

BCX51T series

45 V, 1 A PNP power bipolar transistors

Rev. 1 — 22 August 2019

Product data sheet

1. Product profile

1.1. General description

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

Table 1. Product overview

Type number	Package		NPN complement
	Nexperia	JEDEC	
BCX51T	SOT89	SC-62	BCX54T
BCX51-10T			BCX54-10T
BCX51-16T			BCX54-16T

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
- High-side switches
- Power management
- Amplifiers

1.4. Quick reference data

Table 2. Quick reference data

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

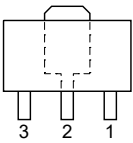
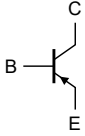
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	-45	V
I_C	collector current		-	-	-1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1\text{ ms}$	-	-	-2	A

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
h_{FE}	DC current gain						
	BCX51T	$V_{CE} = -2 \text{ V}; I_C = -150 \text{ mA}$	[1]	63	-	250	
	BCX51-10T		[1]	63	-	160	
	BCX51-16T		[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		 006aaa231
2	C	collector		
3	B	base		

3. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
BCX51T	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
BCX51-10T			
BCX51-16T			

4. Marking

Table 5. Marking

Type number	Marking code
BCX51T	C5
BCX51-10T	C6
BCX51-16T	C7

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	-	-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		-	-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 Printed-Circuit-Board (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^2 .
- [3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm^2 .

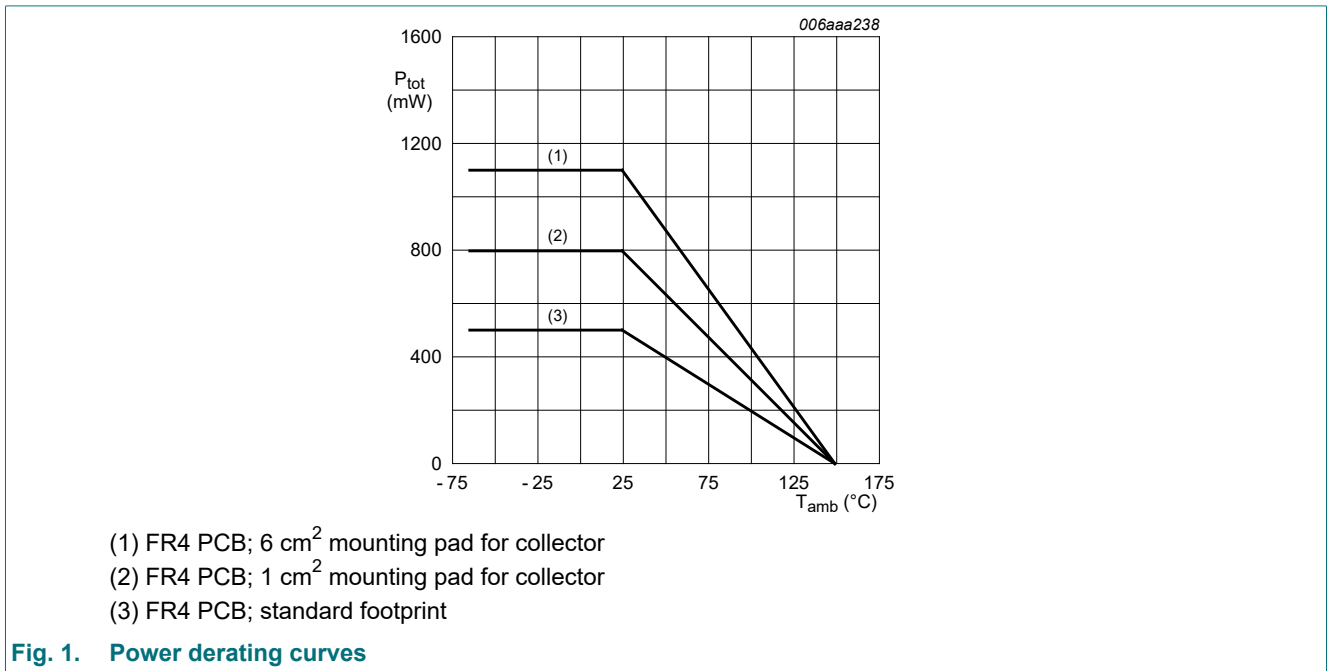


Fig. 1. Power derating curves

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

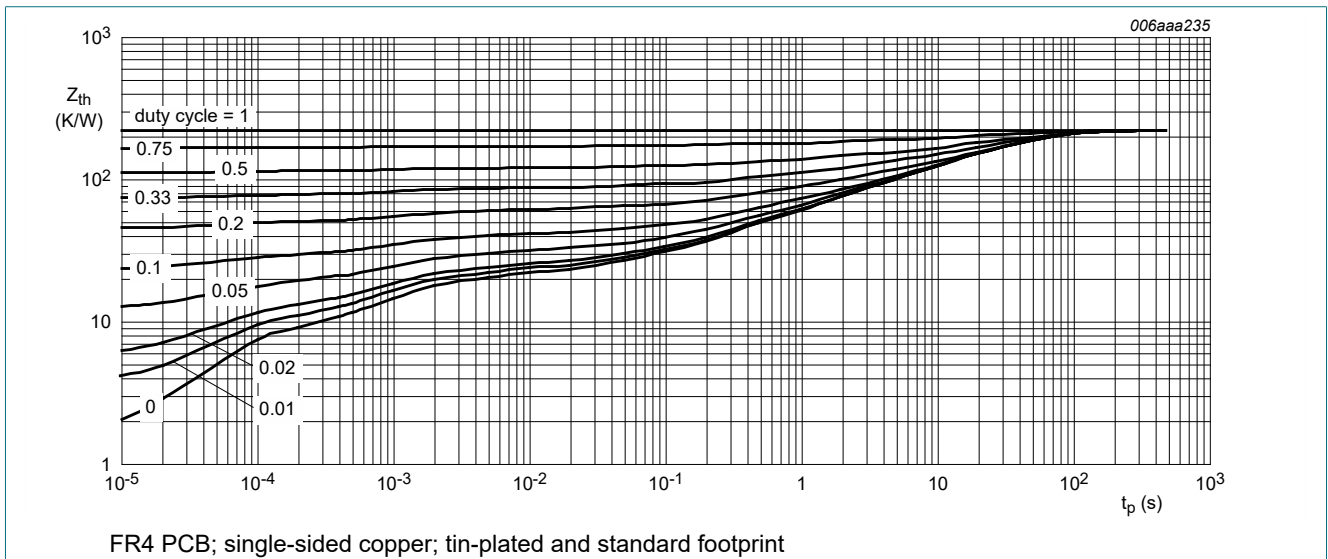


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

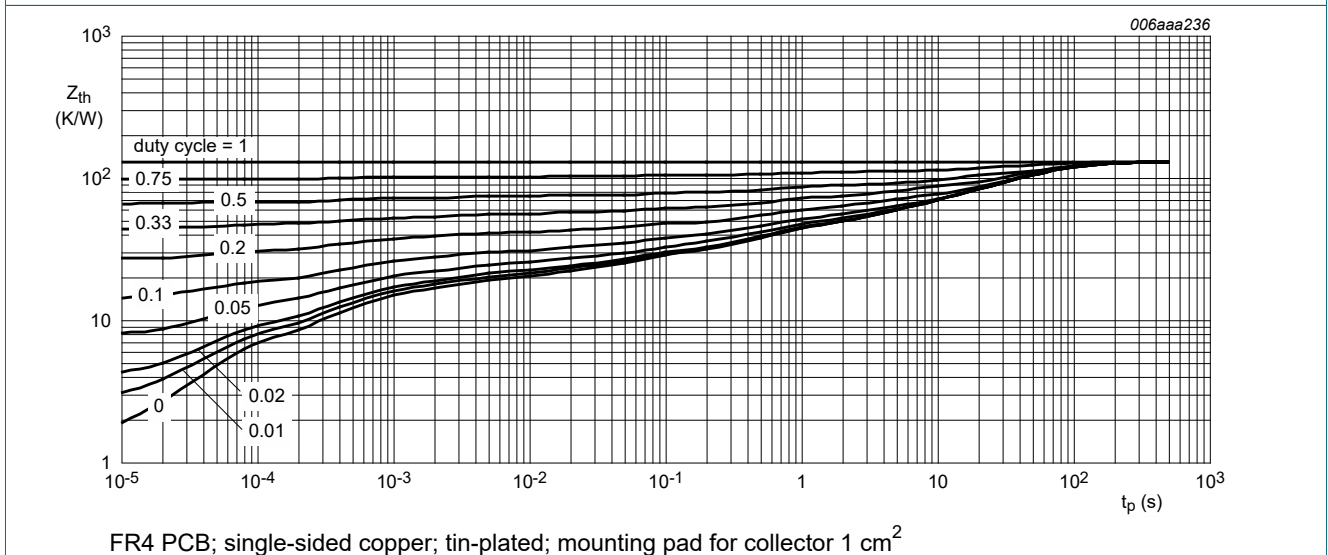
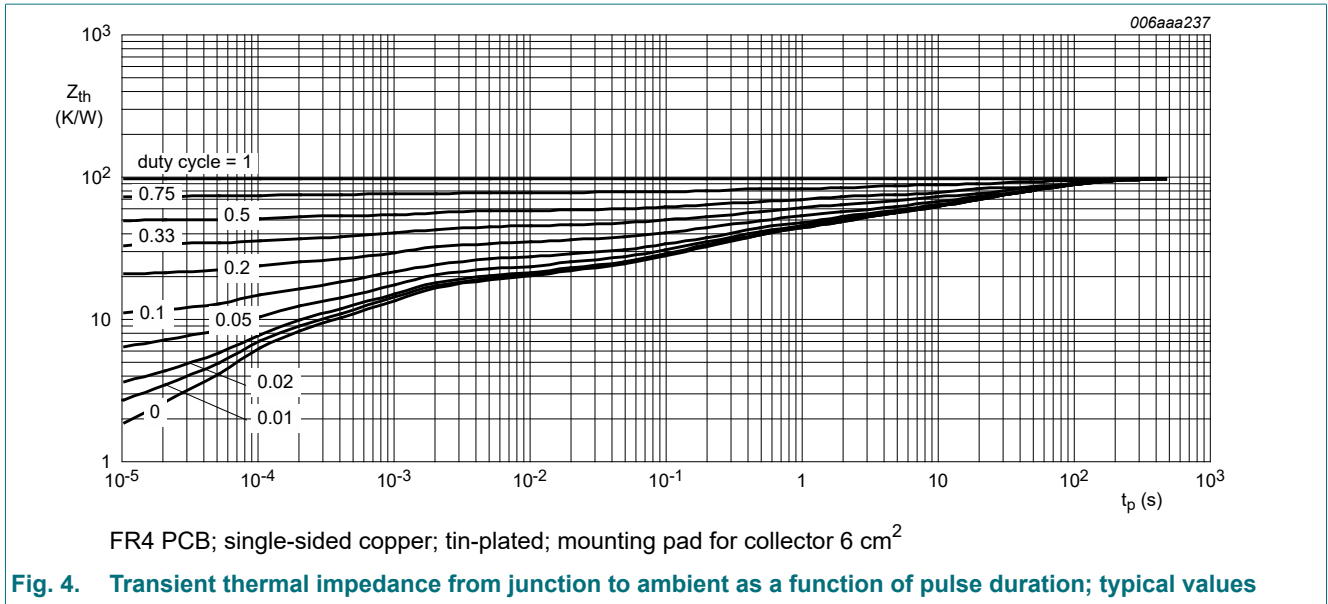


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



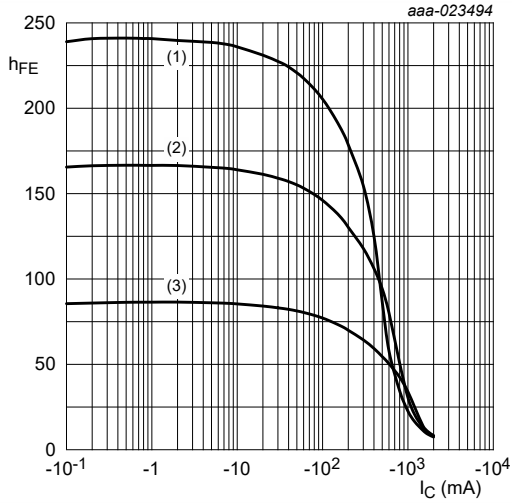
7. Characteristics

Table 8. Characteristics

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

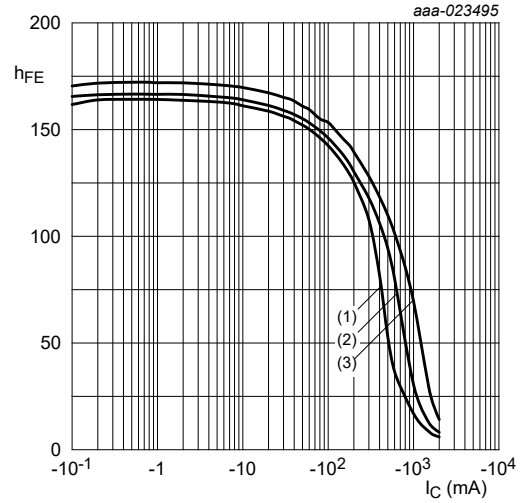
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V _{(BR)CBO}	collector-base breakdown voltage	I _C = -100 μA; I _E = 0 A	-45	-		V	
V _{(BR)CEO}	collector-emitter breakdown voltage	I _C = -2 mA; I _E = 0 A	-45	-		V	
V _{(BR)EBO}	emitter-base breakdown voltage	I _E = -100 μA; I _C = 0 A	-5	-		V	
I _{CBO}	collector-base cut-off current	V _{CB} = -30 V; I _E = 0 A	-	-	-100	nA	
		V _{CB} = -30 V; I _E = 0 A; T _j = 150 °C	-	-	-10	μA	
I _{EBO}	emitter-base cut-off current	V _{EB} = -5 V; I _C = 0 A	-	-	-100	nA	
h _{FE}	DC current gain						
	BCX51T, -10T, -16T	V _{CE} = -2 V; I _C = -5 mA		63	-	-	
		V _{CE} = -2 V; I _C = -500 mA	[1]	40	-	-	
	BCX51T	V _{CE} = -2 V; I _C = -150 mA	[1]	63	-	250	
	BCX51-10T	V _{CE} = -2 V; I _C = -150 mA	[1]	63	-	160	
BCX51-16T	V _{CE} = -2 V; I _C = -150 mA	[1]	100	-	250		
V _{CEsat}	collector-emitter saturation voltage	I _C = -500 mA; I _B = -50 mA	[1]	-	-500	mV	
V _{BE}	base-emitter voltage	V _{CE} = -2 V; I _C = -500 mA	[1]	-	-1	V	
f _T	transition frequency	V _{CE} = -5 V; I _C = -50 mA; f = 100 MHz		140	-	MHz	
C _c	collector capacitance	V _{CB} = -10 V; I _E = I _e = 0 A; f = 1 MHz		7	-	pF	

[1] pulsed; t_p ≤ 300 μs; δ ≤ 0.02



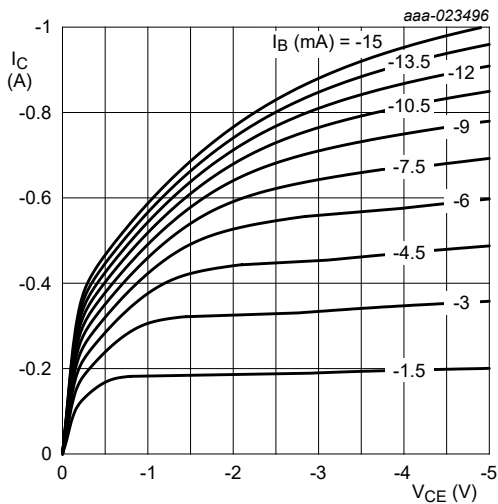
$V_{CE} = -2\text{ V}$
 (1) $T_{amb} = 100\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = -55\text{ }^\circ\text{C}$

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



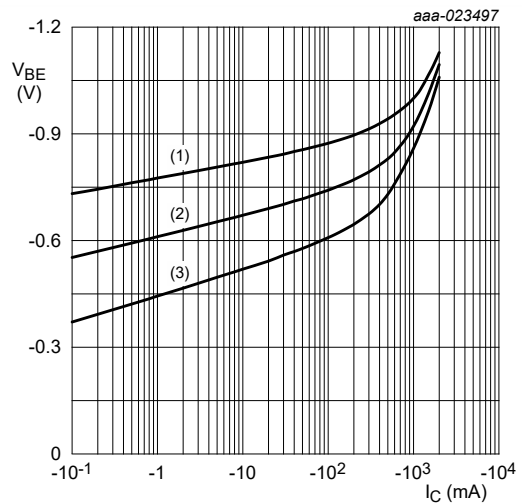
$T_{amb} = 25\text{ }^\circ\text{C}$
 (1) $V_{CE} = -1\text{ V}$
 (2) $V_{CE} = -2\text{ V}$
 (3) $V_{CE} = -5\text{ V}$

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



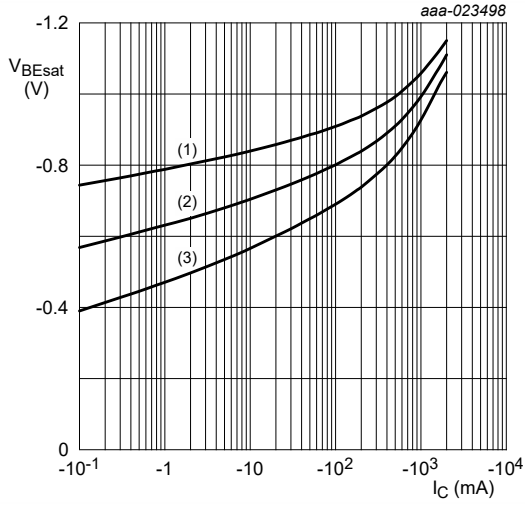
$T_{amb} = 25\text{ }^\circ\text{C}$

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



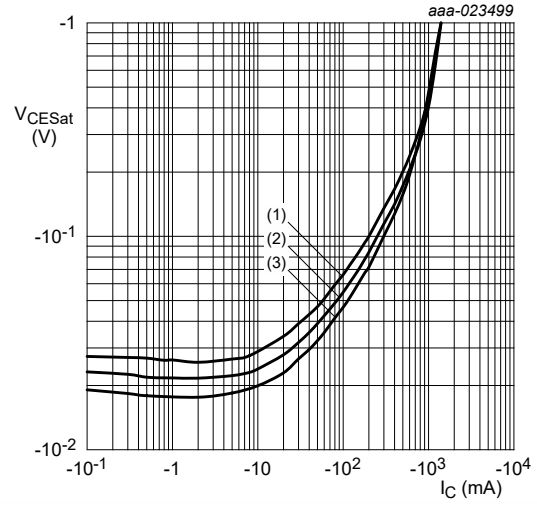
$V_{CE} = -2\text{ V}$
 (1) $T_{amb} = -55\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = 100\text{ }^\circ\text{C}$

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



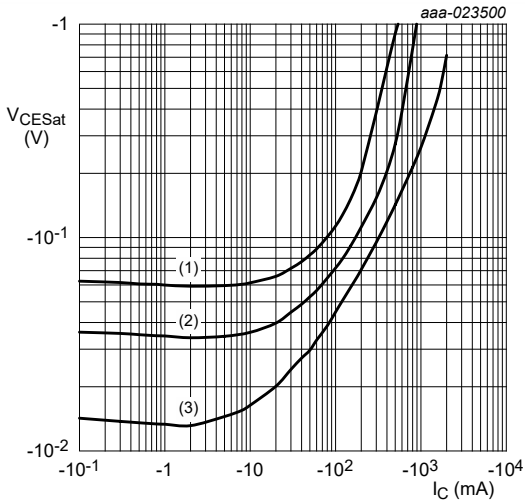
$I_C/I_B = 10$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



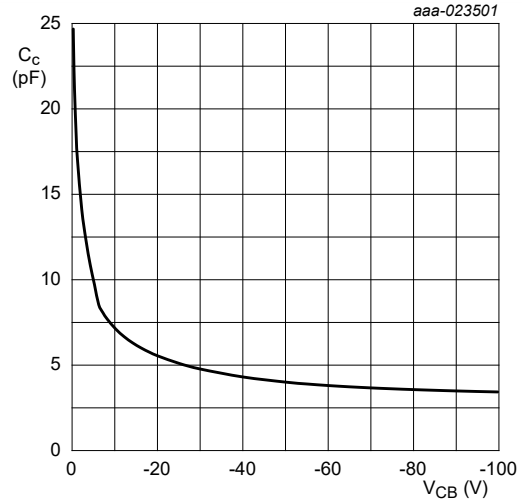
$I_C/I_B = 10$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



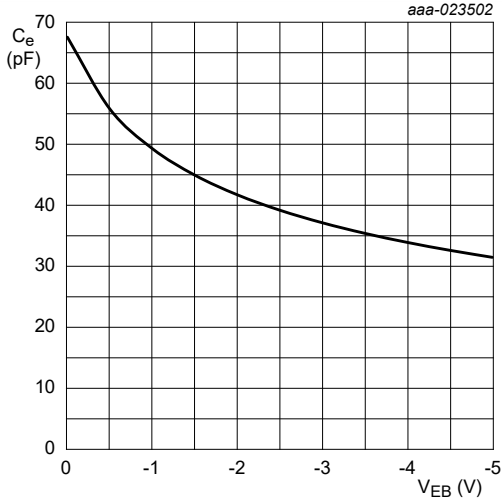
$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 50$
 (2) $I_C/I_B = 20$
 (3) $I_C/I_B = 5$

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



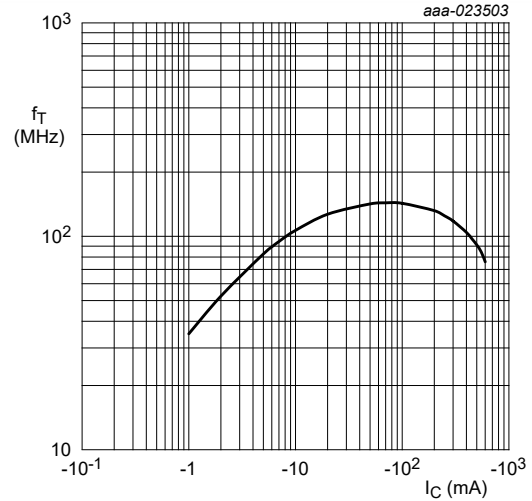
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

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

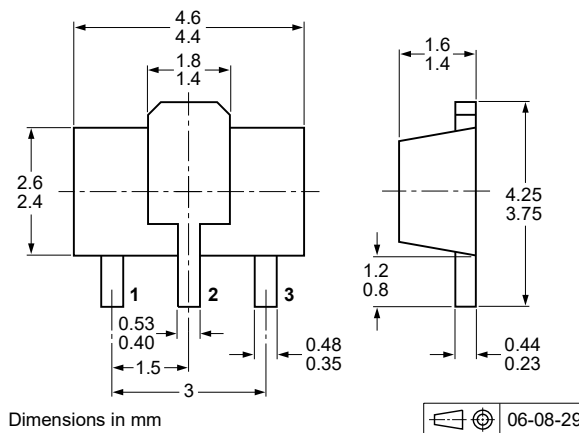


Fig. 15. Package outline SOT89 (SC-62)

10. Soldering

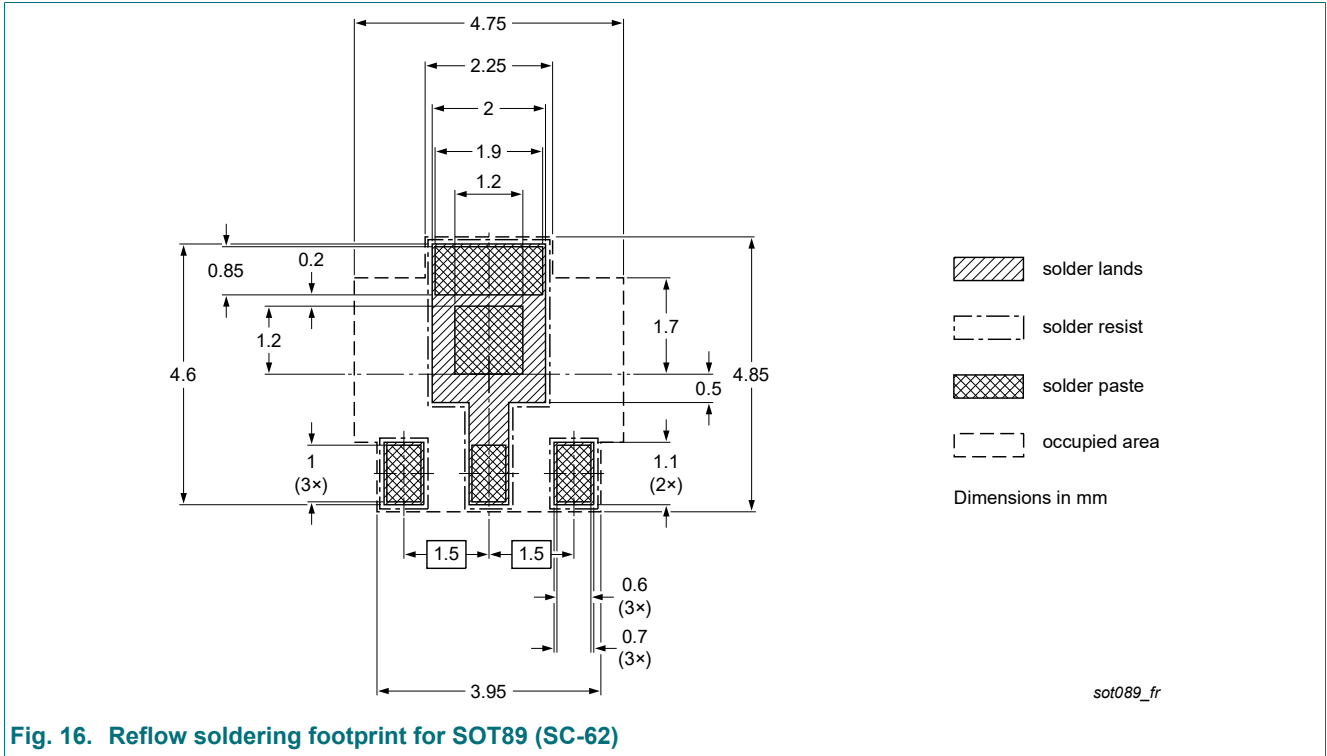


Fig. 16. Reflow soldering footprint for SOT89 (SC-62)

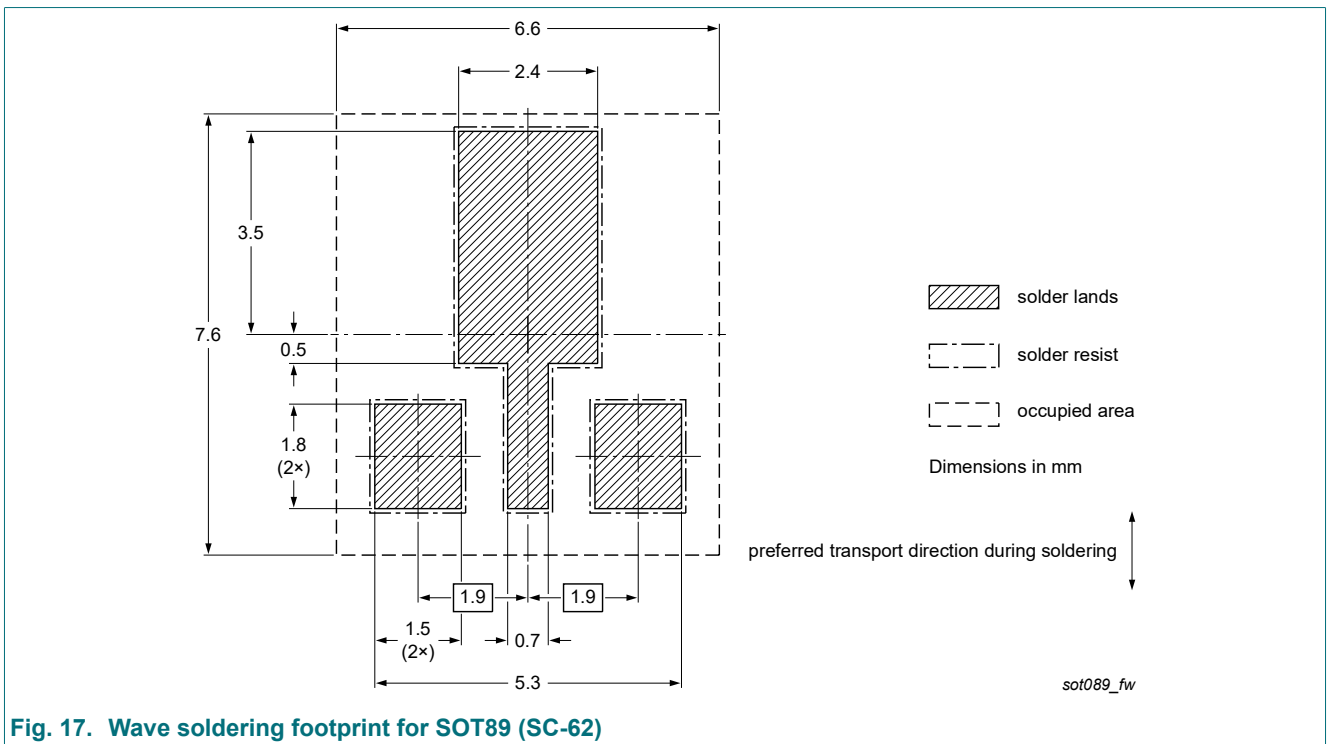


Fig. 17. Wave soldering footprint for SOT89 (SC-62)

11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCX51T_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.

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