

BCX56 series

80 V, 1 A NPN medium power transistors

Rev. 13 — 25 October 2023

Product data sheet

1. General description

NPN medium power transistors in a SOT89 (SC-62) flat lead Surface-Mounted Device (SMD) plastic package

2. Features and benefits

- High collector current capability I_C and I_{CM}
- Three current gain selections
- High power dissipation capability

3. Applications

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

4. Quick reference data

Table 1. Quick reference data

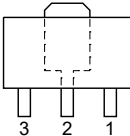
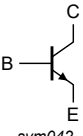
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-----------|---------------------------|--|-----|-----|-----|-----|------|
| V_{CEO} | collector-emitter voltage | open base | | - | - | 80 | 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 | | | | | | |
| | BCX56 | $V_{CE} = 2\text{ V}; I_C = 150\text{ mA}$ | [1] | 63 | - | 250 | |
| | BCX56-10 | | [1] | 63 | - | 160 | |
| | BCX56-16 | | [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 | E | emitter |  |  |
| 2 | C | collector | | |
| 3 | B | base | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|--------------------------|---------|---|-----------------------|
| | Name | Description | Version |
| BCX56 | SC-62 | plastic, surface-mounted package; 3 leads; 1.5 mm pitch; 4.5 mm x 2.5 mm x 1.5 mm body | SOT89 |
| BCX56-10 | | | |
| BCX56-16 | | | |

7. Marking

Table 4. Marking

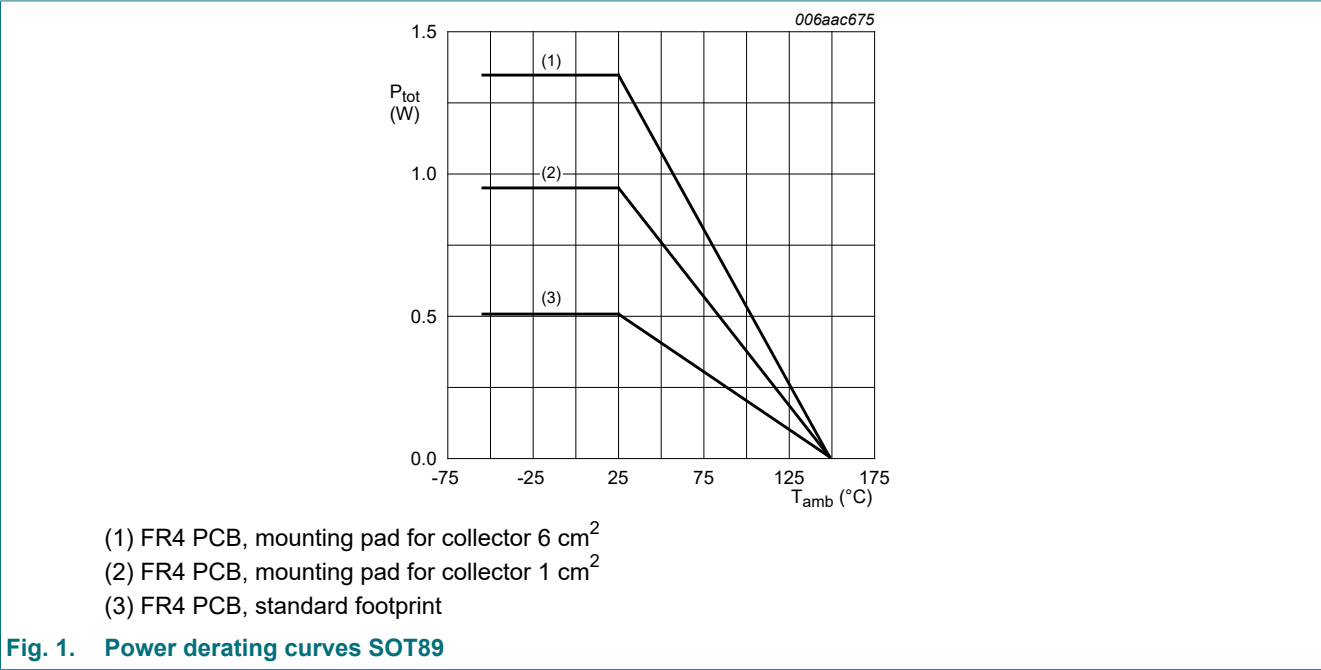
| Type number | Marking code |
|-------------|--------------|
| BCX56 | BH |
| BCX56-10 | BK |
| BCX56-16 | BL |

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 | - | 100 | V |
| V_{CEO} | collector-emitter voltage | open base | - | 80 | 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 | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ [1] | - | 0.50 | W |
| | | [2] | - | 0.95 | 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 cm^2 .
[3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 6 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] | - | - | 250 | K/W |
| | | | [2] | | | 132 | 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 cm².
[3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm².

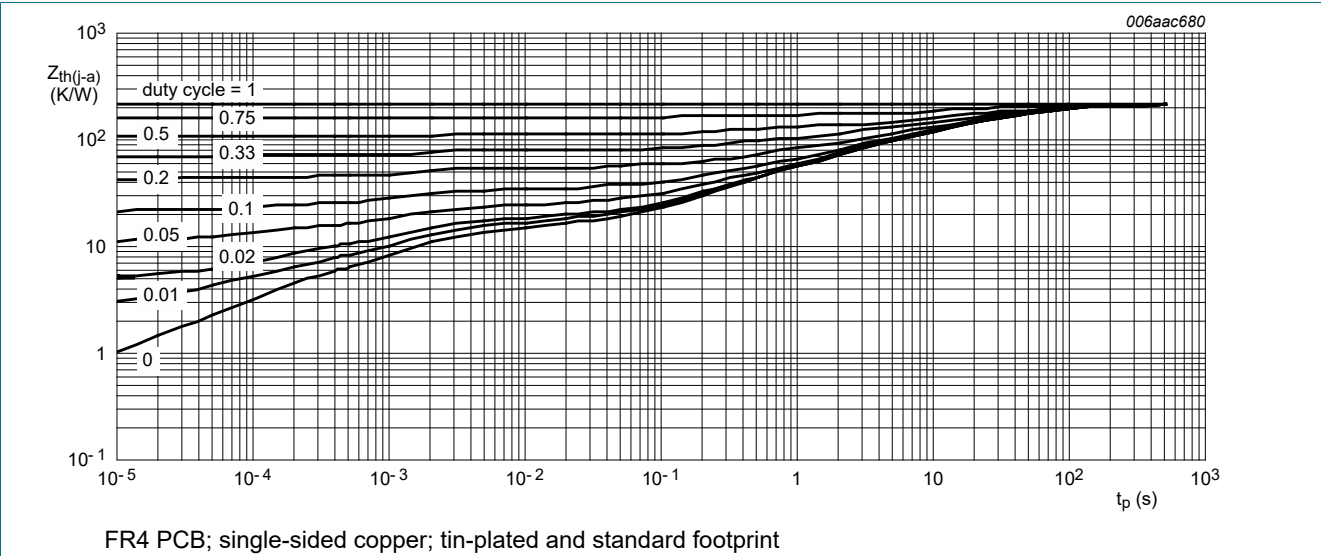


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

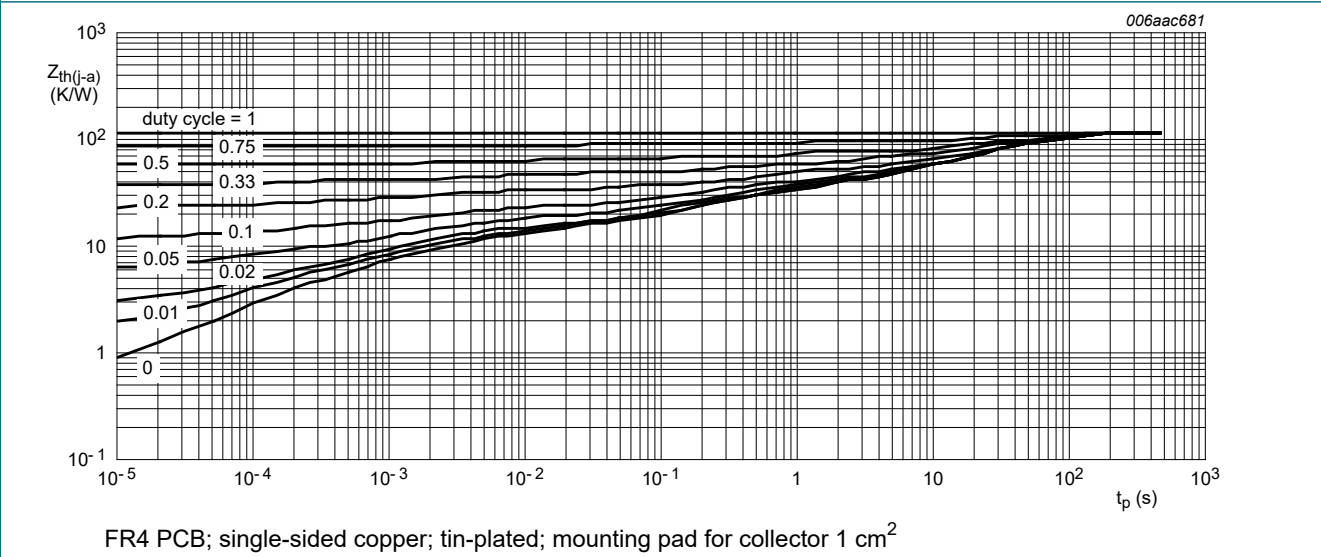
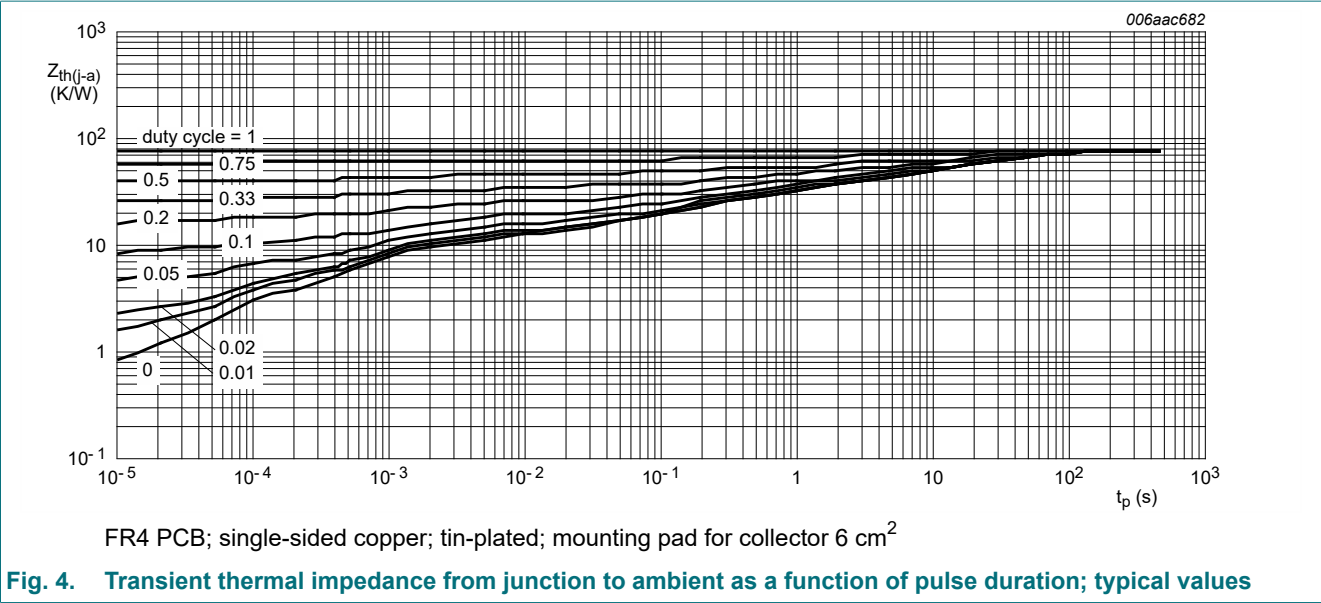


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



10. Characteristics

Table 7. Characteristics
T_{amb} = 25 °C unless otherwise specified.

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|----------------------|--------------------------------------|--|-----|-----|-----|-----|------|
| V _{(BR)CBO} | collector-base breakdown voltage | I _C = 100 µA; I _E = 0 A | | 100 | - | - | V |
| V _{(BR)CEO} | collector-emitter breakdown voltage | I _C = 2 mA; I _B = 0 A | | 80 | - | - | V |
| V _{(BR)EBO} | emitter-base breakdown voltage | I _E = 100 µA; 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 °C | | - | - | 10 | µA |
| I _{EBO} | emitter-base cut-off current | V _{EB} = 5 V; I _C = 0 A | | - | - | 100 | nA |
| h _{FE} | DC current gain | | | | | | |
| | BCX56 | V _{CE} = 2 V; I _C = 5 mA | [1] | 63 | - | - | |
| | | V _{CE} = 2 V; I _C = 150 mA | | 63 | - | 250 | |
| | | V _{CE} = 2 V; I _C = 500 mA | | 40 | - | - | |
| | BCX56-10 | V _{CE} = 2 V; I _C = 5 mA | [1] | 63 | - | - | |
| | | V _{CE} = 2 V; I _C = 150 mA | | 63 | - | 160 | |
| | | V _{CE} = 2 V; I _C = 500 mA | | 40 | - | - | |
| | BCX56-16 | V _{CE} = 2 V; I _C = 5 mA | [1] | 63 | - | - | |
| | | V _{CE} = 2 V; I _C = 150 mA | | 100 | - | 250 | |
| | | V _{CE} = 2 V; I _C = 500 mA | | 40 | - | - | |
| V _{CEsat} | collector-emitter saturation voltage | I _C = 500 mA; I _B = 50 mA | [1] | - | - | 0.5 | V |
| V _{BE} | base-emitter voltage | V _{CE} = 2 V; I _C = 500 mA | [1] | - | - | 1 | V |
| C _c | collector capacitance | V _{CB} = 10 V; I _E = i _e = 0 A; f = 1 MHz | | - | 6 | - | pF |
| f _T | transition frequency | V _{CE} = 5 V; I _C = 50 mA; f = 100 MHz | | 100 | 180 | - | MHz |

[1] pulsed; t_p ≤ 300 µs; δ ≤ 0.02

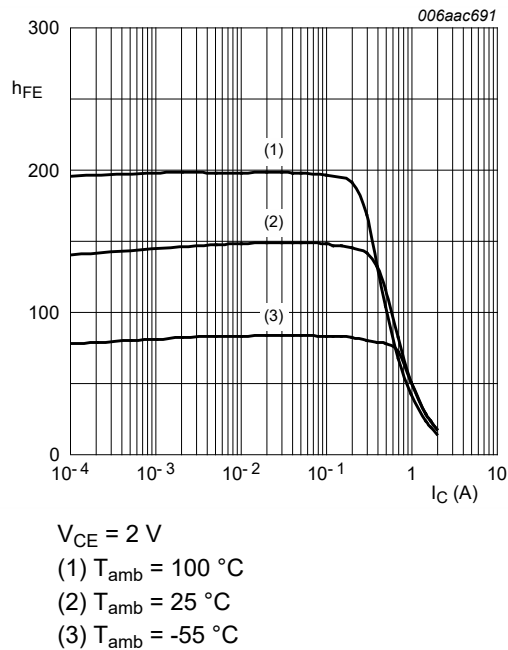


Fig. 5. DC current gain as a function of collector current; typical values

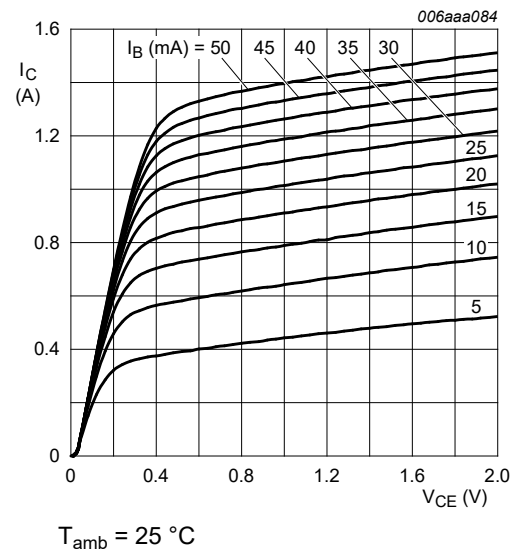


Fig. 6. Collector current as a function of collector-emitter voltage; typical values

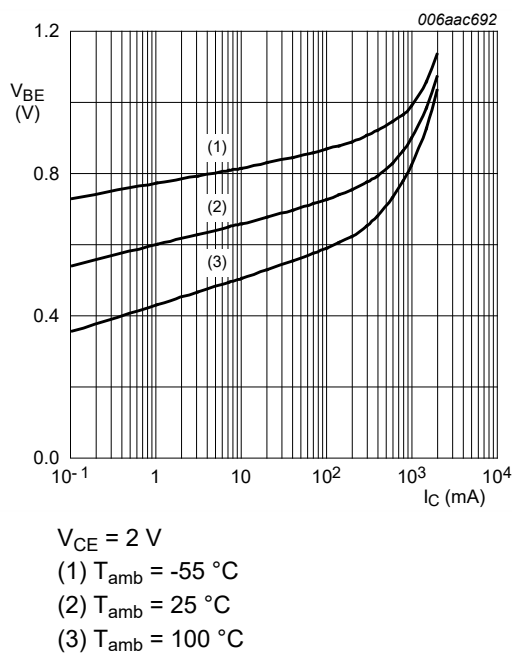


Fig. 7. Base-emitter voltage as a function of collector current; typical values

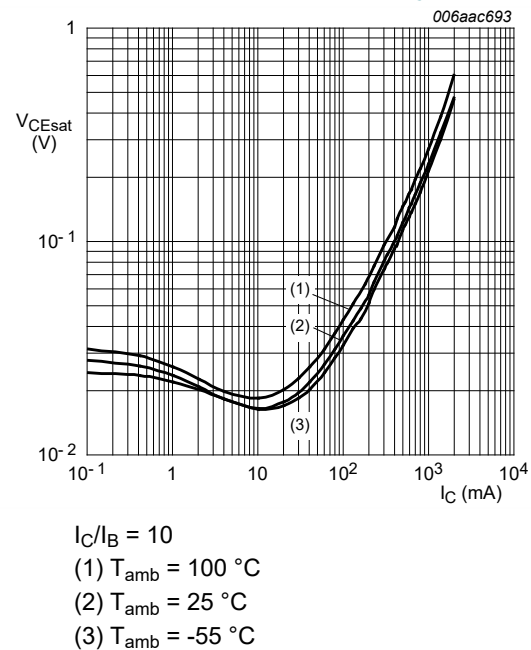


Fig. 9.

11. Package outline

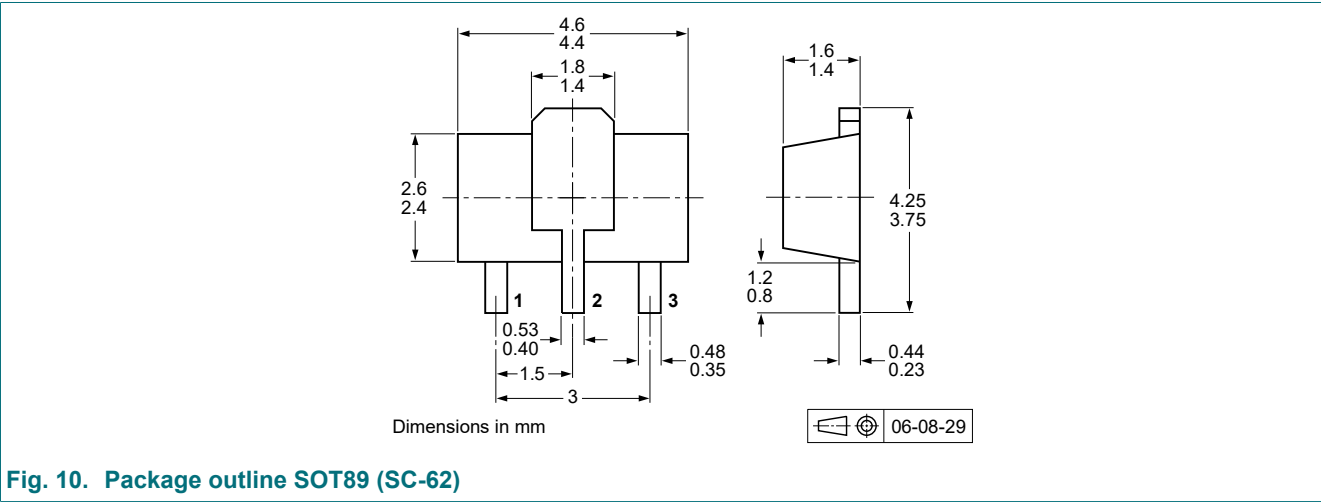


Fig. 10. Package outline SOT89 (SC-62)

12. Soldering

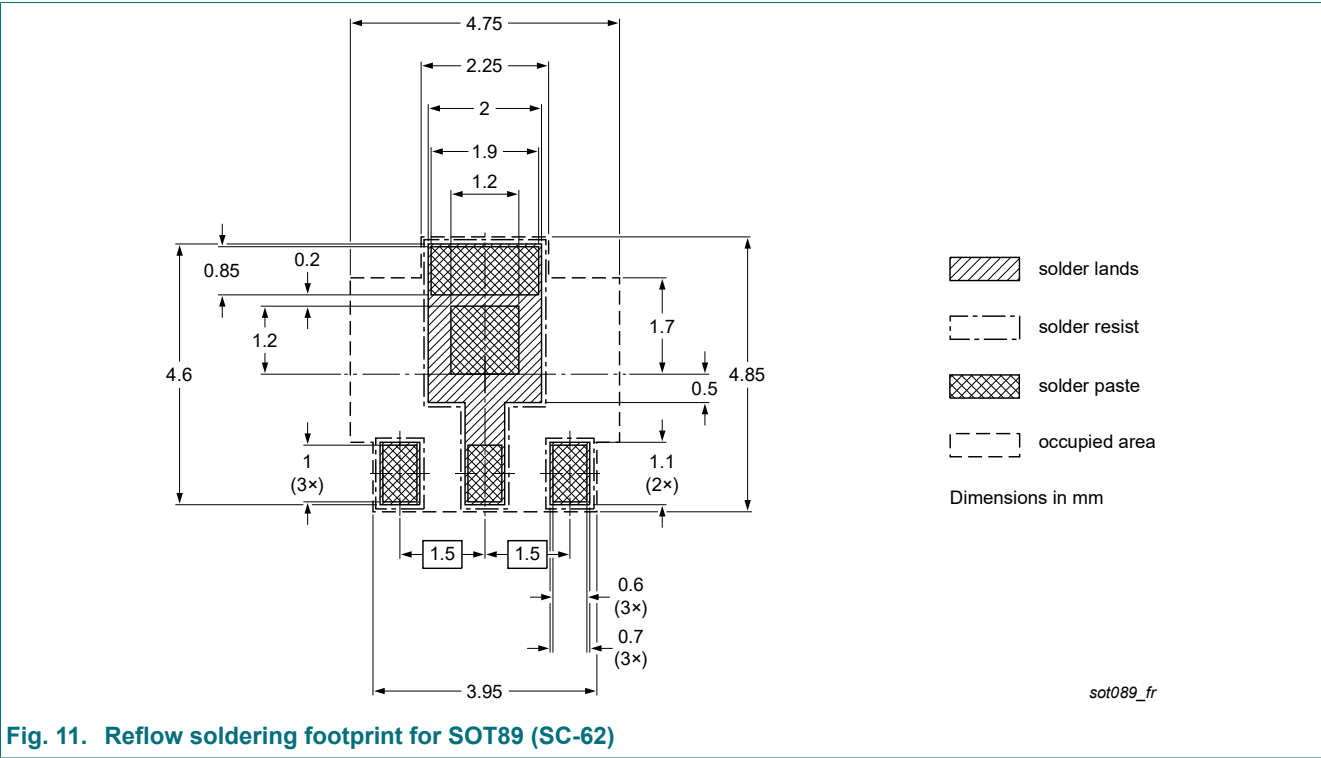


Fig. 11. Reflow soldering footprint for SOT89 (SC-62)

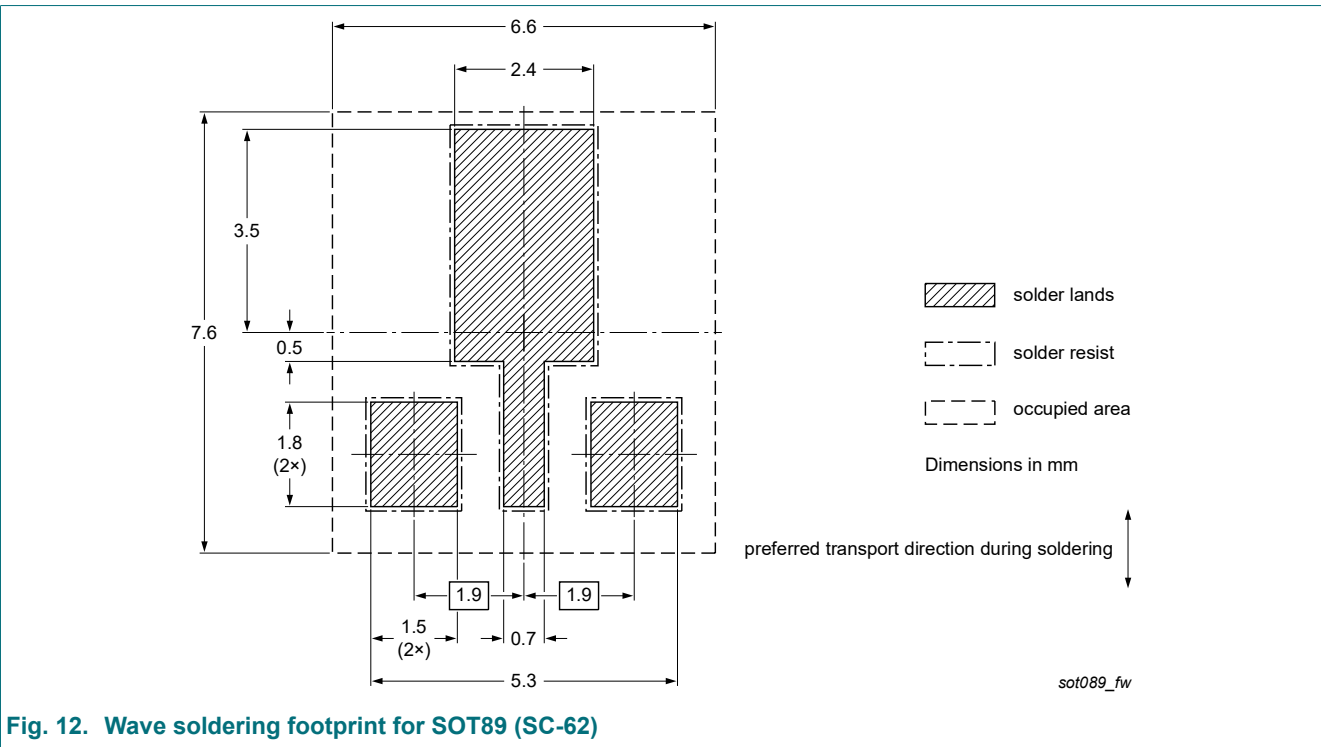


Fig. 12. Wave soldering footprint for SOT89 (SC-62)

13. Revision history

Table 8. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|------------------------|--|-----------------------|---------------|---|
| BCX56_SER v.13 | 20231026 | Product data sheet | - | BCX56_SER v.12 |
| Modifications: | • Typos corrected in "Applications" and "Ordering information" | | | |
| BCX56_SER v.12 | 20230623 | Product data sheet | - | BCX56_SER v.11 |
| BCX56_SER v.11 | 20230401 | Product data sheet | - | BCX56_SER v.10 |
| BCX56_SER v.10 | 20220624 | Product data sheet | - | BCP56_BCX56_BC56PA v.9 |
| BCP56_BCX56_BC56PA v.9 | 20111025 | Product data sheet | - | BC639_BCP56_BCX56 v.8 |
| BC639_BCP56_BCX56 v.8 | 20070622 | Product data sheet | - | BC639_BCP56_BCX56 v.7 |
| BC639_BCP56_BCX56 v.7 | 20050308 | Product data sheet | | BC639_BCP56_BCX56 v.6 |
| BC639_BCP56_BCX56 v.6 | 20050303 | Product data sheet | CPCN200405029 | BC635_637_639 v.4 BCP54_55_56 v.5 BCX54_55_56 v.4 |
| BC635_637_639 v.4 | 20011010 | Product specification | - | BC635_637_639 v.3 |
| BCX54_55_56 v.5 | 20030206 | Product specification | - | BCX54_55_56 v.4 |
| BCX54_55_56 v.4 | 20011010 | Product specification | - | BCX54_55_56 v.3 |

14. 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: 25 October 2023

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