
# PBHV9050T-Q

## 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.

## 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 $I_C$
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 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)

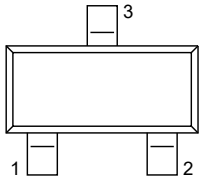
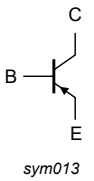
## 4. Quick reference data

**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; $I_C$ = -10 mA; $T_{amb}$ = 25 °C | | 100 | 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-Q | 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-Q | LL% |

[1] % = placeholder for manufacturing site code

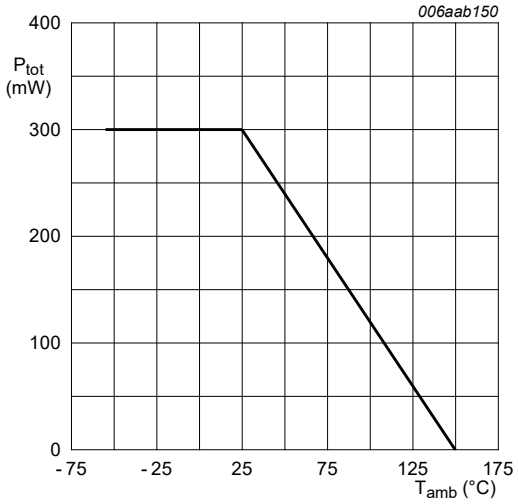
# 8. Limiting values

**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

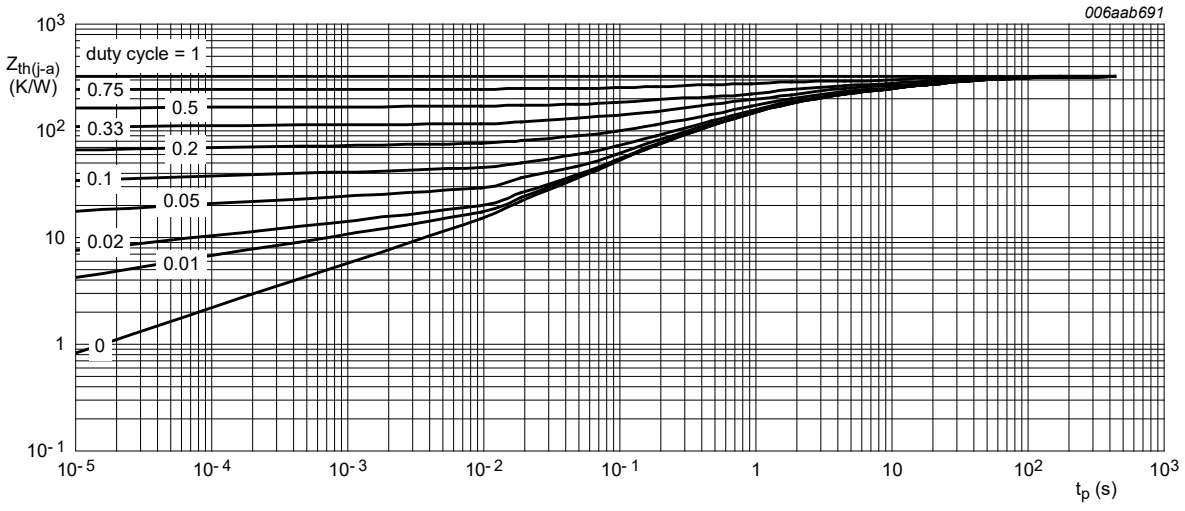
**Fig. 1. Power derating curve**

## 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.



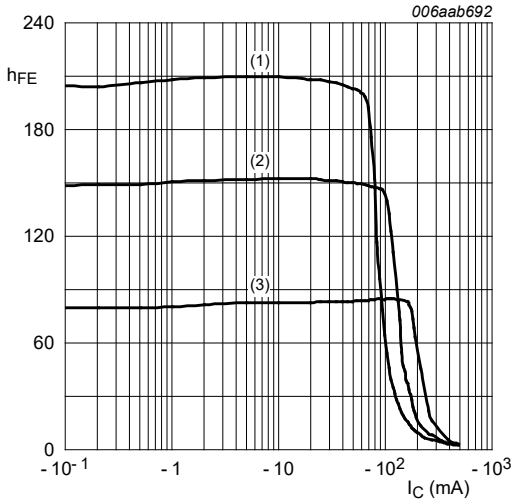

FR4 PCB, standard footprint

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

## 10. Characteristics

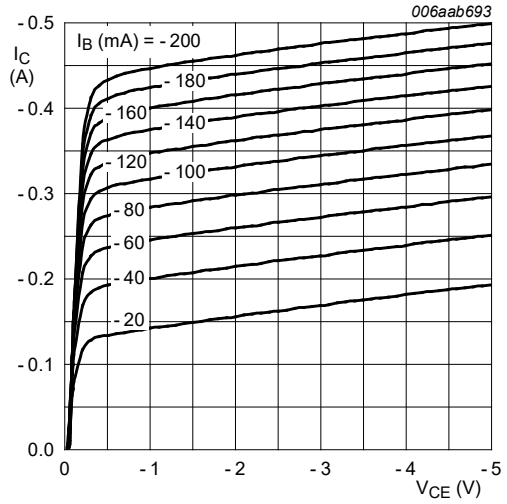
**Table 7. Characteristics**

| 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; $t_p \leq$ 300 µs; $\delta \leq$ 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; $t_p \leq$ 300 µs; $\delta \leq$ 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 |



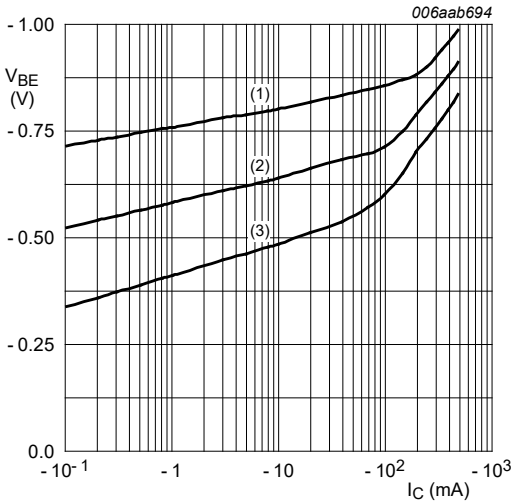

$V_{CE}$ = -10 V
(1) $T_{amb}$ = 100 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = -55 °C

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



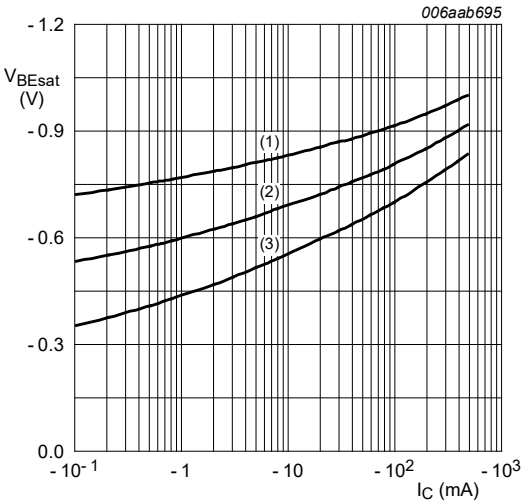

$T_{amb}$ = 25 °C

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



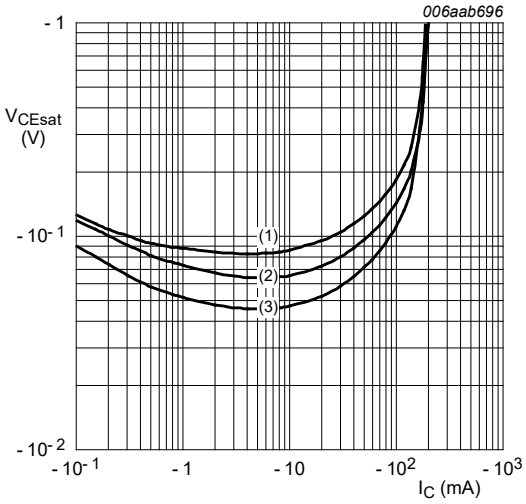

$V_{CE}$ = -10 V
(1) $T_{amb}$ = -55 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = 100 °C

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



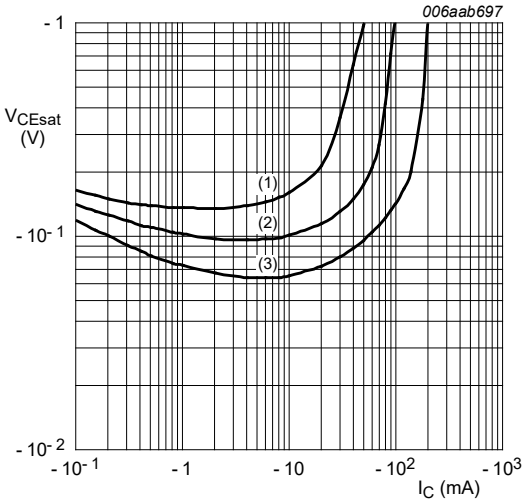

$I_C/I_B$ = 5
(1) $T_{amb}$ = -55 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = 100 °C

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



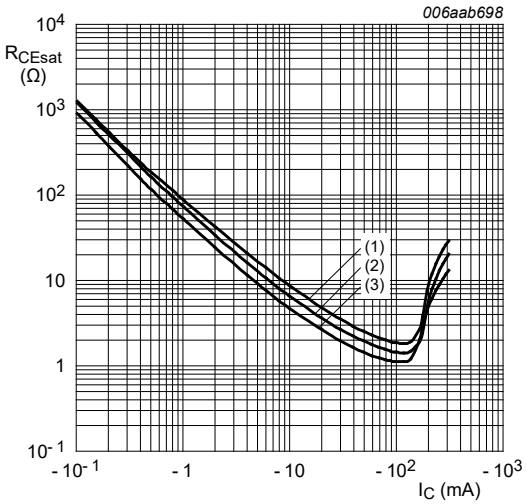

$I_C/I_B$ = 5
(1) $T_{amb}$ = 100 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = -55 °C

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



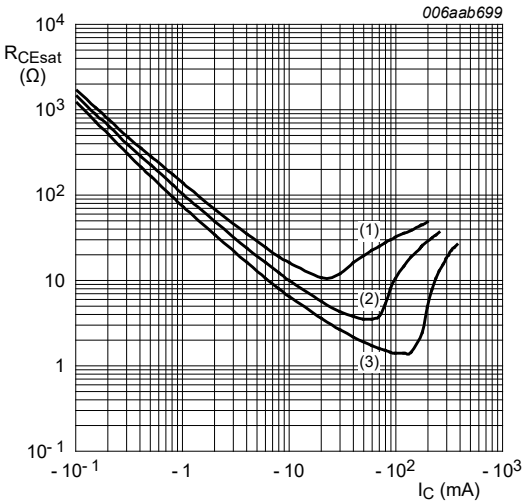

$T_{amb}$ = 25 °C
(1) $I_C/I_B$ = 20
(2) $I_C/I_B$ = 10
(3) $I_C/I_B$ = 5

**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

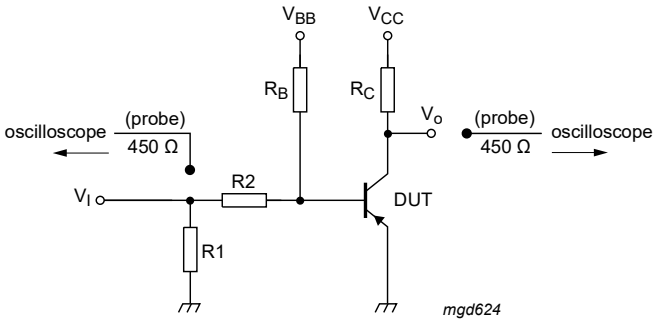



**Fig. 11. Test circuit for switching times**

## 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

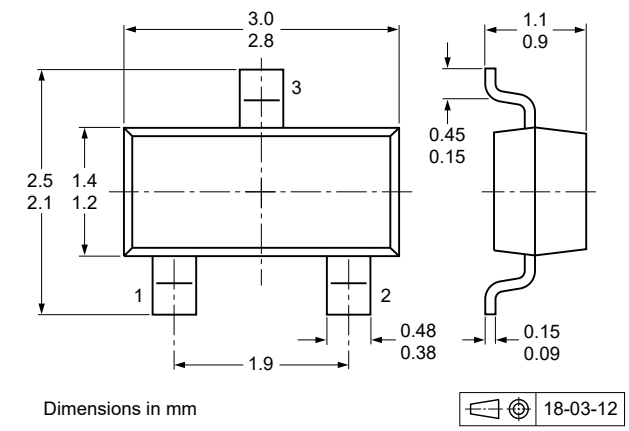



**Fig. 12. Package outline SOT23**

## 13. Soldering

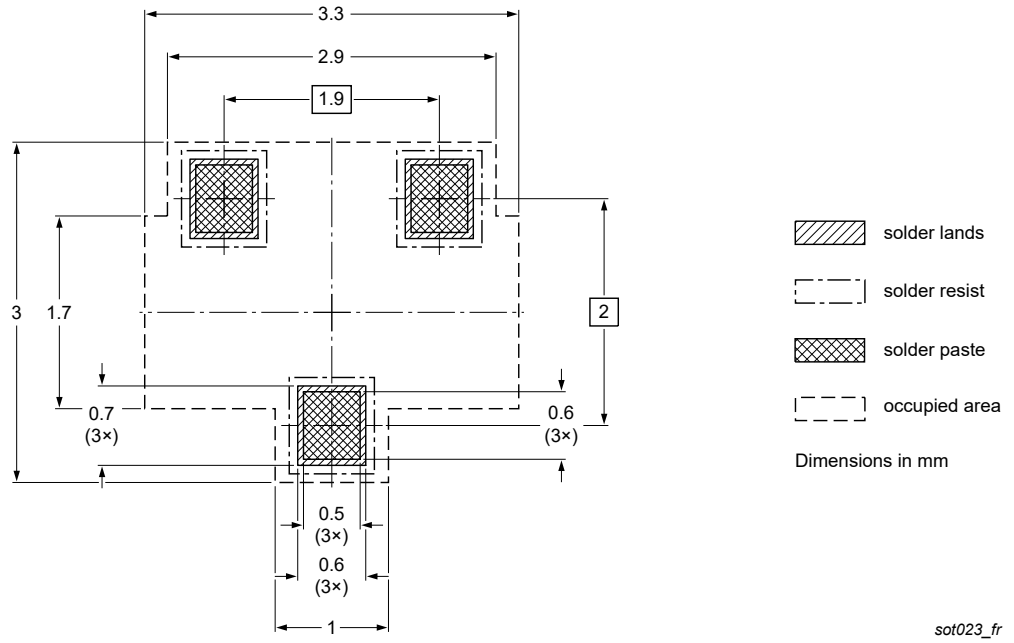



**Fig. 13. Reflow soldering footprint for SOT23**

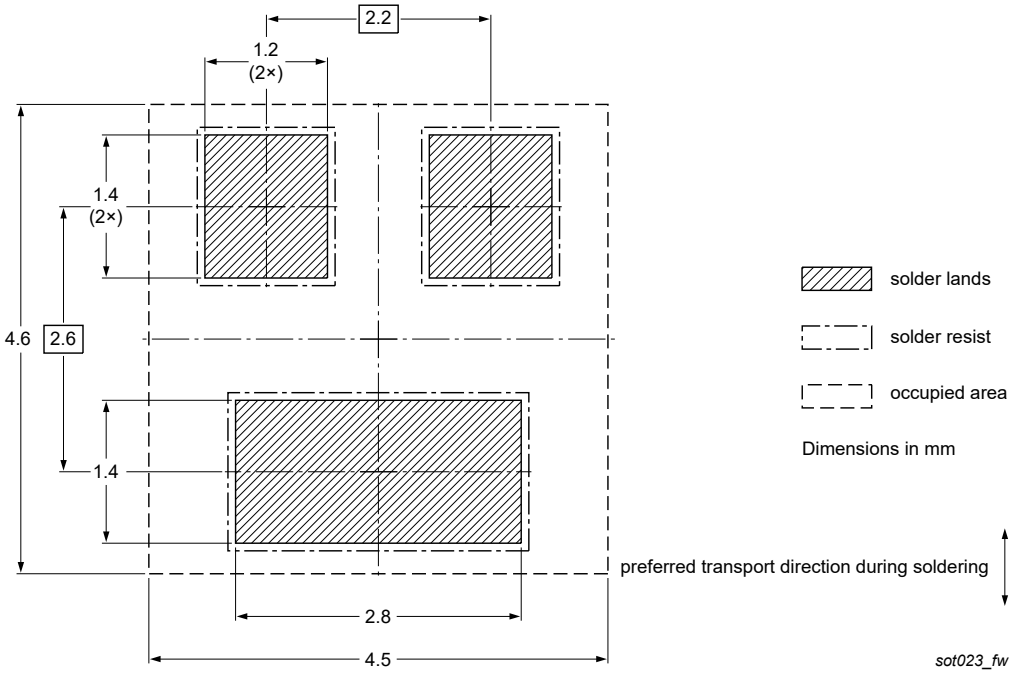



**Fig. 14. Wave soldering footprint for SOT23**

# 14. Revision history

**Table 8. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PBHV9050T-Q v.1 | 20220809 | 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. |
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[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: 9 August 2022**

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