

# BCX56T series

80 V, 1 A NPN power bipolar transistors

Rev. 1 — 22 August 2019

Product data sheet

## 1. Product profile

### 1.1. General description

NPN power transistors in a medium power SOT89 (SC-62) flat lead Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		PNP complement
	Nexperia	JEDEC	
BCX56T	SOT89	SC-62	BCX53T
BCX56-10T			BCX53-10T
BCX56-16T			BCX53-16T

### 1.2. Features and benefits

- High collector current capability  $I_C$  and  $I_{CM}$
- Three current gain selections
- High power dissipation capability
- AEC-Q101 qualified

### 1.3. Applications

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

### 1.4. Quick reference data

Table 2. Quick reference data

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

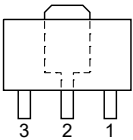
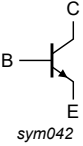
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	80	V
$I_C$	collector current		-	-	1	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1\text{ ms}$	-	-	2	A

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$h_{FE}$	DC current gain						
	BCX56T	$V_{CE} = 2 \text{ V}; I_C = 150 \text{ mA}$	[1]	63	-	250	
	BCX56-10T		[1]	63	-	160	
BCX56-16T	[1]		100	-	250		

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

## 2. Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter		 sym042
2	C	collector		
3	B	base		

## 3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BCX56T	SC-62	plastic, surface-mounted package; 3 leads; 1.5 mm pitch; 4.5 mm x 2.5 mm x 1.5 mm body	SOT89
BCX56-10T			
BCX56-16T			

## 4. Marking

Table 5. Marking

Type number	Marking code
BCX56T	A7
BCX56-10T	A5
BCX56-16T	A6

## 5. Limiting values

**Table 6. Limiting values**

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

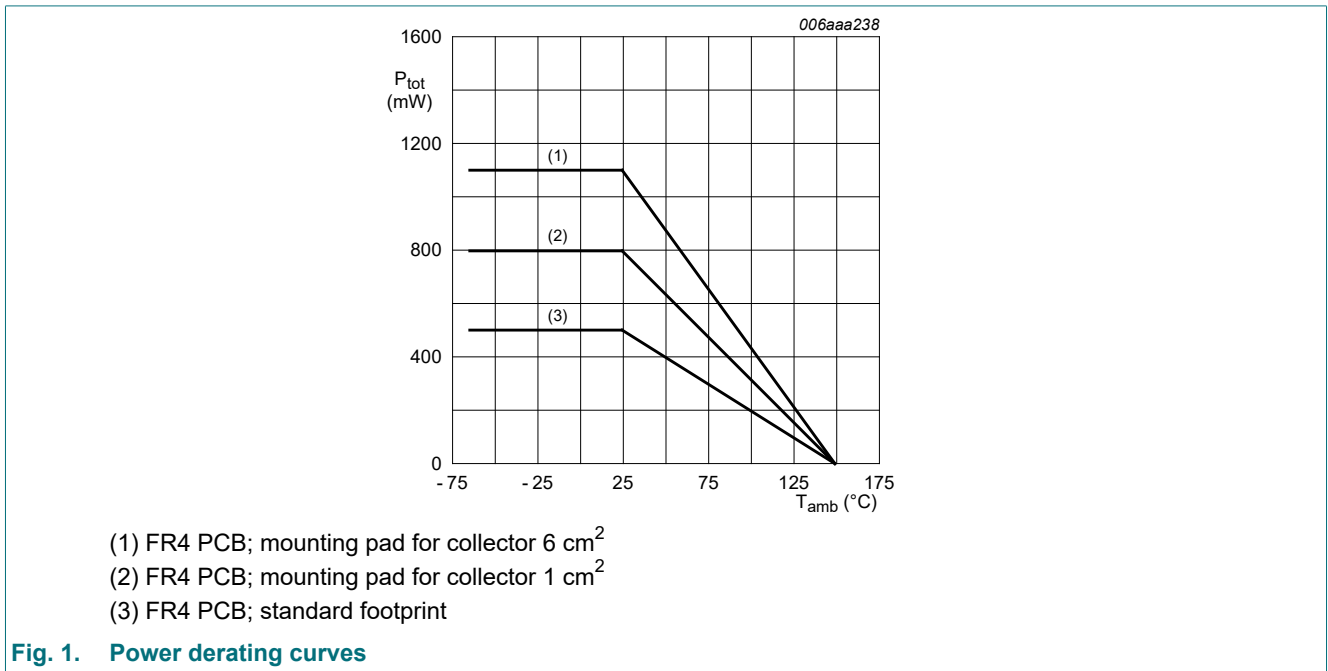
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter	-	100	V
$V_{CEO}$	collector-emitter voltage	open base	-	80	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		-	200	mA
$I_{BM}$	peak base current	single pulse; $t_p \leq 1\text{ ms}$	-	300	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	500	mW
			[2]	800	mW
			[3]	1100	mW
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-55	150	°C
$T_{stg}$	storage temperature		-65	150	°C

[1] Device mounted on an FR4 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  $1\text{ cm}^2$ .

[3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector  $6\text{ cm}^2$ .



**Fig. 1. Power derating curves**

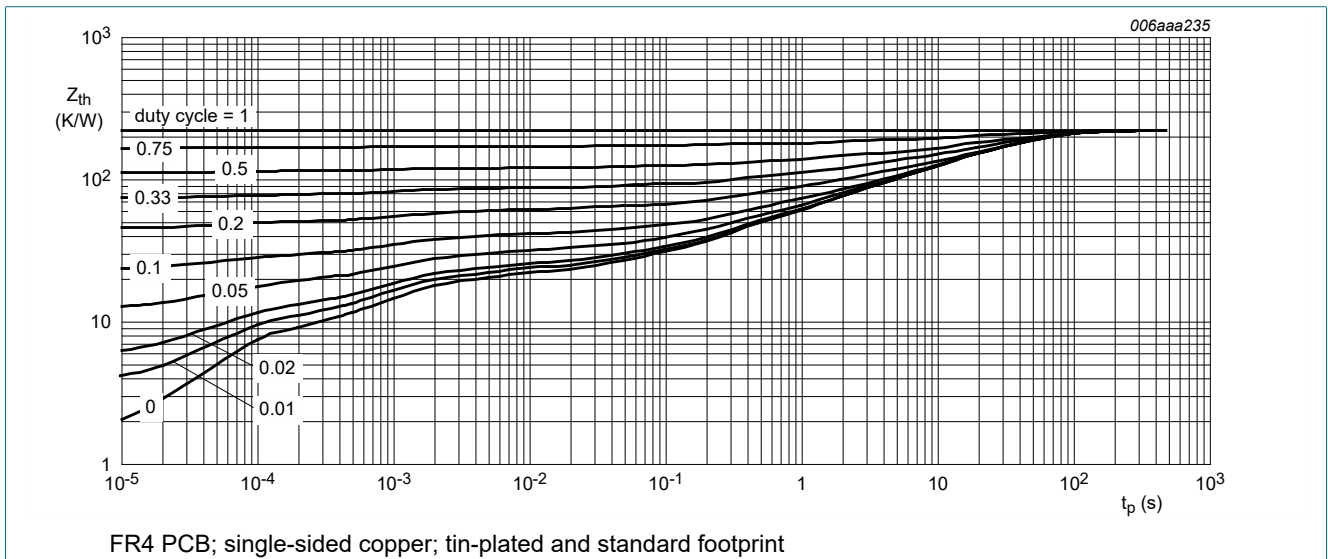
## 6. Thermal characteristics

**Table 7. Thermal characteristics**

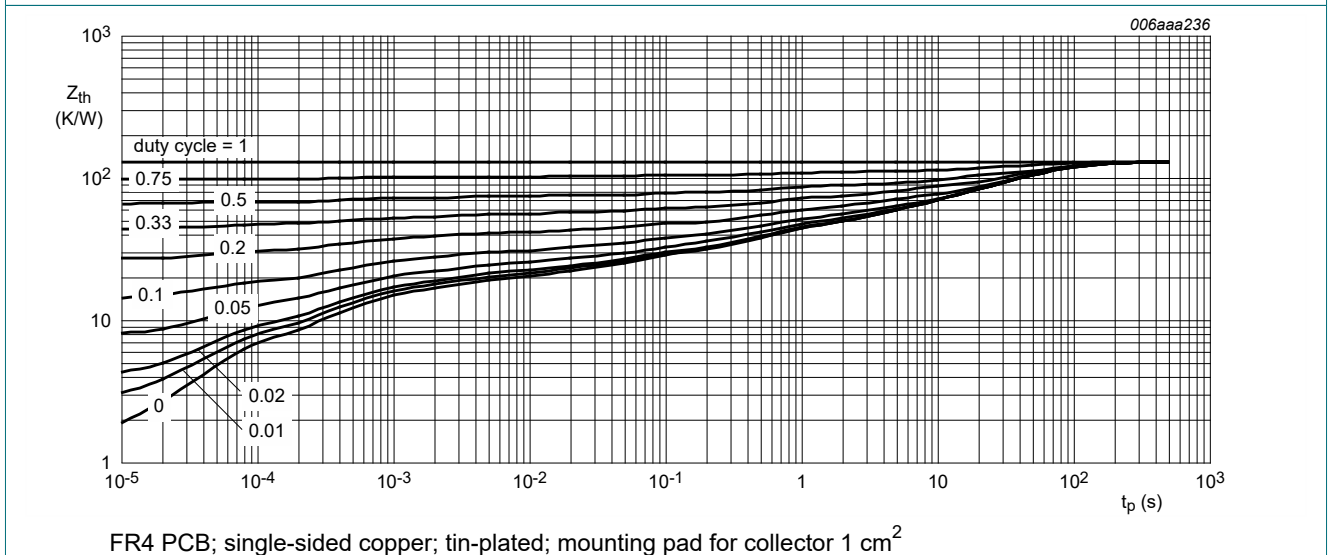
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

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]	-	-	157	K/W
			[3]	-	-	114	K/W

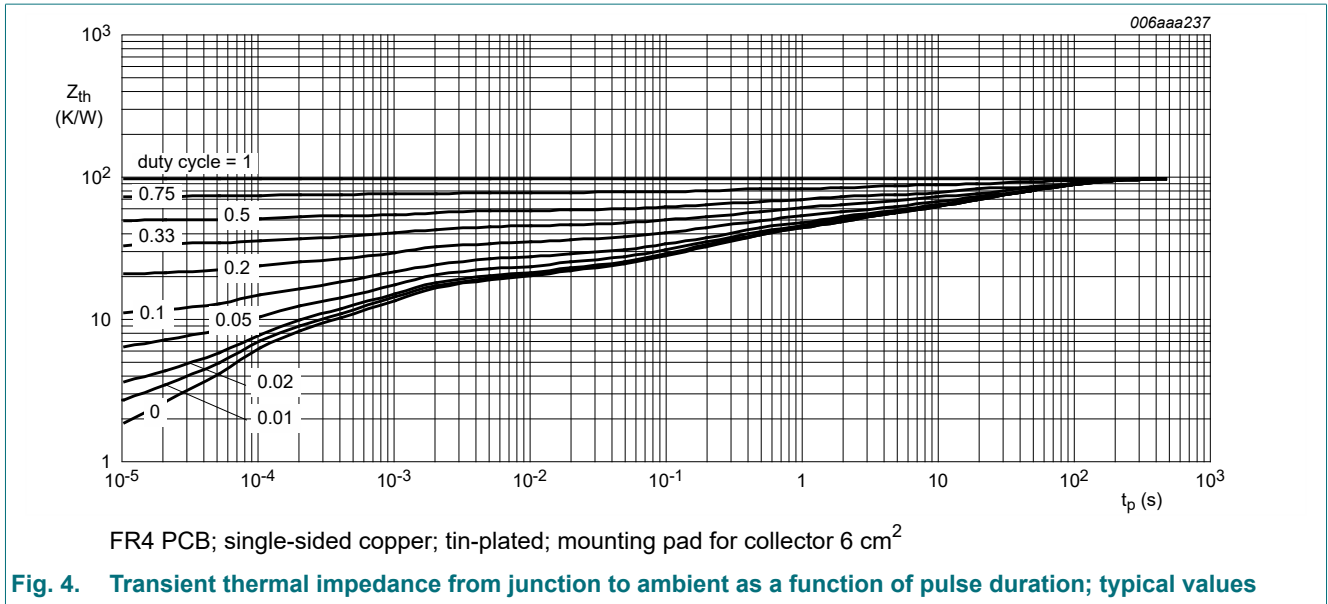
- [1] Device mounted on an FR4 PCB; single-sided copper; tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector  $1\text{ cm}^2$ .
- [3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector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



**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**



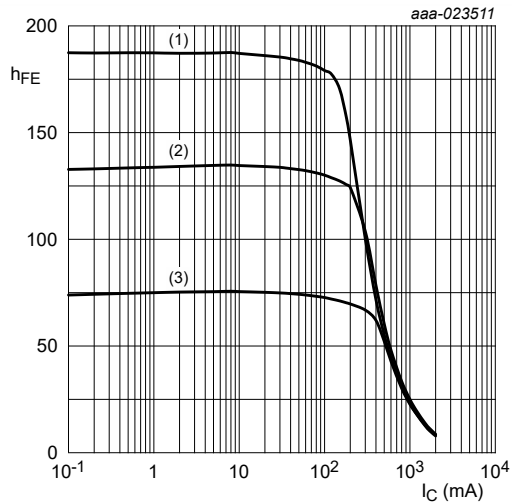
## 7. Characteristics

**Table 8. Characteristics**

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

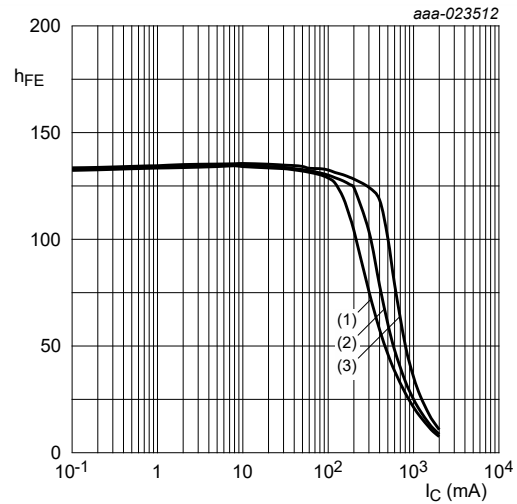
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\ \mu\text{A}; I_E = 0\ \text{A}$	100	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2\ \text{mA}; I_E = 0\ \text{A}$	80	-	-	V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\ \mu\text{A}; I_C = 0\ \text{A}$	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						
	BCX56T, -10T, -16T	$V_{CE} = 2\ \text{V}; I_C = 5\ \text{mA}$	63	-	-		
		$V_{CE} = 2\ \text{V}; I_C = 500\ \text{mA}$	[1]	40	-	-	
	BCX56T	$V_{CE} = 2\ \text{V}; I_C = 150\ \text{mA}$	[1]	63	-	250	
	BCX56-10T	$V_{CE} = 2\ \text{V}; I_C = 150\ \text{mA}$	[1]	63	-	160	
BCX56-16T	$V_{CE} = 2\ \text{V}; I_C = 150\ \text{mA}$	[1]	100	-	250		
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 500\ \text{mA}; I_B = 50\ \text{mA}$	[1]	-	-	500 mV	
$V_{BE}$	base-emitter voltage	$V_{CE} = 2\ \text{V}; I_C = 500\ \text{mA}$	[1]	-	-	1 V	
$f_T$	transition frequency	$V_{CE} = 5\ \text{V}; I_C = 50\ \text{mA}; f = 100\ \text{MHz}$	-	155	-	MHz	
$C_c$	collector capacitance	$V_{CB} = 10\ \text{V}; I_E = i_e = 0\ \text{A}; f = 1\ \text{MHz}$	-	4.5	-	pF	

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



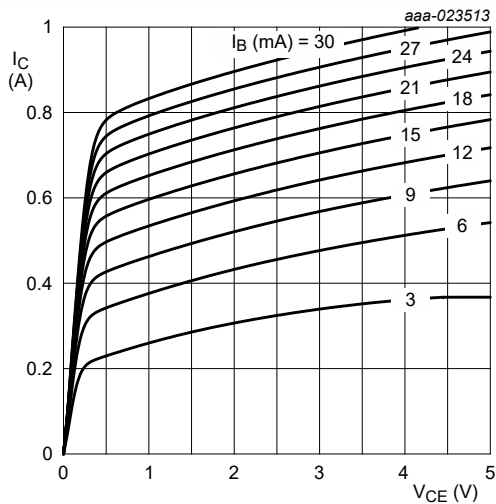
$V_{CE} = 2\text{ V}$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



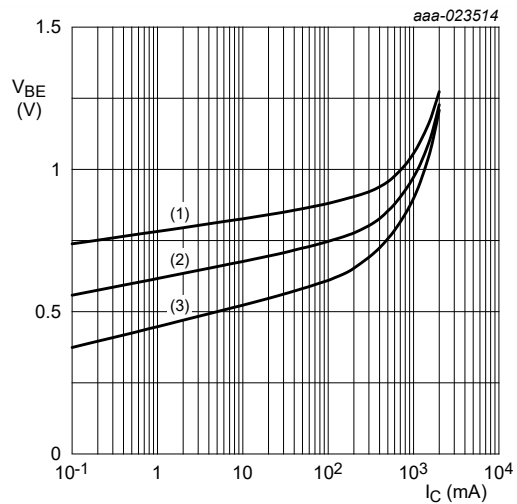
$T_{amb} = 25\text{ °C}$   
 (1)  $V_{CE} = 1\text{ V}$   
 (2)  $V_{CE} = 2\text{ V}$   
 (3)  $V_{CE} = 5\text{ V}$

**Fig. 6. DC current gain as a function of collector current; typical values**



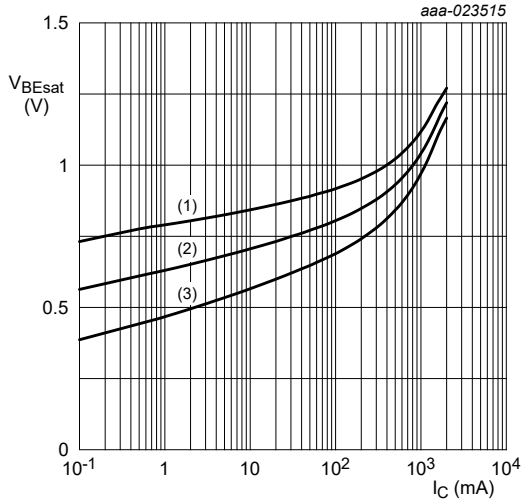
$T_{amb} = 25\text{ °C}$

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



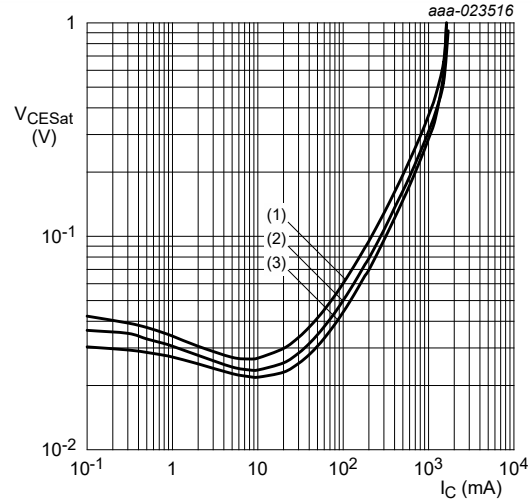
$V_{CE} = 2\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

**Fig. 8. Base-emitter voltage as a function of collector current; typical values**



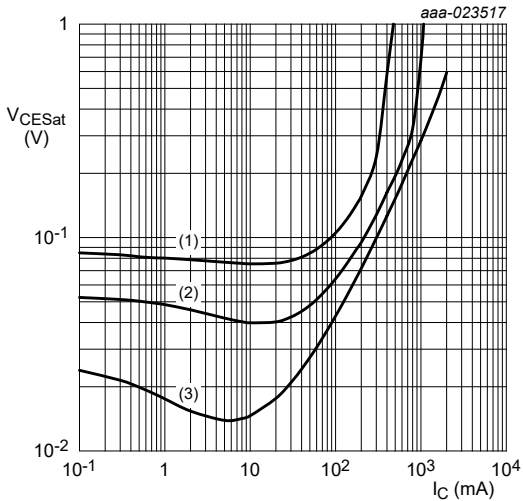
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

Fig. 9. Base-emitter saturation voltage as a function of collector current; typical values



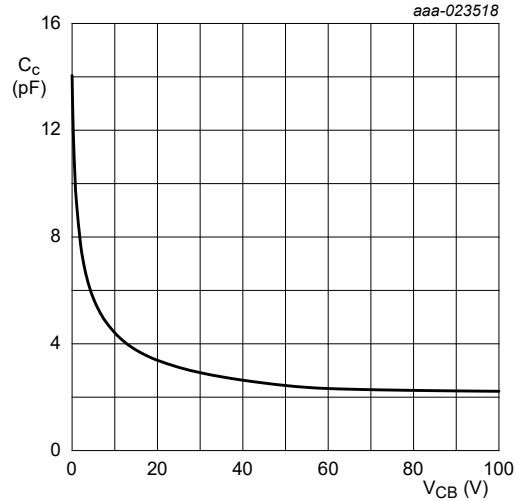
$I_C/I_B = 10$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values



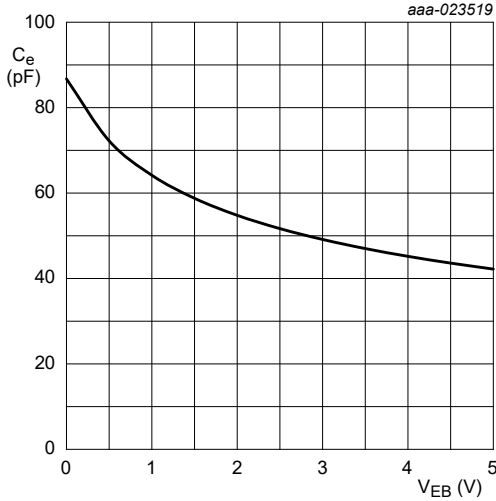
$T_{amb} = 25\text{ °C}$   
 (1)  $I_C/I_B = 50$   
 (2)  $I_C/I_B = 20$   
 (3)  $I_C/I_B = 5$

Fig. 11. Collector-emitter saturation voltage as a function of collector current; typical values



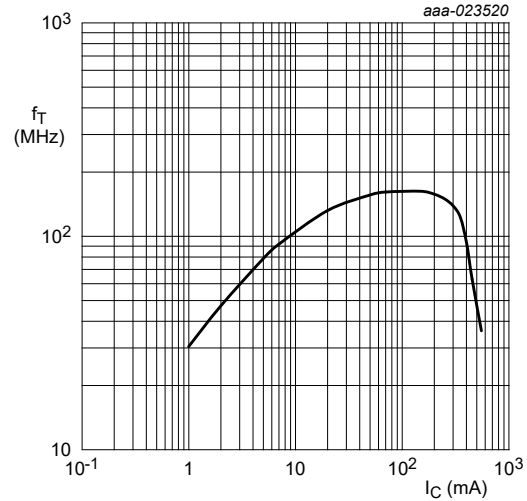
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

Fig. 12. Collector capacitance as a function of collector-base voltage; typical values



$f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

**Fig. 13. Emitter capacitance as a function of emitter-base voltage; typical values**



$V_{CE} = 5 \text{ V}$

$f = 100 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

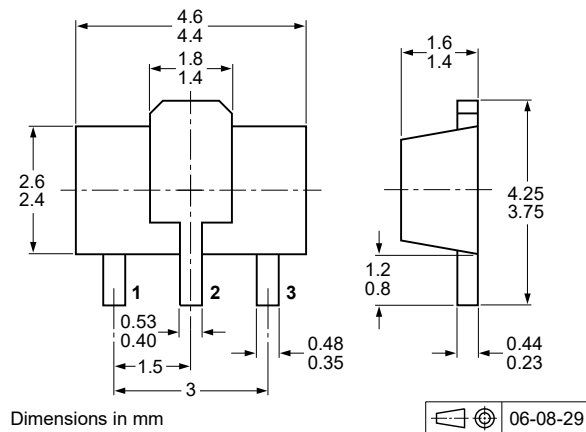
**Fig. 14. Transition frequency as a function of collector current; typical values**

## 8. Test information

### 8.1. 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.

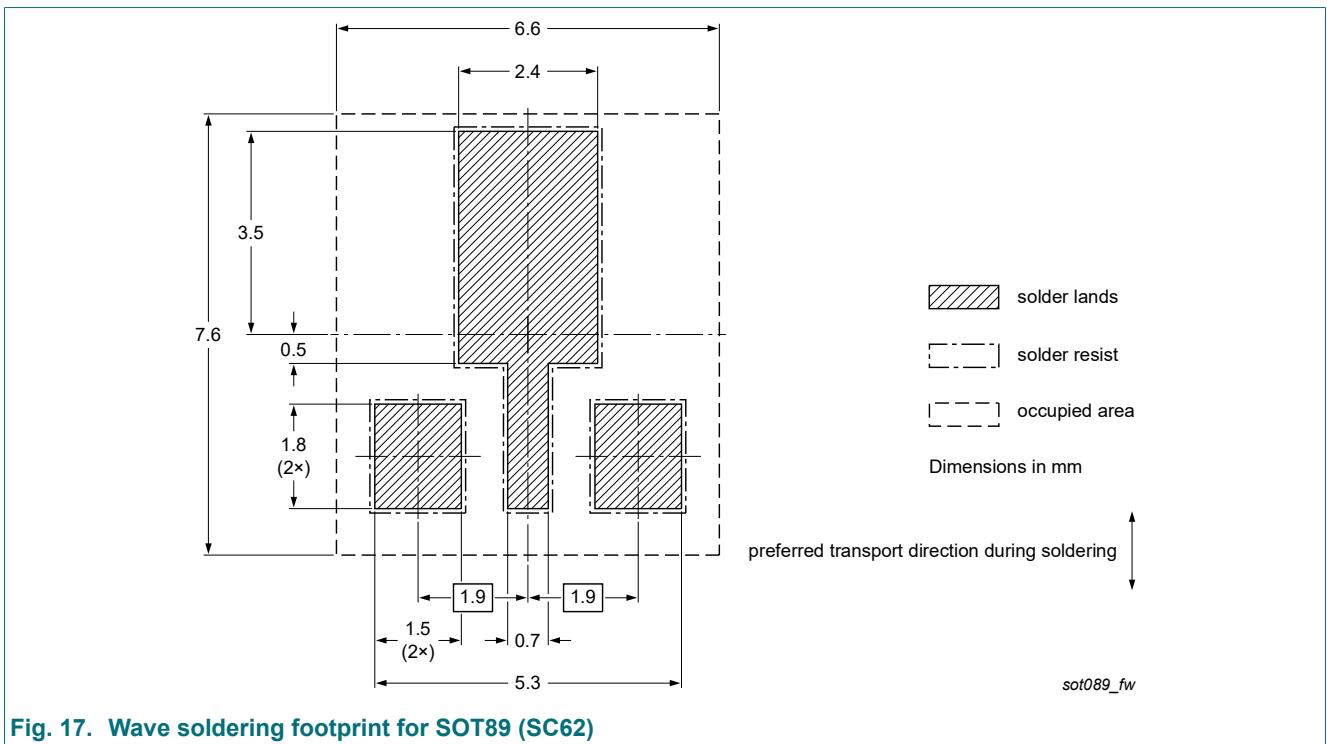
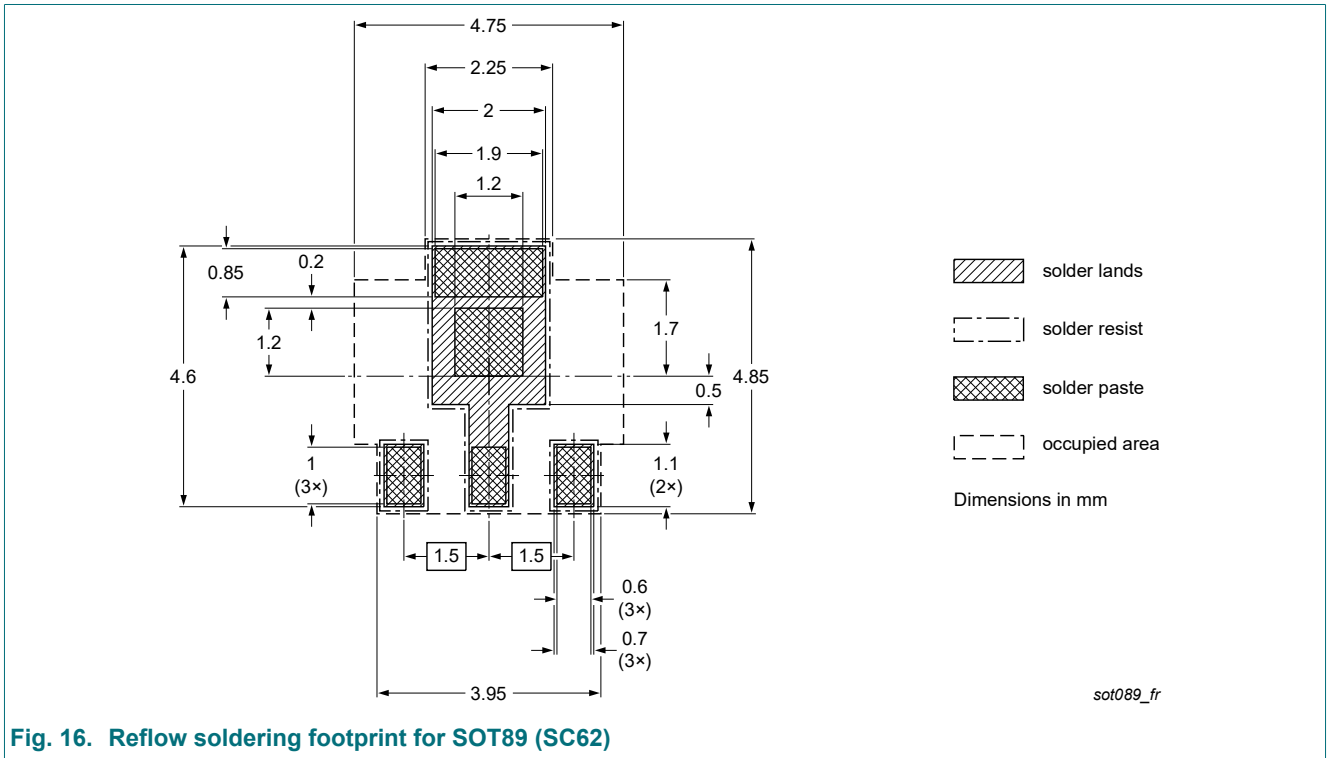
## 9. Package outline



**Fig. 15. Package outline SOT89 (SC-62)**



### 10. Soldering



## 11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCX56T_SER v.1	20190822	Product data sheet	-	-

## 12. 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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