



**THE DATASHEET OF
BCP56-10T-QX**





BCP56T-Q series

80 V, 1 A NPN medium power transistors

Rev. 2 — 29 June 2022

Product data sheet

1. General description

NPN medium power transistors in a medium power SOT223 (SC-73) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		NPN complement
	Nexperia	JEDEC	
BCP56T-Q	SOT223	SC-73	BCP53T-Q
BCP56-10T-Q			BCP53-10T-Q
BCP56-16T-Q			BCP53-16T-Q

2. Features and benefits

- High collector current capability I_C and I_{CM}
- Three current gain selections
- High power dissipation capability
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

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

4. Quick reference data

Table 2. Quick reference data

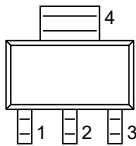
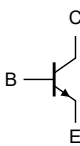
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

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	
h_{FE}	DC current gain						
	BCP56T-Q	$V_{CE} = 2\text{ V}; I_C = 150\text{ mA}$	[1]	63	-	250	
	BCP56-10T-Q		[1]	63	-	160	
	BCP56-16T-Q		[1]	100	-	250	

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

5. 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		

6. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
BCP56T-Q	SC-73	plastic, surface-mounted package with increased heatsink; 4 leads	SOT223
BCP56-10T-Q			
BCP56-16T-Q			

7. Marking

Table 5. Marking

Type number	Marking code
BCP56T-Q	BCP56T
BCP56-10T-Q	P5610T
BCP56-16T-Q	P5616T

8. Limiting values

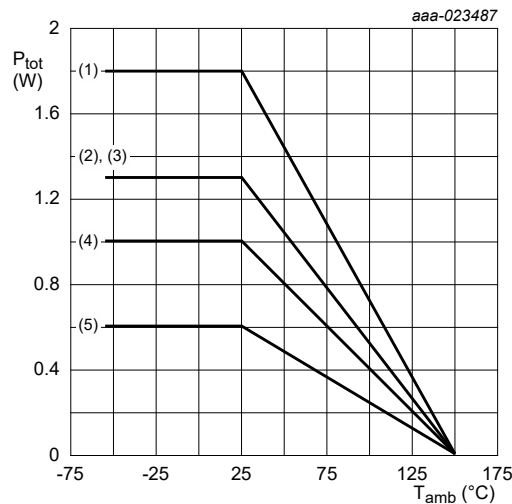
Table 6. Limiting values

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

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

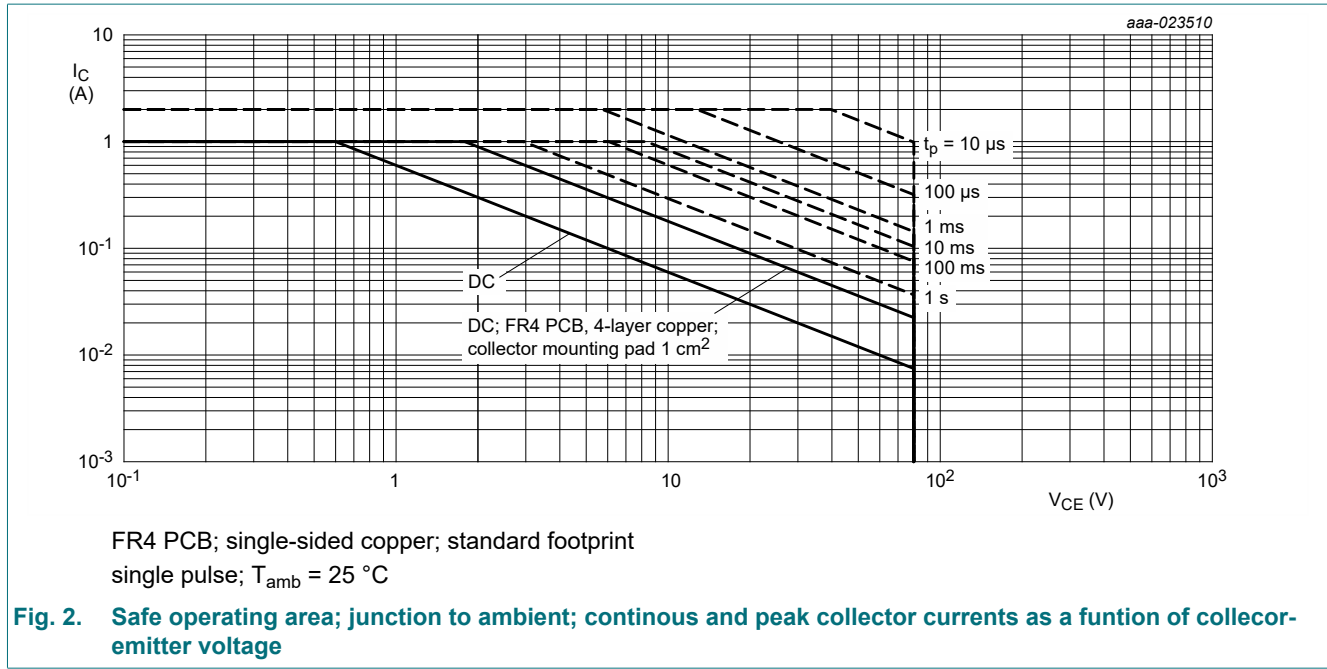
Symbol	Parameter	Conditions	Min	Max	Unit	
V_{CBO}	collector-base voltage	open emitter	-	100	V	
V_{CEO}	collector-emitter voltage	open base	-	80	V	
V_{EBO}	emitter-base voltage	open collector	-	5	V	
I_C	collector current		-	1	A	
I_{CM}	peak collector current	single pulse; $t_p \leq 1\text{ ms}$	-	2	A	
I_B	base current		-	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 cm^2 .
- [3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 6 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 cm^2 .



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

Fig. 1. Power derating curves



9. 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.

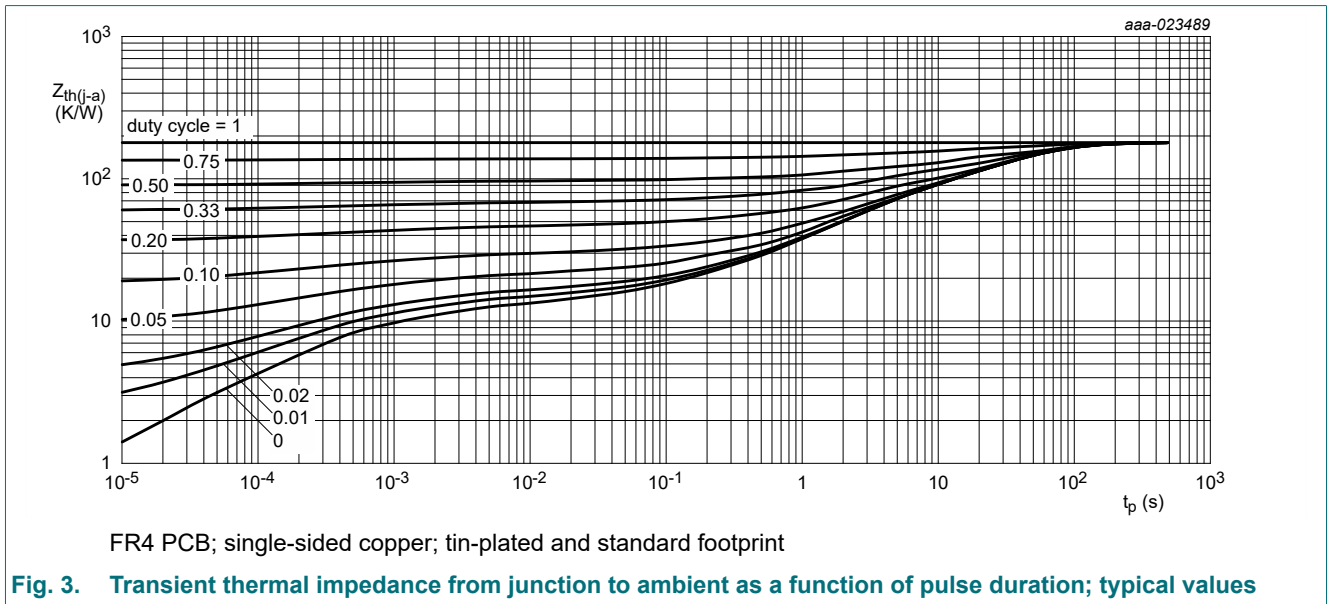
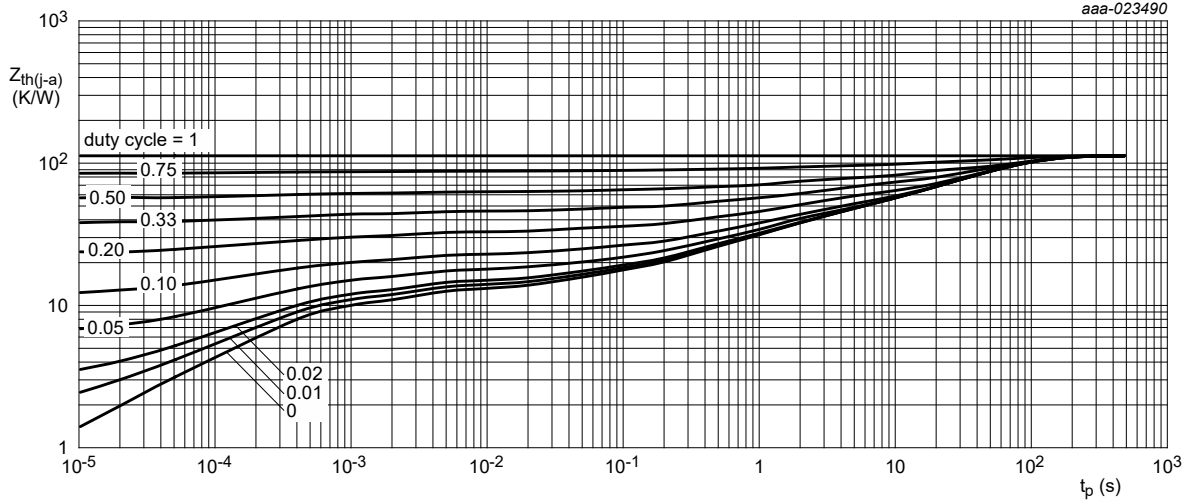
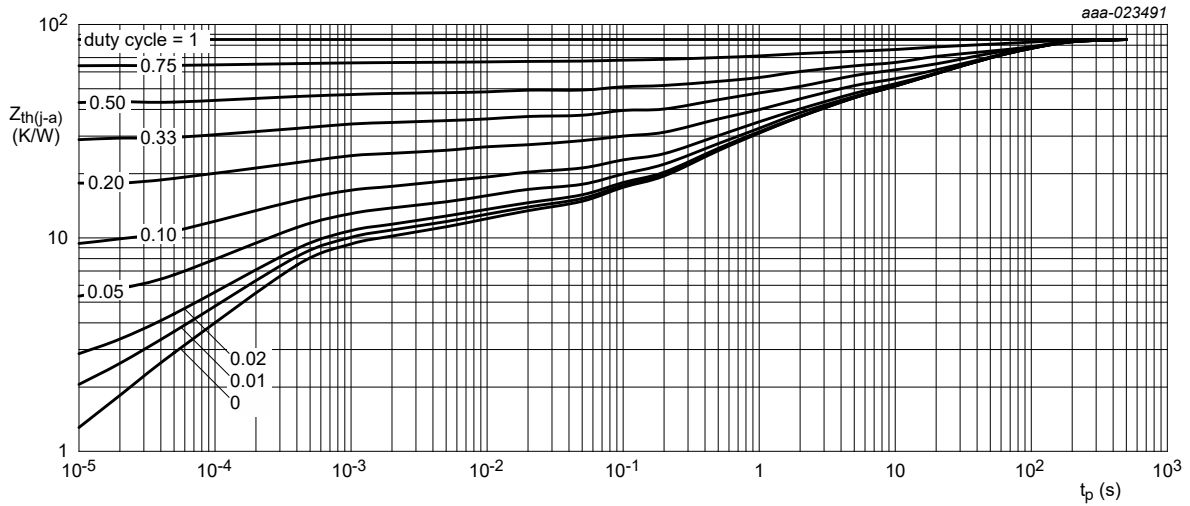


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



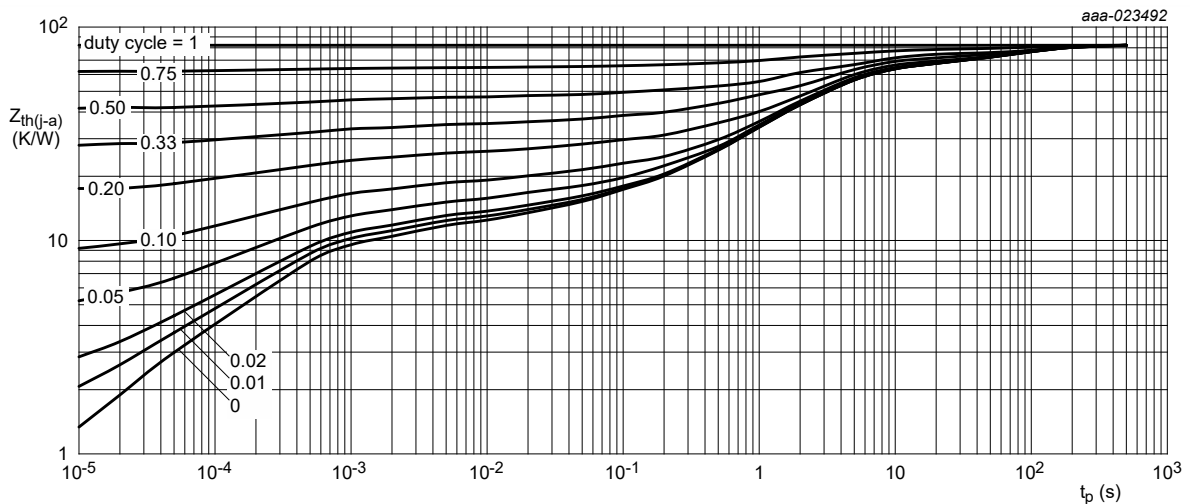
FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm²

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



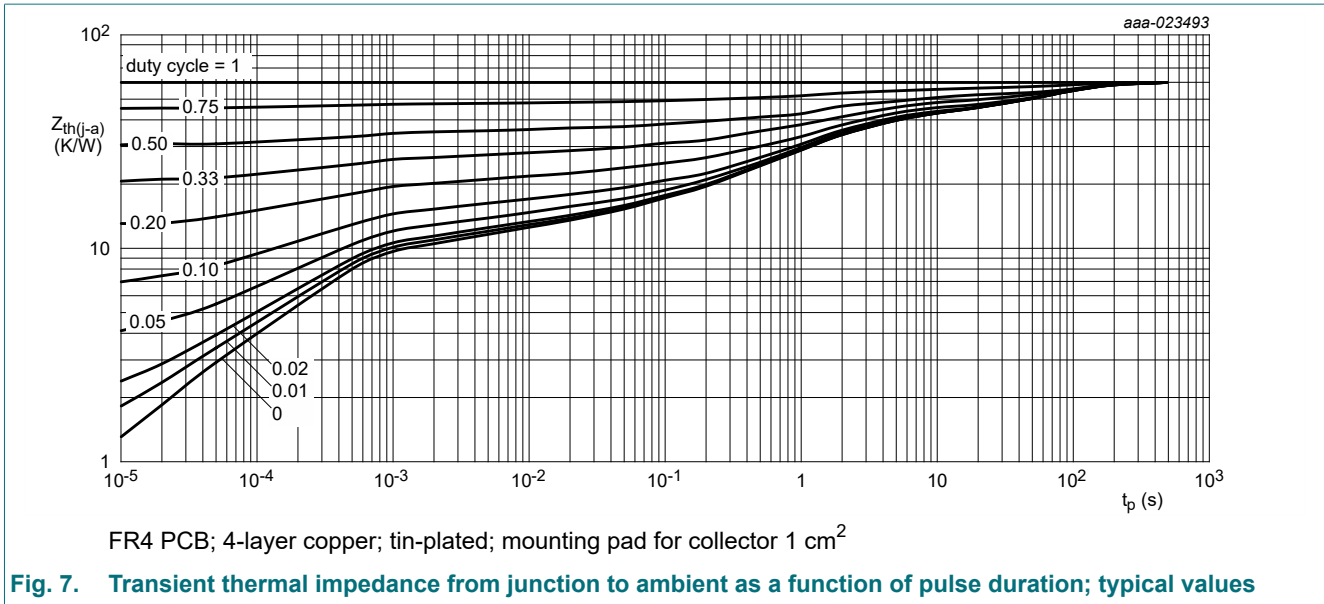
FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm²

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

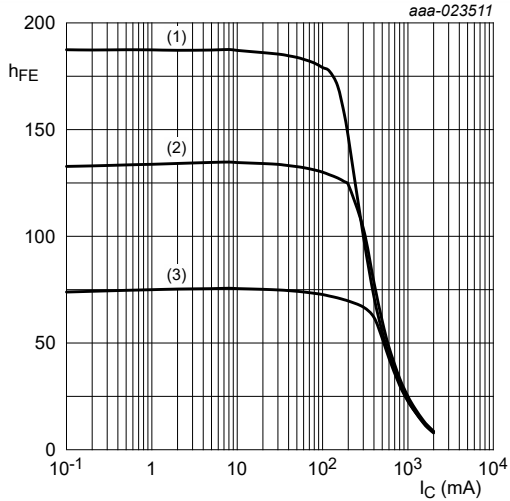


10. Characteristics

Table 8. Characteristics
 $T_{amb} = 25\text{ °C}$ unless otherwise specified.

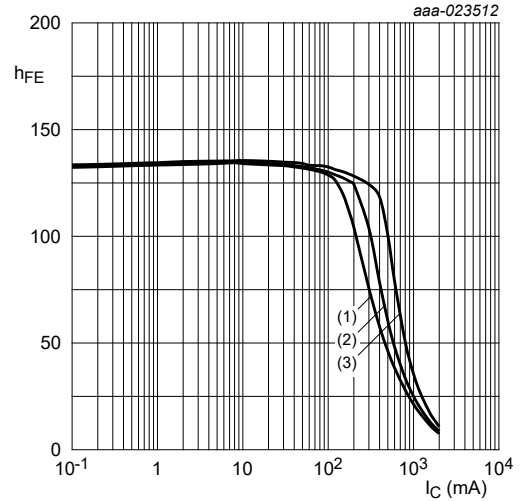
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\ \mu\text{A}; I_E = 0\ \text{A}$	100	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2\ \text{mA}; I_B = 0\ \text{A}$	80	-	-	V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\ \mu\text{A}; I_C = 0\ \text{A}$	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	μA	
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\ \text{V}; I_C = 0\ \text{A}$	-	-	100	nA	
h_{FE}	DC current gain						
	BCP56T-Q	$V_{CE} = 2\ \text{V}; I_C = 5\ \text{mA}$	[1]	63	-	-	
		$V_{CE} = 2\ \text{V}; I_C = 150\ \text{mA}$	[1]	63	-	250	
		$V_{CE} = 2\ \text{V}; I_C = 500\ \text{mA}$	[1]	40	-	-	
	BCP56-10T-Q	$V_{CE} = 2\ \text{V}; I_C = 5\ \text{mA}$	[1]	63	-	-	
		$V_{CE} = 2\ \text{V}; I_C = 150\ \text{mA}$	[1]	63	-	160	
		$V_{CE} = 2\ \text{V}; I_C = 500\ \text{mA}$	[1]	40	-	-	
	BCP56-16T-Q	$V_{CE} = 2\ \text{V}; I_C = 5\ \text{mA}$	[1]	63	-	-	
		$V_{CE} = 2\ \text{V}; I_C = 150\ \text{mA}$	[1]	100	-	250	
		$V_{CE} = 2\ \text{V}; I_C = 500\ \text{mA}$	[1]	40	-	-	
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	
C_C	collector capacitance	$V_{CB} = 10\ \text{V}; I_E = i_e = 0\ \text{A}; f = 1\ \text{MHz}$	-	4.5	-	pF	
f_T	transition frequency	$V_{CE} = 5\ \text{V}; I_C = 50\ \text{mA}; f = 100\ \text{MHz}$	100	155	-	MHz	

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



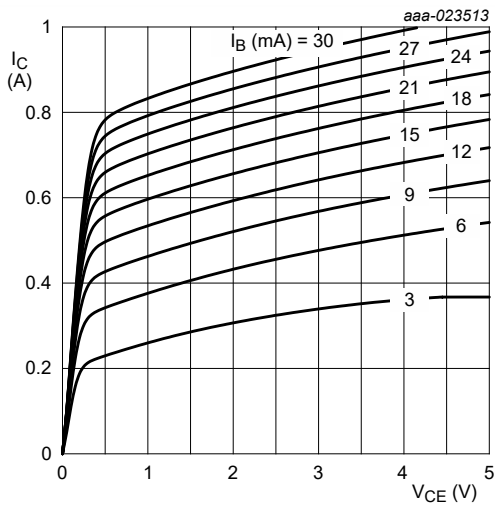
$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = 100\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = -55\text{ }^\circ\text{C}$

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



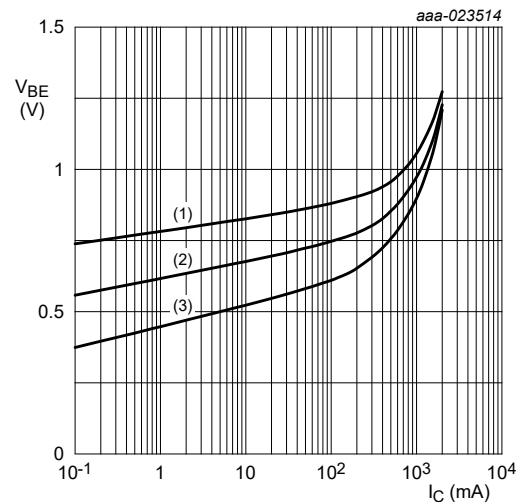
$T_{amb} = 25\text{ }^\circ\text{C}$
 (1) $V_{CE} = 1\text{ V}$
 (2) $V_{CE} = 2\text{ V}$
 (3) $V_{CE} = 5\text{ V}$

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



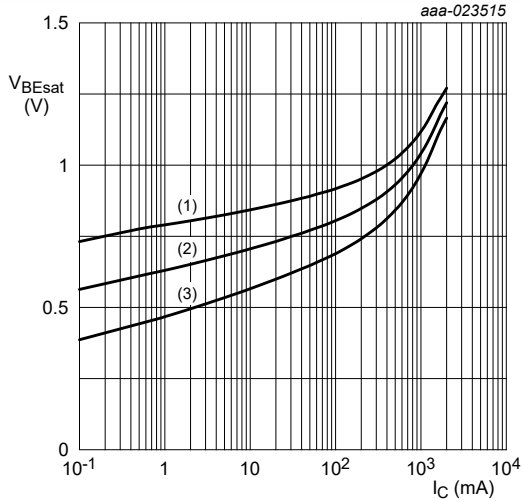
$T_{amb} = 25\text{ }^\circ\text{C}$

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



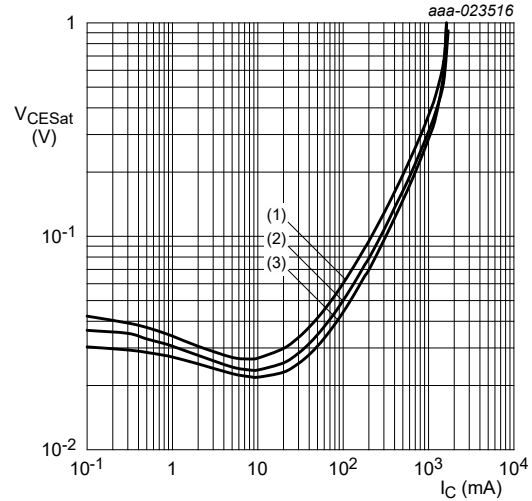
$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = -55\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = 100\text{ }^\circ\text{C}$

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



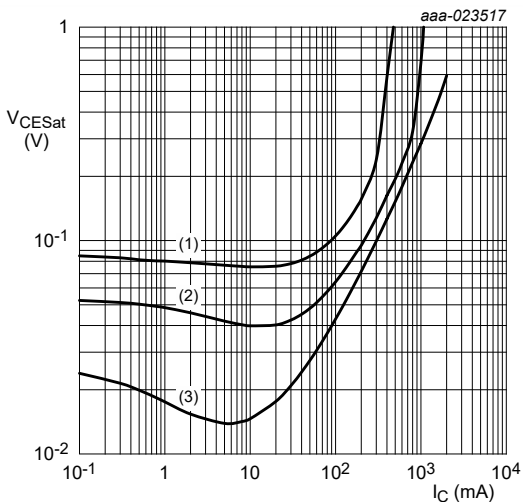
$I_C/I_B = 10$
 (1) $T_{amb} = -55\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = 100\text{ }^\circ\text{C}$

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



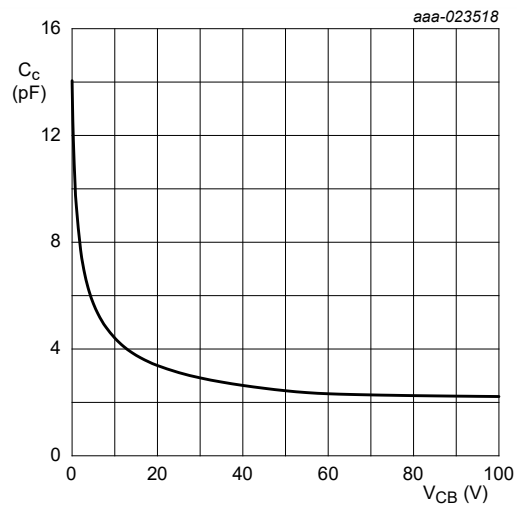
$I_C/I_B = 10$
 (1) $T_{amb} = 100\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = -55\text{ }^\circ\text{C}$

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



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



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

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

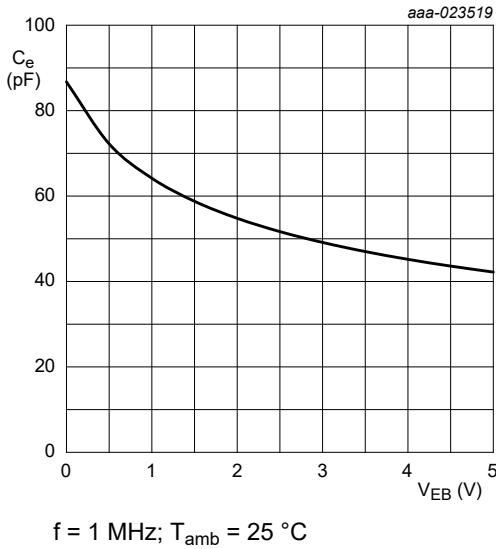


Fig. 16. Emitter capacitance as a function of emitter-base voltage; typical values

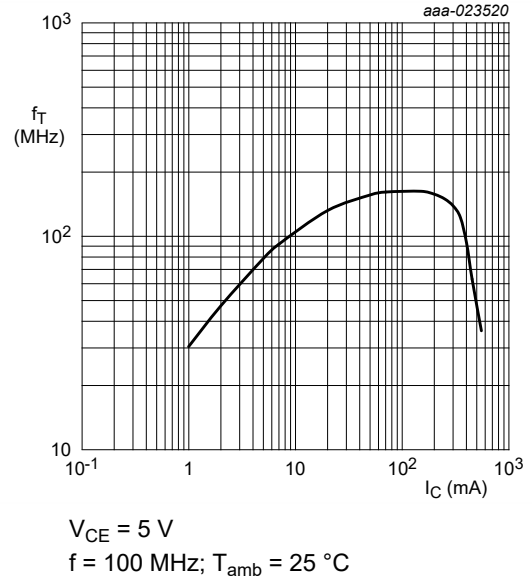


Fig. 17. Transition frequency as a function of collector current; typical values

11. Test information

11.1. 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.

12. Package outline

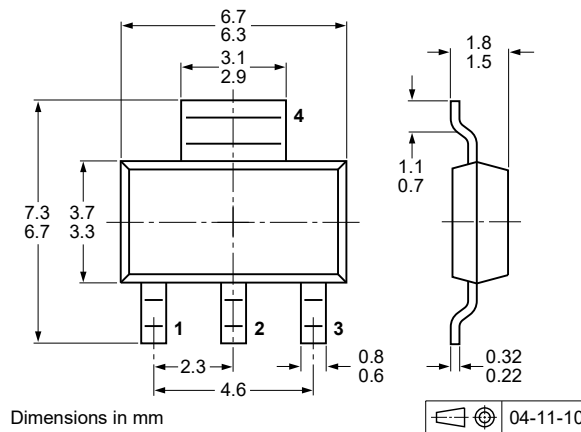


Fig. 18. Package outline SOT223 (SC-73)

14. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCP56T-Q_SER v.1	20220629	Product data sheet	-	BCP56T-Q_SER v.1
Modifications:	• Characteristics at $V_{(BR)CEO}$: Conditions corrected			
BCP56T-Q_SER v.1	20210623	Product data sheet	-	-

15. 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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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 29 June 2022

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