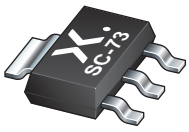



# BCP53H series

## 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 °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*

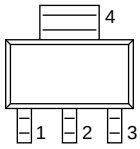
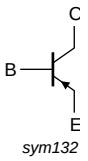
*$T_{amb}$ = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $h_{FE}$ | DC current gain | $V_{CE}$ = −2 V; $I_C$ = −150 mA [1] | 63 | - | 250 | |
| | BCP53-10H | $V_{CE}$ = −2 V; $I_C$ = −150 mA [1] | 63 | - | 160 | |
| | BCP53-16H | $V_{CE}$ = −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 |   |   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 |

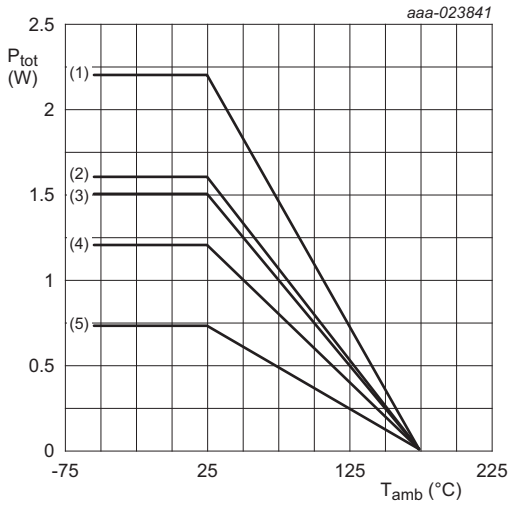
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 $cm^2$.

[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 $cm^2$

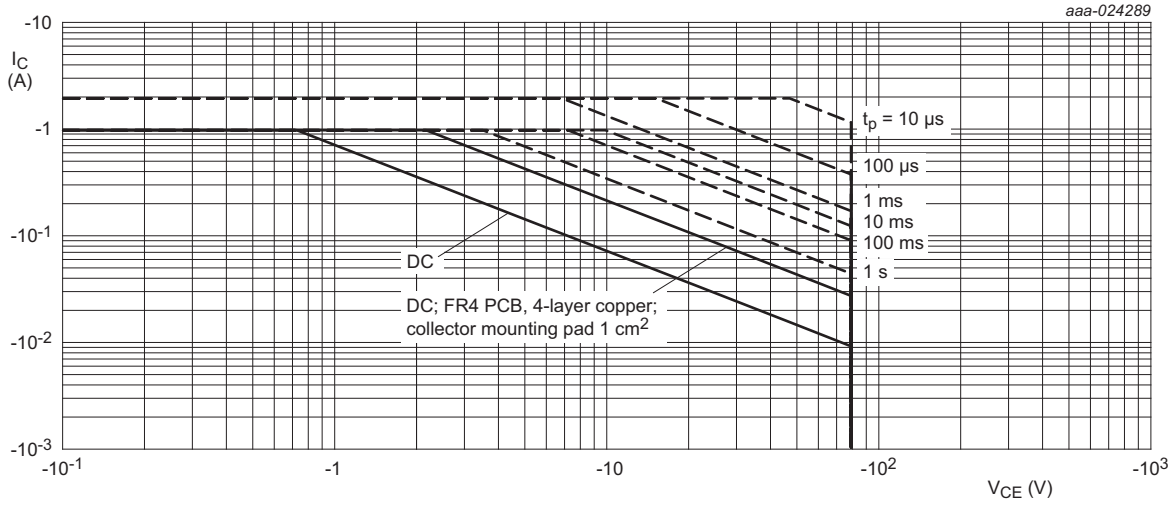
(2) FR4 PCB, 4-layer copper, standard footprint

(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**




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 |

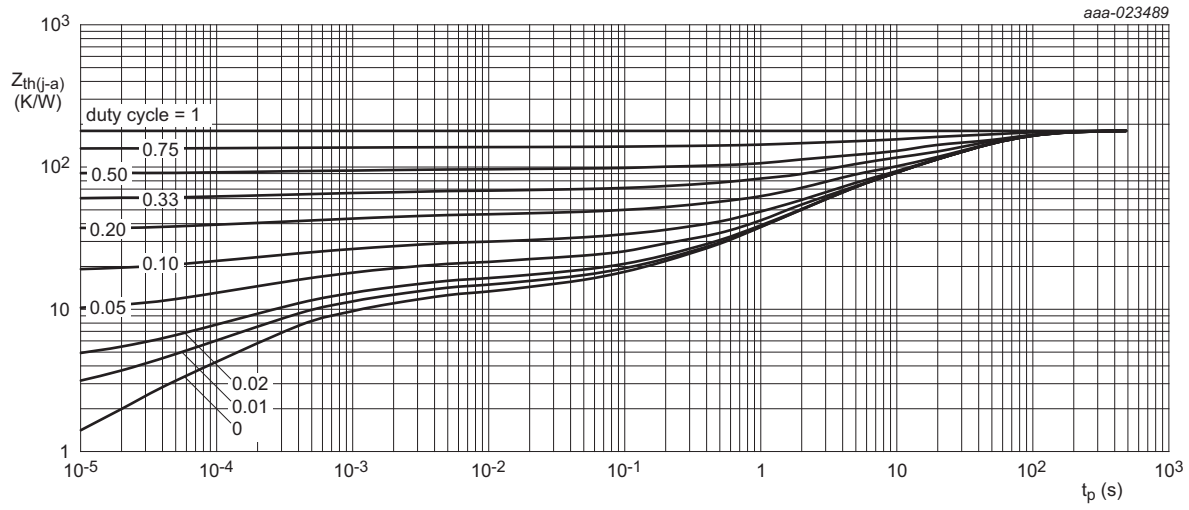
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 $cm^2$.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 6 $cm^2$.

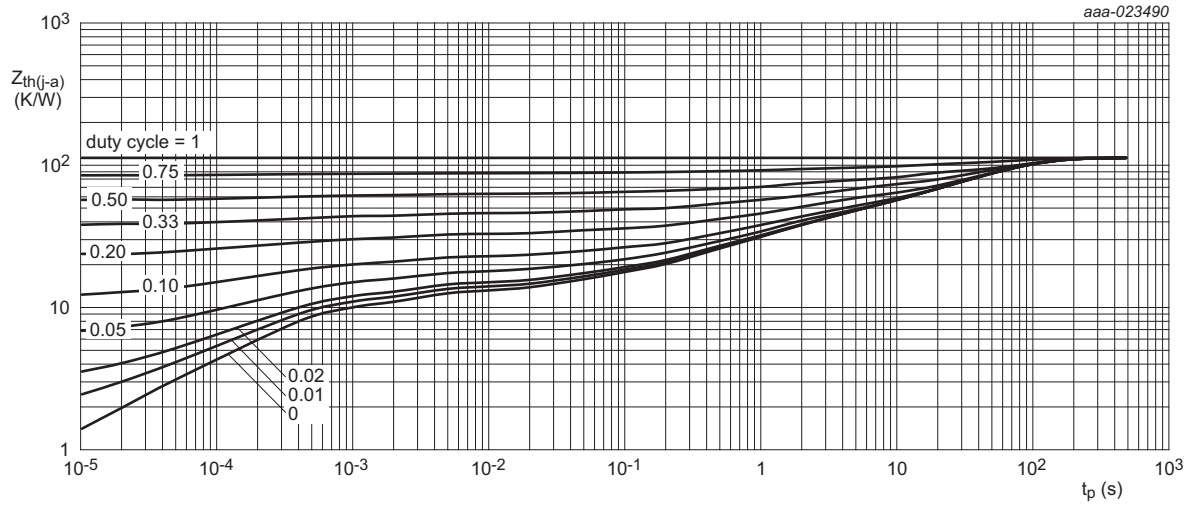
[4] Device mounted on an FR4 PCB, 4-layer copper; tin-plated and standard footprint.

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



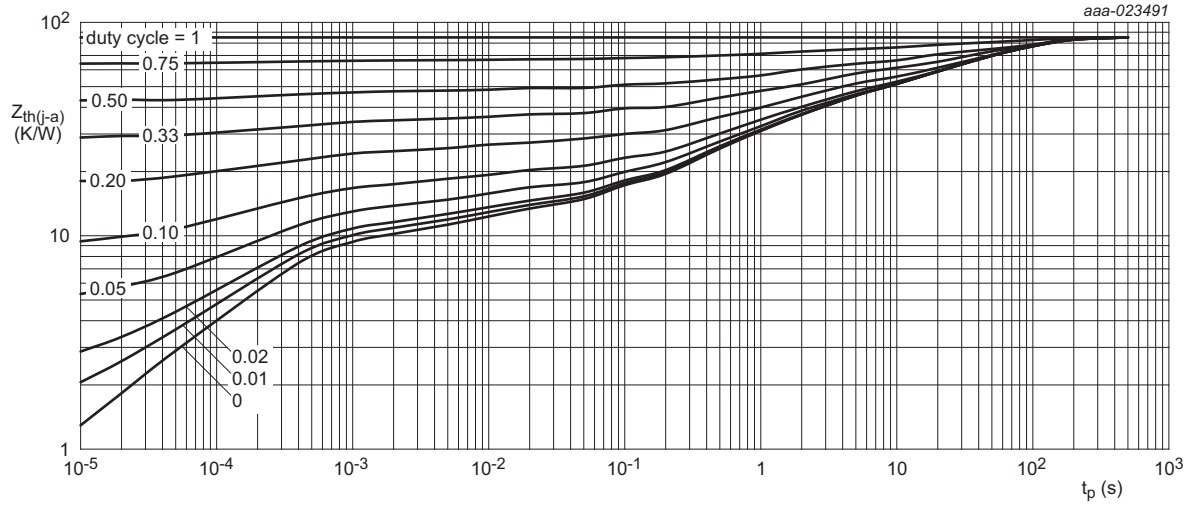

FR4 PCB, single-sided copper, tin-plated and standard footprint

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



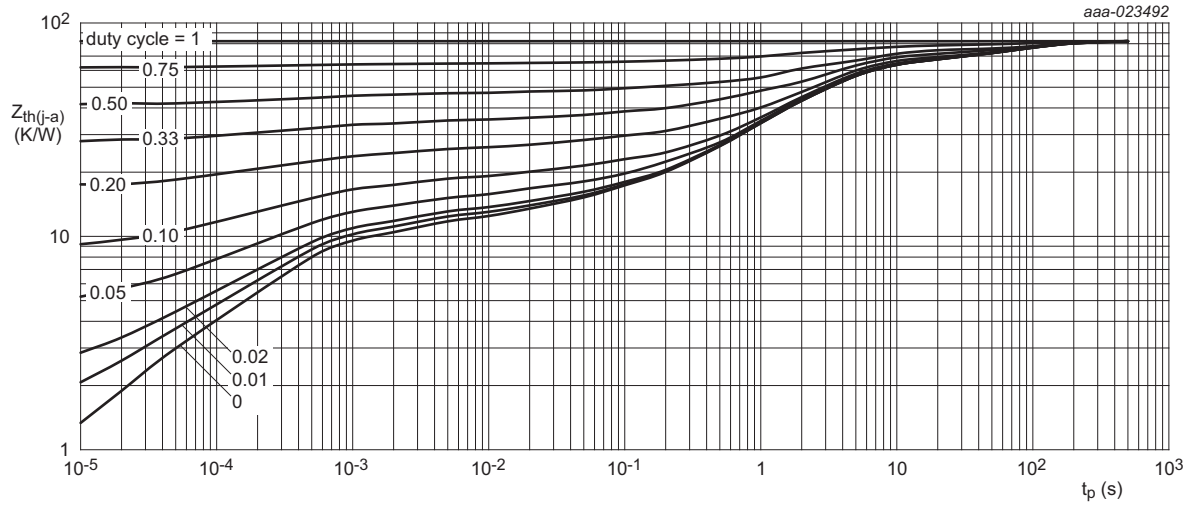

FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 $cm^2$

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



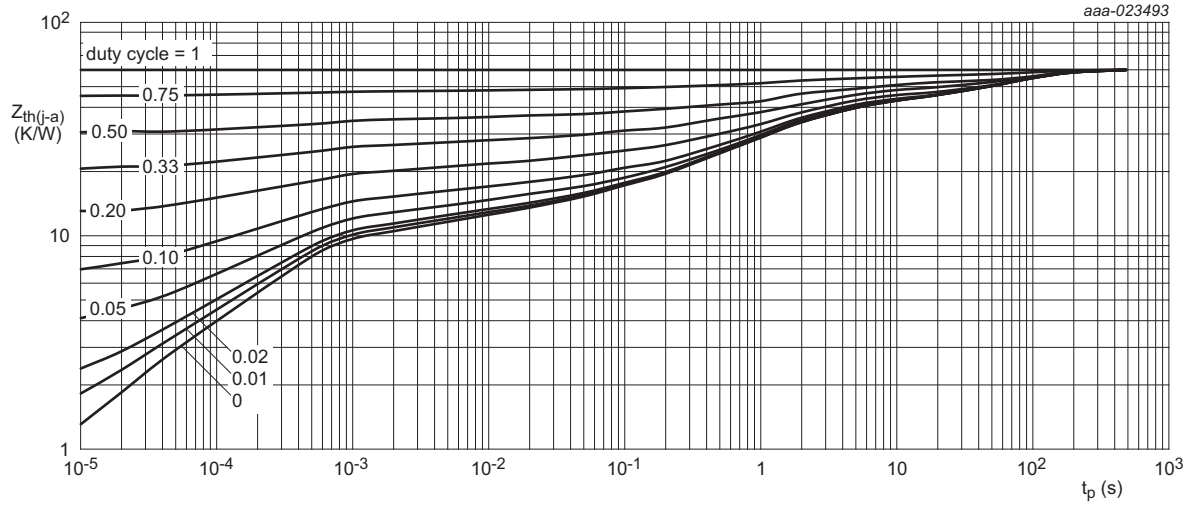

FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 6 $cm^2$

**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**

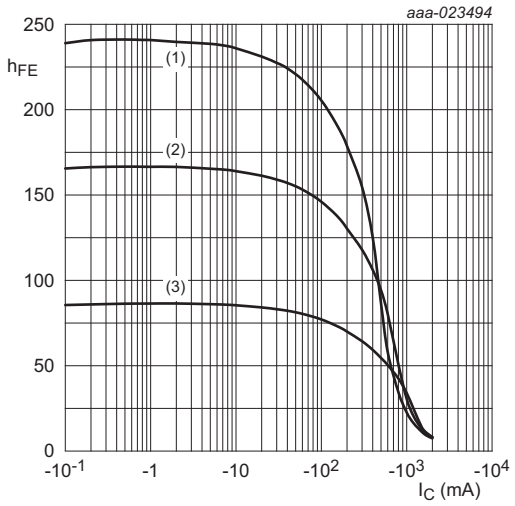
# 7. Characteristics

**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 | - | - | |
| | BCP53-10H | $V_{CE}$ = –2 V; $I_C$ = –150 mA [1] | 63 | - | 160 | |
| | BCP53-16H | $V_{CE}$ = –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 | 140 | - | MHz |
| $C_c$ | collector capacitance | $V_{CB}$ = –10 V; $I_E$ = $i_e$ = 0 A; f = 1 MHz | - | 7 | - | pF |

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



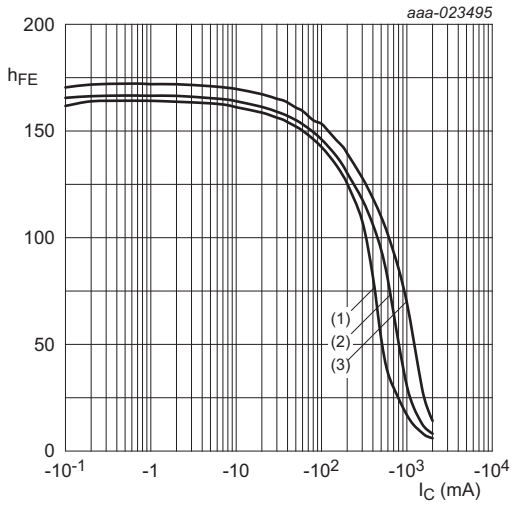

$V_{CE}$ = –2 V

(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**



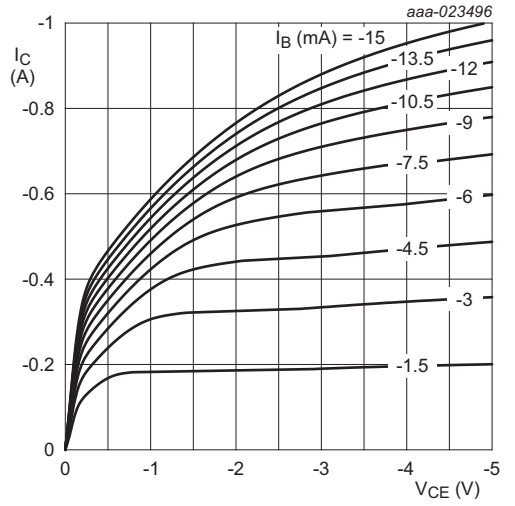

$T_{amb}$ = 25 °C

(1) $V_{CE}$ = –1 V

(2) $V_{CE}$ = –2 V

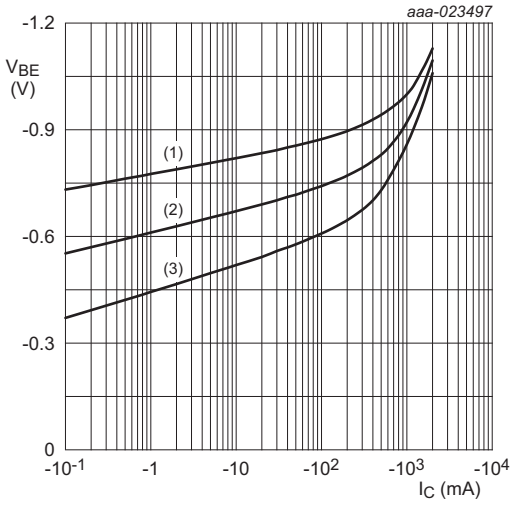
(3) $V_{CE}$ = –5 V

**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**



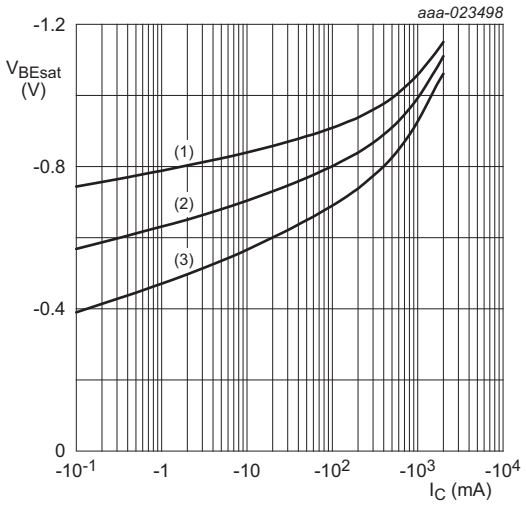

$V_{CE}$ = –2 V

(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**



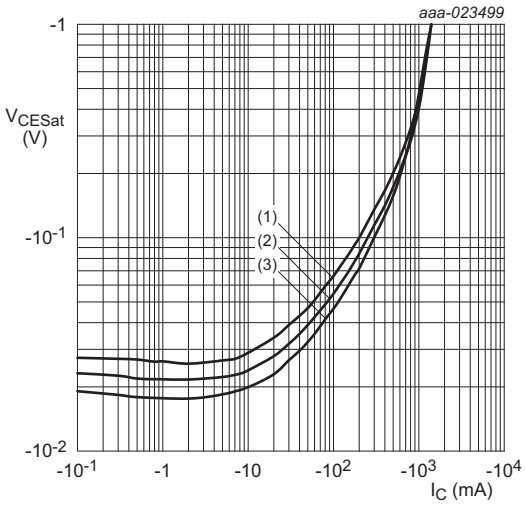

$I_C/I_B = 10$

(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**



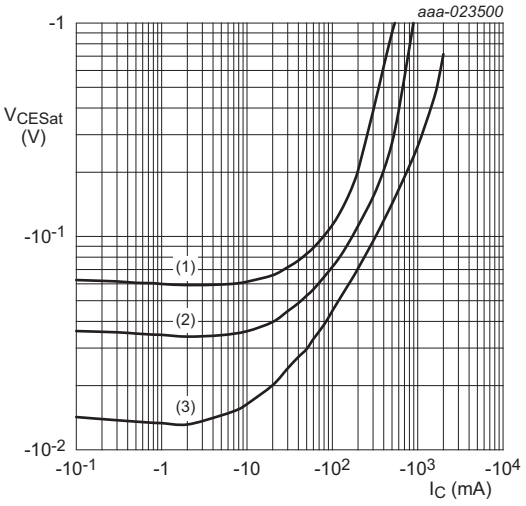

$I_C/I_B = 10$

(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**



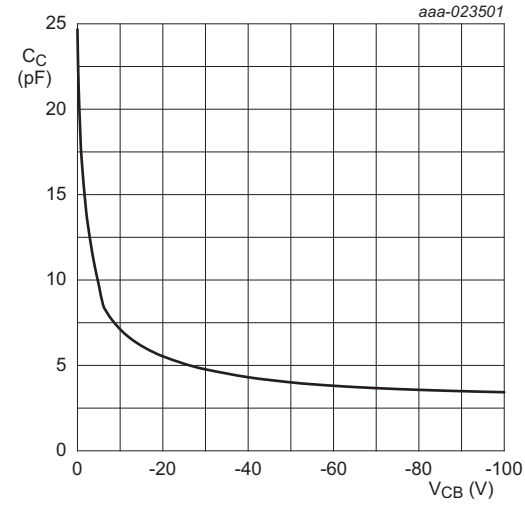

$T_{amb} = 25$ °C

(1) $I_C/I_B = 50$

(2) $I_C/I_B = 20$

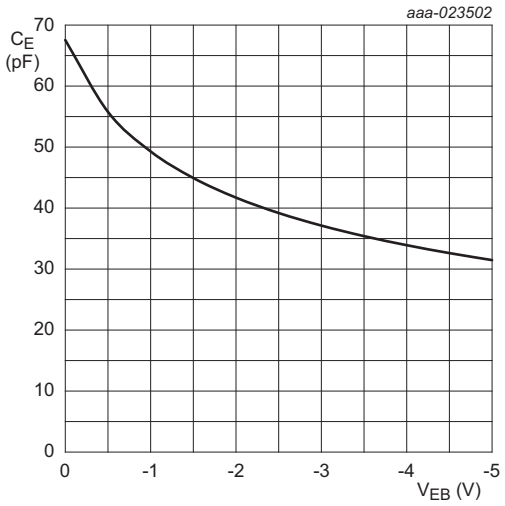
(3) $I_C/I_B = 5$

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



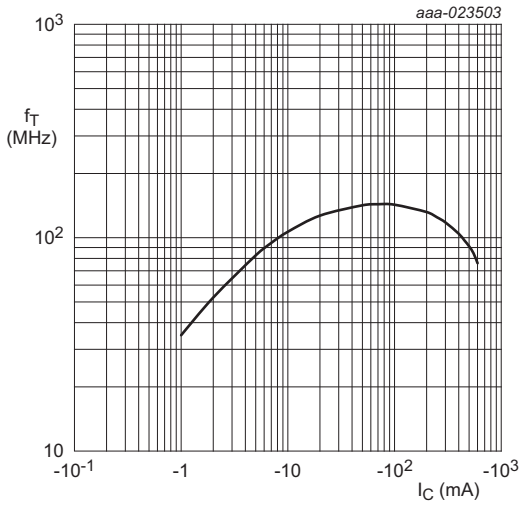

f = 1 MHz; $T_{amb} = 25$ °C

**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

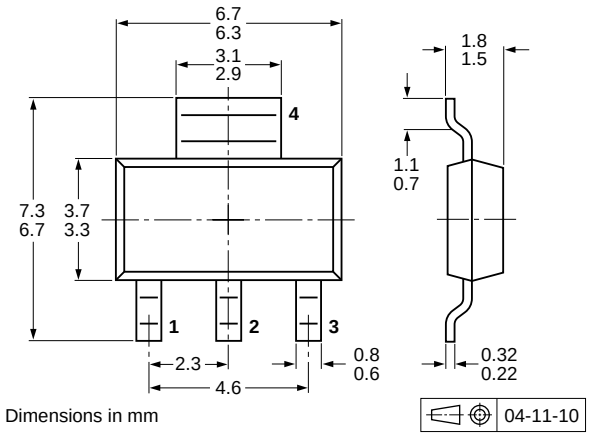



**Fig 18. Package outline SOT223 (SC-73)**

## 10. Soldering

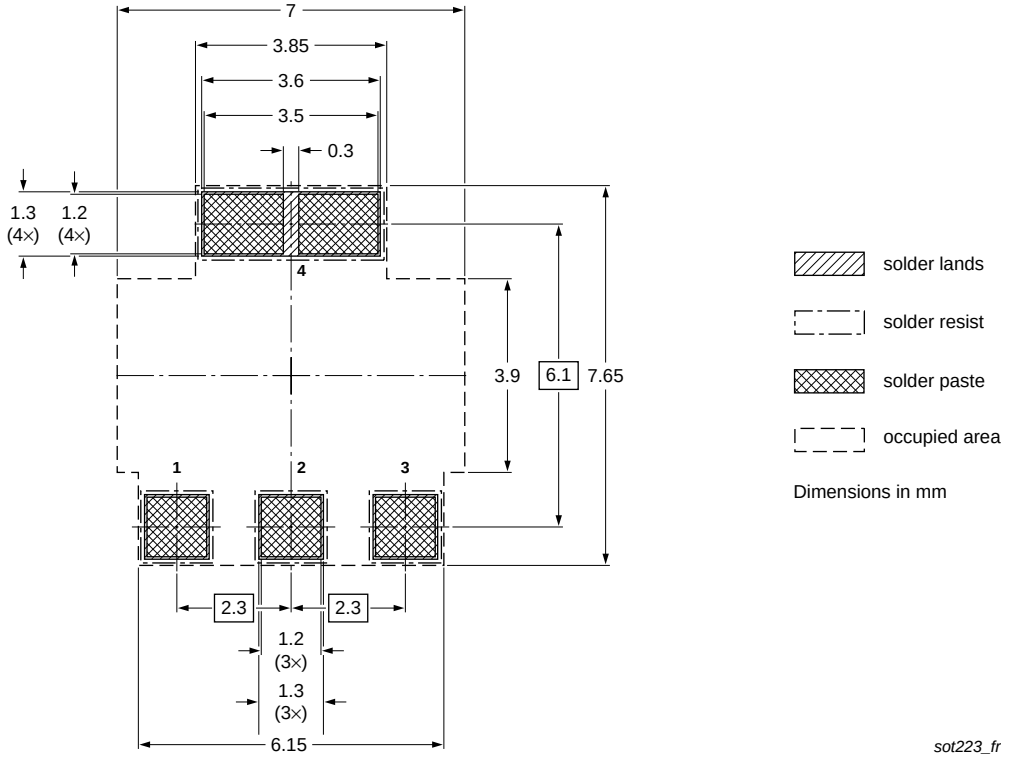



**Fig 19. Reflow soldering footprint SOT223 (SC-73)**

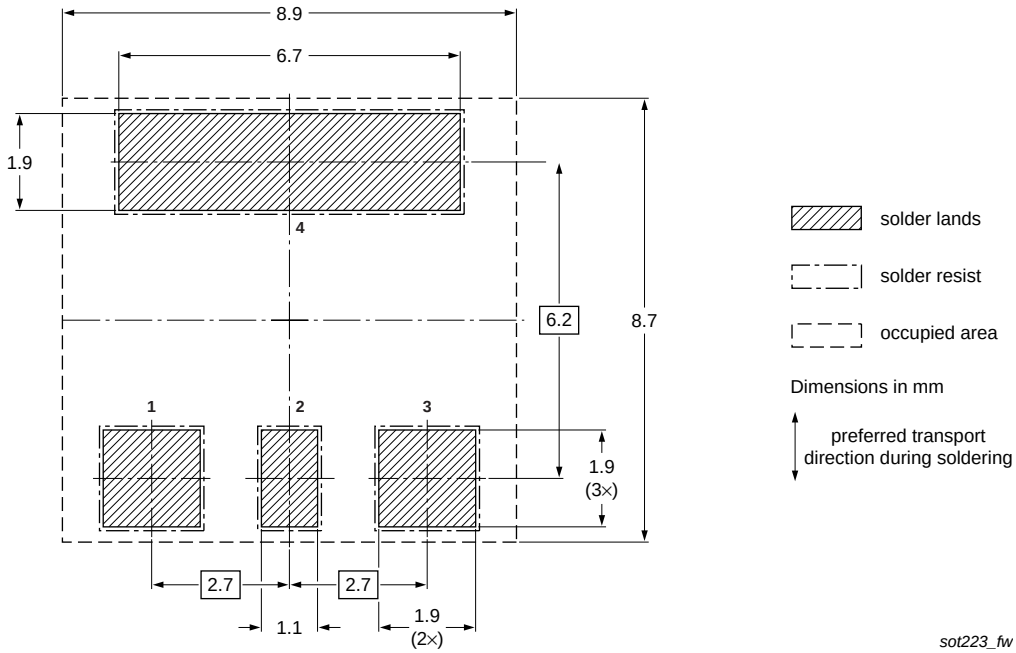



**Fig 20. Wave soldering footprint SOT223 (SC-73)**

## 11. Revision history

**Table 9. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BCP53H_SER v.1 | 20170721 | 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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### 12.4 Trademarks

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## 13. Contact information

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

For sales office addresses, please send an email to:

**salesaddresses@nexperia.com**

## 14. Contents





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