

# BCX54-Q series

45 V, 1 A NPN medium power transistors

Rev. 2 — 30 March 2022

Product data sheet

## 1. General description

NPN medium power transistors in a SOT89 (SC-62) 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

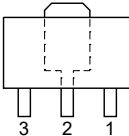
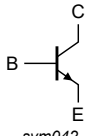
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

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						
	BCX54-Q	$V_{CE} = 2\text{ V}; I_C = 150\text{ mA}$	[1]	63	-	250	
	BCX54-10-Q		[1]	63	-	160	
	BCX54-16-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	E	emitter		 sym042
2	C	collector		
3	B	base		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
BCX54-Q	SC-62	plastic surface-mounted package; exposed die pad for good heat transfer; 3 leads	SOT89
BCX54-10-Q			
BCX54-16-Q			

## 7. Marking

Table 4. Marking

Type number	Marking code
BCX54-Q	BA
BCX54-10-Q	BC
BCX54-16-Q	BD

## 8. Limiting values

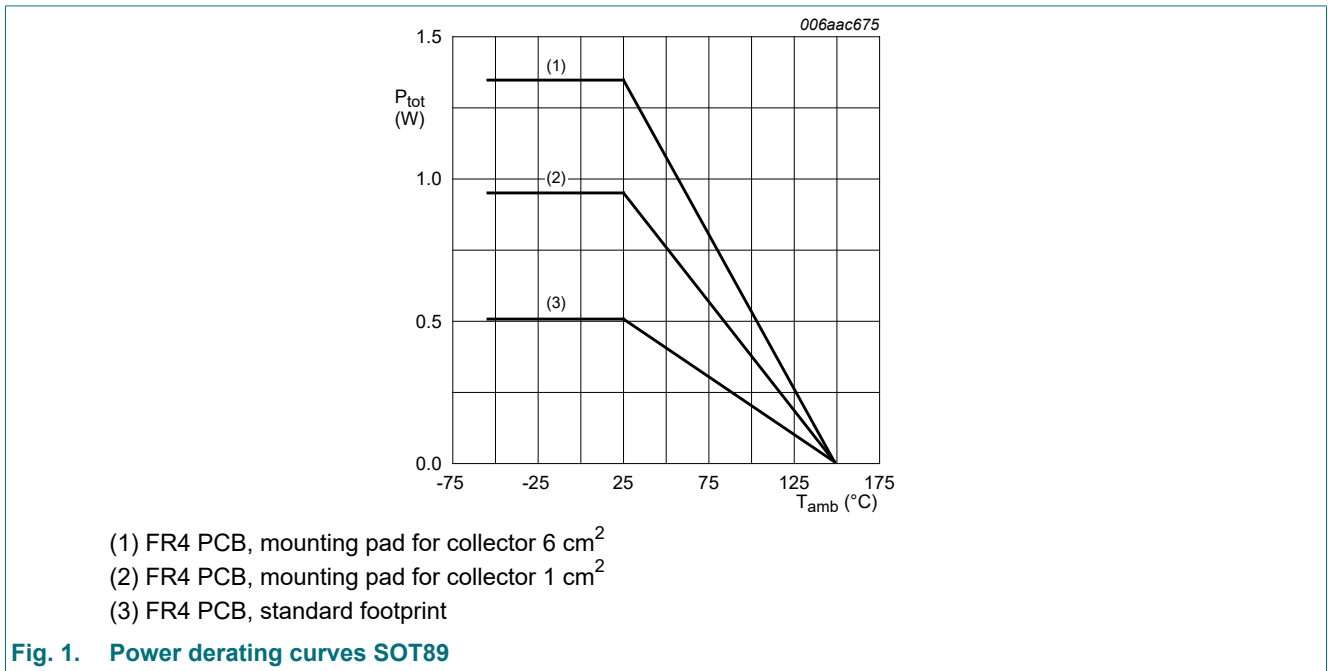
**Table 5. Limiting values**

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]	0.50	W
			[2]	0.95	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 cm<sup>2</sup>.
- [3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.



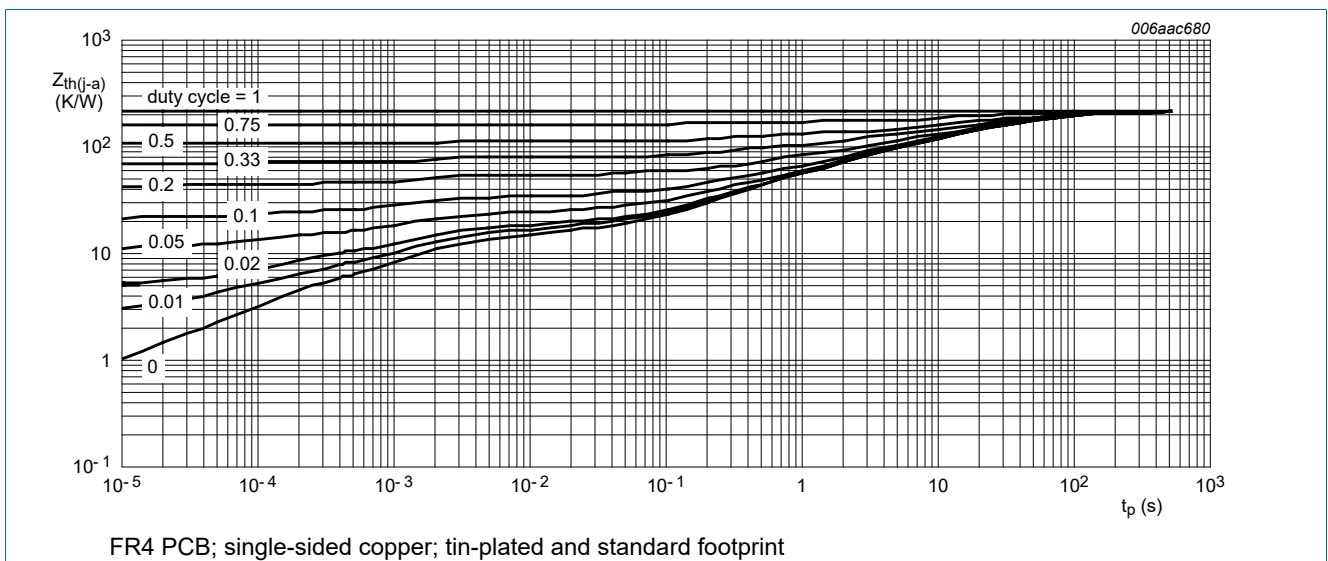
## 9. Thermal characteristics

**Table 6. Thermal characteristics**

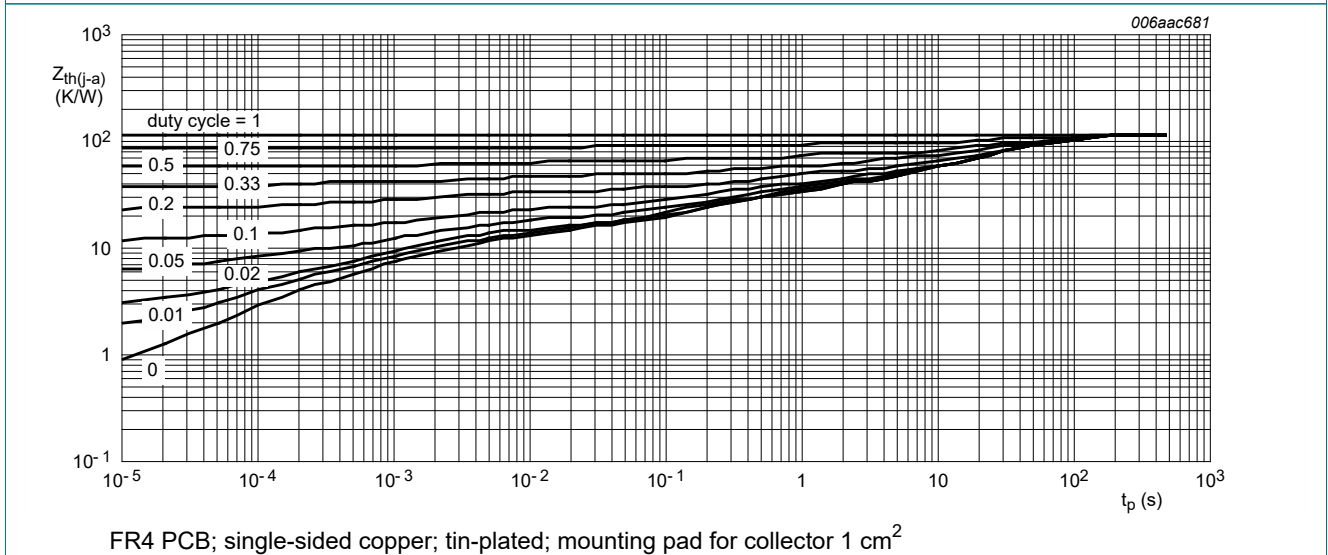
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	250	K/W
			[2]			132	K/W
			[3]			93	K/W
$R_{(j-sp)}$	thermal resistance from junction to solder point			-	-	16	K/W

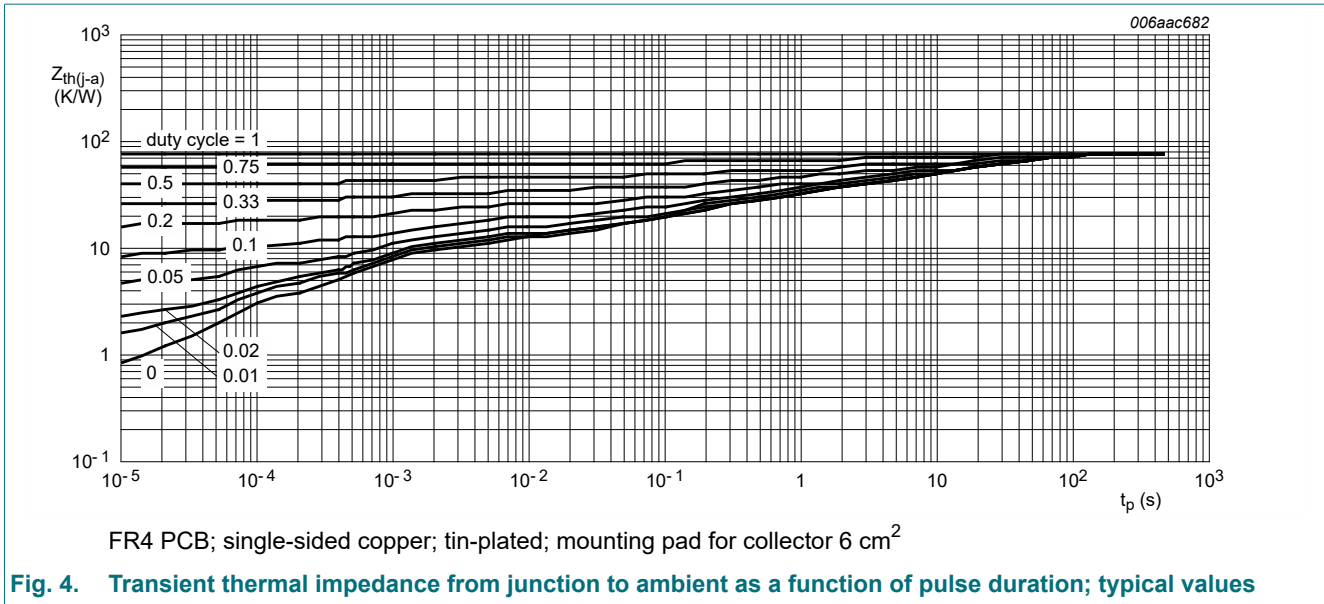
- [1] Device mounted on an FR4 PCB; single-sided copper; tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.
- [3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector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

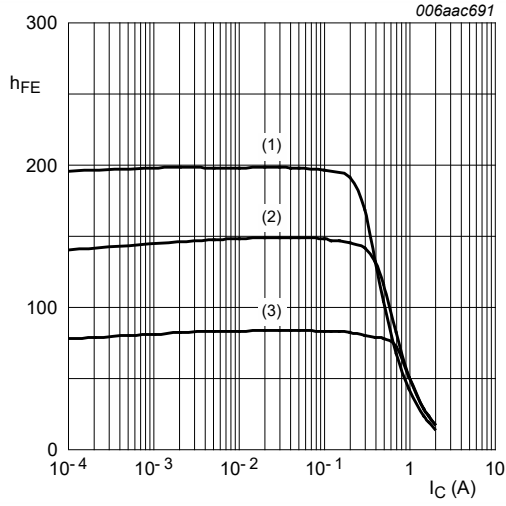


## 10. Characteristics

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

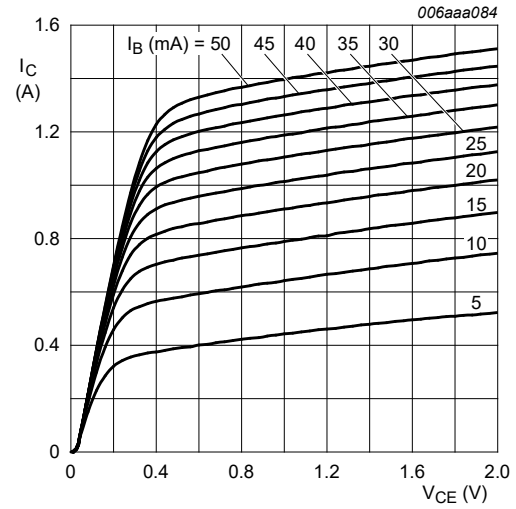
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\ \mu\text{A}; I_E = 0\ \text{A}$	45	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2\ \text{mA}; I_B = 0\ \text{A}$	45	-	-	V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\ \mu\text{A}; I_C = 0\ \text{A}$	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	$\mu\text{A}$	
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\ \text{V}; I_C = 0\ \text{A}$	-	-	100	nA	
$h_{FE}$	DC current gain						
	BCX54-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	-	-	
	BCX54-10-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	-	-	
	BCX54-16-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;  $t_p \leq 300\ \mu\text{s}$ ;  $\delta \leq 0.02$



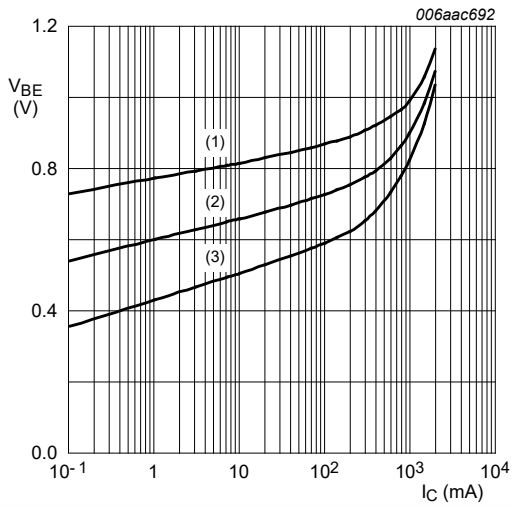
$V_{CE} = 2\text{ V}$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



$T_{amb} = 25\text{ °C}$

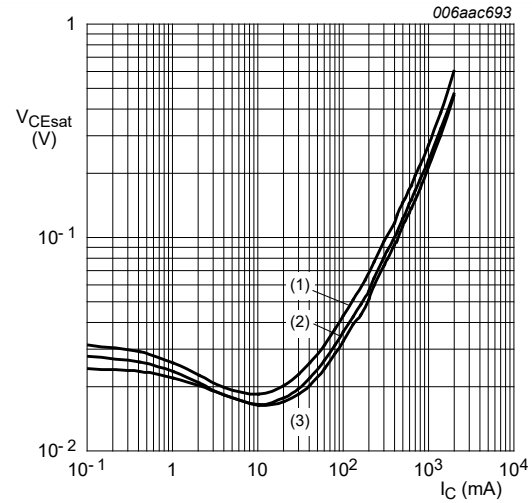
**Fig. 6. Collector current as a function of collector-emitter voltage; typical values**



$V_{CE} = 2\text{ V}$   
 (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**

**Fig. 8. Collector-emitter saturation 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. 9.**

## 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

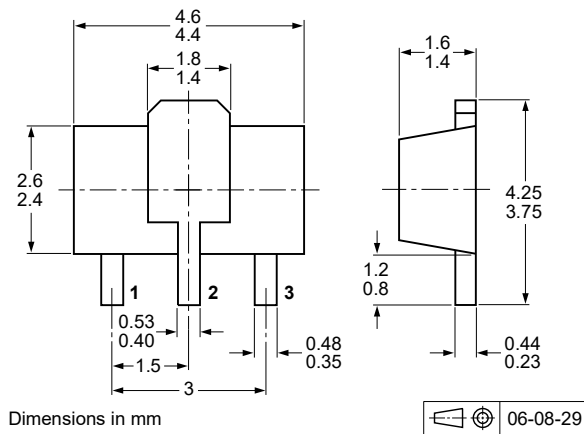
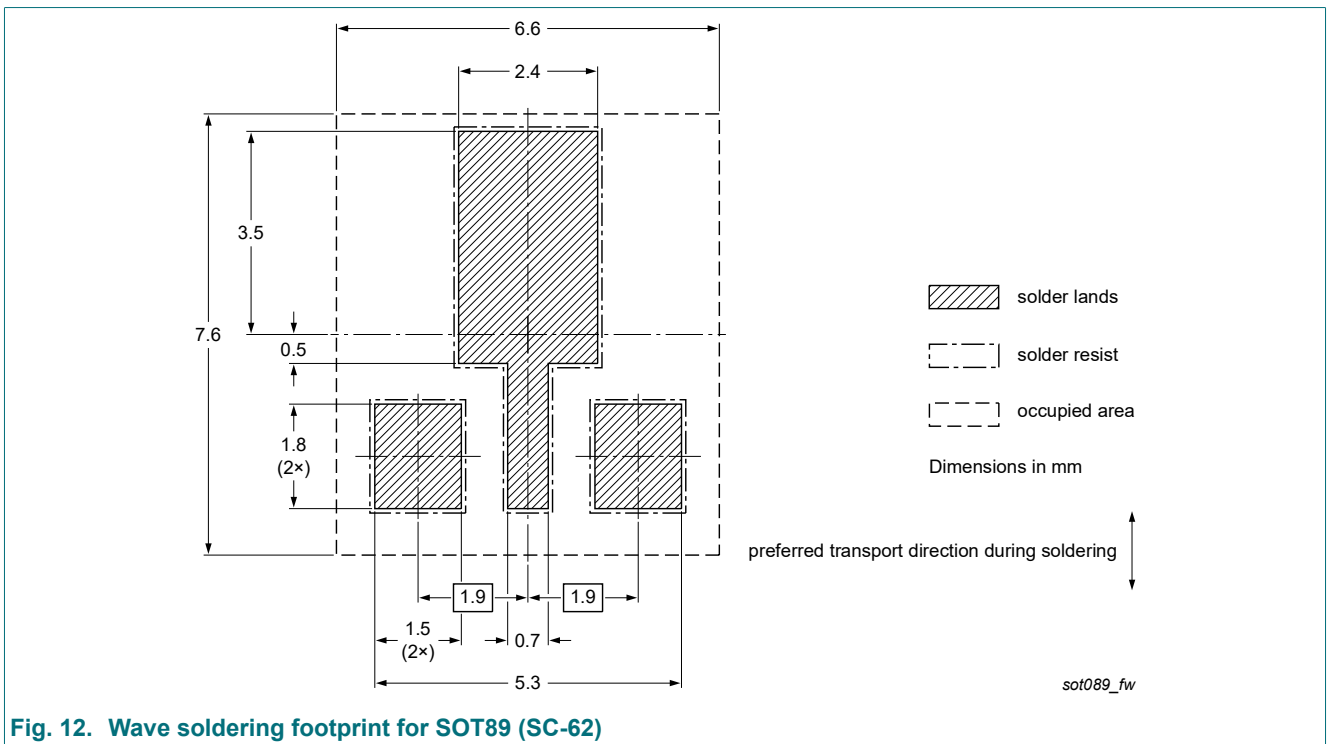
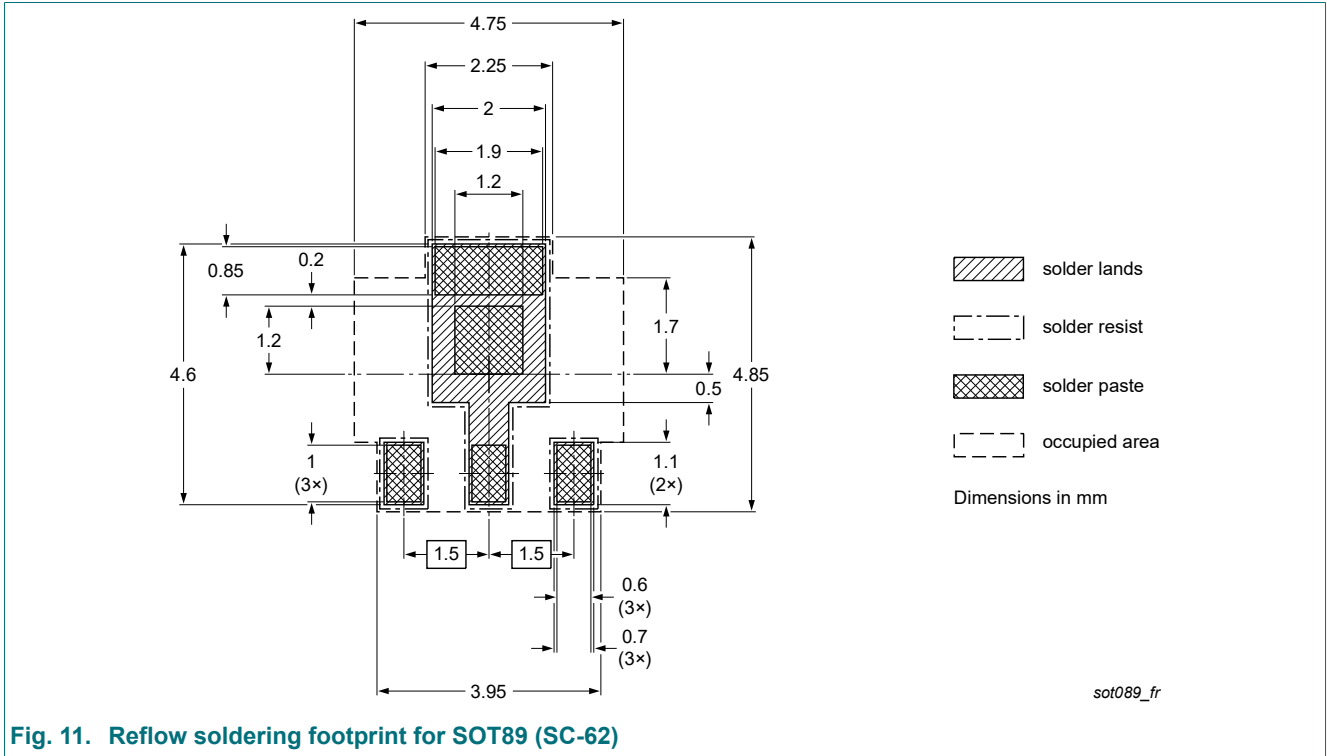


Fig. 10. Package outline SOT89 (SC-62)



### 13. Soldering



## 14. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCX54-Q_SER v.2	20220330	Product data sheet	-	BCX54-Q_SER v.1
Modifications:	• Characteristics, Fig 8: Legend corrected			
BCX54-Q_SER v.1	20220324	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".
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