



BCP69 series

20 V, 2 A PNP medium power transistors

Rev. 9 — 21 November 2024

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

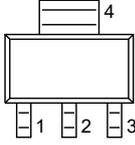
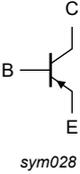
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|-----------|---------------------------|--|-----|-----|-----|------|--|
| V_{CEO} | collector-emitter voltage | open base | - | - | -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 | | | | | | |
| | BCP69 | $V_{CE} = -1\text{ V}; I_C = -500\text{ mA}$ $T_{amb} = 25\text{ °C}$ | [1] | 85 | - | 375 | |
| | BCP69-16 | | [1] | 100 | - | 250 | |
| | BCP69-25 | | [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 | | Version |
|--------------------------|---------|---|------------------------|
| | Name | Description | |
| BCP69 | - | 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 | SOT223 |
| BCP69-16 | | | |
| BCP69-25 | | | |

7. Marking

Table 4. Marking

| Type number | Marking code |
|-------------|--------------|
| BCP69 | BCP69 |
| BCP69-16 | BCP69/16 |
| BCP69-25 | BCP69/25 |

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 | - | -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 | $T_{amb} \leq 25\text{ °C}$ | [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 cm^2 .
- [3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm^2 .

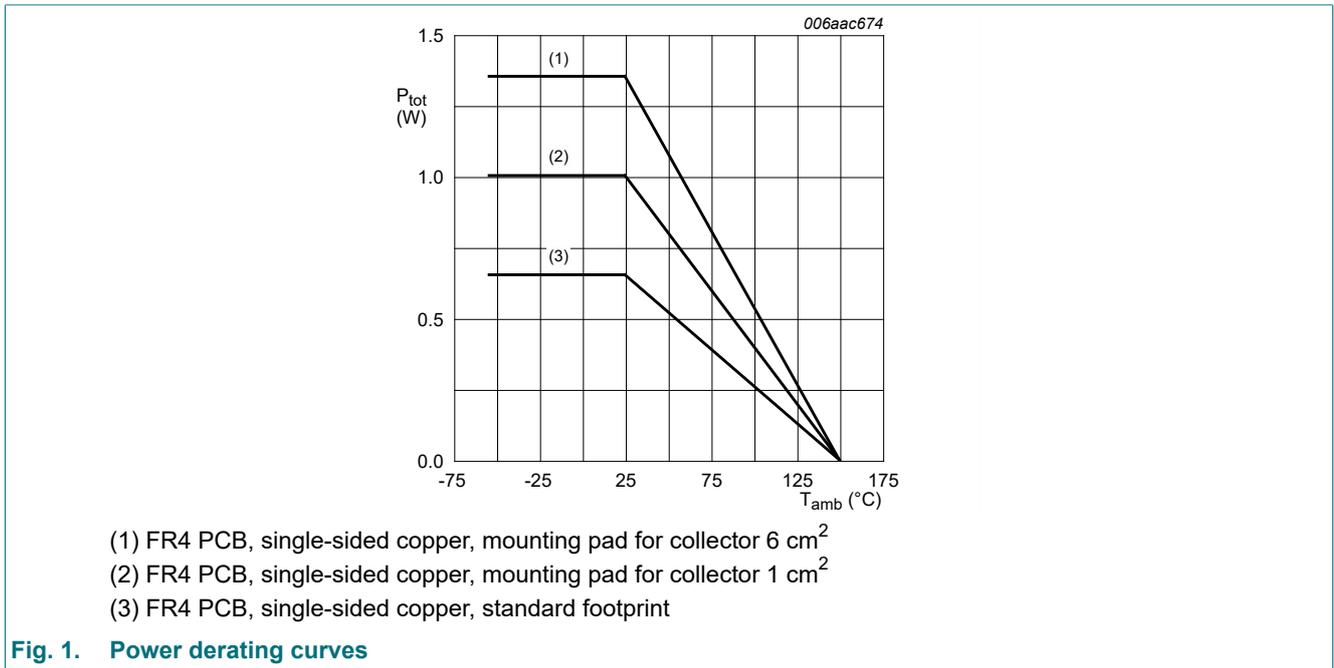


Fig. 1. Power derating curves

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 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 .

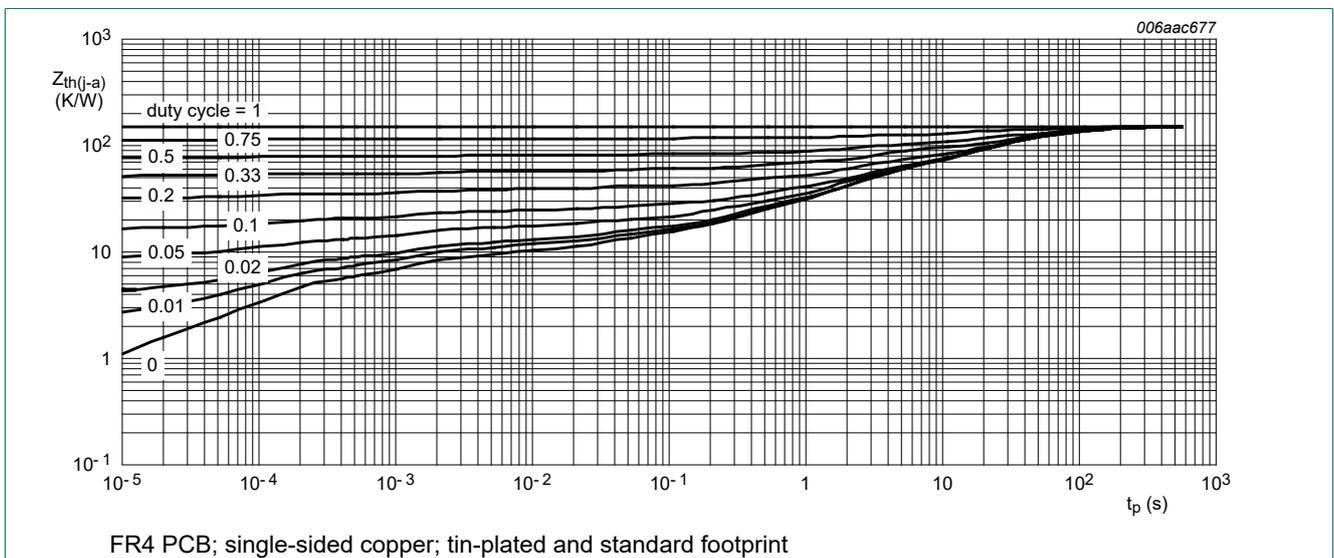


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

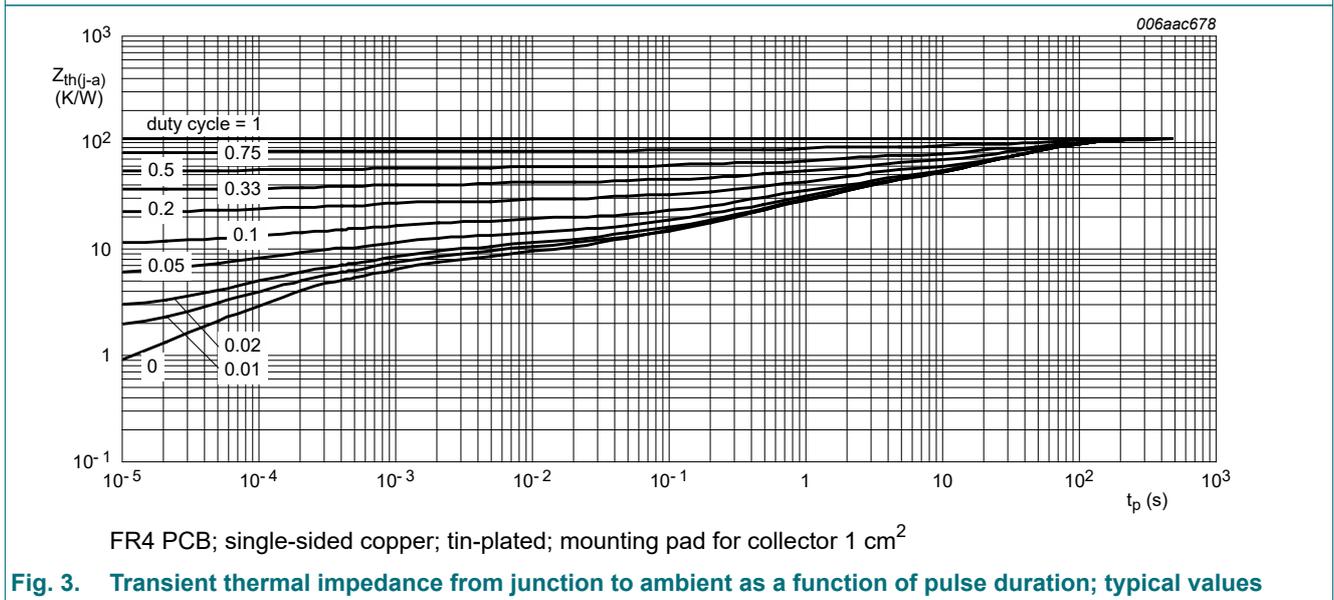
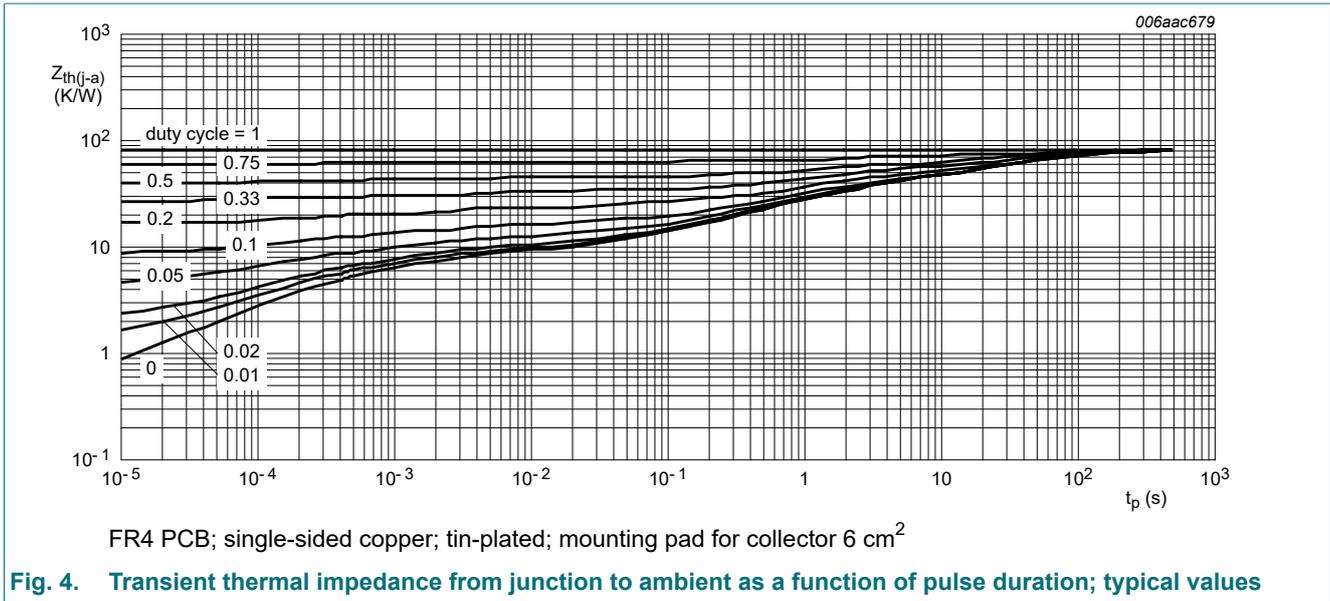


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

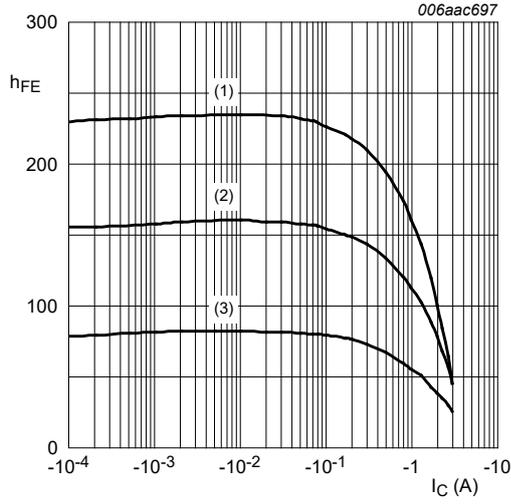


10. Characteristics

Table 7. Characteristics

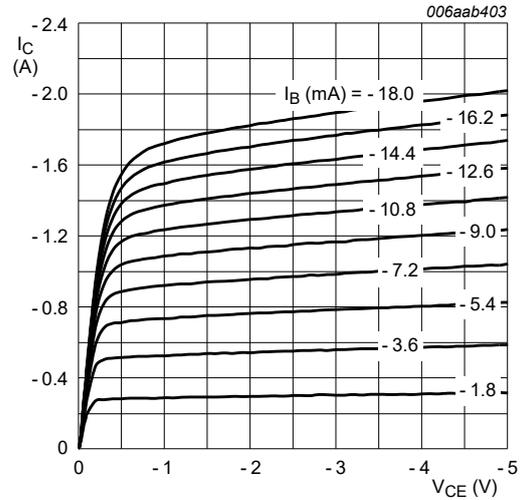
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | | |
|---|--------------------------------|---|---|-----|------|---------------|------|---|
| I_{CBO} | collector-base cut-off current | $V_{CB} = -25\text{ V}; I_E = 0\text{ A}$ $T_{amb} = 25\text{ °C}$ | - | - | -100 | nA | | |
| | | $V_{CB} = -25\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$ | - | - | -10 | μA | | |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}$ $T_{amb} = 25\text{ °C}$ | - | - | -100 | nA | | |
| h_{FE} | DC current gain | | | | | | | |
| | BCP69 | $V_{CE} = -10\text{ V}; I_C = -5\text{ mA}$ $T_{amb} = 25\text{ °C}$ | [1] | 50 | - | - | | |
| | | $V_{CE} = -1\text{ V}; I_C = -500\text{ mA}$ $T_{amb} = 25\text{ °C}$ | [1] | 85 | - | 375 | | |
| | | $V_{CE} = -1\text{ V}; I_C = -1\text{ A}$ $T_{amb} = 25\text{ °C}$ | [1] | 60 | - | - | | |
| | | $V_{CE} = -1\text{ V}; I_C = -2\text{ A}$ $T_{amb} = 25\text{ °C}$ | [1] | 40 | - | - | | |
| | BCP69-16 | $V_{CE} = -10\text{ V}; I_C = -5\text{ mA}$ $T_{amb} = 25\text{ °C}$ | [1] | 50 | - | - | | |
| | | $V_{CE} = -1\text{ V}; I_C = -500\text{ mA}$ $T_{amb} = 25\text{ °C}$ | [1] | 100 | - | 250 | | |
| | | $V_{CE} = -1\text{ V}; I_C = -1\text{ A}$ $T_{amb} = 25\text{ °C}$ | [1] | 60 | - | - | | |
| | | $V_{CE} = -1\text{ V}; I_C = -2\text{ A}$ $T_{amb} = 25\text{ °C}$ | [1] | 40 | - | - | | |
| | BCP69-25 | $V_{CE} = -10\text{ V}; I_C = -5\text{ mA}$ $T_{amb} = 25\text{ °C}$ | [1] | 50 | - | - | | |
| | | $V_{CE} = -1\text{ V}; I_C = -500\text{ mA}$ $T_{amb} = 25\text{ °C}$ | [1] | 160 | - | 375 | | |
| | | $V_{CE} = -1\text{ V}; I_C = -1\text{ A}$ $T_{amb} = 25\text{ °C}$ | [1] | 60 | - | - | | |
| | | $V_{CE} = -1\text{ V}; I_C = -2\text{ A}$ $T_{amb} = 25\text{ °C}$ | [1] | 40 | - | - | | |
| | V_{CEsat} | collector-emitter saturation voltage | $I_C = -1\text{ A}; I_B = -100\text{ mA}$ $T_{amb} = 25\text{ °C}$ | [1] | - | - | -0.5 | V |
| | | | $I_C = -2\text{ A}; I_B = -200\text{ mA}$ $T_{amb} = 25\text{ °C}$ | [1] | - | - | -0.6 | V |
| | V_{BE} | base-emitter voltage | $V_{CE} = -10\text{ V}; I_C = -5\text{ mA}$ $T_{amb} = 25\text{ °C}$ | [1] | - | - | -0.7 | V |
| $V_{CE} = -1\text{ V}; I_C = -1\text{ A}$ $T_{amb} = 25\text{ °C}$ | | | [1] | - | - | -1 | V | |
| C_c | collector capacitance | $V_{CB} = -10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$ $T_{amb} = 25\text{ °C}$ | - | 28 | - | pF | | |
| f_T | transition frequency | $V_{CE} = -5\text{ V}; I_C = -50\text{ mA}; f = 100\text{ MHz}$ $T_{amb} = 25\text{ °C}$ | 40 | 140 | - | MHz | | |

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



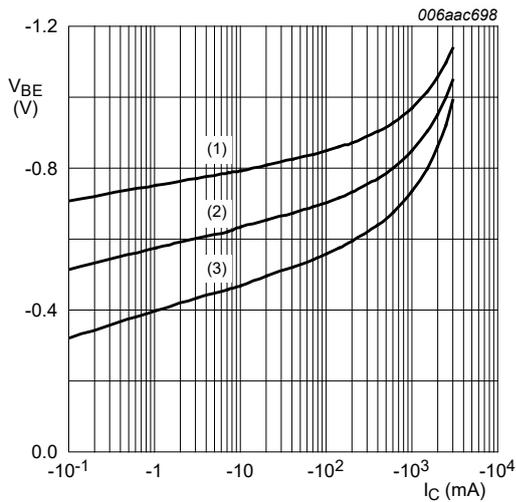
$V_{CE} = -1\text{ V}$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Fig. 5. hFE selection -16: DC current gain as a function of collector current; typical values



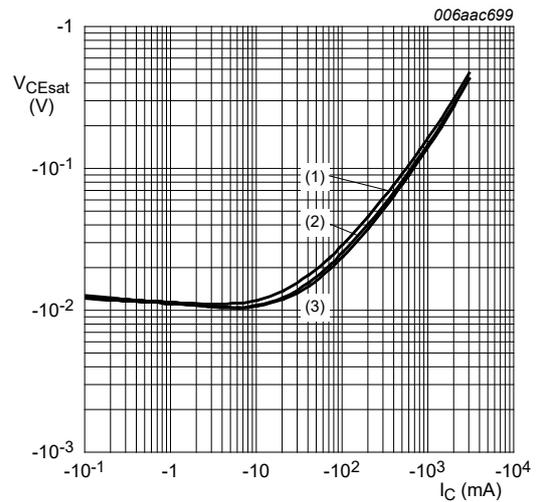
$T_{amb} = 25\text{ °C}$

Fig. 6. hFE selection -16: Collector current as a function of collector-emitter voltage; typical values



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

Fig. 7. hFE selection -16: Base-emitter 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. 8. hFE selection -16: Collector-emitter saturation voltage as a function of collector current; typical values

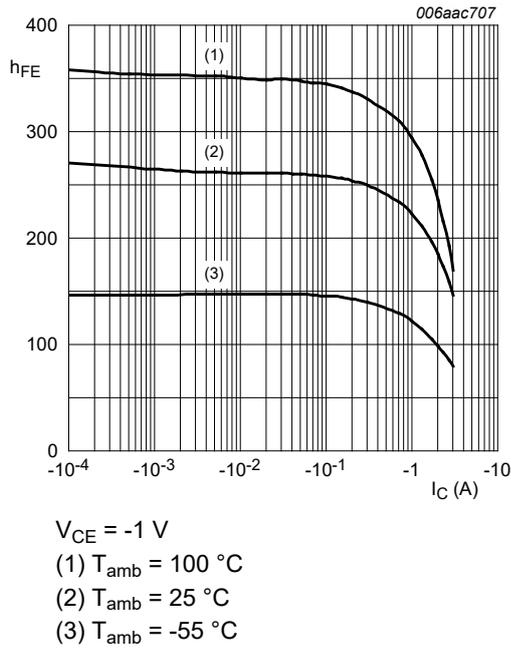


Fig. 9. hFE selection -25: DC current gain as a function of collector current; typical values

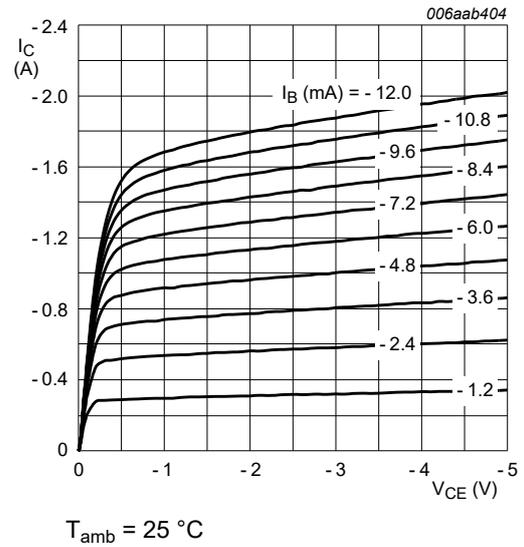


Fig. 10. hFE selection -25: Collector current as a function of collector-emitter voltage; typical values

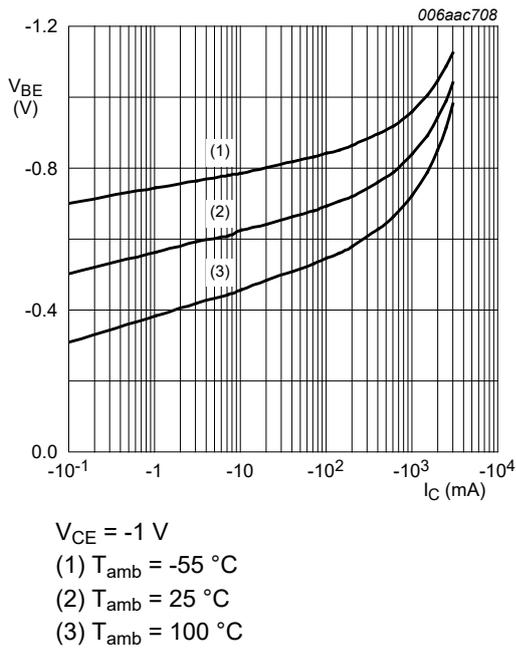


Fig. 11. hFE selection -25: Base-emitter voltage as a function of collector current; typical values

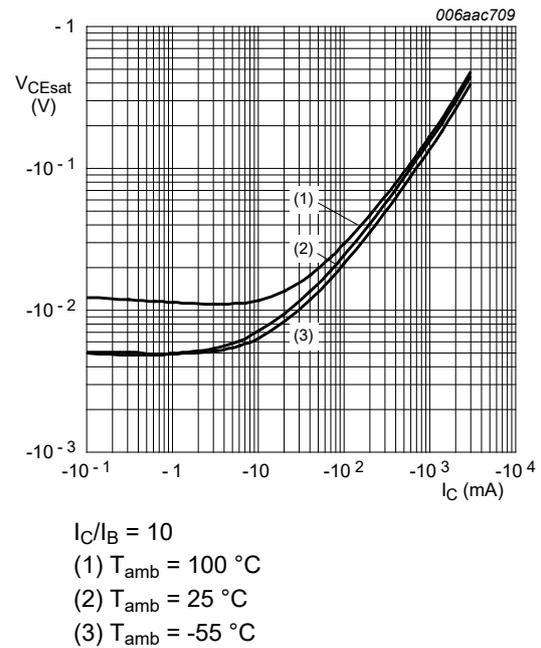


Fig. 12. hFE selection -25: Collector-emitter saturation voltage as a function of collector current; typical values

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

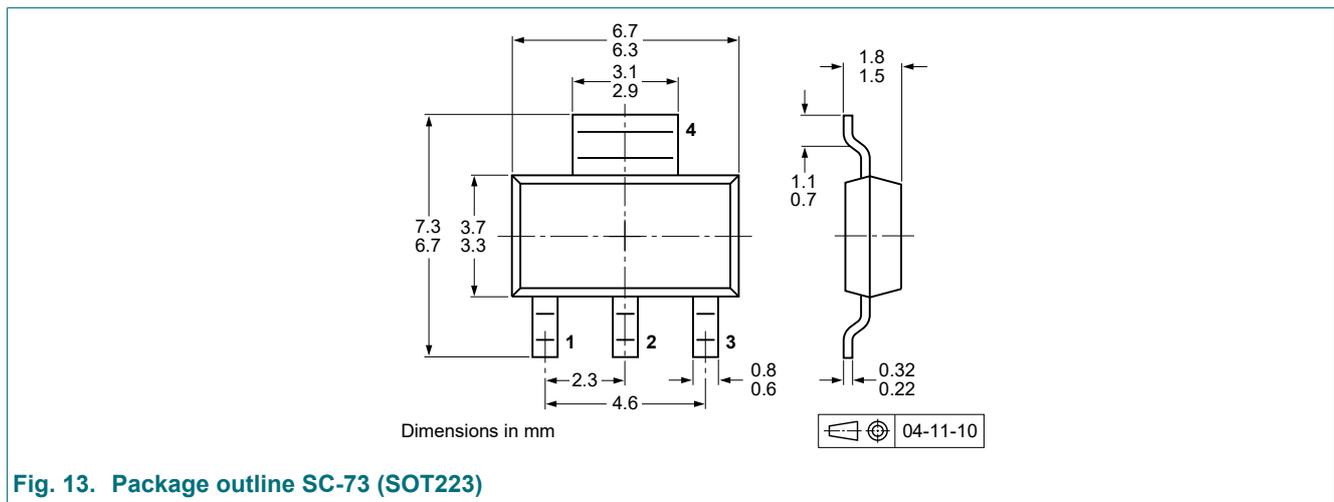


Fig. 13. Package outline SC-73 (SOT223)

13. Soldering

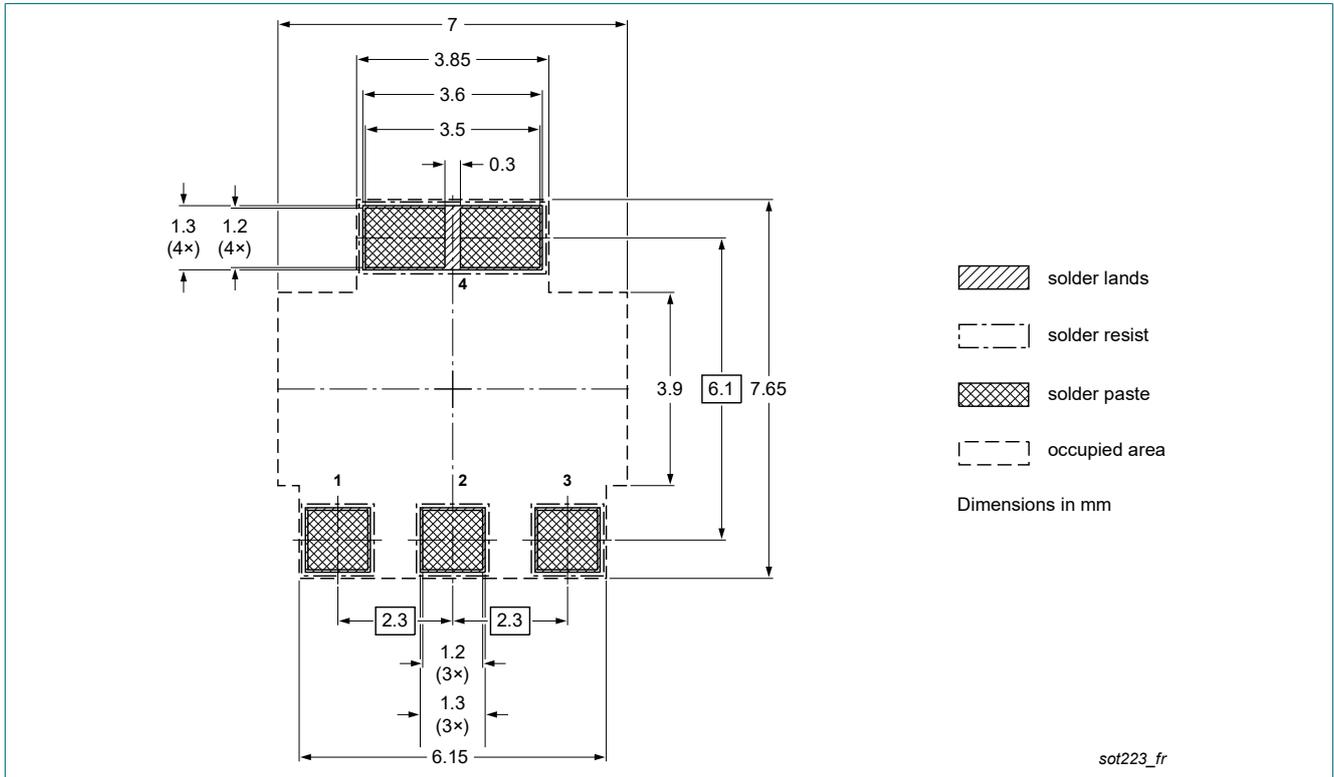


Fig. 14. Reflow soldering footprint for SC-73 (SOT223)

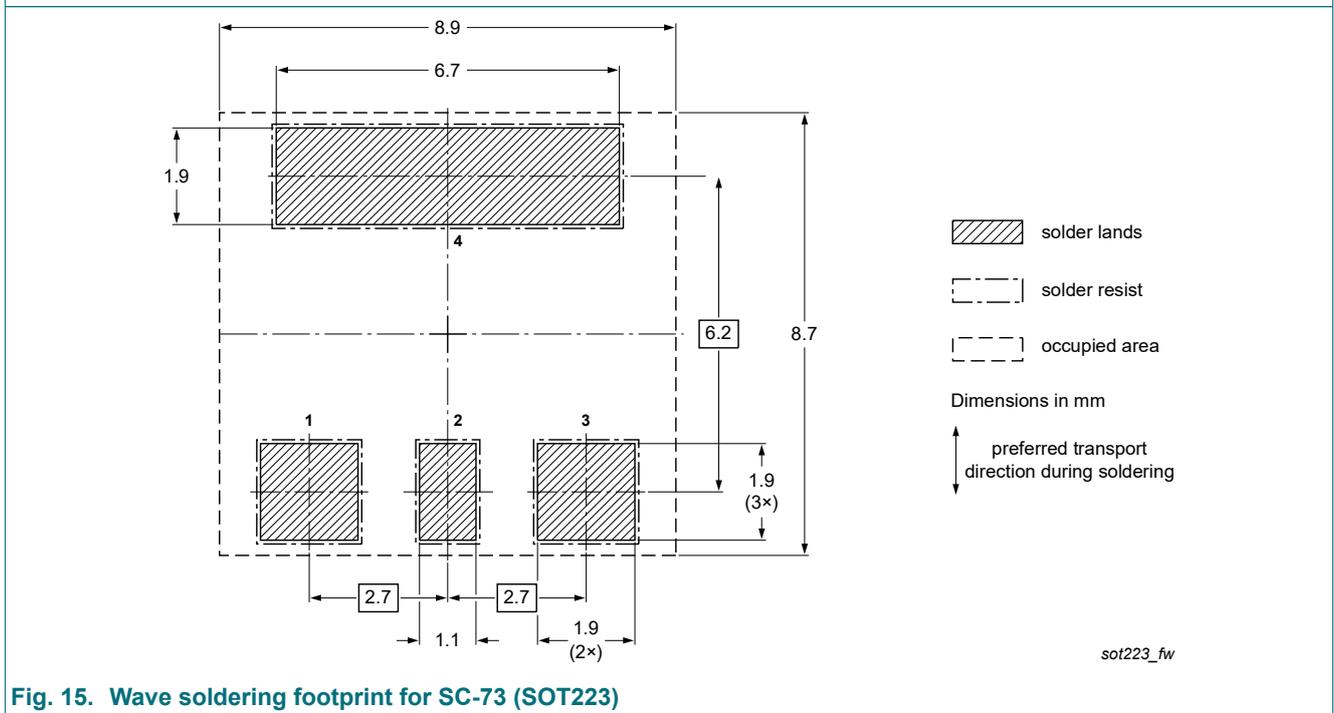


Fig. 15. Wave soldering footprint for SC-73 (SOT223)

14. Revision history

Table 8. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|------------------------|---|-----------------------|---------------|------------------------|
| BCP69_SER v.9 | 20241121 | Product data sheet | - | BCP69_BC869_BC69PA v.8 |
| Modifications: | <ul style="list-style-type: none"> Quick reference data: conditions at h_{FE} corrected | | | |
| BCP69_SER v.8 | 20240704 | Product data sheet | - | BCP69_BC869_BC69PA v.7 |
| BCP69_BC869_BC69PA v.7 | 20111012 | Product data sheet | - | BC869_6 BCP69_6 |
| BC869_6 | 20041108 | Product data sheet | - | BC869_5 |
| BC869_5 | 20031202 | Product specification | - | BC869_4 |
| BC869_4 | 19990408 | Product specification | - | BC869_3 |
| BC869_3 | 19980716 | Product specification | - | BC869_CNV_2 |
| BC869_CNV_2 | 19970401 | Product specification | - | - |
| BCP69_6 | 20081202 | Product data sheet | - | BCP69_5 |
| BCP69_5 | 20031125 | Product specification | - | BCP69_4 |
| BCP69_4 | 20021115 | Product specification | - | BCP69_3 |
| BCP69_3 | 19990408 | Product specification | - | BCP69_CNV_2 |
| BCP69_CNV_2 | 19970312 | Product specification | - | - |

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. |

- [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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