



# BCP68-Q series

20 V, 2 A NPN medium power transistors

Rev. 1 — 9 May 2022

Product data sheet

## 1. General description

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

## 2. Features and benefits

- High collector current capability  $I_C$  and  $I_{CM}$
- Two current gain selections
- High power dissipation capability
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

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

## 4. Quick reference data

Table 1. Quick reference data

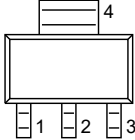
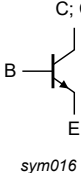
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

| Symbol    | Parameter                 | Conditions                                    |     | Min | Typ | Max | Unit |
|-----------|---------------------------|-----------------------------------------------|-----|-----|-----|-----|------|
| $V_{CEO}$ | collector-emitter voltage | open base                                     |     | -   | -   | 20  | V    |
| $I_C$     | collector current         |                                               |     | -   | -   | 2   | A    |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1\text{ ms}$          |     | -   | -   | 3   | A    |
| $h_{FE}$  | DC current gain           |                                               |     |     |     |     |      |
|           | BCP68-Q                   | $V_{CE} = 1\text{ V}$ ; $I_C = 500\text{ mA}$ | [1] | 85  | -   | 375 |      |
|           | BCP68-25-Q                |                                               | [1] | 160 | -   | 375 |      |

[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        |  |  |
| 2   | C      | collector   |                                                                                    |                                                                                     |
| 3   | E      | emitter     |                                                                                    |                                                                                     |
| 4   | C      | collector   |                                                                                    |                                                                                     |

## 6. Ordering information

Table 3. Ordering information

| Type number                | Package |                                                                   |                        |
|----------------------------|---------|-------------------------------------------------------------------|------------------------|
|                            | Name    | Description                                                       | Version                |
| <a href="#">BCP68-Q</a>    | SC-73   | plastic, surface-mounted package with increased heatsink; 4 leads | <a href="#">SOT223</a> |
| <a href="#">BCP68-25-Q</a> |         |                                                                   |                        |

## 7. Marking

Table 4. Marking

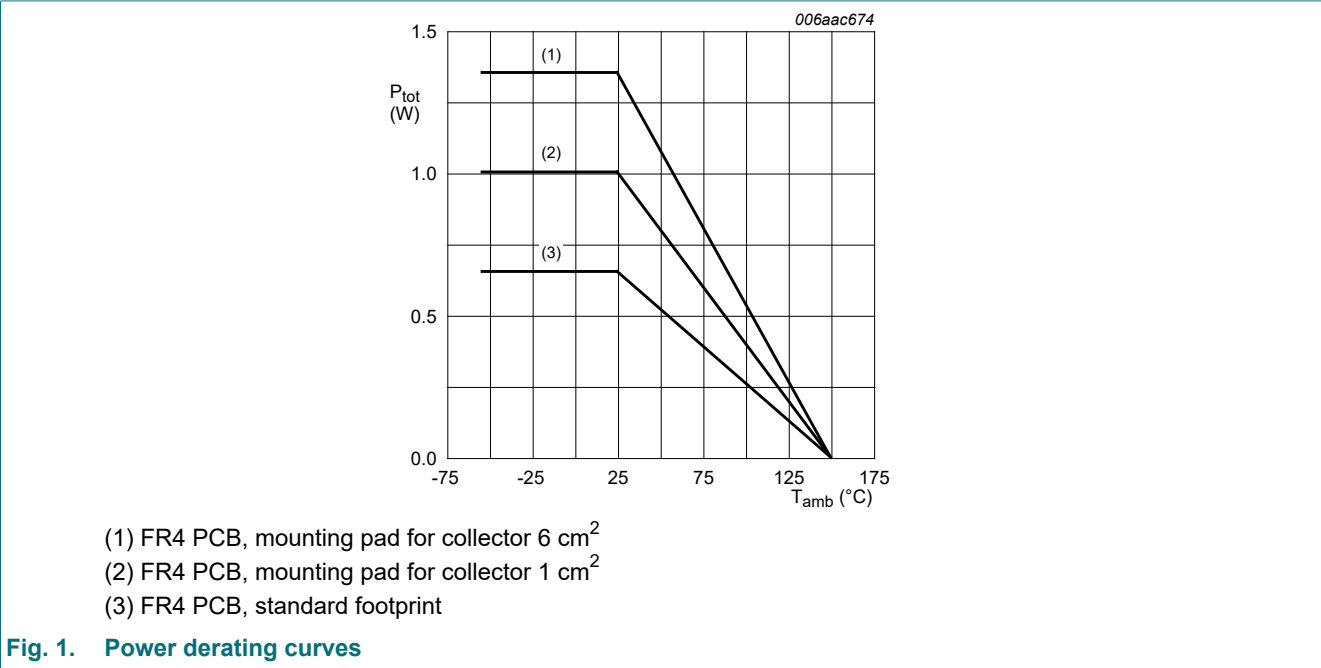
| Type number | Marking code |
|-------------|--------------|
| BCP68-Q     | BCP68        |
| BCP68-25-Q  | BCP68/25     |

8. Limiting values

Table 5. 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                                  | -   | 32   | V                  |
| $V_{CEO}$ | collector-emitter voltage | open base                                     | -   | 20   | V                  |
| $V_{EBO}$ | emitter-base voltage      | open collector                                | -   | 5    | V                  |
| $I_C$     | collector current         |                                               | -   | 2    | A                  |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1\text{ ms}$          | -   | 3    | A                  |
| $I_B$     | base current              |                                               | -   | 0.4  | A                  |
| $I_{BM}$  | peak base current         | single pulse; $t_p \leq 1\text{ ms}$          | -   | 0.4  | A                  |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ [1] | -   | 0.65 | W                  |
|           |                           | [2]                                           | -   | 1.00 | W                  |
|           |                           | [3]                                           | -   | 1.35 | 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  $1\text{ cm}^2$ .  
[3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector  $6\text{ cm}^2$ .



9. Thermal characteristics

Table 6. 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] | -   | -   | 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 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>.

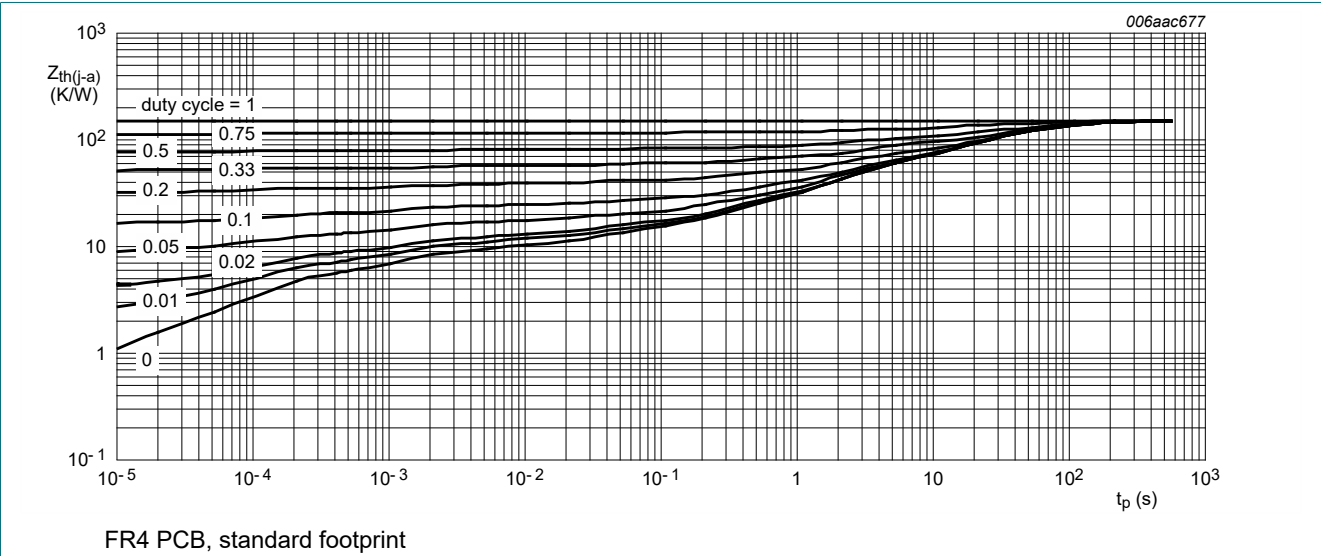


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

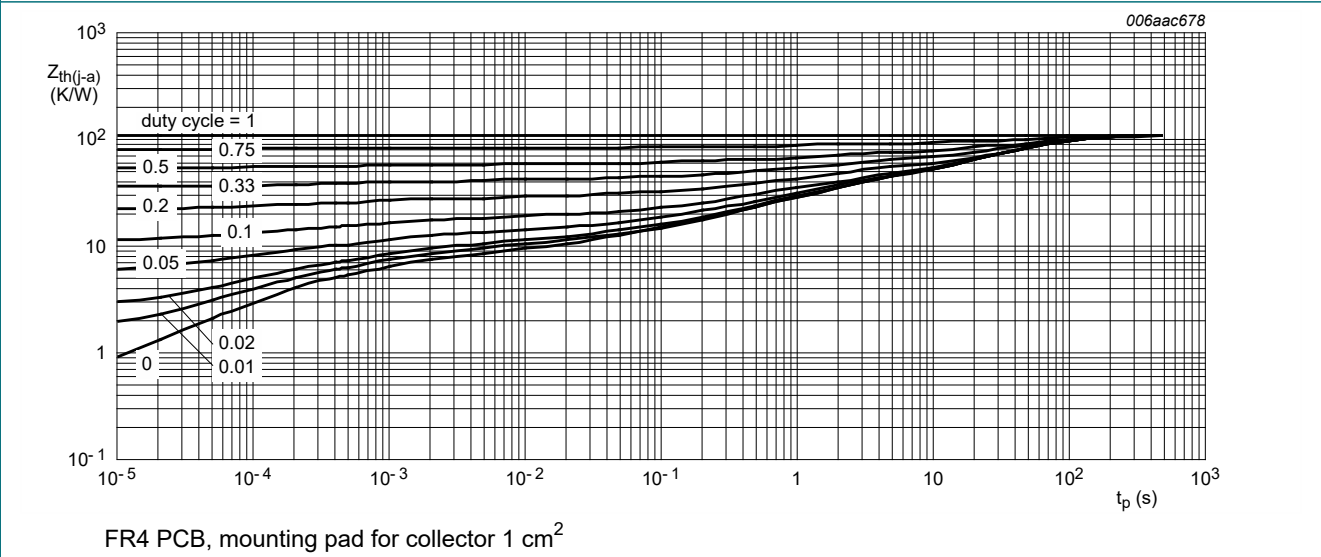
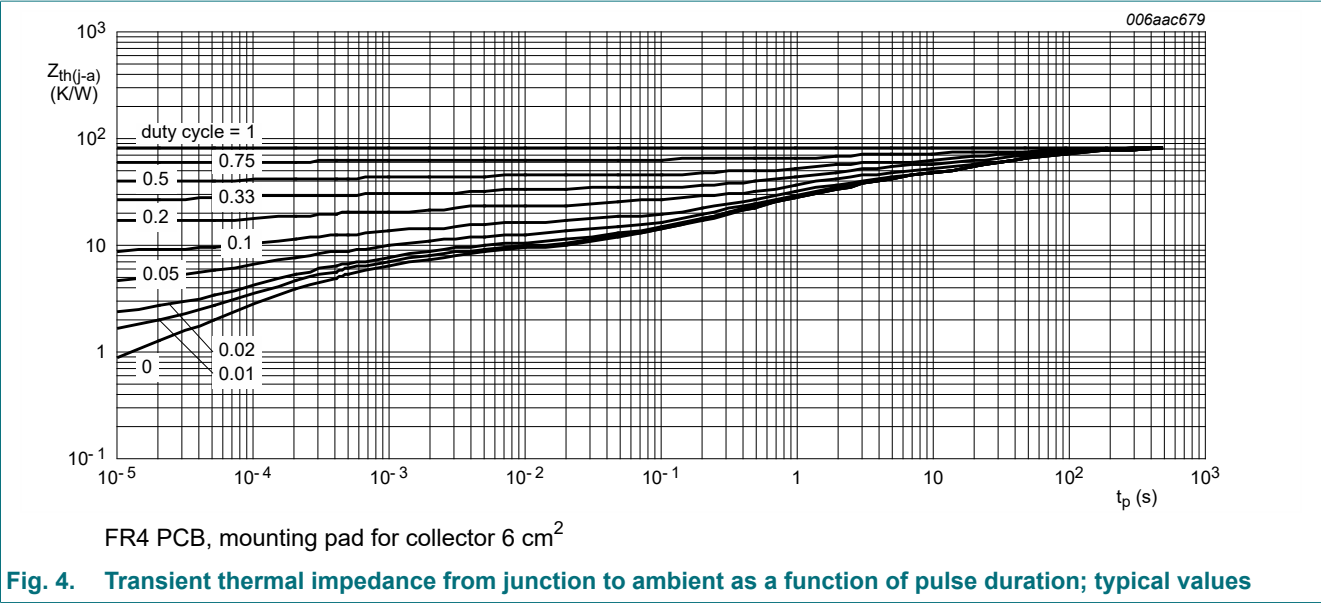


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



## 10. Characteristics

**Table 7. Characteristics**

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

| Symbol        | Parameter                            | Conditions                                                             |     | Min | Typ | Max | Unit          |
|---------------|--------------------------------------|------------------------------------------------------------------------|-----|-----|-----|-----|---------------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage     | $I_C = 100\text{ }\mu\text{A}$ ; $I_E = 0\text{ A}$                    |     | 32  | -   | -   | V             |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage  | $I_C = 30\text{ mA}$ ; $I_B = 0\text{ A}$                              |     | 20  | -   | -   | 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       | $V_{CB} = 25\text{ V}$ ; $I_E = 0\text{ A}$                            |     | -   | -   | 100 | nA            |
|               |                                      | $V_{CB} = 25\text{ V}$ ; $I_E = 0\text{ A}$ ; $T_J = 150\text{ °C}$    |     | -   | -   | 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                      |                                                                        |     |     |     |     |               |
|               | BCP68-Q                              | $V_{CE} = 10\text{ V}$ ; $I_C = 5\text{ mA}$                           | [1] | 50  | -   | -   |               |
|               |                                      | $V_{CE} = 1\text{ V}$ ; $I_C = 500\text{ mA}$                          | [1] | 85  | -   | 375 |               |
|               |                                      | $V_{CE} = 1\text{ V}$ ; $I_C = 1\text{ A}$                             | [1] | 60  | -   | -   |               |
|               |                                      | $V_{CE} = 1\text{ V}$ ; $I_C = 2\text{ A}$                             | [1] | 40  | -   | -   |               |
|               | BCP68-25-Q                           | $V_{CE} = 10\text{ V}$ ; $I_C = 5\text{ mA}$                           | [1] | 50  | -   | -   |               |
|               |                                      | $V_{CE} = 1\text{ V}$ ; $I_C = 500\text{ mA}$                          | [1] | 160 | -   | 375 |               |
|               |                                      | $V_{CE} = 1\text{ V}$ ; $I_C = 1\text{ A}$                             | [1] | 60  | -   | -   |               |
|               |                                      | $V_{CE} = 1\text{ V}$ ; $I_C = 2\text{ A}$                             | [1] | 40  | -   | -   |               |
| $V_{CEsat}$   | collector-emitter saturation voltage | $I_C = 1\text{ A}$ ; $I_B = 100\text{ mA}$                             | [1] | -   | -   | 0.5 | V             |
|               |                                      | $I_C = 2\text{ A}$ ; $I_B = 200\text{ mA}$                             | [1] | -   | -   | 0.6 | V             |
| $V_{BE}$      | base-emitter voltage                 | $V_{CE} = 10\text{ V}$ ; $I_C = 5\text{ mA}$                           | [1] | -   | -   | 0.7 | V             |
|               |                                      | $V_{CE} = 1\text{ V}$ ; $I_C = 1\text{ A}$                             | [1] | -   | -   | 1   | V             |
| $C_c$         | collector capacitance                | $V_{CB} = 10\text{ V}$ ; $I_E = I_E = 0\text{ A}$ ; $f = 1\text{ MHz}$ |     | -   | 22  | -   | pF            |
| $f_T$         | transition frequency                 | $V_{CE} = 5\text{ V}$ ; $I_C = 50\text{ mA}$ ; $f = 100\text{ MHz}$    |     | 40  | 170 | -   | MHz           |

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

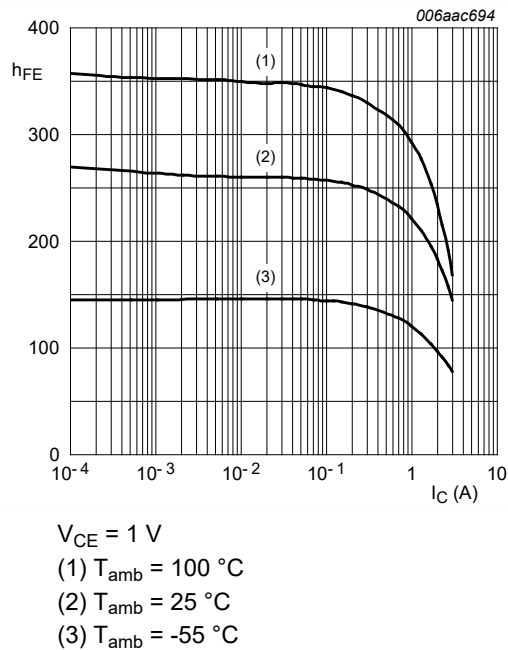


Fig. 5. DC current gain as a function of collector current; typical values

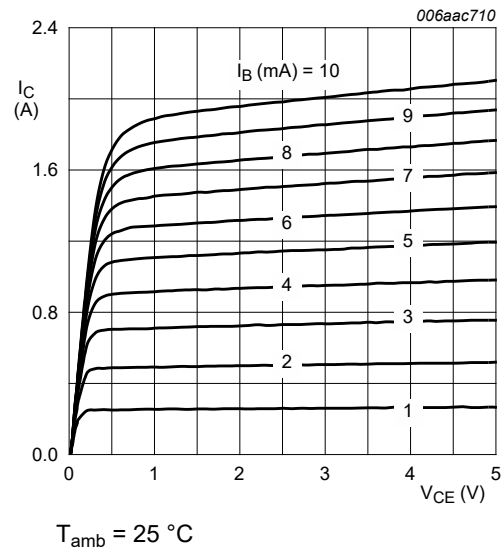


Fig. 6. Collector current as a function of collector-emitter voltage; typical values

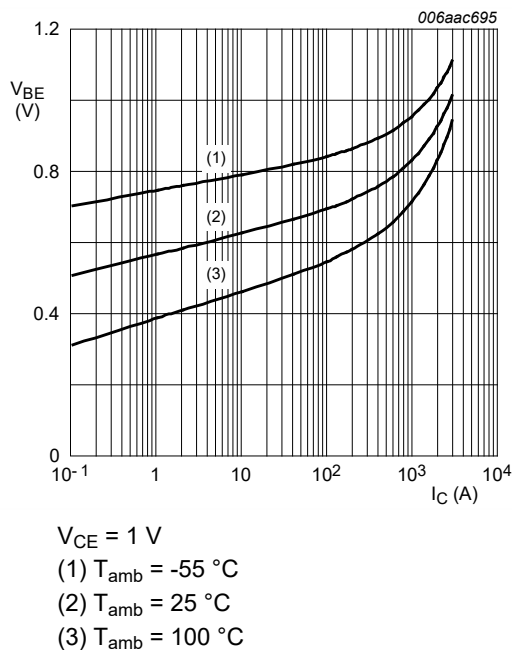


Fig. 7. Base-emitter voltage as a function of collector current; typical values

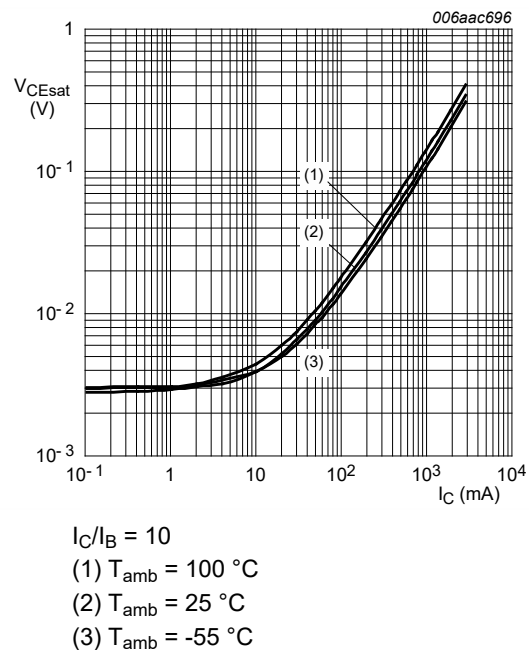


Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values

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

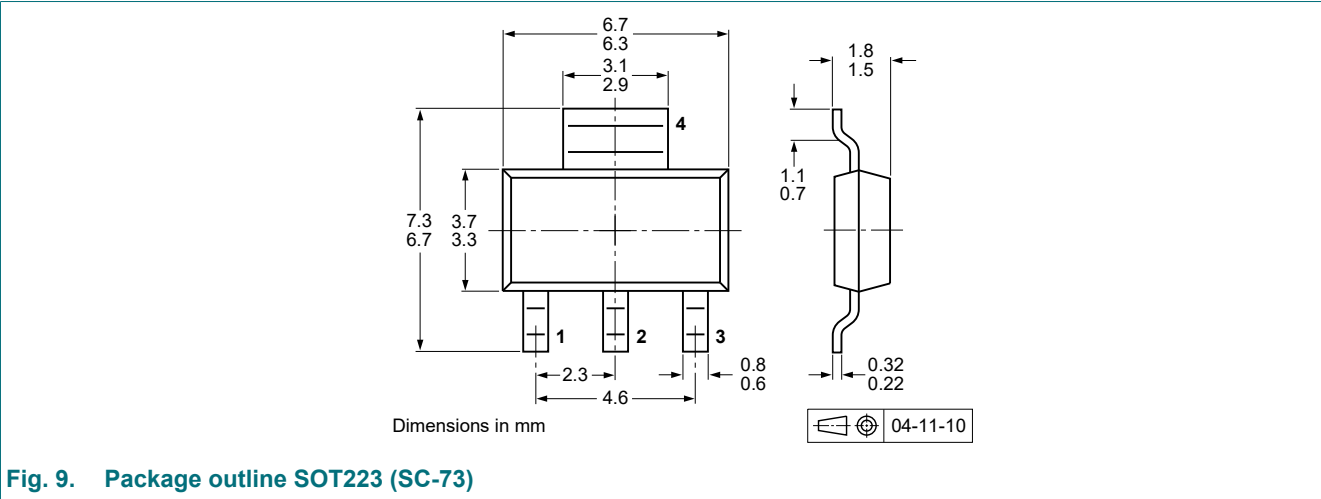
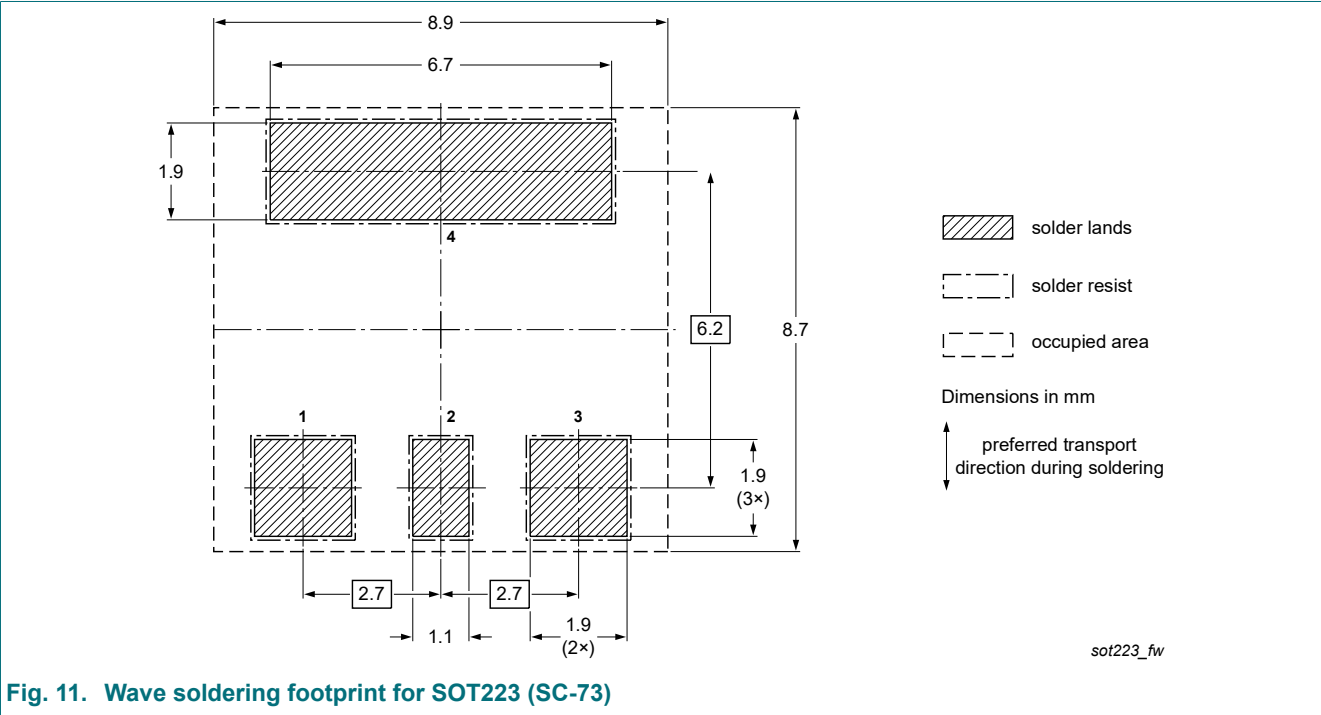
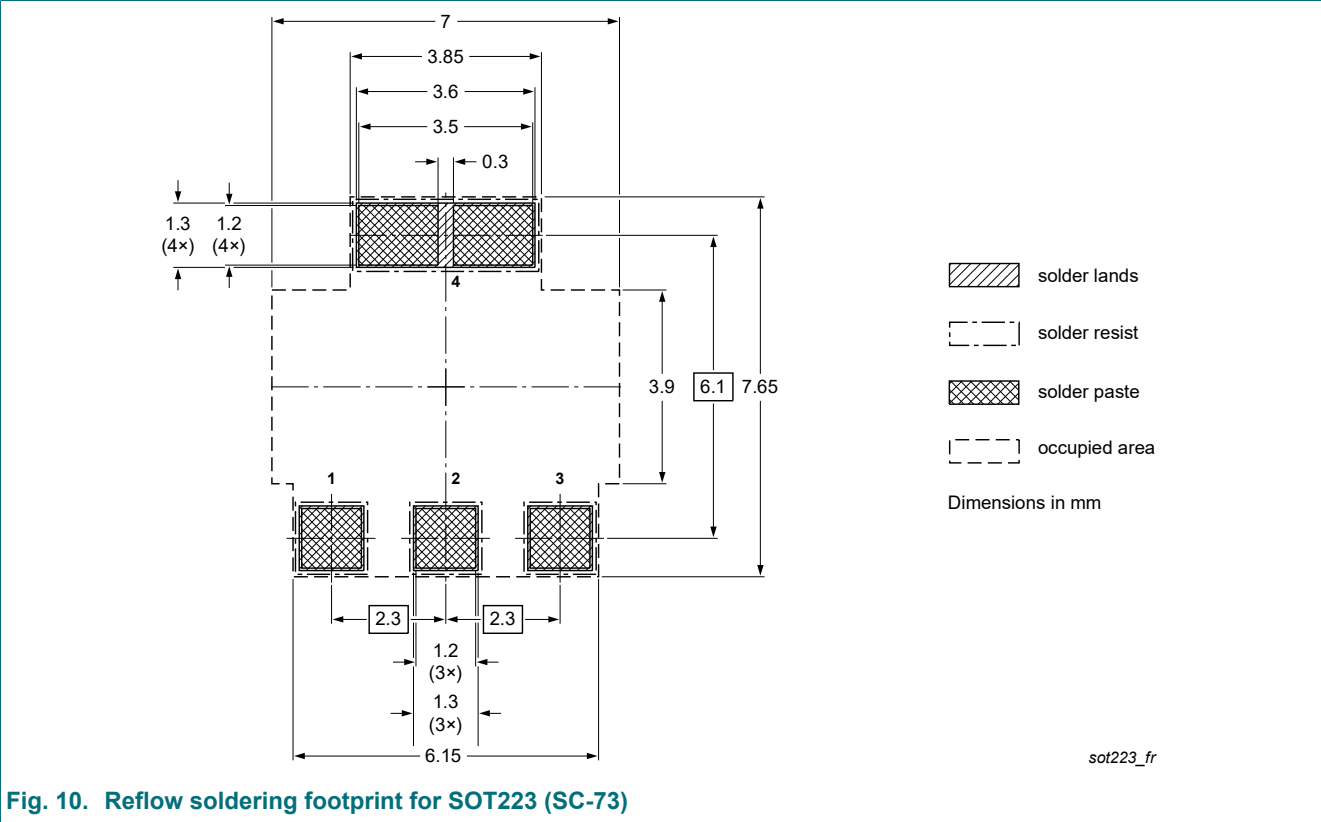


Fig. 9. Package outline SOT223 (SC-73)

13. Soldering



14. Revision history

Table 8. Revision history

| Document ID     | Release date | Data sheet status  | Change notice | Supersedes |
|-----------------|--------------|--------------------|---------------|------------|
| BCP68-Q_SER v.1 | 20220509     | Product data sheet | -             | -          |

## 15. 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: 9 May 2022