



PBSS4160X

60 V, 1 A NPN low V_{CEsat} BISS transistor

23 May 2017

Product data sheet

1. General description

NPN low V_{CEsat} Breakthrough in Small Signal (BISS) transistor in a medium power SOT89 (SC-62) flat lead Surface-Mounted Device (SMD) plastic package.

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

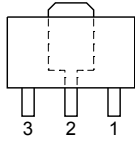
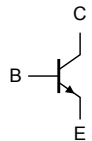
Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|---------------------------|--|-----|-----|-----|------|
| V_{CEO} | collector-emitter voltage | open base | - | - | 60 | V |
| I_C | collector current | | - | - | 1 | A |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | - | 2 | A |
| h_{FE} | DC current gain | $V_{CE} = 10$ V; $I_C = 500$ mA; $T_{amb} = 25$ °C | [1] | 170 | - | 360 |

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

5. 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 | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PBSS4160X | 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 |
|-------------|--------------|
| PBSS4160X | S41 |

8. Limiting values

Table 5. Limiting values

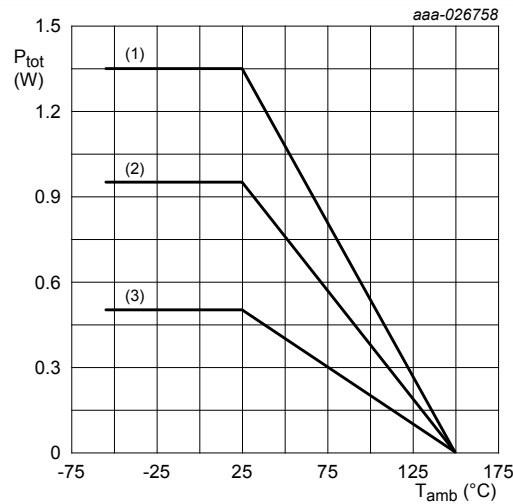
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|-----------|---------------------------|-------------------------------|-----|-----|------|------|
| V_{CBO} | collector-base voltage | open emitter | | - | 60 | V |
| V_{CEO} | collector-emitter voltage | open base | | - | 60 | V |
| V_{EBO} | emitter-base voltage | open collector | | - | 7 | V |
| I_C | collector current | | | - | 1 | A |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | | - | 2 | A |
| I_B | base current | | | - | 300 | mA |
| I_{BM} | peak base current | single pulse; $t_p \leq 1$ ms | | - | 1 | A |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | [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 Printed-Circuit Board (PCB), single-sided copper, tin-plated; mounting pad for collector 1 cm².

[3] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated; mounting pad for collector 6 cm².



(1) FR4 PCB, single-sided copper, 6 cm²

(2) FR4 PCB, single-sided copper, 1 cm²

(3) FR4 PCB, single-sided copper, standard footprint

Fig. 1. Power derating curves

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 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 6 cm².

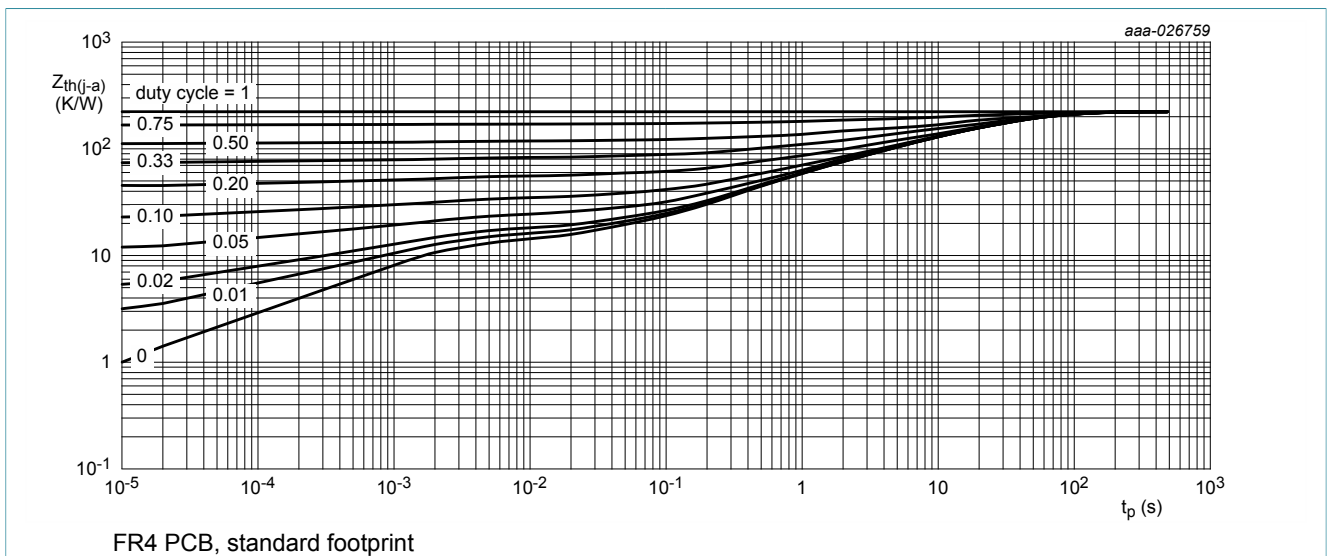


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

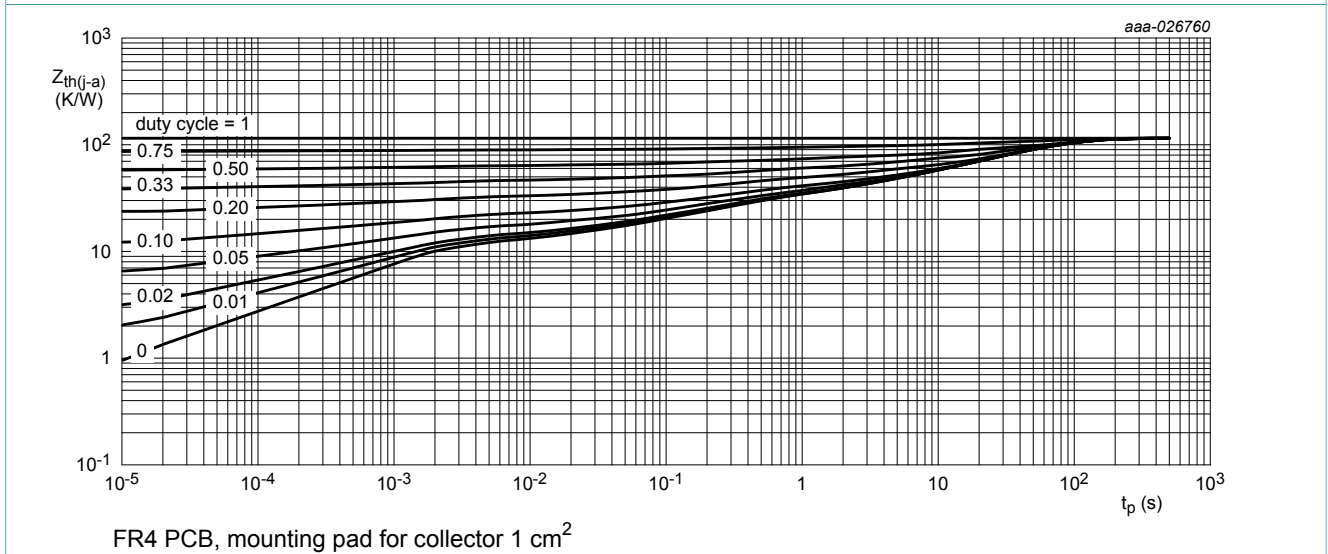
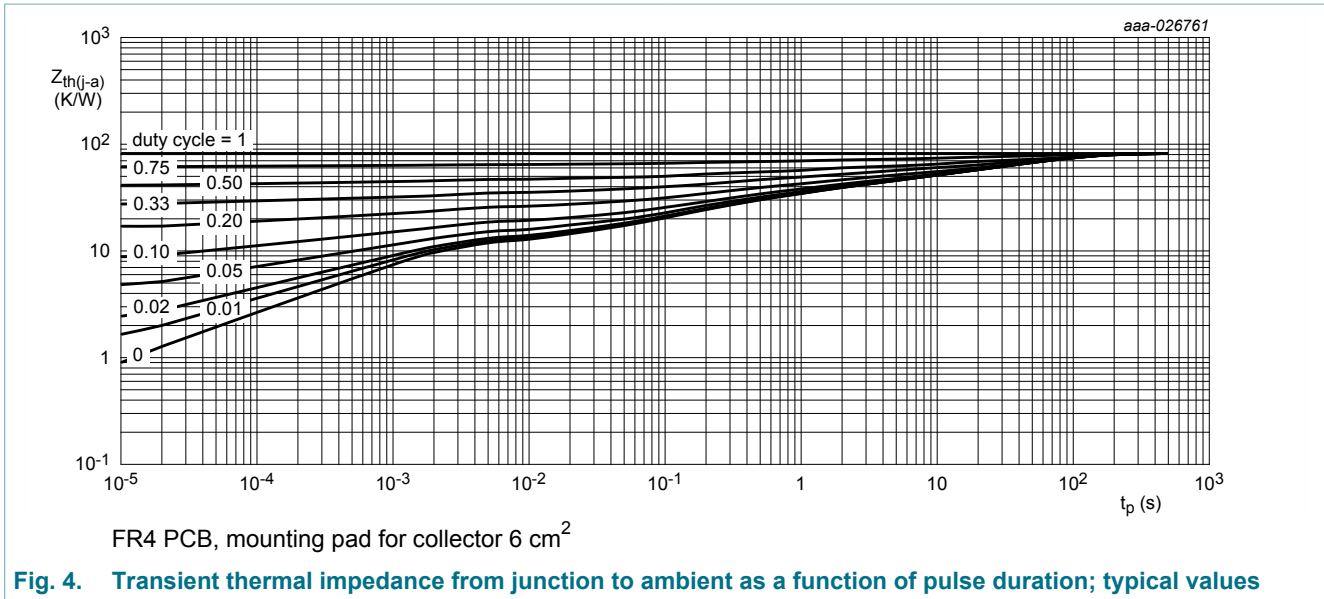


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

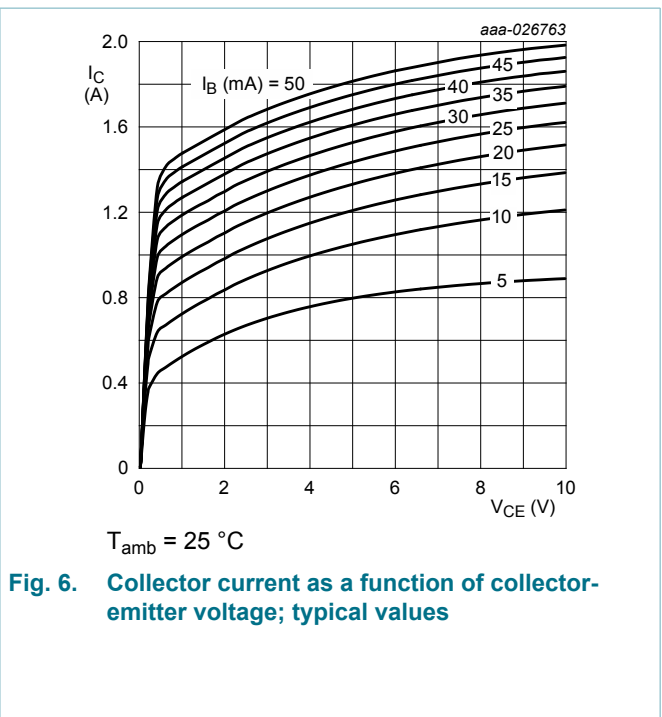
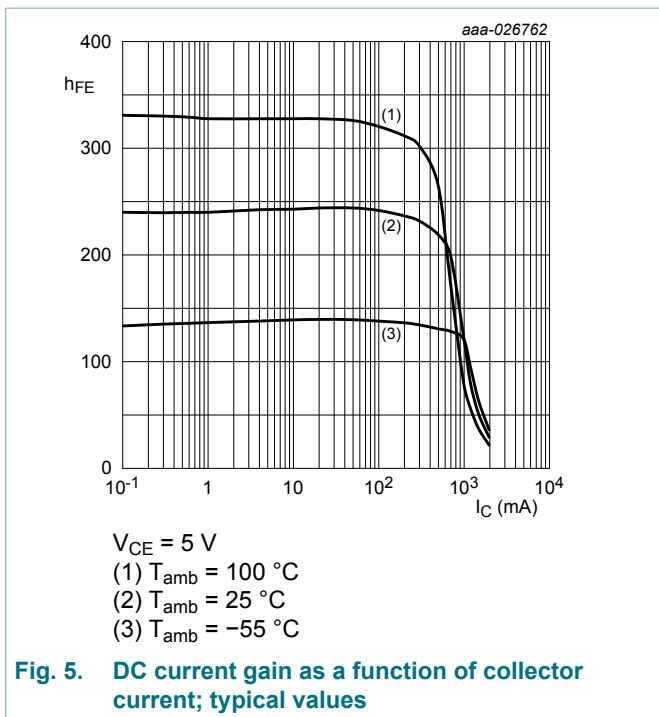


10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|--------------------|---|---|-----|-----|-----|-----|------|
| I _{CBO} | collector-base cut-off current | V _{CB} = 48 V; I _E = 0 A; T _{amb} = 25 °C | | - | - | 100 | nA |
| | | V _{CB} = 48 V; I _E = 0 A; T _J = 150 °C | | - | - | 10 | 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} = 10 V; I _C = 500 mA; T _{amb} = 25 °C | [1] | 170 | - | 360 | |
| | | V _{CE} = 5 V; I _C = 1 A; T _{amb} = 25 °C | [1] | 50 | - | - | |
| V _{CEsat} | collector-emitter saturation voltage | I _C = 500 mA; I _B = 50 mA; T _{amb} = 25 °C | [1] | - | - | 200 | mV |
| R _{CEsat} | collector-emitter saturation resistance | | | - | - | 0.4 | Ω |
| V _{BEsat} | base-emitter saturation voltage | | [1] | - | - | 1.2 | V |
| V _{BE} | base-emitter voltage | V _{CE} = 5 V; I _C = 1 A; T _{amb} = 25 °C | [1] | - | - | 1 | V |
| f _T | transition frequency | V _{CE} = 10 V; I _C = 50 mA; f = 100 MHz; T _{amb} = 25 °C | | - | 180 | - | MHz |
| C _c | collector capacitance | V _{CB} = 10 V; I _E = 0 A; i _e = 0 A; f = 1 MHz; T _{amb} = 25 °C | | - | 6 | - | pF |

[1] Pulse test: t_p ≤ 300 μs; δ ≤ 0.02



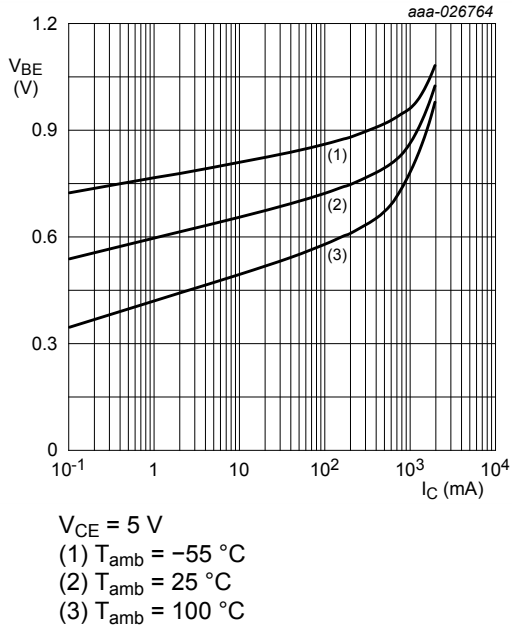


Fig. 7. Base-emitter voltage as a function of collector current; typical values

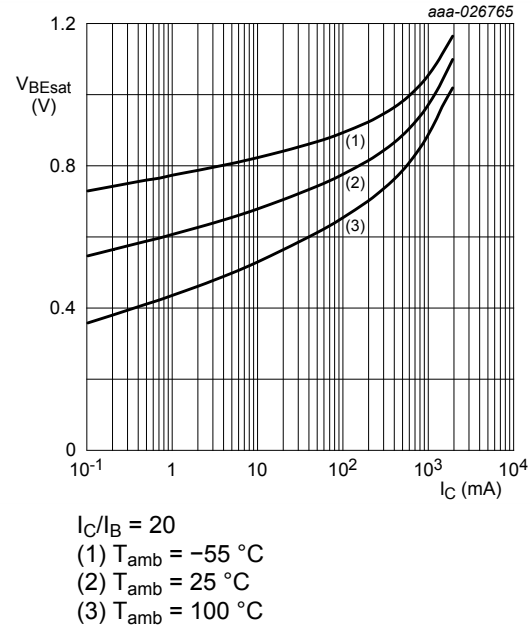


Fig. 8. Base-emitter saturation voltage as a function of collector current; typical values

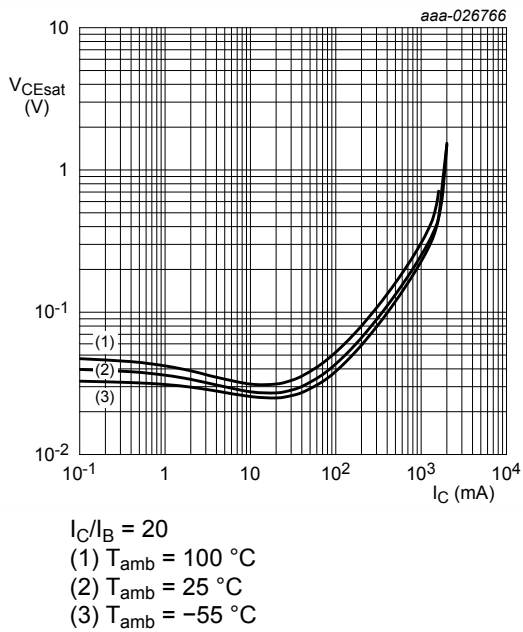


Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values

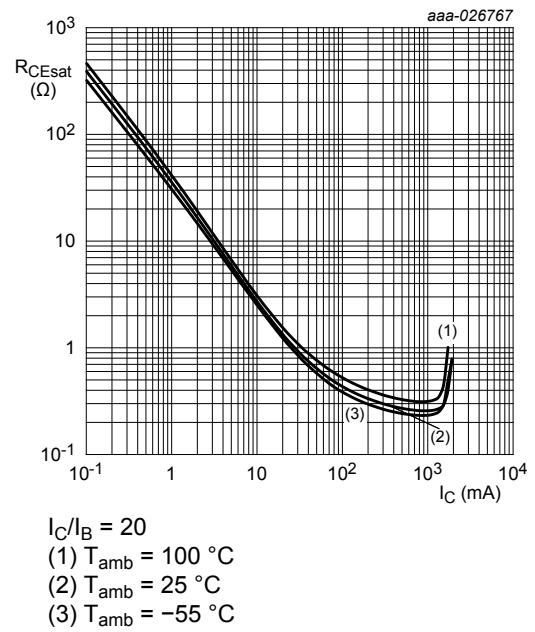
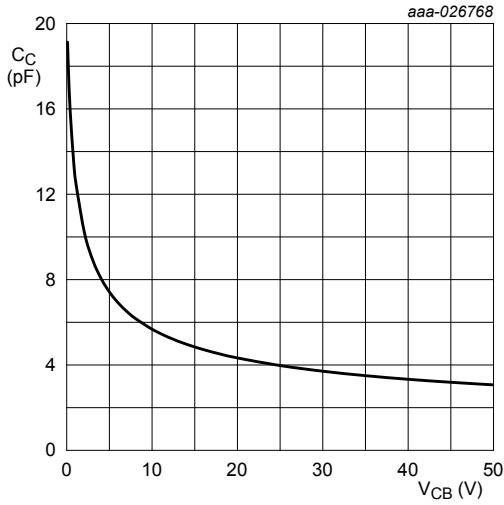
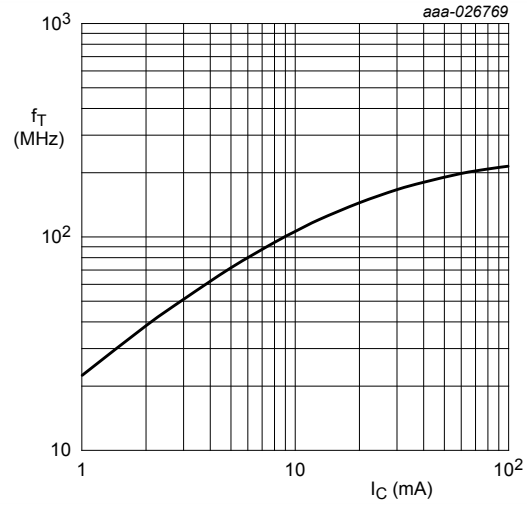


Fig. 10. Collector-emitter saturation resistance as a function of collector current; typical values



$f = 1 \text{ MHz}$
 $T_{amb} = 25 \text{ }^\circ\text{C}$

Fig. 11. Collector capacitance as a function of collector-base voltage; typical values



$V_{CE} = 10 \text{ V}$
 $f = 100 \text{ MHz}$
 $T_{amb} = 25 \text{ }^\circ\text{C}$

Fig. 12. Transition frequency 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

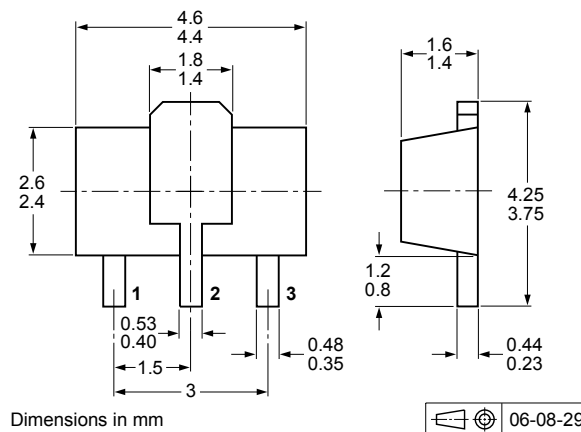


Fig. 13. Package outline SOT89

13. Soldering

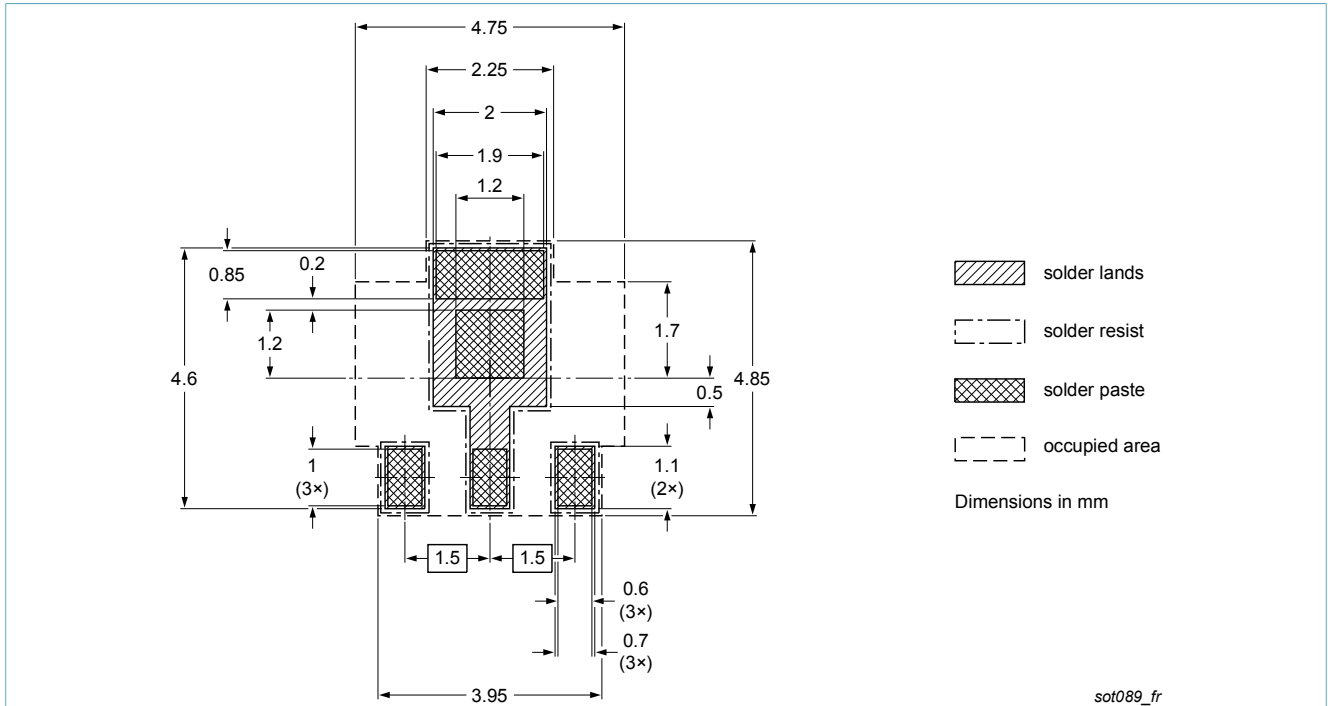


Fig. 14. Reflow soldering footprint for SOT89

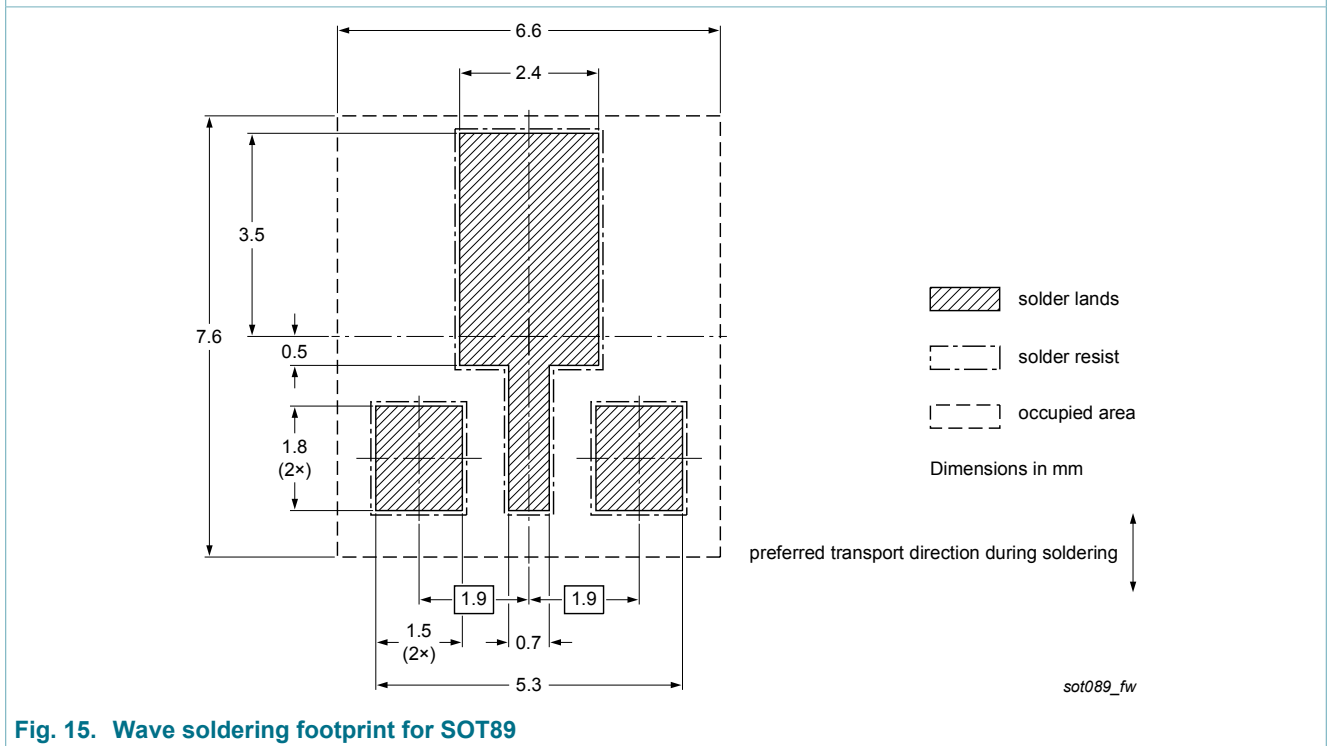


Fig. 15. Wave soldering footprint for SOT89

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PBSS4160X v.1 | 20170523 | 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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