



THE DATASHEET OF BCP56HX





BCP56H series

80 V, 1 A NPN medium power transistors

Rev. 1 — 23 November 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	
BCP56H	SOT223	SC-73	-	BCP53H
BCP56-10H				BCP53-10H
BCP56-16H				BCP53-16H

1.2 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
- 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

$T_{amb} = 25\text{ °C}$ 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

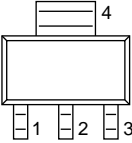
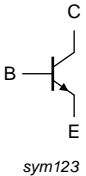
Table 2. Quick reference data ...continued
 $T_{amb} = 25\text{ °C}$ unless otherwise specified.

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

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

2. Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base		
2	C	collector		
3	E	emitter		
4	C	collector		

3. Ordering information

Table 4. Ordering information

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

4. Marking

Table 5. Marking codes

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

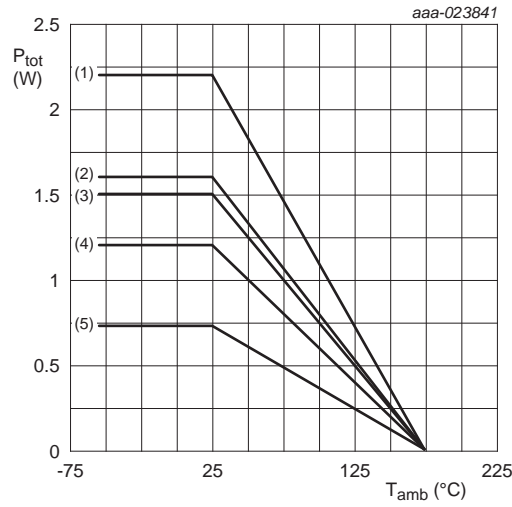
5. Limiting values

Table 6. Limiting values

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

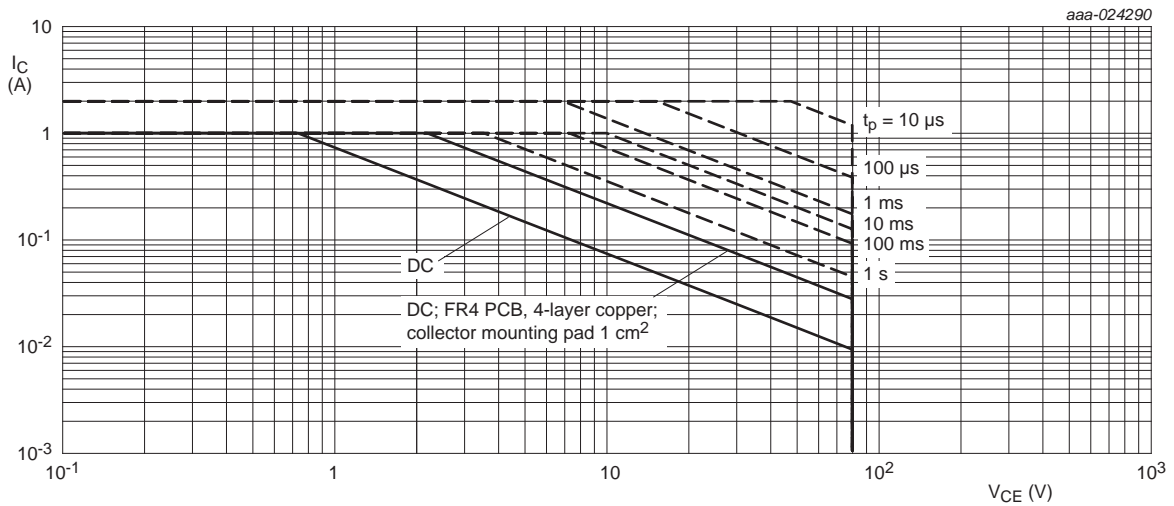
Symbol	Parameter	Conditions	Min	Max	Unit	
V_{CBO}	collector-base voltage	open emitter	-	100	V	
V_{CEO}	collector-emitter voltage	open base	-	80	V	
V_{EBO}	emitter-base voltage	open collector	-	7	V	
I_C	collector current		-	1	A	
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	2	A	
I_B	base 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]	-	725	mW
			[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 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 6 cm².
- [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 cm².



- (1) FR4 PCB, 4-layer copper, 1 cm²
- (2) FR4 PCB, 4-layer copper, standard footprint
- (3) FR4 PCB, single-sided copper, 6 cm²
- (4) FR4 PCB, single-sided copper, 1 cm²
- (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

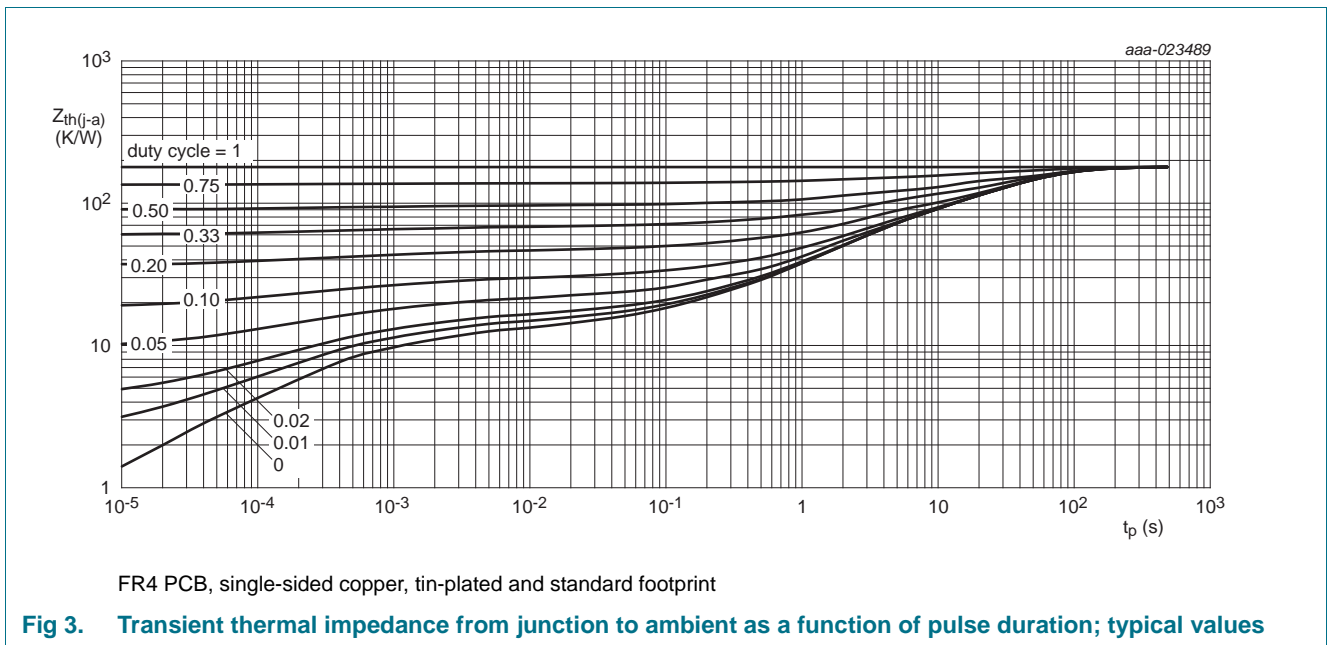
Fig 2. Safe operating area; junction to ambient; continuous and peak collector currents as a function of collector-emitter voltage

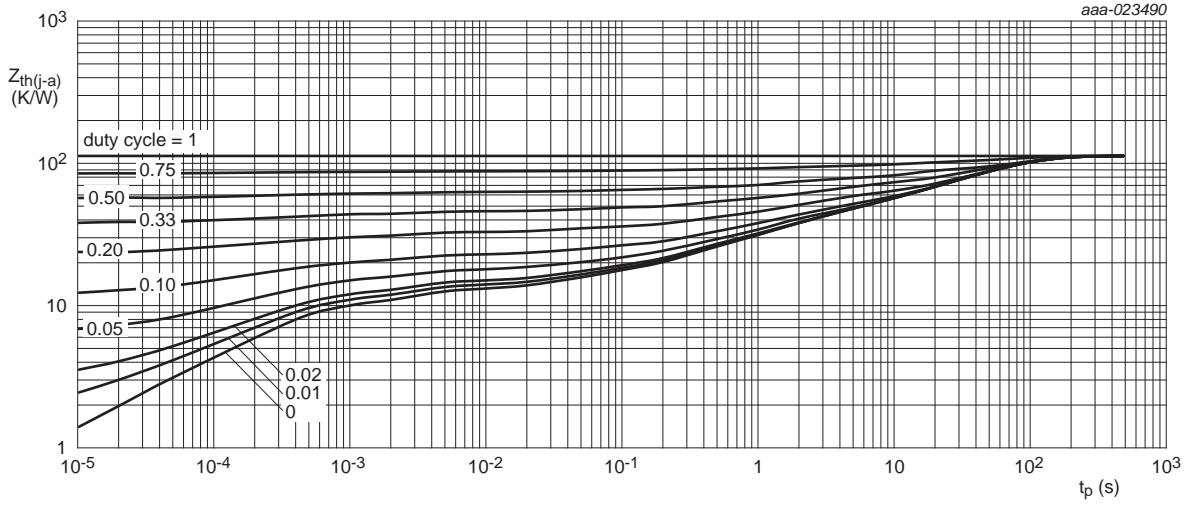
6. Thermal characteristics

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

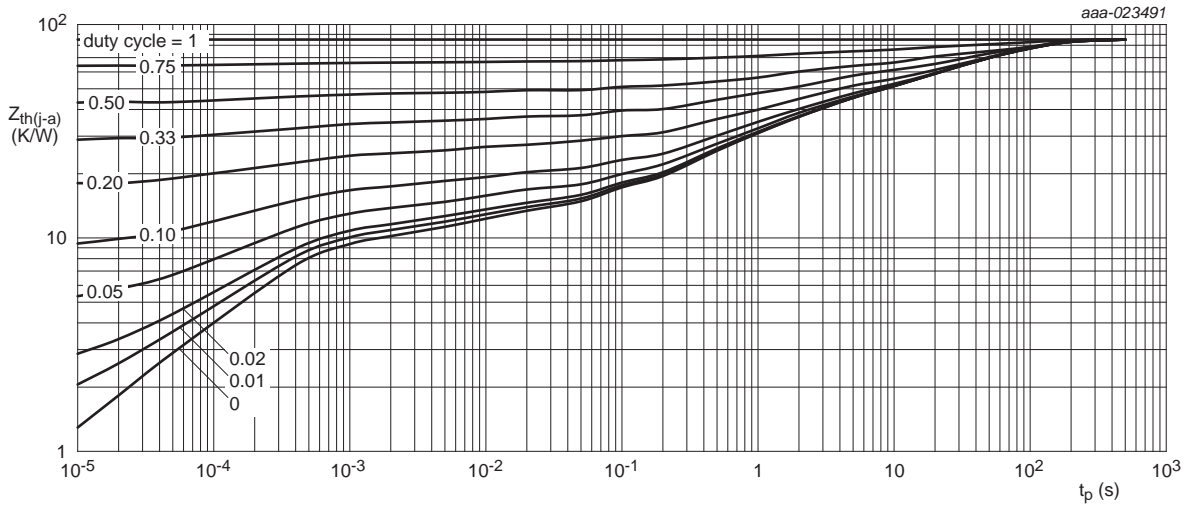
- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 6 cm².
- [4] 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 cm².





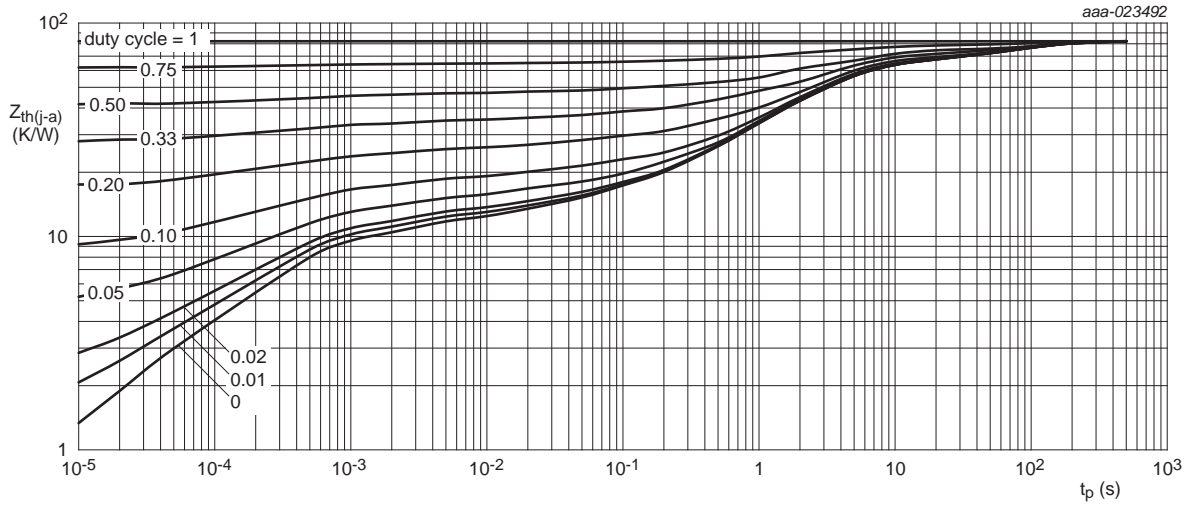
FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 cm²

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



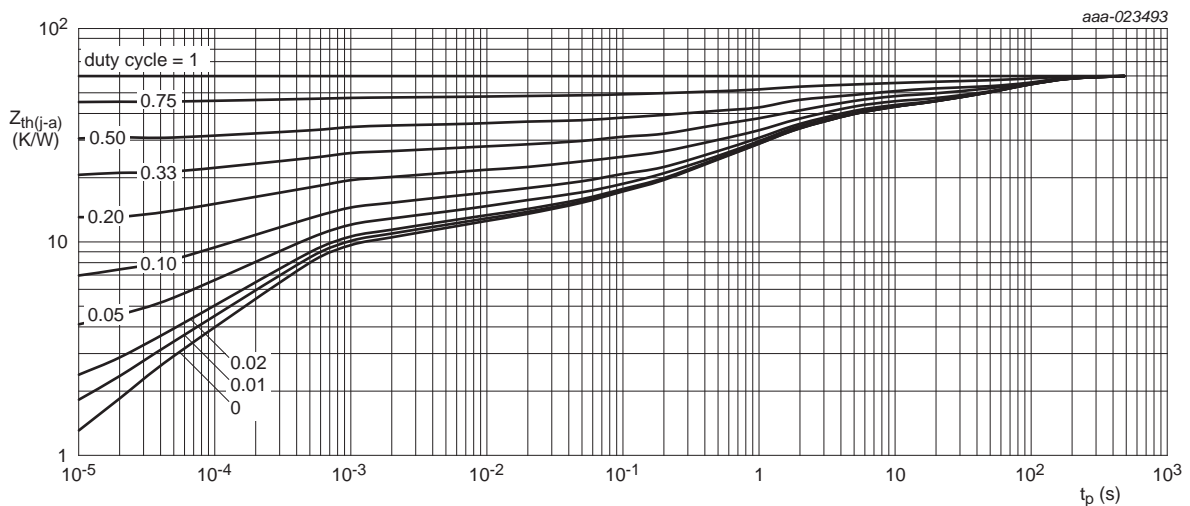
FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 6 cm²

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



FR4 PCB, 4-layer copper, tin-plated; mounting pad for collector 1 cm²

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

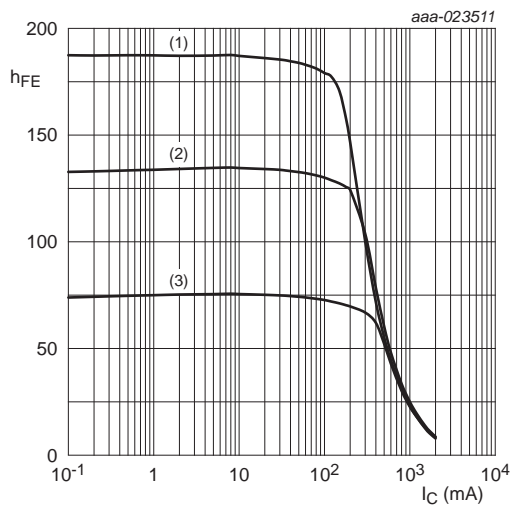
7. Characteristics

Table 8. Characteristics

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

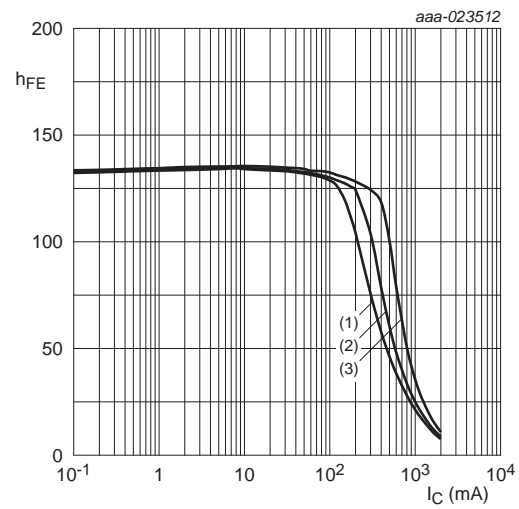
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = 30\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$	-	-	10	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	100	nA
h_{FE}	DC current gain	$V_{CE} = 2\text{ V}; I_C = 5\text{ mA}$	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	$V_{CE} = 2\text{ V}; I_C = 150\text{ mA}$ [1]	63	-	160	
	BCP56-16T	$V_{CE} = 2\text{ V}; I_C = 150\text{ mA}$ [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	$V_{CB} = 10\text{ V}; I_E = I_B = 0\text{ A};$ $f = 1\text{ MHz}$	-	4.5	-	pF

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



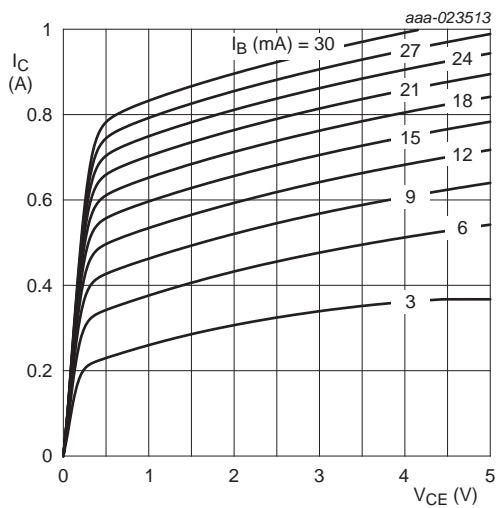
$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



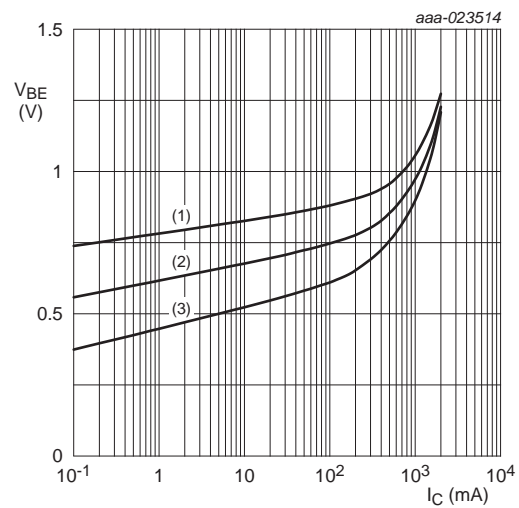
$T_{amb} = 25\text{ }^{\circ}\text{C}$
 (1) $V_{CE} = 1\text{ V}$
 (2) $V_{CE} = 2\text{ V}$
 (3) $V_{CE} = 5\text{ V}$

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



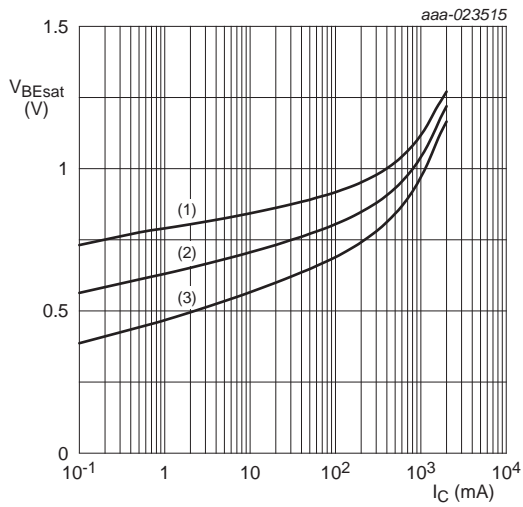
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



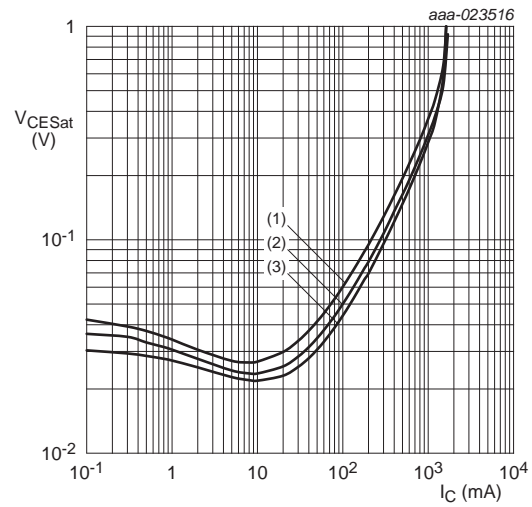
$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



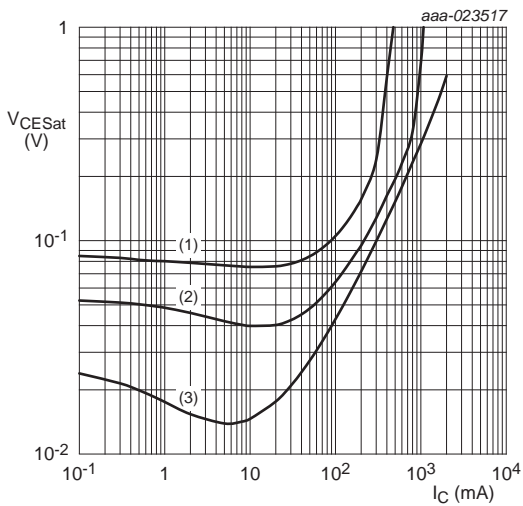
$I_C/I_B = 10$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



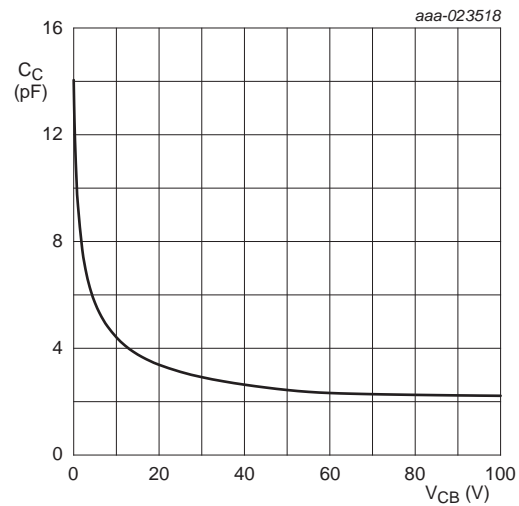
$I_C/I_B = 10$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



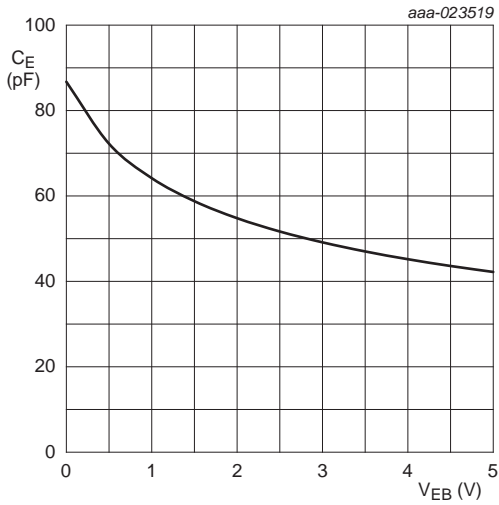
$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 50$
 (2) $I_C/I_B = 20$
 (3) $I_C/I_B = 5$

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



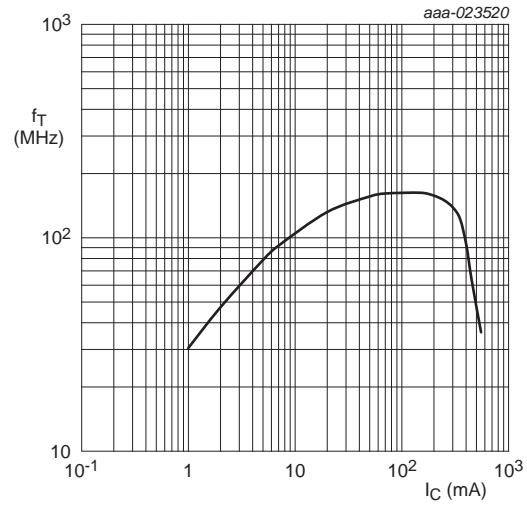
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

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



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

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

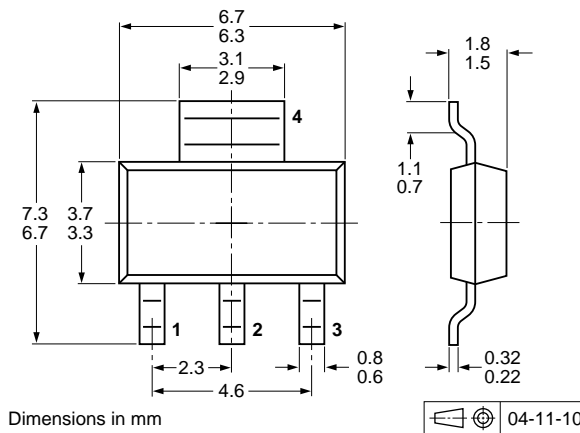


Fig 18. Package outline SOT223 (SC-73)

11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCP56H_SER v.1	20161123	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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13. Contact information

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