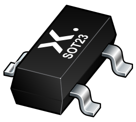



# PBHV9050T

## 500 V, 150 mA PNP high-voltage low VCEsat transistor

9 August 2022 — Product data sheet

## 1. General description

PNP high-voltage low $V_{CEsat}$ transistor in a SOT23 small Surface-Mounted Device (SMD) plastic package.

NPN complement: PMBTA45

## 2. Features and benefits

- High voltage
- Low collector-emitter saturation voltage $V_{CEsat}$
- High collector current capability $I_C$ and $_{ICM}$
- High collector current gain ($h_{FE}$) at high $I_C$
- AEC-Q101 qualified

## 3. Applications

- Electronic ballasts
- LED driver for LED chain module
- LCD backlighting
- Automotive motor management
- Flyback converters
- Hook switch for wired telecom
- Switch Mode Power Supply (SMPS)

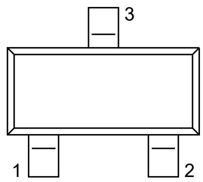
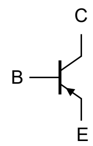
## 4. Quick reference data

**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{CESM}$ | collector-emitter peak voltage | $V_{BE}$ = 0 V | | - | - | -500 | V |
| $V_{CEO}$ | collector-emitter voltage | open base | | - | - | -500 | V |
| $I_C$ | collector current | | | - | - | -0.15 | A |
| $h_{FE}$ | DC current gain | $V_{CE}$ = -10 V; $I_C$ = -50 mA; pulsed; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | 80 | 160 | 300 | |

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | B | base |   SOT23 |   sym013 |
| 2 | E | emitter | | |
| 3 | C | collector | | |

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PBHV9050T | 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] |
|---|---|
| PBHV9050T | LL% |

[1] % = placeholder for manufacturing site code

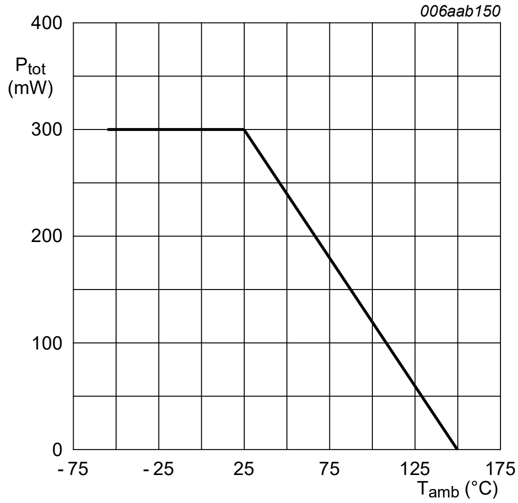
## 8. Limiting values

**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 | | - | -500 | V |
| $V_{CEO}$ | collector-emitter voltage | open base | | - | -500 | V |
| $V_{CESM}$ | collector-emitter peak voltage | $V_{BE}$ = 0 V | | - | -500 | V |
| $V_{EBO}$ | emitter-base voltage | open collector | | - | -6 | V |
| $I_C$ | collector current | | | - | -0.15 | A |
| $I_{CM}$ | peak collector current | single pulse; $t_p \leq$ 1 ms | | - | -0.5 | A |
| $I_{BM}$ | peak base current | | | - | -200 | mA |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq$ 25 °C | [1] | - | 300 | mW |
| $T_j$ | junction temperature | | | - | 150 | °C |
| $T_{amb}$ | ambient temperature | | | -55 | 150 | °C |
| $T_{stg}$ | storage temperature | | | -65 | 150 | °C |

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.




FR4 PCB, standard footprint

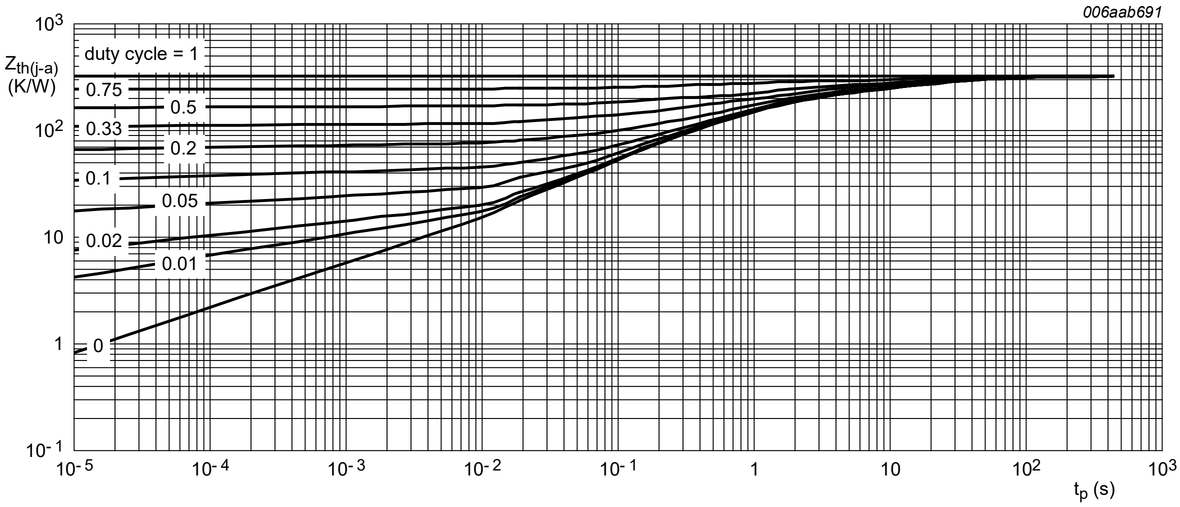
**Fig. 1. Power derating curve**

# 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 |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | | - | - | 70 | K/W |

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.



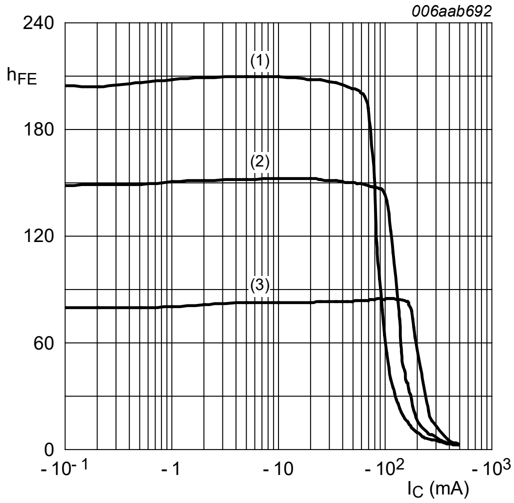

FR4 PCB, standard footprint

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

## 10. Characteristics

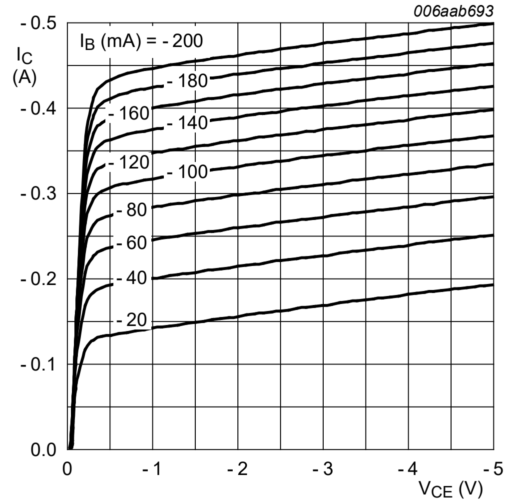
**Table 7. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_{CBO}$ | collector-base cut-off current | $V_{CB}$ = -360 V; $I_E$ = 0 A; $T_{amb}$ = 25 °C | | - | - | -100 | nA |
| | | $V_{CB}$ = -360 V; $I_E$ = 0 A; $T_j$ = 150 °C | | - | - | -10 | µA |
| $I_{CES}$ | collector-emitter cut-off current | $V_{CE}$ = -360 V; $V_{BE}$ = 0 V; $T_{amb}$ = 25 °C | | - | - | -100 | nA |
| $I_{EBO}$ | emitter-base cut-off current | $V_{EB}$ = -5 V; $I_C$ = 0 A; $T_{amb}$ = 25 °C | | - | - | -100 | nA |
| $h_{FE}$ | DC current gain | $V_{CE}$ = -10 V; $I_C$ = -10 mA; $T_{amb}$ = 25 °C | | 100 | 160 | 300 | |
| | | $V_{CE}$ = -10 V; $I_C$ = -50 mA; pulsed; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | 80 | 160 | 300 | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = -20 mA; $I_B$ = -2 mA; $T_{amb}$ = 25 °C | | - | -115 | -200 | mV |
| | | $I_C$ = -50 mA; $I_B$ = -10 mA; $T_{amb}$ = 25 °C | | - | -95 | -200 | mV |
| $V_{BEsat}$ | base-emitter saturation voltage | $I_C$ = -50 mA; $I_B$ = -10 mA; pulsed; $t_p$ ≤ 300 µs; δ ≤ 0.02; $T_{amb}$ = 25 °C | | - | -0.75 | -0.9 | V |
| $t_d$ | delay time | $V_{CC}$ = -20 V; $I_C$ = -0.05 A; $I_{Bon}$ = -5 mA; $I_{Boff}$ = 10 mA; $T_{amb}$ = 25 °C | | - | 75 | - | ns |
| $t_r$ | rise time | | | - | 1600 | - | ns |
| $t_{on}$ | turn-on time | | | - | 1675 | - | ns |
| $t_s$ | storage time | | | - | 1200 | - | ns |
| $t_f$ | fall time | | | - | 550 | - | ns |
| $t_{off}$ | turn-off time | | | - | 1750 | - | ns |
| $f_T$ | transition frequency | $V_{CE}$ = -10 V; $I_C$ = -10 mA; f = 100 MHz; $T_{amb}$ = 25 °C | | - | 50 | - | MHz |
| $C_c$ | collector capacitance | $V_{CB}$ = -20 V; $I_E$ = 0 A; $i_e$ = 0 A; f = 1 MHz; $T_{amb}$ = 25 °C | | - | 6 | - | pF |
| $C_e$ | emitter capacitance | $V_{EB}$ = -0.5 V; $I_C$ = 0 A; $i_c$ = 0 A; f = 1 MHz; $T_{amb}$ = 25 °C | | - | 170 | - | pF |



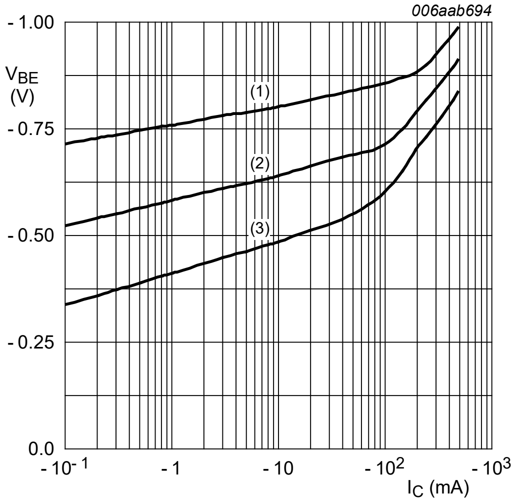

$V_{CE}$ = -10 V
(1) $T_{amb}$ = 100 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = -55 °C

**Fig. 3. DC current gain as a function of collector current; typical values**



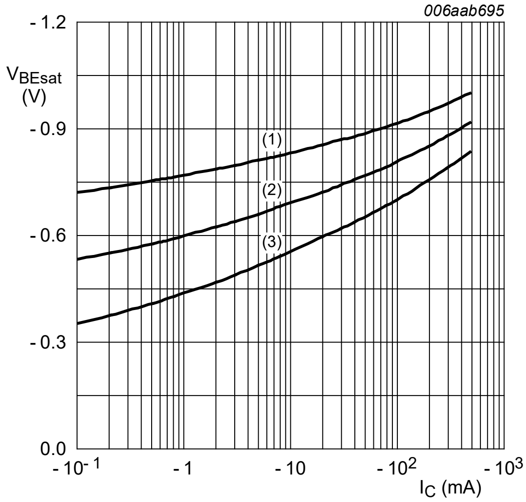

$T_{amb}$ = 25 °C

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



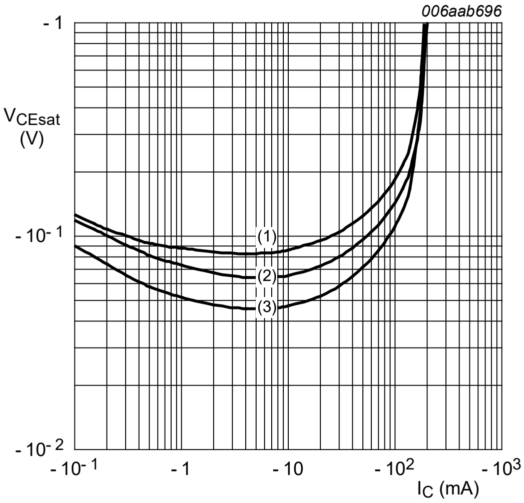

$V_{CE}$ = -10 V
(1) $T_{amb}$ = -55 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = 100 °C

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



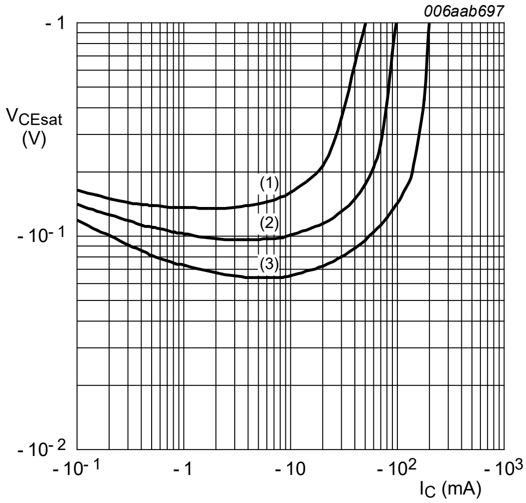

$I_C/I_B$ = 5
(1) $T_{amb}$ = -55 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = 100 °C

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



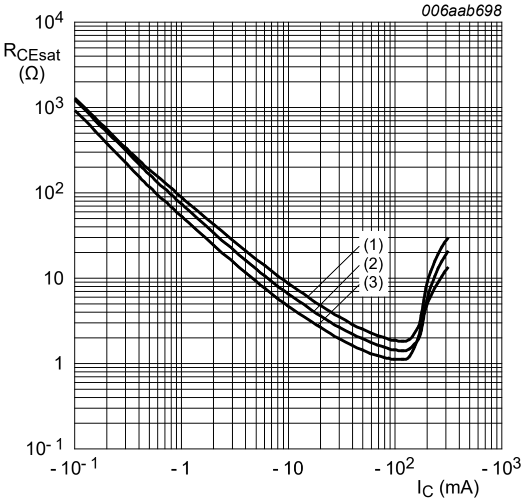

$I_C/I_B$ = 5
(1) $T_{amb}$ = 100 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = -55 °C

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



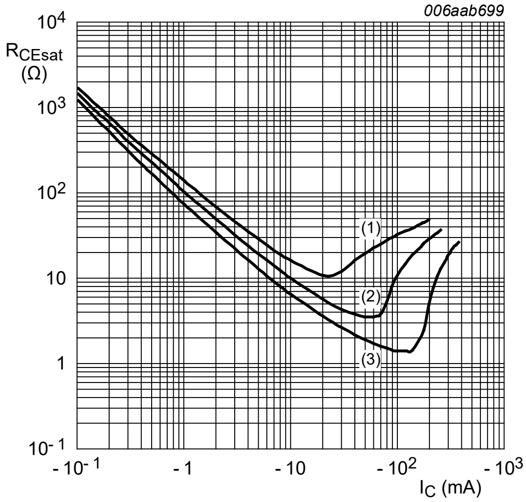

$T_{amb}$ = 25 °C
(1) $I_C/I_B$ = 20
(2) $I_C/I_B$ = 10
(3) $I_C/I_B$ = 5

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




$I_C/I_B$ = 5
(1) $T_{amb}$ = 100 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = -55 °C

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




$T_{amb}$ = 25 °C
(1) $I_C/I_B$ = 20
(2) $I_C/I_B$ = 10
(3) $I_C/I_B$ = 5

**Fig. 10. Collector-emitter saturation resistance as a function of collector current; typical values**

## 11. Test information

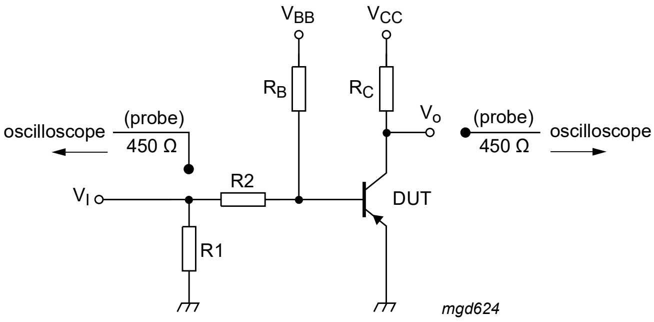



**Fig. 11. Test circuit for switching times**

### 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

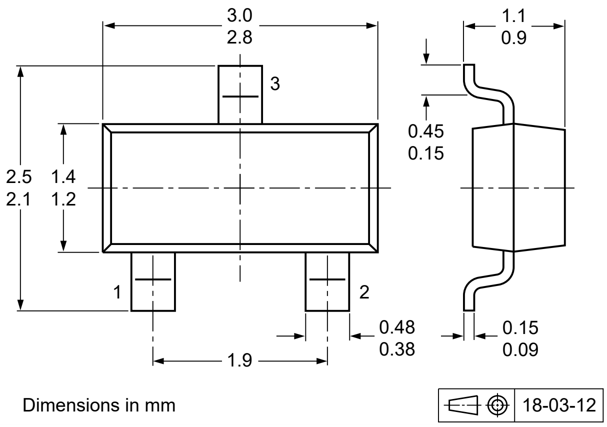



**Fig. 12. Package outline SOT23**

## 13. Soldering

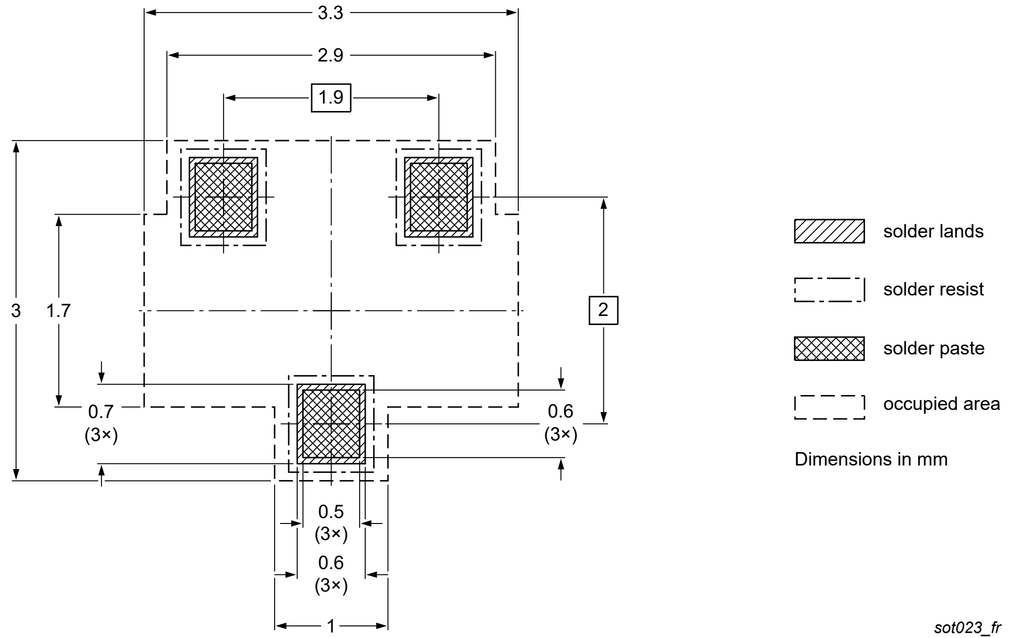



**Fig. 13. Reflow soldering footprint for SOT23**

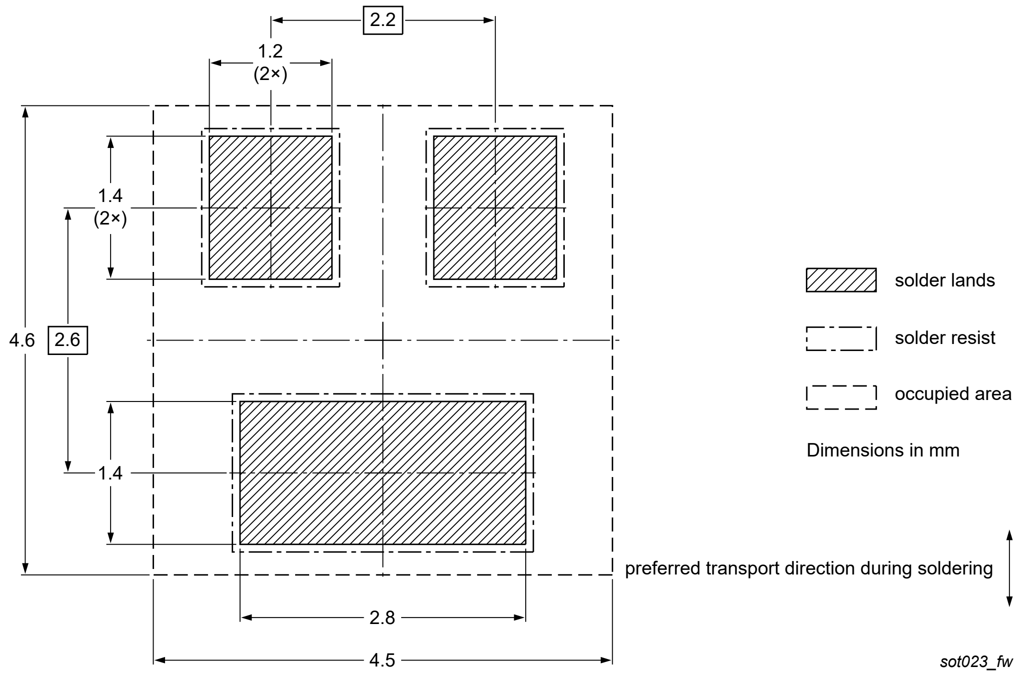



**Fig. 14. Wave soldering footprint for SOT23**

## 14. Revision history

**Table 8. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
| --- | --- | --- | --- | --- |
| PBHV9050T v.2 | 20220809 | Product data sheet | - | PBHV9050T v.1 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.<br>• Legal texts have been adapted to the new company name where appropriate.<br>• Packing information removed. | | | |
| PBHV9050T v.1 | 20090916 | Product data sheet | - | - |

# 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: 9 August 2022**