


# PBSS5360X

## 60 V, 3 A PNP low VCEsat (BISS) transistor

3 July 2017 **Product data sheet**

## 1. General description

PNP low $V_{CEsat}$ Breakthrough in Smal Signal (BISS) transitor in a medium power SOT89 (SC-62) flat lead Surface-Mounted Device (SMD) plastic package.

NPN complement: PBSS4360X

## 2. Features and benefits

- Low collector-emitter saturation voltage $V_{CEsat}$
- High collector current capability $I_C$ and $I_{CM}$
- High energy efficiency due to less heat generation
- AEC-Q101 qualified

## 3. Applications

- DC-to-DC conversion
- Supply line switches
- Battery charger
- LCD backlighting
- Driver in low supply voltage applications (e.g. lamps and LEDs)
- Inductive load driver (e.g. relays, buzzers and motors)

## 4. Quick reference data

**Table 1. Quick reference data**

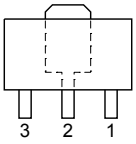
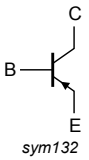
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{CEO}$ | collector-emitter voltage | open base | | - | - | -60 | V |
| $I_C$ | collector current | | | - | - | -3 | A |
| $I_{CM}$ | peak collector current | single pulse; $t_p \leq$ 1 ms | | - | - | -6 | A |
| $R_{CEsat}$ | collector-emitter saturation resistance | $I_C$ = -2 A; $I_B$ = -200 mA; $T_{amb}$ = 25 °C | [1] | - | - | 225 | mΩ |

[1] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$

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## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | E | emitter |  SOT89 |  sym132 |
| 2 | C | collector | | |
| 3 | B | base | | |

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PBSS5360X | SOT89 | plastic, surface-mounted package; 3 leads; 1.5 mm pitch; 4.5 mm x 2.5 mm x 1.5 mm body | SOT89 |

## 7. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|---|---|
| PBSS5360X | S42 |


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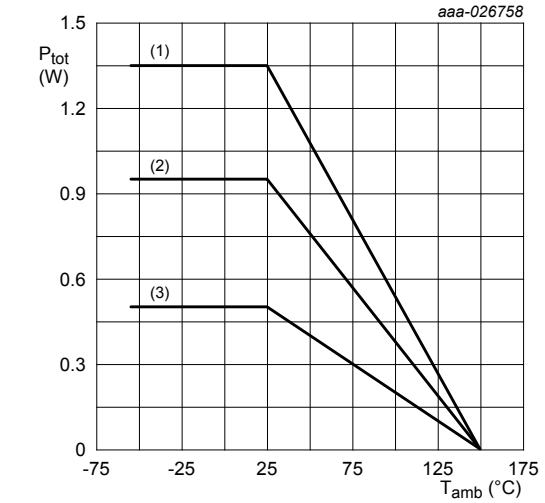
# 8. Limiting values

**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 | | - | -80 | V |
| $V_{CEO}$ | collector-emitter voltage | open base | | - | -60 | V |
| $V_{EBO}$ | emitter-base voltage | open collector | | - | -7 | V |
| $I_C$ | collector current | | | - | -3 | A |
| $I_{CM}$ | peak collector current | single pulse; $t_p \leq 1$ ms | | - | -6 | A |
| $I_B$ | base current | | | - | -500 | mA |
| $I_{BM}$ | peak base current | single pulse; $t_p \leq 1$ ms | | - | -1 | A |
| $P_{tot}$ | total power dissipation | | [1] | - | 500 | mW |
| | | | [2] | - | 950 | mW |
| | | | [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, 6 $cm^2$
(2) FR4 PCB, single-sided copper, 1 $cm^2$
(3) FR4 PCB, single-sided copper, standard footprint

**Fig. 1. Power derating curves**


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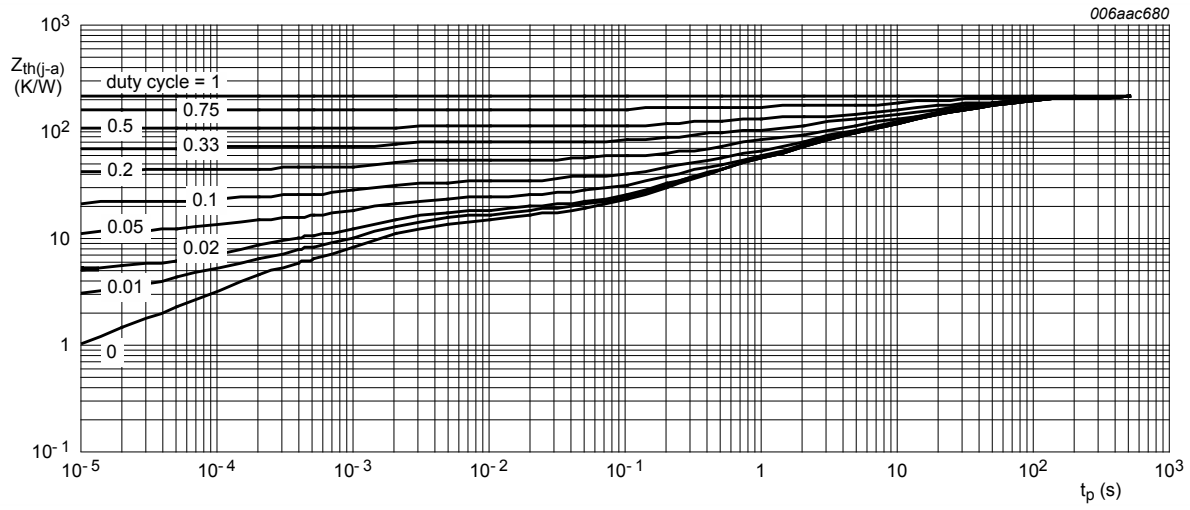
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# 9. Thermal characteristics

**Table 6. Thermal characteristics**

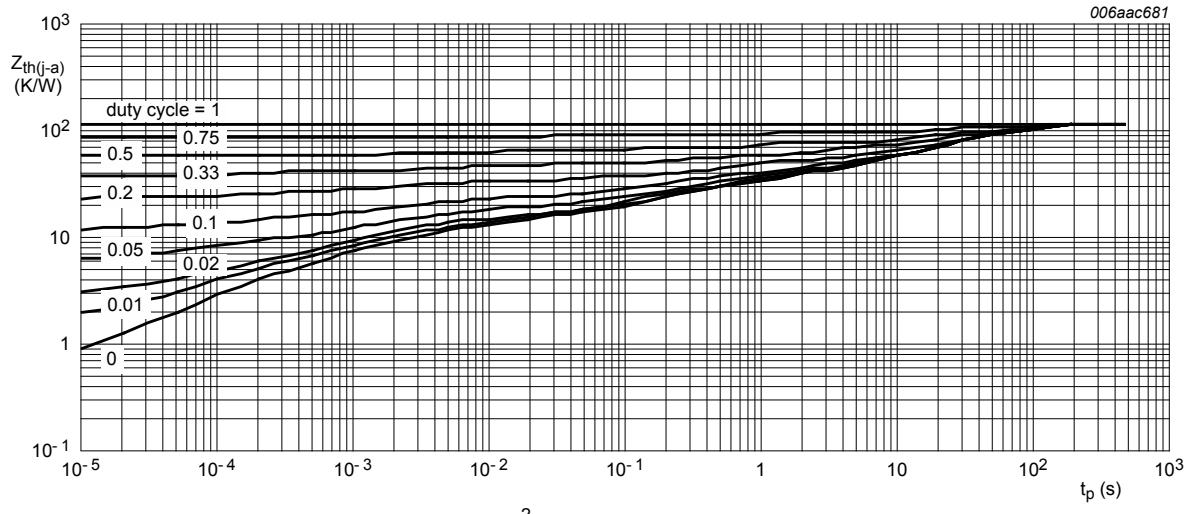
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 250 | K/W |
| | | | [2] | - | - | 132 | K/W |
| | | | [3] | - | - | 93 | K/W |

[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, standard footprint

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

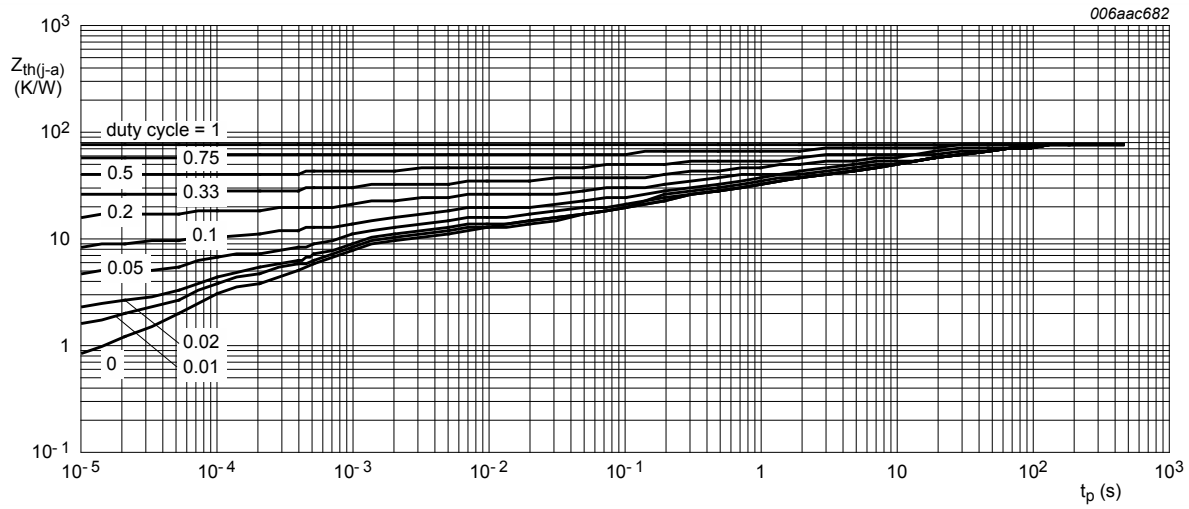



FR4 PCB, mounting pad for collector 1 $cm^2$

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


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FR4 PCB, mounting pad for collector 6 $cm^2$

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


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# 10. Characteristics

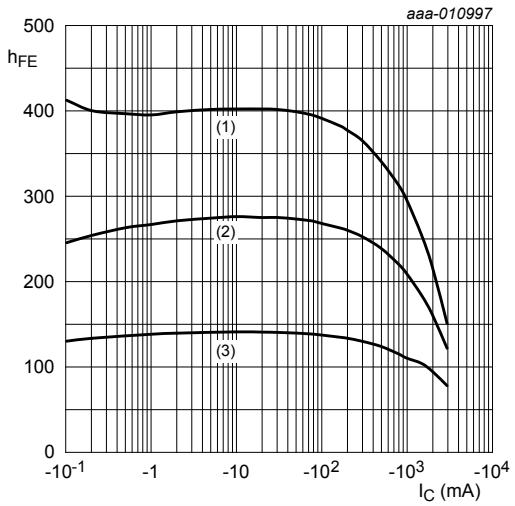
**Table 7. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_{CBO}$ | collector-base cut-off current | $V_{CB}$ = -48 V; $I_E$ = 0 A; $T_{amb}$ = 25 °C | | - | - | -100 | nA |
| | | $V_{CB}$ = -48 V; $I_E$ = 0 A; $T_j$ = 150 °C | | - | - | -50 | µA |
| $I_{CES}$ | collector-emitter cut-off current | $V_{CE}$ = -48 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 | $V_{CE}$ = -5 V; $I_C$ = -50 mA; $T_{amb}$ = 25 °C | | 150 | - | - | |
| | | $V_{CE}$ = -5 V; $I_C$ = -500 mA; $T_{amb}$ = 25 °C | | 130 | - | - | |
| | | $V_{CE}$ = -5 V; $I_C$ = -1 A; $T_{amb}$ = 25 °C | | 120 | - | - | |
| | | $V_{CE}$ = -5 V; $I_C$ = -2 A; $T_{amb}$ = 25 °C | [1] | 100 | - | - | |
| | | $V_{CE}$ = -5 V; $I_C$ = -3 A; $T_{amb}$ = 25 °C | [1] | 80 | - | - | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = -500 mA; $I_B$ = -50 mA; $T_{amb}$ = 25 °C | | - | - | -150 | mV |
| | | $I_C$ = -1 A; $I_B$ = -100 mA; $T_{amb}$ = 25 °C | [1] | - | - | -200 | mV |
| | | $I_C$ = -2 A; $I_B$ = -200 mA; $T_{amb}$ = 25 °C | [1] | - | - | -450 | mV |
| | | $I_C$ = -3 A; $I_B$ = -300 mA; $T_{amb}$ = 25 °C | [1] | - | - | -550 | mV |
| $R_{CEsat}$ | collector-emitter saturation resistance | $I_C$ = -2 A; $I_B$ = -200 mA; $T_{amb}$ = 25 °C | [1] | - | - | 225 | mΩ |
| $V_{BEsat}$ | base-emitter saturation voltage | $I_C$ = -1 A; $I_B$ = -100 mA; $T_{amb}$ = 25 °C | [1] | - | - | -1.2 | V |
| $V_{BEon}$ | base-emitter turn-on voltage | $V_{CE}$ = -5 V; $I_C$ = -1 A; $T_{amb}$ = 25 °C | [1] | - | - | -1.1 | V |
| $f_T$ | transition frequency | $V_{CE}$ = -10 V; $I_C$ = -50 mA; f = 100 MHz; $T_{amb}$ = 25 °C | | 65 | 130 | - | MHz |
| $C_c$ | collector capacitance | $V_{CB}$ = -10 V; $I_E$ = 0 A; $i_e$ = 0 A; f = 1 MHz; $T_{amb}$ = 25 °C | | - | 28 | 32 | pF |

[1] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$

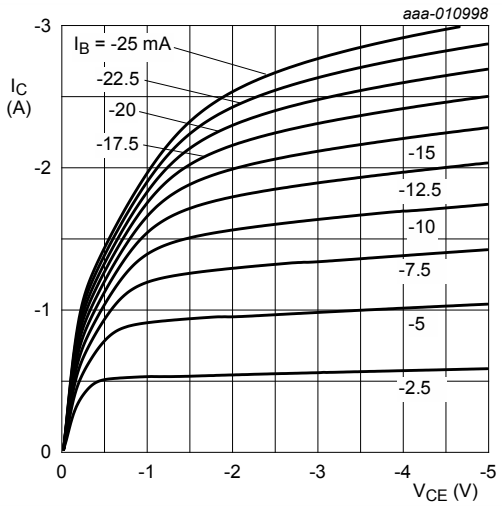

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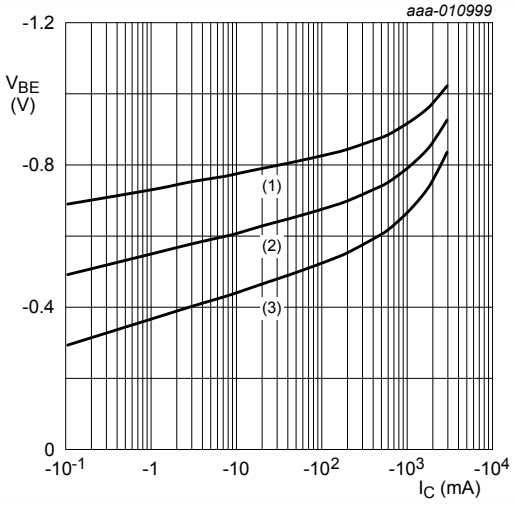

$V_{CE}$ = −5 V
(1) $T_{amb}$ = 100 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = −55 °C

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



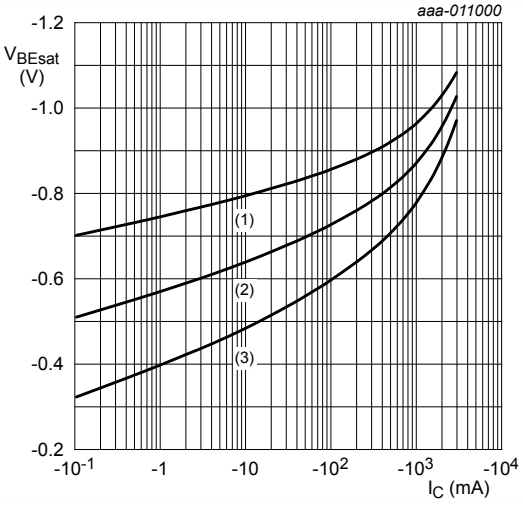

$T_{amb}$ = 25 °C

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




$V_{CE}$ = −5 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**

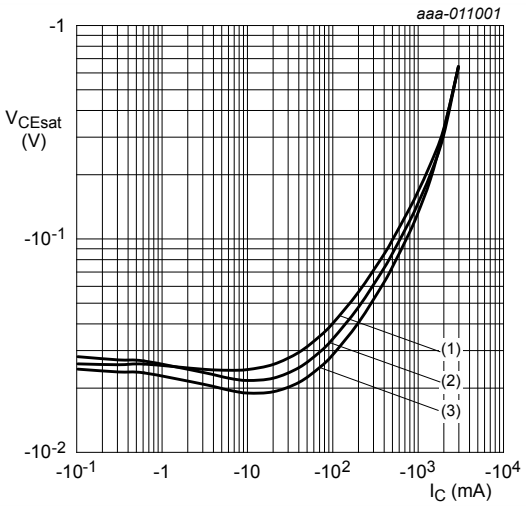



$I_C/I_B$ = 20
(1) $T_{amb}$ = −55 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = 100 °C

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

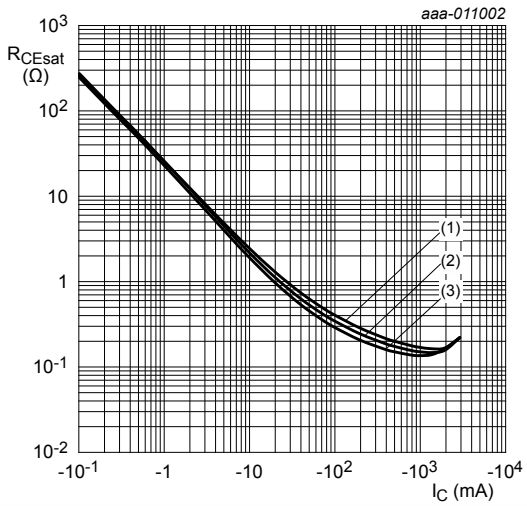

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$I_C/I_B$ = 20
(1) $T_{amb}$ = 100 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = −55 °C

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




$I_C/I_B$ = 20
(1) $T_{amb}$ = 100 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = −55 °C

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

# 11. Test information

## 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

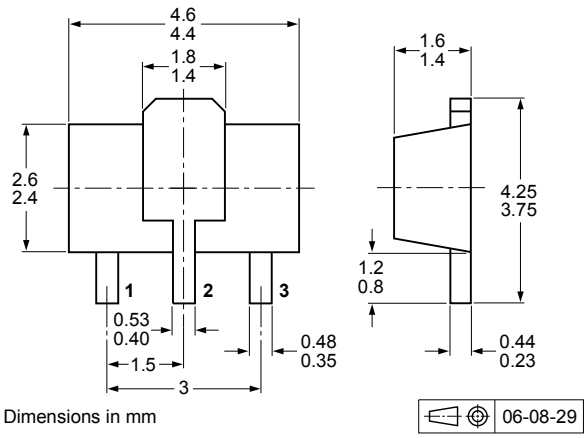



**Fig. 11. Package outline SOT89**


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# 13. Soldering

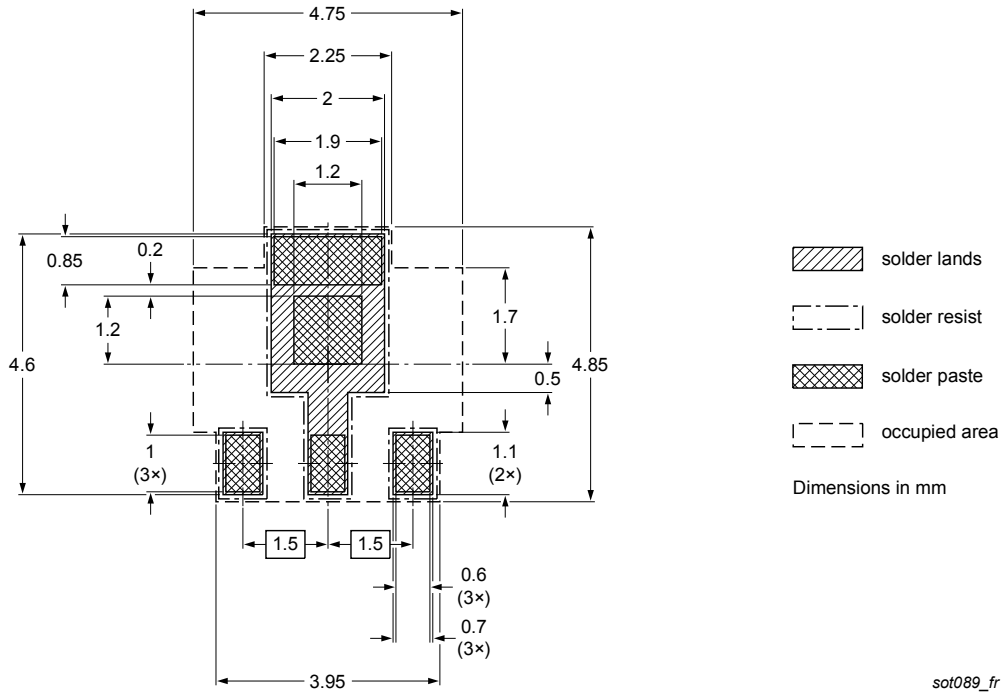



**Fig. 12. Reflow soldering footprint for SOT89**

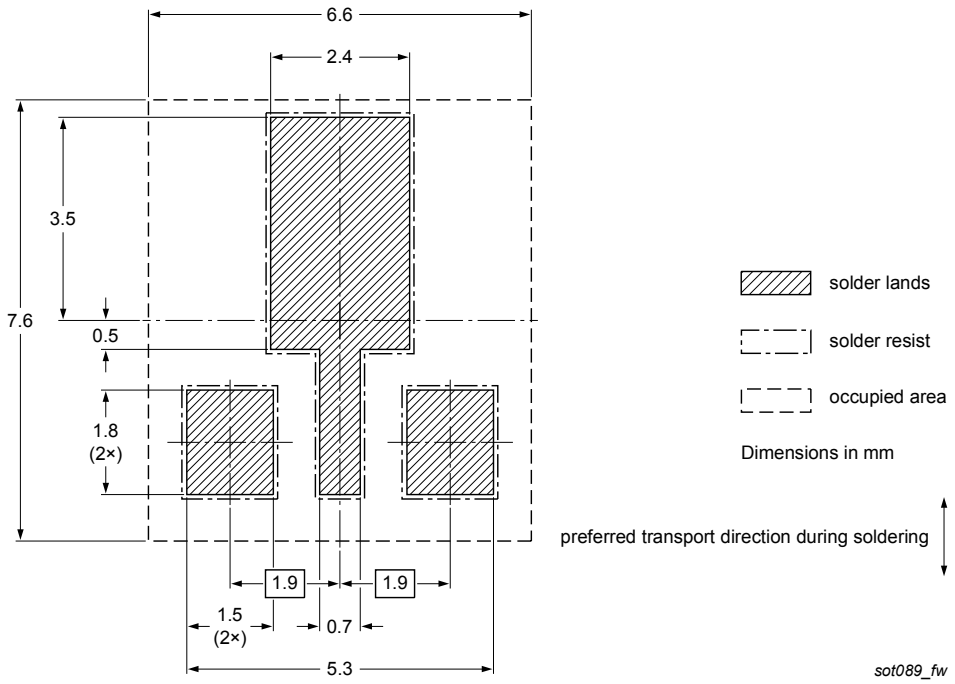



**Fig. 13. Wave soldering footprint for SOT89**


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# 14. Revision history

**Table 8. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PBSS5360X v.1 | 20170703 | Product data sheet | - | - |


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# 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".
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**Date of release: 3 July 2017**