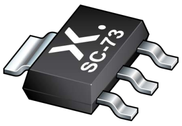


BCP56T series

80 V, 1 A NPN medium power transistors

Rev. 1 — 5 July 2016 Product data sheet

1. Product profile

1.1 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			PNP complement
	Nexperia	JEITA	JEDEC	
BCP56T	SOT223	SC-73	-	BCP53T
BCP56-10T				BCP53-10T
BCP56-16T				BCP53-16T

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
- Low-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	-	-	80	V
I_C	collector current		-	-	1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	2	A

Table 2. Quick reference data *...continued*

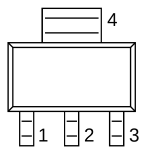
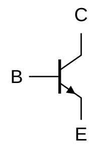
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
h_{FE}	DC current gain	V_{CE} = 2 V; I_C = 150 mA	[1]	63	-	250	
	BCP56-10T	V_{CE} = 2 V; I_C = 150 mA	[1]	63	-	160	
	BCP56-16T	V_{CE} = 2 V; I_C = 150 mA	[1]	100	-	250	

[1] Pulse test: $t_p \leq 300\ \mu s$; $\delta = 0.02$

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

4. Marking

Table 5. Marking codes

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

5. Limiting values

Table 6. Limiting values

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

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; $t_p \leq 1$ ms		-	2	A
I_B	base current			-	0.2	A
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms		-	0.3	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °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

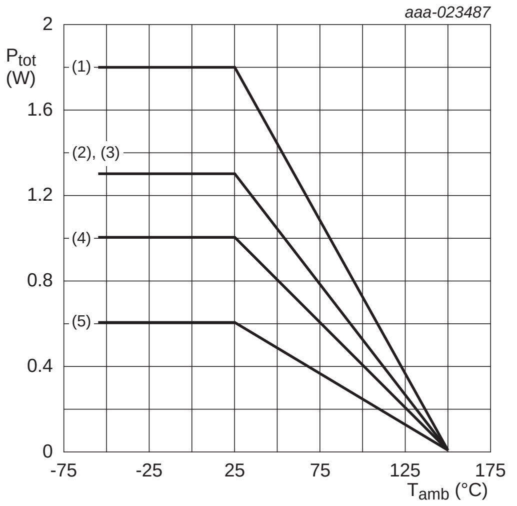
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 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.

[4] Device mounted on an FR4 PCB, 4-layer copper; tin-plated and standard footprint.

[5] Device mounted on an FR4 PCB, 4-layer copper; tin-plated; mounting pad for collector 1 cm^2.



(1) FR4 PCB, 4-layer copper, 1 cm^2

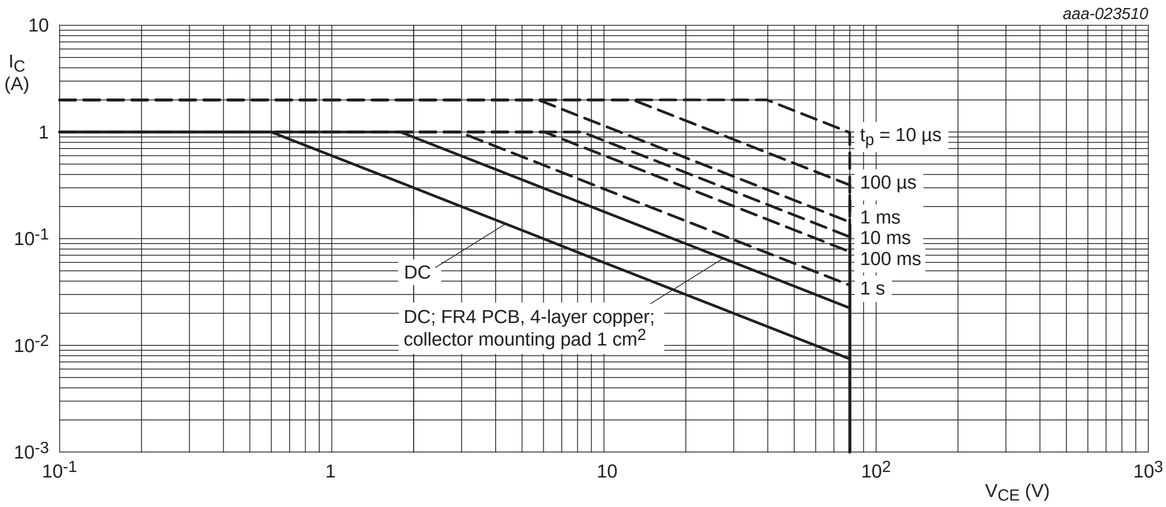
(2) FR4 PCB, single-sided copper, 6 cm^2

(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



Unless otherwise specified:

T_{amb} = 25 °C

Single pulse

FR4 PCB, single-sided copper; standard footprint

Fig 2. Safe operating area; junction to ambient; continuous and peak collector currents as a function of collector-emitter voltage

6. Thermal characteristics

Table 7. Thermal characteristics

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
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	18	K/W

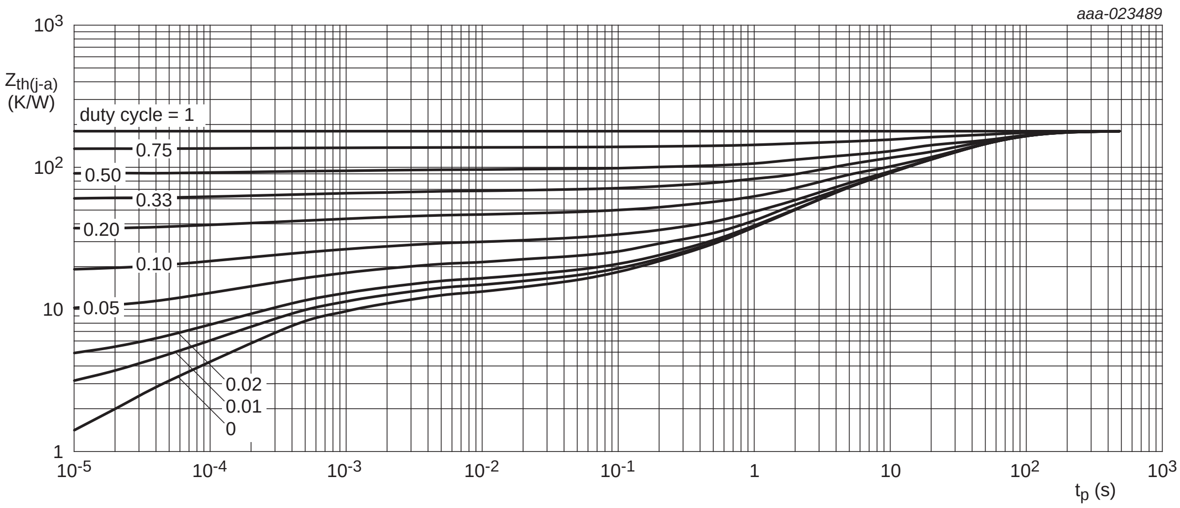
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[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.

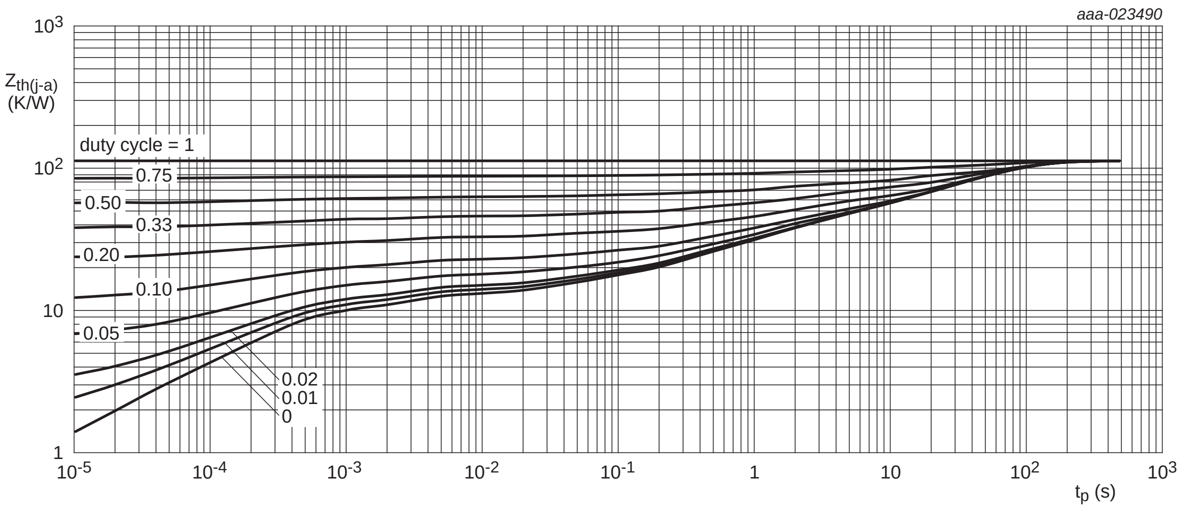
[4] Device mounted on an FR4 PCB, 4-layer copper; tin-plated and standard footprint.

[5] Device mounted on an FR4 PCB, 4-layer copper; tin-plated; mounting pad for collector 1 cm^2.



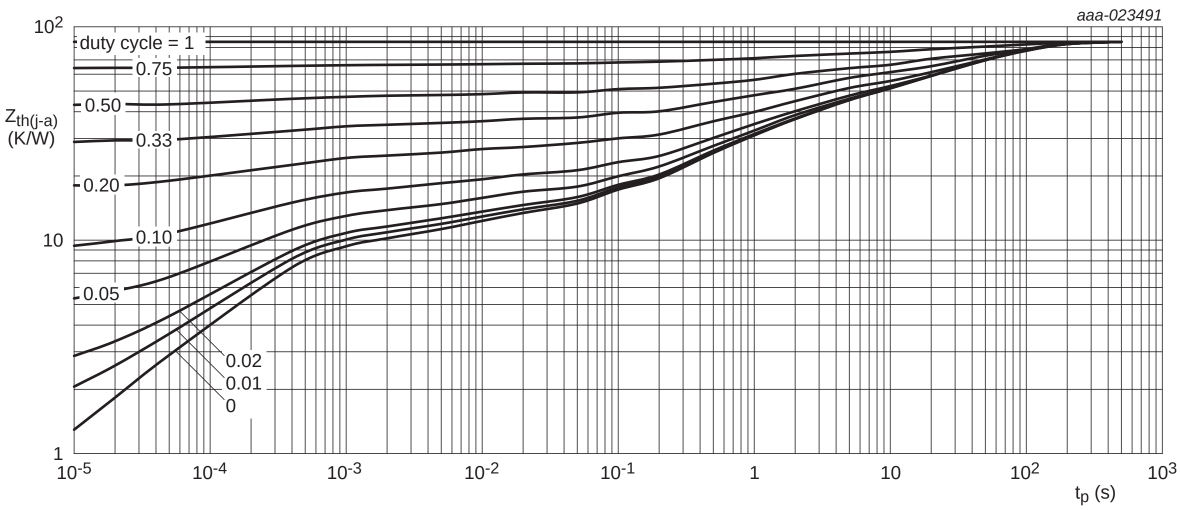
FR4 PCB, single-sided copper, tin-plated and standard footprint

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



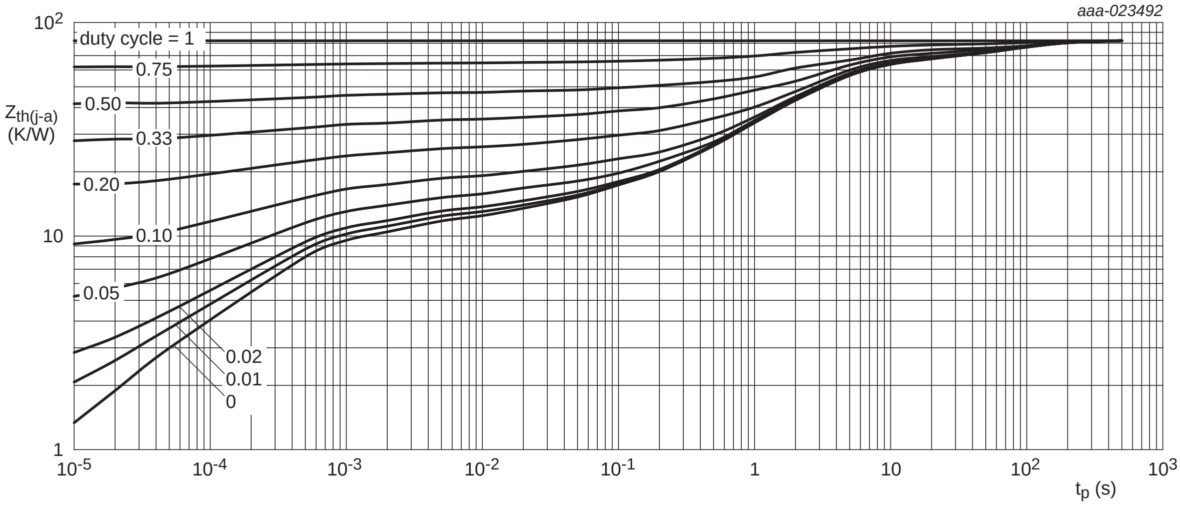
FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 cm^2

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



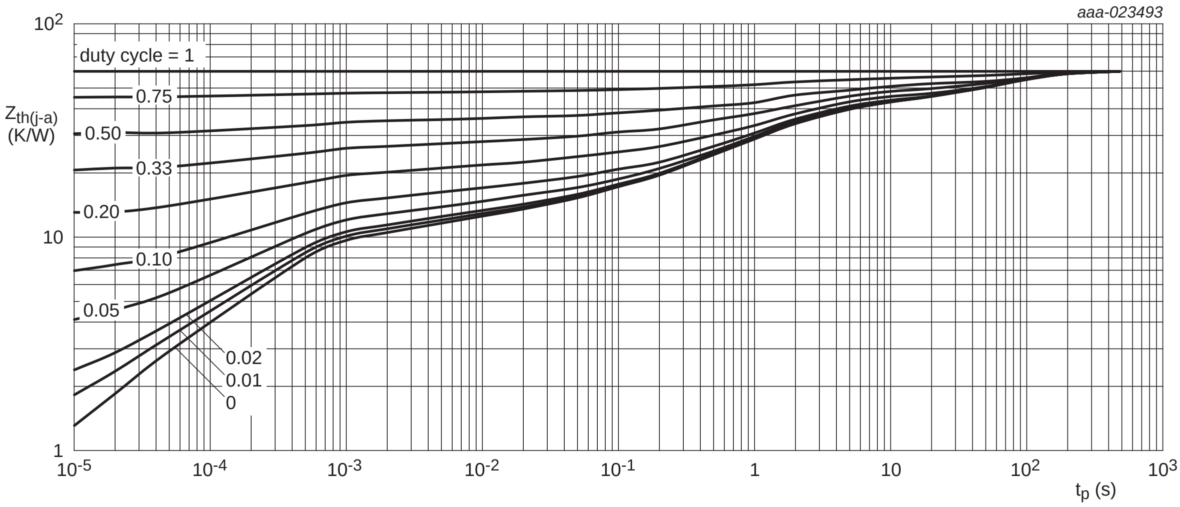
FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 6 cm^2

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



FR4 PCB, 4-layer copper, tin-plated; mounting pad for collector 1 cm^2

Fig 7. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

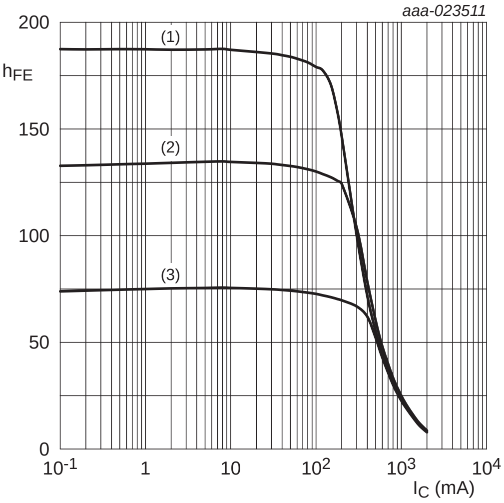
7. Characteristics

Table 8. Characteristics

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
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	V_{CE} = 2 V; I_C = 5 mA		63	-	-	
		V_{CE} = 2 V; I_C = 150 mA	[1]	63	-	250	
		V_{CE} = 2 V; I_C = 500 mA	[1]	40	-	-	
	BCP56-10T	V_{CE} = 2 V; I_C = 150 mA	[1]	63	-	160	
	BCP56-16T	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] Pulse test: $t_p \leq 300$ µs; $\delta = 0.02$



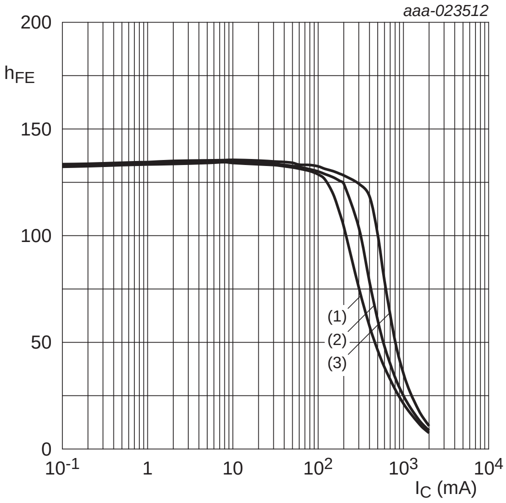
V_{CE} = 2 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –55 °C

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



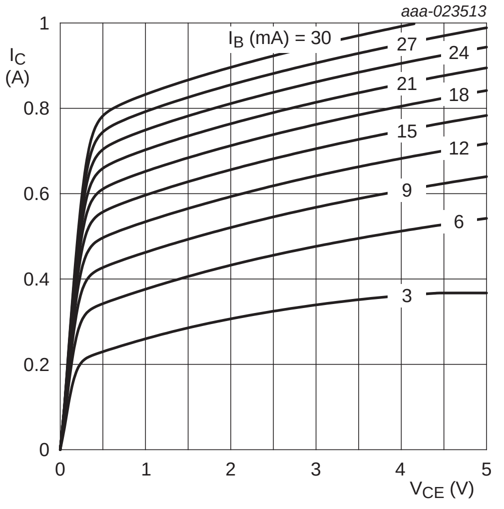
T_{amb} = 25 °C

(1) V_{CE} = 1 V

(2) V_{CE} = 2 V

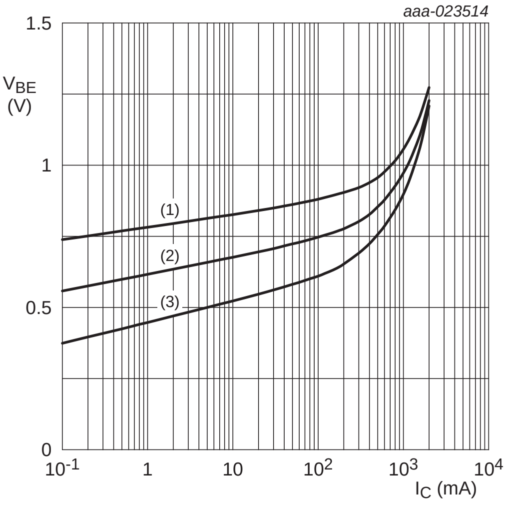
(3) V_{CE} = 5 V

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



T_{amb} = 25 °C

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



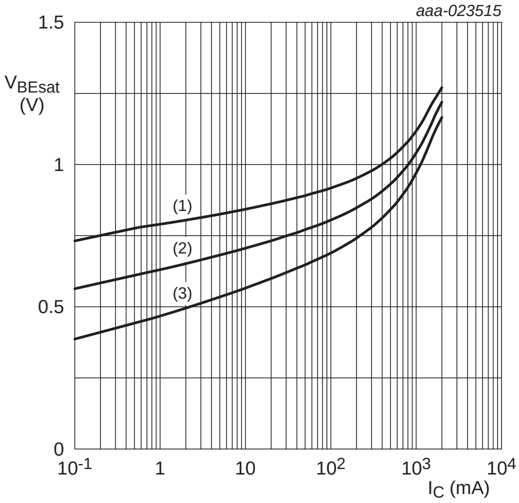
V_{CE} = 2 V

(1) T_{amb} = –55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



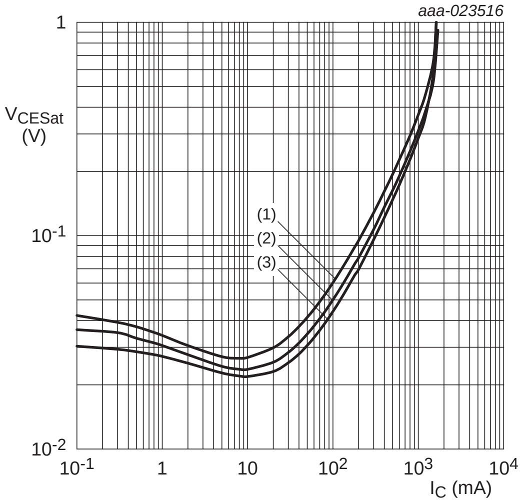
$I_C/I_B = 10$

(1) $T_{amb} = -55$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = 100$ °C

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



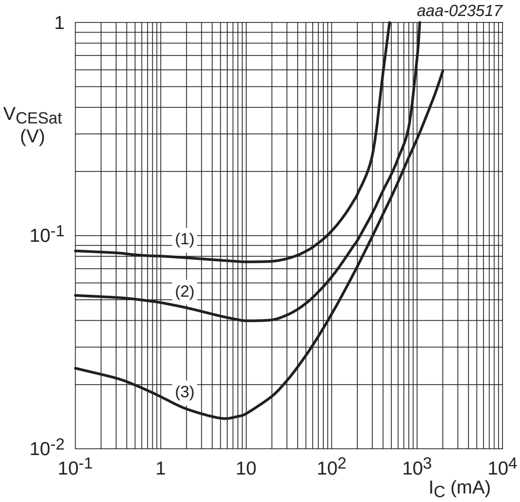
$I_C/I_B = 10$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

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



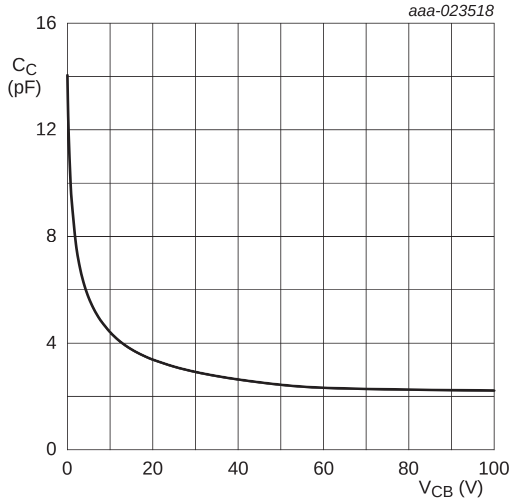
$T_{amb} = 25$ °C

(1) $I_C/I_B = 50$

(2) $I_C/I_B = 20$

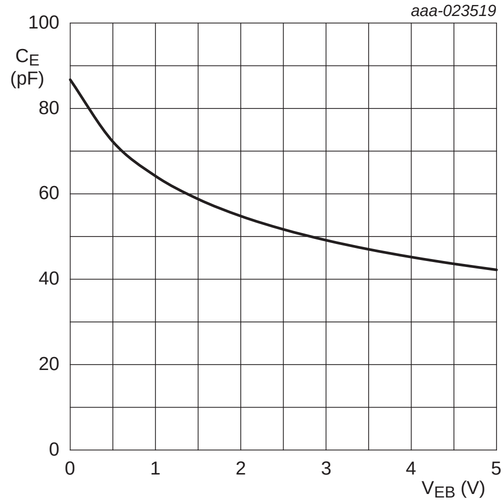
(3) $I_C/I_B = 5$

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



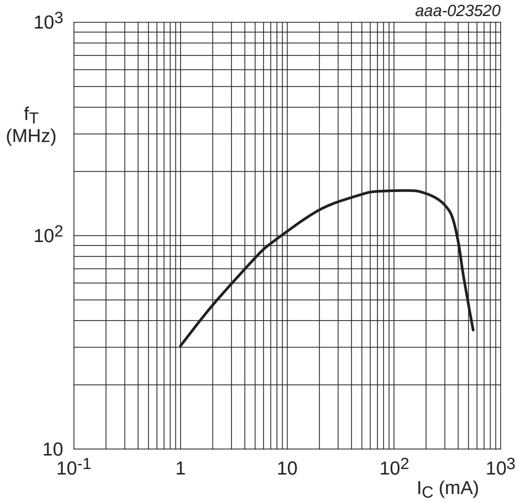
f = 1 MHz; $T_{amb} = 25$ °C

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



f = 1 MHz; T_{amb} = 25 °C

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



V_{CE} = 5 V;
f = 100 MHz; T_{amb} = 25 °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

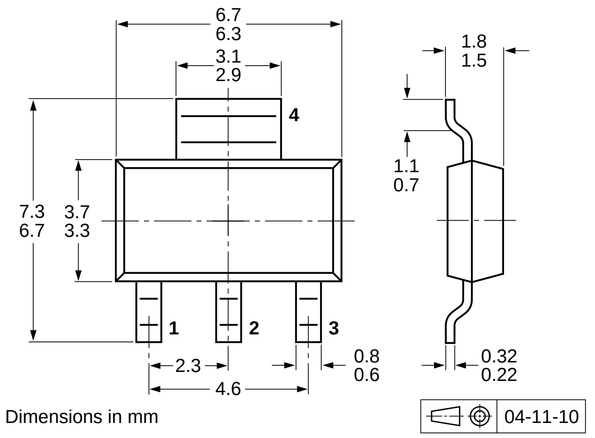


Fig 18. Package outline SOT223 (SC-73)

10. Soldering

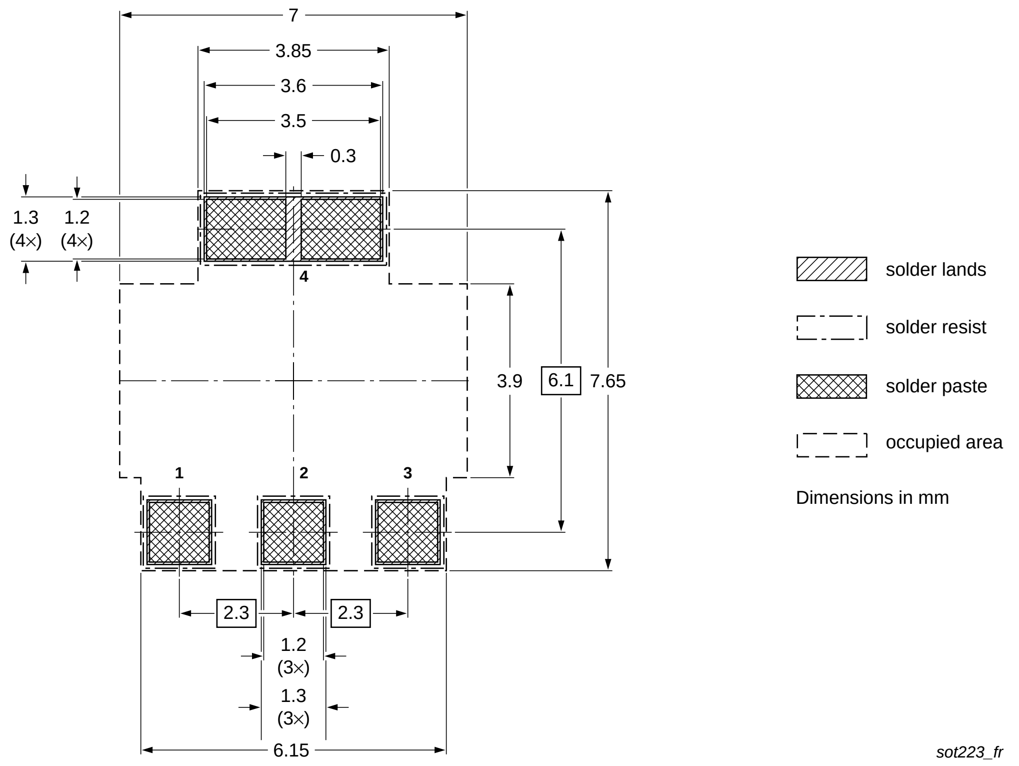


Fig 19. Reflow soldering footprint SOT223 (SC-73)

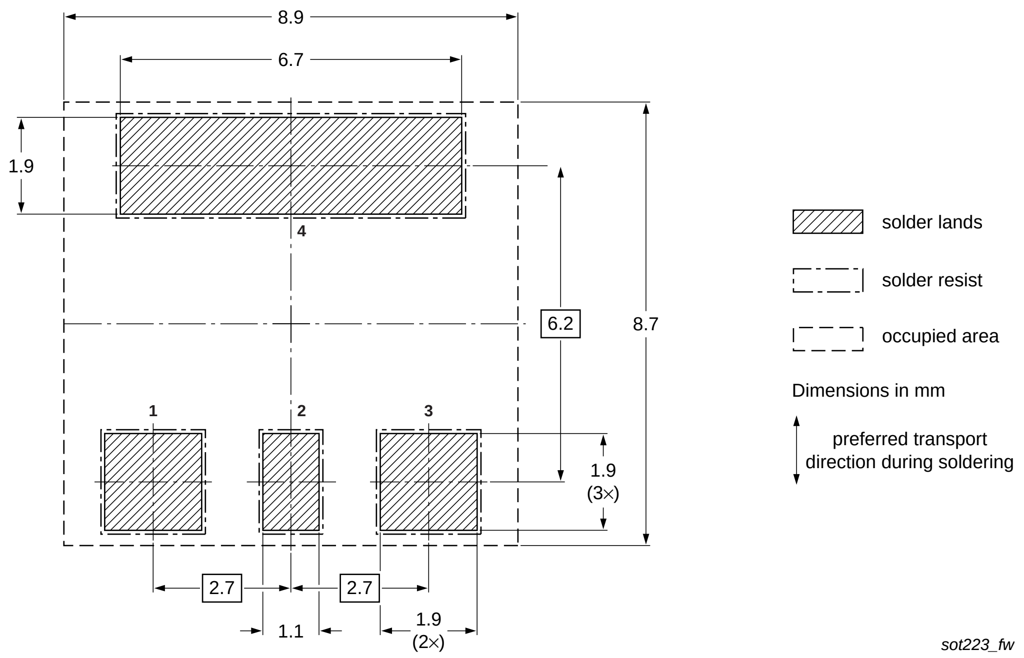


Fig 20. Wave soldering footprint SOT223 (SC-73)

11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCP56T_SER v.1	20160705	Product data sheet	-	-

12. Legal information

12.1 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 URL http://www.nexperia.com.

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For more information, please visit: **http://www.nexperia.com**

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