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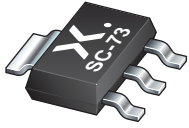
## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: [info@chipsmall.com](mailto:info@chipsmall.com) Web: [www.chipsmall.com](http://www.chipsmall.com)

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China





# BCP53H series

80 V, 1 A PNP medium power transistors

Rev. 1 — 21 July 2017

Product data sheet

## 1. Product profile

### 1.1 General description

PNP 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	JEITA	JEDEC	
BCP53H	SOT223	SC-73	-	BCP56H
BCP53-10H				BCP56-10H
BCP53-16H				BCP56-16H

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

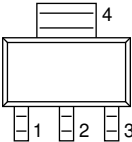
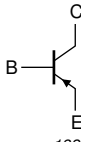
**Table 2. Quick reference data ...continued**  
 $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

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	
	BCP53-10H	$V_{CE} = -2\text{ V}$ ; $I_C = -150\text{ mA}$ [1]	63	-	160	
	BCP53-16H	$V_{CE} = -2\text{ V}$ ; $I_C = -150\text{ mA}$ [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		 sym132
2	C	collector		
3	E	emitter		
4	C	collector		

## 3. Ordering information

**Table 4. Ordering information**

Type number	Package		
	Name	Description	Version
BCP53H	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223
BCP53-10H			
BCP53-16H			

## 4. Marking

**Table 5. Marking codes**

Type number	Marking code
BCP53H	BCP53H
BCP53-10H	P5310H
BCP53-16H	P5316H

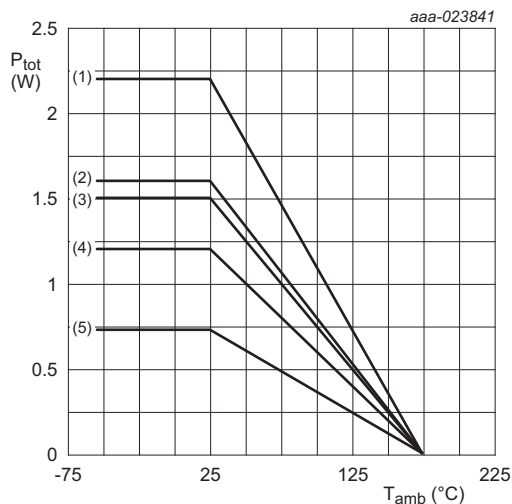
## 5. Limiting values

**Table 6. Limiting values**

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

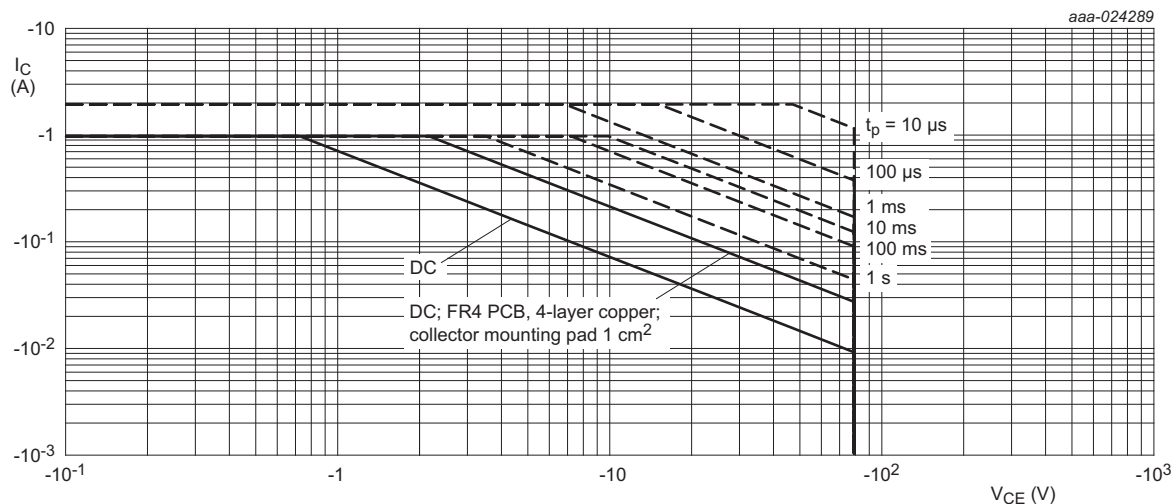
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter	-	-100	V
$V_{CEO}$	collector-emitter voltage	open base	-	-80	V
$V_{EBO}$	emitter-base voltage	open collector	-	-7	V
$I_C$	collector current		-	-1	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-2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



- (1) FR4 PCB, 4-layer copper, 1 cm<sup>2</sup>
- (2) FR4 PCB, 4-layer copper, standard footprint
- (3) FR4 PCB, single-sided copper, 6 cm<sup>2</sup>
- (4) FR4 PCB, single-sided copper, 1 cm<sup>2</sup>
- (5) FR4 PCB, single-sided copper, standard footprint

**Fig 1. Power derating curves**



Unless otherwise specified:

$T_{amb} = 25\text{ °C}$

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**

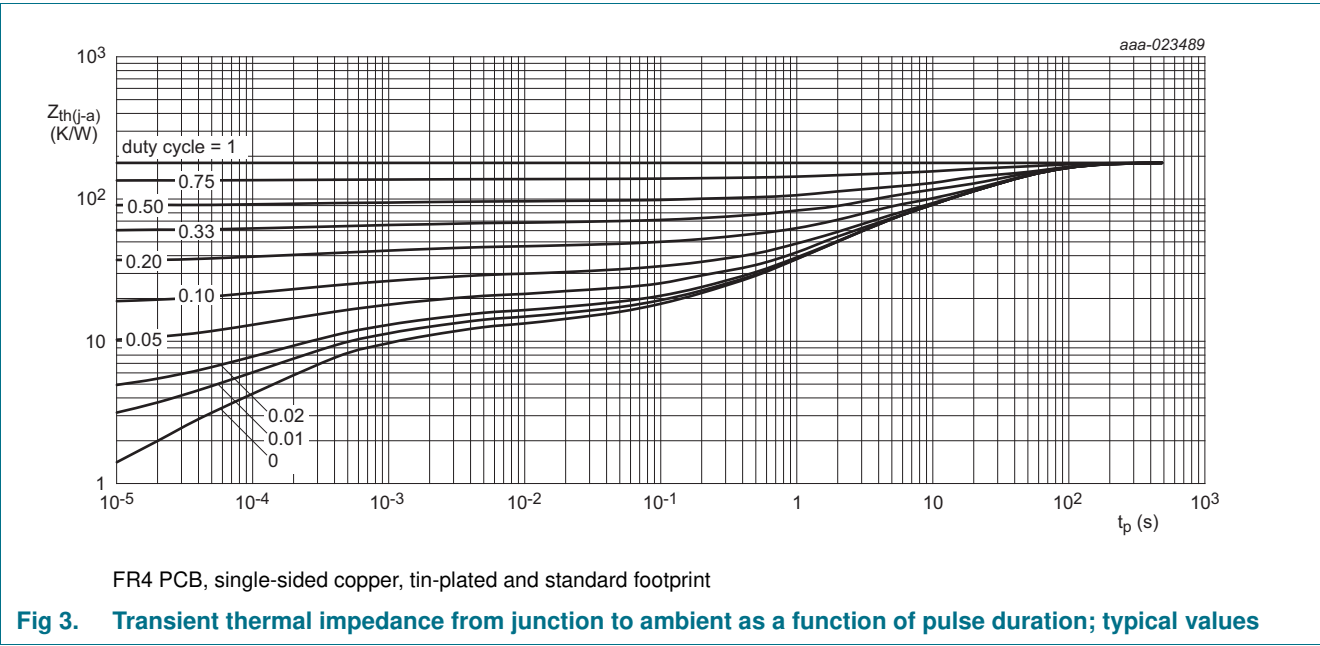


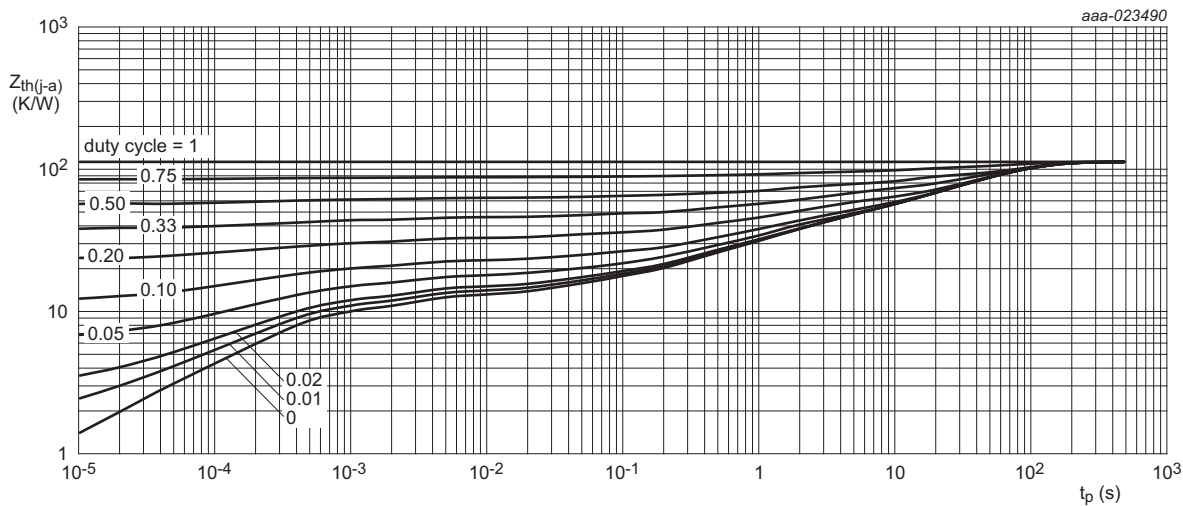
6. Thermal characteristics

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

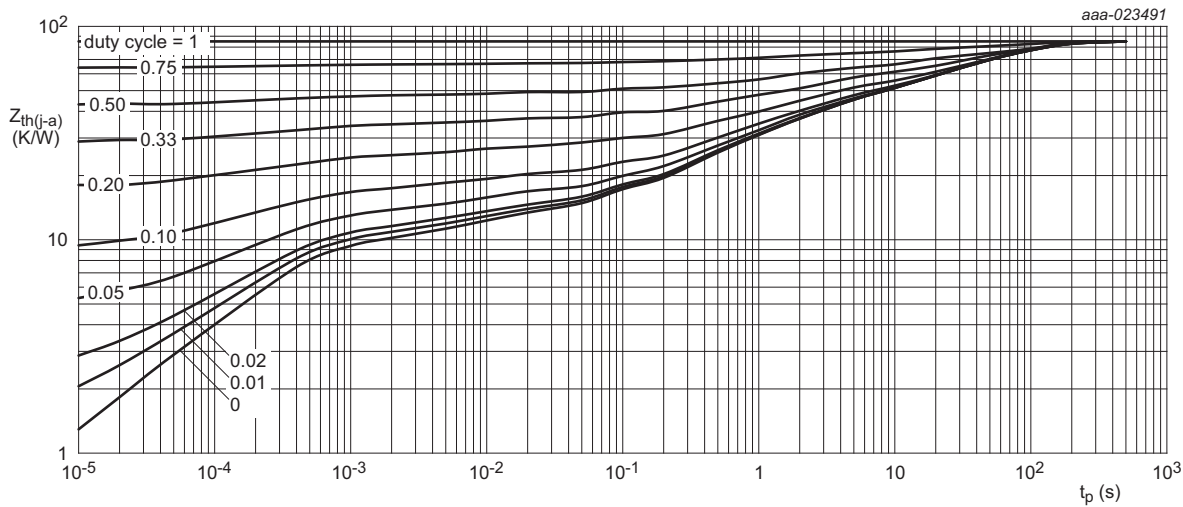
- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.  
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 cm<sup>2</sup>.  
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated; mounting pad for collector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





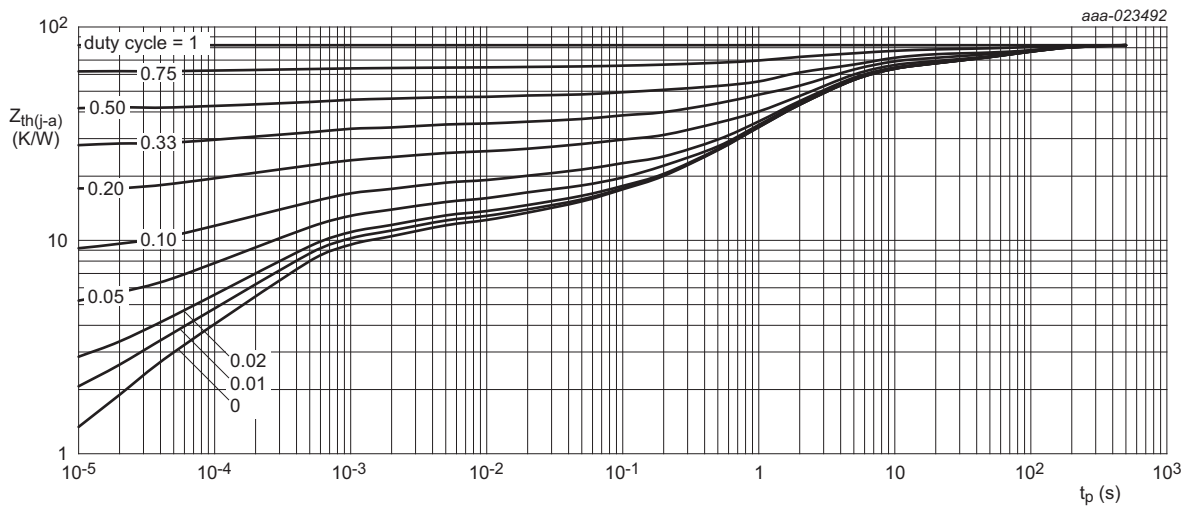
FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 cm<sup>2</sup>

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



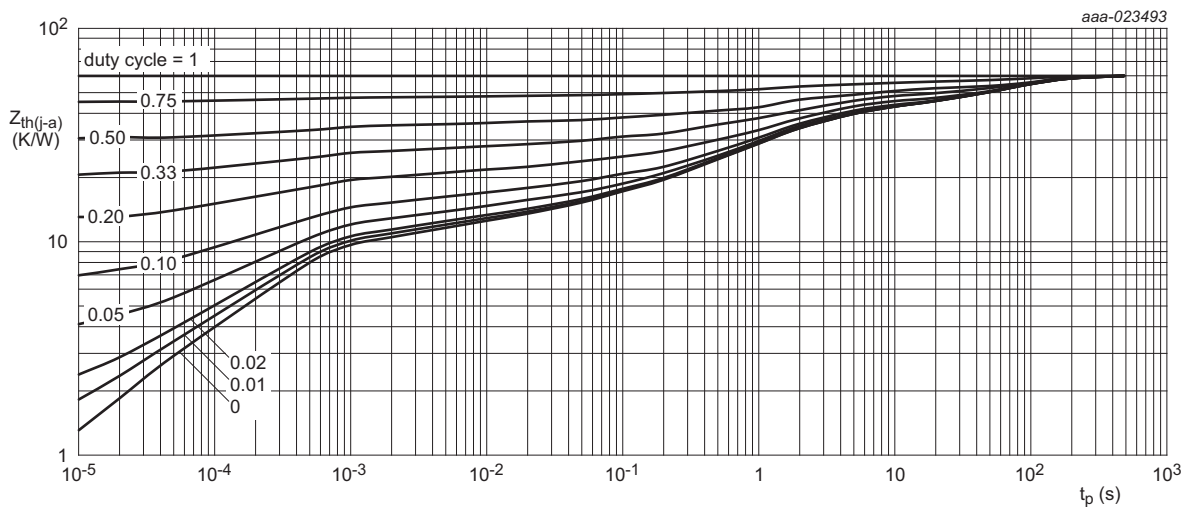
FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 6 cm<sup>2</sup>

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



FR4 PCB, 4-layer copper, tin-plated; mounting pad for collector 1 cm<sup>2</sup>

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



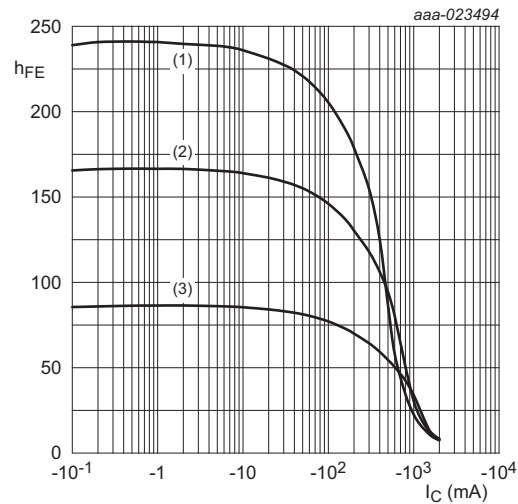
## 7. Characteristics

**Table 8. Characteristics**

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

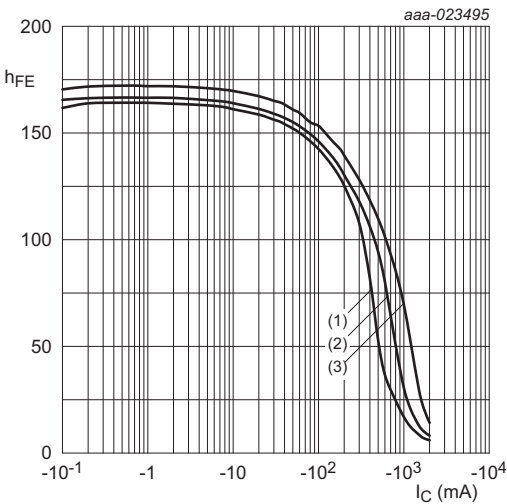
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -30\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	-10	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}$	-	-	-100	nA
$h_{FE}$	DC current gain	$V_{CE} = -2\text{ V}; I_C = -5\text{ mA}$	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	-	-	
	BCP53-10H	$V_{CE} = -2\text{ V}; I_C = -150\text{ mA}$ [1]	63	-	160	
	BCP53-16H	$V_{CE} = -2\text{ V}; I_C = -150\text{ mA}$ [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	140	-	MHz
$C_C$	collector capacitance	$V_{CB} = -10\text{ V}; I_E = I_E = 0\text{ A}; f = 1\text{ MHz}$	-	7	-	pF

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



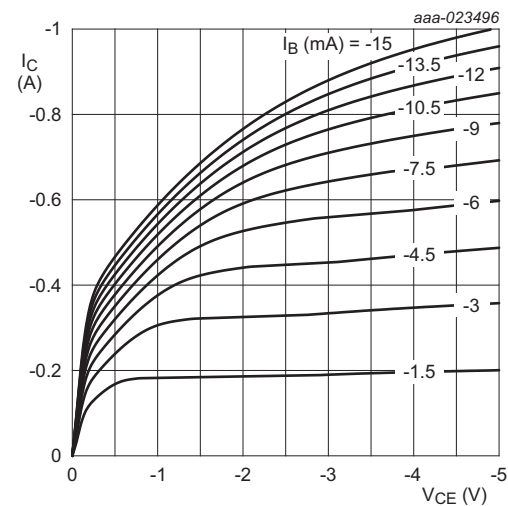
- $V_{CE} = -2$  V
- (1)  $T_{amb} = 100$  °C
  - (2)  $T_{amb} = 25$  °C
  - (3)  $T_{amb} = -55$  °C

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



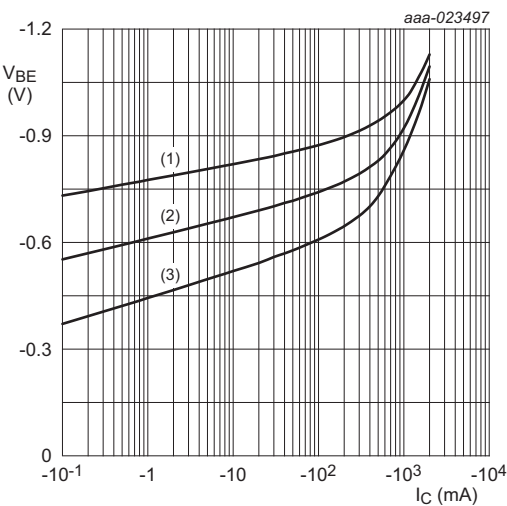
- $T_{amb} = 25$  °C
- (1)  $V_{CE} = -1$  V
  - (2)  $V_{CE} = -2$  V
  - (3)  $V_{CE} = -5$  V

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



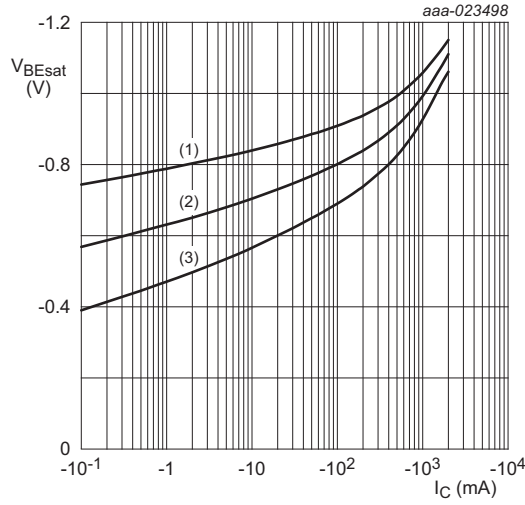
$T_{amb} = 25$  °C

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



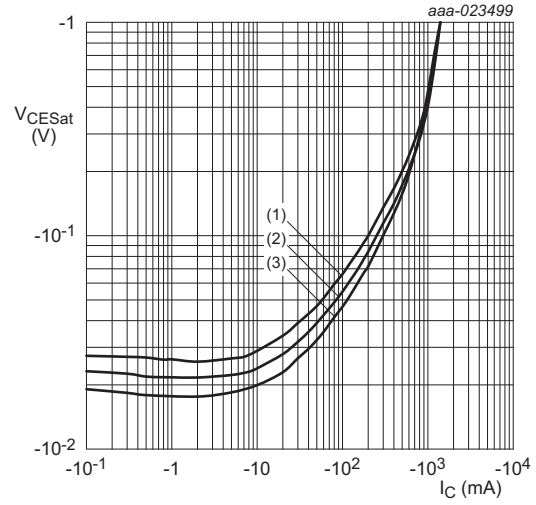
- $V_{CE} = -2$  V
- (1)  $T_{amb} = -55$  °C
  - (2)  $T_{amb} = 25$  °C
  - (3)  $T_{amb} = 100$  °C

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



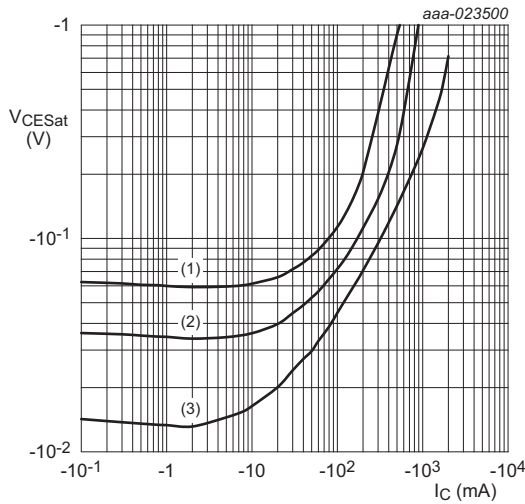
- $I_C/I_B = 10$
- (1)  $T_{amb} = -55\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = 100\text{ °C}$

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



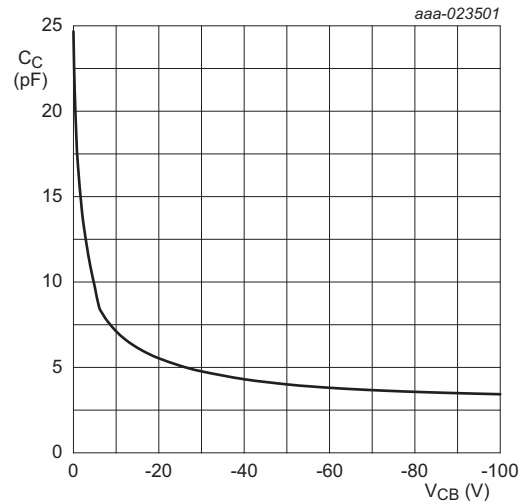
- $I_C/I_B = 10$
- (1)  $T_{amb} = 100\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

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



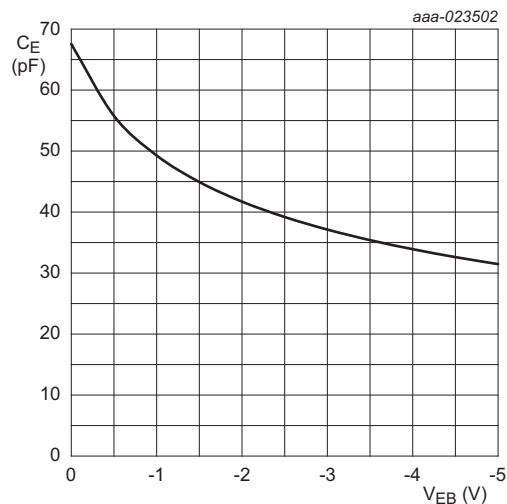
- $T_{amb} = 25\text{ °C}$
- (1)  $I_C/I_B = 50$
  - (2)  $I_C/I_B = 20$
  - (3)  $I_C/I_B = 5$

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



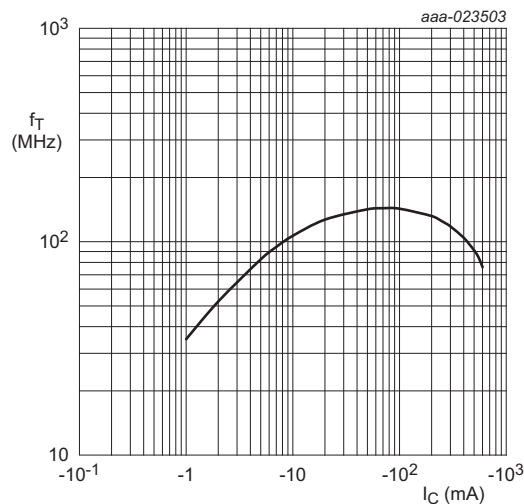
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

**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



$V_{CE} = -5 \text{ V}$ ;  
 $f = 100 \text{ MHz}$ ;  $T_{\text{amb}} = 25 \text{ }^{\circ}\text{C}$

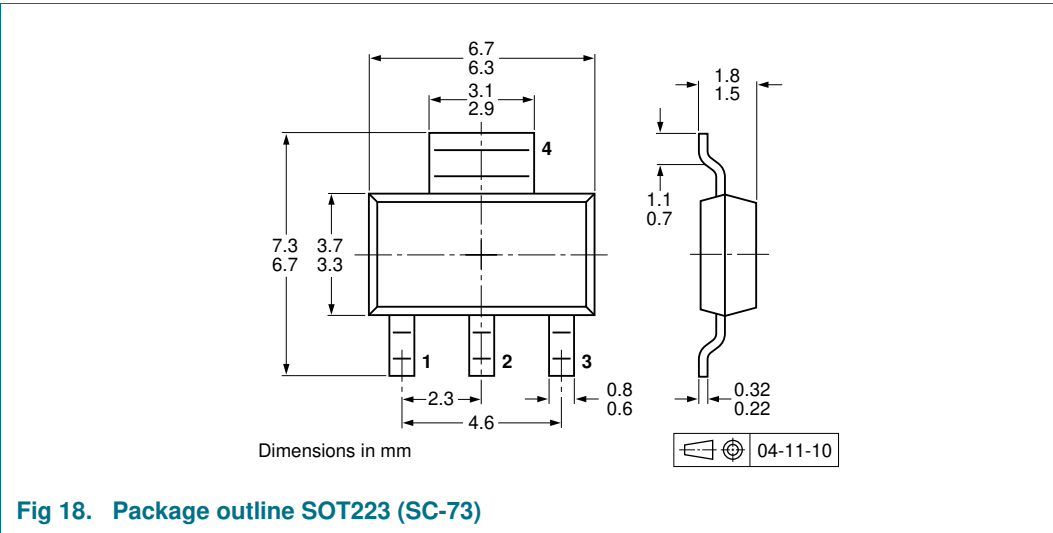
Fig 17. Transition frequency as a function of collector current; typical values

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



10. Soldering

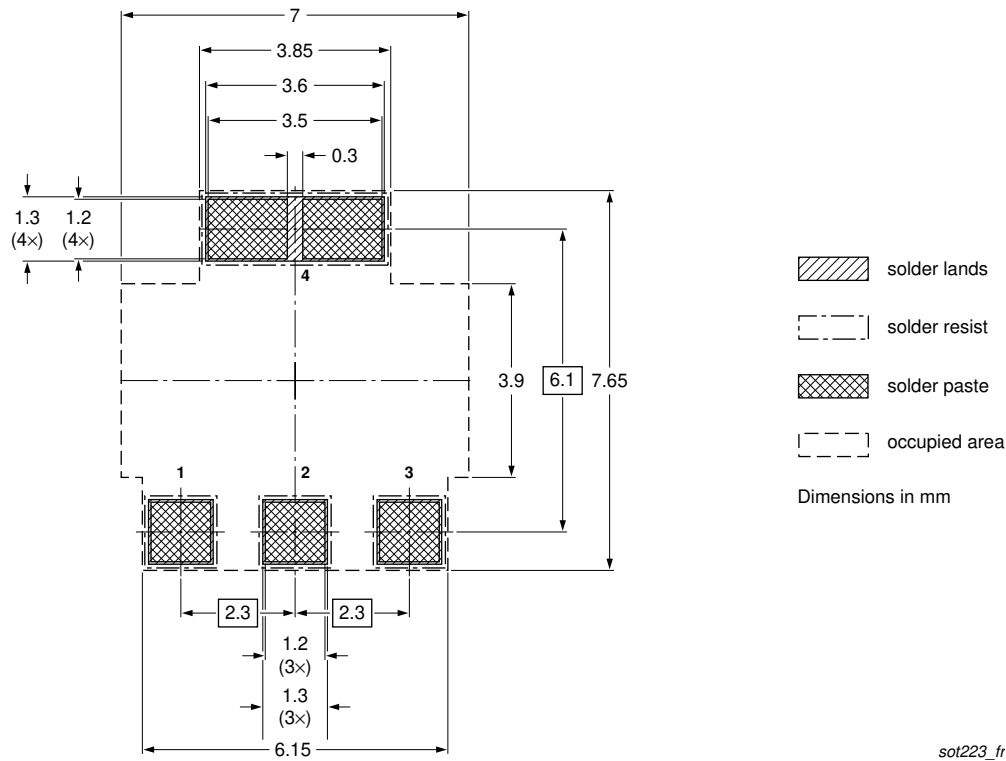


Fig 19. Reflow soldering footprint SOT223 (SC-73)

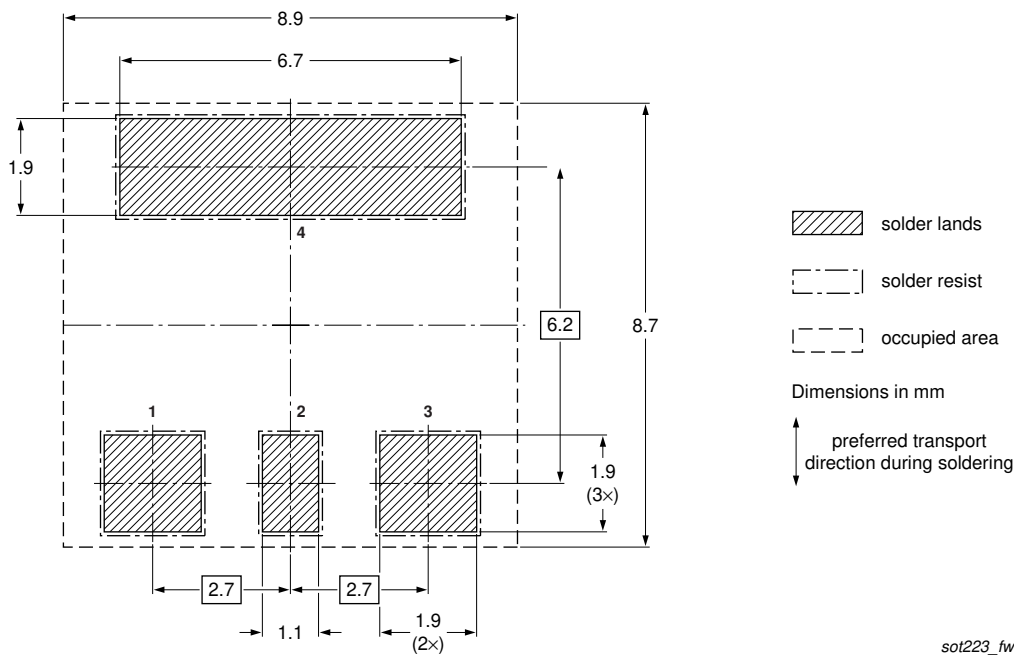


Fig 20. Wave soldering footprint SOT223 (SC-73)

## 11. Revision history

**Table 9.** Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCP53H_SER v.1	20170721	Product data sheet	-	-



## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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[salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)

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