

PBSS9110X

100 V, 1 A PNP low V_{CEsat} (BISS) transistor

Rev. 02 — 22 November 2009

Product data sheet

1. Product profile

1.1 General description

PNP low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in a SOT89 (SC-62/TO-243) SMD plastic package.

NPN complement: PBSS8110X.

1.2 Features

- SOT89 package
- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High efficiency leading to less heat generation

1.3 Applications

- Major application segments:
 - ◆ Automotive 42 V power
 - ◆ Telecom infrastructure
 - ◆ Industrial
- Peripheral driver:
 - ◆ Driver in low supply voltage applications (e.g. lamps and LEDs)
 - ◆ Inductive load driver (e.g. relays, buzzers and motors)
- DC-to-DC conversion

1.4 Quick reference data

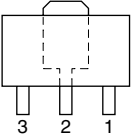
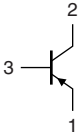
Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|---|----------------------------------|-------|-----|------|------------|
| V_{CEO} | collector-emitter voltage | open base | - | - | -100 | V |
| I_C | collector current (DC) | | - | - | -1 | A |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | - | -3 | A |
| R_{CEsat} | collector-emitter saturation resistance | $I_C = -1$ A; $I_B = -100$ mA | [1] - | 170 | 320 | m Ω |

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

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Symbol |
|-----|-------------|---|---|
| 1 | emitter |  |  |
| 2 | collector | | |
| 3 | base | | |

006aaa231

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PBSS9110X | SC-62 | plastic surface mounted package; collector pad for good heat transfer; 3 leads | SOT89 |

4. Marking

Table 4. Marking codes

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| PBSS9110X | *4C |

- [1] * = -: made in Hong Kong
 * = p: made in Hong Kong
 * = t: made in Malaysia
 * = W: made in China

5. Limiting values

Table 5. Limiting values

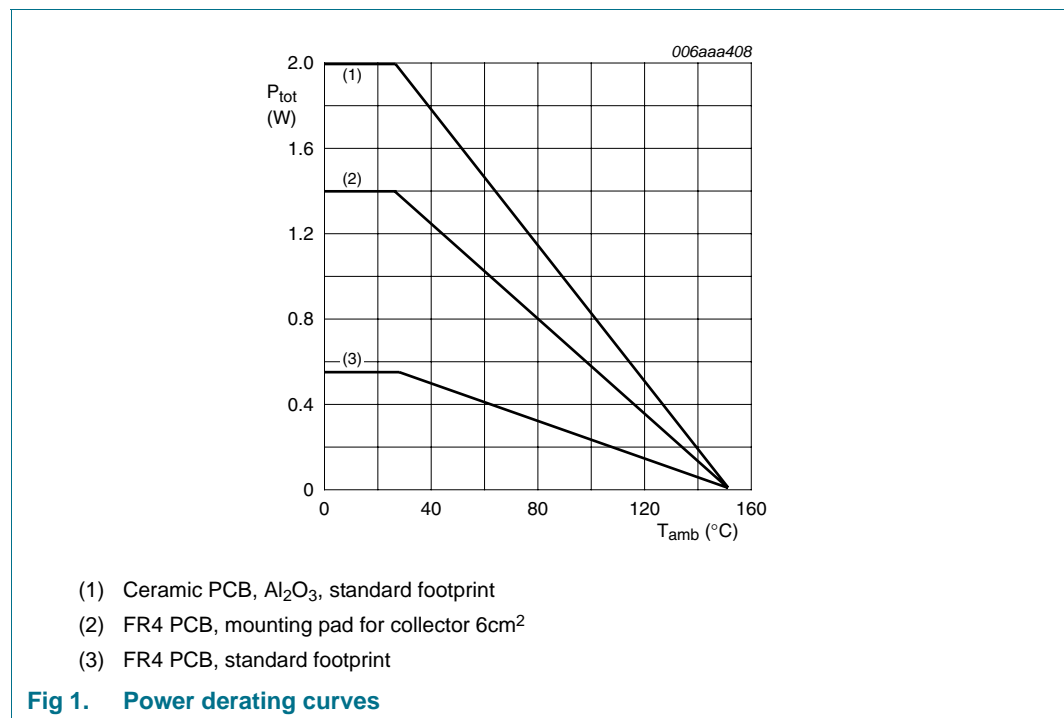
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit | |
|-----------|---------------------------|----------------------------------|-----|------|------|---|
| V_{CBO} | collector-base voltage | open emitter | - | -120 | V | |
| V_{CEO} | collector-emitter voltage | open base | - | -100 | V | |
| V_{EBO} | emitter-base voltage | open collector | - | -5 | V | |
| I_C | collector current (DC) | | - | -1 | A | |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | -3 | A | |
| I_B | base current (DC) | | - | -0.3 | A | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 0.55 | W |
| | | | [2] | - | 1.4 | W |
| | | | [3] | - | 2.0 | 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 Printed-Circuit Board (PCB), single-sided copper, tin-plated, standard footprint.

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

[3] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.



6. Thermal characteristics

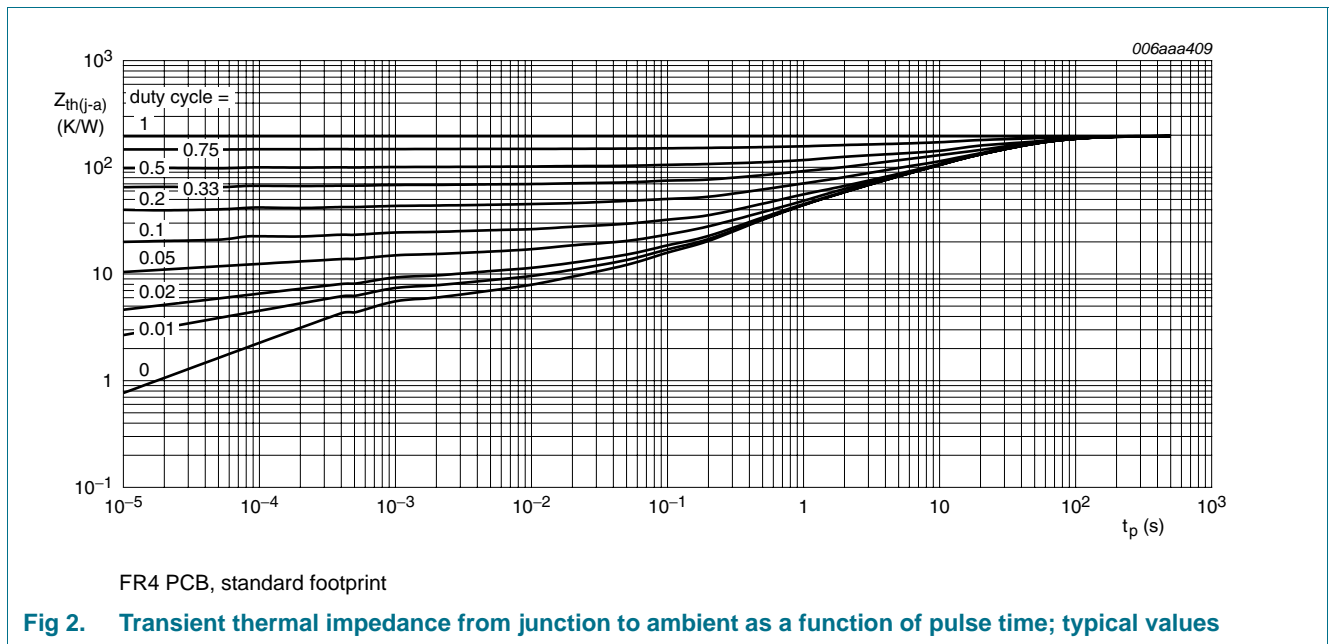
Table 6. Thermal characteristics

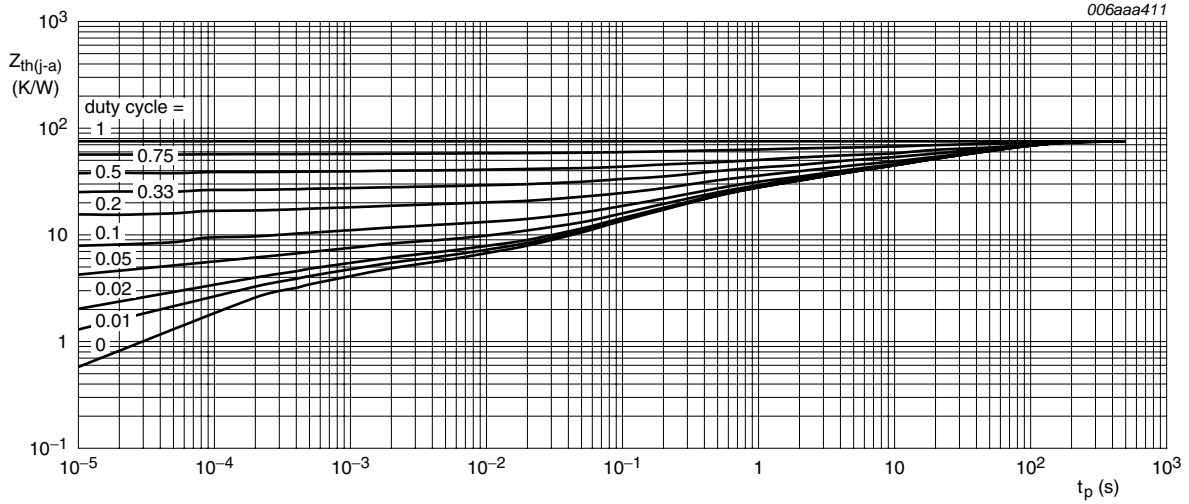
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|----------------|--|-------------|-----|-----|-----|------|-----|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 227 | K/W |
| | | | [2] | - | - | 89 | K/W |
| | | | [3] | - | - | 63 | K/W |
| $R_{th(j-sp)}$ | 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 6cm².

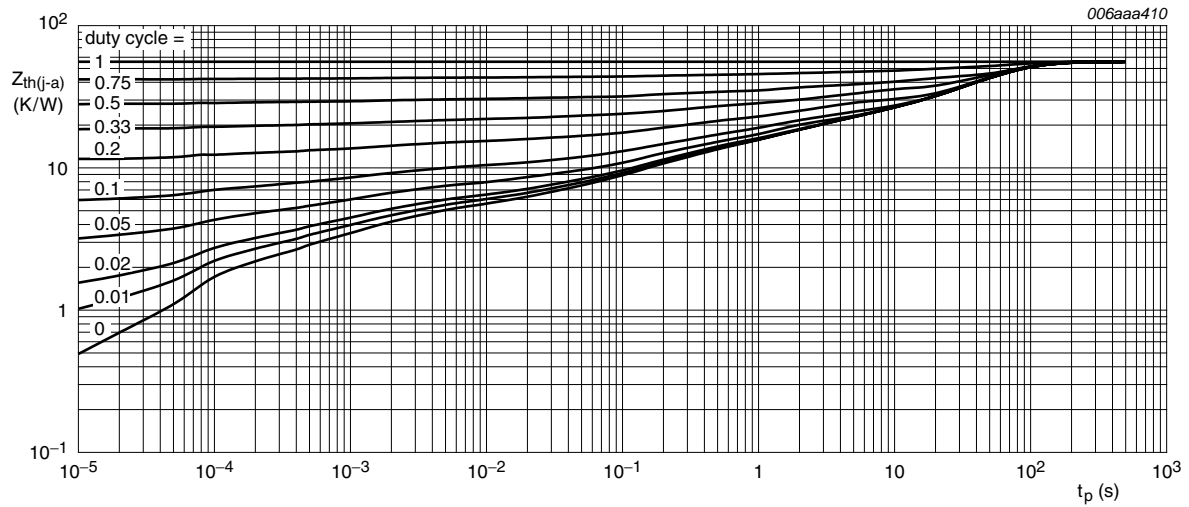
[3] Device mounted on a ceramic PCB, AL₂O₃, standard footprint.





FR4 PCB, mounting pad for collector 6cm²

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



Ceramic PCB, Al₂O₃, standard footprint

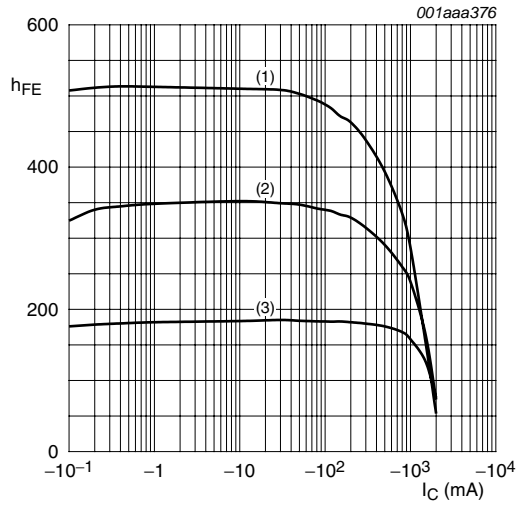
Fig 4. Transient thermal impedance from junction to ambient as a function of pulse time; typical values

7. Characteristics

Table 7. Characteristics
 $T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

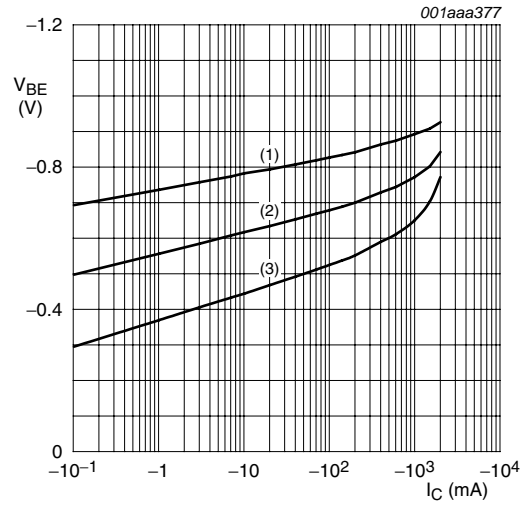
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|---|--|---------|-----|------|------------------|
| I_{CBO} | collector-base cut-off current | $V_{CB} = -80\text{ V}; I_E = 0\text{ A}$ | - | - | -100 | nA |
| | | $V_{CB} = -80\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$ | - | - | -50 | μA |
| I_{CES} | collector-emitter cut-off current | $V_{CE} = -80\text{ V}; V_{BE} = 0\text{ V}$ | - | - | -100 | nA |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = -4\text{ V}; I_C = 0\text{ A}$ | - | - | -100 | nA |
| h_{FE} | DC current gain | $V_{CE} = -5\text{ V}; I_C = -1\text{ mA}$ | 150 | - | - | |
| | | $V_{CE} = -5\text{ V}; I_C = -250\text{ mA}$ | 150 | - | - | |
| | | $V_{CE} = -5\text{ V}; I_C = -0.5\text{ A}$ | [1] 150 | - | 450 | |
| | | $V_{CE} = -5\text{ V}; I_C = -1\text{ A}$ | [1] 125 | - | - | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = -250\text{ mA}; I_B = -25\text{ mA}$ | - | - | -120 | mV |
| | | $I_C = -500\text{ mA}; I_B = -50\text{ mA}$ | - | - | -180 | mV |
| | | $I_C = -1\text{ A}; I_B = -100\text{ mA}$ | [1] - | - | -320 | mV |
| R_{CEsat} | collector-emitter saturation resistance | $I_C = -1\text{ A}; I_B = -100\text{ mA}$ | [1] - | 170 | 320 | $\text{m}\Omega$ |
| V_{BEsat} | base-emitter saturation voltage | $I_C = -1\text{ A}; I_B = -100\text{ mA}$ | - | - | -1.1 | V |
| V_{BEon} | base-emitter turn-on voltage | $I_C = -1\text{ A}; V_{CE} = -5\text{ V}$ | - | - | -1.0 | V |
| t_d | delay time | $V_{CC} = -10\text{ V}; I_C = -0.5\text{ A}; I_{Bon} = -0.025\text{ A}; I_{Boff} = 0.025\text{ A}$ | - | 20 | - | ns |
| t_r | rise time | | - | 60 | - | ns |
| t_{on} | turn-on time | | - | 80 | - | ns |
| t_s | storage time | | - | 290 | - | ns |
| t_f | fall time | | - | 120 | - | ns |
| t_{off} | turn-off time | | - | 410 | - | ns |
| f_T | transition frequency | $I_C = -50\text{ mA}; V_{CE} = -10\text{ V}; f = 100\text{ MHz}$ | 100 | - | - | MHz |
| C_c | collector capacitance | $I_E = i_e = 0\text{ A}; V_{CB} = -10\text{ V}; f = 1\text{ MHz}$ | - | - | 17 | pF |

[1] Pulse test: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$.



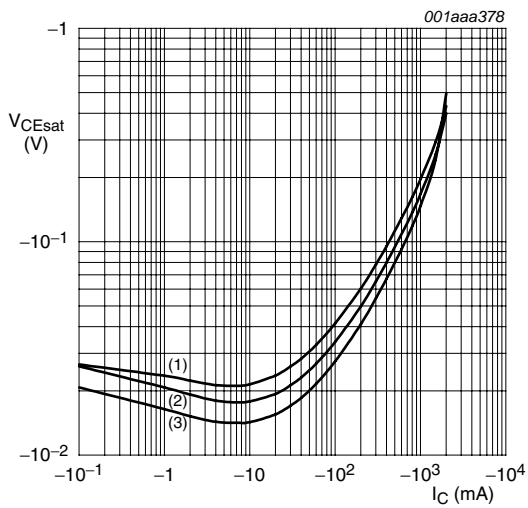
- $V_{CE} = -10$ V
- (1) $T_{amb} = 100^\circ C$
 - (2) $T_{amb} = 25^\circ C$
 - (3) $T_{amb} = -55^\circ C$

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



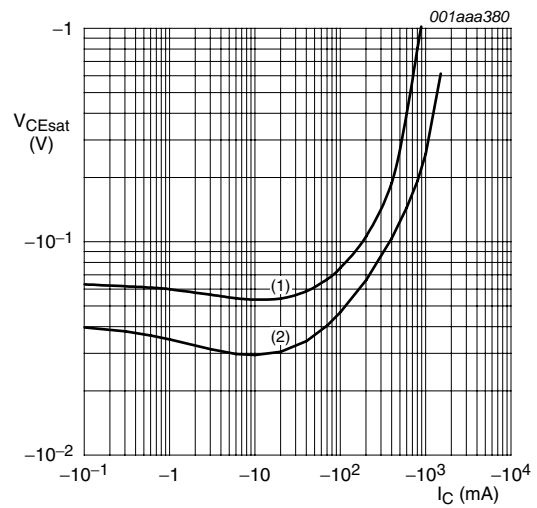
- $V_{CE} = -10$ V
- (1) $T_{amb} = -55^\circ C$
 - (2) $T_{amb} = 25^\circ C$
 - (3) $T_{amb} = 100^\circ C$

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



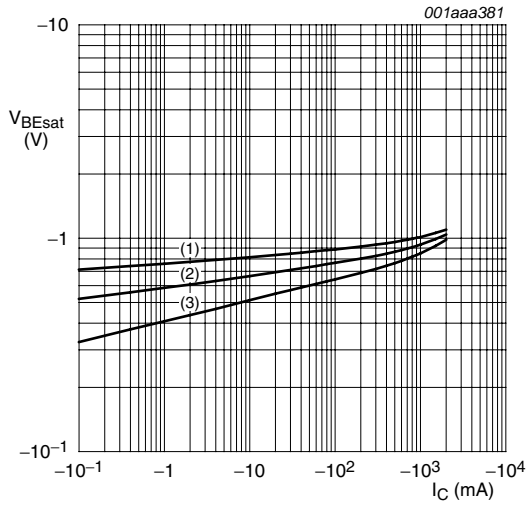
- $I_C/I_B = 10$
- (1) $T_{amb} = 100^\circ C$
 - (2) $T_{amb} = 25^\circ C$
 - (3) $T_{amb} = -55^\circ C$

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



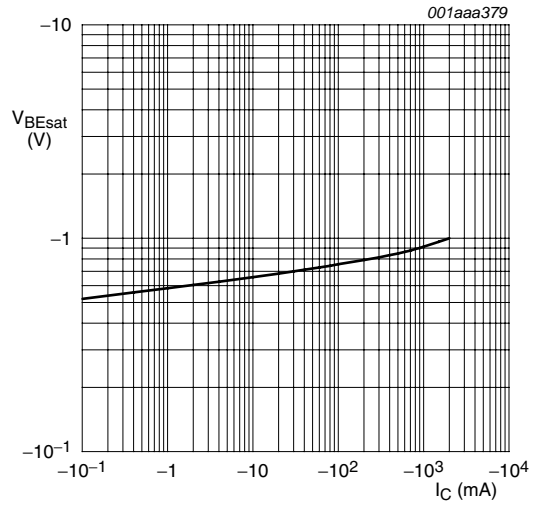
- $T_{amb} = 25^\circ C$
- (1) $I_C/I_B = 50$
 - (2) $I_C/I_B = 20$

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



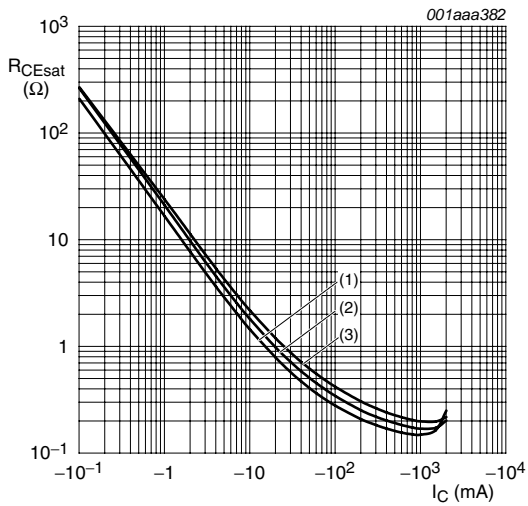
$I_C/I_B = 10$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



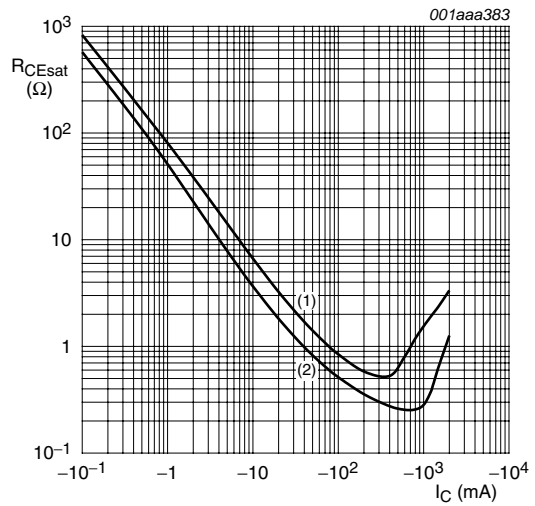
$I_C/I_B = 20$
 $T_{amb} = 25\text{ °C}$

Fig 10. Base-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 10$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

Fig 11. Collector-emitter saturation resistance as a function of collector current; typical values



$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 50$
 (2) $I_C/I_B = 20$

Fig 12. Collector-emitter saturation resistance as a function of collector current; typical values

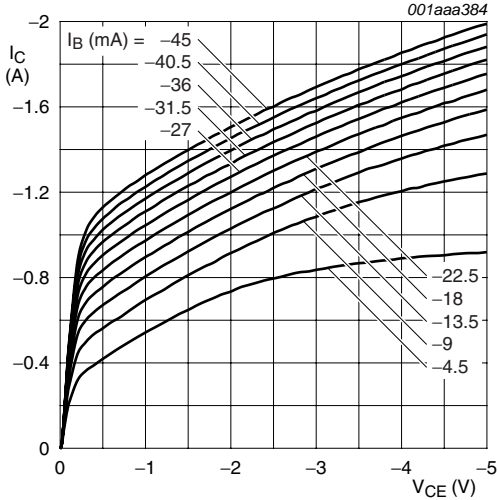


Fig 13. Collector current as a function of collector-emitter voltage; typical values

8. Test information

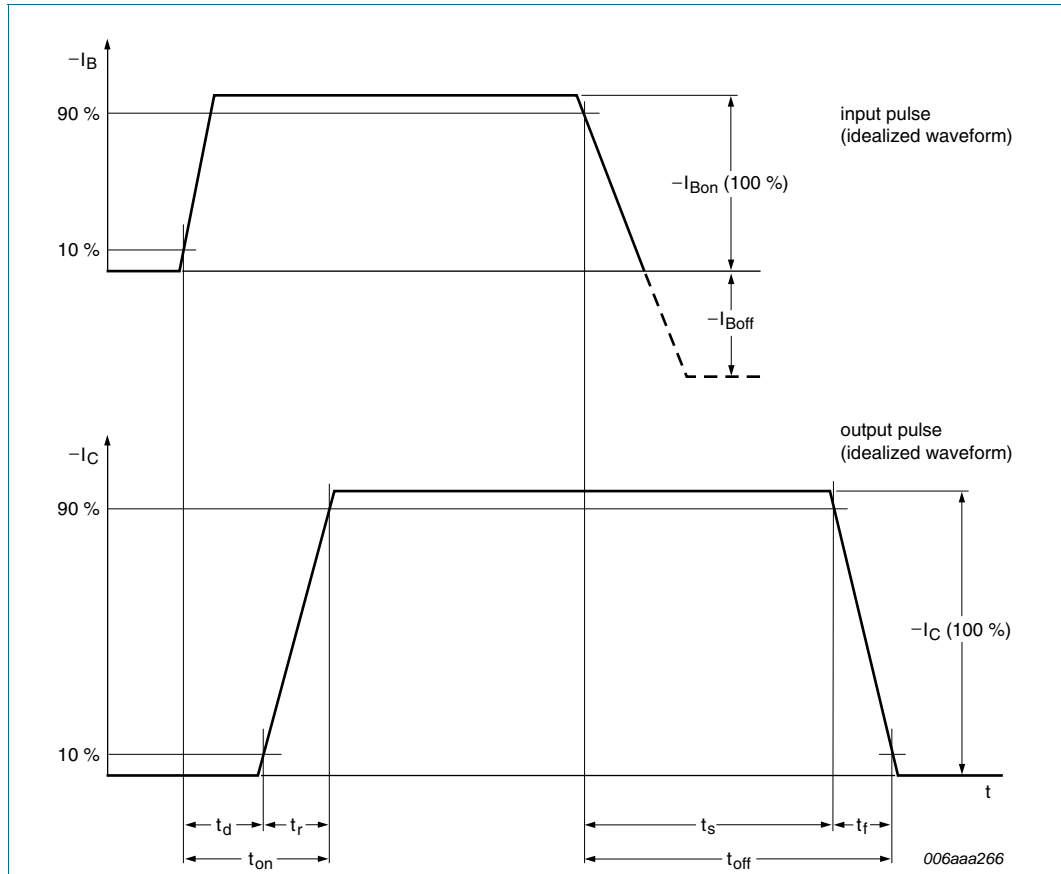
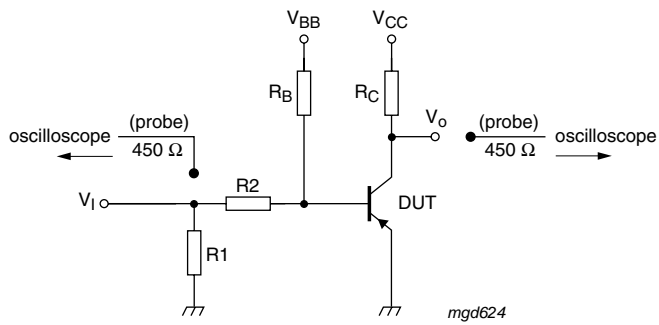


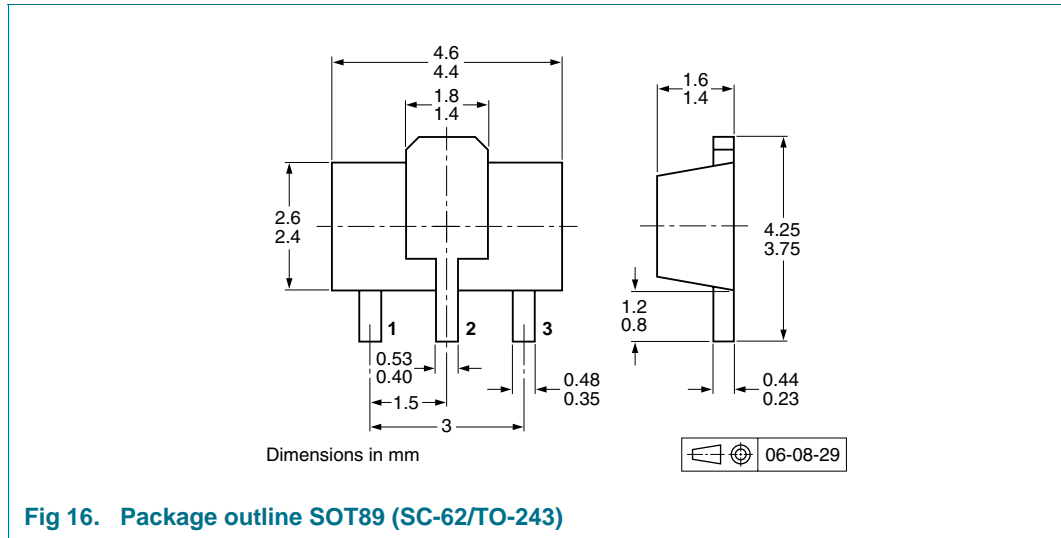
Fig 14. BISS transistor switching time definition



$V_{CC} = -10\text{ V}$; $I_C = -0.5\text{ A}$; $I_{Bon} = -0.025\text{ A}$; $I_{Boff} = 0.025\text{ A}$

Fig 15. Test circuit for switching times

9. Package outline



10. Packing information

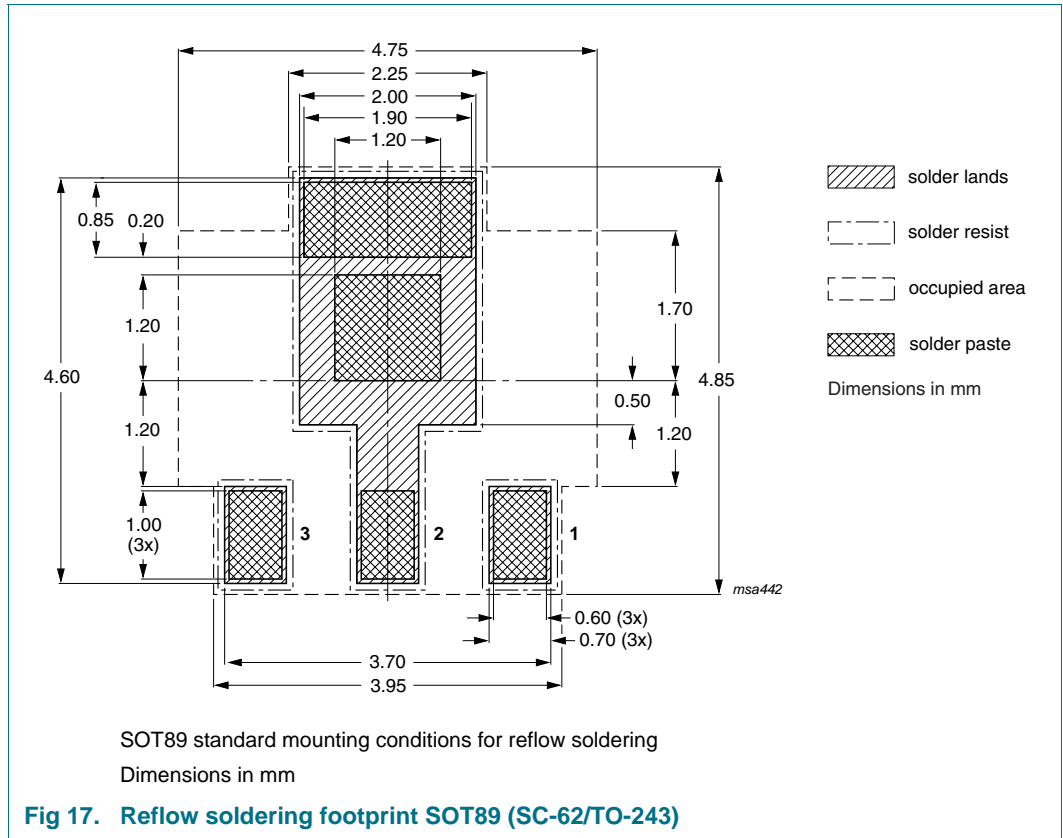
Table 8. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

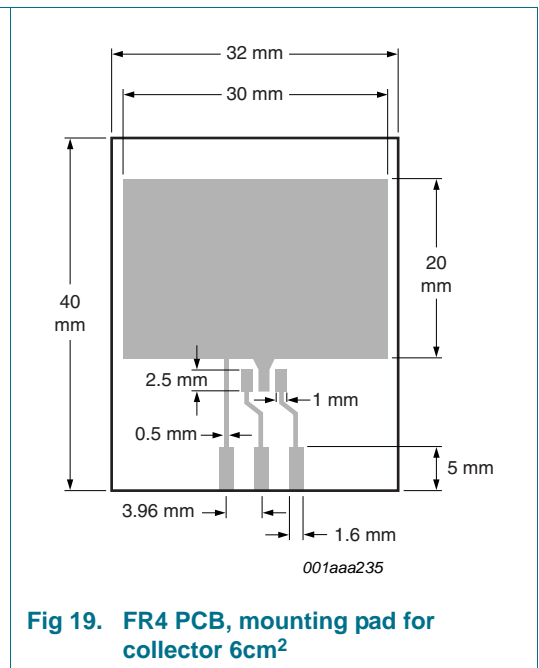
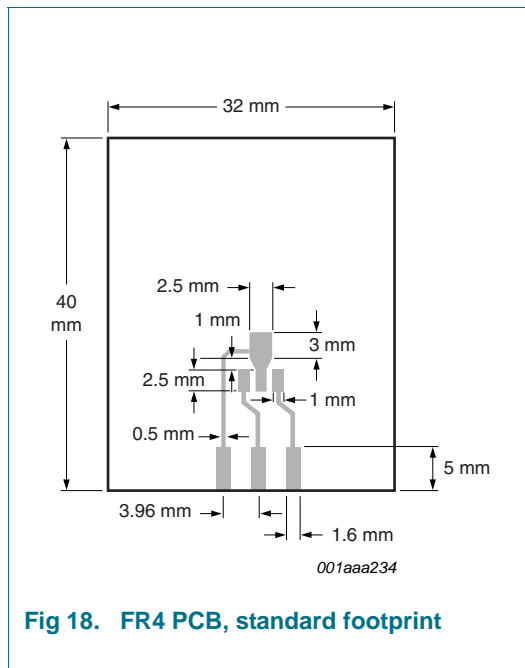
| Type number | Package | Description | Packing quantity | |
|-------------|---------|---------------------------------|------------------|------|
| | | | 1000 | 4000 |
| PBSS9110X | SOT89 | 8 mm pitch, 12 mm tape and reel | -115 | -135 |

[1] For further information and the availability of packing methods, see [Section 15](#).

11. Soldering



12. Mounting



13. Revision history

Table 9. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|---|--------------------|---------------|-------------|
| PBSS9110X_2 | 20091122 | Product data sheet | - | PBSS9110X_1 |
| Modifications: | <ul style="list-style-type: none">• This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content.• Figure 12 “Collector-emitter saturation resistance as a function of collector current; typical values”: updated• Figure 13 “Collector current as a function of collector-emitter voltage; typical values”: updated | | | |
| PBSS9110X_1 | 20050502 | Product data sheet | - | - |

14. Legal information

14.1 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: 22 November 2009

Document identifier: PBSS9110X_2

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