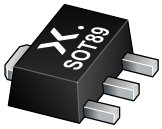



# BCX52 series

## 60 V, 1 A PNP medium power transistors

Rev. 10 — 30 May 2024 Product data sheet

## 1. General description

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

## 2. Features and benefits

- High current
- Three current gain selections
- High power dissipation capability
- Exposed heatsink for excellent thermal and electrical conductivity
- 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**

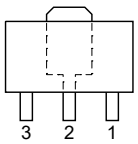
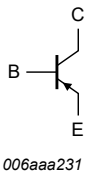
*$T_{amb}$ = 25 °C unless otherwise specified.*

| 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; $t_p \leq 1$ ms | | - | - | -2 | A |
| $h_{FE}$ | DC current gain | | | | | | |
| | BCX52 | $V_{CE}$ = -2 V; $I_C$ = -150 mA; $T_{amb}$ = 25 °C | [1] | 63 | - | 250 | |
| | BCX52-10 | | [1] | 63 | - | 160 | |
| | BCX52-16 | | [1] | 100 | - | 250 | |

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

## 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 |
| BCX52 | SOT89 | plastic, surface-mounted package; 3 leads; 1.5 mm pitch; 4.5 mm x 2.5 mm x 1.5 mm body | SOT89 |
| BCX52-10 | | | |
| BCX52-16 | | | |

## 7. Marking

**Table 4. Marking**

| Type number | Marking code |
|---|---|
| BCX52 | AE |
| BCX52-10 | AG |
| BCX52-16 | AM |

# 8. Limiting values

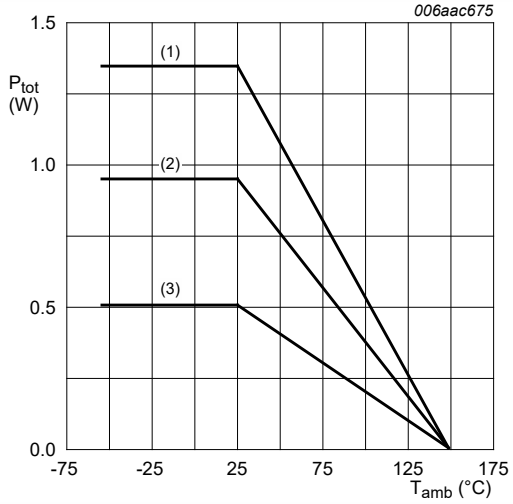
**Table 5. Limiting values**

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

*$T_{amb}$ = 25 °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; $t_p \leq 1$ ms | | - | -2 | A |
| $I_B$ | base current | | | - | -0.3 | A |
| $I_{BM}$ | peak base current | single pulse; $t_p \leq 1$ ms | | - | -0.3 | A |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 0.50 | W |
| | | | [2] | - | 0.95 | 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 $cm^2$.




(1) FR4 PCB, single-sided copper, mounting pad for collector 6 $cm^2$
(2) FR4 PCB, single-sided copper, mounting pad for collector 1 $cm^2$
(3) FR4 PCB, single-sided copper, standard footprint

**Fig. 1. Power derating curves**

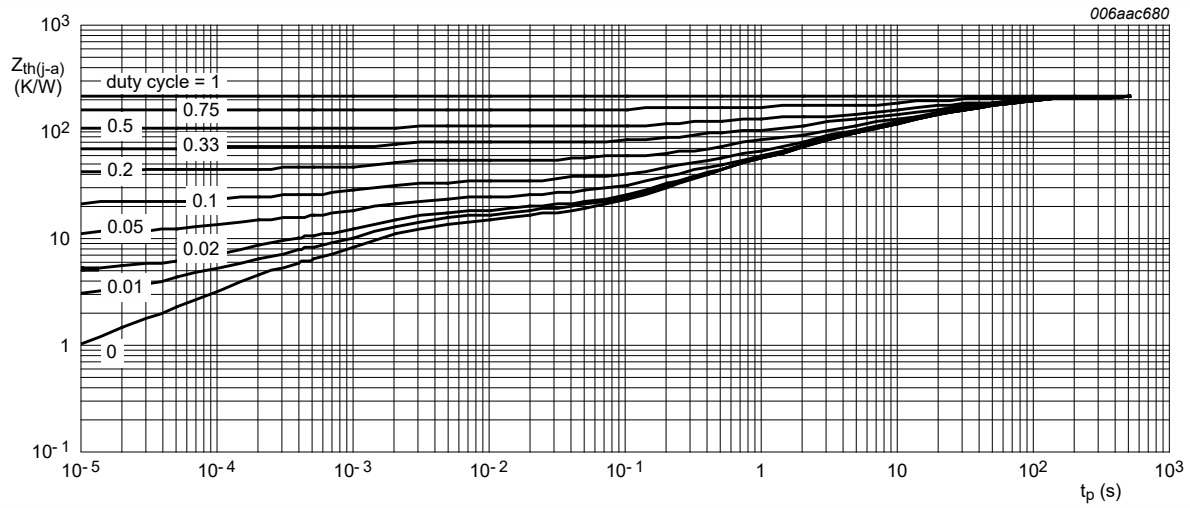
# 9. Thermal characteristics

**Table 6. Thermal characteristics**

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

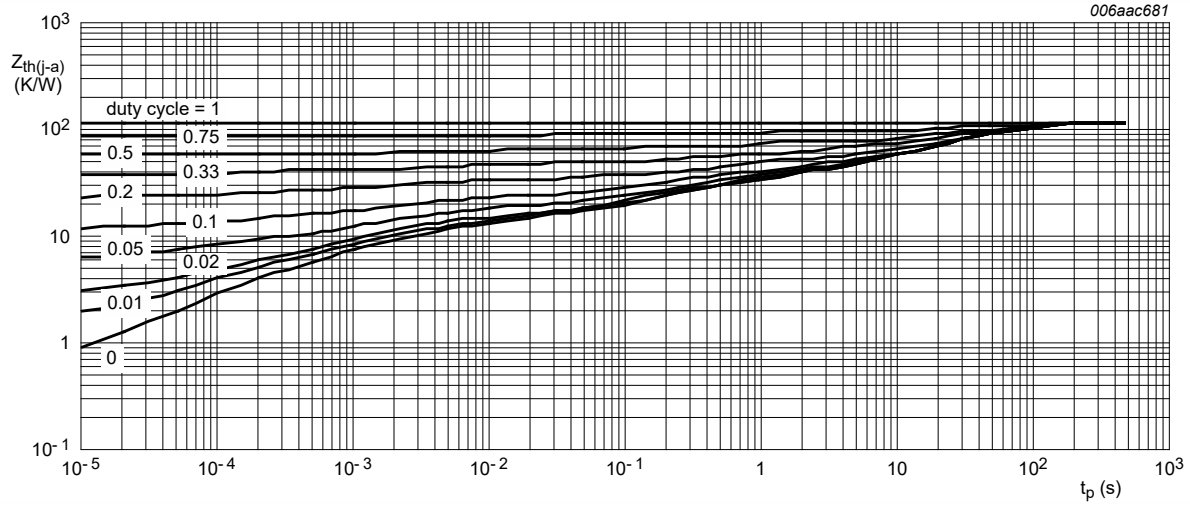
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 250 | K/W |
| | | | [2] | - | - | 132 | K/W |
| | | | [3] | - | - | 93 | K/W |
| $R_{(j-sp)}$ | thermal resistance 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 $cm^2$.
[3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 $cm^2$.



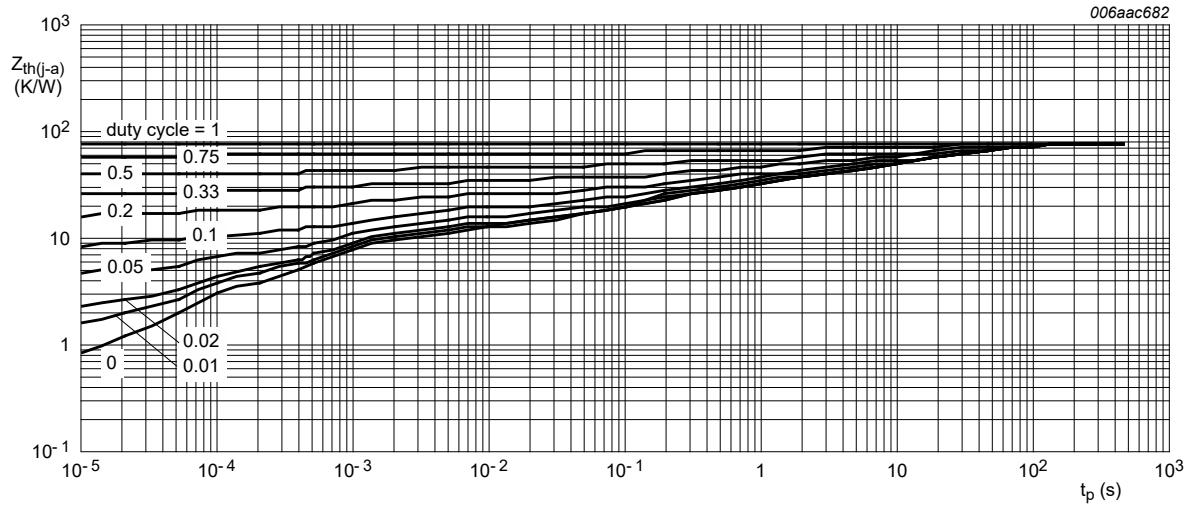

FR4 PCB; single-sided copper; tin-plated and standard footprint

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




FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 $cm^2$

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




FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 $cm^2$

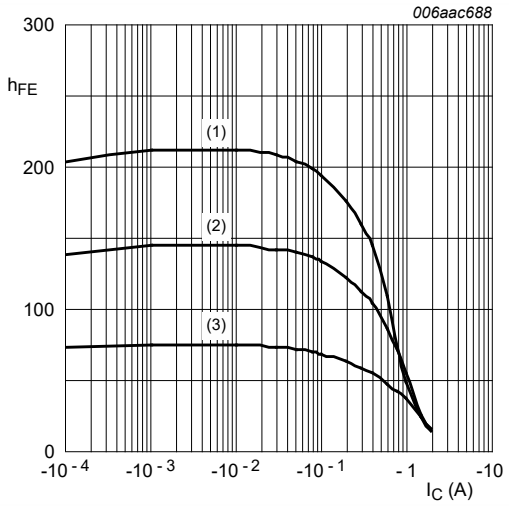
**Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

# 10. Characteristics

**Table 7. Characteristics**

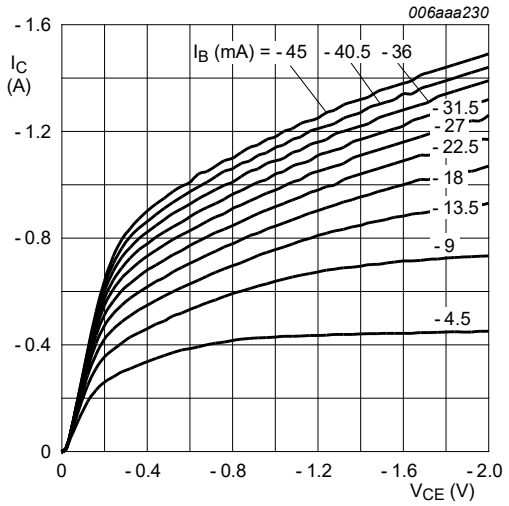
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_{CBO}$ | collector-base cut-off current | $V_{CB}$ = -30 V; $I_E$ = 0 A<br>$T_{amb}$ = 25 °C | | - | - | -100 | nA |
| | | $V_{CB}$ = -30 V; $I_E$ = 0 A; $T_j$ = 150 °C | | - | - | -10 | µA |
| $I_{EBO}$ | emitter-base cut-off current | $V_{EB}$ = -5 V; $I_C$ = 0 A<br>$T_{amb}$ = 25 °C | | - | - | -100 | nA |
| $h_{FE}$ | DC current gain | | | | | | |
| | BCX52 | $V_{CE}$ = -2 V; $I_C$ = -5 mA<br>$T_{amb}$ = 25 °C | [1] | 63 | - | - | |
| | | $V_{CE}$ = -2 V; $I_C$ = -150 mA<br>$T_{amb}$ = 25 °C | | 63 | - | 250 | |
| | | $V_{CE}$ = -2 V; $I_C$ = -500 mA<br>$T_{amb}$ = 25 °C | | 40 | - | - | |
| | BCX52-10 | $V_{CE}$ = -2 V; $I_C$ = -5 mA<br>$T_{amb}$ = 25 °C | [1] | 63 | - | - | |
| | | $V_{CE}$ = -2 V; $I_C$ = -150 mA<br>$T_{amb}$ = 25 °C | | 63 | - | 160 | |
| | | $V_{CE}$ = -2 V; $I_C$ = -500 mA<br>$T_{amb}$ = 25 °C | | 40 | - | - | |
| | BCX52-16 | $V_{CE}$ = -2 V; $I_C$ = -5 mA<br>$T_{amb}$ = 25 °C | [1] | 63 | - | - | |
| | | $V_{CE}$ = -2 V; $I_C$ = -150 mA<br>$T_{amb}$ = 25 °C | | 100 | - | 250 | |
| | | $V_{CE}$ = -2 V; $I_C$ = -500 mA<br>$T_{amb}$ = 25 °C | | 40 | - | - | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = -500 mA; $I_B$ = -50 mA<br>$T_{amb}$ = 25 °C | [1] | - | - | -0.5 | V |
| $V_{BE}$ | base-emitter voltage | $V_{CE}$ = -2 V; $I_C$ = -500 mA<br>$T_{amb}$ = 25 °C | [1] | - | - | -1 | V |
| $C_c$ | collector capacitance | $V_{CB}$ = -10 V; $I_E$ = $i_e$ = 0 A; f = 1 MHz<br>$T_{amb}$ = 25 °C | | - | 15 | - | pF |
| $f_T$ | transition frequency | $V_{CE}$ = -5 V; $I_C$ = -50 mA; f = 100 MHz<br>$T_{amb}$ = 25 °C | | - | 145 | - | MHz |

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



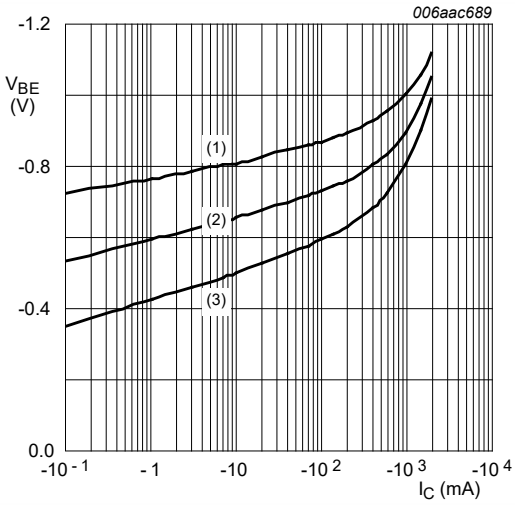

$V_{CE}$ = -2 V
(1) $T_{amb}$ = 100 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = -55 °C

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



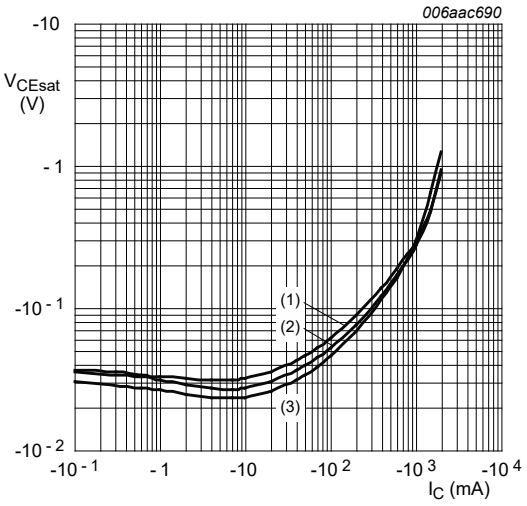

$T_{amb}$ = 25 °C

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




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

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




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

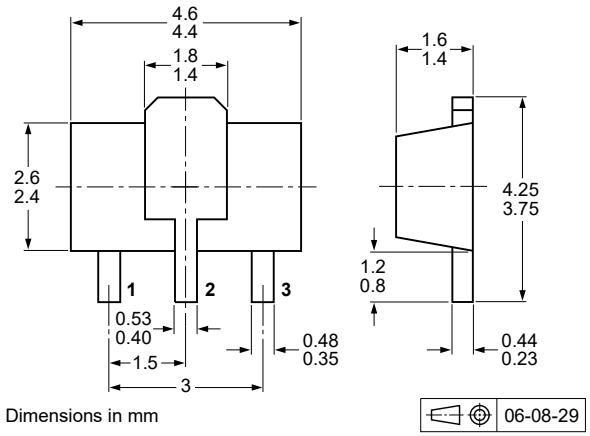



**Fig. 9. Package outline SOT89**

## 13. Soldering

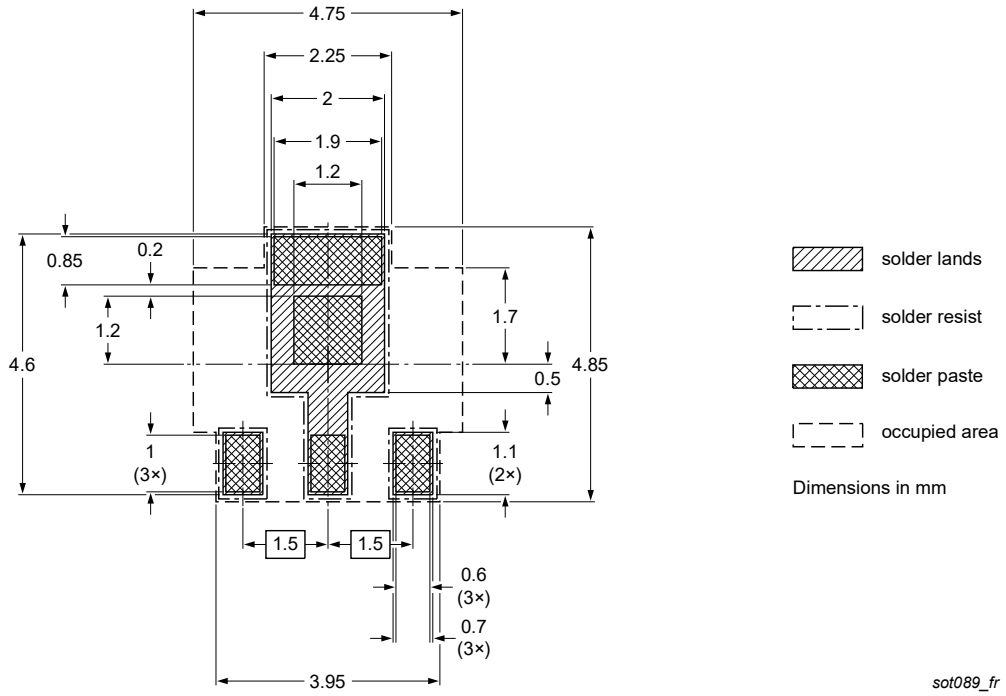



**Fig. 10. Reflow soldering footprint for SOT89**

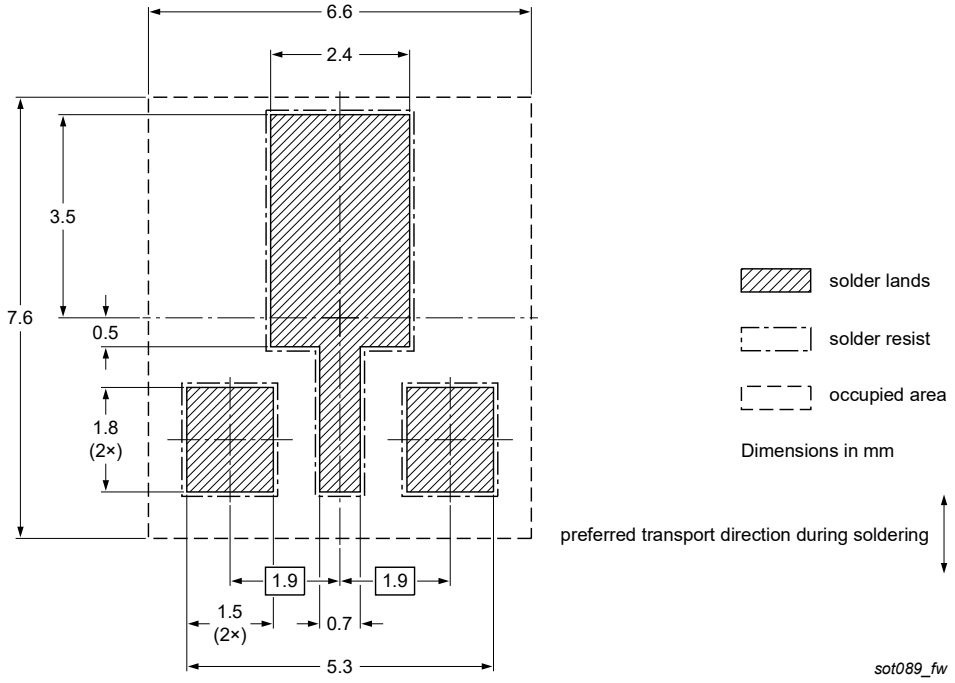



**Fig. 11. Wave soldering footprint for SOT89**

# 14. Revision history

**Table 8. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BXP52_SER v.10 | 20240530 | Product data sheet | - | BCP52_BCX52_BC52PA v.9 |
| Modifications: | • Data sheet separated into 3 data sheets<br>• Section "Packing information" removed | | | |
| BCP52_BCX52_BC52PA v.9 | 20111018 | Product data sheet | - | BCP52_BCX52 v.8 |
| BCP52_BCX52 v.8 | 20080225 | Product data sheet | - | BC638_BCP52_BCX52 v.7 |
| BC638_BCP52_BCX52 v.7 | 20070626 | Product data sheet | - | BC638_BCP52_BCX52 v.6 |
| BC638_BCP52_BCX52 v.6 | 20060329 | Product data sheet | CPCN200405029 | 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. |

[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".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at https://www.nexperia.com.

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**Date of release: 30 May 2024**

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