



BCP54T series

45 V, 1 A NPN medium power transistors

Rev. 1 — 29 April 2019

Product data sheet

1. Product profile

1.1. General description

NPN medium power transistors in a medium power SOT223 (SC73) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		NPN complement
	Nexperia	JEDEC	
BCP54T	SOT223	SC-73	BCP51T
BCP54-10T			BCP51-10T
BCP54-16T			BCP51-16T

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.

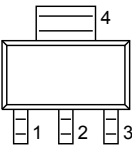
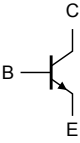
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	45	V
I_C	collector current		-	-	1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1\text{ ms}$	-	-	2	A

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
h_{FE}	DC current gain						
	BCP54T	$V_{CE} = 2 \text{ V}; I_C = 150 \text{ mA}$	[1]	63	-	250	
	BCP54-10T		[1]	63	-	160	
BCP54-16T	[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	B	base		 sym123
2	C	collector		
3	E	emitter		
4	C	collector		

3. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
BCP54T	SC-73	plastic, surface-mounted package with increased heatsink; 4 leads	SOT223
BCP54-10T			
BCP54-16T			

4. Marking

Table 5. Marking

Type number	Marking code
BCP54T	BCP54T
BCP54-10T	P5410T
BCP54-16T	P5416T

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		-	0.2	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]	0.6	W
			[2]	1	W
			[3]	1.3	W
			[4]	1.3	W
			[5]	1.8	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.
- [4] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated and standard footprint.
- [5] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated; mounting pad for collector 1 cm².

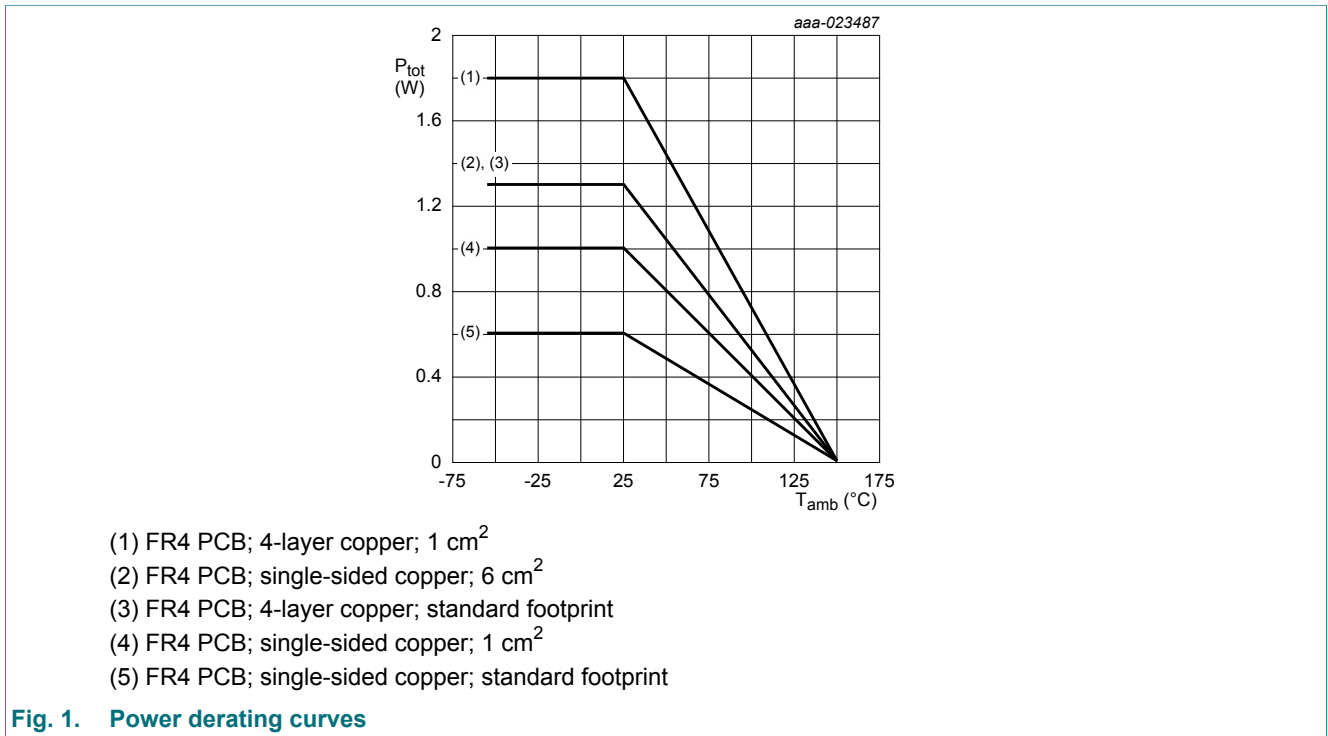
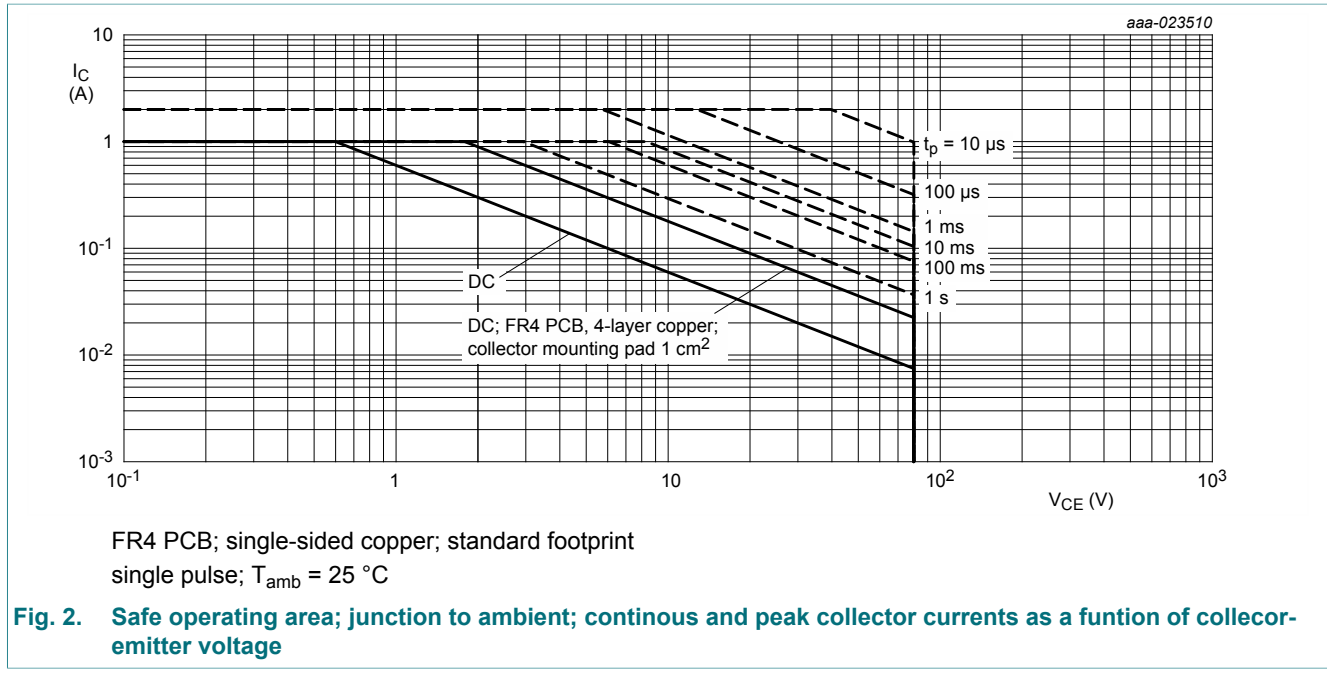


Fig. 1. Power derating curves



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]	-	-	209	K/W
			[2]			125	K/W
			[3]			97	K/W
			[4]	-	-	97	K/W
			[5]	-	-	70	K/W
$R_{(j-sp)}$	thermal resistance from junction to solder point			-	-	18	K/W

- [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.
- [4] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated and standard footprint.
- [5] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated; mounting pad for collector 1 cm².

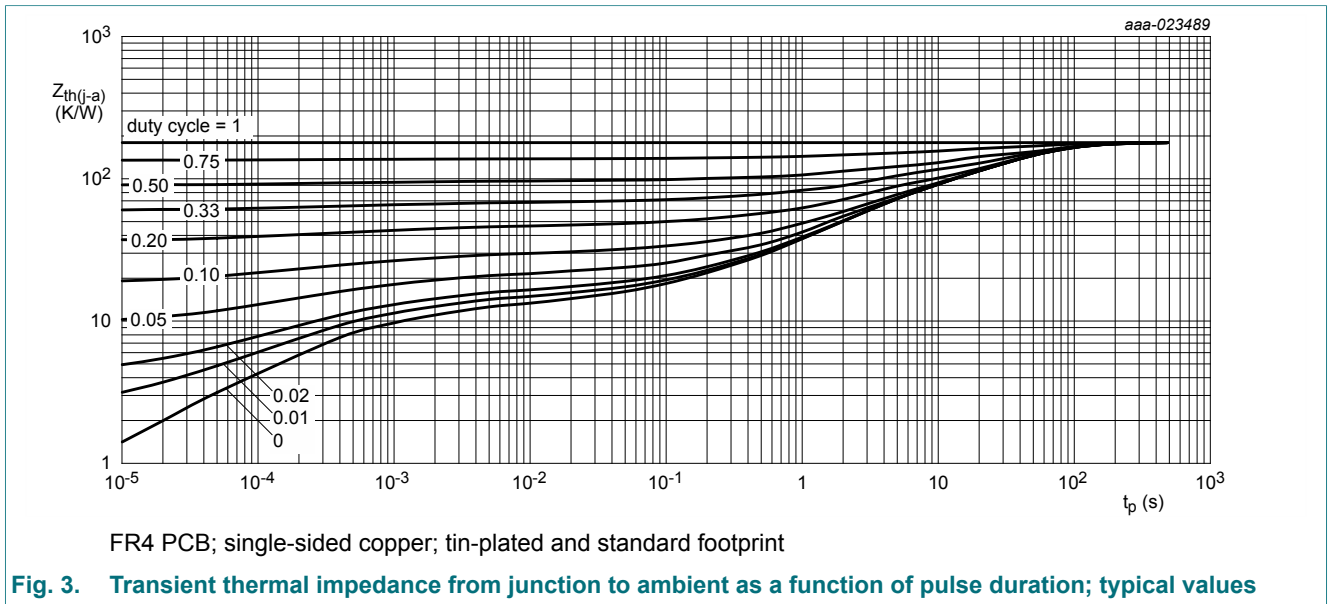
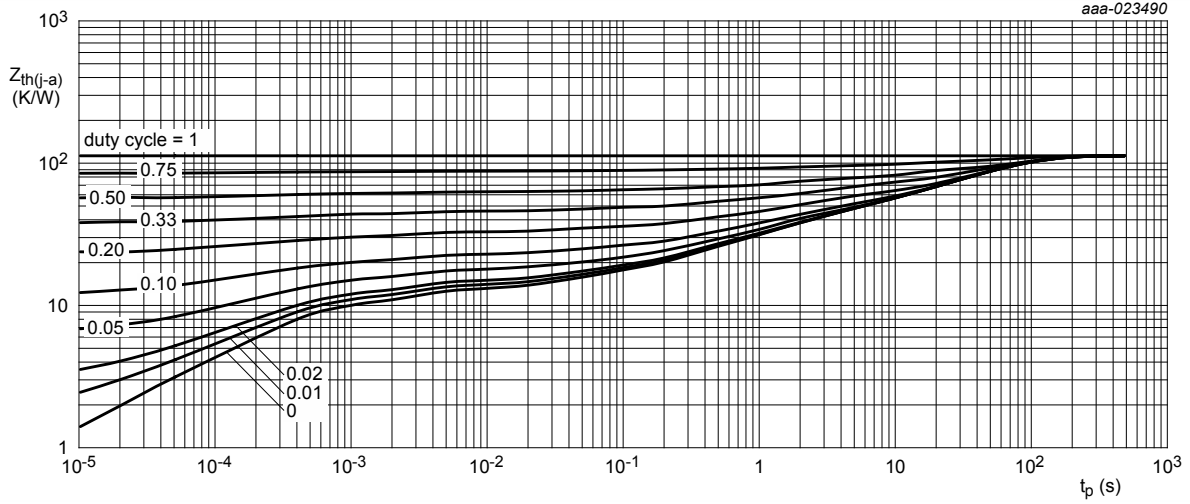
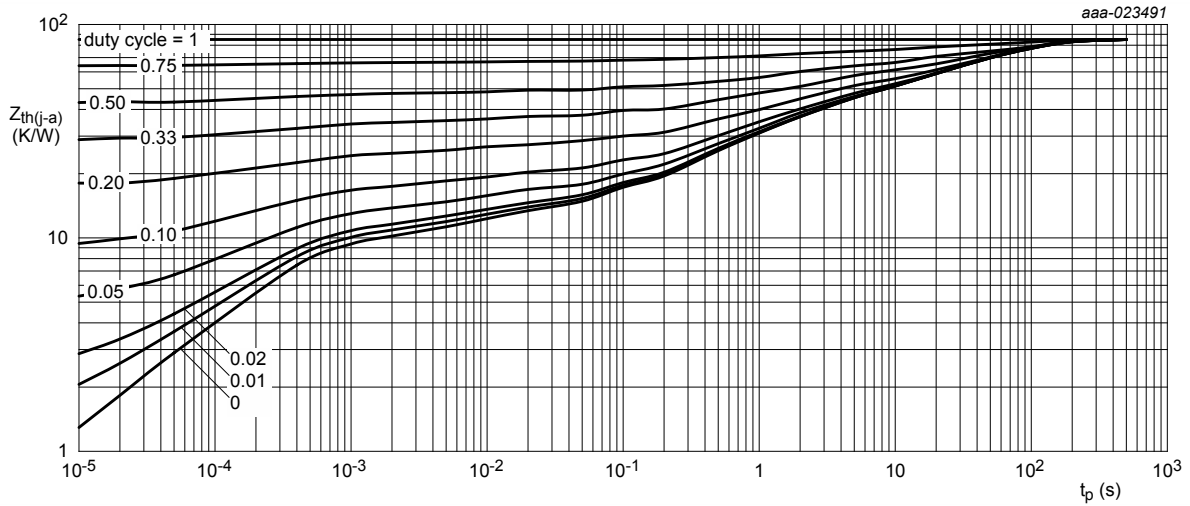


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



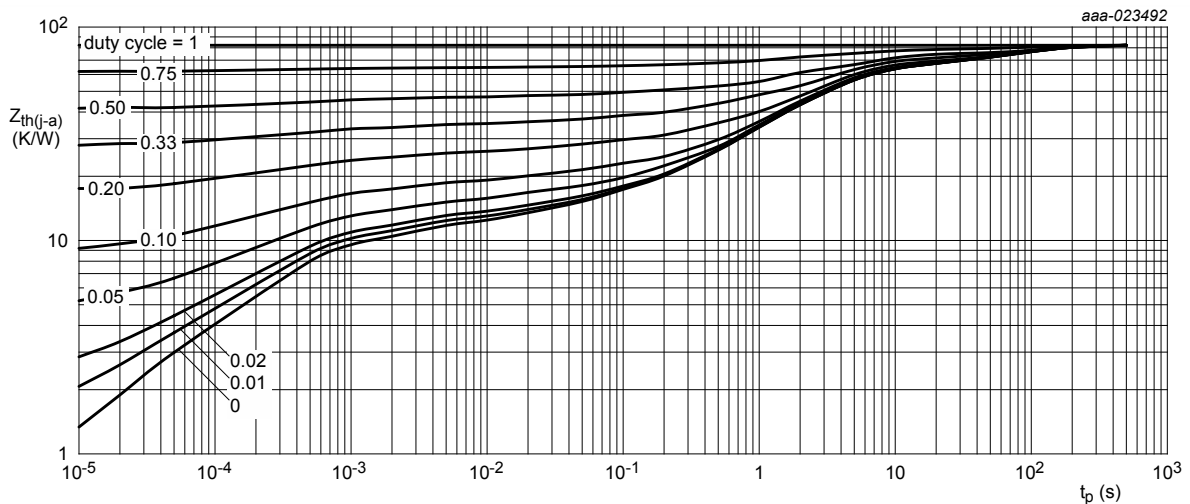
FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm²

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



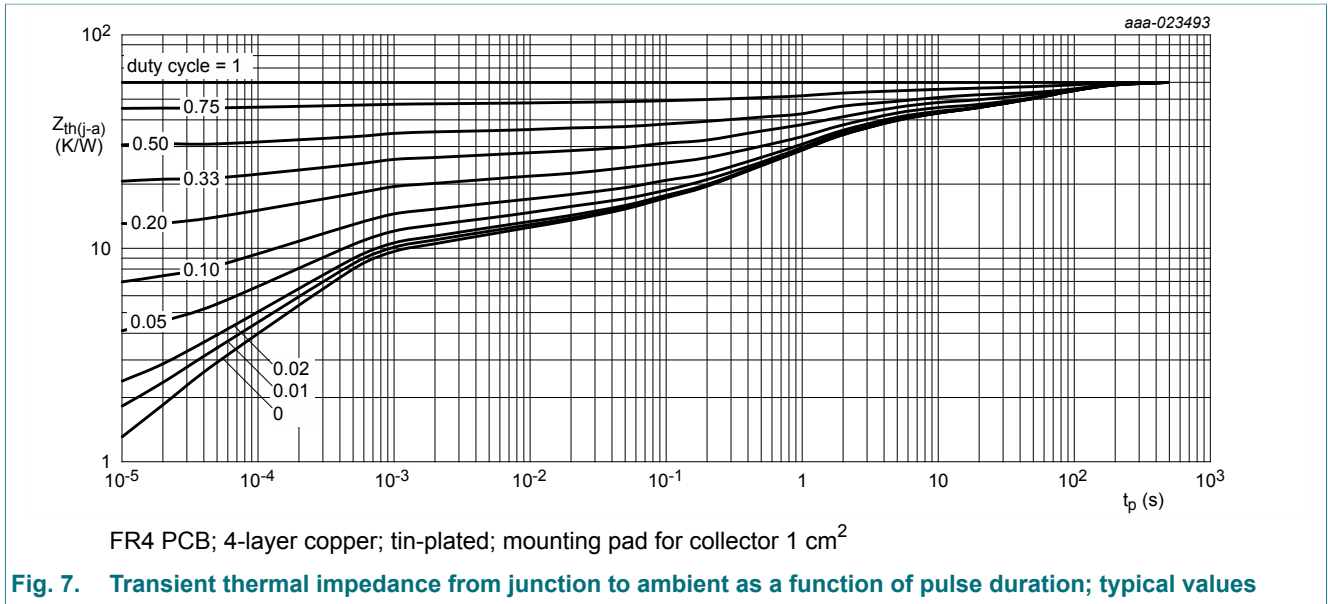
FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm²

Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB; 4-layer copper; tin-plated and standard footprint

Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



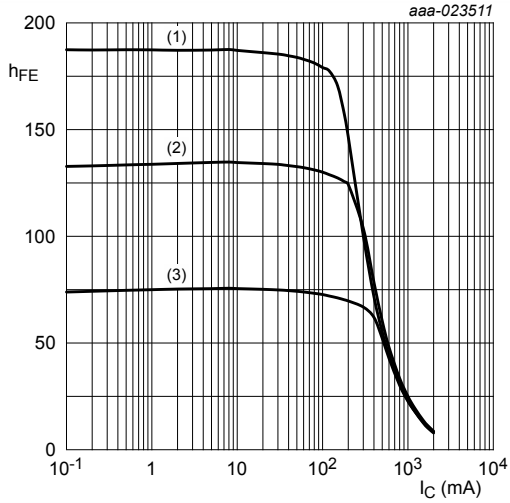
7. Characteristics

Table 8. Characteristics

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

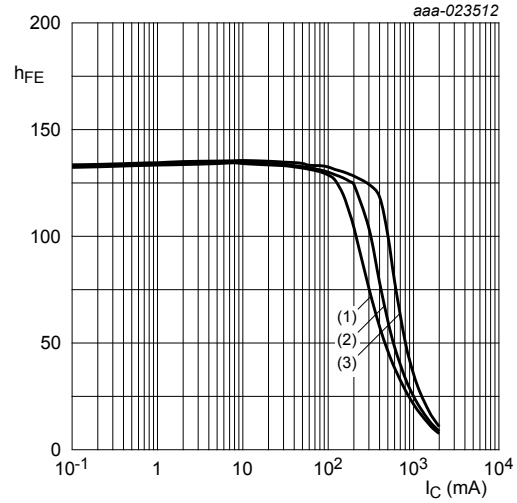
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V _{(BR)CBO}	collector-base breakdown voltage	I _C = 100 μA; I _E = 0 A	45	-	-	V	
V _{(BR)CEO}	collector-emitter breakdown voltage	I _C = 2 mA; I _E = 0 A	45	-	-	V	
V _{(BR)EBO}	emitter-base breakdown voltage	I _E = 100 μA; I _C = 0 A	5	-	-	V	
I _{CBO}	collector-base 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						
	BCP54T, -10T, -16T	V _{CE} = 2 V; I _C = 5 mA	63	-	-		
		V _{CE} = 2 V; I _C = 500 mA	[1]	40	-	-	
	BCP54T	V _{CE} = 2 V; I _C = 150 mA	[1]	63	-	250	
	BCP54-10T	V _{CE} = 2 V; I _C = 150 mA	[1]	63	-	160	
BCP54-16T	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	100	155	-	MHz	
C _c	collector capacitance	V _{CB} = 10 V; I _E = i _e = 0 A; f = 1 MHz	-	4.5	-	pF	

[1] pulsed; t_p ≤ 300 μs; δ ≤ 0.02



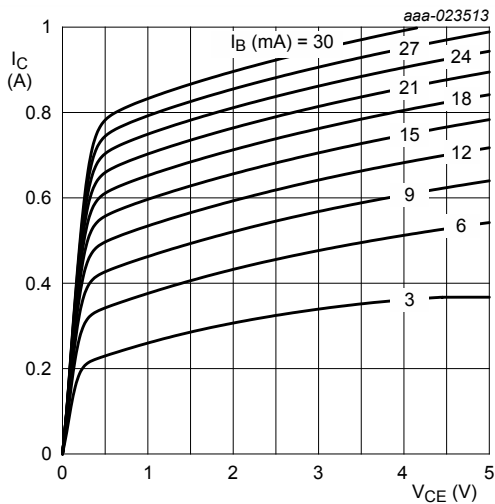
$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Fig. 8. DC current gain as a function of collector current; typical values



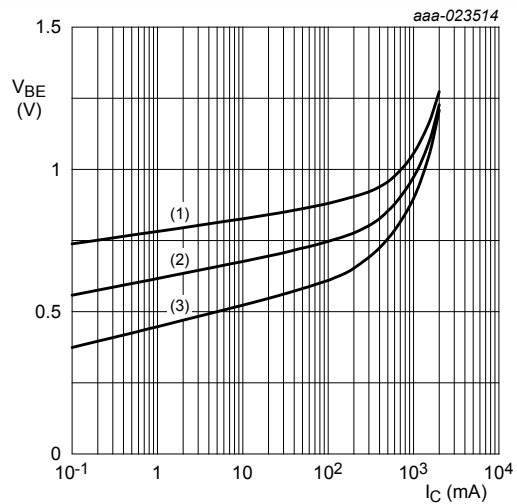
$T_{amb} = 25\text{ °C}$
 (1) $V_{CE} = 1\text{ V}$
 (2) $V_{CE} = 2\text{ V}$
 (3) $V_{CE} = 5\text{ V}$

Fig. 9. DC current gain as a function of collector current; typical values



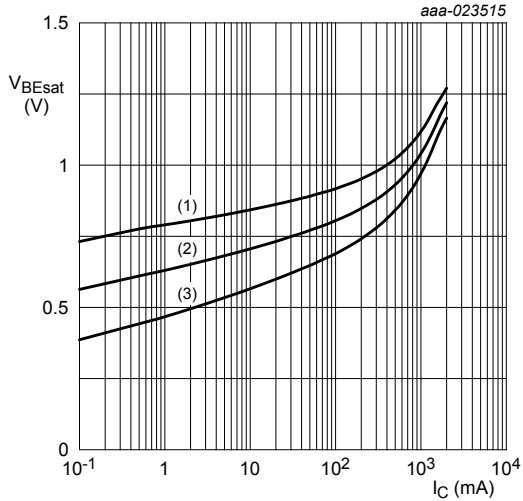
$T_{amb} = 25\text{ °C}$

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



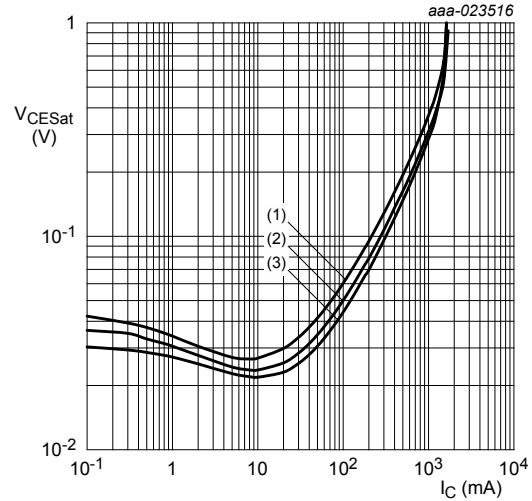
$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



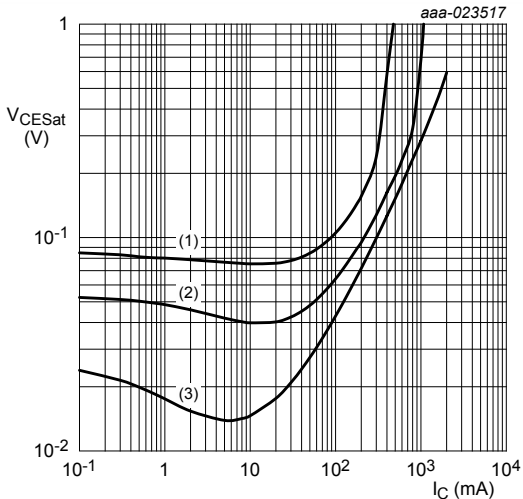
$I_C/I_B = 10$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

Fig. 12. Base-emitter saturation voltage as a function of collector current; typical values



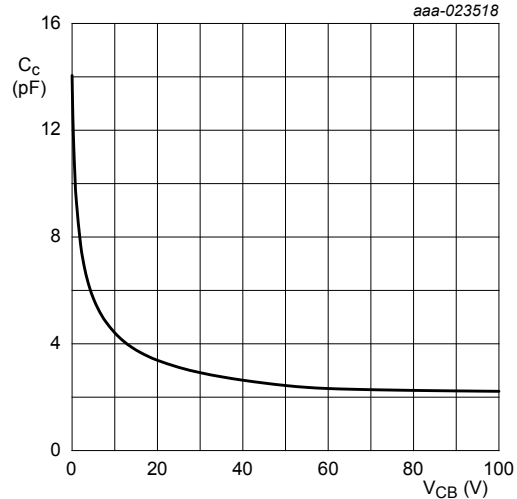
$I_C/I_B = 10$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Fig. 13. Collector-emitter saturation voltage as a function of collector current; typical values



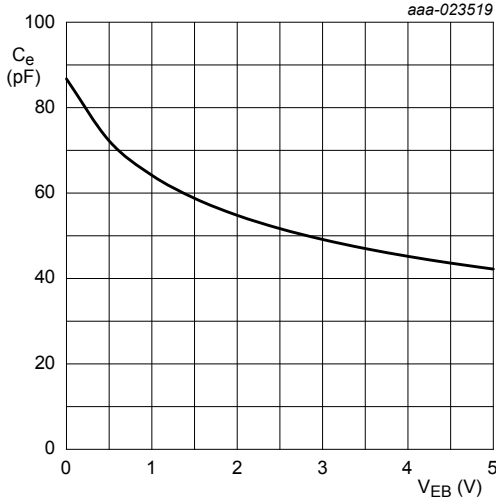
$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 50$
 (2) $I_C/I_B = 20$
 (3) $I_C/I_B = 5$

Fig. 14. Collector-emitter saturation voltage as a function of collector current; typical values



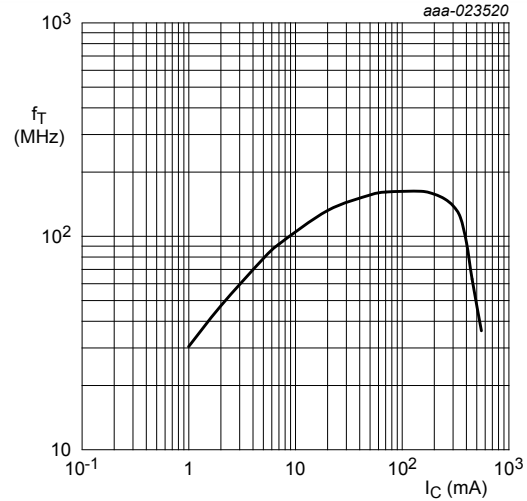
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

Fig. 15. Collector capacitance as a function of collector-base voltage; typical values



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

Fig. 16. 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. 17. 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

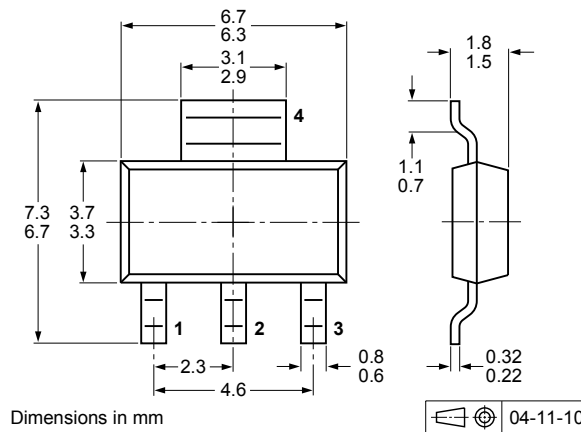


Fig. 18. Package outline SOT223 (SC-73)

10. Soldering

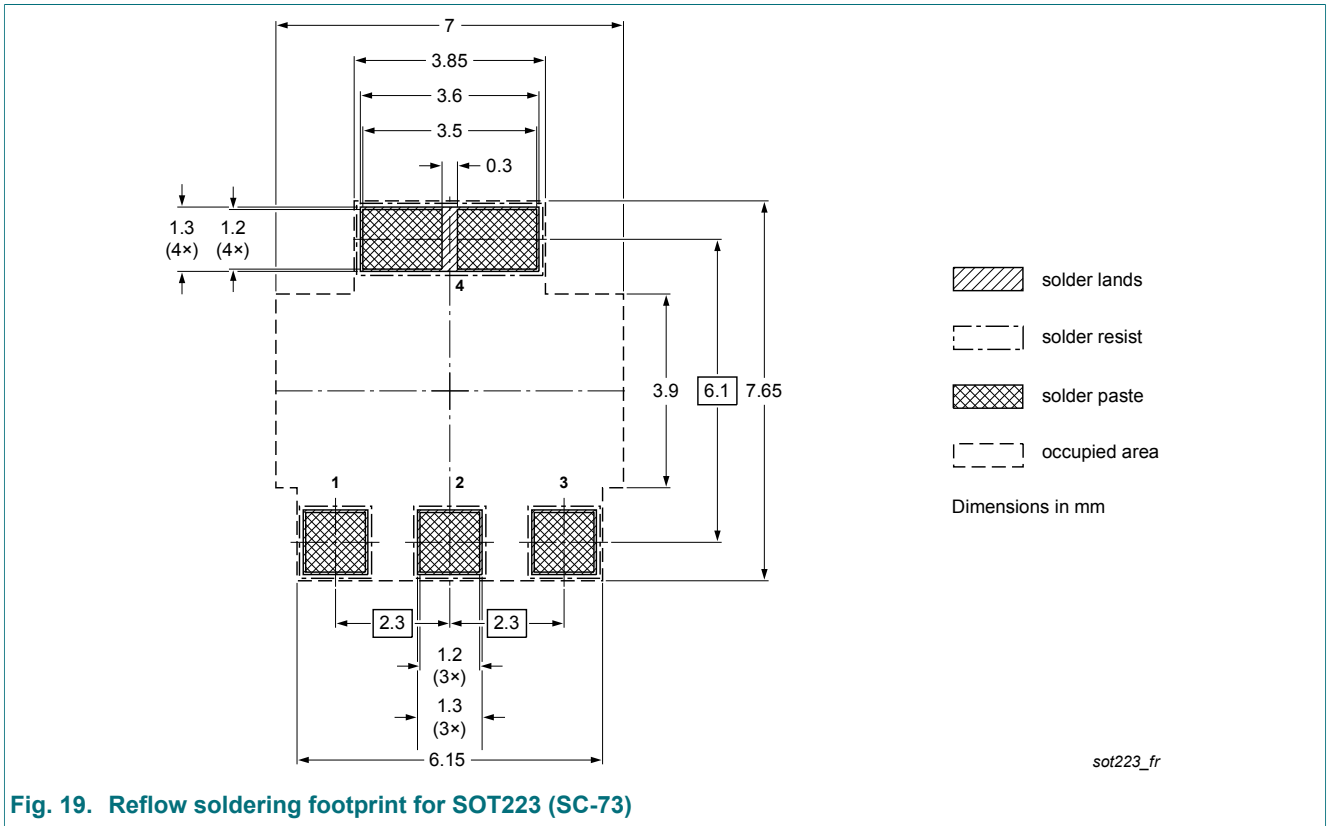


Fig. 19. Reflow soldering footprint for SOT223 (SC-73)

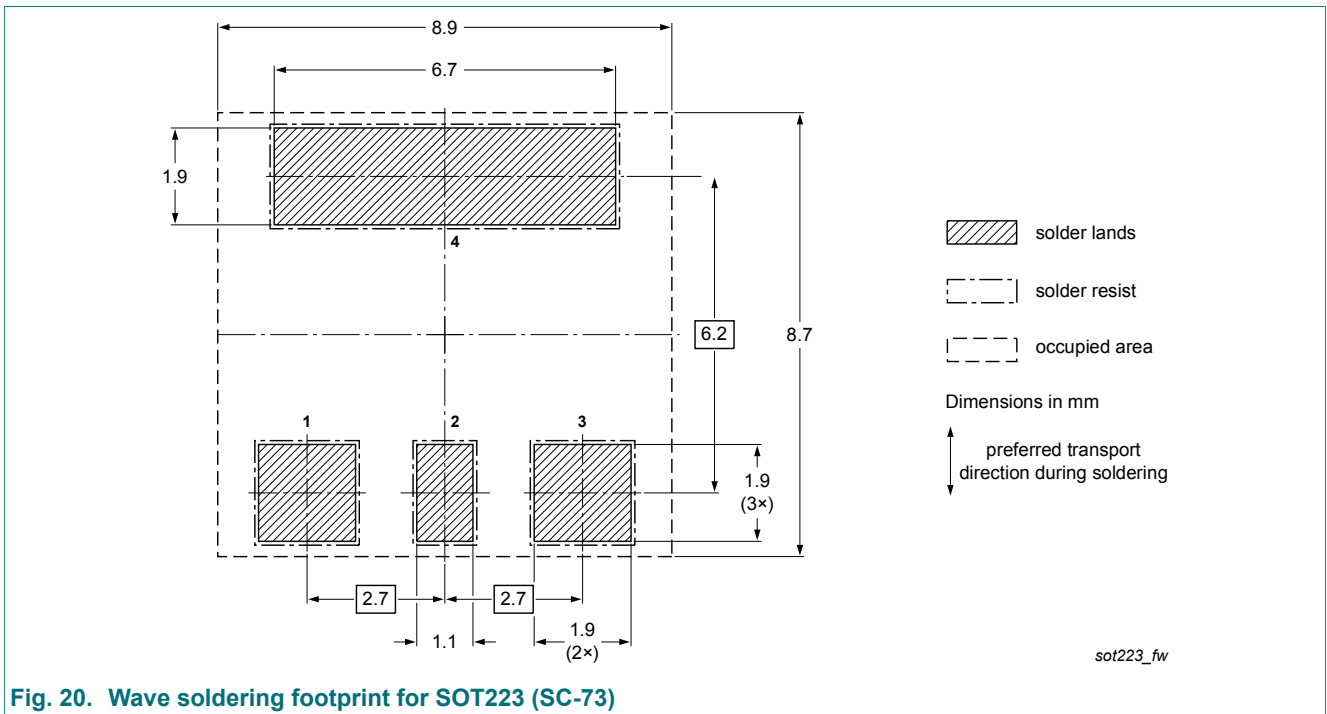


Fig. 20. Wave soldering footprint for SOT223 (SC-73)

11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCP54T_SER v.1	20190429	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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