



# BCP51 series

45 V, 1 A PNP medium power transistors

Rev. 10 — 16 October 2023

Product data sheet

## 1. General description

PNP medium power transistors in a SOT223 (SC-73) Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- High current
- Three current gain selections
- High power dissipation capability
- AEC-Q101 qualified

## 3. Applications

- Linear voltage regulators
- High-side switches
- Battery-driven devices
- Power management
- MOSFET drivers
- Amplifiers

## 4. Quick reference data

Table 1. Quick reference data

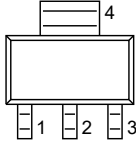
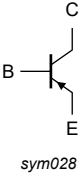
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

| Symbol    | Parameter                 | Conditions   | Min | Typ | Max | Unit |  |
|-----------|---------------------------|--|-----|-----|-----|------|--|
| $V_{CEO}$ | collector-emitter voltage | open base  | -   | -   | -45 | V    |  |
| $I_C$     | collector current         |  | -   | -   | -1  | A    |  |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1\text{ ms}$                                     | -   | -   | -2  | A    |  |
| $h_{FE}$  | DC current gain           |  |     |     |     |      |  |
|           | BCP51                     | $V_{CE} = -2\text{ V}; I_C = -150\text{ mA}$<br>$T_{amb} = 25\text{ °C}$ | [1] | 63  | -   | 250  |  |
|           | BCP51-10                  |  | [1] | 63  | -   | 160  |  |
|           | BCP51-16                  |  | [1] | 100 | -   | 250  |  |

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

## 5. Pinning information

Table 2. Pinning

| Pin | Symbol | Description | Simplified outline   | Graphic symbol  |
|-----|--------|-------------|--|---|
| 1   | B      | base        |  | <br>sym028 |
| 2   | C      | collector   |  |   |
| 3   | E      | emitter     |  |   |
| 4   | C      | collector   |  |   |

## 6. Ordering information

Table 3. Ordering information

| Type number              | Package |   | Version                |
|--------------------------|---------|---|------------------------|
|                          | Name    | Description   |                        |
| <a href="#">BCP51</a>    | -       | plastic, surface-mounted package with increased heatsink; 4 leads; 2.3 mm pitch; 6.5 mm x 3.5 mm x 1.65 mm body | <a href="#">SOT223</a> |
| <a href="#">BCP51-10</a> |         |   |                        |
| <a href="#">BCP51-16</a> |         |   |                        |

## 7. Marking

Table 4. Marking

| Type number | Marking code |
|-------------|--------------|
| BCP51       | BCP51        |
| BCP51-10    | BCP51/10     |
| BCP51-16    | BCP51/16     |

## 8. Limiting values

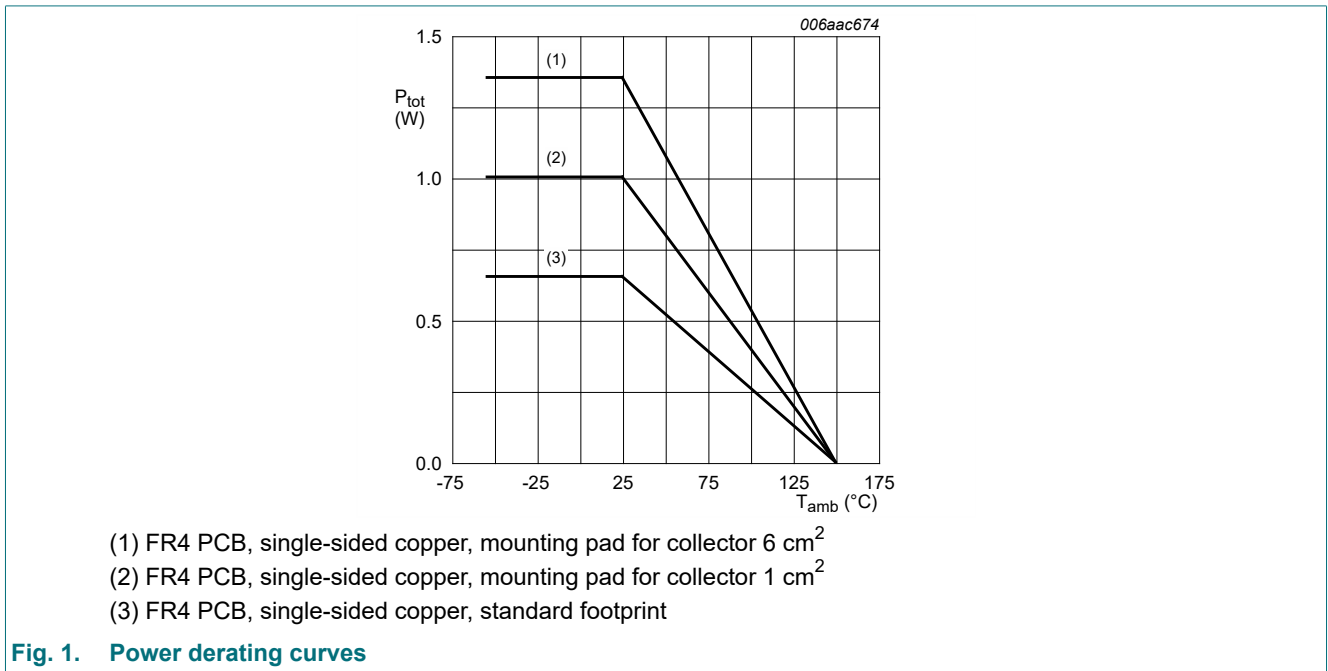
**Table 5. Limiting values**

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                         | -   | -45  | V    |   |
| $V_{CEO}$ | collector-emitter voltage | open base                            | -   | -45  | 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              |                                      | -   | -0.3 | A    |   |
| $I_{BM}$  | peak base current         | single pulse; $t_p \leq 1\text{ ms}$ | -   | -0.3 | A    |   |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25\text{ °C}$          | [1] | -    | 0.65 | W |
|           |                           |                                      | [2] | -    | 1.00 | W |
|           |                           |                                      | [3] | -    | 1.35 | W |
| $T_j$     | 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**

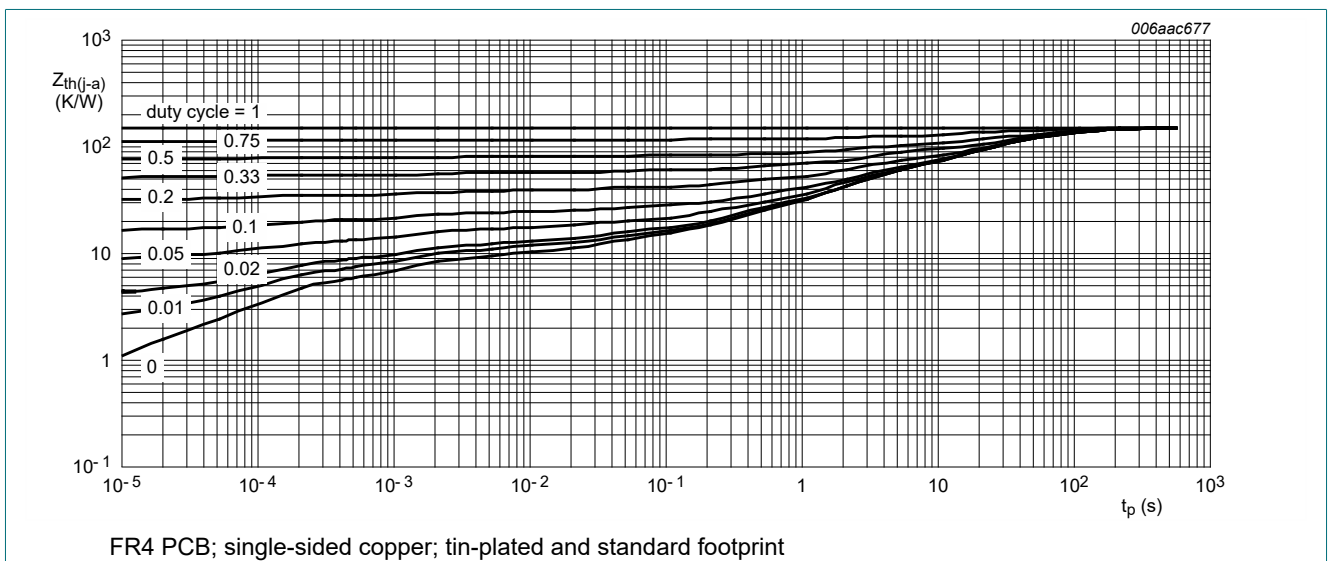
## 9. Thermal characteristics

**Table 6. Thermal characteristics**

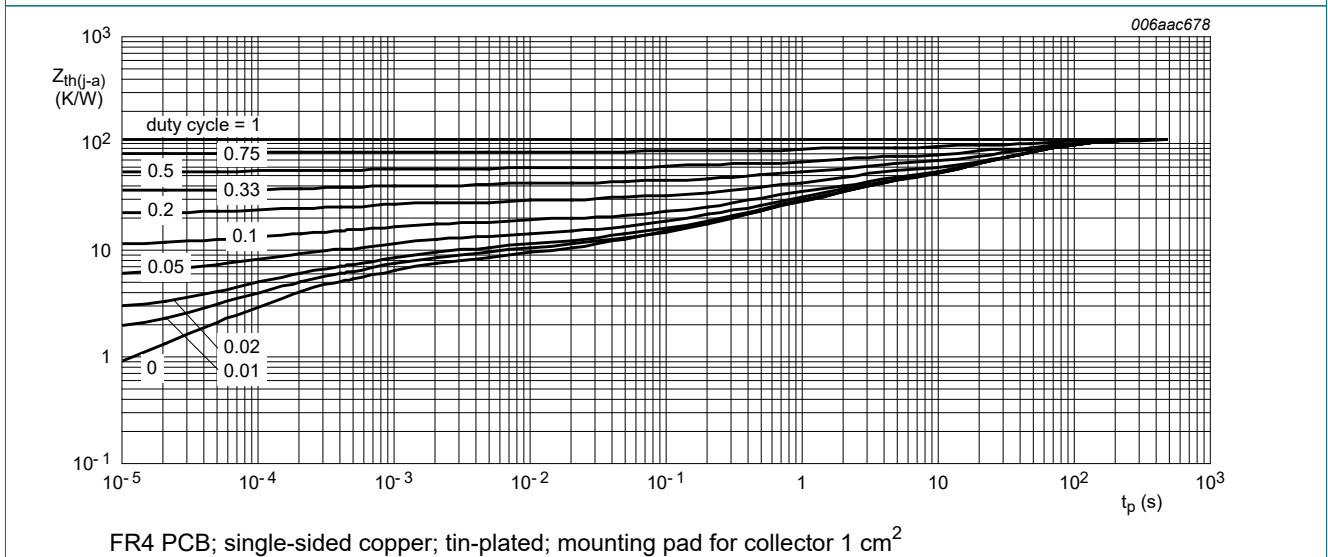
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

| Symbol        | Parameter  | Conditions  |     | Min | Typ | Max | Unit |
|---------------|--|-------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient      | in free air | [1] | -   | -   | 192 | K/W  |
|               |  |             | [2] | -   | -   | 125 | K/W  |
|               |  |             | [3] | -   | -   | 93  | K/W  |
| $R_{(j-sp)}$  | thermal resistance from junction to solder point |             |     | -   | -   | 16  | K/W  |

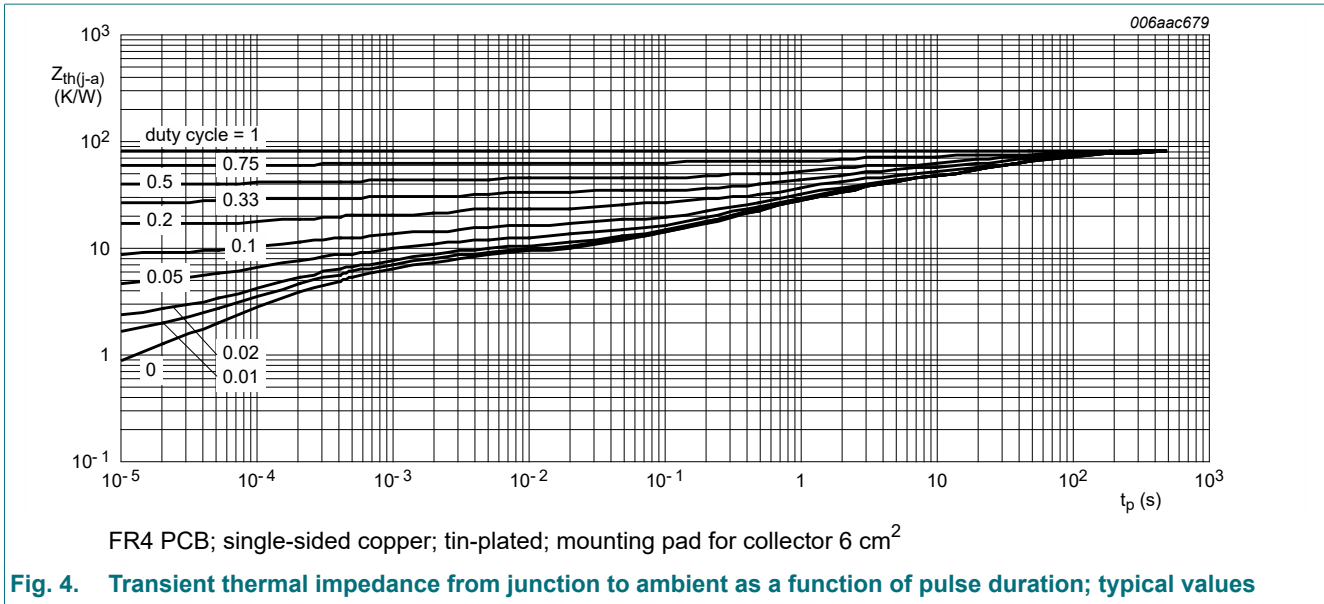
- [1] Device mounted on an FR4 PCB; single-sided copper; tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector  $1\text{ cm}^2$ .
- [3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector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



**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**

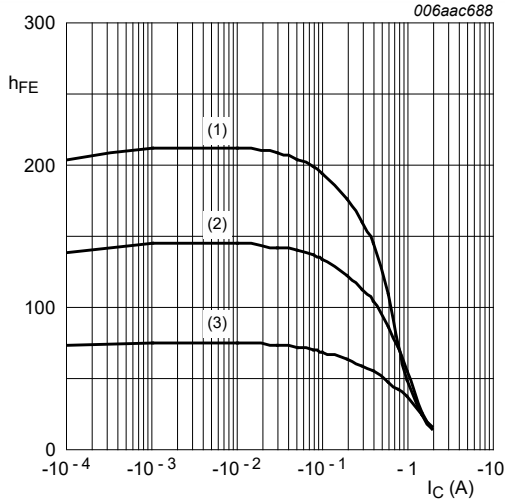


## 10. Characteristics

Table 7. Characteristics

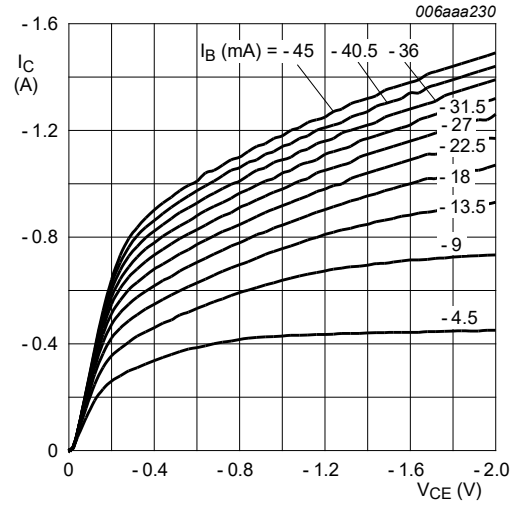
| Symbol    | Parameter                      | Conditions  | Min   | Typ | Max  | Unit          |   |
|-----------|--------------------------------|---|---|-----|------|---------------|---|
| $I_{CBO}$ | collector-base cut-off current | $V_{CB} = -30 \text{ V}; I_E = 0 \text{ A}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$                          | -   | -   | -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   | $V_{EB} = -5 \text{ V}; I_C = 0 \text{ A}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$                           | -   | -   | -100 | nA            |   |
| $h_{FE}$  | DC current gain                |   |   |     |      |               |   |
|           | BCP51                          | $V_{CE} = -2 \text{ V}; I_C = -5 \text{ mA}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$                         | [1]   | 63  | -    | -             |   |
|           |                                | $V_{CE} = -2 \text{ V}; I_C = -150 \text{ mA}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$                       |   | 63  | -    | 250           |   |
|           |                                | $V_{CE} = -2 \text{ V}; I_C = -500 \text{ mA}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$                       |   | 40  | -    | -             |   |
|           | BCP51-10                       | $V_{CE} = -2 \text{ V}; I_C = -5 \text{ mA}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$                         | [1]   | 63  | -    | -             |   |
|           |                                | $V_{CE} = -2 \text{ V}; I_C = -150 \text{ mA}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$                       |   | 63  | -    | 160           |   |
|           |                                | $V_{CE} = -2 \text{ V}; I_C = -500 \text{ mA}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$                       |   | 40  | -    | -             |   |
|           | BCP51-16                       | $V_{CE} = -2 \text{ V}; I_C = -5 \text{ mA}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$                         | [1]   | 63  | -    | -             |   |
|           |                                | $V_{CE} = -2 \text{ V}; I_C = -150 \text{ mA}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$                       |   | 100 | -    | 250           |   |
|           |                                | $V_{CE} = -2 \text{ V}; I_C = -500 \text{ mA}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$                       |   | 40  | -    | -             |   |
|           | $V_{CEsat}$                    | collector-emitter saturation voltage  | $I_C = -500 \text{ mA}; I_B = -50 \text{ mA}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$  | [1] | -    | -0.5          | V |
|           | $V_{BE}$                       | base-emitter voltage  | $V_{CE} = -2 \text{ V}; I_C = -500 \text{ mA}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$ | [1] | -    | -1            | V |
| $C_c$     | collector capacitance          | $V_{CB} = -10 \text{ V}; I_E = I_e = 0 \text{ A}; f = 1 \text{ MHz}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$ |   | -   | 15   | pF            |   |
| $f_T$     | transition frequency           | $V_{CE} = -5 \text{ V}; I_C = -50 \text{ mA}; f = 100 \text{ MHz}$<br>$T_{amb} = 25 \text{ }^\circ\text{C}$   |   | -   | 145  | MHz           |   |

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



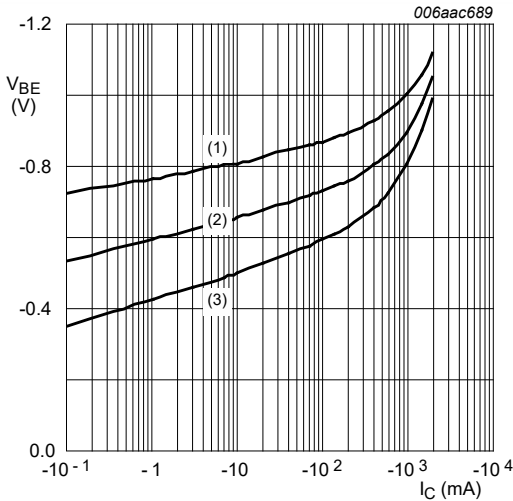
$V_{CE} = -2 \text{ V}$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^\circ\text{C}$

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



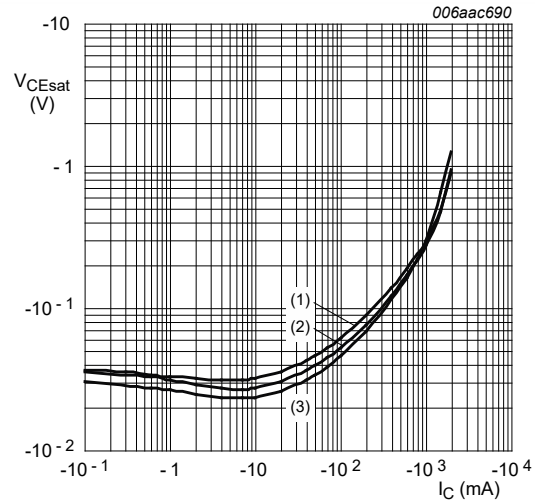
$T_{amb} = 25 \text{ }^\circ\text{C}$

Fig. 6. 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. 7. Base-emitter voltage as a function of collector current; typical values



$I_C/I_B = 10$   
 (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. Collector-emitter saturation voltage as a function of collector current; typical values

## 11. Test information

### 11.1. 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.

## 12. Package outline

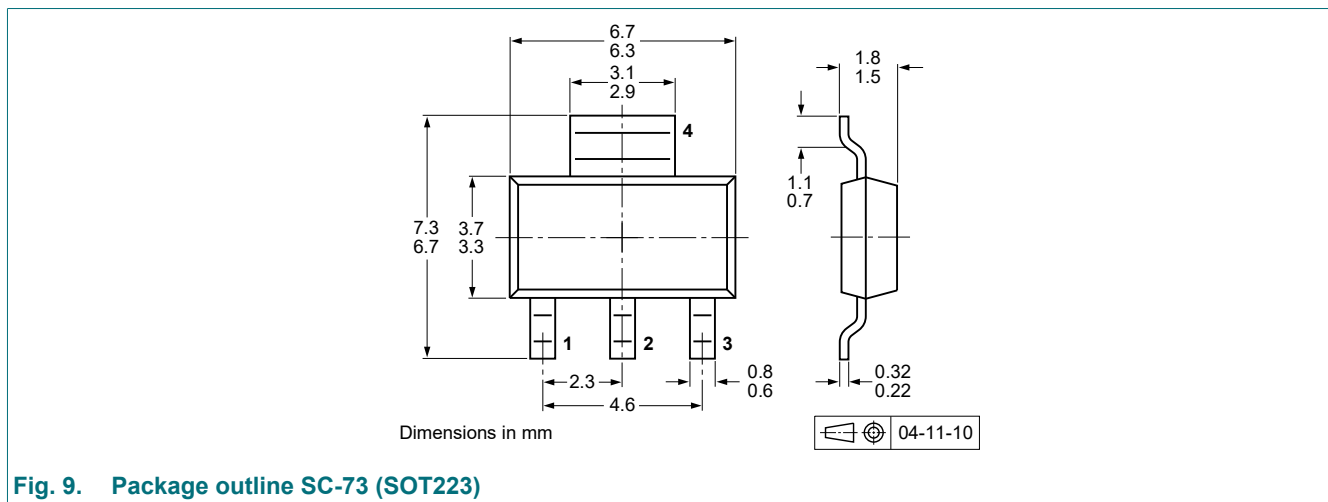


Fig. 9. Package outline SC-73 (SOT223)



### 13. Soldering

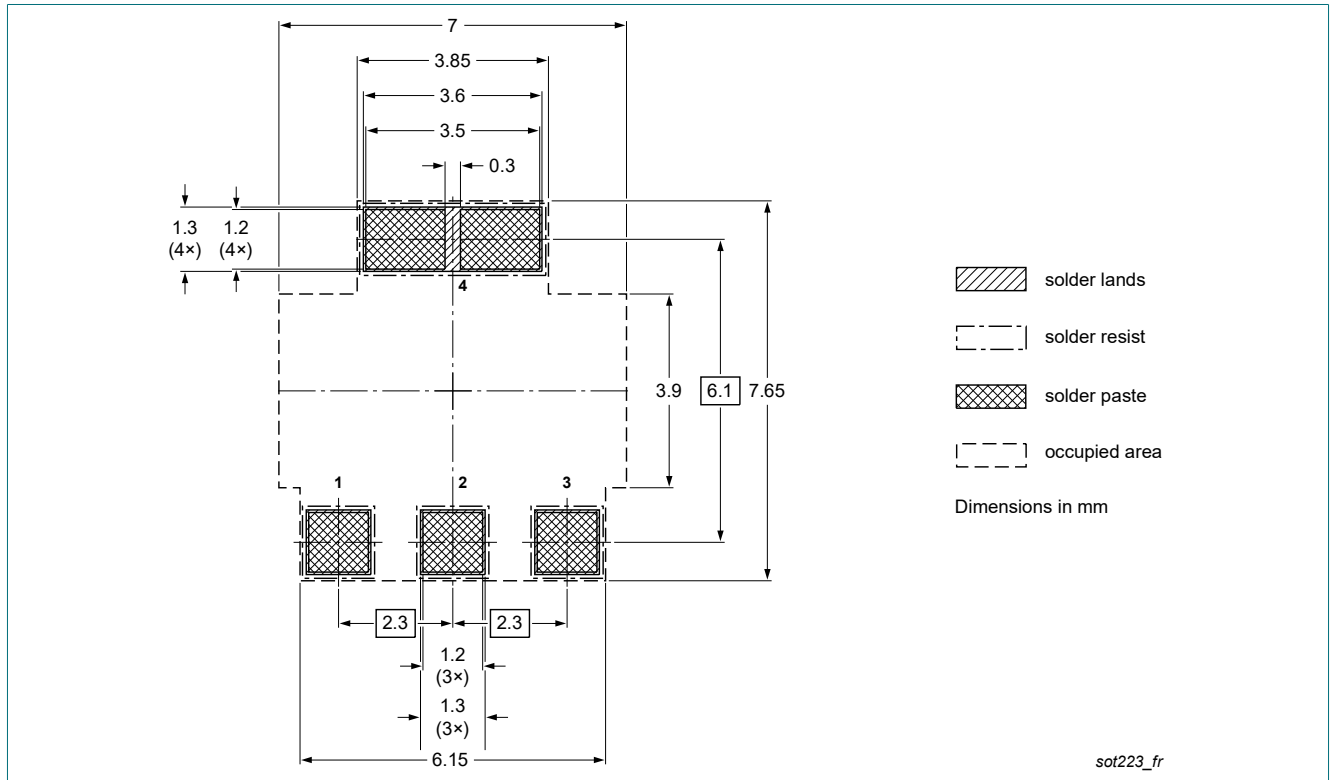


Fig. 10. Reflow soldering footprint for SC-73 (SOT223)

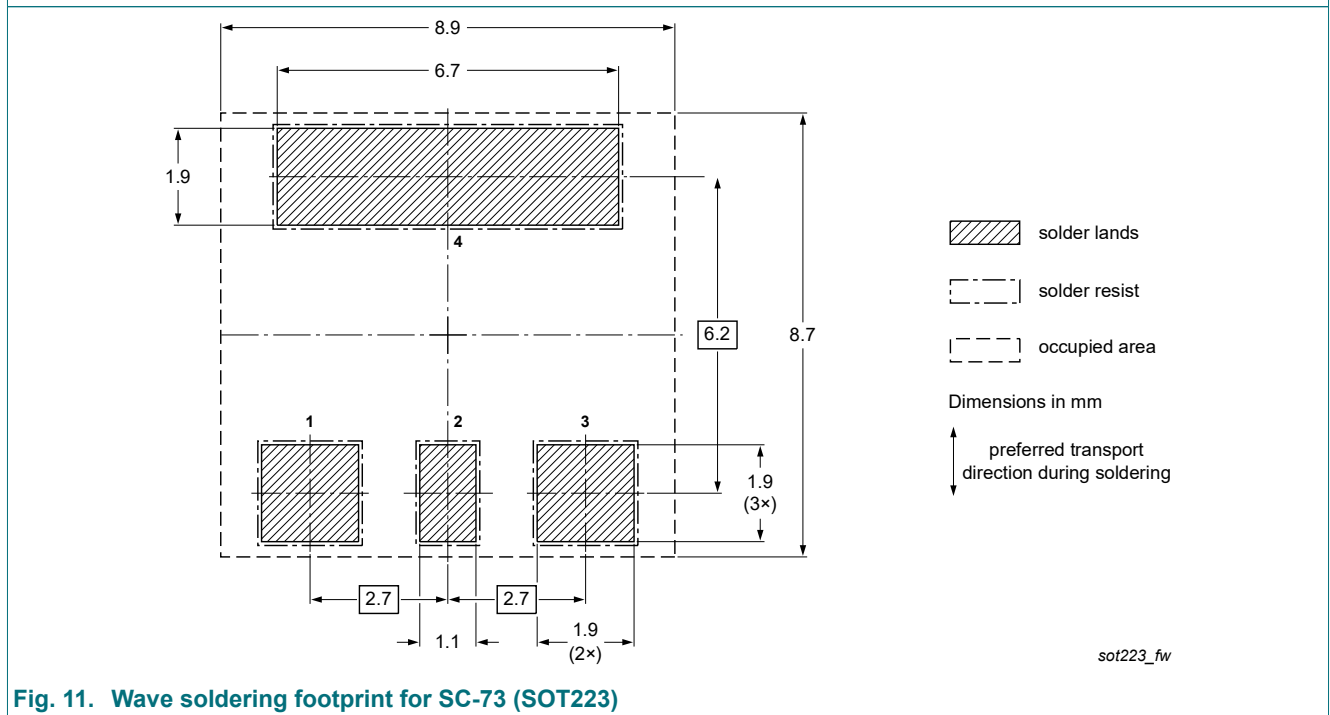


Fig. 11. Wave soldering footprint for SC-73 (SOT223)

## 14. Revision history

Table 8. Revision history

| Document ID            | Release date   | Data sheet status     | Change notice | Supersedes  |
|------------------------|--|-----------------------|---------------|---|
| BCP51_SER v.10         | 20231016   | Product data sheet    | -             | BCP51_BCX51_BC51PA v.9                                  |
| Modifications:         | <ul style="list-style-type: none"> <li>Data sheet separated into 3 data sheets</li> <li>Section "Packing information" removed</li> </ul> |                       |               |   |
| BCP51_BCX51_BC51PA v.9 | 20111013   | Product data sheet    | -             | BC636_BCP51_BCX51 v.8                                   |
| BC636_BCP51_BCX51 v.8  | 20080222   | Product data sheet    | -             | BC636_BCP51_BCX51 v.7                                   |
| BC636_BCP51_BCX51 v.7  | 20070629   | Product data sheet    | -             | BC636_BCP51_BCX51 v.6                                   |
| BC636_BCP51_BCX51 v.6  | 20060329   | Product data sheet    | -             | BC636_638_640 v.5<br>BCP51_52_53 v.5<br>BCX51_52_53 v.4 |
| BC636_638_640 v.5      | 20041011   | Product specification | -             | BCX51_52_53 v.5   |
| BCX51_52_53 v.5        | 20030206   | Product specification | -             | BCX51_52_53 v.4   |
| BCX51_52_53 v.4        | 20011010   | Product specification | -             | BCX51_52_53 v.3   |

## 15. 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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