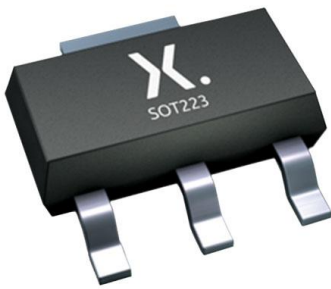


# BCP54-10TF Datasheet

[www.digi-electronics.com](http://www.digi-electronics.com)



<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	BCP54-10TF-DG
Manufacturer	<a href="#">Nexperia USA Inc.</a>
Manufacturer Product Number	BCP54-10TF
Description	BCP54-10T/SOT223/SC-73
Detailed Description	Bipolar (BJT) Transistor NPN 45 V 1 A 155MHz 1.3 W Surface Mount SOT-223



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

DiGi is a global authorized distributor of electronic components.

## Purchase and inquiry

**Manufacturer Product Number:**

BCP54-10TF

**Series:**

-

**Transistor Type:**

NPN

**Voltage - Collector Emitter Breakdown (Max):**

45 V

**Current - Collector Cutoff (Max):**

100nA (ICBO)

**Power - Max:**

1.3 W

**Operating Temperature:**

150°C (TJ)

**Qualification:**

AEC-Q101

**Package / Case:**

TO-261-4, TO-261AA

**Base Product Number:**

BCP54

**Manufacturer:**

Nexperia USA Inc.

**Product Status:**

Active

**Current - Collector (Ic) (Max):**

1 A

**Vce Saturation (Max) @ Ib, Ic:**

500mV @ 50mA, 500mA

**DC Current Gain (hFE) (Min) @ Ic, Vce:**

63 @ 150mA, 2V

**Frequency - Transition:**

155MHz

**Grade:**

Automotive

**Mounting Type:**

Surface Mount

**Supplier Device Package:**

SOT-223

## Environmental & Export classification

**RoHS Status:**

ROHS3 Compliant

**REACH Status:**

REACH Unaffected

**HTSUS:**

8541.29.0075

**Moisture Sensitivity Level (MSL):**

1 (Unlimited)

**ECCN:**

EAR99



# 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.

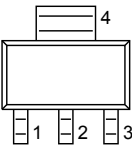
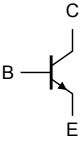
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	45	V
$I_C$	collector current		-	-	1	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1\text{ ms}$	-	-	2	A

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

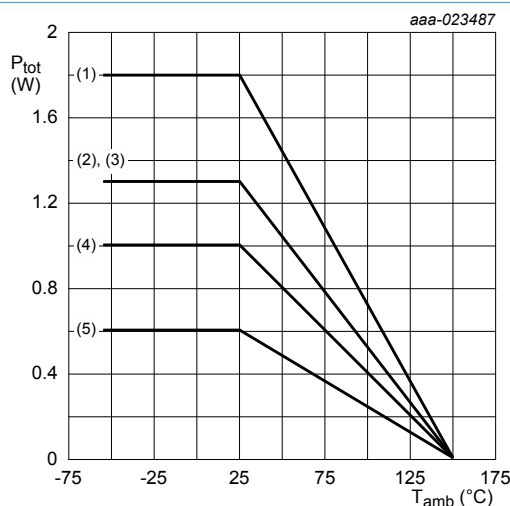
**Table 6. Limiting values**

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

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

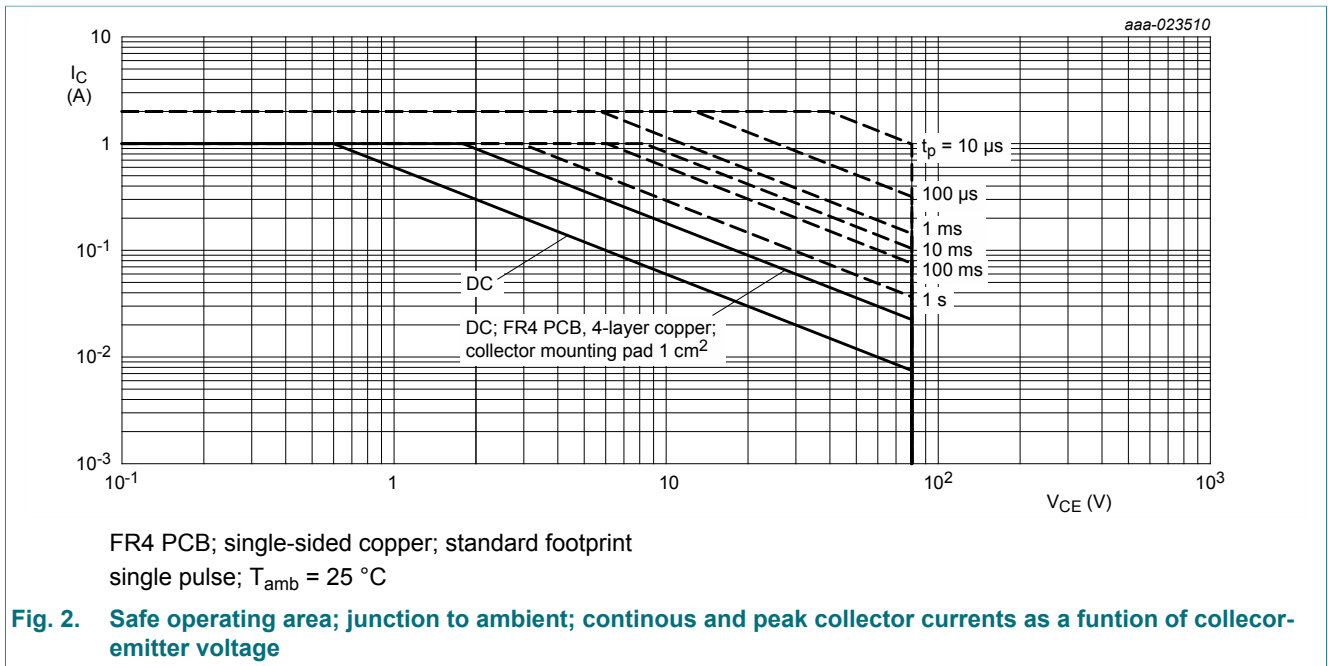
Symbol	Parameter	Conditions	Min	Max	Unit	
$V_{CBO}$	collector-base voltage	open emitter	-	45	V	
$V_{CEO}$	collector-emitter voltage	open base	-	45	V	
$V_{EBO}$	emitter-base voltage	open collector	-	5	V	
$I_C$	collector current		-	1	A	
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1\text{ ms}$	-	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  $1\text{ cm}^2$ .  
 [3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector  $6\text{ cm}^2$ .  
 [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  $1\text{ cm}^2$ .



- (1) FR4 PCB; 4-layer copper;  $1\text{ cm}^2$   
 (2) FR4 PCB; single-sided copper;  $6\text{ cm}^2$   
 (3) FR4 PCB; 4-layer copper; standard footprint  
 (4) FR4 PCB; single-sided copper;  $1\text{ cm}^2$   
 (5) FR4 PCB; single-sided copper; standard footprint

**Fig. 1. Power derating curves**

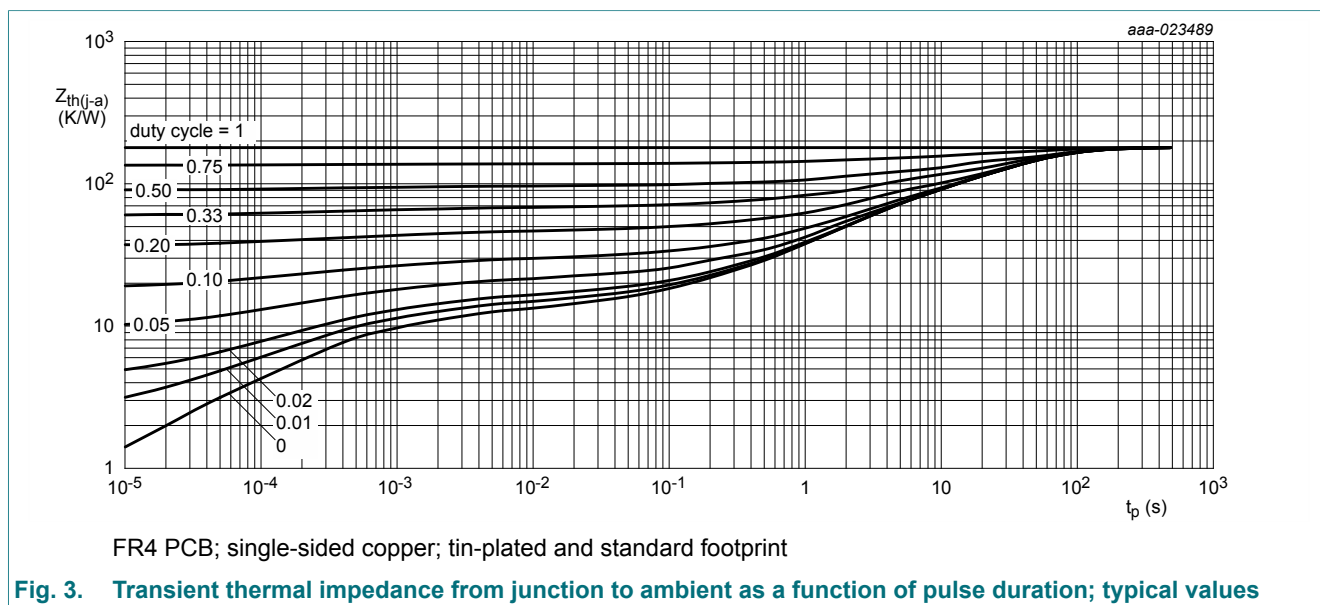


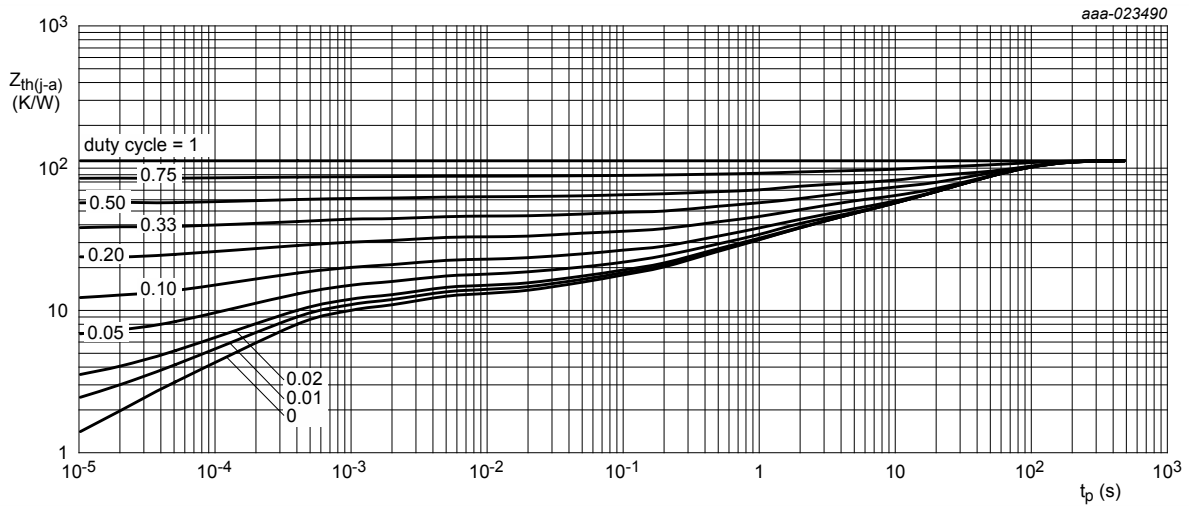
## 6. Thermal characteristics

**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

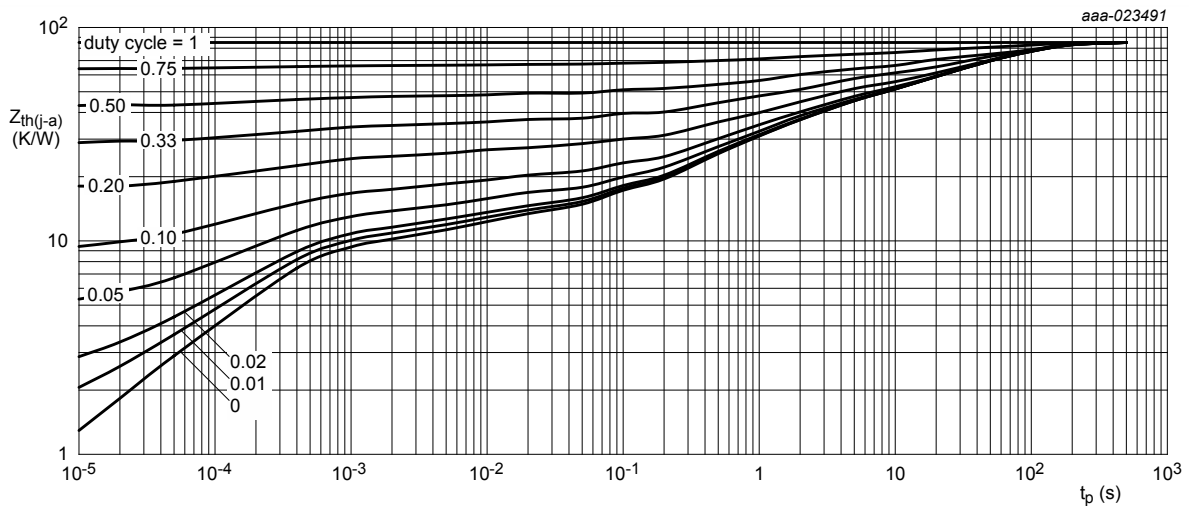
- [1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated and standard footprint.  
 [2] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.  
 [3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.  
 [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 cm<sup>2</sup>.





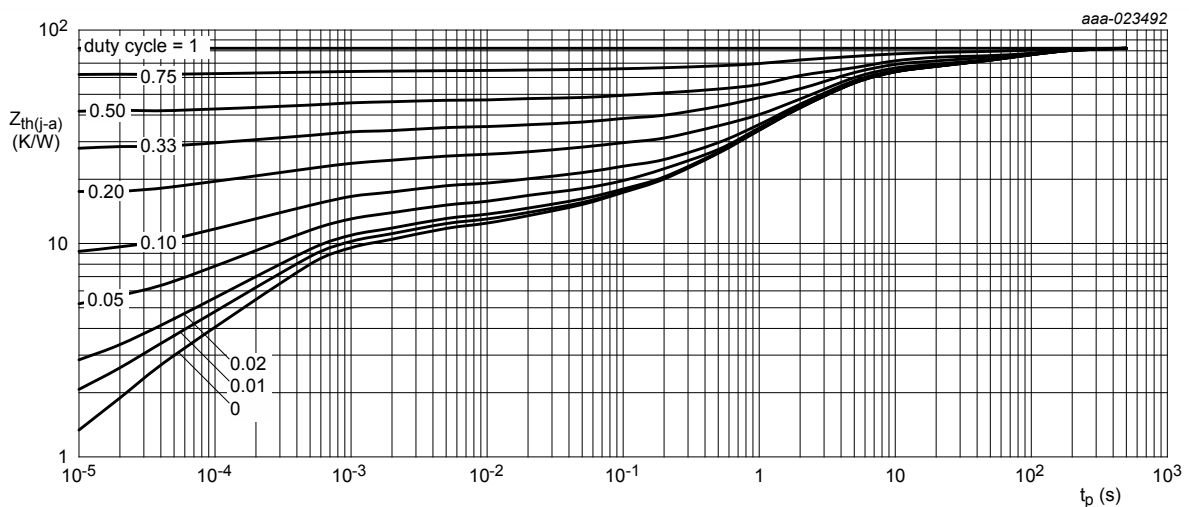
FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>

**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 cm<sup>2</sup>

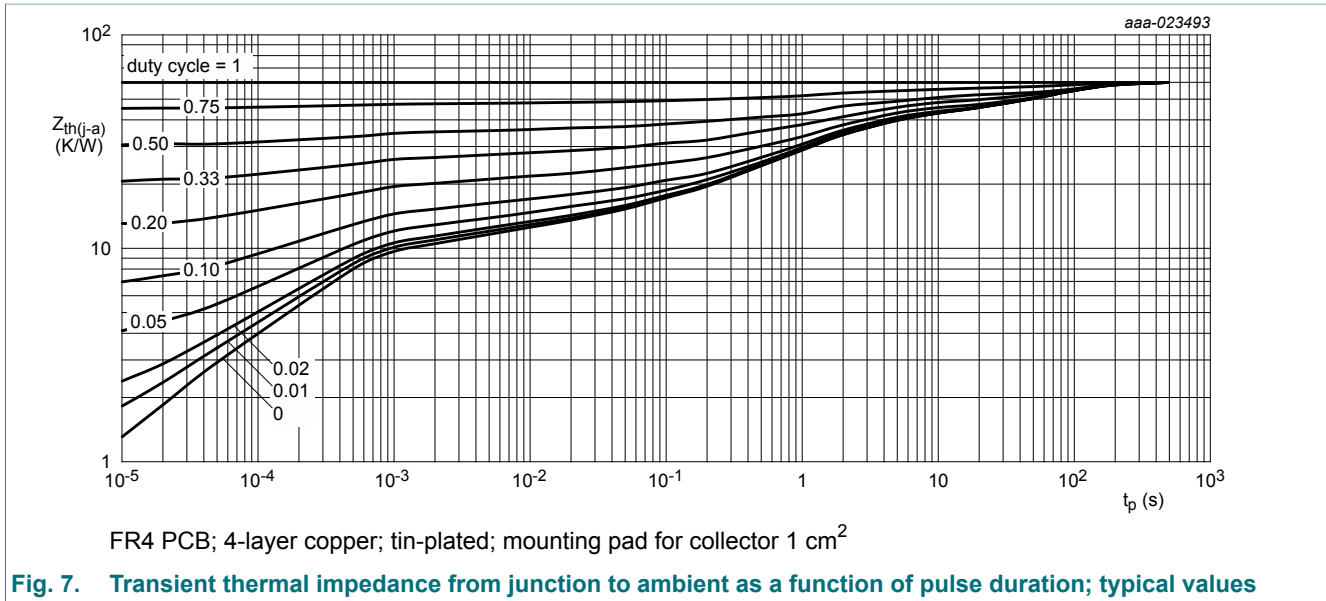
**Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**



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**





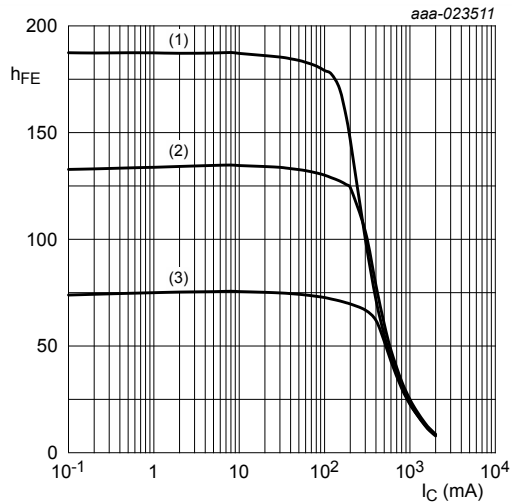
## 7. Characteristics

**Table 8. Characteristics**

$T_{amb} = 25\text{ °C}$  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	$I_C = 2\ \text{mA}$ ; $I_E = 0\ \text{A}$	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						
	BCP54T, -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	-	-	
	BCP54T	$V_{CE} = 2\ \text{V}$ ; $I_C = 150\ \text{mA}$	[1]	63	-	250	
	BCP54-10T	$V_{CE} = 2\ \text{V}$ ; $I_C = 150\ \text{mA}$	[1]	63	-	160	
BCP54-16T	$V_{CE} = 2\ \text{V}$ ; $I_C = 150\ \text{mA}$	[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	$V_{CE} = 5\ \text{V}$ ; $I_C = 50\ \text{mA}$ ; $f = 100\ \text{MHz}$	100	155	-	MHz	
$C_c$	collector capacitance	$V_{CB} = 10\ \text{V}$ ; $I_E = I_C = 0\ \text{A}$ ; $f = 1\ \text{MHz}$	-	4.5	-	pF	

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



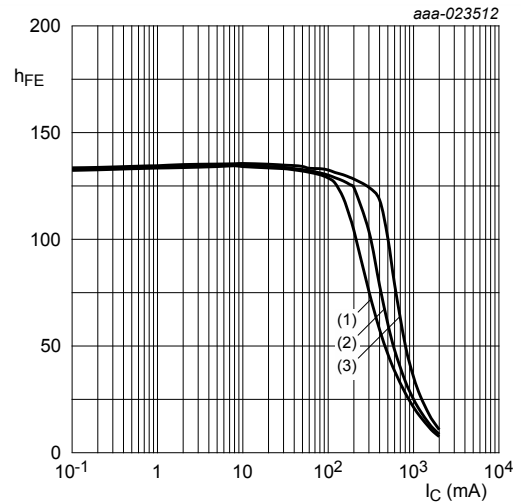
$$V_{CE} = 2 \text{ V}$$

(1)  $T_{amb} = 100 \text{ }^{\circ}\text{C}$

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

(3)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$

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



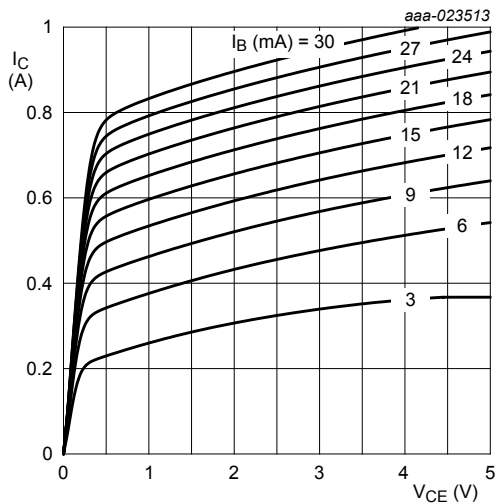
$$T_{amb} = 25 \text{ }^{\circ}\text{C}$$

(1)  $V_{CE} = 1 \text{ V}$

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

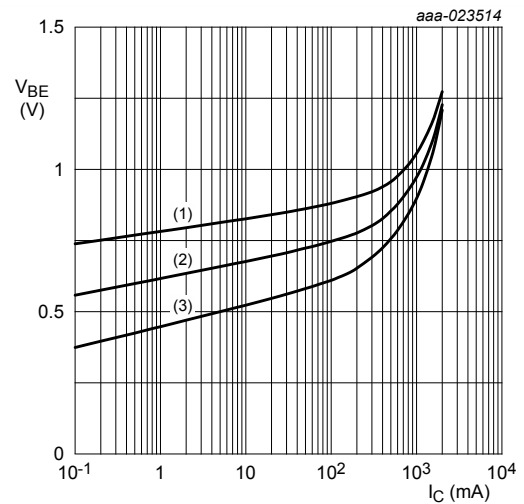
(3)  $V_{CE} = 5 \text{ V}$

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



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

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



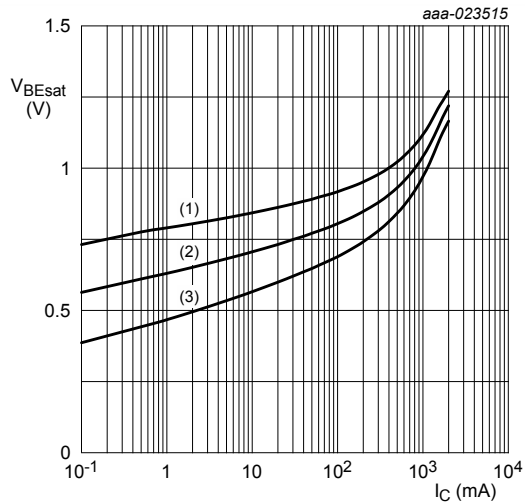
$$V_{CE} = 2 \text{ V}$$

(1)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$

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

(3)  $T_{amb} = 100 \text{ }^{\circ}\text{C}$

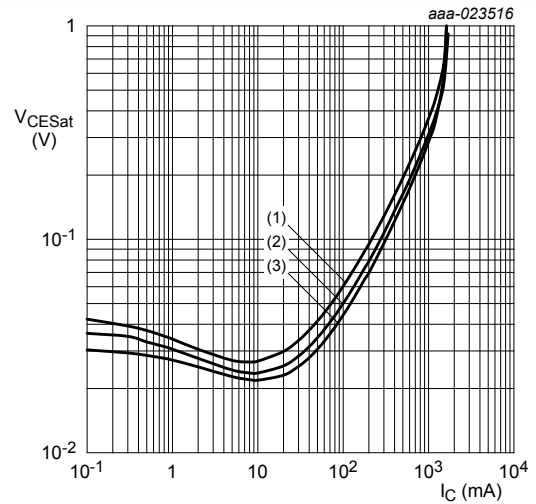
**Fig. 11.** Base-emitter voltage as a function of collector current; typical values



$$I_C/I_B = 10$$

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

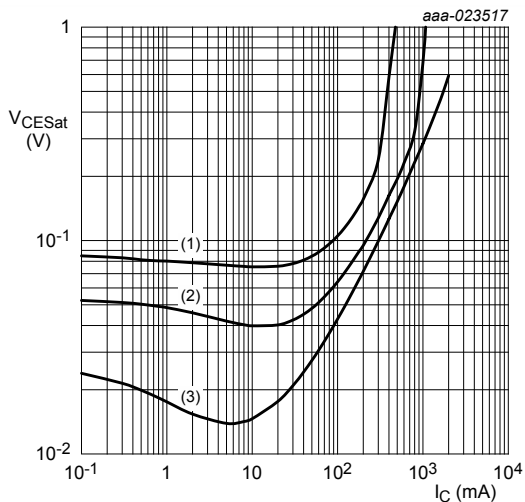
**Fig. 12. Base-emitter saturation voltage as a function of collector current; typical values**



$$I_C/I_B = 10$$

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

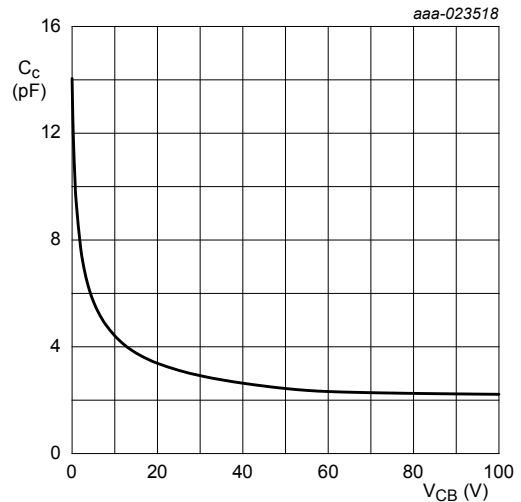
**Fig. 13. Collector-emitter saturation voltage as a function of collector current; typical values**



$$T_{amb} = 25\text{ °C}$$

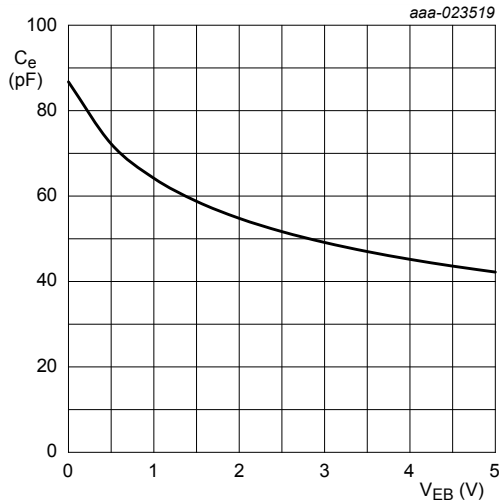
- (1)  $I_C/I_B = 50$
- (2)  $I_C/I_B = 20$
- (3)  $I_C/I_B = 5$

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



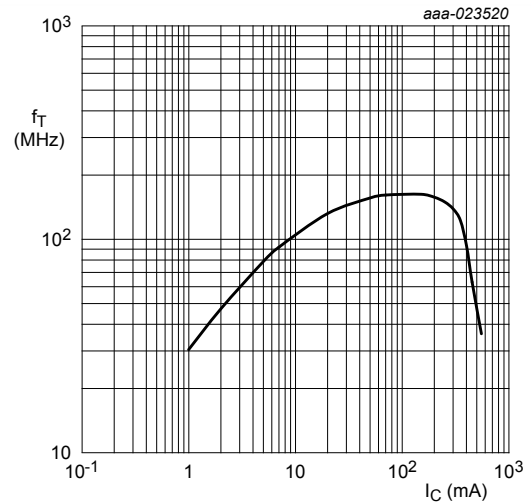
$$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$$

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



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

**Fig. 16. Emitter capacitance as a function of emitter-base voltage; typical values**



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

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

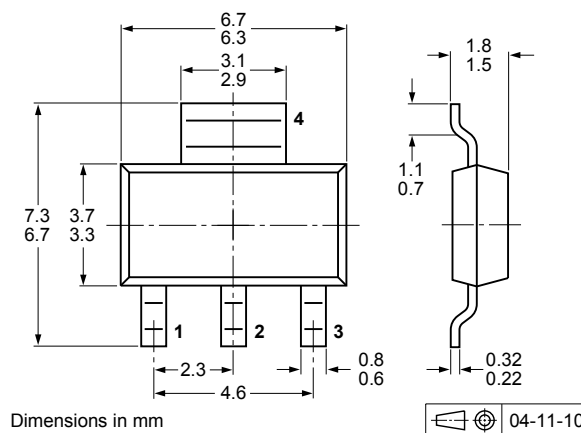
**Fig. 17. Transition frequency as a function of collector current; typical values**

## 8. Test information

### 8.1. Quality information

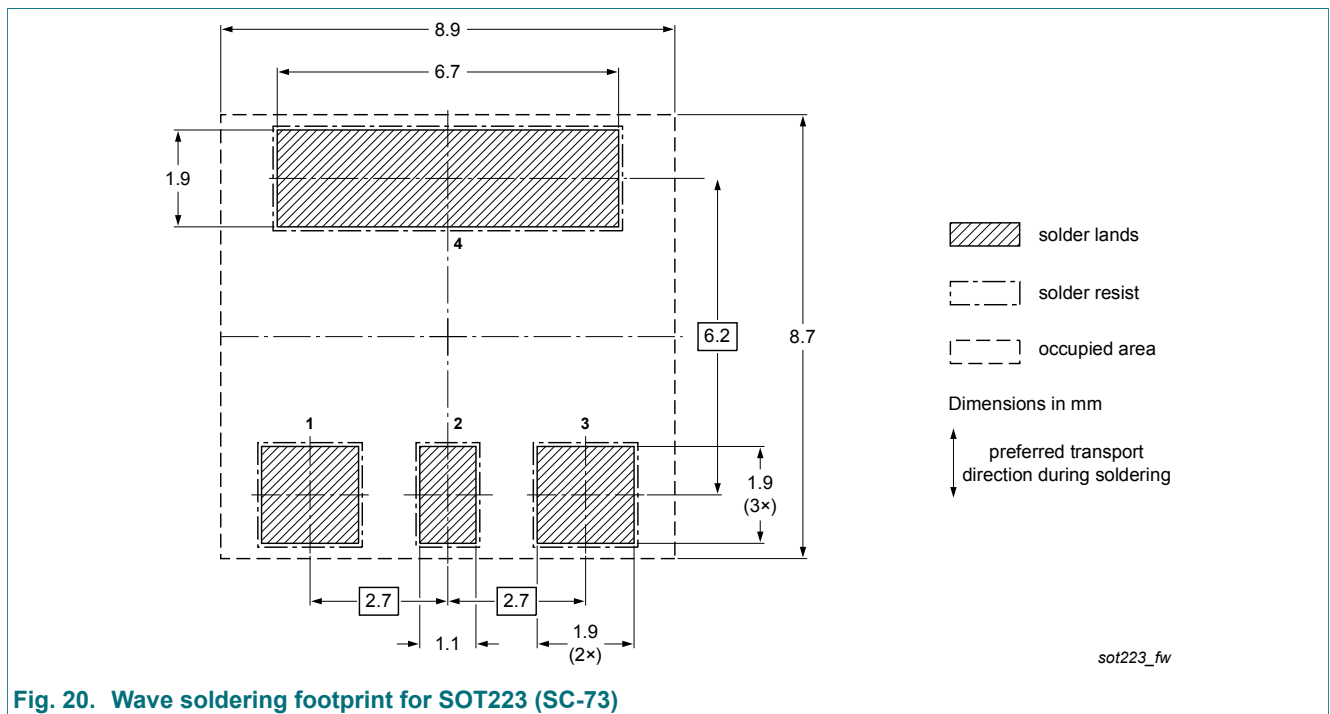
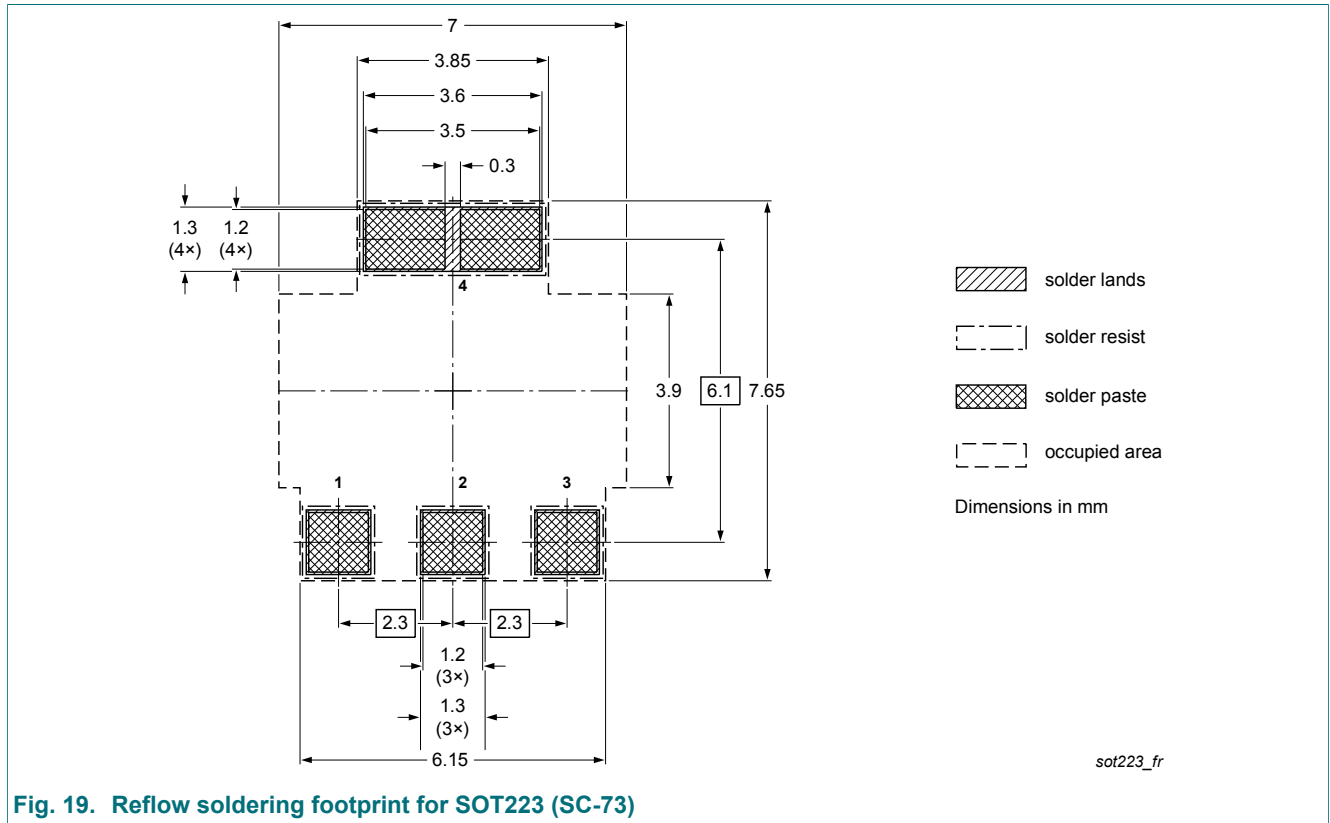
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

## 9. Package outline



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

## 10. Soldering



## 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.

- [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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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