

# BCP54-Q series

45 V, 1 A NPN medium power transistors

Rev. 1 — 2 May 2022

Product data sheet

## 1. General description

NPN medium power transistors in a SOT223 (SC-73) flat lead Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- High collector current capability  $I_C$  and  $I_{CM}$
- Three current gain selections
- High power dissipation capability
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- Linear voltage regulators
- MOSFET drivers
- Low-side switches
- Battery-driven devices
- Power management
- Amplifiers

## 4. Quick reference data

Table 1. Quick reference data

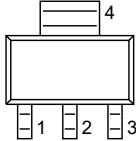
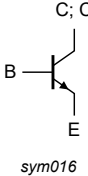
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base		-	-	45	V
$I_C$	collector current			-	-	1	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1\text{ ms}$		-	-	2	A
$h_{FE}$	DC current gain						
	BCP54-Q	$V_{CE} = 2\text{ V}; I_C = 150\text{ mA}$	[1]	63	-	250	
	BCP54-10-Q		[1]	63	-	160	
	BCP54-16-Q		[1]	100	-	250	

[1] pulsed;  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$

## 5. Pinning information

Table 2. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base		
2	C	collector		
3	E	emitter		
4	C	collector		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
<a href="#">BCP54-Q</a>	SC-73	plastic, surface-mounted package with increased heatsink; 4 leads	<a href="#">SOT223</a>
<a href="#">BCP54-10-Q</a>			
<a href="#">BCP54-16-Q</a>			

## 7. Marking

Table 4. Marking

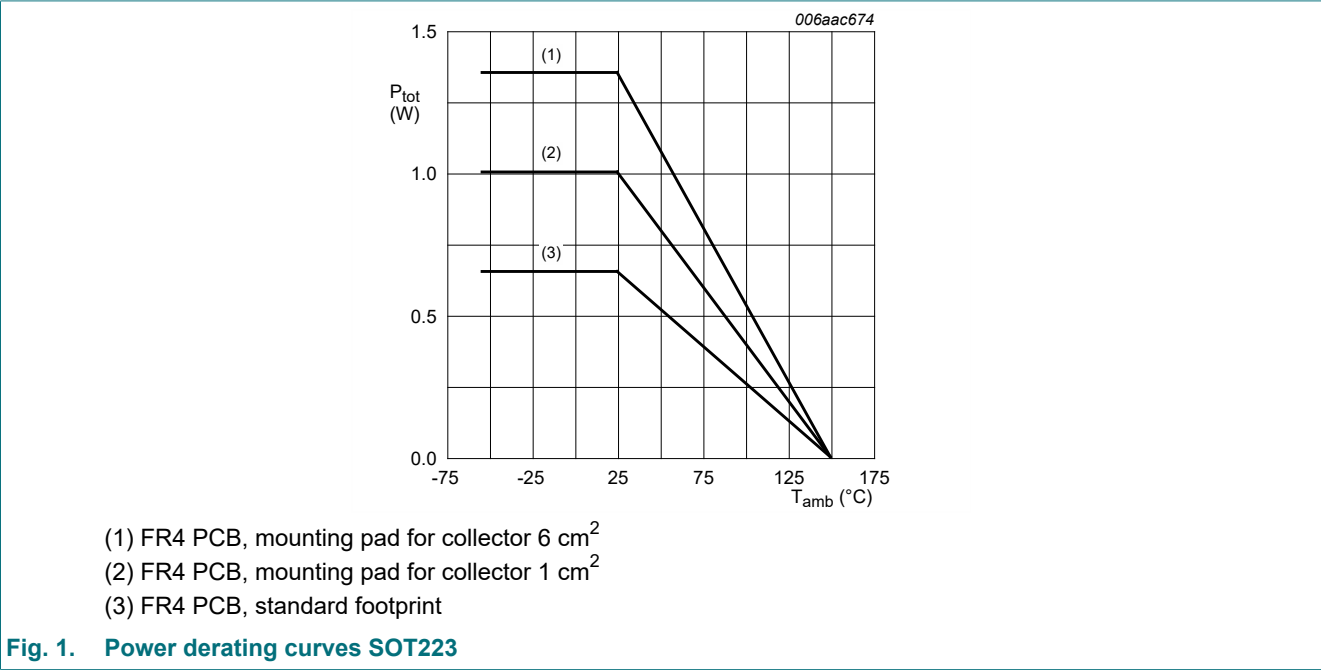
Type number	Marking code
BCP54-Q	BCP54
BCP54-10-Q	BCP54/10
BCP54-16Q	BCP54/16

8. Limiting values

Table 5. Limiting values  
In accordance with the Absolute Maximum Rating System (IEC 60134).  
 $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter	-	45	V
$V_{CEO}$	collector-emitter voltage	open base	-	45	V
$V_{EBO}$	emitter-base voltage	open collector	-	5	V
$I_C$	collector current		-	1	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1\text{ ms}$	-	2	A
$I_B$	base current		-	0.3	A
$I_{BM}$	peak base current	single pulse; $t_p \leq 1\text{ ms}$	-	0.3	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$ [1]	-	0.65	W
		[2]	-	1.00	W
		[3]	-	1.35	W
$T_j$	junction temperature		-	150	$^{\circ}\text{C}$
$T_{amb}$	ambient temperature		-55	150	$^{\circ}\text{C}$
$T_{stg}$	storage temperature		-65	150	$^{\circ}\text{C}$

- [1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated and standard footprint.  
[2] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector  $1\text{ cm}^2$ .  
[3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector  $6\text{ cm}^2$ .



9. Thermal characteristics

Table 6. Thermal characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	195	K/W
			[2]			125	K/W
			[3]			93	K/W
$R_{(j-sp)}$	thermal resistance from junction to solder point			-	-	16	K/W

- [1] Device mounted on an FR4 PCB; single-sided copper; tin-plated and standard footprint.  
[2] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.  
[3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.

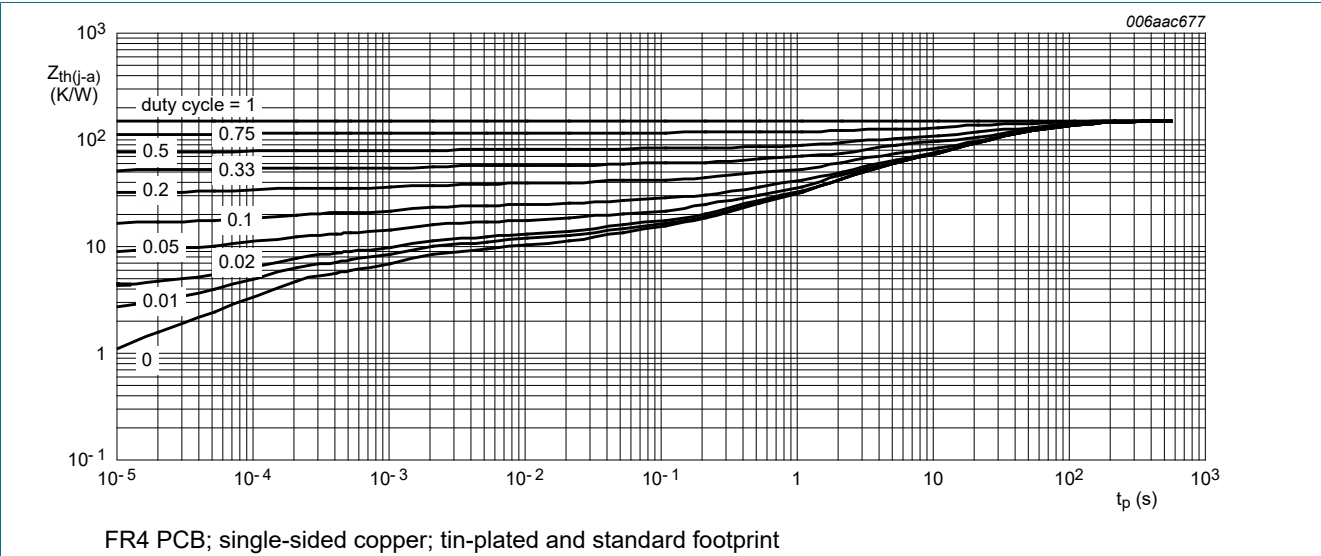


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

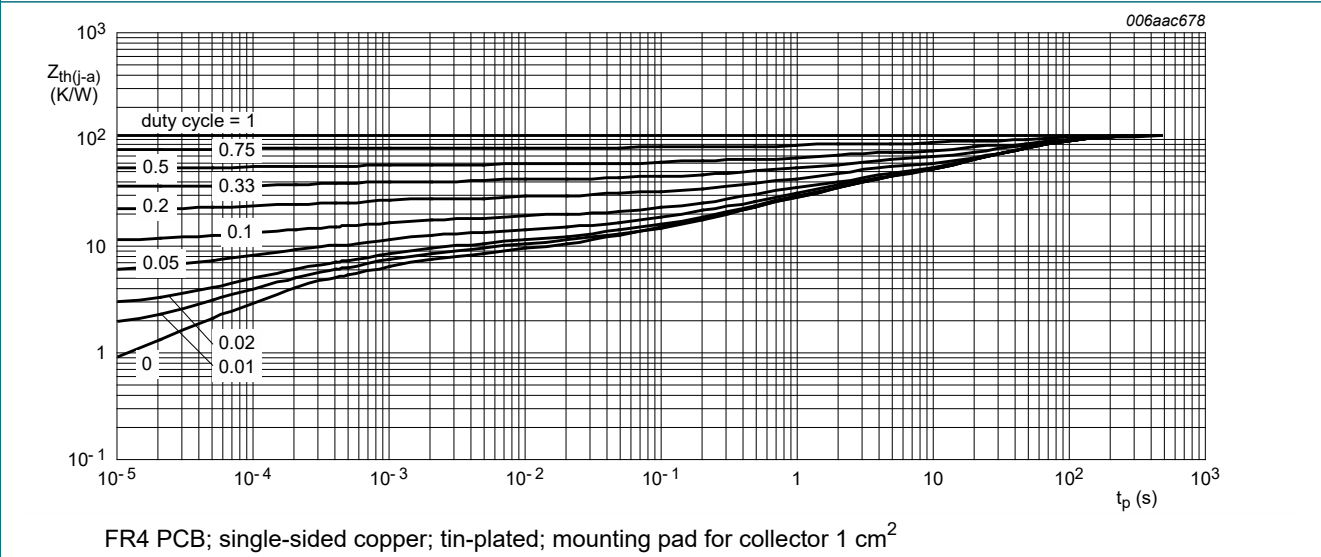
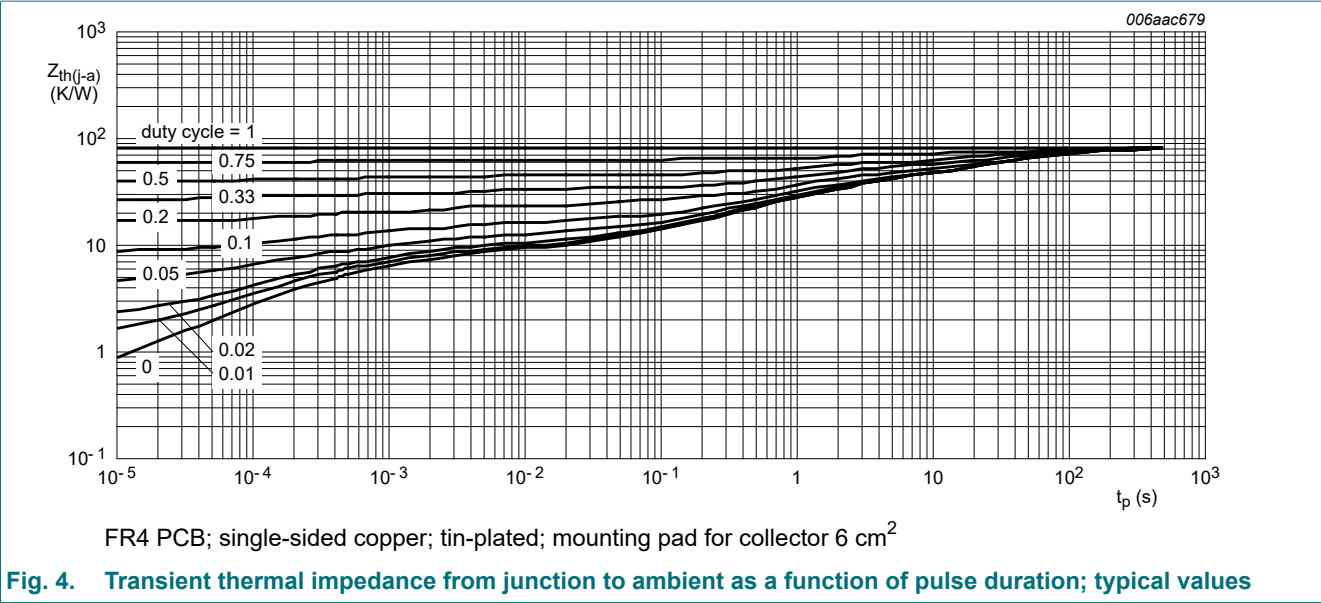


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



## 10. Characteristics

**Table 7. Characteristics**

$T_{amb} = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\text{ }\mu\text{A}$ ; $I_E = 0\text{ A}$		45	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2\text{ mA}$ ; $I_B = 0\text{ A}$		45	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\text{ }\mu\text{A}$ ; $I_C = 0\text{ A}$		5	-	-	V
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 30\text{ V}$ ; $I_E = 0\text{ A}$		-	-	100	nA
		$V_{CB} = 30\text{ V}$ ; $I_E = 0\text{ A}$ ; $T_J = 150\text{ °C}$		-	-	10	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}$ ; $I_C = 0\text{ A}$		-	-	100	nA
$h_{FE}$	DC current gain						
	BCP54-Q	$V_{CE} = 2\text{ V}$ ; $I_C = 5\text{ mA}$	[1]	63	-	-	
		$V_{CE} = 2\text{ V}$ ; $I_C = 150\text{ mA}$		63	-	250	
		$V_{CE} = 2\text{ V}$ ; $I_C = 500\text{ mA}$		40	-	-	
	BCP54-10-Q	$V_{CE} = 2\text{ V}$ ; $I_C = 5\text{ mA}$	[1]	63	-	-	
		$V_{CE} = 2\text{ V}$ ; $I_C = 150\text{ mA}$		63	-	160	
		$V_{CE} = 2\text{ V}$ ; $I_C = 500\text{ mA}$		40	-	-	
	BCP54-16-Q	$V_{CE} = 2\text{ V}$ ; $I_C = 5\text{ mA}$	[1]	63	-	-	
		$V_{CE} = 2\text{ V}$ ; $I_C = 150\text{ mA}$		100	-	250	
		$V_{CE} = 2\text{ V}$ ; $I_C = 500\text{ mA}$		40	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 500\text{ mA}$ ; $I_B = 50\text{ mA}$	[1]	-	-	0.5	V
$V_{BE}$	base-emitter voltage	$V_{CE} = 2\text{ V}$ ; $I_C = 500\text{ mA}$	[1]	-	-	1	V
$C_c$	collector capacitance	$V_{CB} = 10\text{ V}$ ; $I_E = i_e = 0\text{ A}$ ; $f = 1\text{ MHz}$		-	6	-	pF
$f_T$	transition frequency	$V_{CE} = 5\text{ V}$ ; $I_C = 50\text{ mA}$ ; $f = 100\text{ MHz}$		100	180	-	MHz

[1] pulsed;  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$

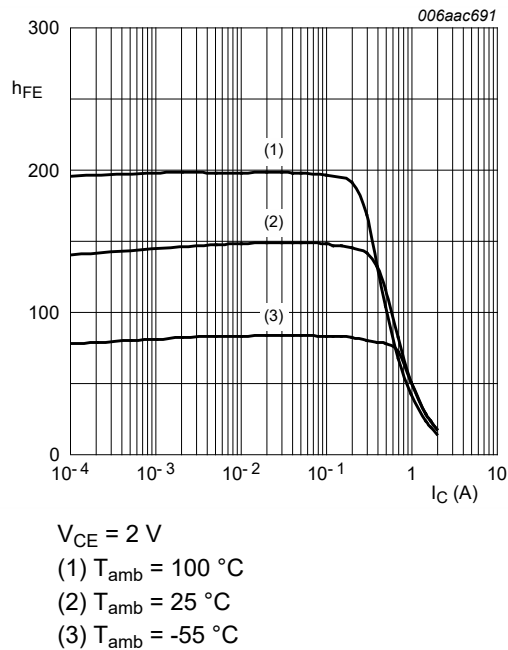


Fig. 5. DC current gain as a function of collector current; typical values

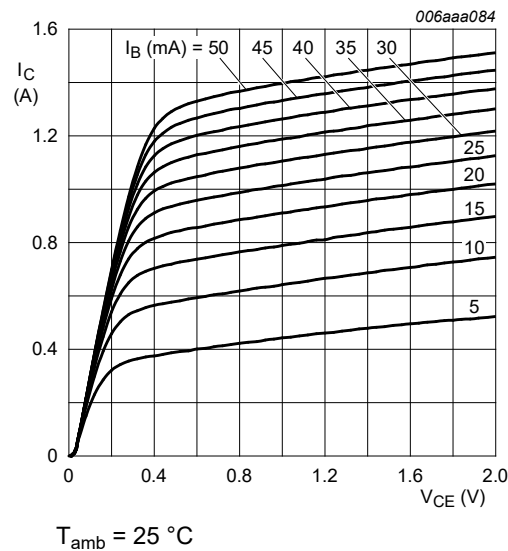


Fig. 6. Collector current as a function of collector-emitter voltage; typical values

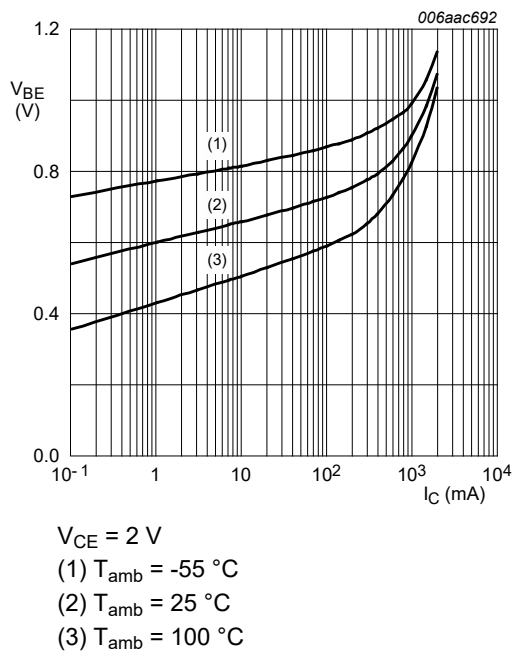


Fig. 7. Base-emitter voltage as a function of collector current; typical values

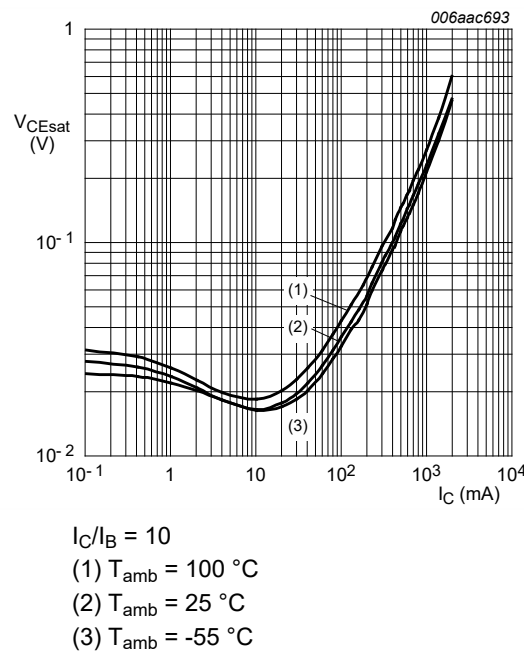


Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values

11. Test information

11.1. 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

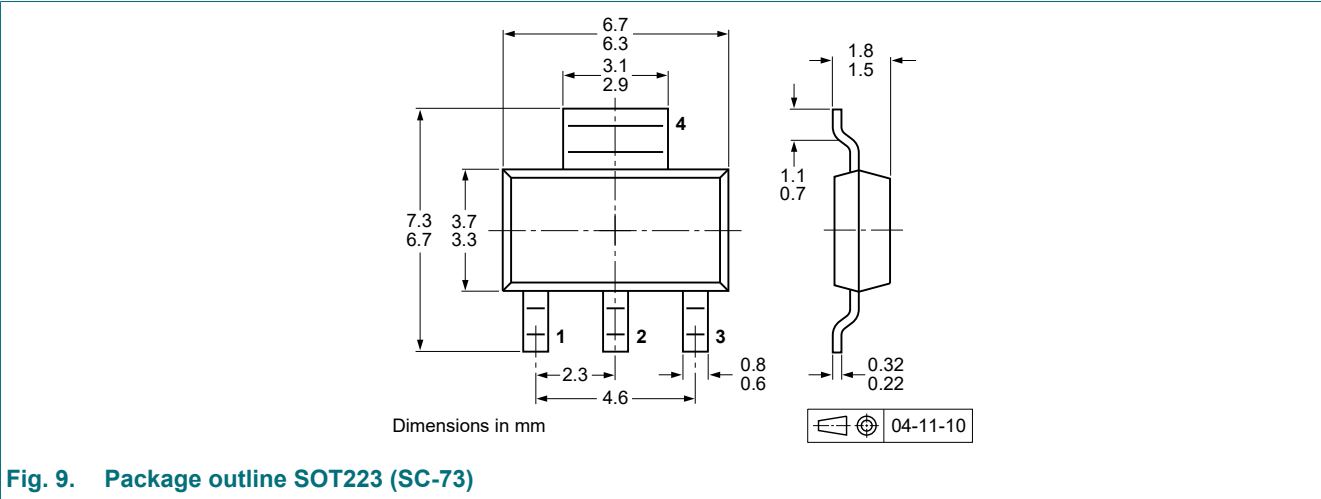
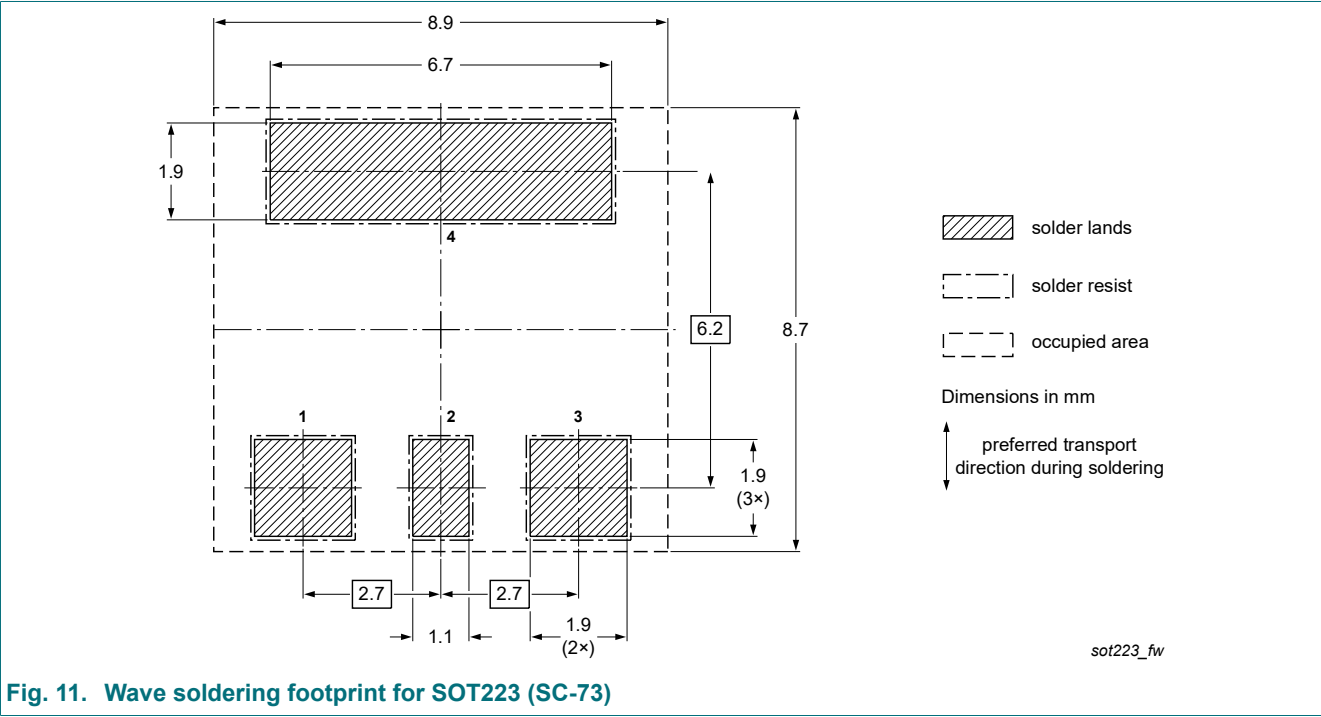
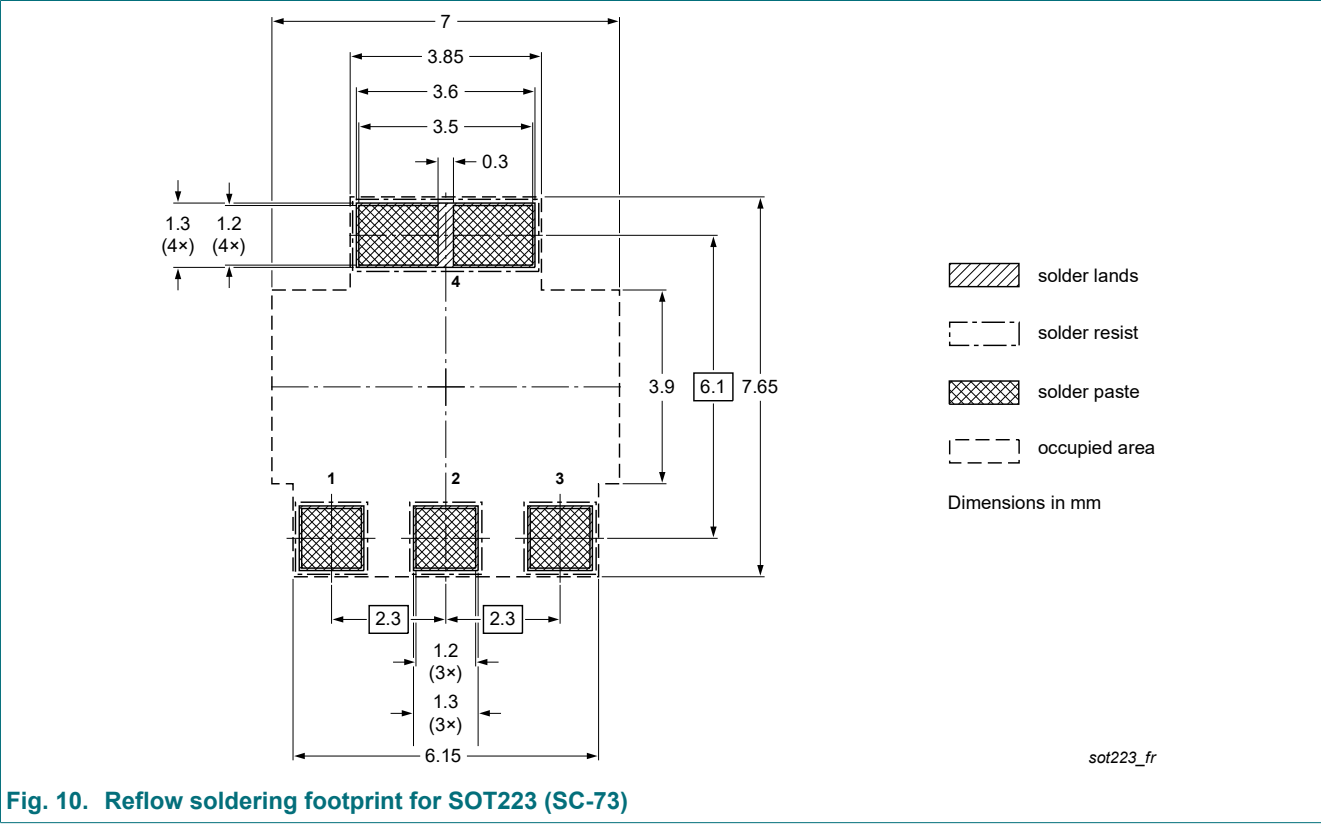


Fig. 9. Package outline SOT223 (SC-73)



13. Soldering



14. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCP54-Q_SER v.1	20220502	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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