



THE DATASHEET OF BC56PA-QX





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

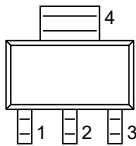
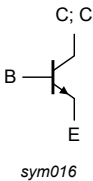
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

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		Version
	Name	Description	
BCP54-Q	SC-73	plastic, surface-mounted package with increased heatsink; 4 leads	SOT223
BCP54-10-Q			
BCP54-16-Q			

7. Marking

Table 4. Marking

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

8. Limiting values

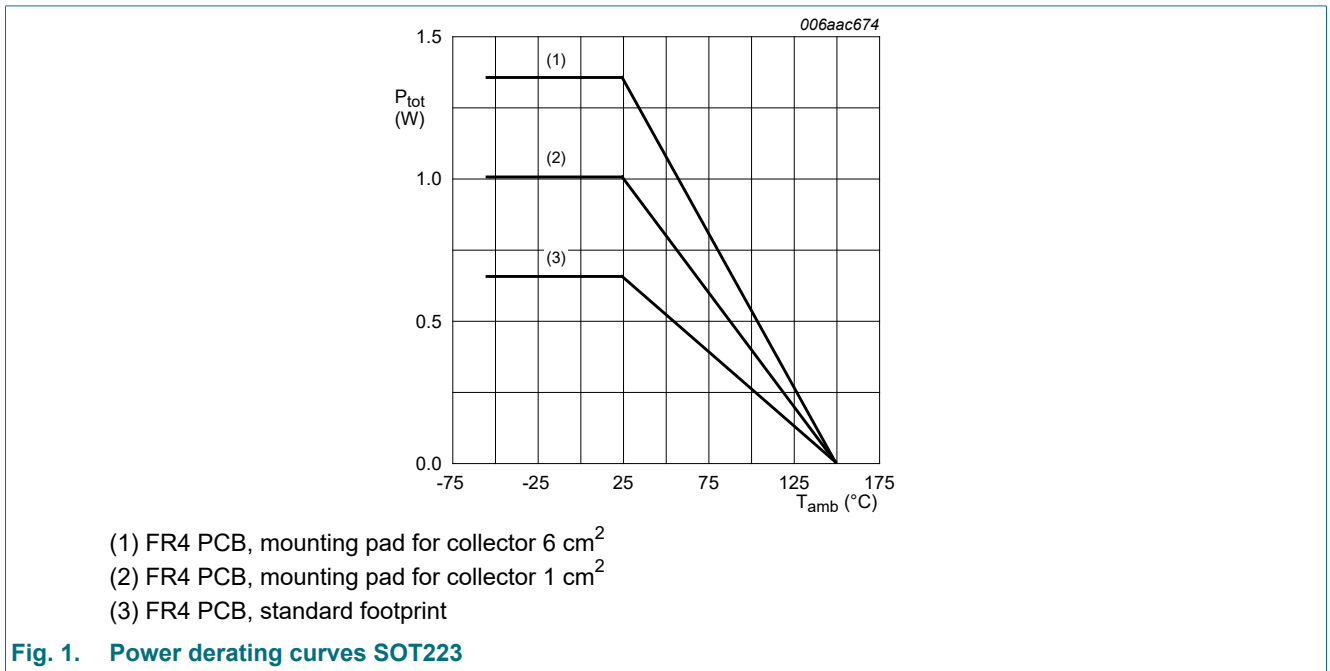
Table 5. Limiting values

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

$T_{amb} = 25\text{ °C}$ 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	$T_{amb} \leq 25\text{ °C}$	[1]	0.65	W
			[2]	1.00	W
			[3]	1.35	W
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		-55	150	°C
T_{stg}	storage temperature		-65	150	°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 cm².
- [3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 6 cm².



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 cm².
- [3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm².

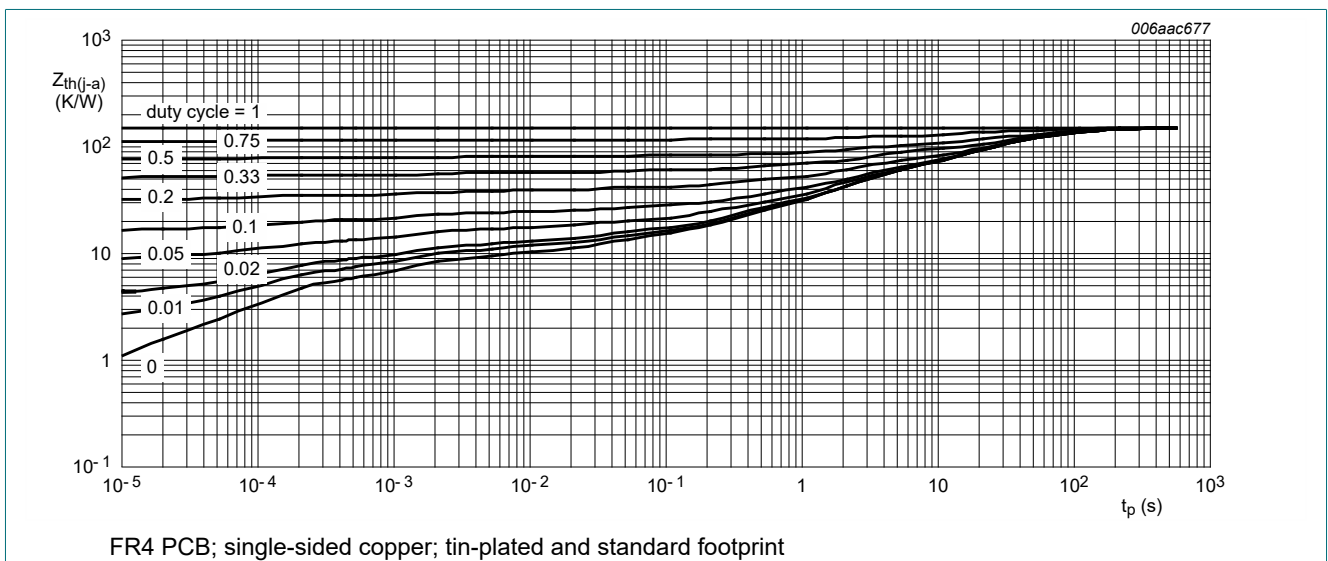


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

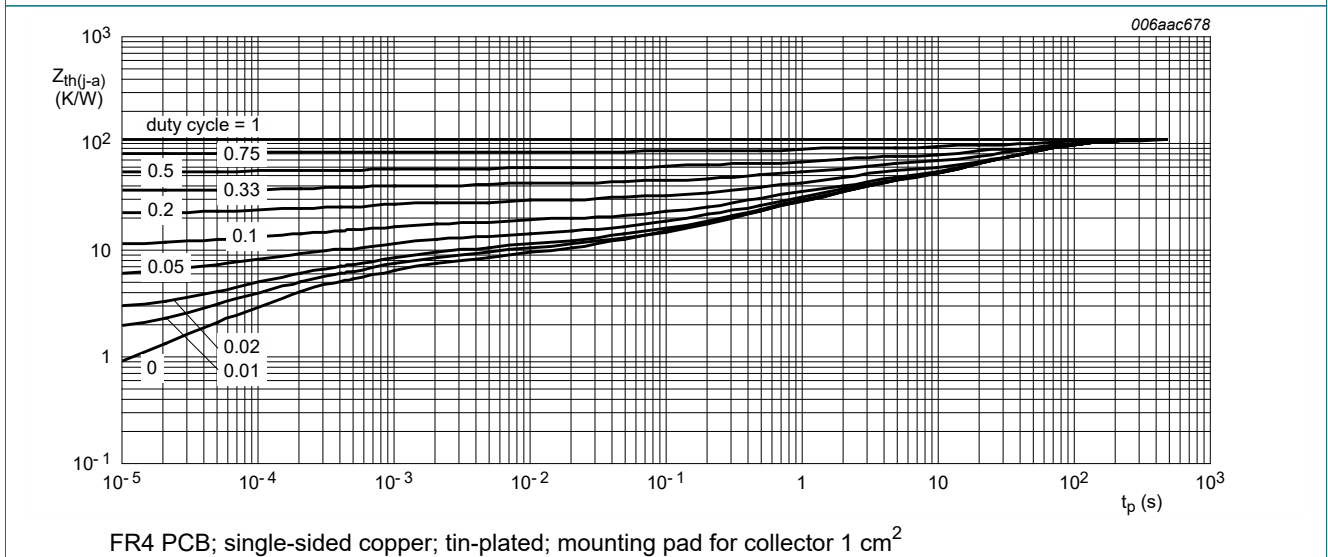
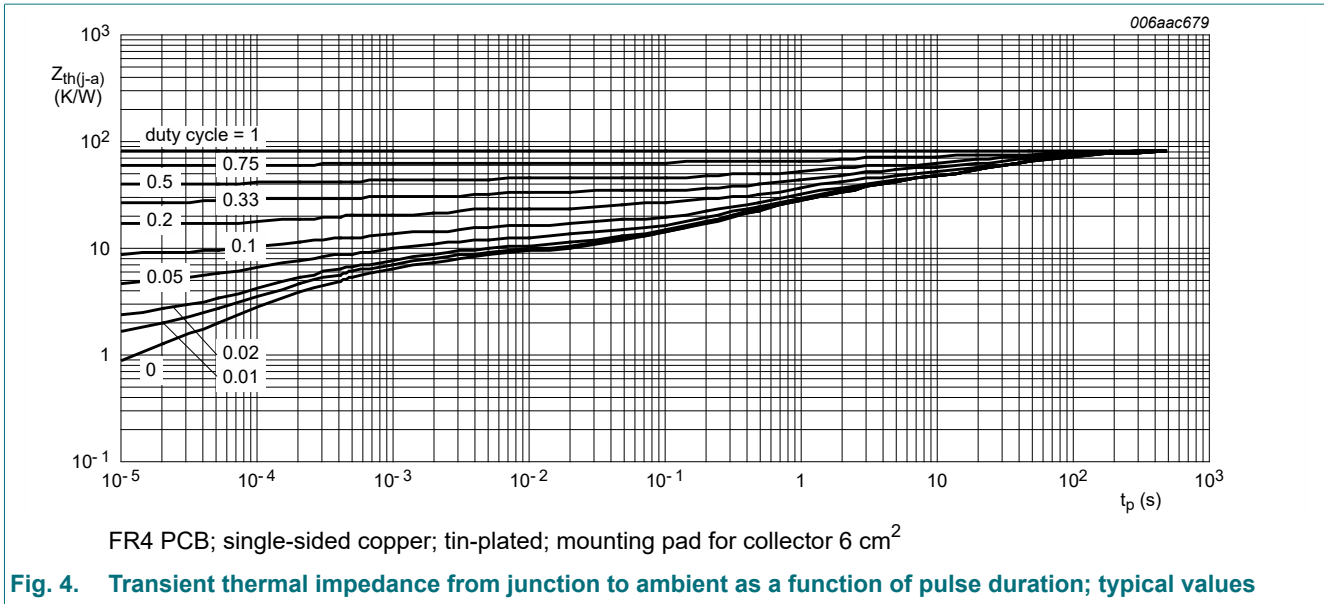


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

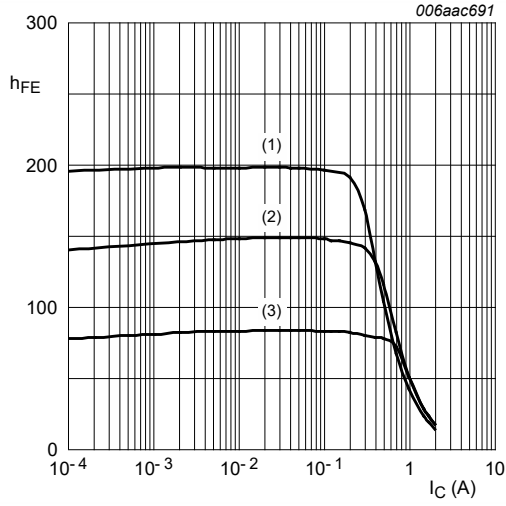


10. Characteristics

Table 7. Characteristics
 $T_{amb} = 25\text{ °C}$ unless otherwise specified.

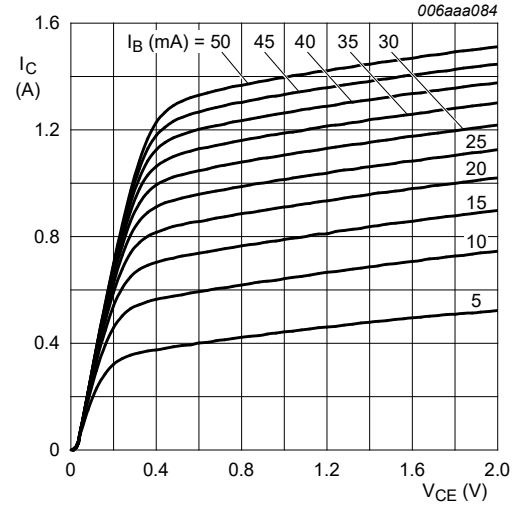
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\ \mu\text{A}; I_E = 0\ \text{A}$	45	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2\ \text{mA}; I_B = 0\ \text{A}$	45	-	-	V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\ \mu\text{A}; I_C = 0\ \text{A}$	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	μA	
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; $t_p \leq 300\ \mu\text{s}$; $\delta \leq 0.02$



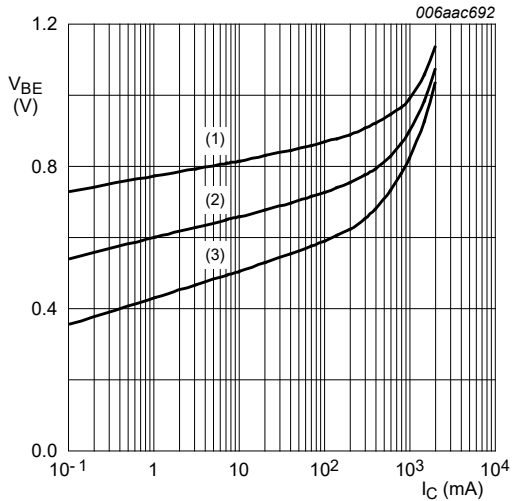
$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



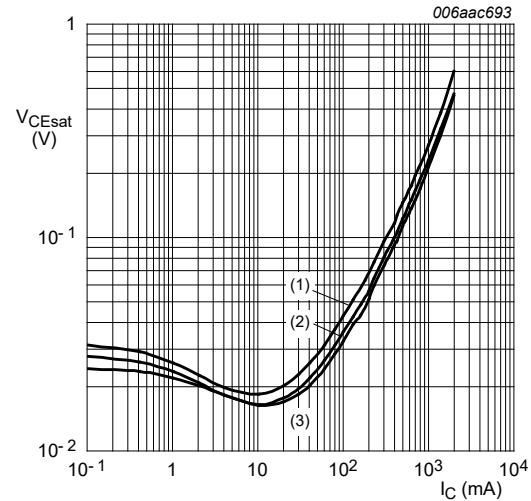
$T_{amb} = 25\text{ °C}$

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



$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



$I_C/I_B = 10$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

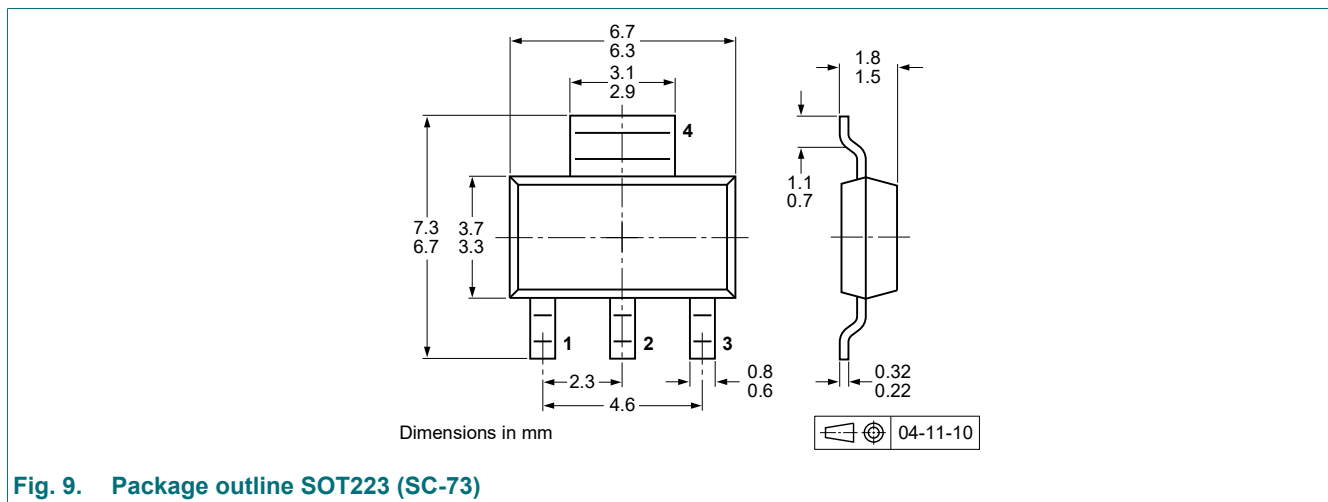
Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values

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



13. Soldering

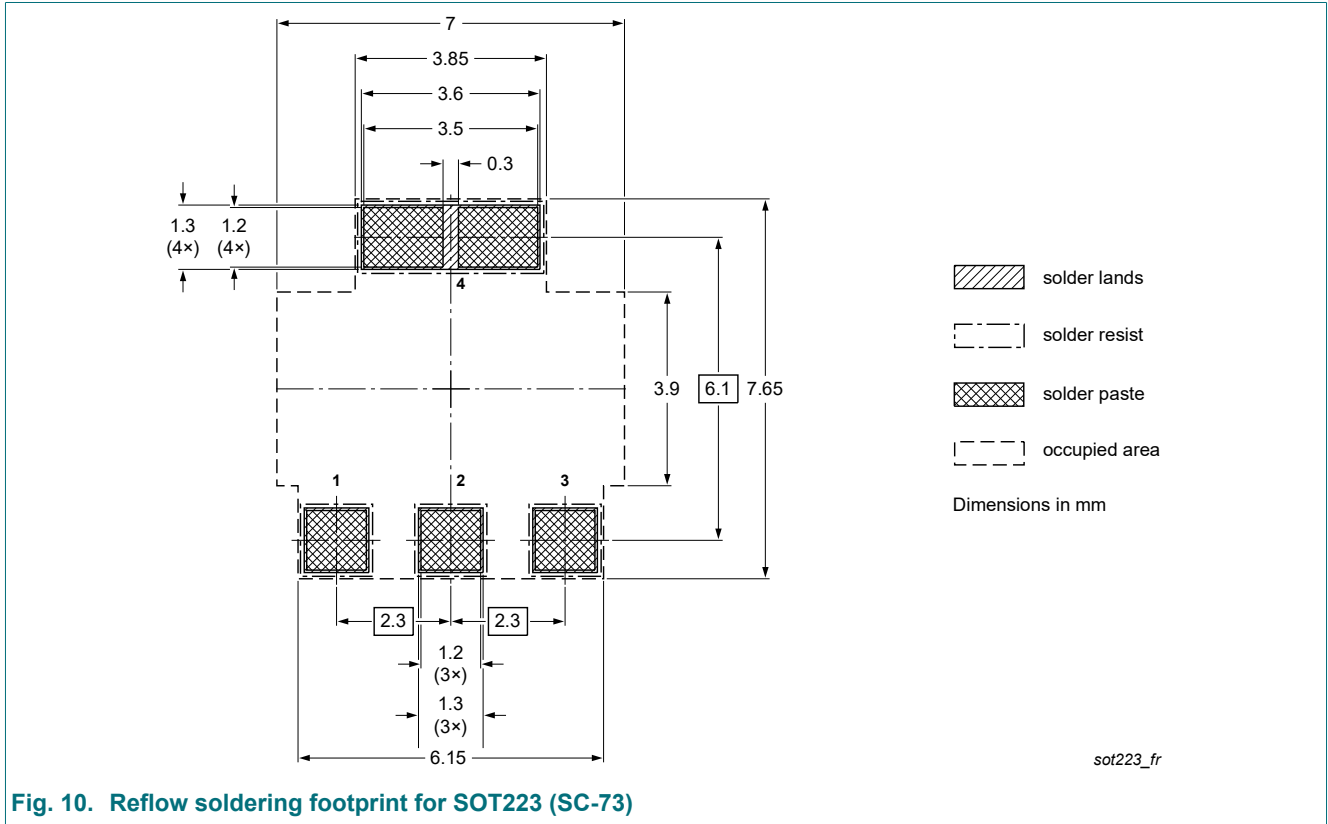


Fig. 10. Reflow soldering footprint for SOT223 (SC-73)

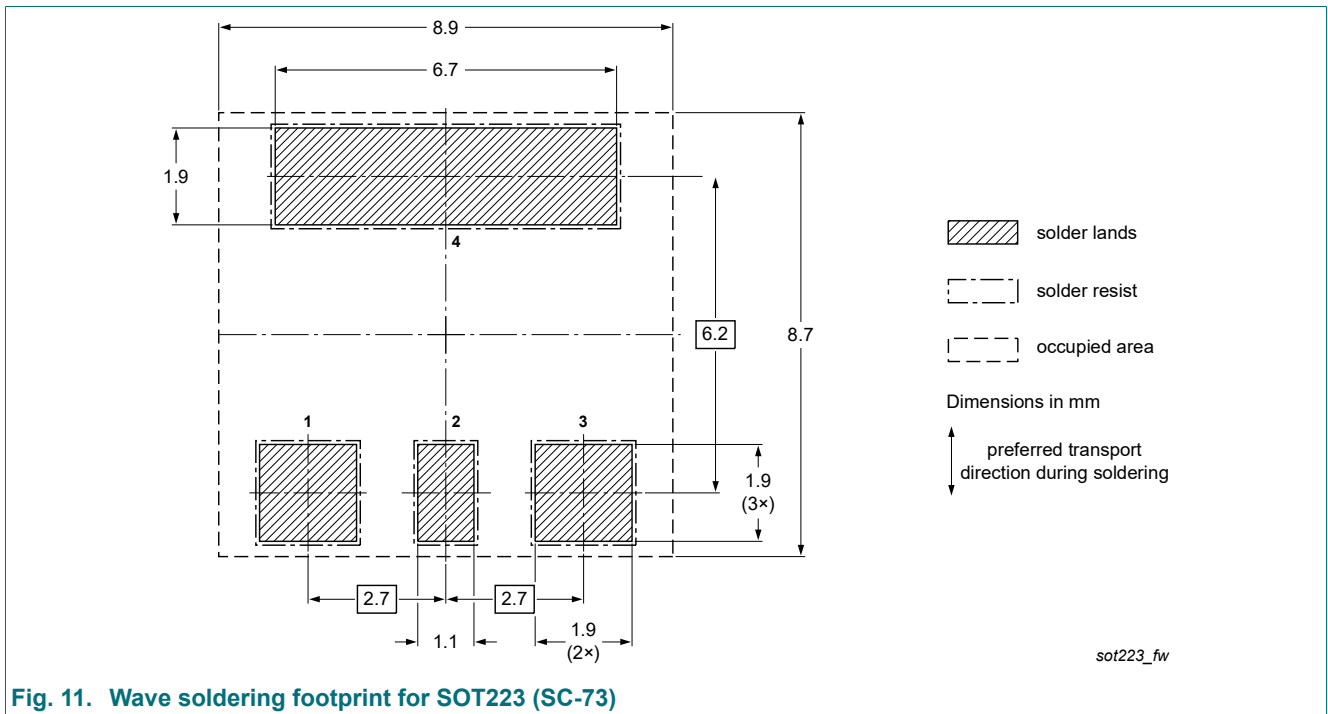


Fig. 11. Wave soldering footprint for SOT223 (SC-73)

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