BCP56H-Q series

80 V, 1 A NPN medium power transistors

Rev. 1 — 31 January 2025 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		PNP comlement
	Nexperia	JEDEC	
BCP56H-Q	SOT223	SC-73	BCP53H-Q
BCP56-10H-Q			BCP53-10H-Q
BCP56H-16H-Q			BCP53-16H-Q

2. Features and benefits

- High collector current capability I_C and I_{CM}
- Three current gain selections
- High power dissipation capability
- High-temperature applications up to 175 °C
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

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

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4. Quick reference data

Table 2. Quick reference data

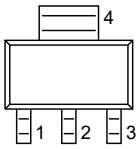
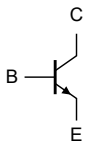
T_{amb} = 25 °C unless otherwise specified.

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
h_{FE}	DC current gain						
	BCP56H-Q	V_{CE} = 2 V; I_C = 150 mA	[1]	63	-	250	
	BCP56-10H-Q		[1]	63	-	160	
	BCP56-16H-Q		[1]	100	-	250	

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

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		
	Name	Description	Version
BCP56H-Q	SC-73	plastic, surface-mounted package with increased heatsink; 4 leads	SOT223
BCP56-10H-Q			
BCP56-16H-Q			

7. Marking

Table 5. Marking

Type number	Marking code
BCP56H-Q	BCP56H
BCP56-10H-Q	P5610H
BCP56-16H-Q	P5616H

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8. Limiting values

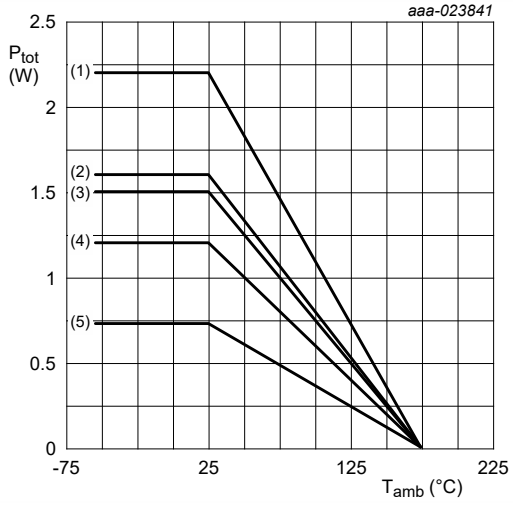
Table 6. Limiting values

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		-	100	V
V_{CEO}	collector-emitter voltage	open base		-	80	V
V_{EBO}	emitter-base voltage	open collector		-	7	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]	-	0.725	W
			[2]	-	1.2	W
			[3]	-	1.5	W
			[4]	-	1.6	W
			[5]	-	2.2	W
T_j	junction temperature			-	175	°C
T_{amb}	ambient temperature			-55	175	°C
T_{stg}	storage temperature			-65	175	°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, 4-layer copper, standard footprint
(3) FR4 PCB, single-sided copper, 6 cm^2
(4) FR4 PCB, single-sided copper, 1 cm^2
(5) FR4 PCB, single sided copper, standard footprint

Fig. 1. Power derating curves

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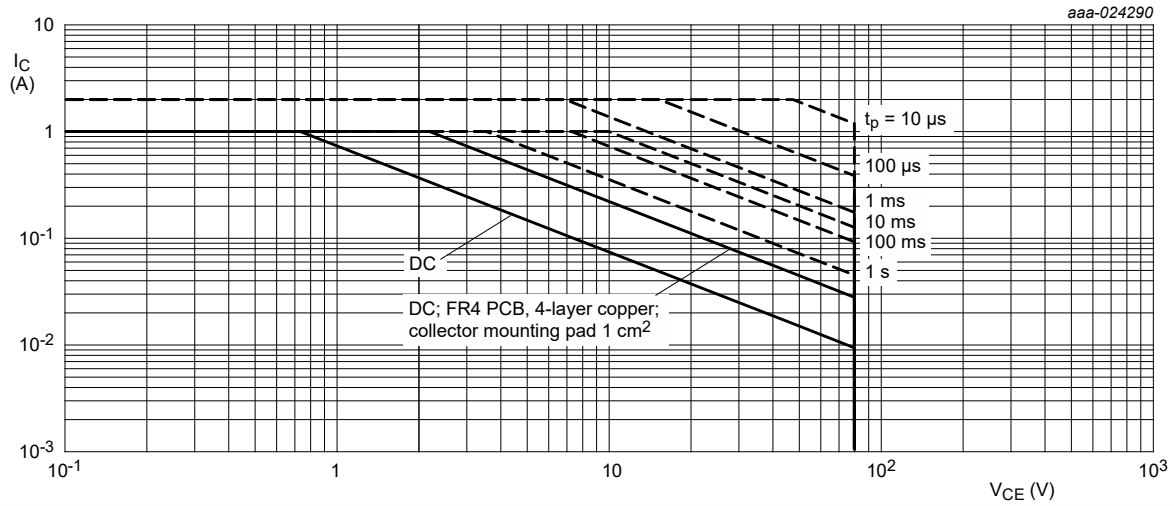

T_{amb} = 25 °C; single pulse; FR4 PCB, single-sided copper; standard footprint

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

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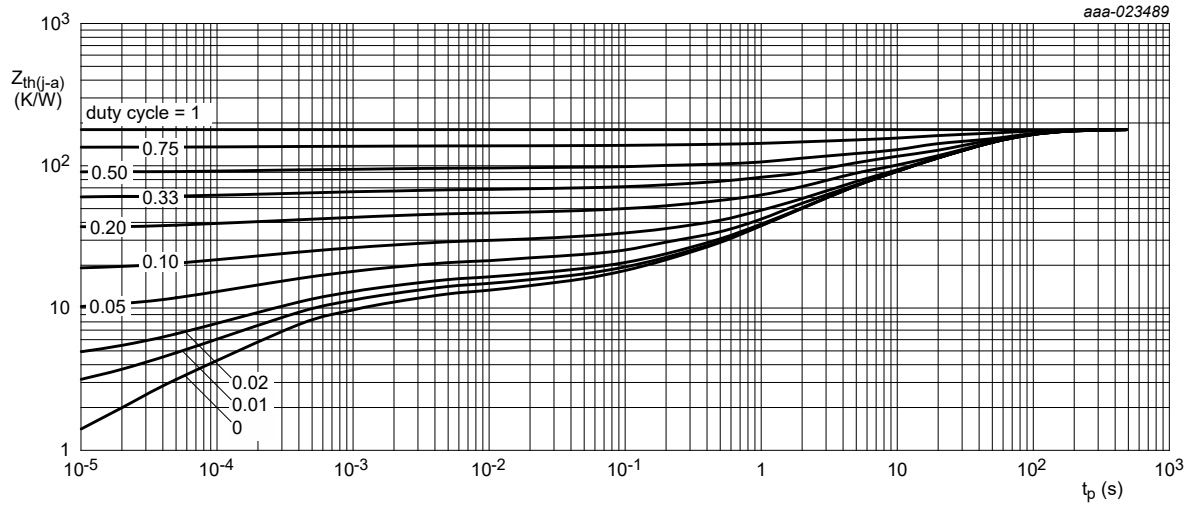
9. Thermal characteristics

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]	-	-	207	K/W
			[2]	-	-	125	K/W
			[3]	-	-	100	K/W
			[4]	-	-	94	K/W
			[5]	-	-	69	K/W
$R_{(j-sp)}$	thermal resistance from junction to solder point			-	-	18	K/W

[1] Device mounted on an FR4 PC); 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

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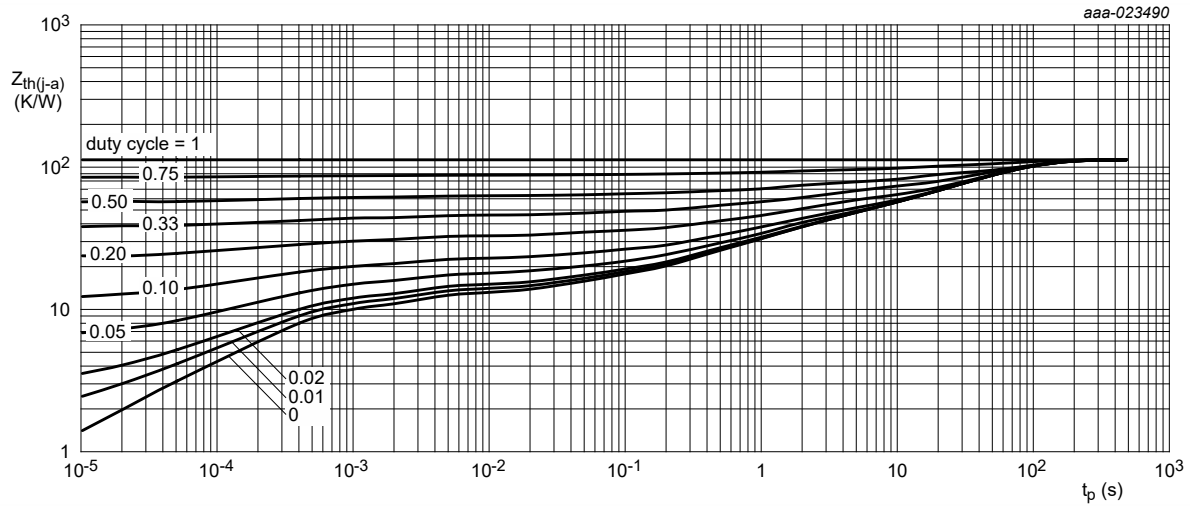
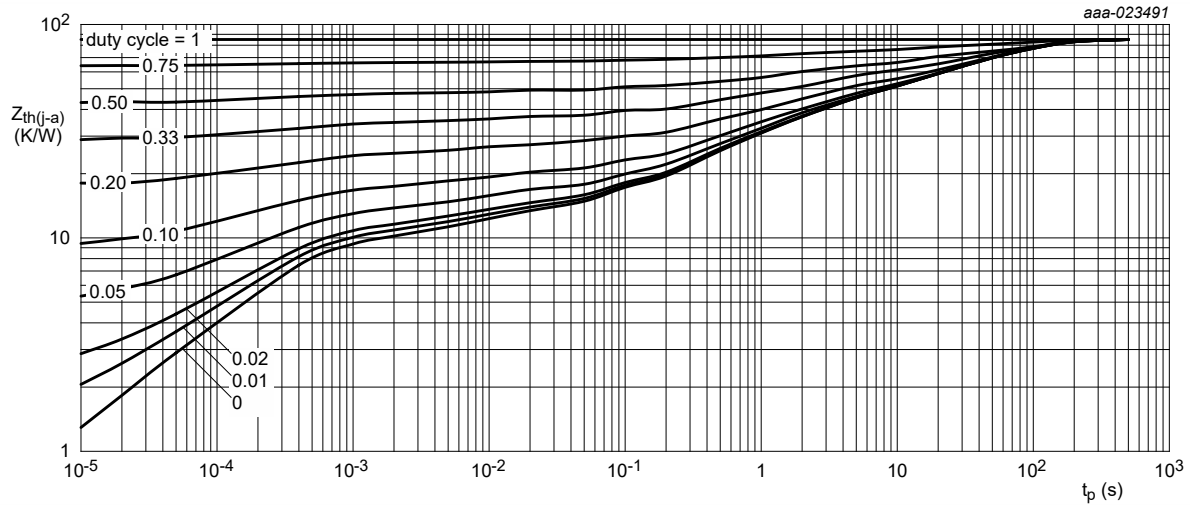


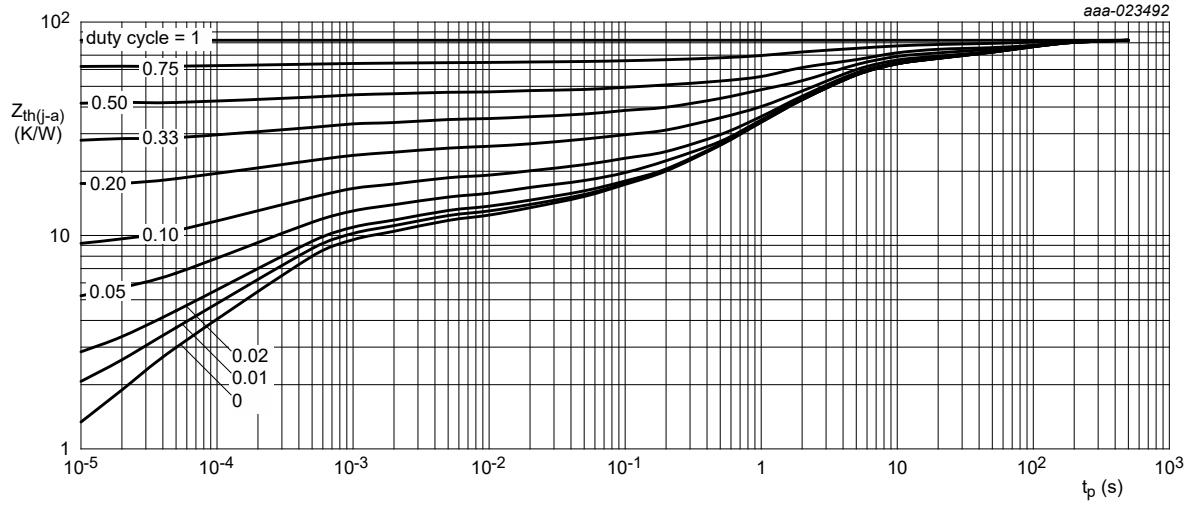
FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 cm^2

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

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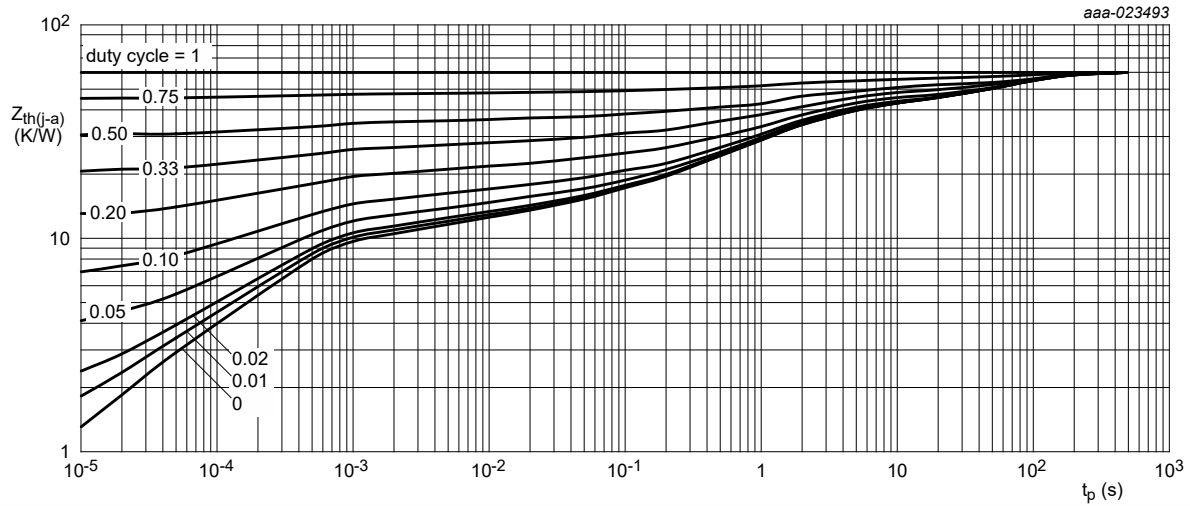

FR4 PCB, 4-layer copper, tin-plated; mounting pad for collector 1 cm^2

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

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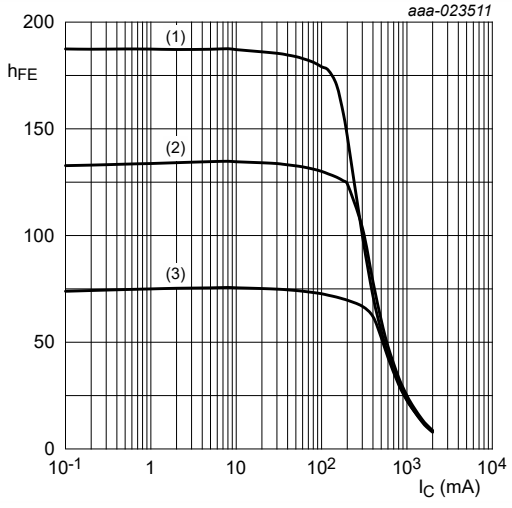
10. Characteristics

Table 8. Characteristics

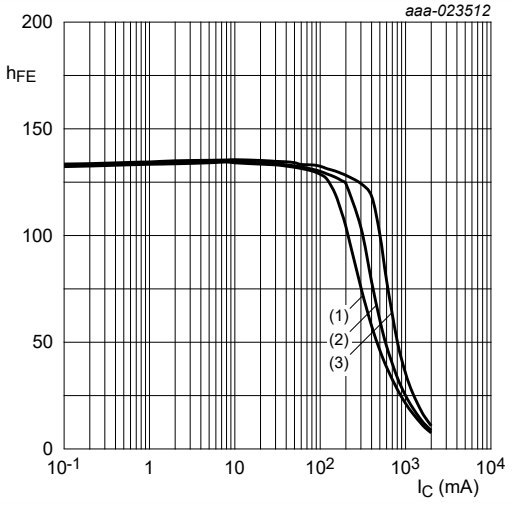
T_{amb} = 25 °C unless otherwise specified.

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					
	BCP56H-Q	V_{CE} = 2 V; I_C = 5 mA	63	-	-	
		V_{CE} = 2 V; I_C = 150 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02	63	-	250	
		V_{CE} = 2 V; I_C = 500 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02	40	-	-	
	BCP56-10H-Q	V_{CE} = 2 V; I_C = 5 mA	63	-	-	
		V_{CE} = 2 V; I_C = 150 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02	63	-	160	
		V_{CE} = 2 V; I_C = 500 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02	40	-	-	
	BCP56-16H-Q	V_{CE} = 2 V; I_C = 5 mA	63	-	-	
		V_{CE} = 2 V; I_C = 150 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02	100	-	250	
		V_{CE} = 2 V; I_C = 500 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02	40	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 500 mA; I_B = 50 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02	-	-	500	mV
V_{BE}	base-emitter voltage	V_{CE} = 2 V; I_C = 500 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02	-	-	1	V
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz	-	4.5	-	pF
f_T	transition frequency	V_{CE} = 5 V; I_C = 50 mA; f = 100 MHz	100	155	-	MHz



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

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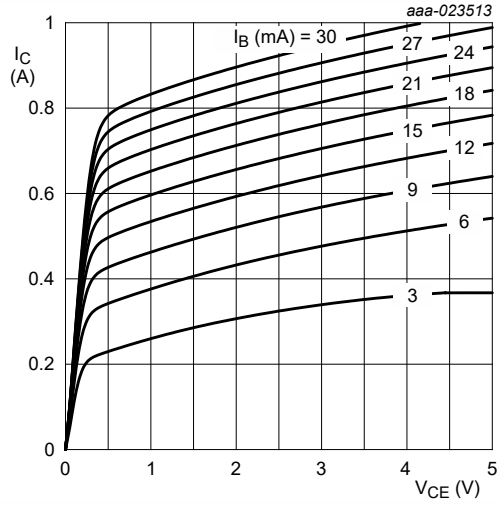
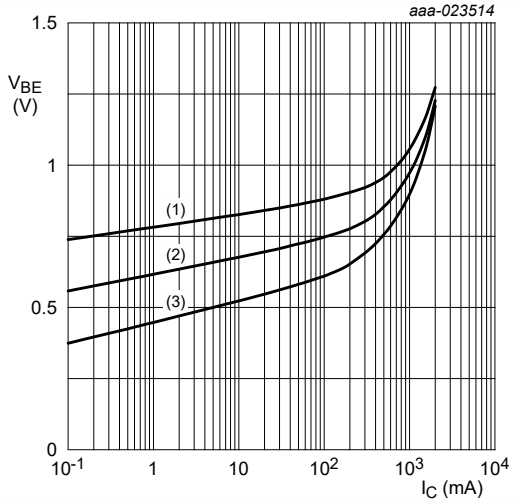


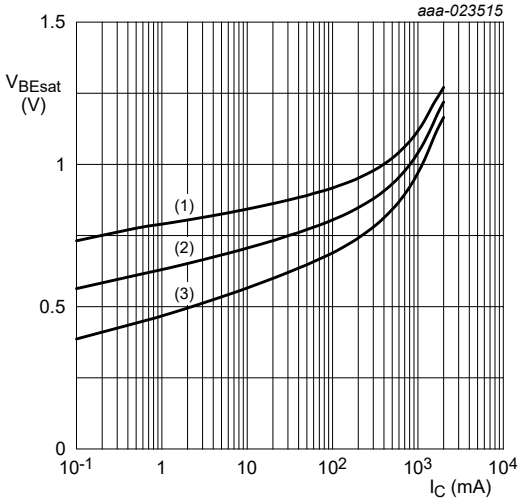
T_{amb} = 25 °C

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



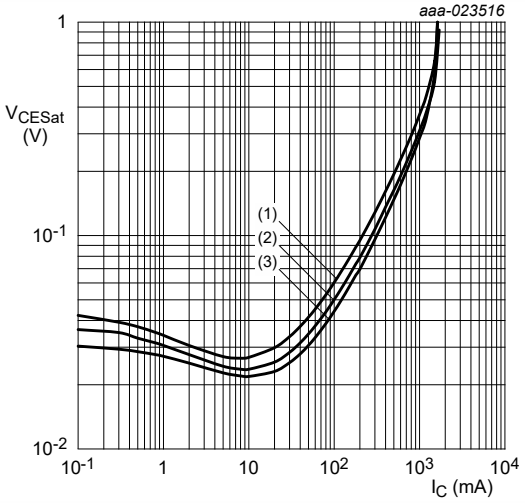
V_{CE} = 2 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

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

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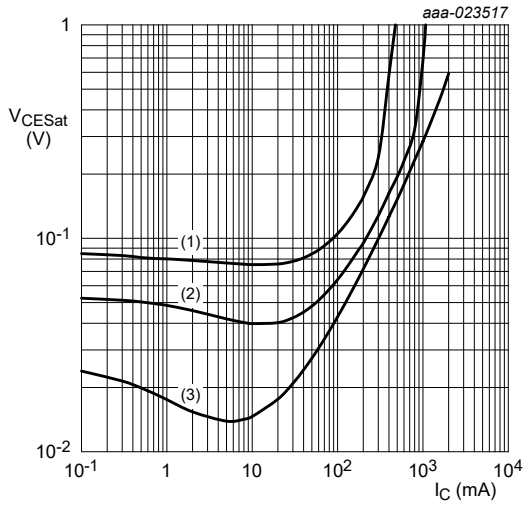


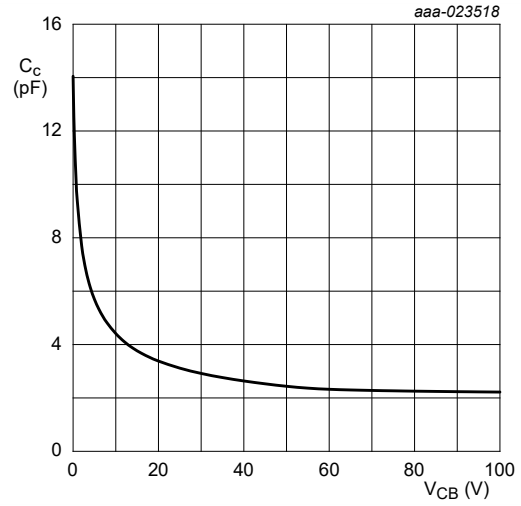
T_{amb} = 25 °C

(1) I_C/I_B= 50

(2) I_C/I_B= 20

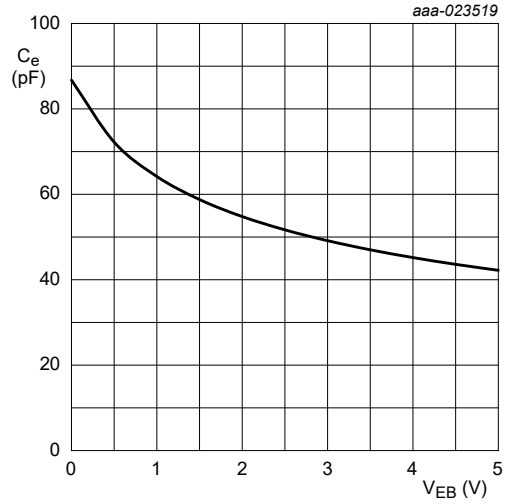
(3) I_C/I_B= 5

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



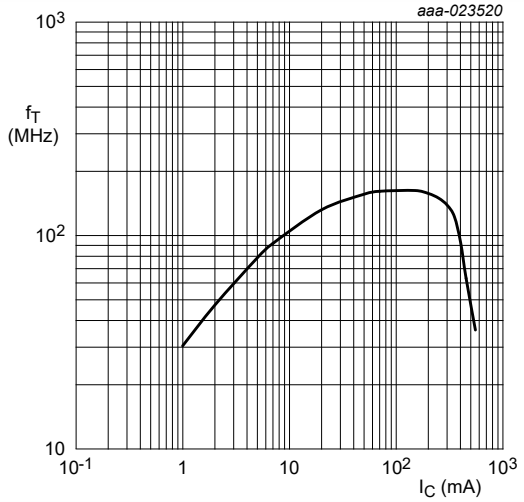
f = 1 MHz; T_{amb} = 25 °C

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

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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

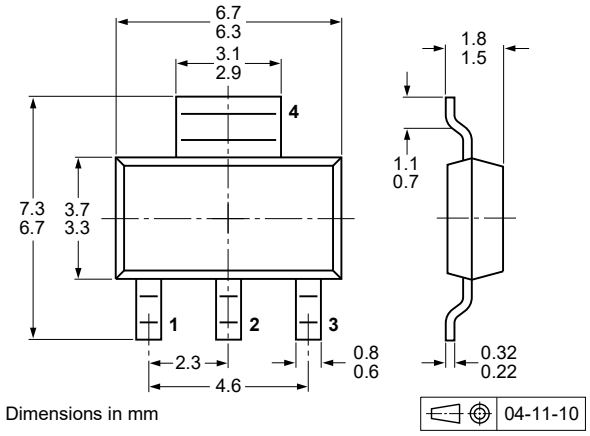

Fig. 18. Package outline SOT223 (SC-73)

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13. Soldering

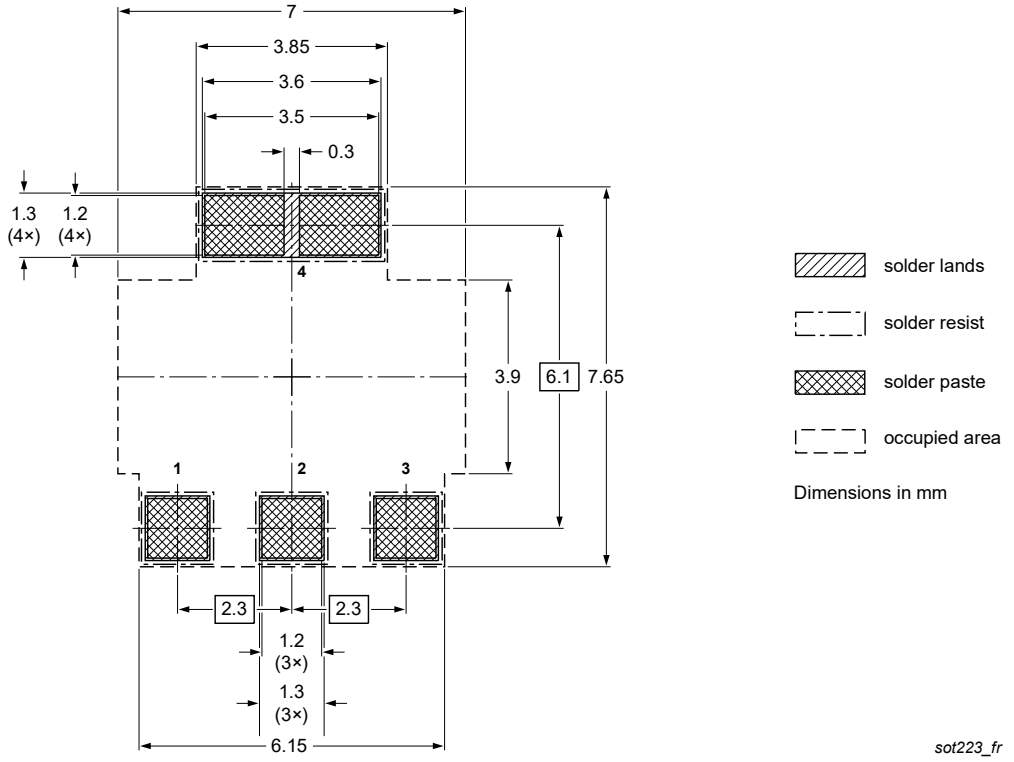

Fig. 19. Reflow soldering footprint for SOT223 (SC-73)

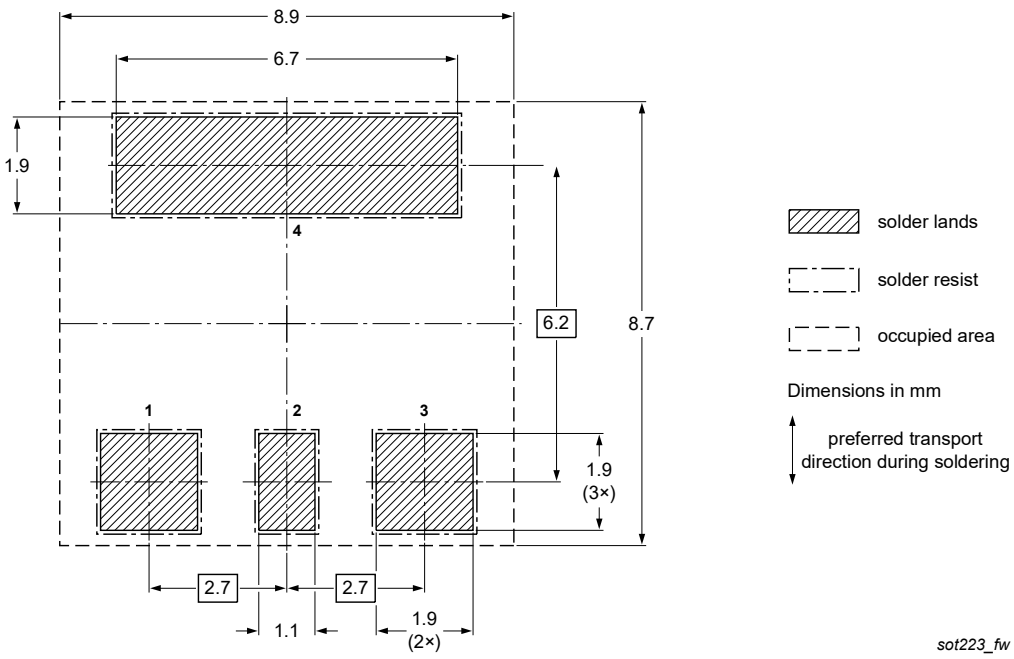

Fig. 20. Wave soldering footprint for SOT223 (SC-73)

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14. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCP56H-Q_SER v.1	20250131	Product data sheet	-	-

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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.

[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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