

PBSS4240X

40 V, 2 A NPN low V_{CEsat} (BISS) transistor

15 October 2012

Product data sheet

1. Product profile

1.1 General description

NPN low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in a medium power and flat lead SOT89 Surface-Mounted Device (SMD) plastic package. PNP complement: PBSS5240X.

1.2 Features and benefits

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

1.3 Applications

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

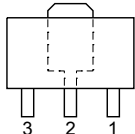
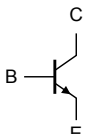
1.4 Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------|---|---|-----|-----|-----|------|
| V _{CEO} | collector-emitter voltage | open base | - | - | 40 | V |
| I _C | collector current | | - | - | 2 | A |
| I _{CM} | peak collector current | | - | - | 3 | A |
| R _{CEsat} | collector-emitter saturation resistance | I _C = 1 A; I _B = 100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | - | - | 260 | mΩ |
| I _{CRM} | repetitive peak collector current | t _p ≤ 20 ms; δ ≤ 0.33; pulsed | - | - | 2.5 | A |

2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------|---|--|
| 1 | E | emitter |  <p style="text-align: center;">SOT89</p> |  <p style="text-align: center;"><i>sym123</i></p> |
| 2 | C | collector | | |
| 3 | B | base | | |

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PBSS4240X | SOT89 | plastic surface-mounted package; die pad for good heat transfer; 3 leads | SOT89 |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PBSS4240X | S47 |

5. 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 | - | 40 | V |
| V_{CEO} | collector-emitter voltage | open base | - | 40 | V |
| V_{EBO} | emitter-base voltage | open collector | - | 5 | V |
| I_C | collector current | | - | 2 | A |
| I_{CRM} | repetitive peak collector current | $\delta \leq 0.33$; $t_p \leq 20$ ms; pulsed | - | 2.5 | A |
| I_{CM} | peak collector current | | - | 3 | A |
| I_B | base current | | - | 300 | mA |
| I_{BM} | peak base current | | - | 1 | A |
| P_{tot} | total power dissipation | [1] | - | 0.5 | W |
| | | [2] | - | 0.95 | W |

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|-----------|----------------------|------------|-----|-----|------|------|
| | | | [3] | - | 1.35 | 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 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².

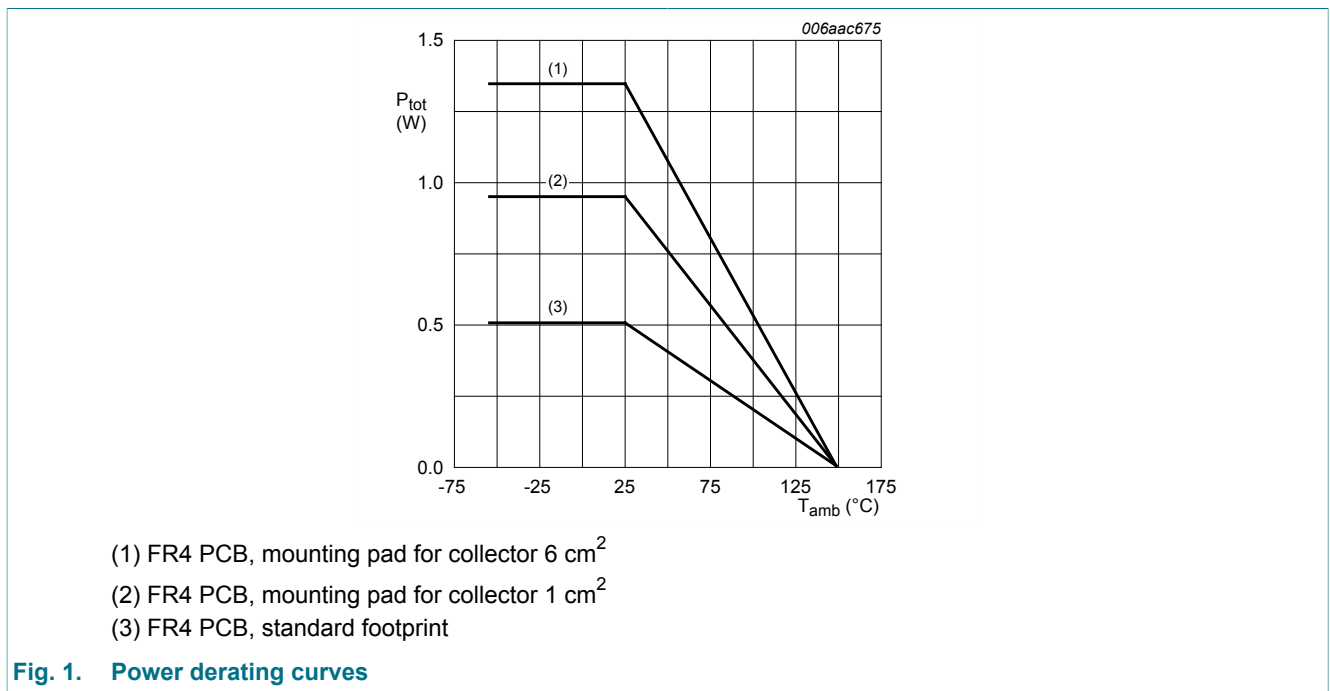


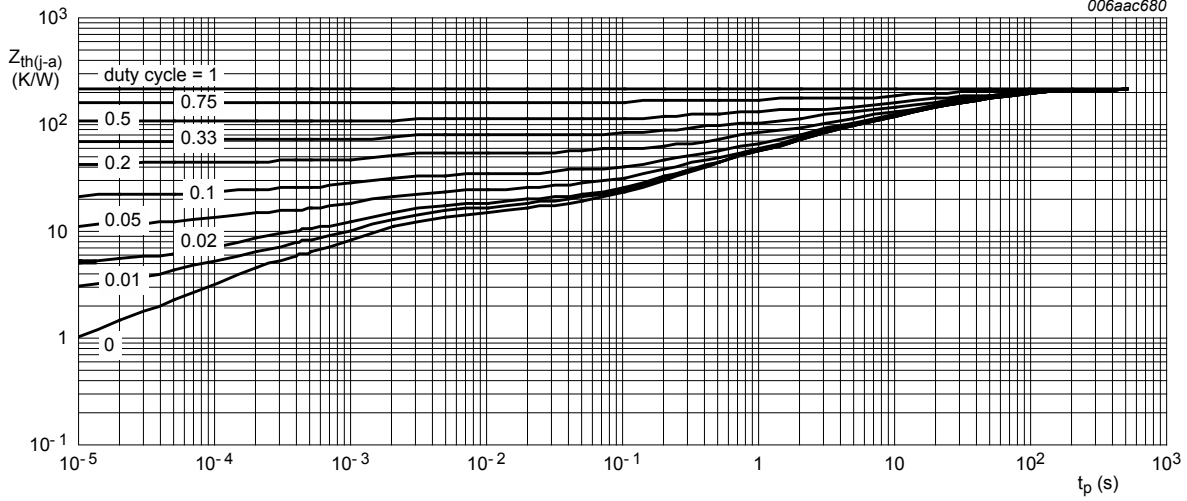
Fig. 1. Power derating curves

6. Thermal characteristics

Table 6. Thermal characteristics

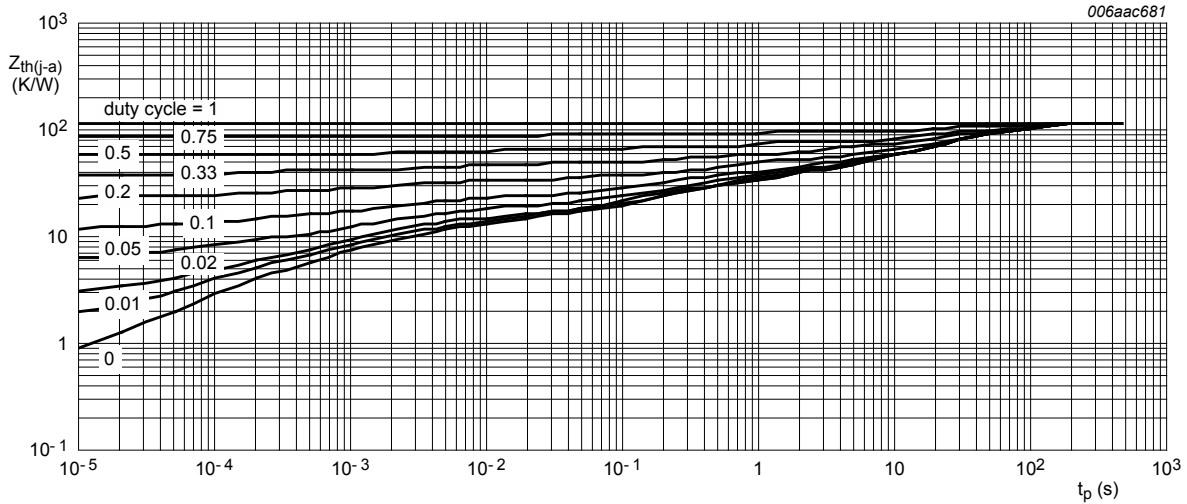
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|----------------|--|-------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 250 | K/W |
| | | | [2] | - | - | 132 | K/W |
| | | | [3] | - | - | 93 | K/W |
| $R_{th(j-sp)}$ | 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 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².



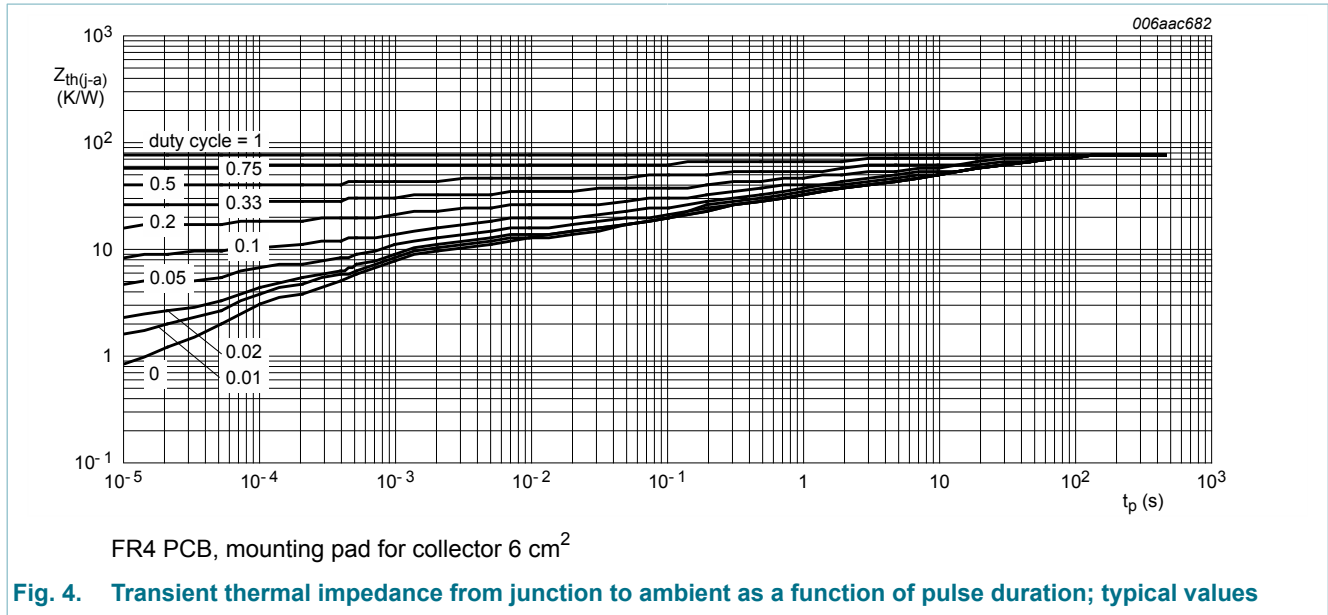
FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for collector 1 cm²

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



7. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------|---|--|-----|-----|-----|------|
| I _{CBO} | collector-base cut-off current | V _{CB} = 40 V; I _E = 0 A; T _{amb} = 25 °C | - | - | 100 | nA |
| | | V _{CB} = 40 V; I _E = 0 A; T _j = 150 °C | - | - | 50 | μA |
| I _{CEO} | collector-emitter cut-off current | V _{CE} = 30 V; I _B = 0 A; 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 = 1 mA; T _{amb} = 25 °C | 300 | - | - | |
| | | V _{CE} = 5 V; I _C = 500 mA; T _{amb} = 25 °C | 300 | - | 900 | |
| | | V _{CE} = 5 V; I _C = 1 A; T _{amb} = 25 °C | 200 | - | - | |
| | | V _{CE} = 5 V; I _C = 2 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | 75 | - | - | |
| V _{CEsat} | collector-emitter saturation voltage | I _C = 100 mA; I _B = 1 mA; T _{amb} = 25 °C | - | - | 80 | mV |
| | | I _C = 500 mA; I _B = 50 mA; T _{amb} = 25 °C | - | - | 140 | mV |
| | | I _C = 1 A; I _B = 100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | - | - | 260 | mV |
| | | I _C = 2 A; I _B = 200 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | - | - | 510 | mV |
| R _{CEsat} | collector-emitter saturation resistance | I _C = 1 A; I _B = 100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | - | - | 260 | mΩ |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|---------------------------------|---|-----|-----|-----|------|
| V_{BEsat} | base-emitter saturation voltage | $I_C = 1\text{ A}$; $I_B = 100\text{ mA}$; pulsed; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$; $T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | 1.2 | V |
| V_{BEon} | base-emitter turn-on voltage | $V_{CE} = 5\text{ V}$; $I_C = 1\text{ A}$; pulsed; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$; $T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | 1.1 | V |
| f_T | transition frequency | $V_{CE} = 10\text{ V}$; $I_C = 50\text{ mA}$; $f = 100\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$ | 150 | - | - | MHz |
| C_c | collector capacitance | $V_{CB} = 10\text{ V}$; $I_E = 0\text{ A}$; $i_e = 0\text{ A}$; $f = 1\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | 10 | pF |

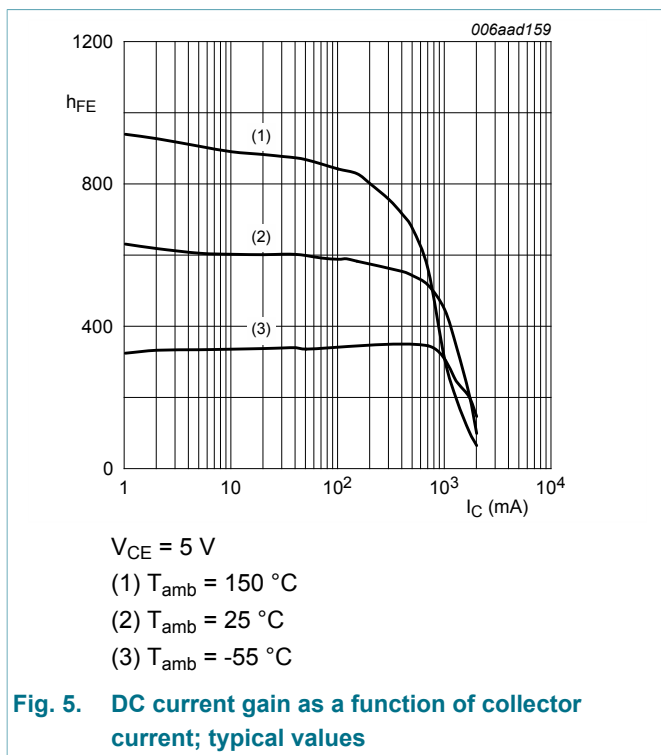


Fig. 5. DC current gain as a function of collector current; typical values

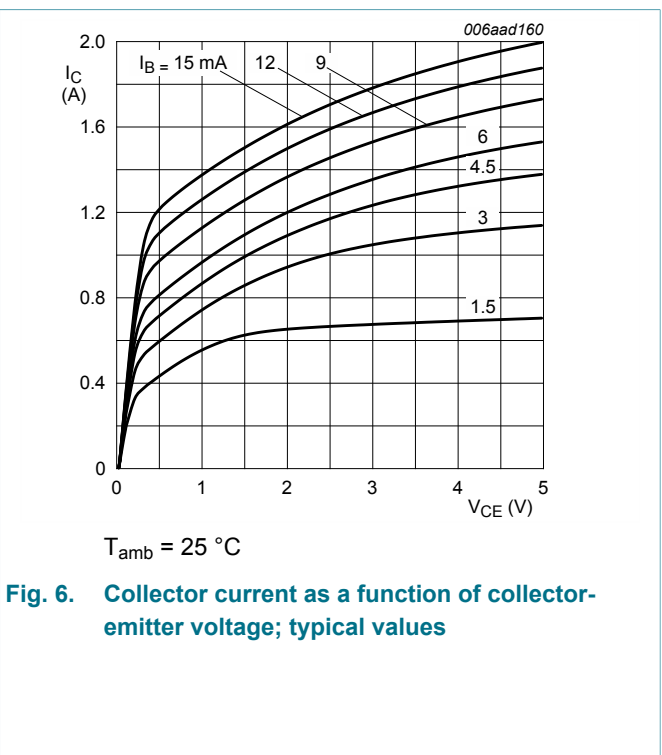
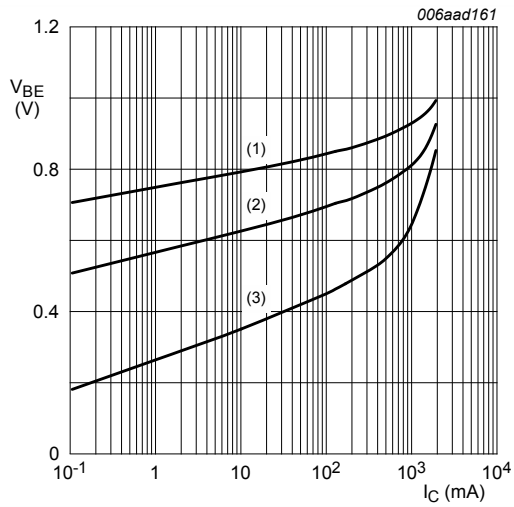
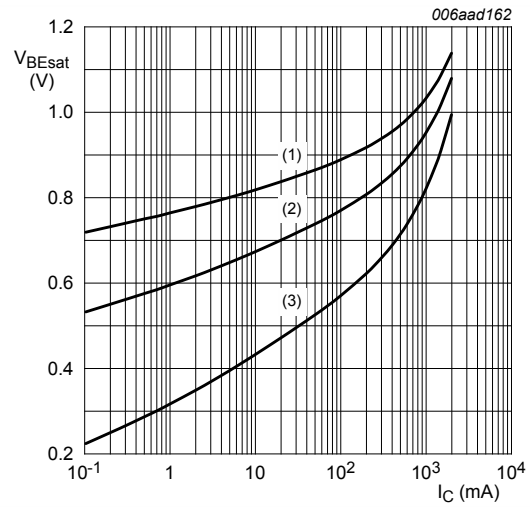


Fig. 6. Collector current as a function of collector-emitter voltage; typical values



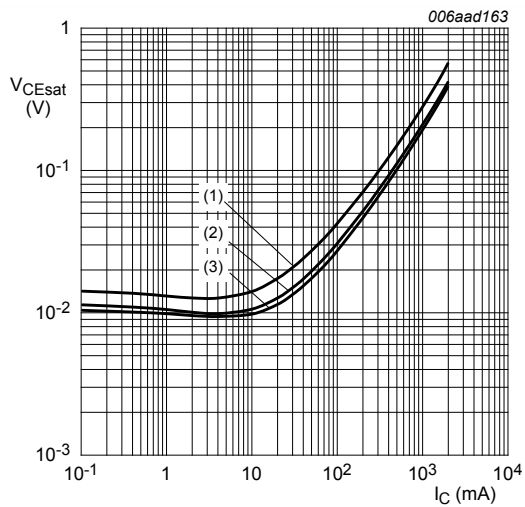
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

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



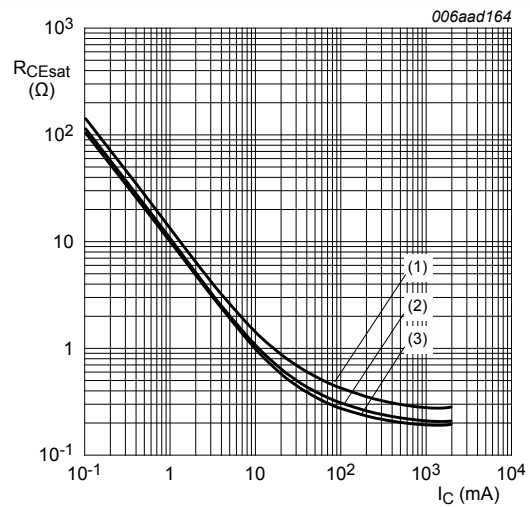
$I_C/I_B = 20$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

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



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

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



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

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

8. Package outline

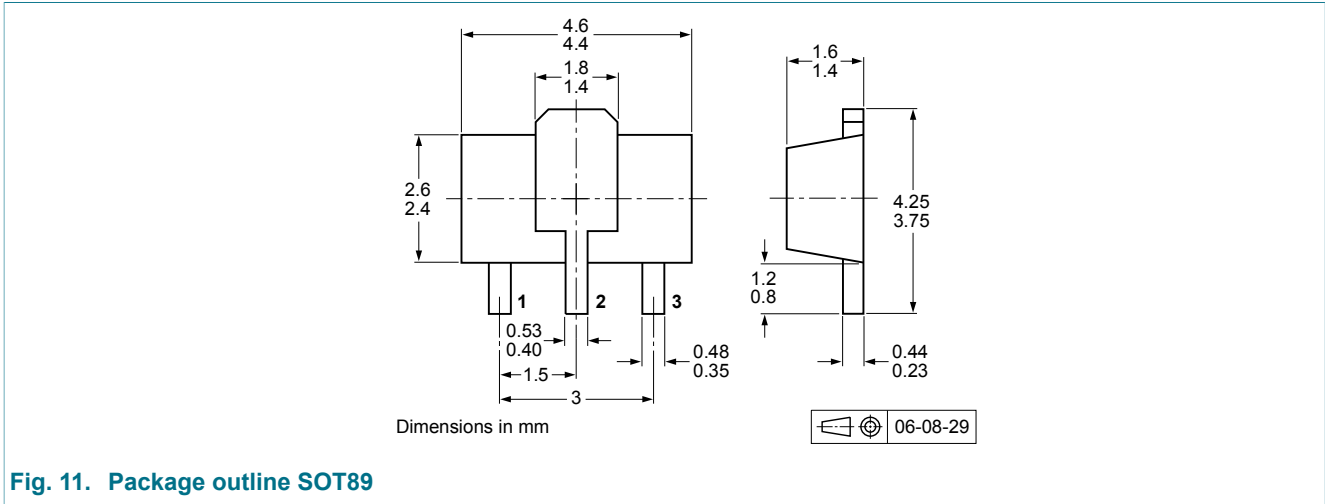


Fig. 11. Package outline SOT89

9. Soldering

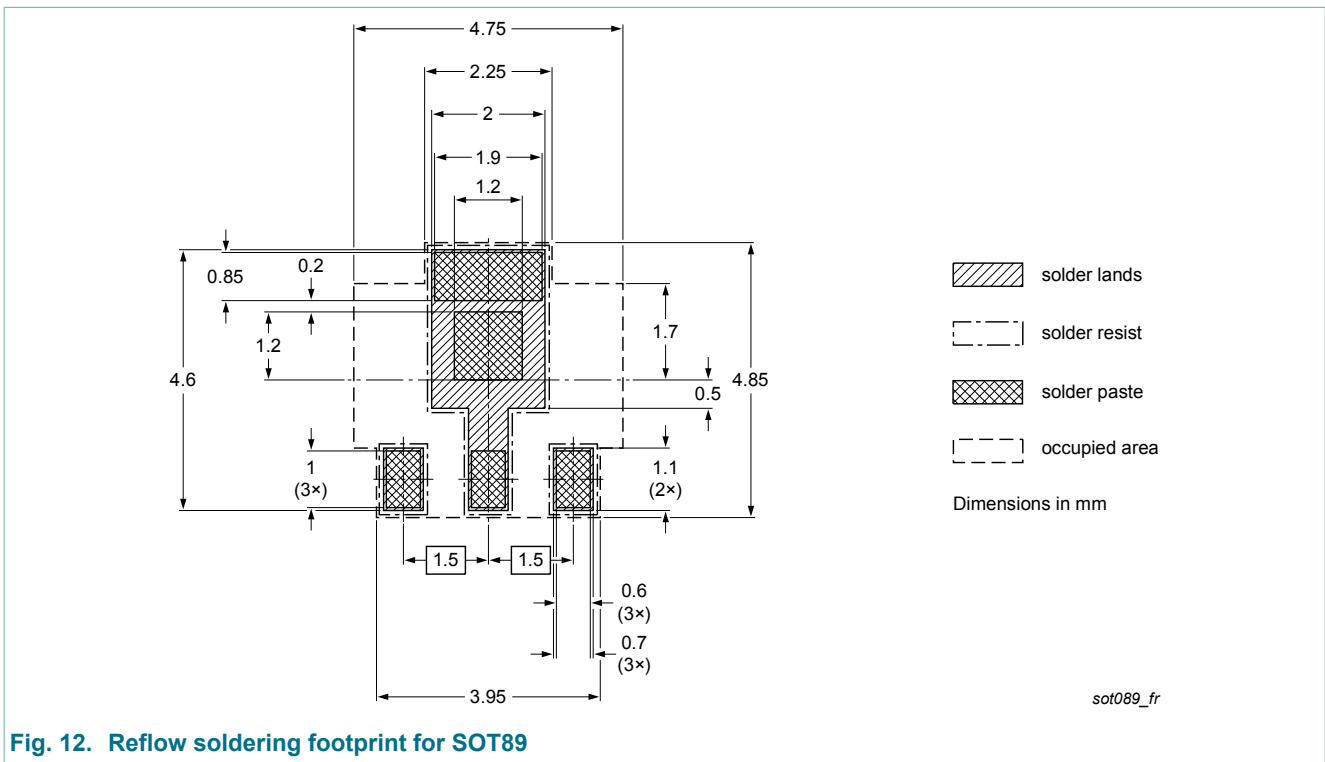


Fig. 12. Reflow soldering footprint for SOT89

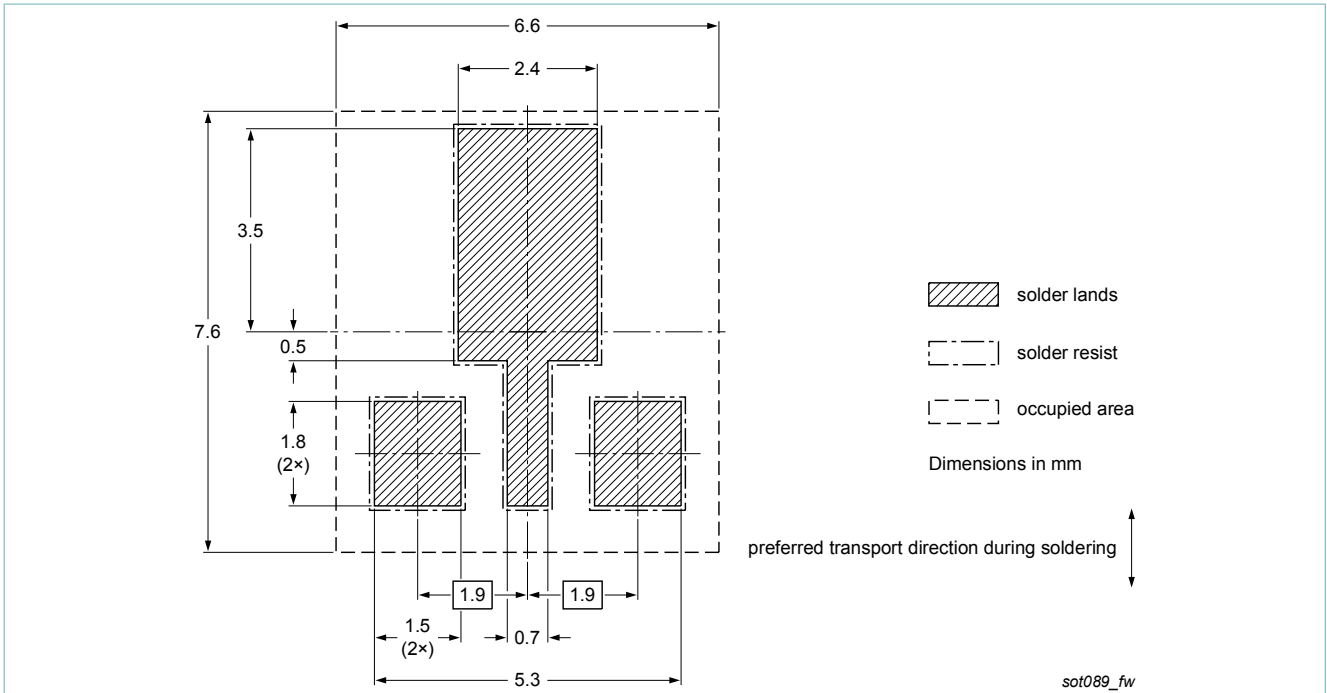


Fig. 13. Wave soldering footprint for SOT89

10. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PBSS4240X v.1 | 20121015 | Product data sheet | - | - |

11. Legal information

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|--------------------------------|--------------------|---|
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