



# BCP52T series

60 V, 1 A PNP medium power transistors

Rev. 1 — 29 April 2019

Product data sheet

## 1. Product profile

### 1.1. General description

PNP medium power transistors in a medium power SOT223 (SC73) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

| Type number | Package  |       | NPN complement |
|-------------|----------|-------|----------------|
|             | Nexperia | JEDEC |                |
| BCP52T      | SOT223   | SC-73 | BCP55T         |
| BCP52-10T   |          |       | BCP55-10T      |
| BCP52-16T   |          |       | BCP55-16T      |

### 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
- High-side switches
- Power management
- Amplifiers

### 1.4. Quick reference data

Table 2. Quick reference data

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

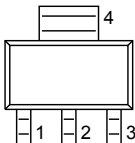
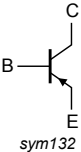
| Symbol    | Parameter                 | Conditions                           | Min | Typ | Max | Unit |
|-----------|---------------------------|--------------------------------------|-----|-----|-----|------|
| $V_{CEO}$ | collector-emitter voltage | open base                            | -   | -   | -60 | V    |
| $I_C$     | collector current         |                                      | -   | -   | -1  | A    |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1\text{ ms}$ | -   | -   | -2  | A    |

| Symbol   | Parameter       | Conditions                                     |     | Min | Typ | Max | Unit |
|----------|-----------------|------------------------------------------------|-----|-----|-----|-----|------|
| $h_{FE}$ | DC current gain |                                                |     |     |     |     |      |
|          | BCP52T          | $V_{CE} = -2 \text{ V}; I_C = -150 \text{ mA}$ | [1] | 63  | -   | 250 |      |
|          | BCP52-10T       |                                                | [1] | 63  | -   | 160 |      |
|          | BCP52-16T       |                                                | [1] | 100 | -   | 250 |      |

[1] pulsed;  $t_p \leq 300 \mu\text{s}$ ;  $\delta \leq 0.02$

## 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 |                                                                      | Version |
|-------------|---------|----------------------------------------------------------------------|---------|
|             | Name    | Description                                                          |         |
| BCP52T      | SC-73   | plastic, surface-mounted package with increased heatsink;<br>4 leads | SOT223  |
| BCP52-10T   |         |                                                                      |         |
| BCP52-16T   |         |                                                                      |         |

## 4. Marking

Table 5. Marking

| Type number | Marking code |
|-------------|--------------|
| BCP52T      | BCP52T       |
| BCP52-10T   | P5210T       |
| BCP52-16T   | P5216T       |

5. Limiting values

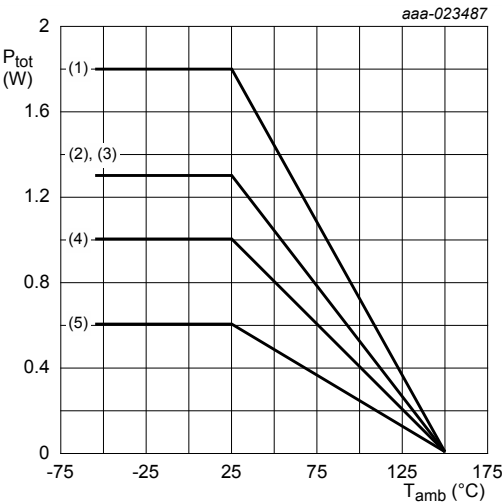
Table 6. Limiting values

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

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

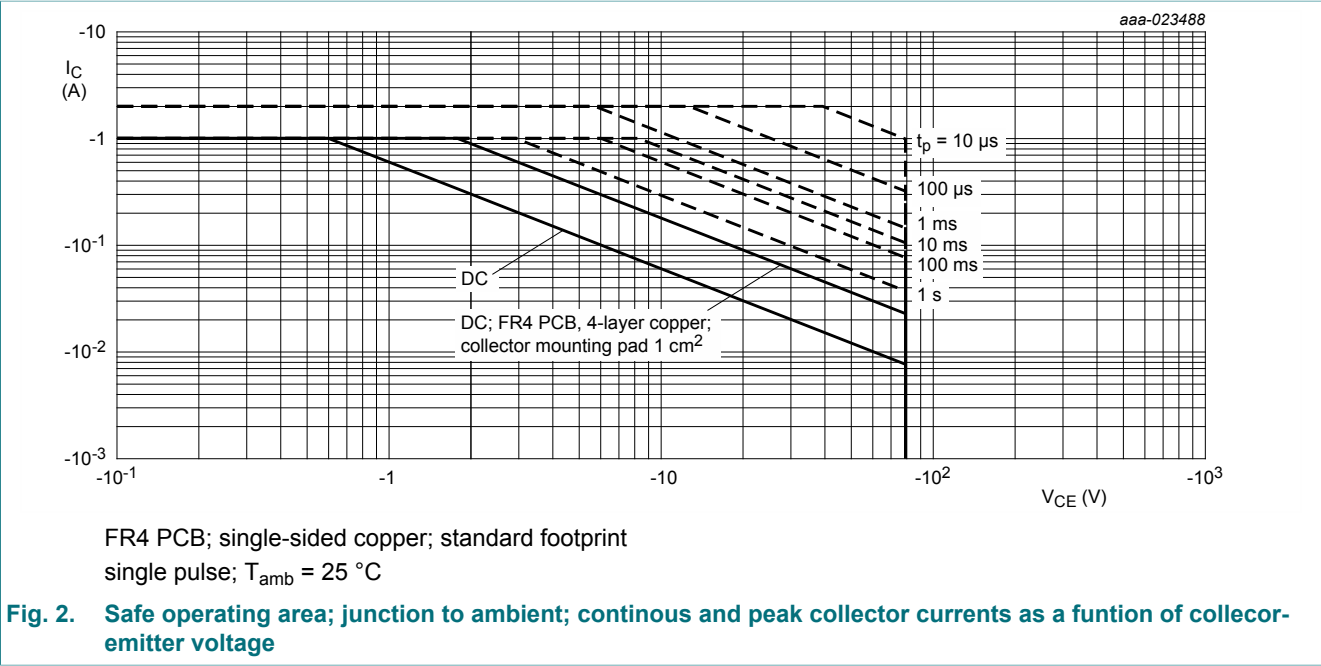
| Symbol    | Parameter                 | Conditions                                    | Min | Max  | Unit               |
|-----------|---------------------------|-----------------------------------------------|-----|------|--------------------|
| $V_{CBO}$ | collector-base voltage    | open emitter                                  | -   | -60  | V                  |
| $V_{CEO}$ | collector-emitter voltage | open base                                     | -   | -60  | V                  |
| $V_{EBO}$ | emitter-base voltage      | open collector                                | -   | -5   | V                  |
| $I_C$     | collector current         |                                               | -   | -1   | A                  |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1\text{ ms}$          | -   | -2   | A                  |
| $I_B$     | base current              |                                               | -   | -0.2 | A                  |
| $I_{BM}$  | peak base current         | single pulse; $t_p \leq 1\text{ ms}$          | -   | -0.3 | A                  |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ [1] | -   | 0.6  | W                  |
|           |                           | [2]                                           | -   | 1    | W                  |
|           |                           | [3]                                           | -   | 1.3  | W                  |
|           |                           | [4]                                           | -   | 1.3  | W                  |
|           |                           | [5]                                           | -   | 1.8  | W                  |
| $T_j$     | junction temperature      |                                               | -   | 150  | $^{\circ}\text{C}$ |
| $T_{amb}$ | ambient temperature       |                                               | -55 | 150  | $^{\circ}\text{C}$ |
| $T_{stg}$ | storage temperature       |                                               | -65 | 150  | $^{\circ}\text{C}$ |

- [1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated and standard footprint.
- [2] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.
- [3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.
- [4] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated and standard footprint.
- [5] Device mounted on an FR4 Printed-Circuit-Board (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; single-sided copper; 6 cm<sup>2</sup>
- (3) FR4 PCB; 4-layer copper; standard footprint
- (4) FR4 PCB; single-sided copper; 1 cm<sup>2</sup>
- (5) FR4 PCB; single-sided copper; standard footprint

Fig. 1. Power derating curves



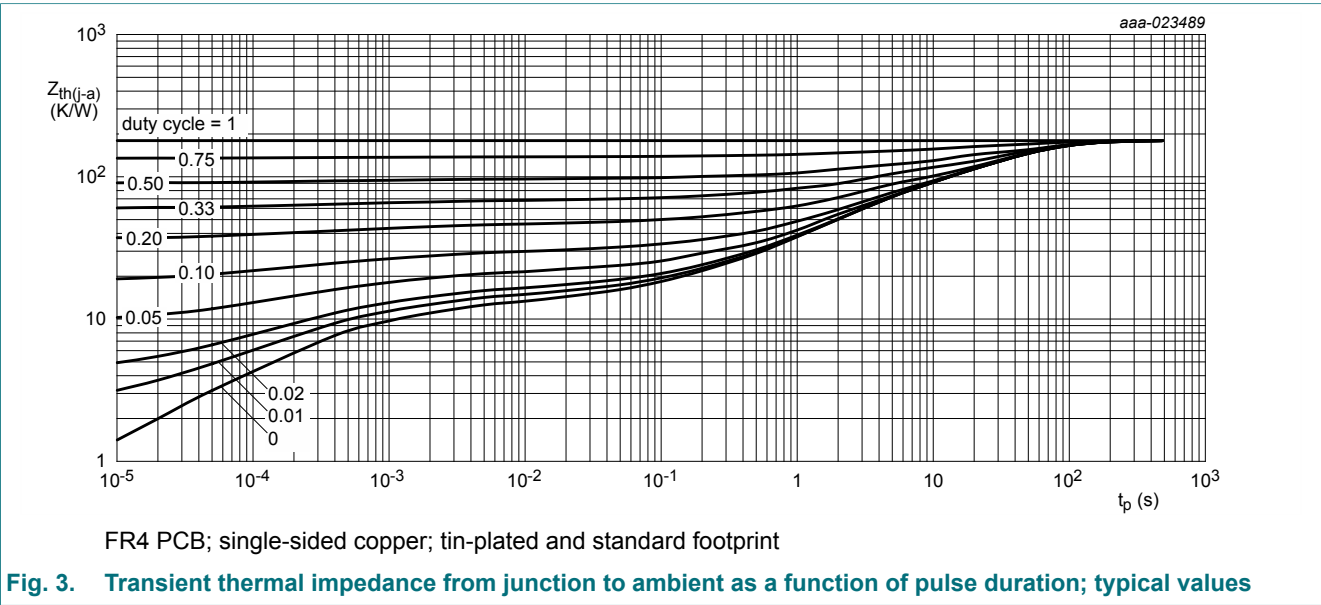
6. Thermal characteristics

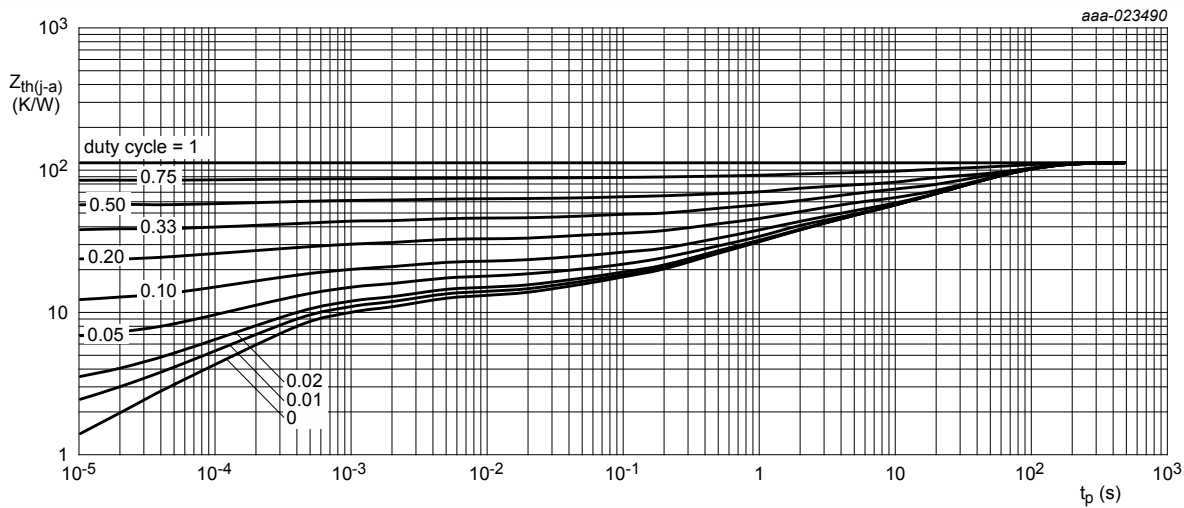
Table 7. Thermal characteristics

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

| Symbol        | Parameter                                        | Conditions  |     | Min | Typ | Max | Unit |
|---------------|--------------------------------------------------|-------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient      | in free air | [1] | -   | -   | 209 | K/W  |
|               |                                                  |             | [2] |     |     | 125 | K/W  |
|               |                                                  |             | [3] |     |     | 97  | K/W  |
|               |                                                  |             | [4] | -   | -   | 97  | K/W  |
|               |                                                  |             | [5] | -   | -   | 70  | K/W  |
| $R_{(j-sp)}$  | thermal resistance from junction to solder point |             |     | -   | -   | 18  | K/W  |

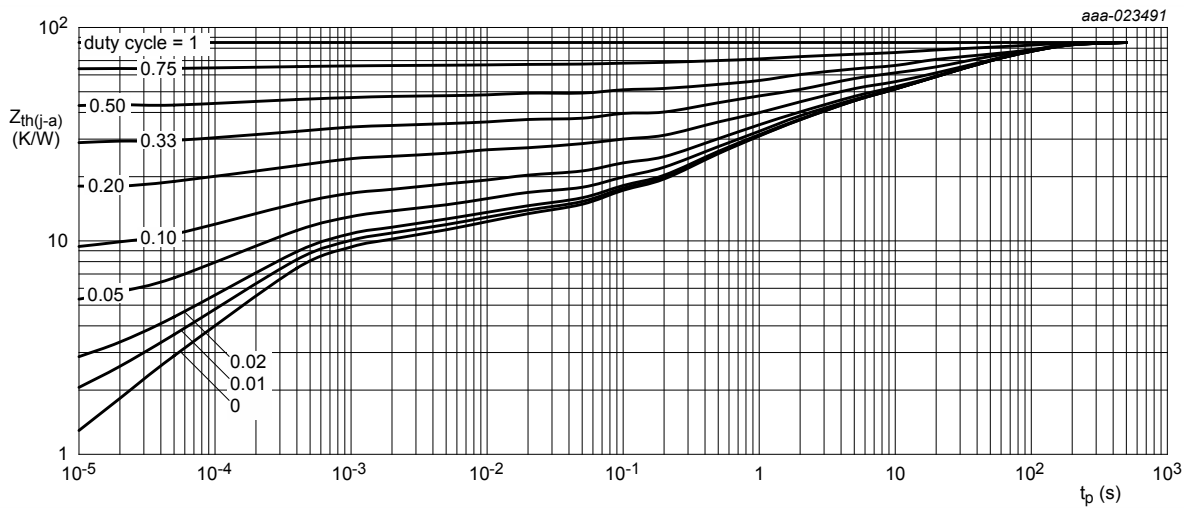
- [1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated and standard footprint.  
[2] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.  
[3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.  
[4] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated and standard footprint.  
[5] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.





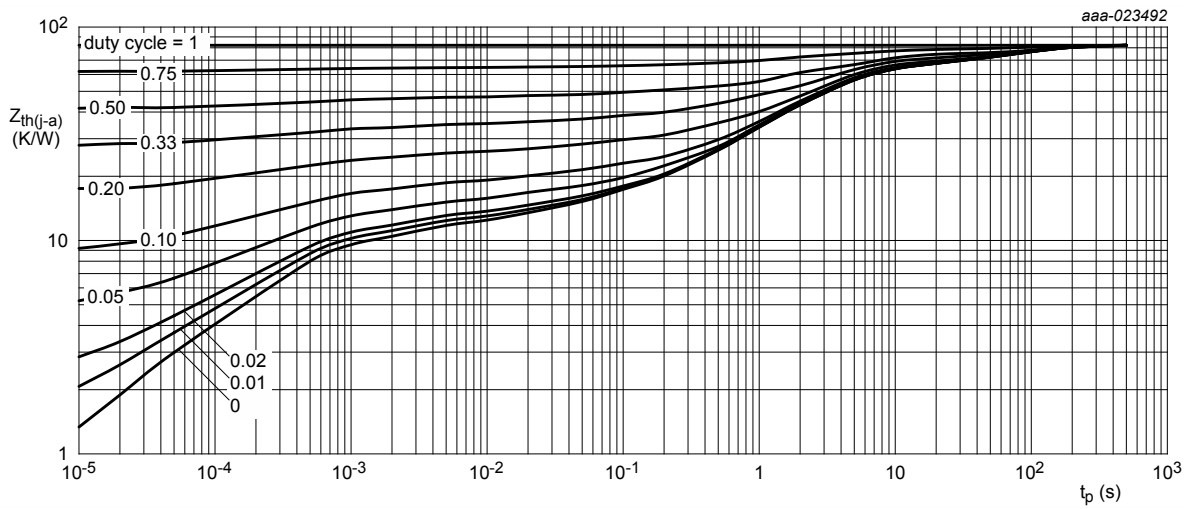
FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>

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



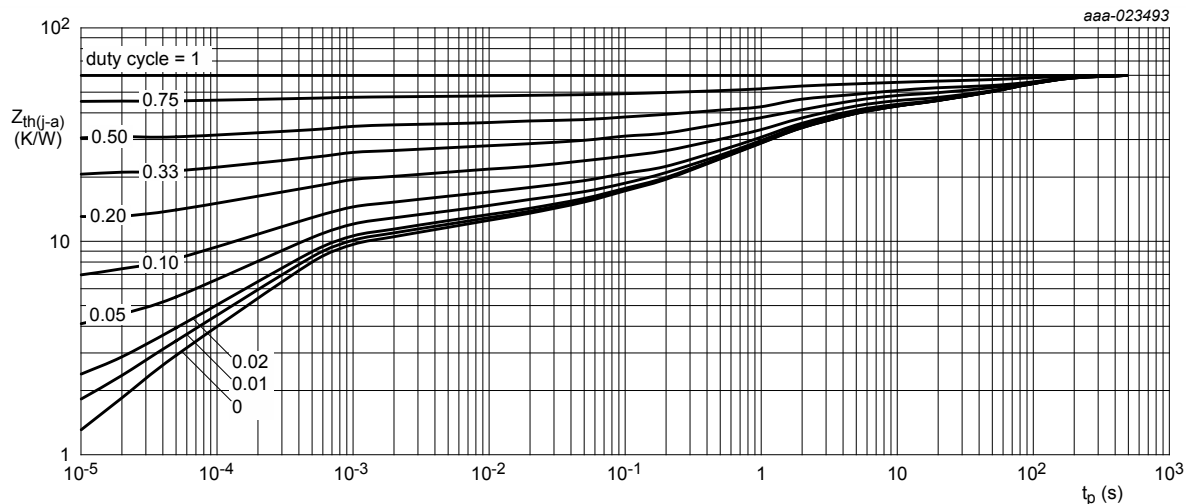
FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>

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**

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

| Symbol        | Parameter                            | Conditions                                                              | Min | Typ | Max  | Unit          |
|---------------|--------------------------------------|-------------------------------------------------------------------------|-----|-----|------|---------------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage     | $I_C = -100\text{ }\mu\text{A}$ ; $I_E = 0\text{ A}$                    | -60 | -   |      | V             |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage  | $I_C = -2\text{ mA}$ ; $I_E = 0\text{ A}$                               | -60 | -   |      | V             |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage       | $I_E = -100\text{ }\mu\text{A}$ ; $I_C = 0\text{ A}$                    | -5  | -   |      | V             |
| $I_{CBO}$     | 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  | $\mu\text{A}$ |
| $I_{EBO}$     | emitter-base cut-off current         | $V_{EB} = -5\text{ V}$ ; $I_C = 0\text{ A}$                             | -   | -   | -100 | nA            |
| $h_{FE}$      | DC current gain                      |                                                                         |     |     |      |               |
|               | BCP52T, -10T, -16T                   | $V_{CE} = -2\text{ V}$ ; $I_C = -5\text{ mA}$                           |     | 63  | -    | -             |
|               |                                      | $V_{CE} = -2\text{ V}$ ; $I_C = -500\text{ mA}$                         | [1] | 40  | -    | -             |
|               | BCP52T                               | $V_{CE} = -2\text{ V}$ ; $I_C = -150\text{ mA}$                         | [1] | 63  | -    | 250           |
|               | BCP52-10T                            | $V_{CE} = -2\text{ V}$ ; $I_C = -150\text{ mA}$                         | [1] | 63  | -    | 160           |
|               | BCP52-16T                            | $V_{CE} = -2\text{ V}$ ; $I_C = -150\text{ mA}$                         | [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 | 140  | - MHz         |
| $C_c$         | collector capacitance                | $V_{CB} = -10\text{ V}$ ; $I_E = I_C = 0\text{ A}$ ; $f = 1\text{ MHz}$ |     | -   | 7    | - pF          |

[1] pulsed;  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$

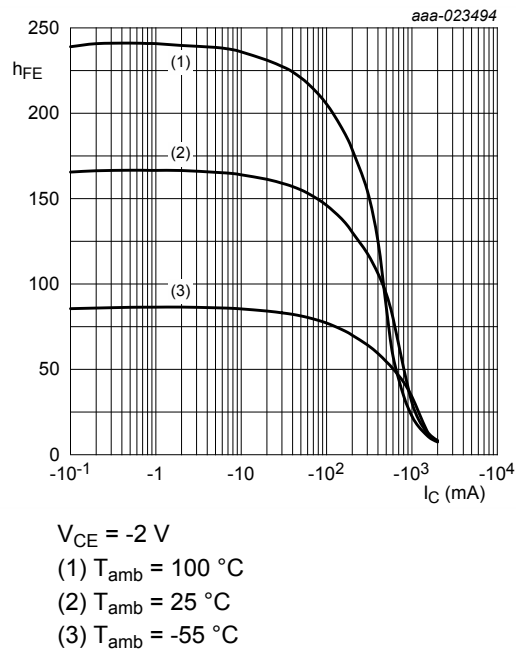


Fig. 8. DC current gain as a function of collector current; typical values

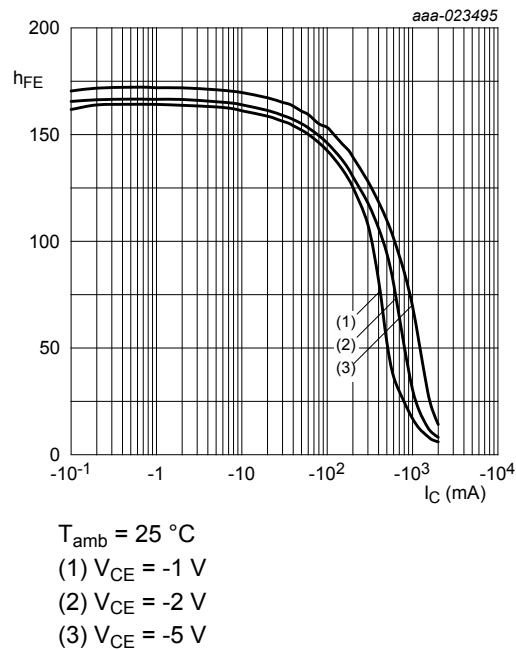


Fig. 9. DC current gain as a function of collector current; typical values

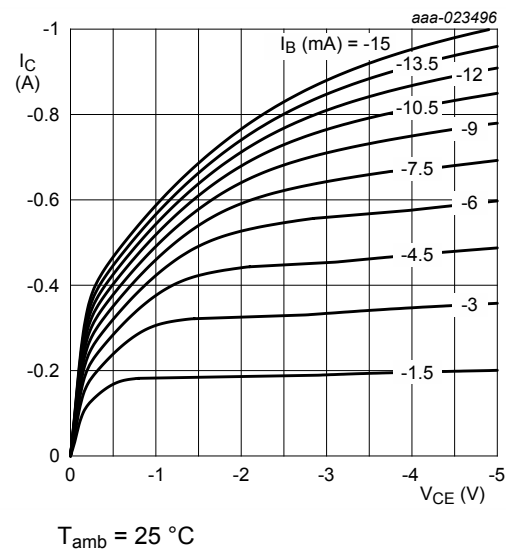


Fig. 10. Collector current as a function of collector-emitter voltage; typical values

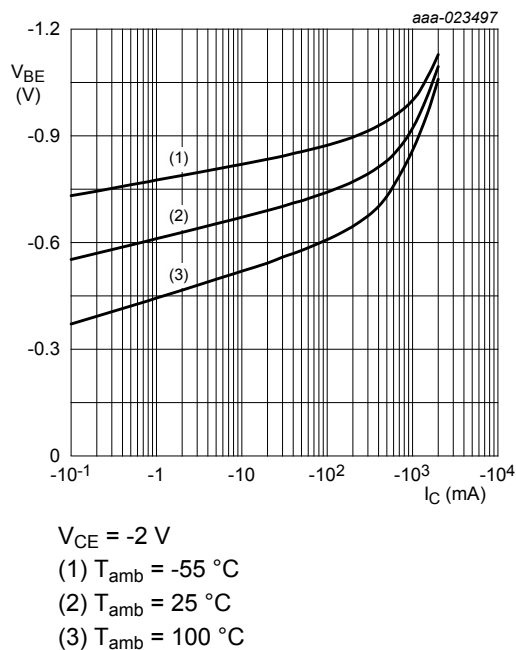


Fig. 11. Base-emitter voltage as a function of collector current; typical values



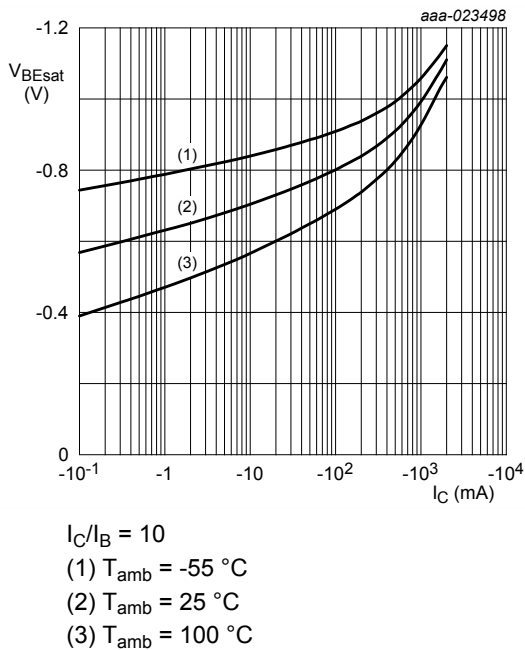


Fig. 12. Base-emitter saturation voltage as a function of collector current; typical values

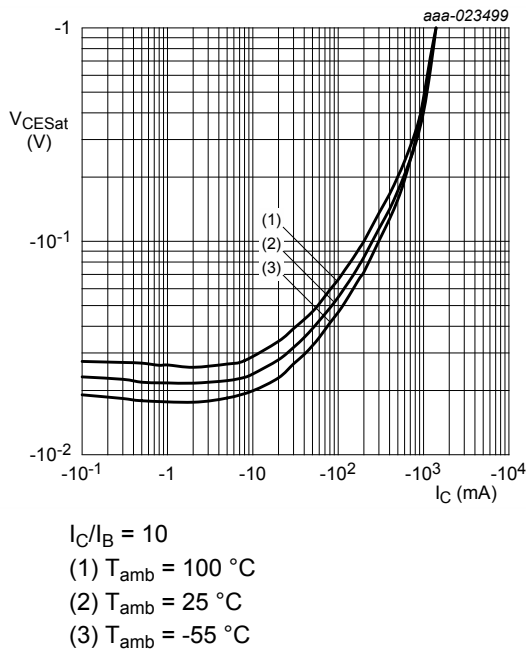


Fig. 13. Collector-emitter saturation voltage as a function of collector current; typical values

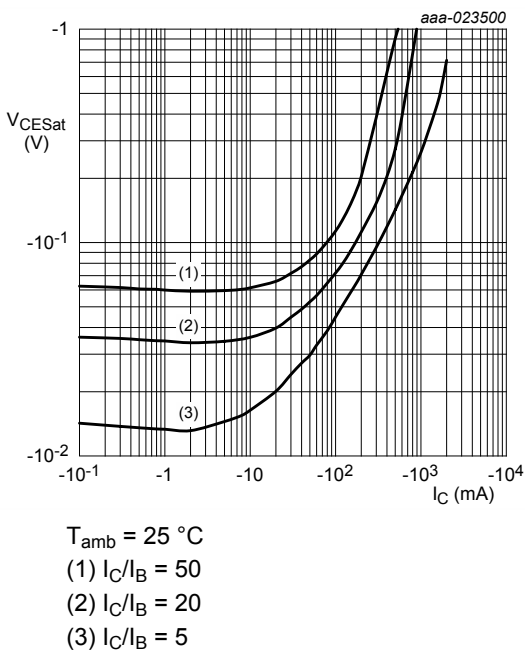


Fig. 14. Collector-emitter saturation voltage as a function of collector current; typical values

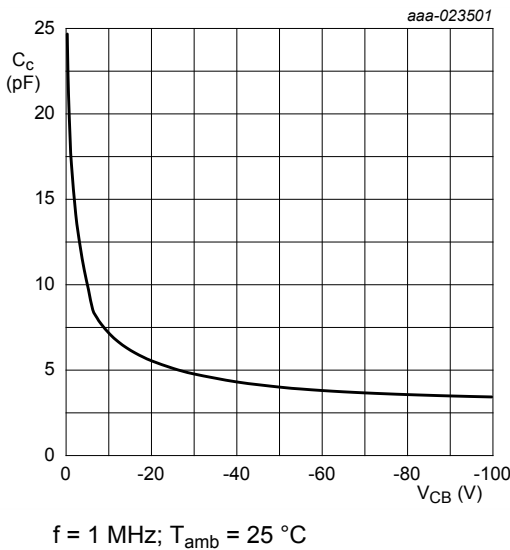
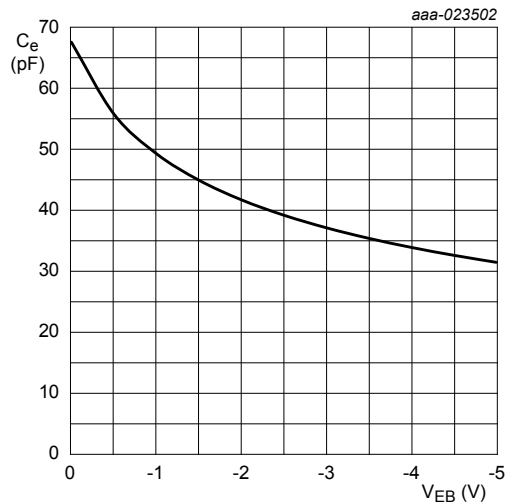
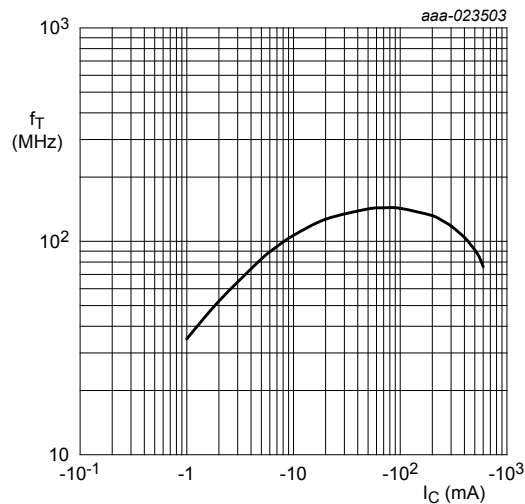


Fig. 15. Collector capacitance as a function of collector-base voltage; typical values



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

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

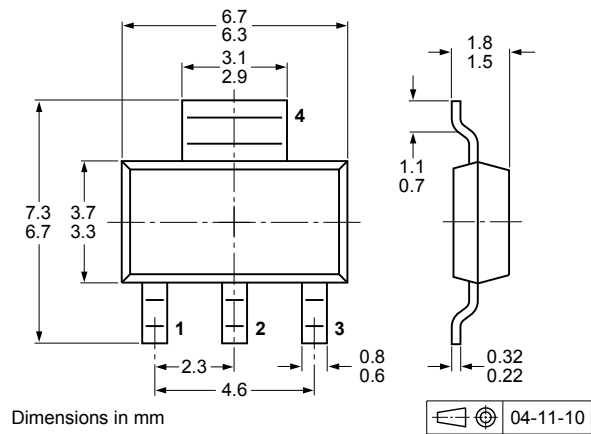
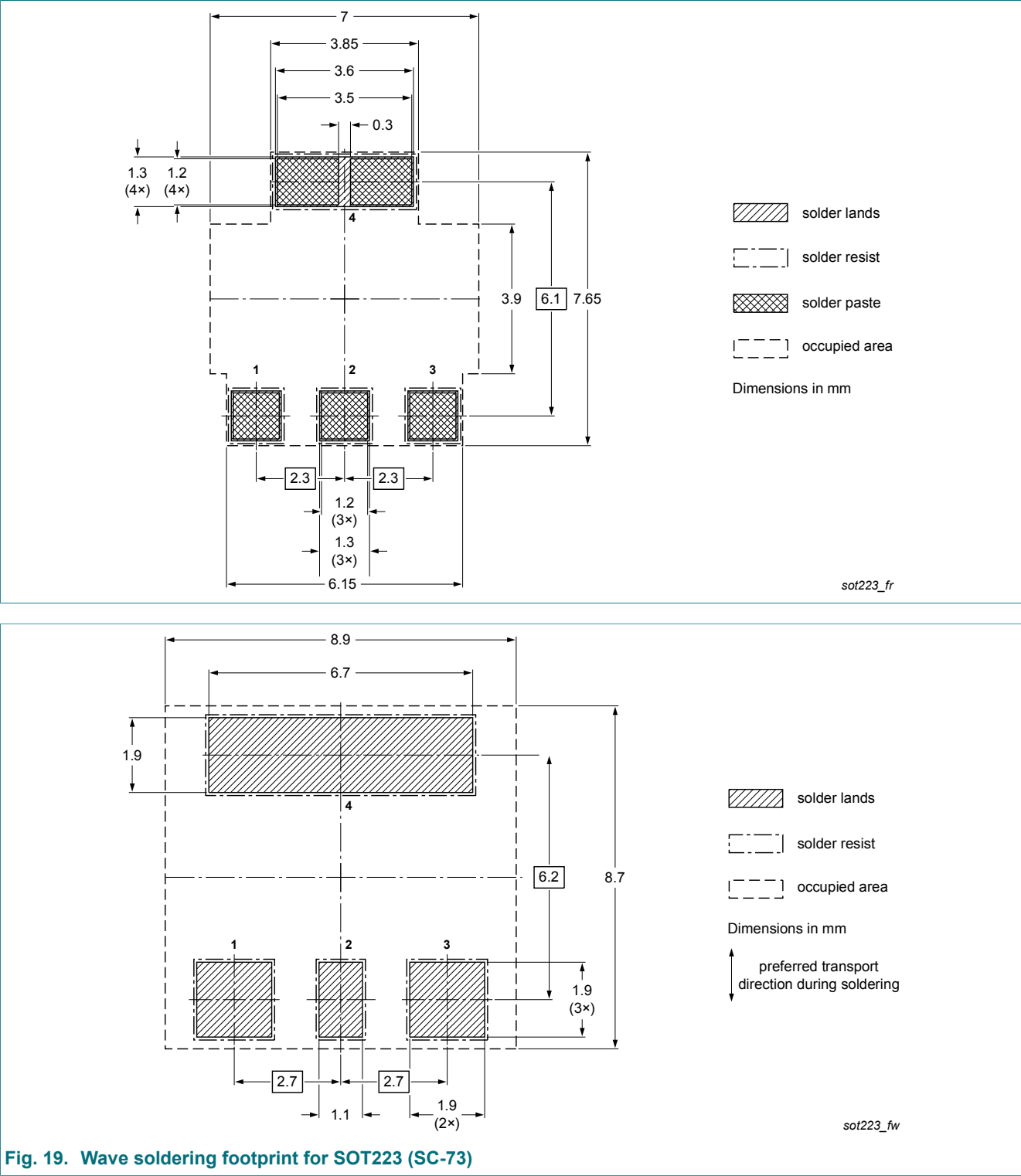


Fig. 18. Package outline SOT223 (SC-73)

10. Soldering



## 11. Revision history

Table 9. Revision history

| Document ID    | Release date | Data sheet status  | Change notice | Supersedes |
|----------------|--------------|--------------------|---------------|------------|
| BCP52T_SER v.1 | 20190429     | Product data sheet | -             | -          |

## 12. Legal information

### Data sheet status

| Document status<br>[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".
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Date of release: 29 April 2019