

# BCX52T series

60 V, 1 A PNP power bipolar transistors

Rev. 1 — 22 August 2019

Product data sheet

## 1. Product profile

### 1.1. General description

PNP power transistors in a medium power SOT89 (SC-62) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

| Type number | Package  |       | NPN complement |
|-------------|----------|-------|----------------|
|             | Nexperia | JEDEC |                |
| BCX52T      | SOT89    | SC-62 | BCX55T         |
| BCX52-10T   |          |       | BCX55-10T      |
| BCX52-16T   |          |       | BCX55-16T      |

### 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.

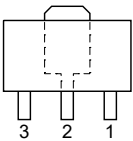
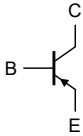
| Symbol    | Parameter                 | Conditions                           | Min | Typ | Max | Unit |
|-----------|---------------------------|--------------------------------------|-----|-----|-----|------|
| $V_{CEO}$ | collector-emitter voltage | open base                            | -   | -   | -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 |  |     |     |     |     |      |
|          | BCX52T          | $V_{CE} = -2 \text{ V}; I_C = -150 \text{ mA}$ | [1] | 63  | -   | 250 |      |
|          | BCX52-10T       |  | [1] | 63  | -   | 160 |      |
|          | BCX52-16T       |  | [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   | E      | emitter     |  | <br>006aaa231 |
| 2   | C      | collector   |  |  |
| 3   | B      | base        |  |  |

## 3. Ordering information

Table 4. Ordering information

| Type number | Package |   | Version |
|-------------|---------|---|---------|
|             | Name    | Description   |         |
| BCX52T      | SC-62   | plastic, surface-mounted package; 3 leads; 1.5 mm pitch;<br>4.5 mm x 2.5 mm x 1.5 mm body | SOT89   |
| BCX52-10T   |         |   |         |
| BCX52-16T   |         |   |         |

## 4. Marking

Table 5. Marking

| Type number | Marking code |
|-------------|--------------|
| BCX52T      | C2           |
| BCX52-10T   | C3           |
| BCX52-16T   | C4           |

## 5. Limiting values

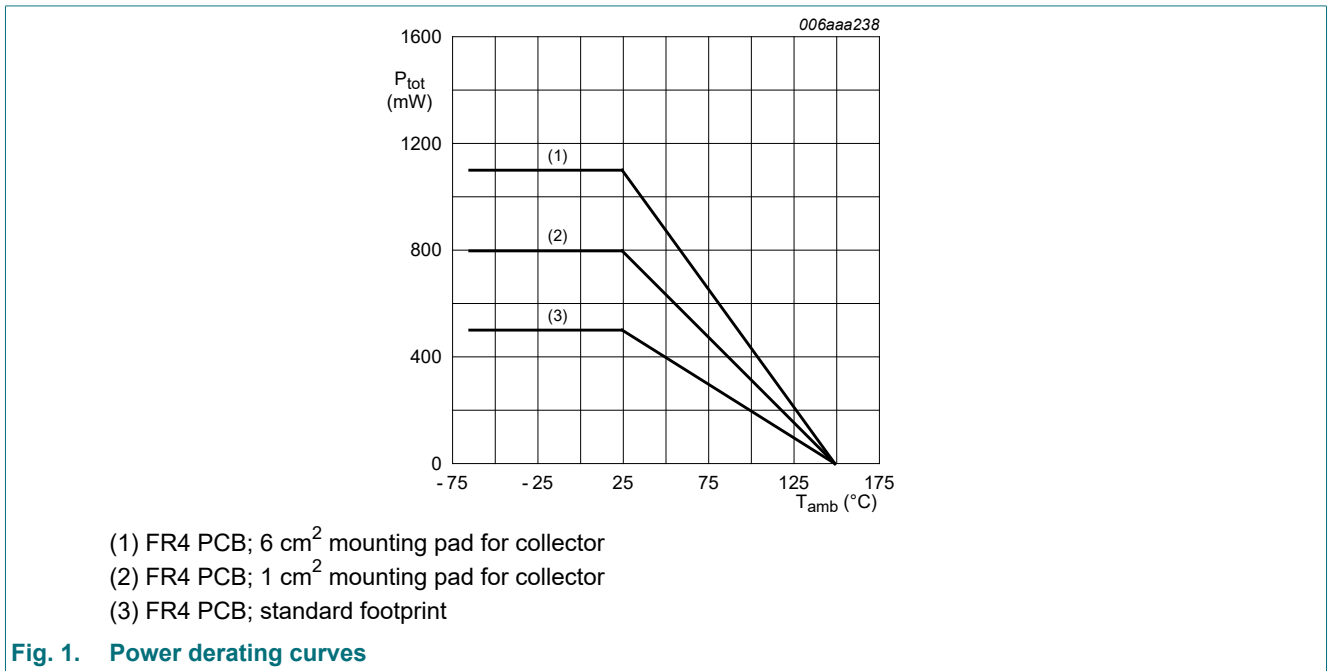
**Table 6. Limiting values**

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

$T_{amb} = 25\text{ °C}$  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              |                                      | -   | -200 | mA   |
| $I_{BM}$  | peak base current         | single pulse; $t_p \leq 1\text{ ms}$ | -   | -300 | mA   |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25\text{ °C}$          | [1] | 500  | mW   |
|           |                           |                                      | [2] | 800  | mW   |
|           |                           |                                      | [3] | 1100 | mW   |
| $T_j$     | junction temperature      |                                      | -   | 150  | °C   |
| $T_{amb}$ | ambient temperature       |                                      | -55 | 150  | °C   |
| $T_{stg}$ | storage temperature       |                                      | -65 | 150  | °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  $1\text{ cm}^2$ .
- [3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector  $6\text{ cm}^2$ .



**Fig. 1. Power derating curves**

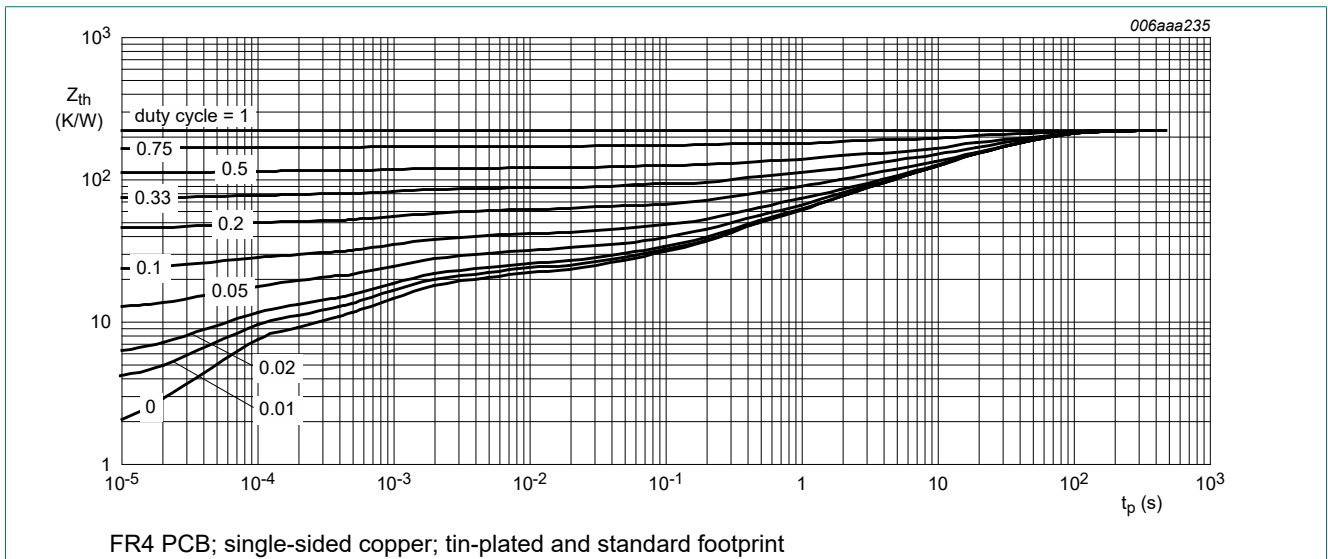
## 6. Thermal characteristics

**Table 7. Thermal characteristics**

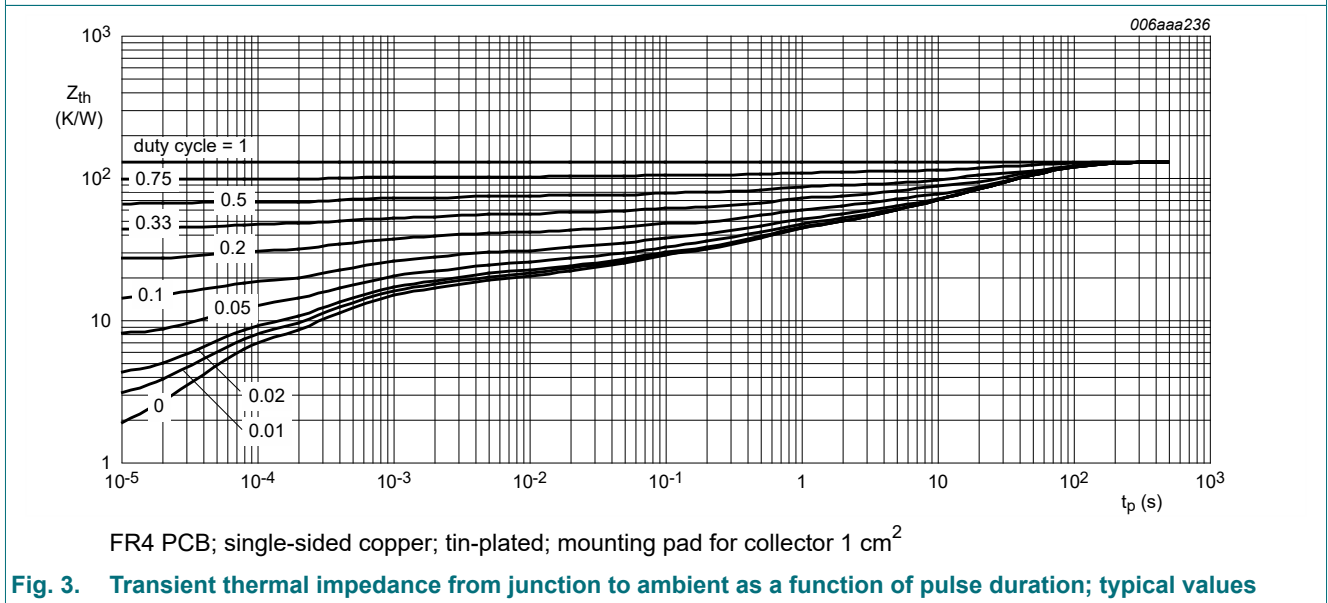
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

| Symbol        | Parameter                                   | Conditions  |     | Min | Typ | Max | Unit |
|---------------|---|-------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | -   | -   | 250 | K/W  |
|               |   |             | [2] | -   | -   | 157 | K/W  |
|               |   |             | [3] | -   | -   | 114 | K/W  |

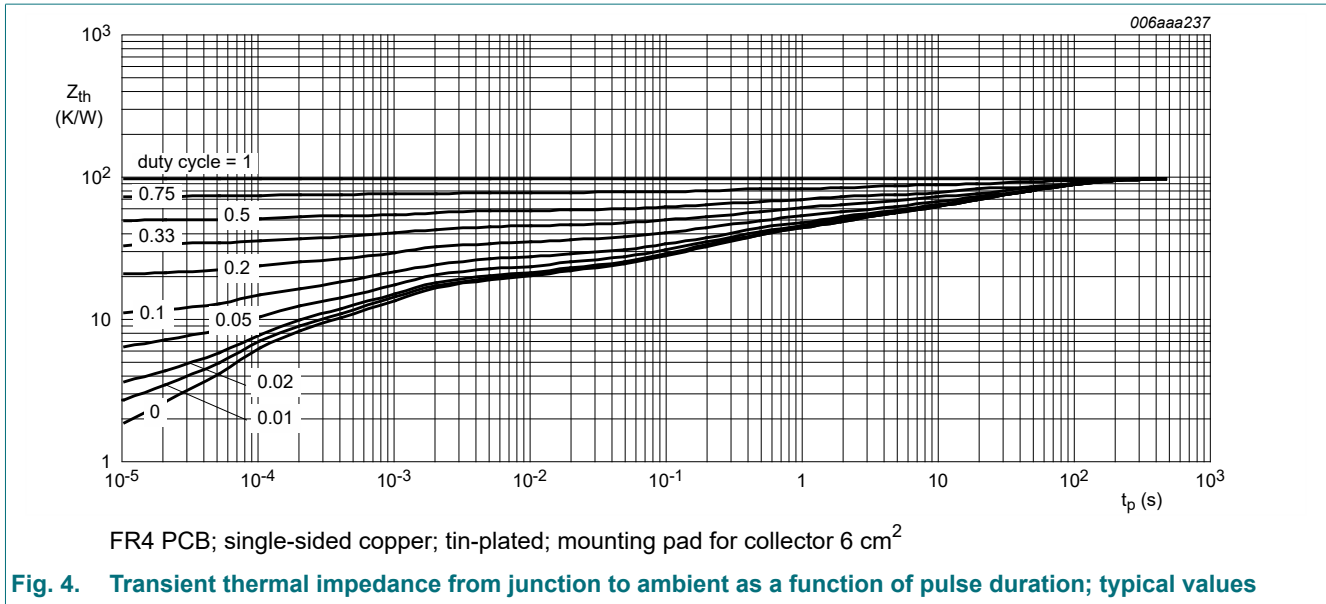
- [1] Device mounted on an FR4 PCB; single-sided copper; tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector  $1\text{ cm}^2$ .
- [3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector  $6\text{ cm}^2$ .



**Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**



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



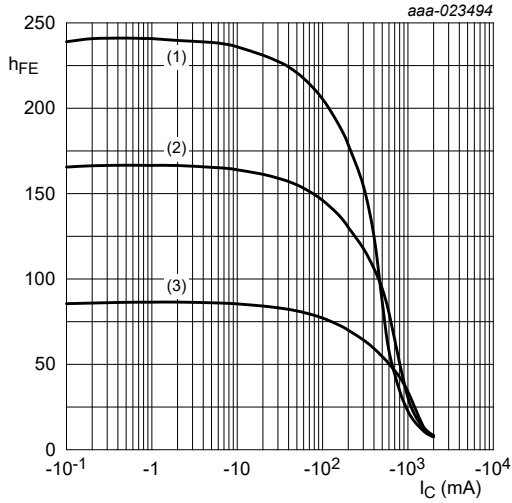
## 7. Characteristics

**Table 8. Characteristics**

*T<sub>amb</sub> = 25 °C unless otherwise specified.*

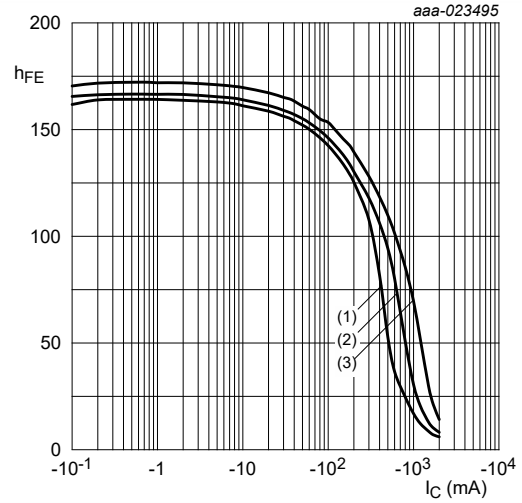
| Symbol        | Parameter                            | Conditions  | Min | Typ | Max  | Unit    |  |
|---------------|--------------------------------------|---|-----|-----|------|---------|--|
| $V_{(BR)CBO}$ | collector-base breakdown voltage     | $I_C = -100 \mu A; I_E = 0 A$                                 | -60 | -   |      | V       |  |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage  | $I_C = -2 mA; I_E = 0 A$                                      | -60 | -   |      | V       |  |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage       | $I_E = -100 \mu A; I_C = 0 A$                                 | -5  | -   |      | V       |  |
| $I_{CBO}$     | collector-base cut-off current       | $V_{CB} = -30 V; I_E = 0 A$                                   | -   | -   | -100 | nA      |  |
|               |                                      | $V_{CB} = -30 V; I_E = 0 A; T_j = 150 \text{ }^\circ\text{C}$ | -   | -   | -10  | $\mu A$ |  |
| $I_{EBO}$     | emitter-base cut-off current         | $V_{EB} = -5 V; I_C = 0 A$                                    | -   | -   | -100 | nA      |  |
| $h_{FE}$      | DC current gain                      |   |     |     |      |         |  |
|               | BCX52T, -10T, -16T                   | $V_{CE} = -2 V; I_C = -5 mA$                                  |     | 63  | -    | -       |  |
|               |                                      | $V_{CE} = -2 V; I_C = -500 mA$                                | [1] | 40  | -    | -       |  |
|               | BCX52T                               | $V_{CE} = -2 V; I_C = -150 mA$                                | [1] | 63  | -    | 250     |  |
|               | BCX52-10T                            | $V_{CE} = -2 V; I_C = -150 mA$                                | [1] | 63  | -    | 160     |  |
| BCX52-16T     | $V_{CE} = -2 V; I_C = -150 mA$       | [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                 | $V_{CE} = -5 V; I_C = -50 mA; f = 100 MHz$                    |     | 140 | -    | MHz     |  |
| $C_c$         | collector capacitance                | $V_{CB} = -10 V; I_E = I_C = 0 A; f = 1 MHz$                  |     | 7   | -    | pF      |  |

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



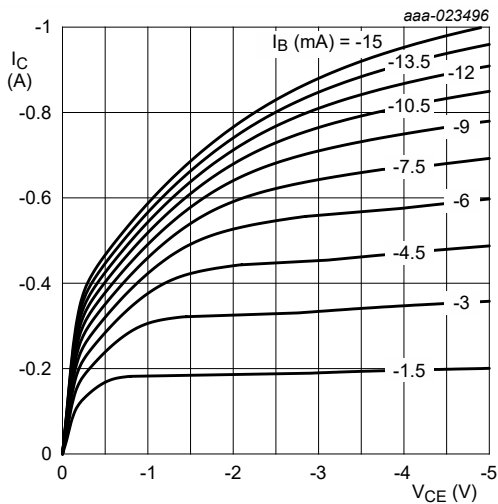
$V_{CE} = -2\text{ V}$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

Fig. 5. DC current gain as a function of collector current; typical values



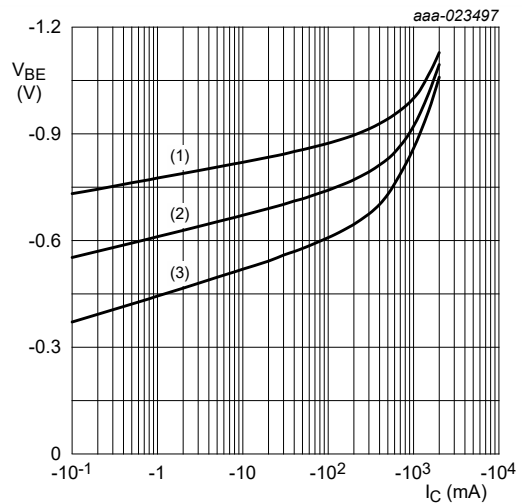
$T_{amb} = 25\text{ }^\circ\text{C}$   
 (1)  $V_{CE} = -1\text{ V}$   
 (2)  $V_{CE} = -2\text{ V}$   
 (3)  $V_{CE} = -5\text{ V}$

Fig. 6. DC current gain as a function of collector current; typical values



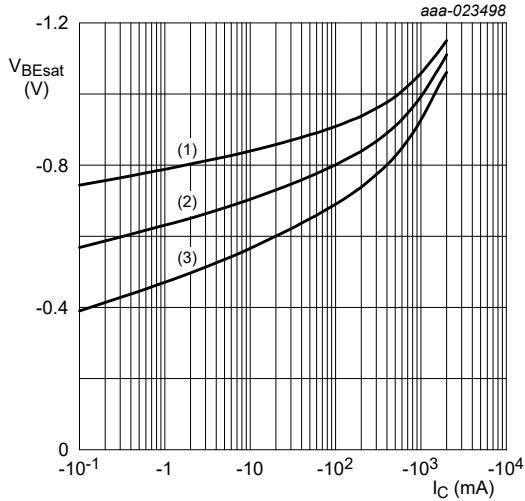
$T_{amb} = 25\text{ }^\circ\text{C}$

Fig. 7. Collector current as a function of collector-emitter voltage; typical values



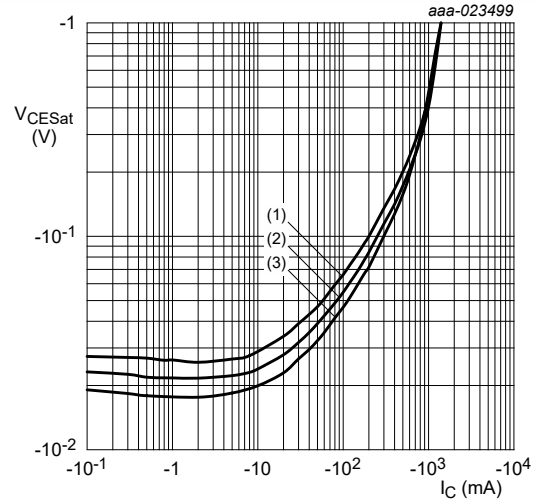
$V_{CE} = -2\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100\text{ }^\circ\text{C}$

Fig. 8. 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. 9. Base-emitter saturation voltage as a function of collector current; typical values



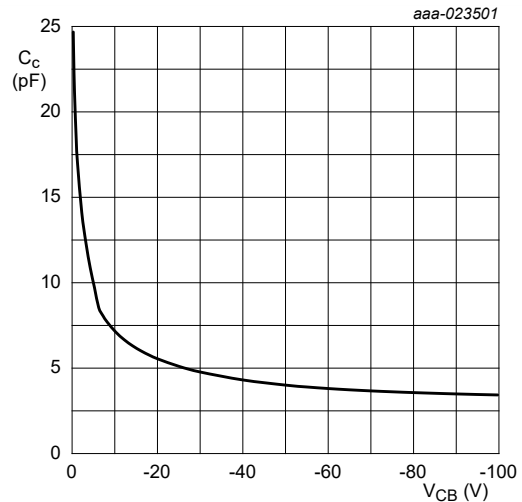
$I_C/I_B = 10$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



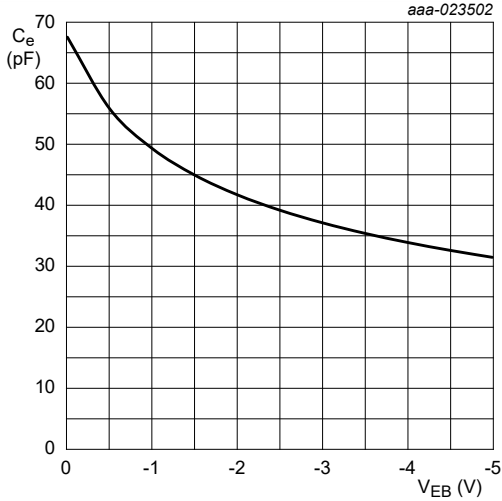
$T_{amb} = 25\text{ °C}$   
 (1)  $I_C/I_B = 50$   
 (2)  $I_C/I_B = 20$   
 (3)  $I_C/I_B = 5$

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



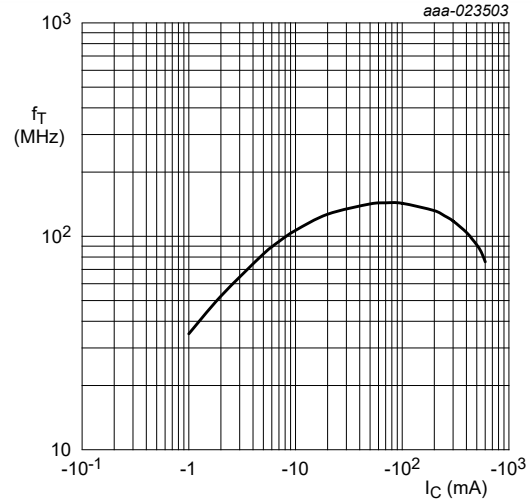
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

Fig. 12. Collector capacitance as a function of collector-base voltage; typical values



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

**Fig. 13. Emitter capacitance as a function of emitter-base voltage; typical values**



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

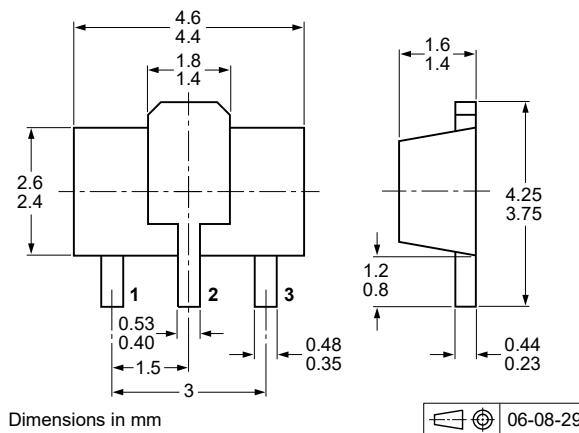
**Fig. 14. Transition frequency as a function of collector current; typical values**

## 8. Test information

### 8.1. Quality information

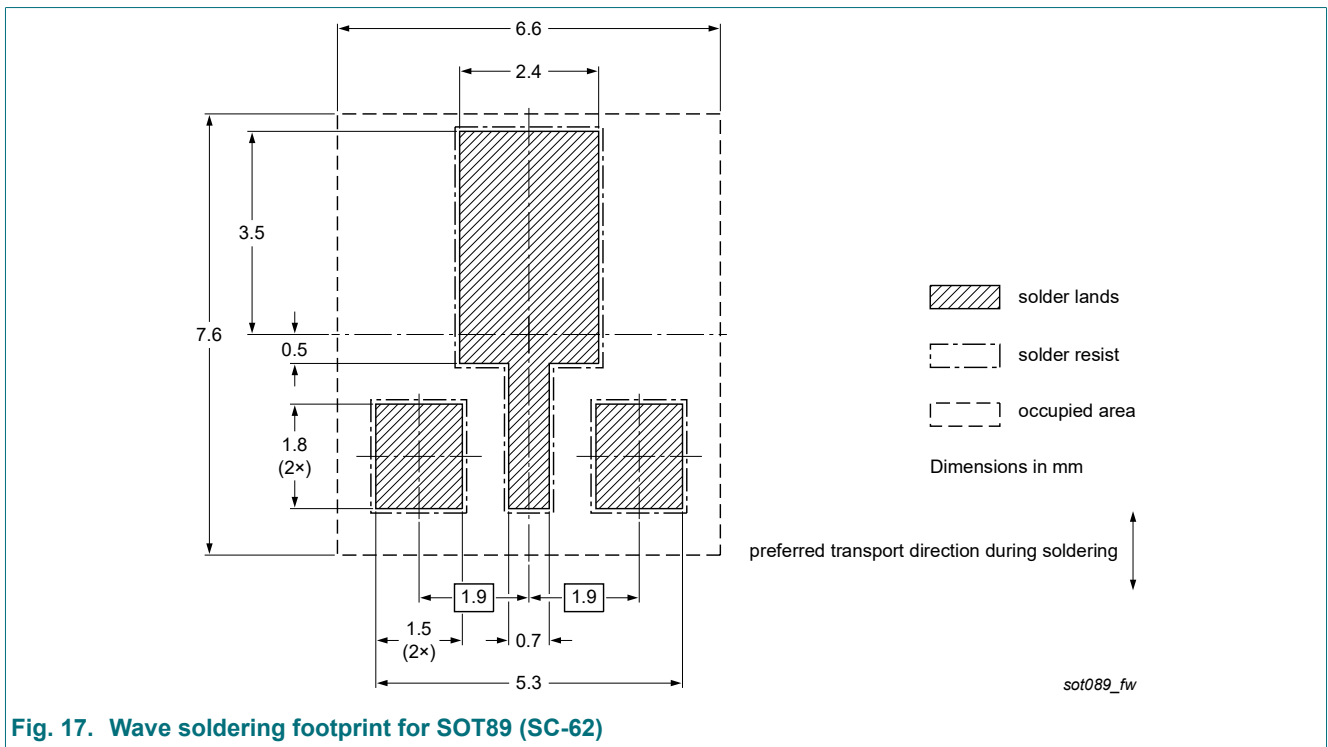
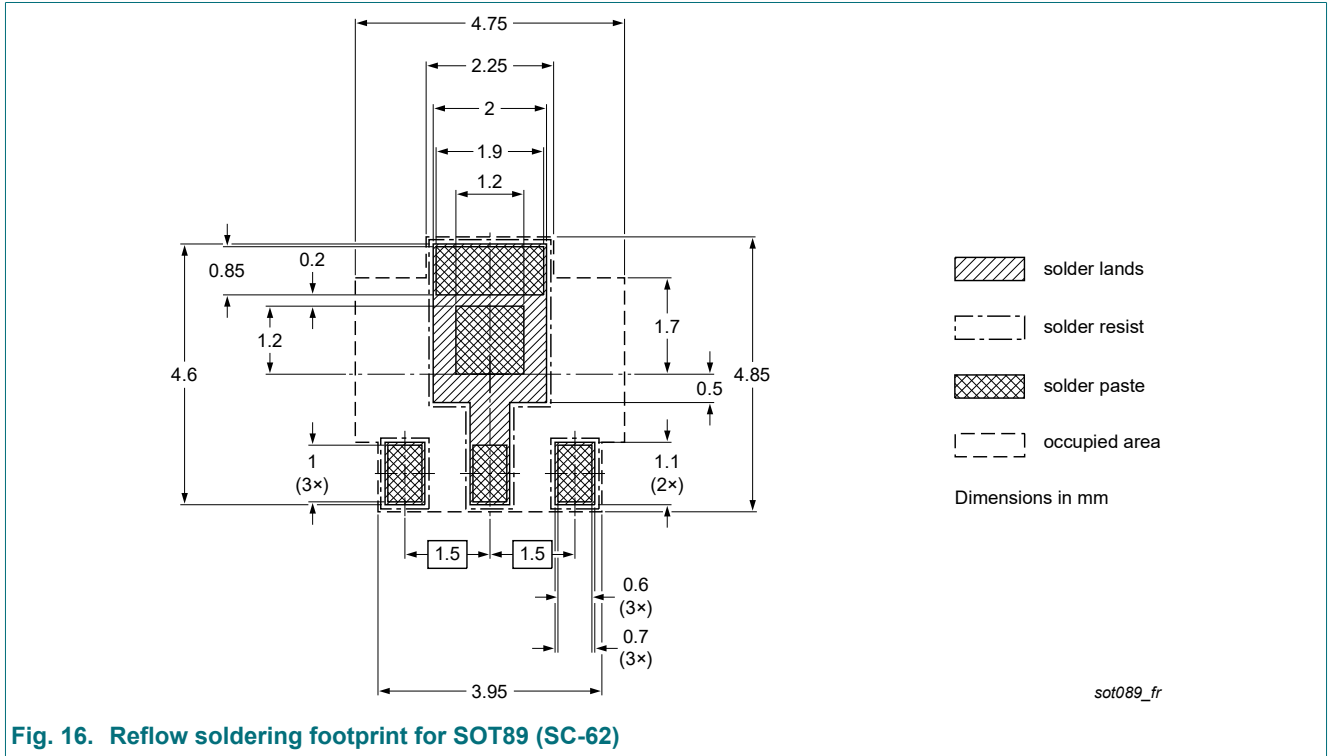
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

## 9. Package outline



**Fig. 15. Package outline SOT89 (SC-62)**

10. Soldering



## 11. Revision history

Table 9. Revision history

| Document ID    | Release date | Data sheet status  | Change notice | Supersedes |
|----------------|--------------|--------------------|---------------|------------|
| BCX52T_SER v.1 | 20190822     | Product data sheet | -             | -          |

## 12. 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.                                     |

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 22 August 2019