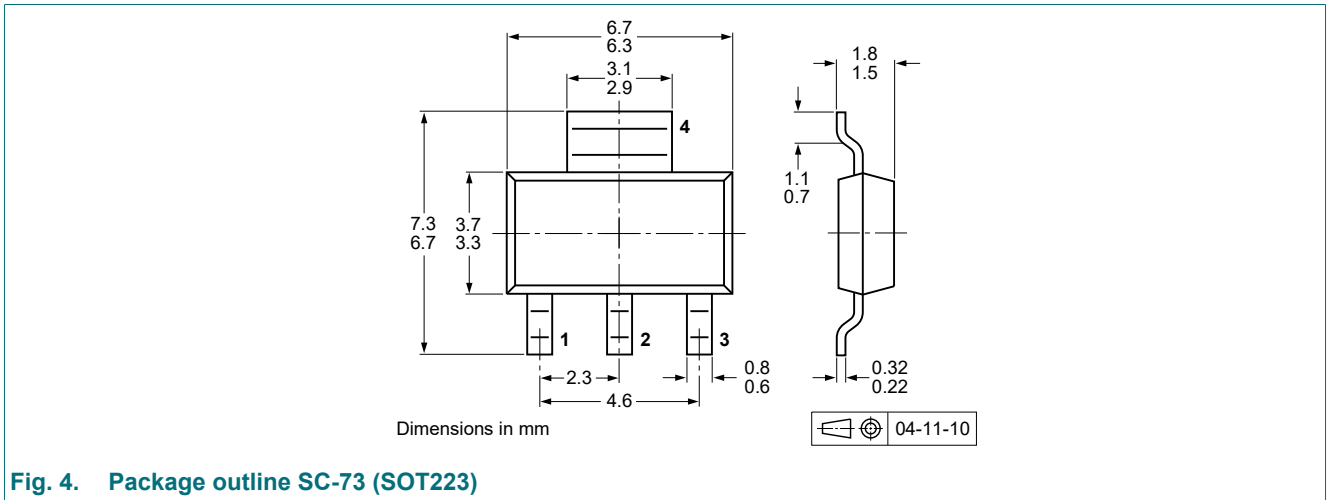


Fig. 4. Package outline SC-73 (SOT223)

## 13. Soldering

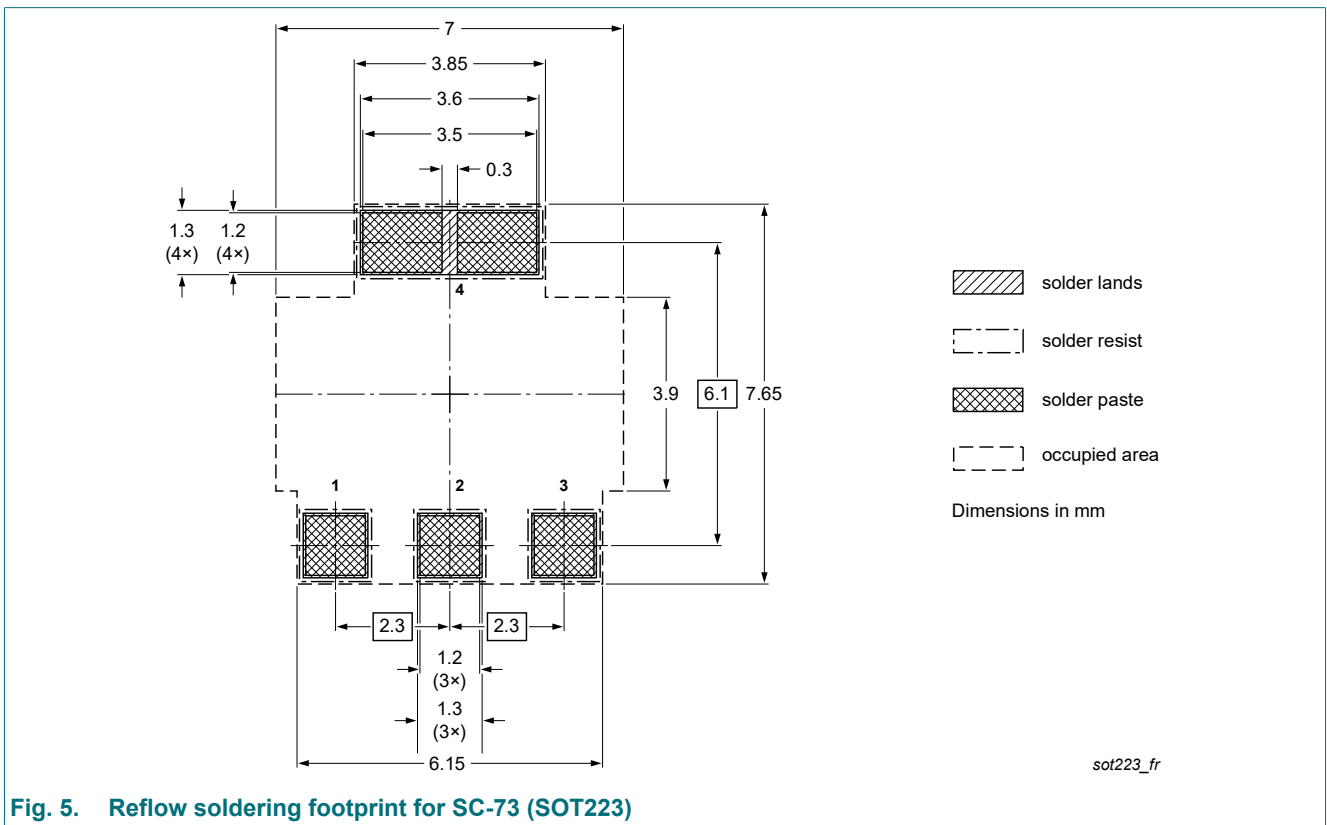


Fig. 5. Reflow soldering footprint for SC-73 (SOT223)

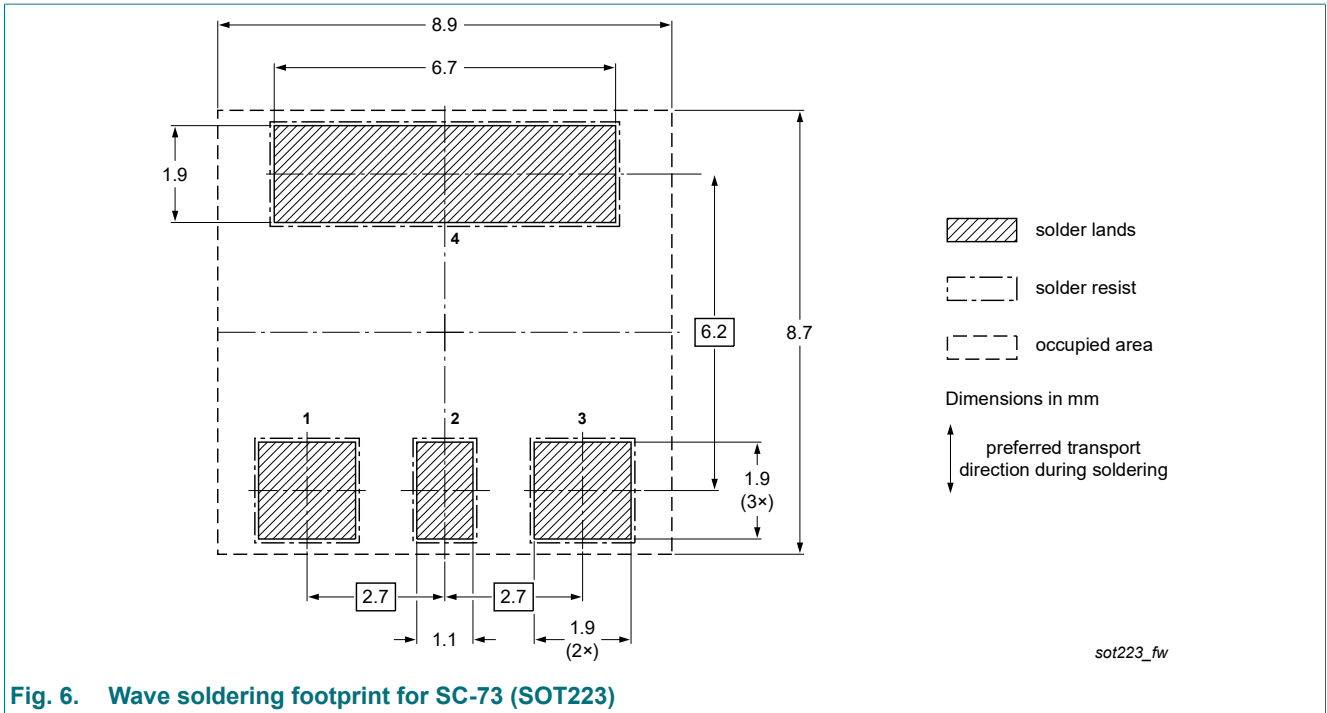


Fig. 6. Wave soldering footprint for SC-73 (SOT223)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BSP51-Q v.1	20230524	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.

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## 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.....	1
6. Ordering information.....	2
7. Marking.....	2
8. Limiting values.....	2
9. Thermal characteristics.....	2
10. Characteristics.....	3
11. Test information.....	4
12. Package outline.....	5
13. Soldering.....	5
14. Revision history.....	7
15. Legal information.....	8

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