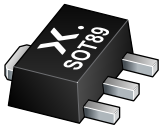

BCX51T series

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 °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; $t_p \leq 1$ ms		-	-	-2	A

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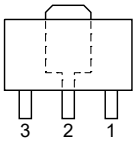
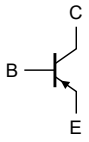
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
h_{FE}	DC current gain						
	BCX51T	V_{CE} = -2 V; I_C = -150 mA	[1]	63	-	250	
	BCX51-10T		[1]	63	-	160	
	BCX51-16T		[1]	100	-	250	

[1] pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$

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		
	Name	Description	Version
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

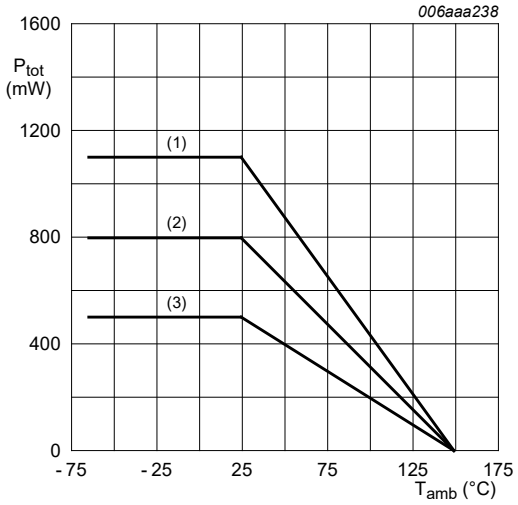
Table 6. Limiting values

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

T_{amb} = 25 °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; $t_p \leq 1$ ms		-	-2	A
I_B	base current			-	-200	mA
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms		-	-300	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °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.



(1) FR4 PCB; 6 cm^2 mounting pad for collector
(2) FR4 PCB; 1 cm^2 mounting pad for collector
(3) FR4 PCB; standard footprint

Fig. 1. Power derating curves

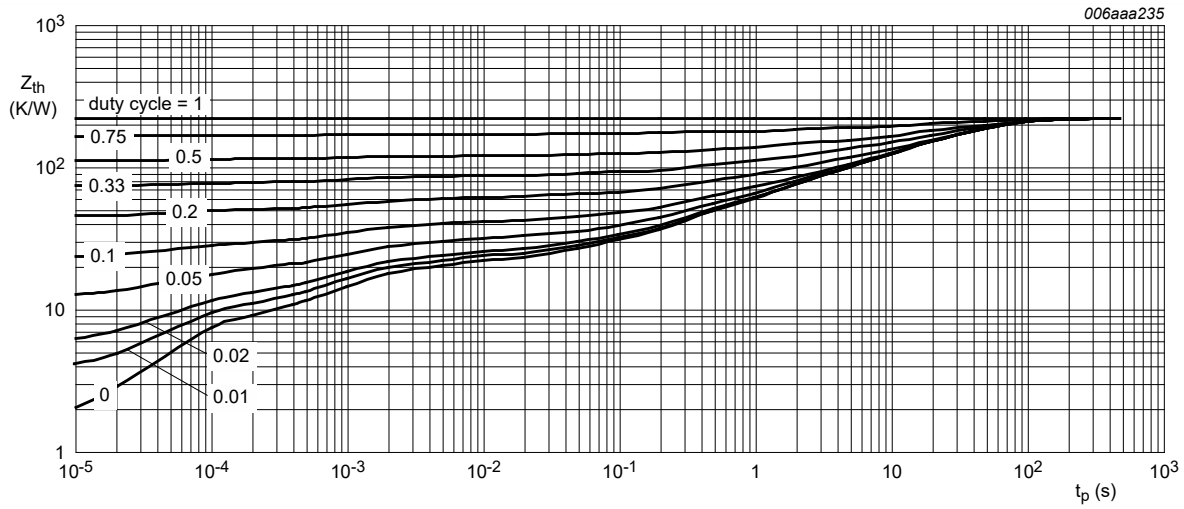
6. Thermal characteristics

Table 7. Thermal characteristics

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

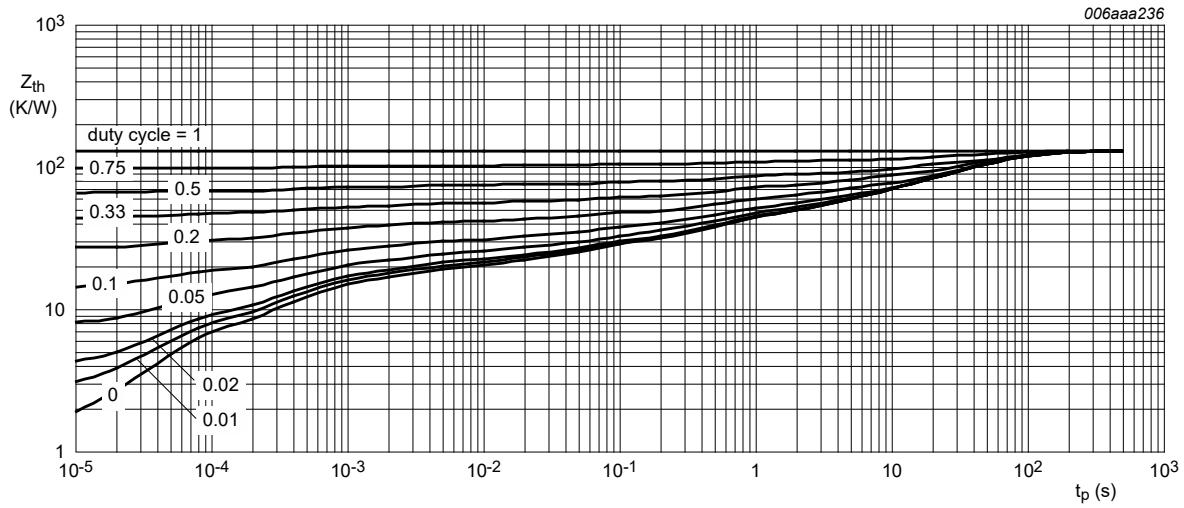
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	250	K/W
			[2]	-	-	157	K/W
			[3]	-	-	114	K/W

[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.



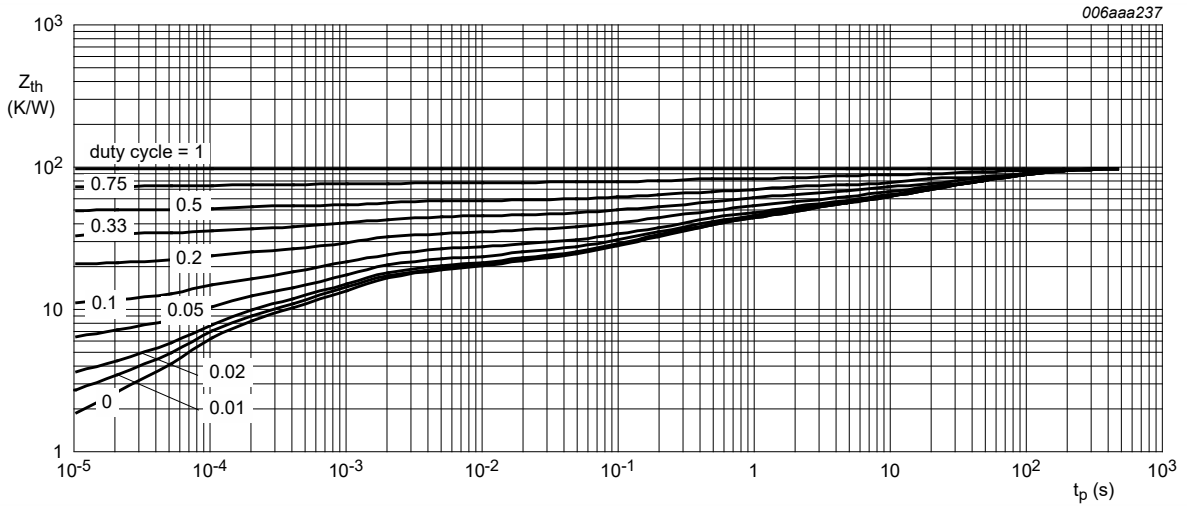
FR4 PCB; single-sided copper; tin-plated and standard footprint

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



FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm^2

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



FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm^2

Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

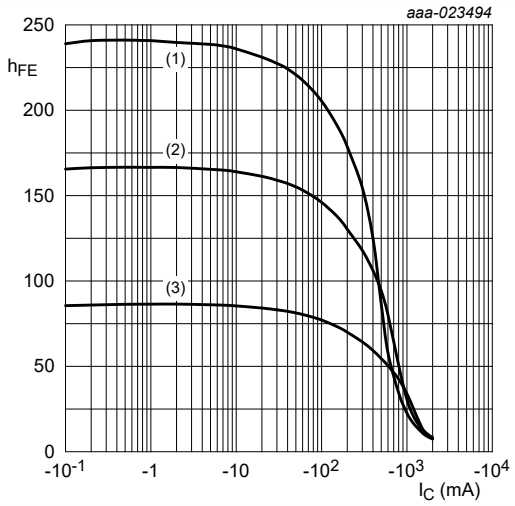
7. Characteristics

Table 8. Characteristics

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

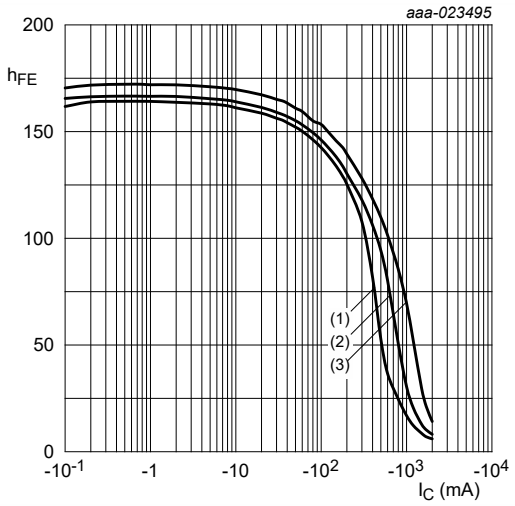
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = -100 µA; I_E = 0 A		-45	-		V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = -2 mA; I_E = 0 A		-45	-		V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = -100 µA; I_C = 0 A		-5	-		V
I_{CBO}	collector-base 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; $t_p \leq 300$ µs; $\delta \leq 0.02$



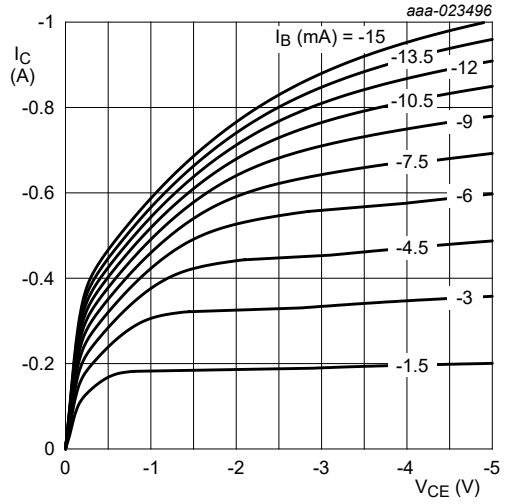
V_{CE} = -2 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



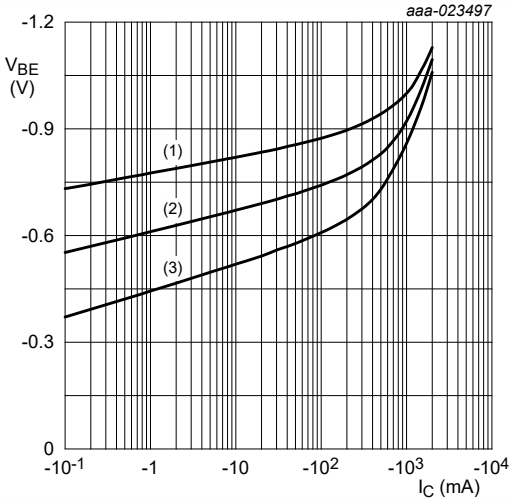
T_{amb} = 25 °C
(1) V_{CE} = -1 V
(2) V_{CE} = -2 V
(3) V_{CE} = -5 V

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



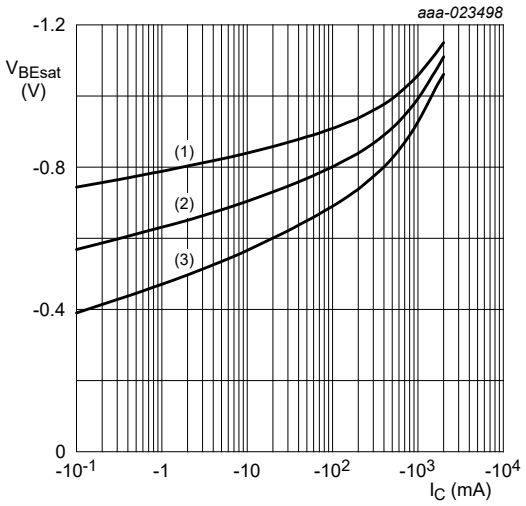
T_{amb} = 25 °C

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



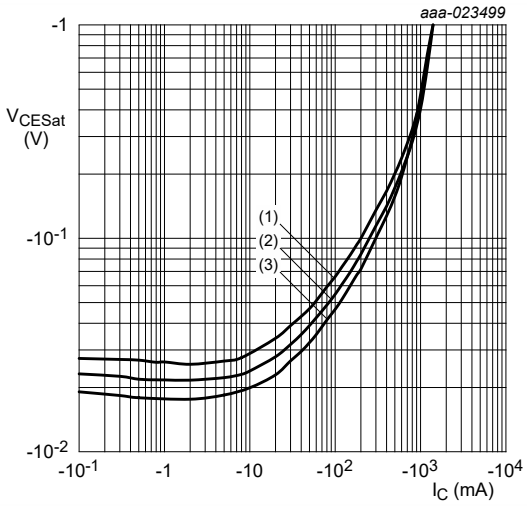
V_{CE} = -2 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

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



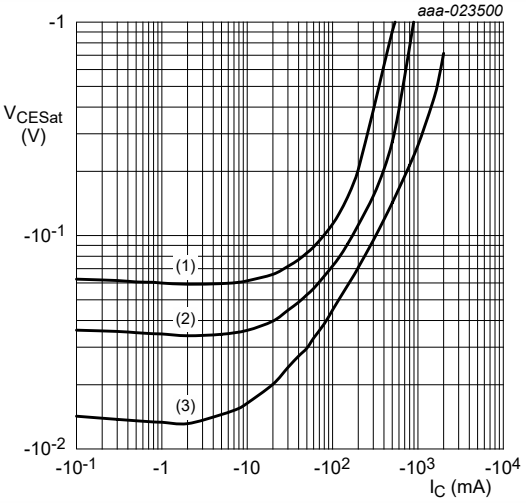
I_C/I_B = 10
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

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



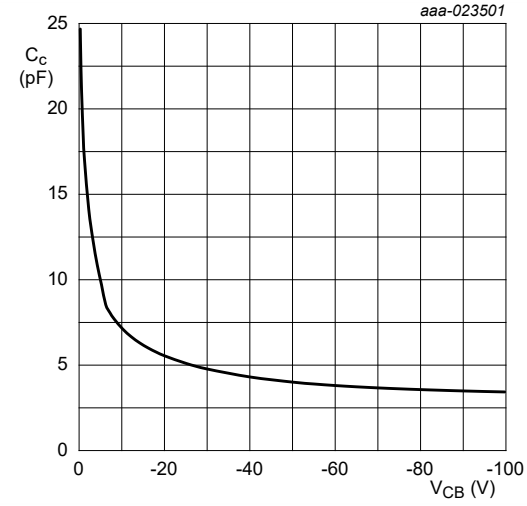
I_C/I_B = 10
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



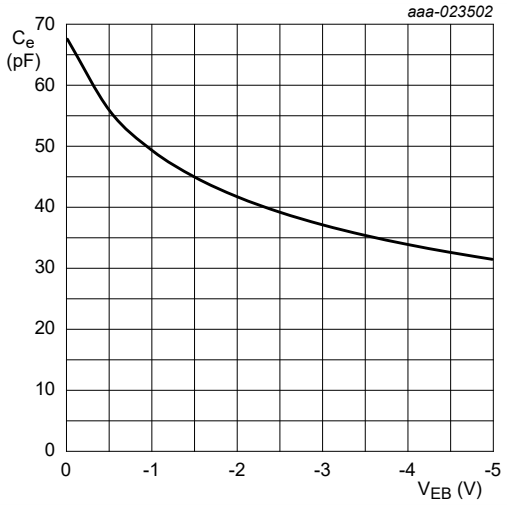
T_{amb} = 25 °C
(1) I_C/I_B = 50
(2) I_C/I_B = 20
(3) I_C/I_B = 5

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



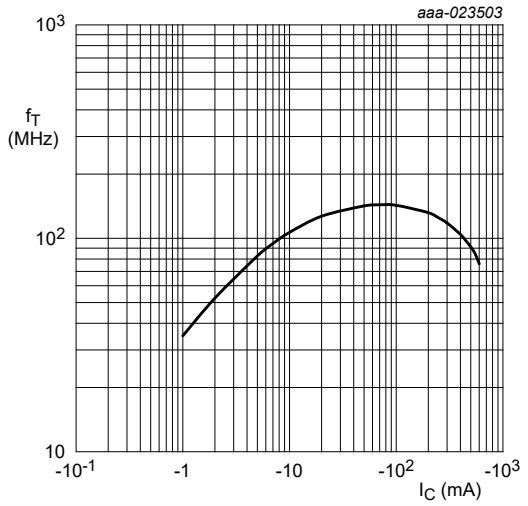
f = 1 MHz; T_{amb} = 25 °C

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



f = 1 MHz; T_{amb} = 25 °C

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



V_{CE} = -5 V

f = 100 MHz; T_{amb} = 25 °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

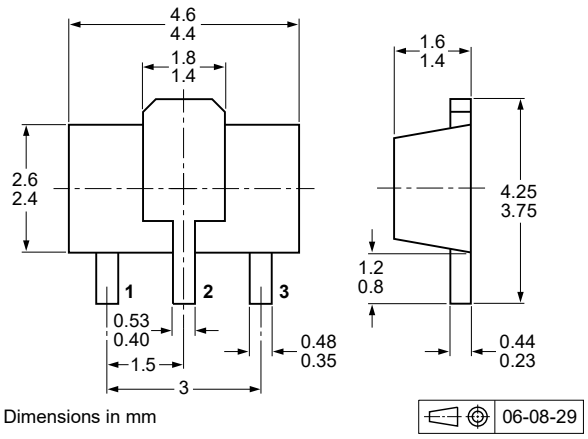


Fig. 15. Package outline SOT89 (SC-62)

10. Soldering

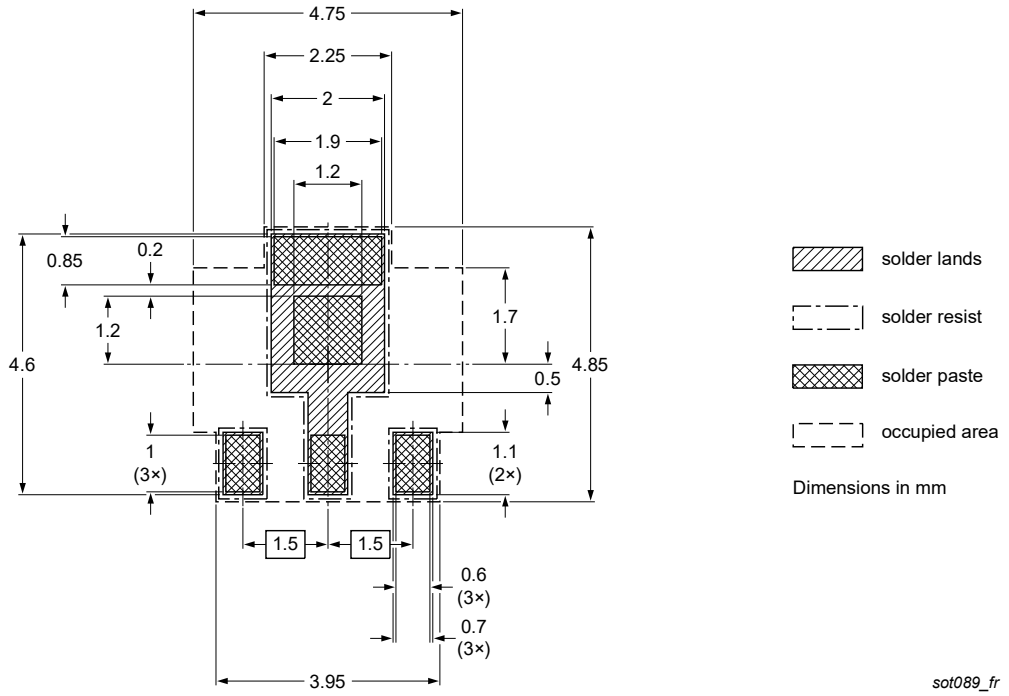


Fig. 16. Reflow soldering footprint for SOT89 (SC-62)

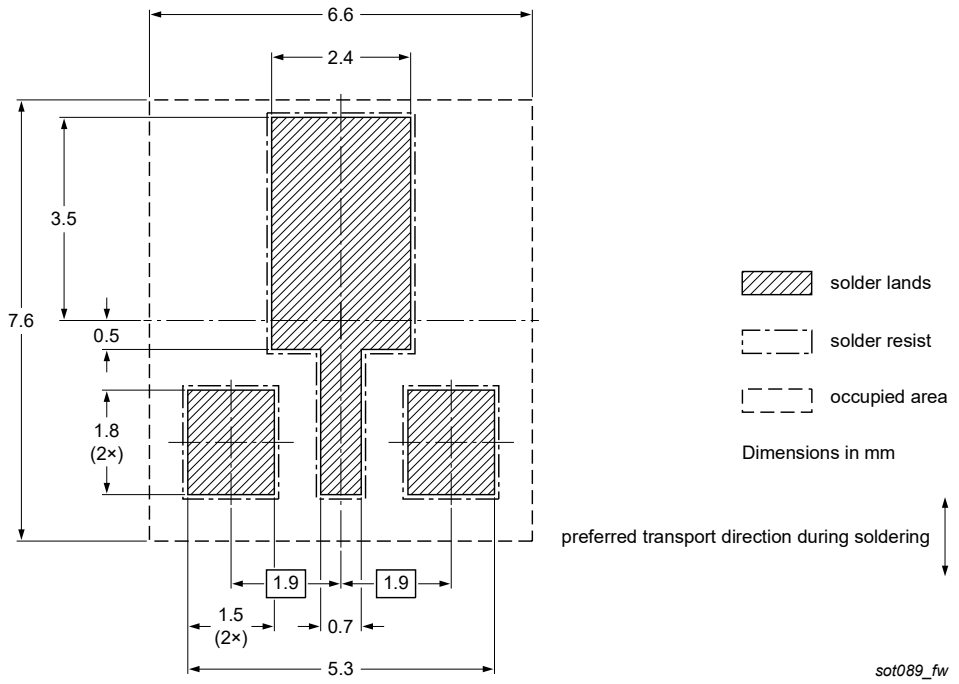


Fig. 17. Wave soldering footprint for SOT89 (SC-62)

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.

[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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Date of release: 22 August 2019