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Kind regards,

Team Nexperia



# 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

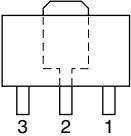
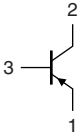
Table 1. Quick reference data

| 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;<br>$t_p \leq 1$ ms | -                     | -   | -3   | A          |
| $R_{CEsat}$ | collector-emitter saturation resistance | $I_C = -1$ A;<br>$I_B = -100$ mA | <a href="#">[1]</a> - | 170 | 320  | m $\Omega$ |

[1] Pulse test:  $t_p \leq 300$   $\mu$ 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 <sup>[1]</sup> |
|-------------|-----------------------------|
| PBSS9110X   | *4C                         |

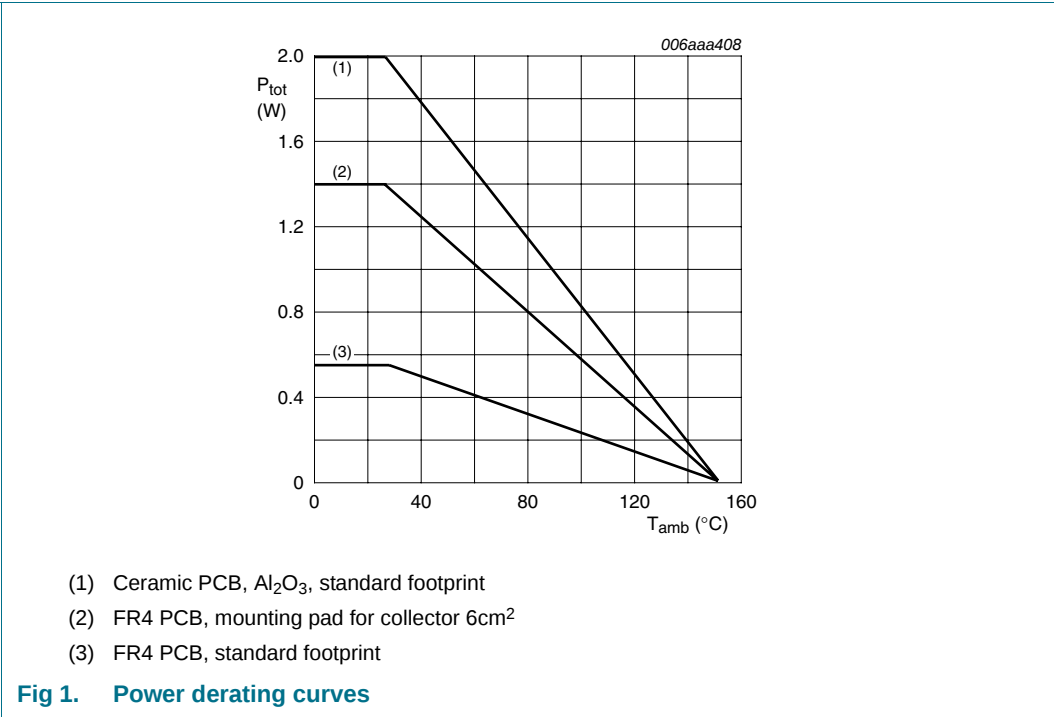
- [1] \* = -: made in Hong Kong  
\* = p: made in Hong Kong  
\* = t: made in Malaysia  
\* = W: made in China

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;<br>$t_p \leq 1$ ms              | -   | -3   | A                  |
| $I_B$     | base current (DC)         |                                               | -   | -0.3 | A                  |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ [1] | -   | 0.55 | W                  |
|           |                           | [2]                                           | -   | 1.4  | W                  |
|           |                           | [3]                                           | -   | 2.0  | W                  |
| $T_j$     | junction temperature      |                                               | -   | 150  | $^{\circ}\text{C}$ |
| $T_{amb}$ | ambient temperature       |                                               | -65 | +150 | $^{\circ}\text{C}$ |
| $T_{stg}$ | storage temperature       |                                               | -65 | +150 | $^{\circ}\text{C}$ |

- [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, 6cm<sup>2</sup> collector mounting pad.  
[3] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, 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 6cm<sup>2</sup>.  
[3] Device mounted on a ceramic PCB, AL<sub>2</sub>O<sub>3</sub>, standard footprint.

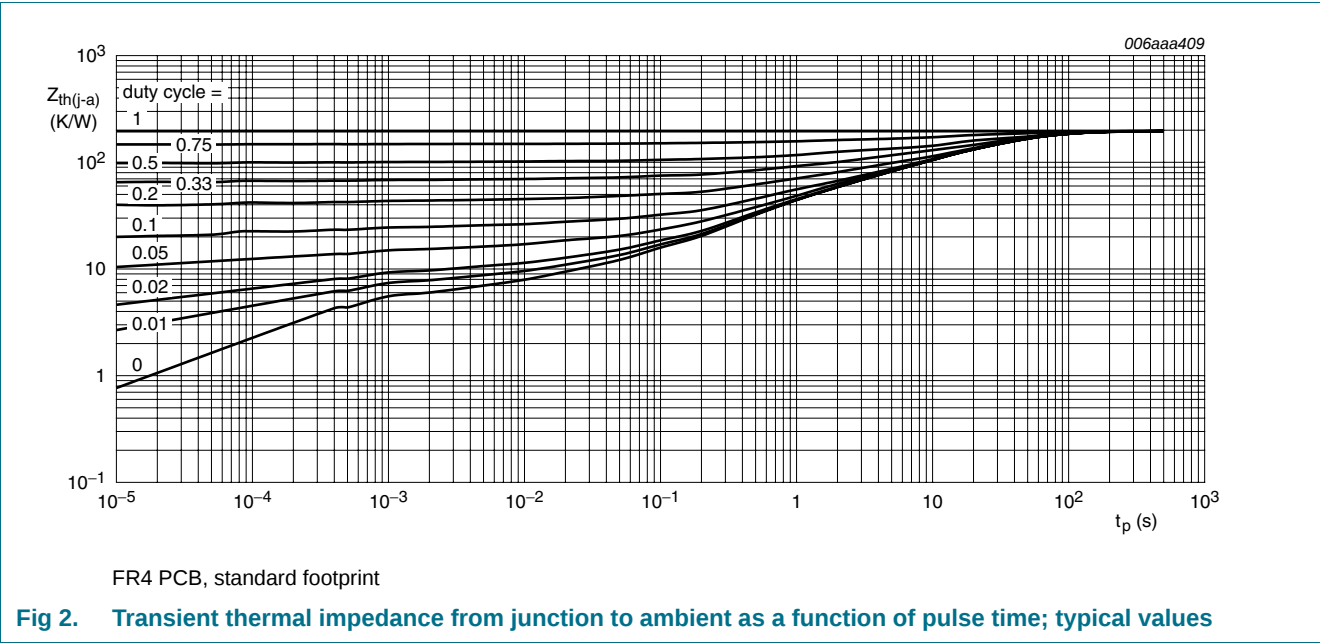
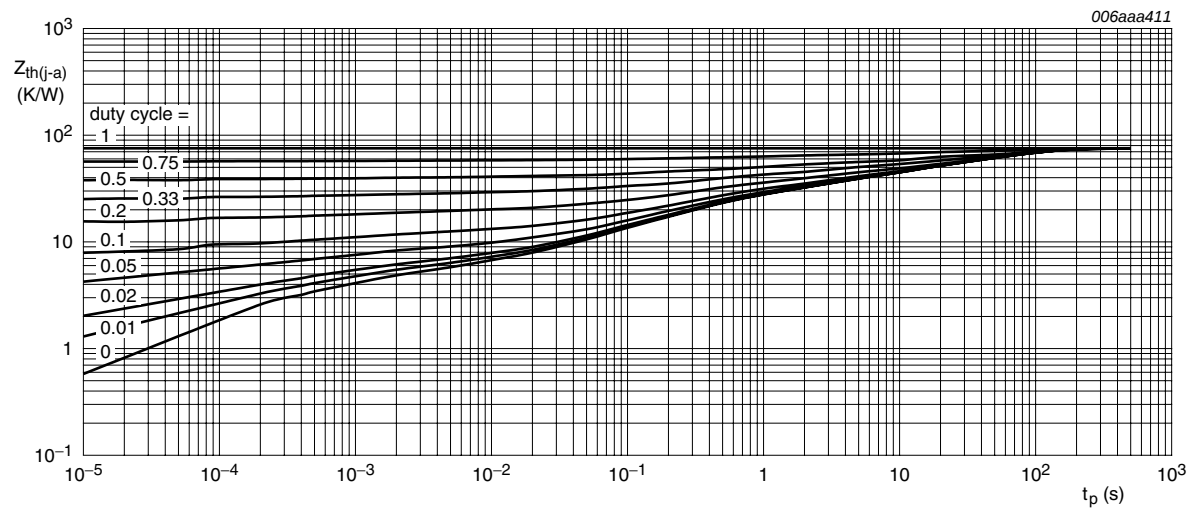
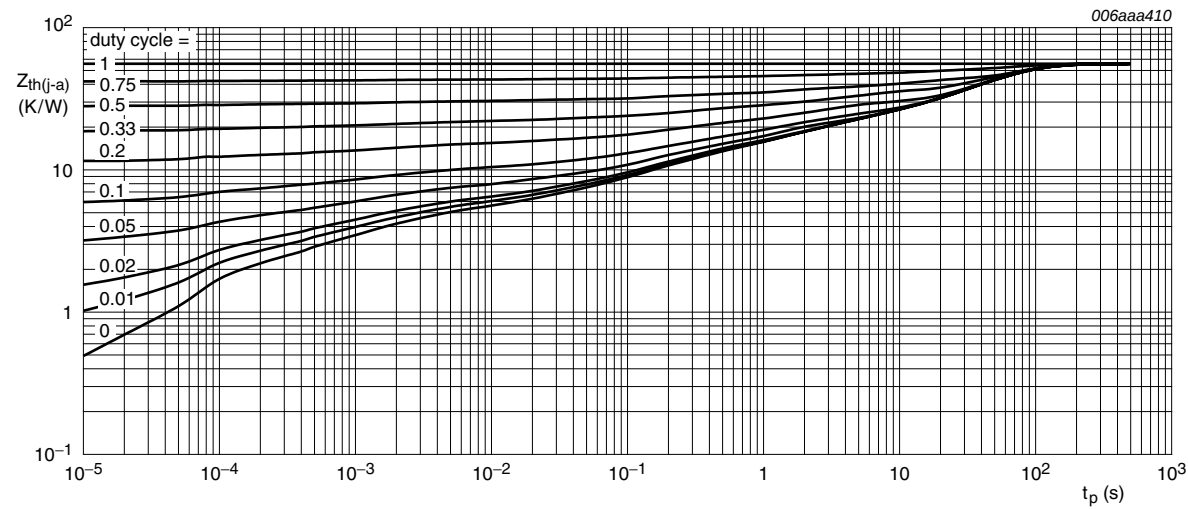


Fig 2. Transient thermal impedance from junction to ambient as a function of pulse time; typical values



FR4 PCB, mounting pad for collector 6cm<sup>2</sup>

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



Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

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

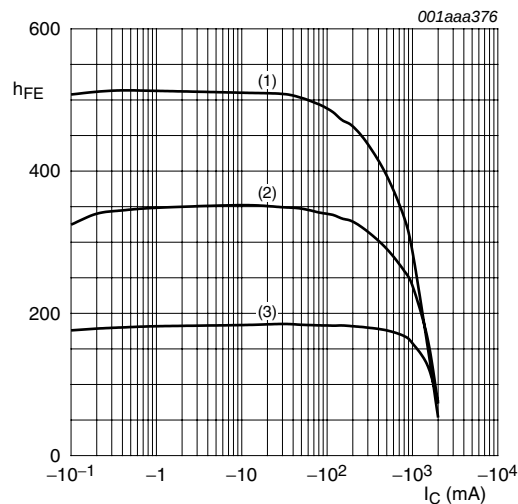
## 7. Characteristics

**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  | $\mu\text{A}$    |
| $I_{CES}$   | 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               |

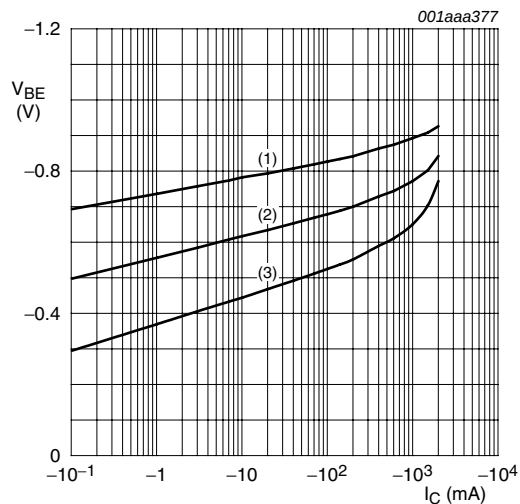
[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .



$V_{CE} = -10$  V

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

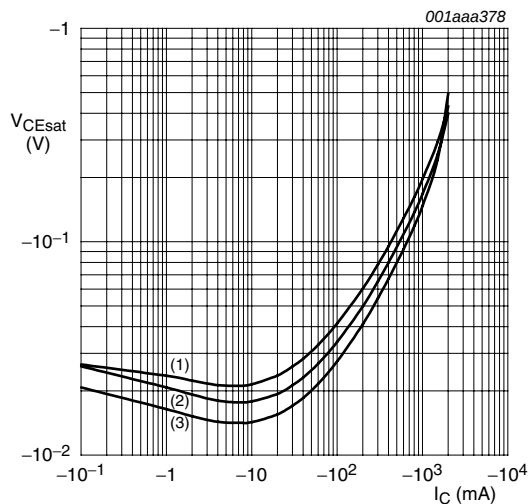
**Fig 5. DC current gain as a function of collector current; typical values**



$V_{CE} = -10$  V

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

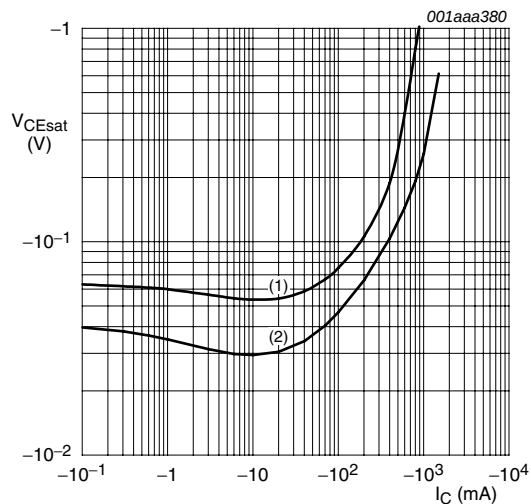
**Fig 6. Base-emitter voltage as a function of collector current; typical values**



$I_C/I_B = 10$

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

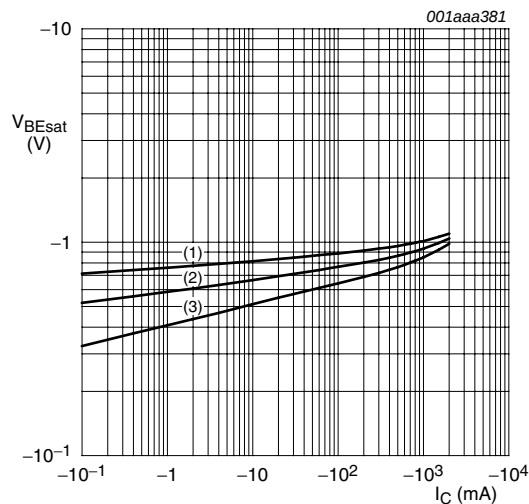
**Fig 7. Collector-emitter saturation voltage as a function of collector current; typical values**



$T_{amb} = 25$  °C

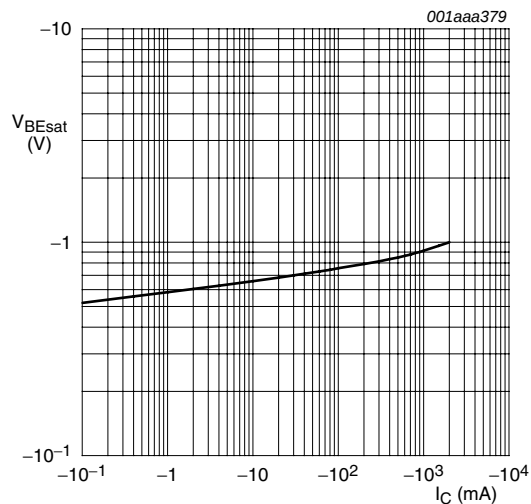
- (1)  $I_C/I_B = 50$
- (2)  $I_C/I_B = 20$

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



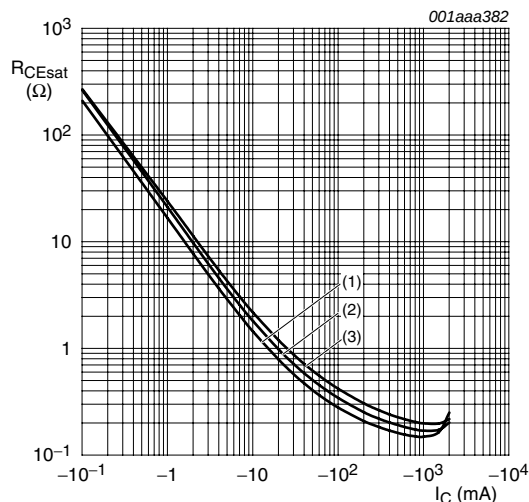
- $I_C/I_B = 10$
- (1)  $T_{amb} = -55\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = 100\text{ °C}$

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



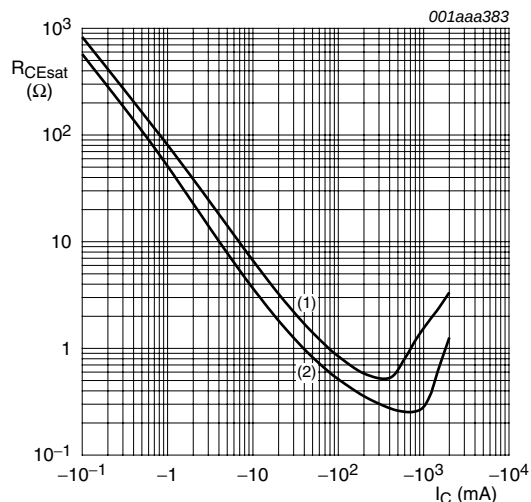
- $I_C/I_B = 20$
- $T_{amb} = 25\text{ °C}$

**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**

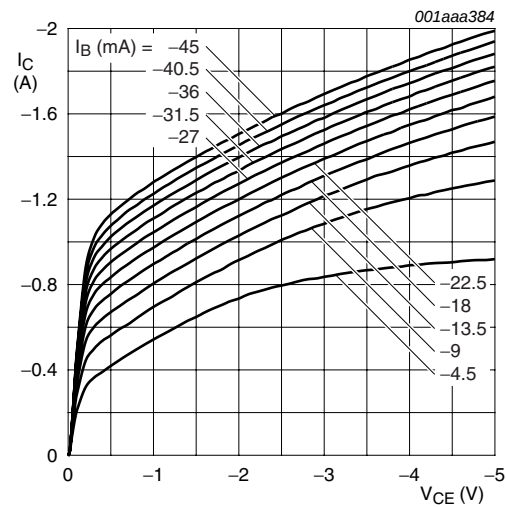


Fig 13. Collector current as a function of collector-emitter voltage; typical values

## 8. Test information

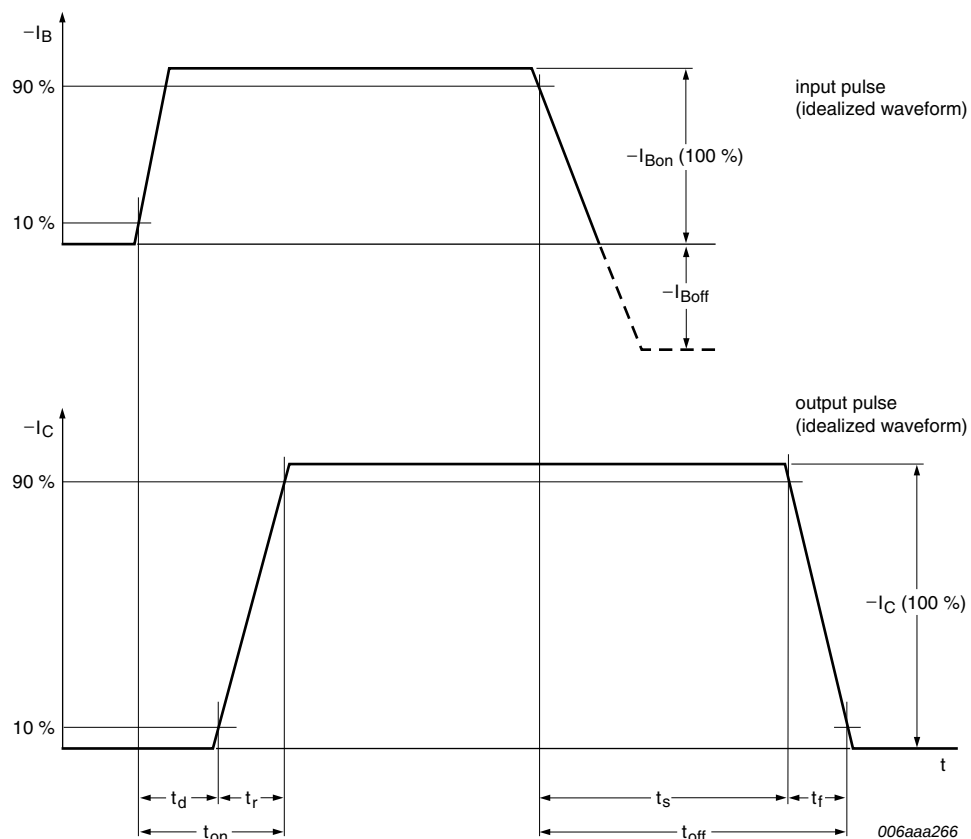
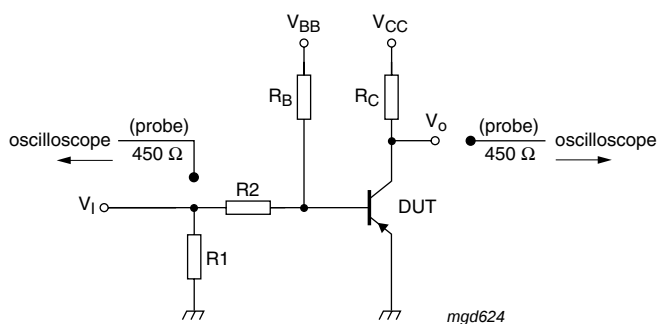


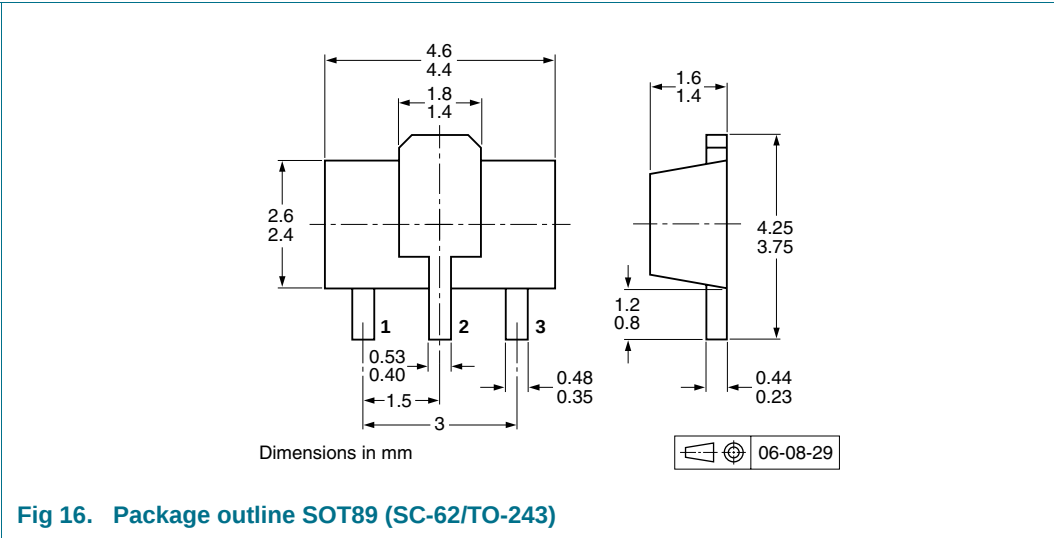
Fig 14. BISS transistor switching time definition



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

Fig 15. Test circuit for switching times

9. Package outline



10. Packing information

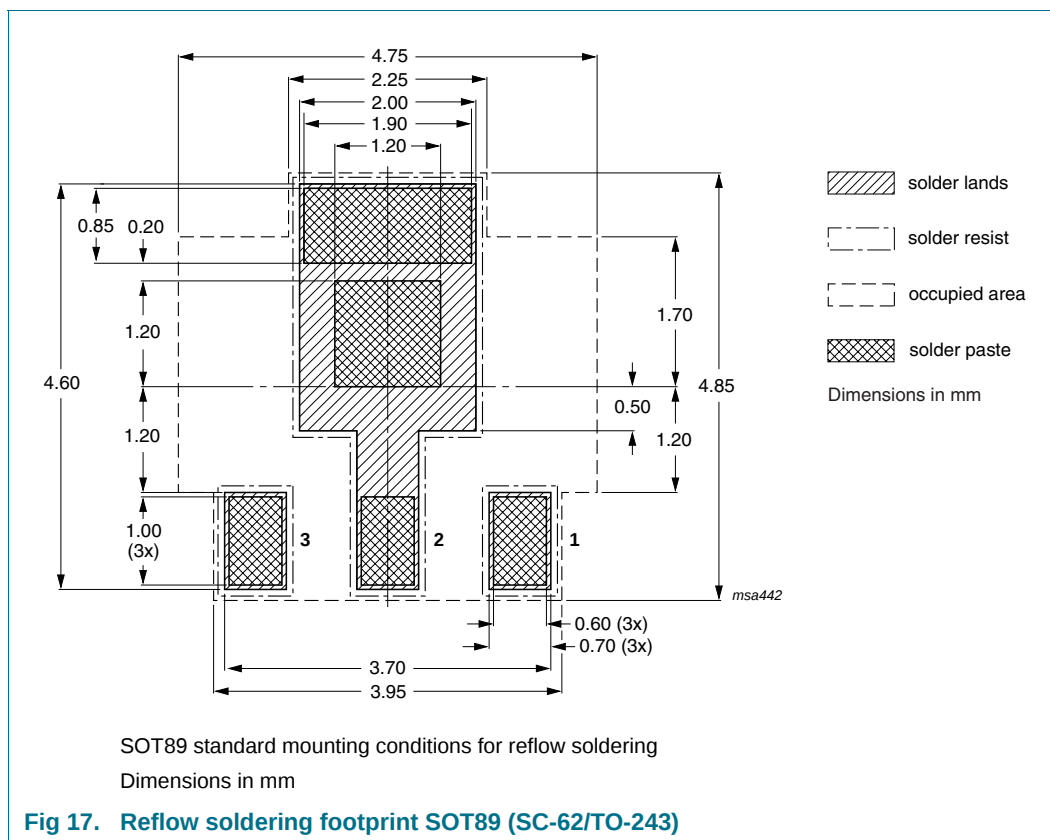
Table 8. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.[\[1\]](#)

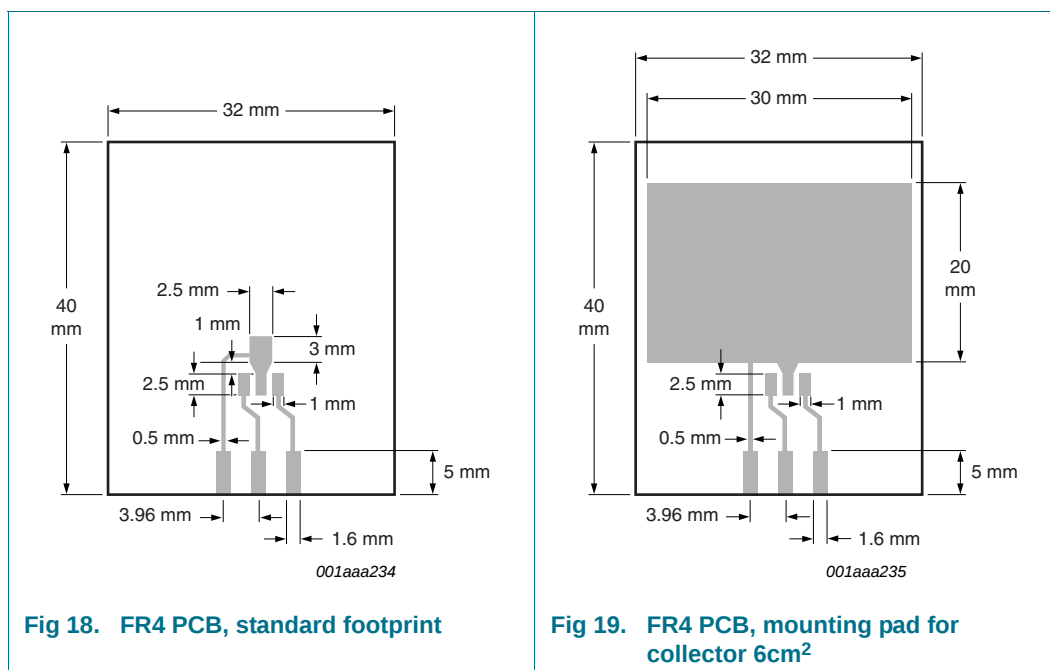
| Type number | Package | Description                     | Packing quantity |      |
|-------------|---------|---------------------------------|------------------|------|
|             |         |                                 | 1000             | 4000 |
| PBSS9110X   | SOT89   | 8 mm pitch, 12 mm 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"><li>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.</li><li><a href="#">Figure 12 "Collector-emitter saturation resistance as a function of collector current; typical values"</a>: updated</li><li><a href="#">Figure 13 "Collector current as a function of collector-emitter voltage; typical values"</a>: updated</li></ul> |                    |               |             |
| PBSS9110X_1    | 20050502                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product data sheet | -             | -           |

## 14. Legal information

### 14.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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16. Contents

1 Product profile ..... 1

1.1 General description ..... 1

1.2 Features ..... 1

1.3 Applications ..... 1

1.4 Quick reference data ..... 1

2 Pinning information..... 2

3 Ordering information..... 2

4 Marking ..... 2

5 Limiting values..... 3

6 Thermal characteristics ..... 4

7 Characteristics..... 6

8 Test information..... 10

9 Package outline ..... 11

10 Packing information ..... 11

11 Soldering ..... 12

12 Mounting..... 12

13 Revision history..... 13

14 Legal information..... 14

14.1 Data sheet status ..... 14

14.2 Definitions..... 14

14.3 Disclaimers ..... 14

14.4 Trademarks..... 14

15 Contact information..... 14

16 Contents ..... 15



Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.



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- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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