
# PBSS4350T

## 50 V; 3 A NPN low VCEsat transistor

1 January 2023 **Product data sheet**

## 1. General description

NPN low $V_{CEsat}$ transistor in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

PNP complement: PBSS5350T

## 2. Features and benefits

- Low collector-emitter saturation voltage $V_{CEsat}$ and corresponding low $R_{CEsat}$
- High collector current capability
- High collector current gain
- Improved efficiency due to reduced heat generation

## 3. Applications

- Power management applications
- Low and medium power DC/DC converters
- Supply line switching
- Battery chargers
- Linear voltage regulation with low voltage drop-out (LDO)

## 4. Quick reference data

**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{CEO}$ | collector-emitter voltage | open base | | - | - | 50 | V |
| $I_C$ | collector current | | | - | - | 2 | A |
| $I_{CM}$ | peak collector current | single pulse; $t_p \leq$ 1 ms | | - | - | 5 | A |
| $R_{CEsat}$ | collector-emitter saturation resistance | $I_C$ = 2 A; $I_B$ = 200 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; $T_{amb}$ = 25 °C | | - | 100 | 130 | mΩ |

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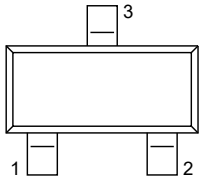
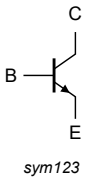
## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | B | base |  SOT23 |  sym123 |
| 2 | E | emitter | | |
| 3 | C | collector | | |





## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PBSS4350T | SOT23 | plastic, surface-mounted package; 3 terminals; 1.9 mm pitch; 2.9 mm x 1.3 mm x 1 mm body | SOT23 |

## 7. Marking

**Table 4. Marking codes**

| Type number | Marking code[1] |
|---|---|
| PBSS4350T | ZC% |

[1] % = placeholder for manufacturing site code

# 8. Limiting values

**Table 5. Limiting values**

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CBO}$ | collector-base voltage | open emitter | | - | 50 | V |
| $V_{CEO}$ | collector-emitter voltage | open base | | - | 50 | V |
| $V_{EBO}$ | emitter-base voltage | open collector | | - | 5 | V |
| $I_C$ | collector current | | | - | 2 | A |
| $I_{CRM}$ | repetitive peak collector current | $\delta \leq 0.25$; $t_p \leq 100$ ms | | - | 3 | A |
| $I_{CM}$ | peak collector current | single pulse; $t_p \leq 1$ ms | | - | 5 | A |
| $I_B$ | base current | | | - | 0.5 | A |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 300 | mW |
| | | | [2] | - | 480 | mW |
| | | | [3] | - | 540 | mW |
| | | | [1] [4] | - | 1.2 | W |
| $T_j$ | junction temperature | | | - | 150 | °C |
| $T_{amb}$ | ambient temperature | | | -65 | 150 | °C |
| $T_{stg}$ | storage temperature | | | -65 | 150 | °C |

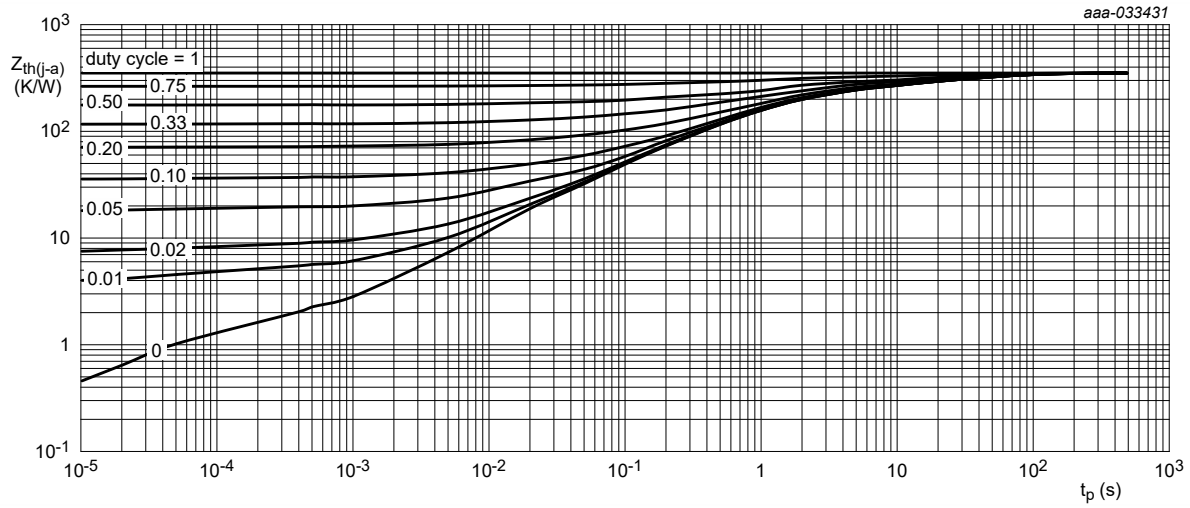
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 $cm^2$.
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 $cm^2$.
[4] Operated under pulsed conditions: $t_p \leq 100$ ms; $\delta \leq 0.25$.

# 9. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 417 | K/W |
| | | | [2] | - | - | 260 | K/W |
| | | | [3] | - | - | 230 | K/W |
| | | | [1] [4] | - | - | 104 | 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 $cm^2$.
[4] Operated under pulsed conditions: $t_p \leq 100$ ms; $\delta \leq 0.25$.



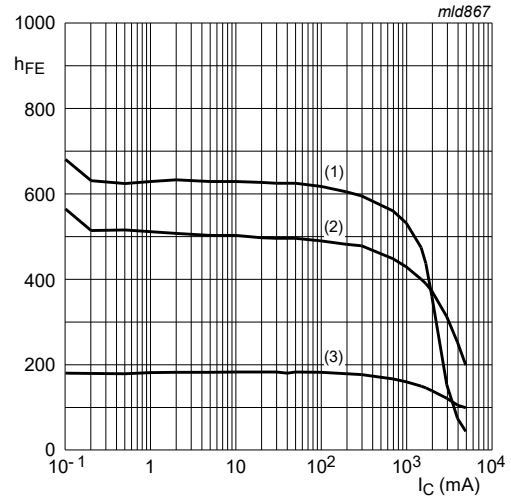

Mounted on FR4 PCB; standard footprint.

**Fig. 1. Transient thermal impedance as a function of pulse duration; typical values**

# 10. Characteristics

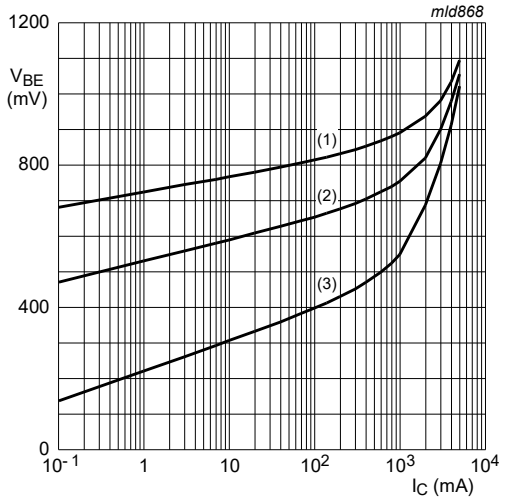
**Table 7. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | $I_C$ = 100 µA; $I_E$ = 0 A; $T_{amb}$ = 25 °C | | 50 | - | - | V |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | $I_C$ = 10 mA; $I_B$ = 0 A; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | 50 | - | - | V |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage (collector open) | $I_E$ = 100 µA; $I_C$ = 0 A; $T_{amb}$ = 25 °C | | 5 | - | - | V |
| $I_{CBO}$ | collector-base cut-off current | $V_{CB}$ = 50 V; $I_E$ = 0 A; $T_{amb}$ = 25 °C | | - | - | 100 | nA |
| | | $V_{CB}$ = 50 V; $I_E$ = 0 A; $T_j$ = 150 °C | | - | - | 50 | µA |
| $I_{EBO}$ | emitter-base cut-off current | $V_{EB}$ = 5 V; $I_C$ = 0 A; $T_{amb}$ = 25 °C | | - | - | 100 | nA |
| $h_{FE}$ | DC current gain | $V_{CE}$ = 2 V; $I_C$ = 100 mA; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | 300 | - | - | |
| | | $V_{CE}$ = 2 V; $I_C$ = 500 mA; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | 300 | - | - | |
| | | $V_{CE}$ = 2 V; $I_C$ = 1 A; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | 300 | - | - | |
| | | $V_{CE}$ = 2 V; $I_C$ = 2 A; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | 200 | - | - | |
| | | $V_{CE}$ = 2 V; $I_C$ = 3 A; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | 100 | - | - | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = 500 mA; $I_B$ = 50 mA; $T_{amb}$ = 25 °C | | - | - | 80 | mV |
| | | $I_C$ = 1 A; $I_B$ = 50 mA; $T_{amb}$ = 25 °C | | - | - | 160 | mV |
| | | $I_C$ = 2 A; $I_B$ = 100 mA; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | - | - | 280 | mV |
| | | $I_C$ = 2 A; $I_B$ = 200 mA; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | - | - | 260 | mV |
| | | $I_C$ = 3 A; $I_B$ = 300 mA; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | - | - | 370 | mV |
| $R_{CEsat}$ | collector-emitter saturation resistance | $I_C$ = 2 A; $I_B$ = 200 mA; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | - | 100 | 130 | mΩ |
| $V_{BEsat}$ | base-emitter saturation voltage | $I_C$ = 2 A; $I_B$ = 100 mA; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | - | - | 1.1 | V |
| | | $I_C$ = 3 A; $I_B$ = 300 mA; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | - | - | 1.2 | V |
| $V_{BEon}$ | base-emitter turn-on voltage | $V_{CE}$ = 2 V; $I_C$ = 1 A; pulsed; $t_p \leq$ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | - | - | 1.2 | V |
| $f_T$ | transition frequency | $V_{CE}$ = 5 V; $I_C$ = 100 mA; f = 100 MHz; $T_{amb}$ = 25 °C | | 100 | - | - | MHz |
| $C_c$ | collector capacitance | $V_{CB}$ = 10 V; $I_E$ = 0 A; $i_e$ = 0 A; f = 1 MHz; $T_{amb}$ = 25 °C | | - | - | 25 | pF |



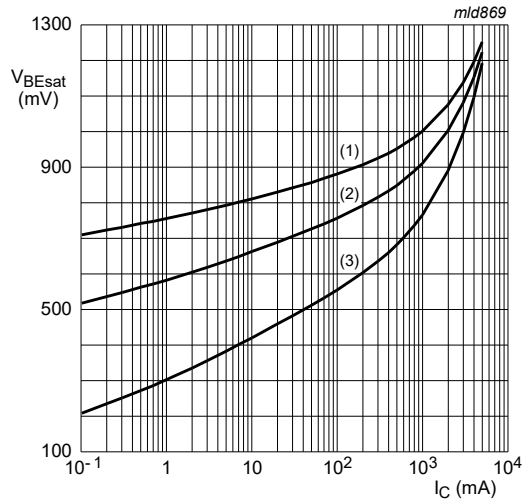

$V_{CE}$ = 2 V
(1) $T_{amb}$ = 150 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = −55 °C

**Fig. 2. DC current gain as a function of collector current; typical values**



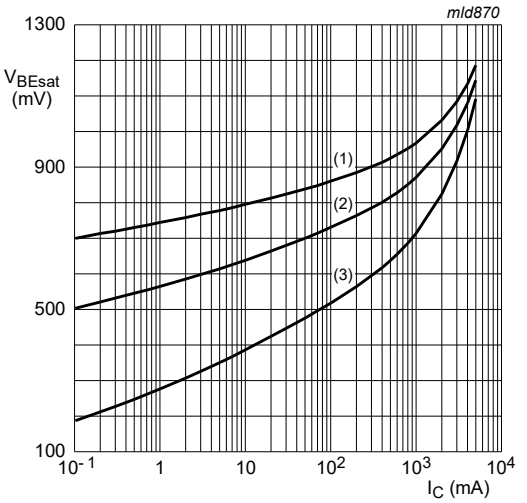

$V_{CE}$ = 2 V
(1) $T_{amb}$ = −55 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = 150 °C

**Fig. 3. Base-emitter voltage as a function of collector current; typical values**



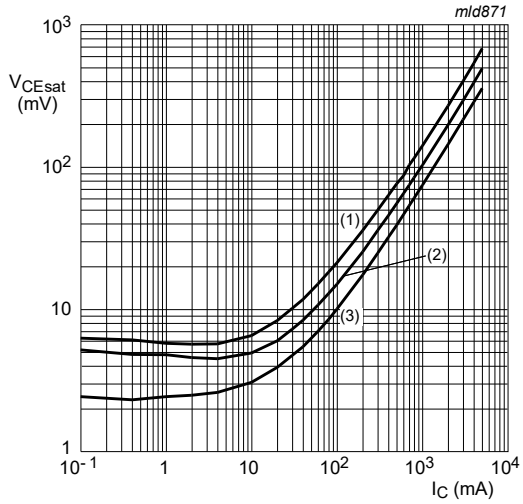

$I_C/I_B$ = 10
(1) $T_{amb}$ = −55 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = 150 °C

**Fig. 4. Base-emitter saturation voltage as a function of collector current; typical values**



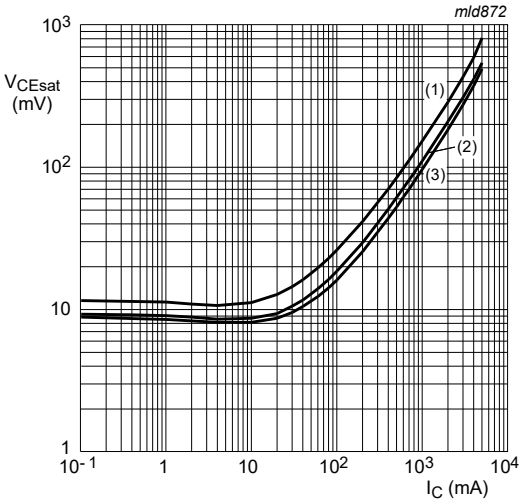

$I_C/I_B$ = 20
(1) $T_{amb}$ = −55 °C
(2) $T_{amb}$= 25 °C
(3) $T_{amb}$ = 150 °C

**Fig. 5. Base-emitter saturation voltage as a function of collector current; typical values**



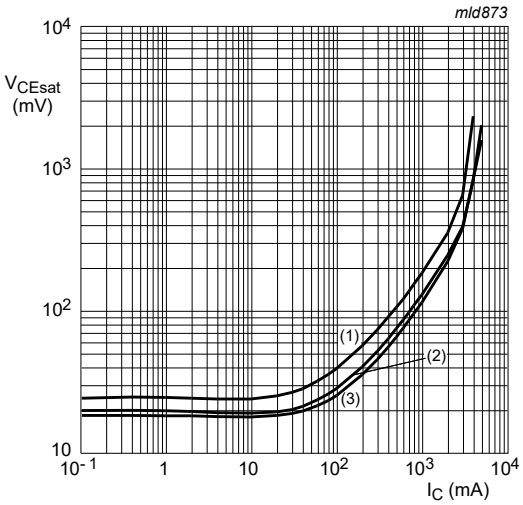

$I_C/I_B$ = 10
(1) $T_{amb}$ = 150 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = −55 °C

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



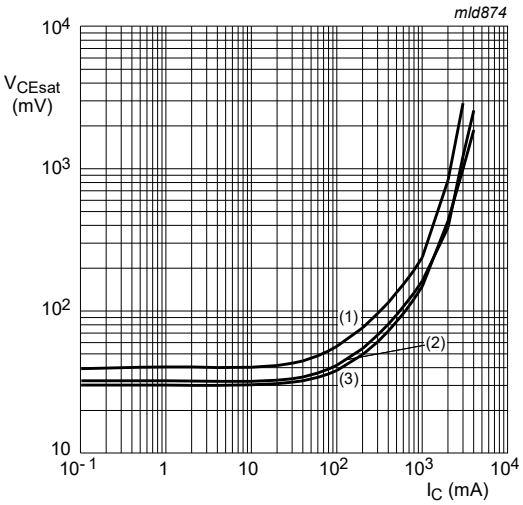

$I_C/I_B$ = 20
(1) $T_{amb}$ = 150 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = −55 °C

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



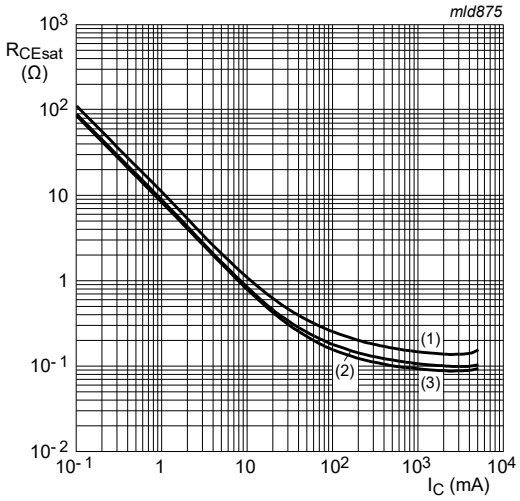

$I_C/I_B$ = 50
(1) $T_{amb}$ = 150 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = −55 °C

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




$I_C/I_B$ = 100
(1) $T_{amb}$ = 150 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = −55 °C

**Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values**




$I_C/I_B$ = 20
(1) $T_{amb}$ = 150 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = −55 °C

**Fig. 10. Equivalent on-resistance as a function of collector current; typical values**

## 11. Package outline

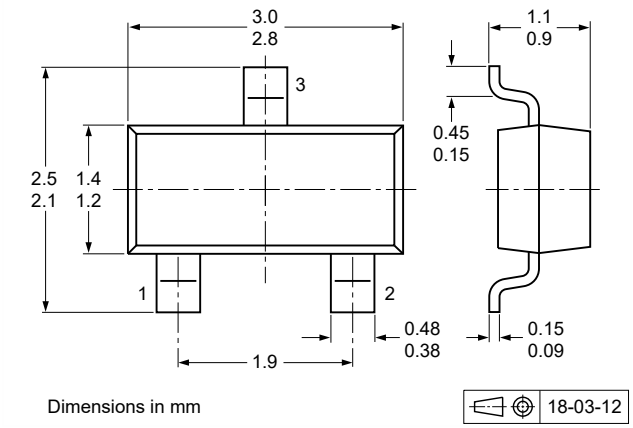



**Fig. 11. Package outline SOT23**

## 12. Soldering

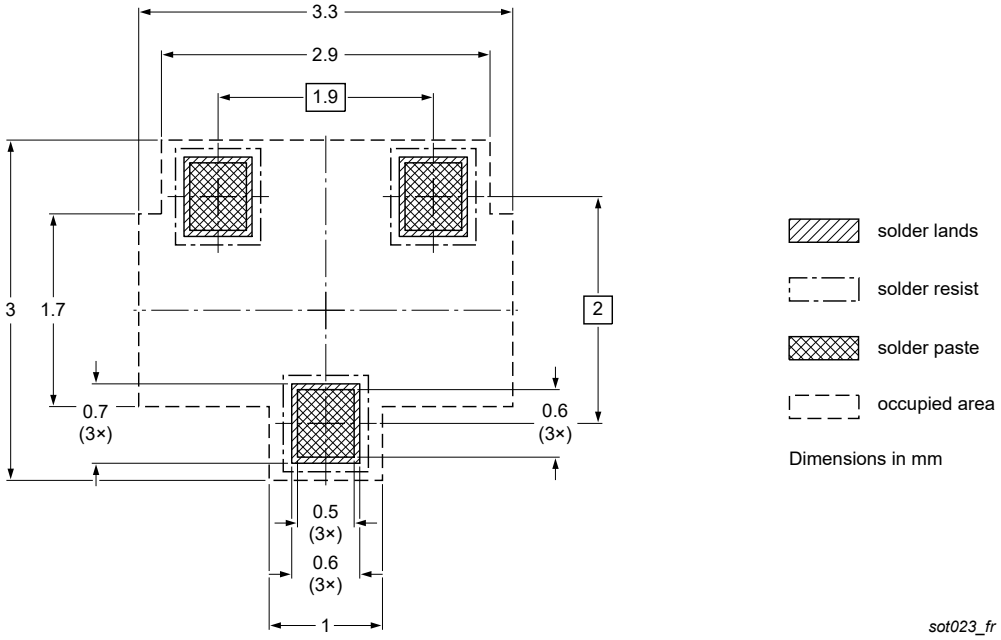



**Fig. 12. Reflow soldering footprint for SOT23**

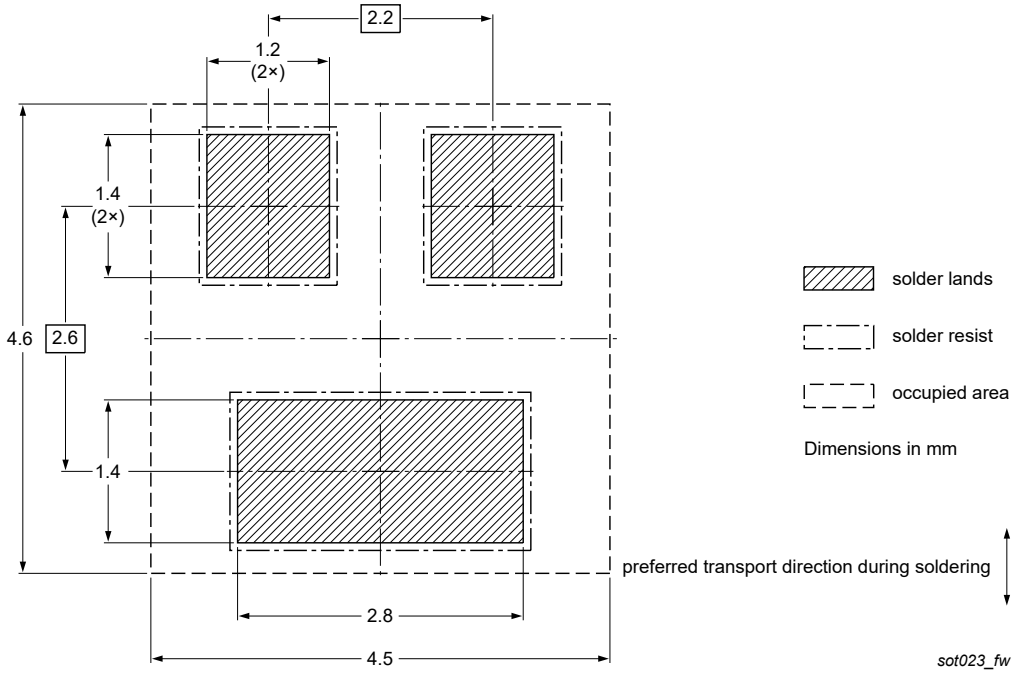



**Fig. 13. Wave soldering footprint for SOT23**

# 13. Revision history

**Table 8. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PBSS4350T v.4 | 20230101 | Product data sheet | - | PBSS4350T v.3 |
| Modifications: | • Product changed to non-automotive qualification. Please refer to nexperia.com for automotive(-Q) product alternative(s). | | | |
| PBSS4350T v.3 | 20220510 | Product data sheet | - | PBSS4350T v.2 |
| PBSS4350T v.2 | 20040109 | Product data sheet | - | PBSS4350T v.1 |
| PBSS4350T v.1 | 20020808 | Product data sheet | - | - |

# 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. |

[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: 1 January 2023**

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