

## Important notice

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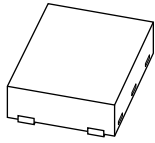
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Kind regards,

Team Nexperia



# PBSS5630PA

30 V, 6 A PNP low  $V_{CEsat}$  (BISS) transistor

Rev. 01 — 19 March 2010

Product data sheet

## 1. Product profile

### 1.1 General description

PNP low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor, encapsulated in an ultra thin SOT1061 leadless small Surface-Mounted Device (SMD) plastic package with medium power capability.

NPN complement: PBSS4630PA.

### 1.2 Features and benefits

- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability  $I_C$  and  $I_{CM}$
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors
- Exposed heat sink for excellent thermal and electrical conductivity
- Leadless small SMD plastic package with medium power capability

### 1.3 Applications

- Loadswitch
- Battery-driven devices
- Power management
- Charging circuits
- Power switches (e.g. motors, fans)

### 1.4 Quick reference data

Table 1. Quick reference data

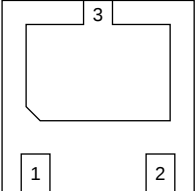
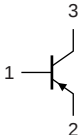
| Symbol      | Parameter                                  | Conditions                       | Min                   | Typ | Max | Unit       |
|-------------|--------------------------------------------|----------------------------------|-----------------------|-----|-----|------------|
| $V_{CEO}$   | collector-emitter voltage                  | open base                        | -                     | -   | -30 | V          |
| $I_C$       | collector current                          |                                  | -                     | -   | -6  | A          |
| $I_{CM}$    | peak collector current                     | single pulse;<br>$t_p \leq 1$ ms | -                     | -   | -7  | A          |
| $R_{CEsat}$ | collector-emitter<br>saturation resistance | $I_C = -6$ A;<br>$I_B = -300$ mA | <a href="#">[1]</a> - | 39  | 58  | 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                                                                                              | Graphic symbol                                                                                    |
|-----|-------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1   | base        |  <p>Transparent top view</p> |  <p>sym013</p> |
| 2   | emitter     |                                                                                                                 |                                                                                                   |
| 3   | collector   |                                                                                                                 |                                                                                                   |

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |                                                                                                                        |         |
|-------------|---------|------------------------------------------------------------------------------------------------------------------------|---------|
|             | Name    | Description                                                                                                            | Version |
| PBSS5630PA  | HUSON3  | plastic thermal enhanced ultra thin small outline package; no leads; three terminals; body $2 \times 2 \times 0.65$ mm | SOT1061 |

## 4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PBSS5630PA  | AB           |

## 5. Limiting values

Table 5. Limiting values

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

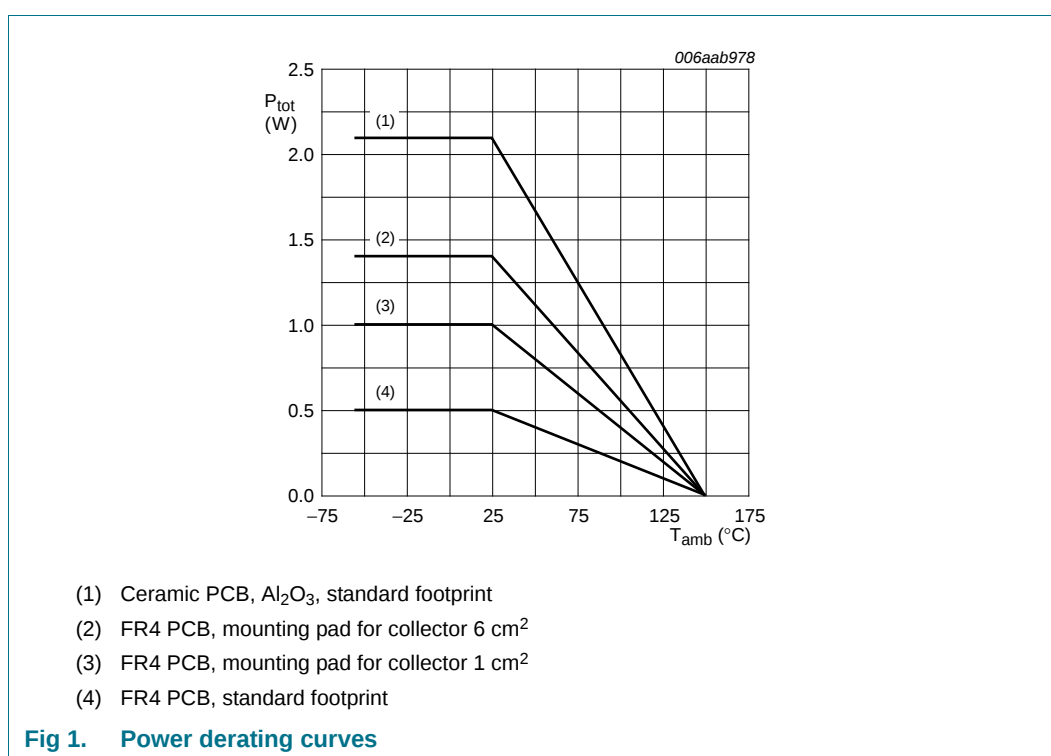
| Symbol           | Parameter                 | Conditions                             | Min   | Max  | Unit |
|------------------|---------------------------|----------------------------------------|-------|------|------|
| V <sub>CBO</sub> | collector-base voltage    | open emitter                           | -     | −30  | V    |
| V <sub>CEO</sub> | collector-emitter voltage | open base                              | -     | −30  | V    |
| V <sub>EBO</sub> | emitter-base voltage      | open collector                         | -     | −7   | V    |
| I <sub>C</sub>   | collector current         |                                        | -     | −6   | A    |
| I <sub>CM</sub>  | peak collector current    | single pulse;<br>t <sub>p</sub> ≤ 1 ms | -     | −7   | A    |
| I <sub>B</sub>   | base current              |                                        | -     | −600 | mA   |
| P <sub>tot</sub> | total power dissipation   | T <sub>amb</sub> ≤ 25 °C               | [1] - | 500  | mW   |
|                  |                           |                                        | [2] - | 1    | W    |
|                  |                           |                                        | [3] - | 1.4  | W    |
|                  |                           |                                        | [4] - | 2.1  | W    |

**Table 5.** Limiting values ...continued

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

| Symbol    | Parameter            | Conditions | Min | Max  | Unit |
|-----------|----------------------|------------|-----|------|------|
| $T_j$     | junction temperature |            | -   | 150  | °C   |
| $T_{amb}$ | ambient temperature  |            | -55 | +150 | °C   |
| $T_{stg}$ | storage temperature  |            | -65 | +150 | °C   |

- [1] Device mounted on an FR4 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<sup>2</sup>.  
 [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.  
 [4] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

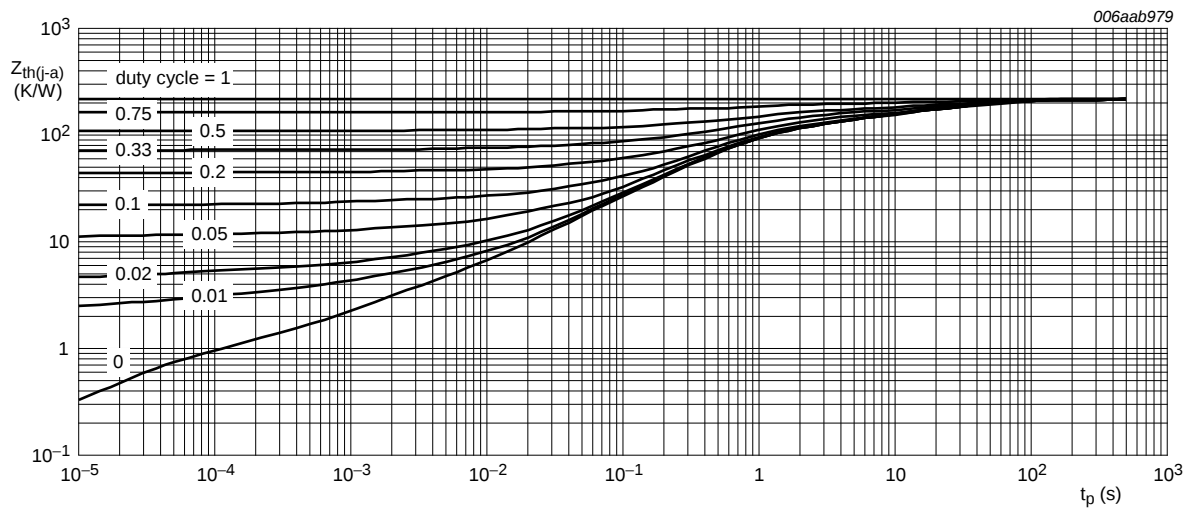


## 6. Thermal characteristics

**Table 6.** Thermal characteristics

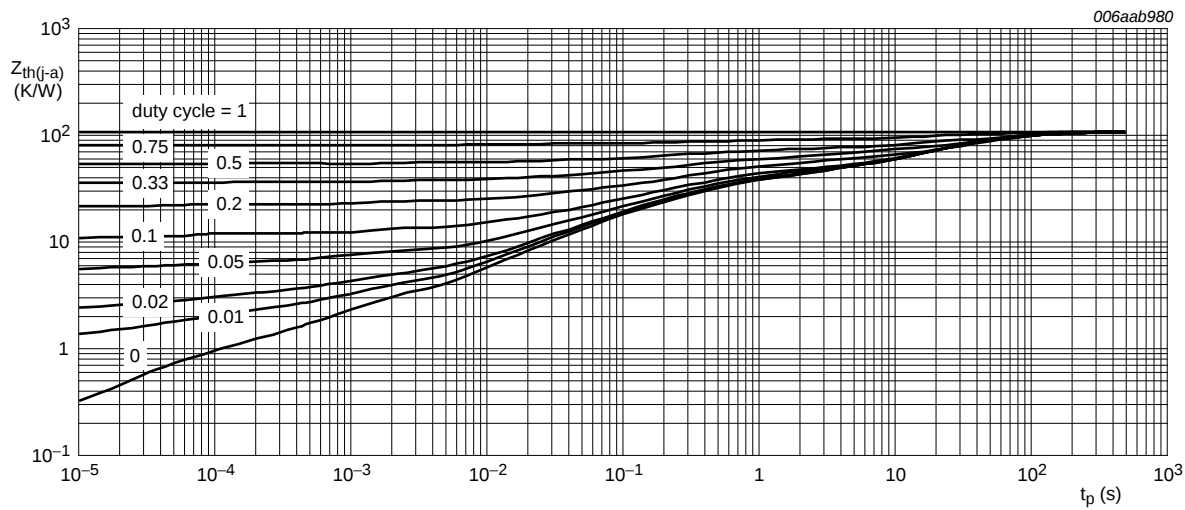
| Symbol        | Parameter                                   | Conditions  | Min | Typ | Max | Unit |
|---------------|---------------------------------------------|-------------|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | -   | 250 | K/W  |
|               |                                             |             | [2] | -   | 125 | K/W  |
|               |                                             |             | [3] | -   | 90  | K/W  |
|               |                                             |             | [4] | -   | 60  | 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<sup>2</sup>.  
 [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.  
 [4] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.



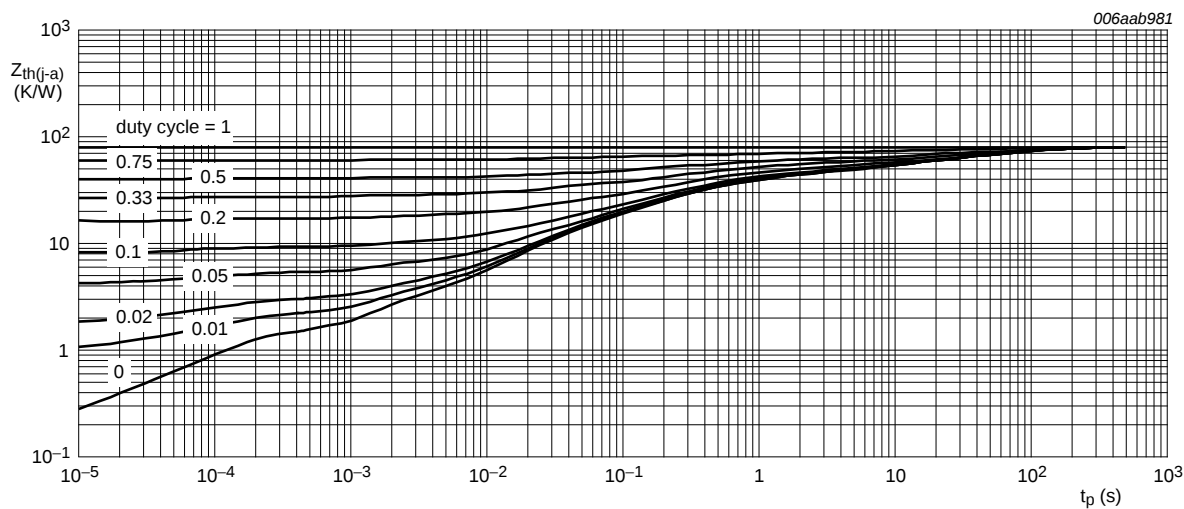
FR4 PCB, standard footprint

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



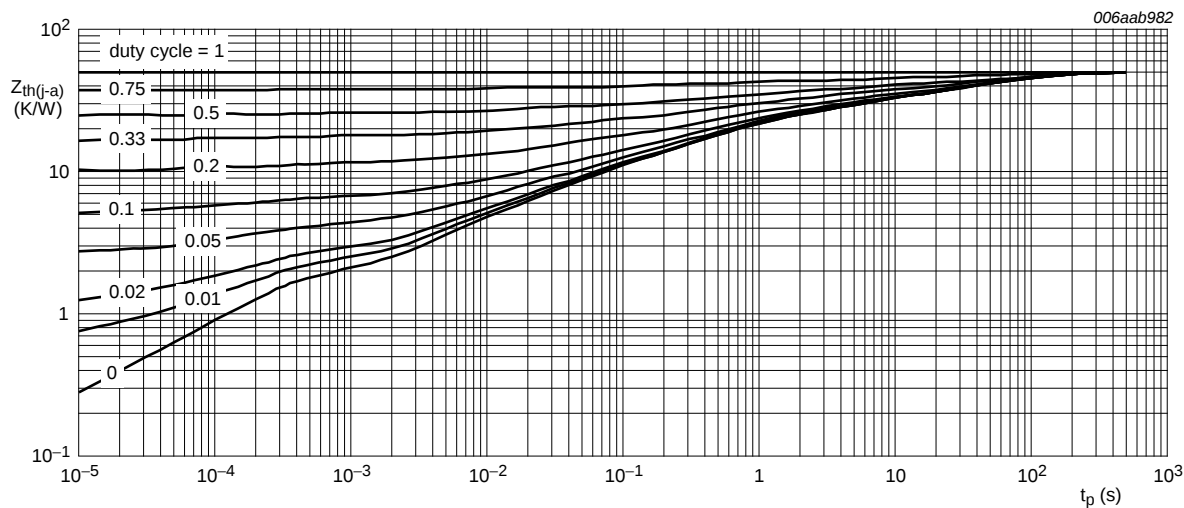
FR4 PCB, mounting pad for collector 1 cm<sup>2</sup>

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



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

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



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

Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

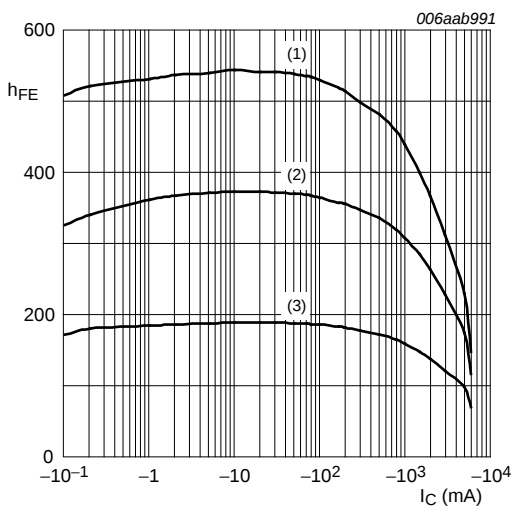
## 7. Characteristics

**Table 7. Characteristics**

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

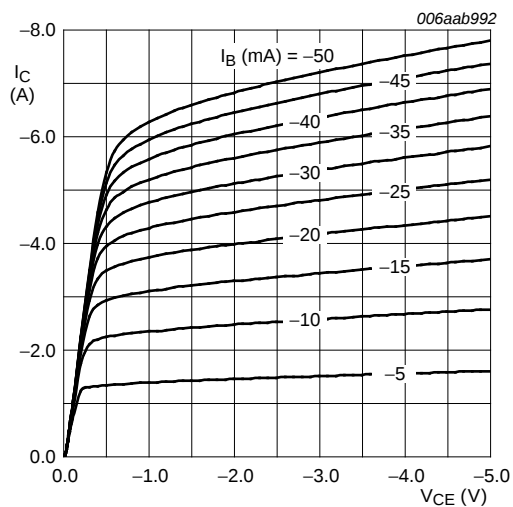
| Symbol      | Parameter                               | Conditions                                                                                  | Min | Typ | Max   | Unit                |
|-------------|-----------------------------------------|---------------------------------------------------------------------------------------------|-----|-----|-------|---------------------|
| $I_{CBO}$   | collector-base cut-off current          | $V_{CB} = -24\text{ V}; I_E = 0\text{ A}$                                                   | -   | -   | -100  | nA                  |
|             |                                         | $V_{CB} = -24\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$                | -   | -   | -50   | $\mu\text{A}$       |
| $I_{CES}$   | collector-emitter cut-off current       | $V_{CE} = -24\text{ V}; V_{BE} = 0\text{ V}$                                                | -   | -   | -100  | nA                  |
| $I_{EBO}$   | emitter-base cut-off current            | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}$                                                    | -   | -   | -100  | nA                  |
| $h_{FE}$    | DC current gain                         | $V_{CE} = -2\text{ V}$                                                                      | [1] |     |       |                     |
|             |                                         | $I_C = -0.5\text{ A}$                                                                       | 230 | 345 | -     |                     |
|             |                                         | $I_C = -1\text{ A}$                                                                         | 220 | 320 | -     |                     |
|             |                                         | $I_C = -2\text{ A}$                                                                         | 190 | 275 | -     |                     |
|             |                                         | $I_C = -6\text{ A}$                                                                         | 110 | 155 | -     |                     |
| $V_{CEsat}$ | collector-emitter saturation voltage    | $I_C = -0.5\text{ A}; I_B = -50\text{ mA}$                                                  | [1] | -   | -25   | -40 mV              |
|             |                                         | $I_C = -1\text{ A}; I_B = -50\text{ mA}$                                                    | [1] | -   | -50   | -80 mV              |
|             |                                         | $I_C = -1\text{ A}; I_B = -10\text{ mA}$                                                    | [1] | -   | -80   | -130 mV             |
|             |                                         | $I_C = -2\text{ A}; I_B = -20\text{ mA}$                                                    | [1] | -   | -135  | -210 mV             |
|             |                                         | $I_C = -3\text{ A}; I_B = -30\text{ mA}$                                                    | [1] | -   | -215  | -325 mV             |
|             |                                         | $I_C = -4\text{ A}; I_B = -400\text{ mA}$                                                   | [1] | -   | -150  | -230 mV             |
|             |                                         | $I_C = -6\text{ A}; I_B = -300\text{ mA}$                                                   | [1] | -   | -235  | -350 mV             |
| $R_{CEsat}$ | collector-emitter saturation resistance | $I_C = -6\text{ A}; I_B = -300\text{ mA}$                                                   | [1] | -   | 39    | 58 $\text{m}\Omega$ |
| $V_{BEsat}$ | base-emitter saturation voltage         | $I_C = -1\text{ A}; I_B = -10\text{ mA}$                                                    | [1] | -   | -0.75 | -0.9 V              |
|             |                                         | $I_C = -6\text{ A}; I_B = -300\text{ mA}$                                                   | [1] | -   | -1.03 | -1.1 V              |
| $V_{BEon}$  | base-emitter turn-on voltage            | $V_{CE} = -2\text{ V}; I_C = -2\text{ A}$                                                   | [1] | -   | -0.76 | -0.9 V              |
| $t_d$       | delay time                              | $V_{CC} = -9\text{ V}; I_C = -2\text{ A}; I_{Bon} = -0.1\text{ A}; I_{Boff} = 0.1\text{ A}$ | -   | 19  | -     | ns                  |
| $t_r$       | rise time                               |                                                                                             | -   | 59  | -     | ns                  |
| $t_{on}$    | turn-on time                            |                                                                                             | -   | 78  | -     | ns                  |
| $t_s$       | storage time                            |                                                                                             | -   | 265 | -     | ns                  |
| $t_f$       | fall time                               |                                                                                             | -   | 55  | -     | ns                  |
| $t_{off}$   | turn-off time                           |                                                                                             | -   | 320 | -     | ns                  |
| $f_T$       | transition frequency                    | $V_{CE} = -10\text{ V}; I_C = -100\text{ mA}; f = 100\text{ MHz}$                           | 50  | 80  | -     | MHz                 |
| $C_c$       | collector capacitance                   | $V_{CB} = -10\text{ V}; I_E = I_E = 0\text{ A}; f = 1\text{ MHz}$                           | -   | 75  | 90    | pF                  |

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



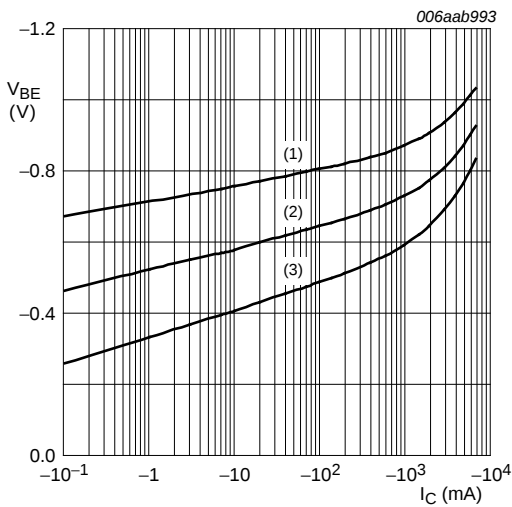
$V_{CE} = -2\text{ V}$   
(1)  $T_{amb} = 100^\circ C$   
(2)  $T_{amb} = 25^\circ C$   
(3)  $T_{amb} = -55^\circ C$

Fig 6. DC current gain as a function of collector current; typical values



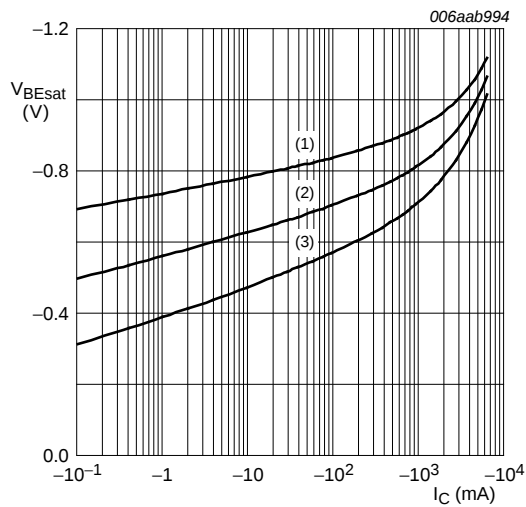
$T_{amb} = 25^\circ C$

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



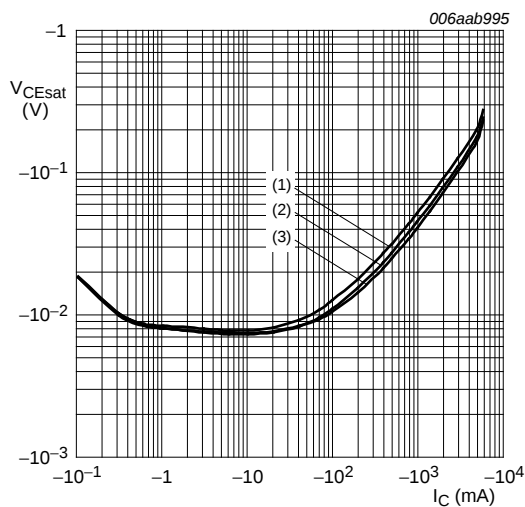
$V_{CE} = -2\text{ V}$   
(1)  $T_{amb} = -55^\circ C$   
(2)  $T_{amb} = 25^\circ C$   
(3)  $T_{amb} = 100^\circ C$

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



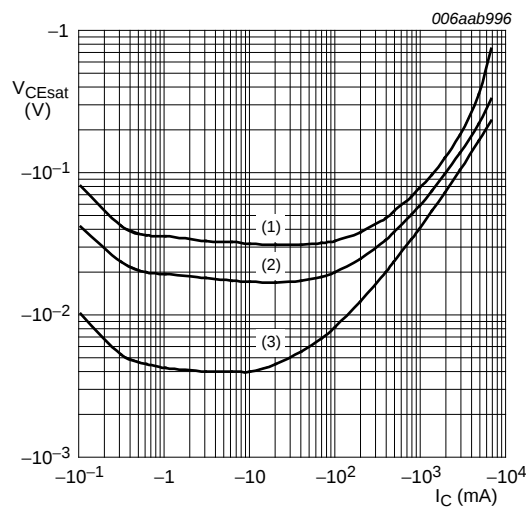
$I_C/I_B = 20$   
(1)  $T_{amb} = -55^\circ C$   
(2)  $T_{amb} = 25^\circ C$   
(3)  $T_{amb} = 100^\circ C$

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



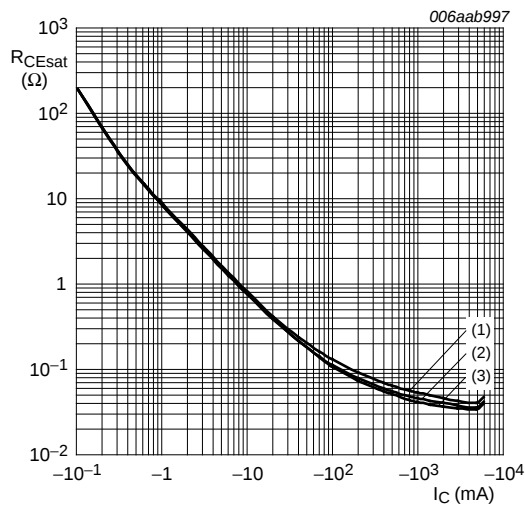
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



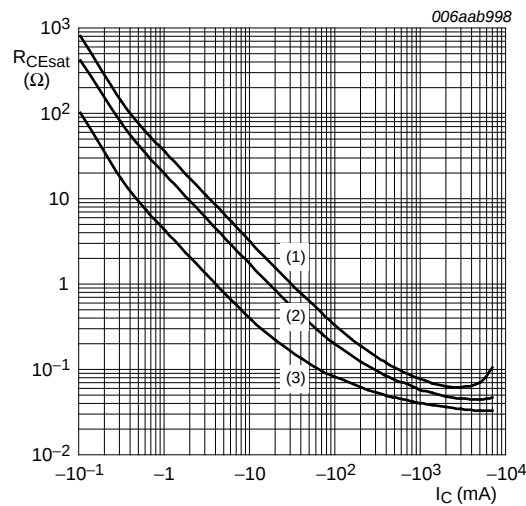
- $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (1)  $I_C/I_B = 100$
  - (2)  $I_C/I_B = 50$
  - (3)  $I_C/I_B = 10$

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



- $I_C/I_B = 20$
- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



- $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (1)  $I_C/I_B = 100$
  - (2)  $I_C/I_B = 50$
  - (3)  $I_C/I_B = 10$

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

8. Test information

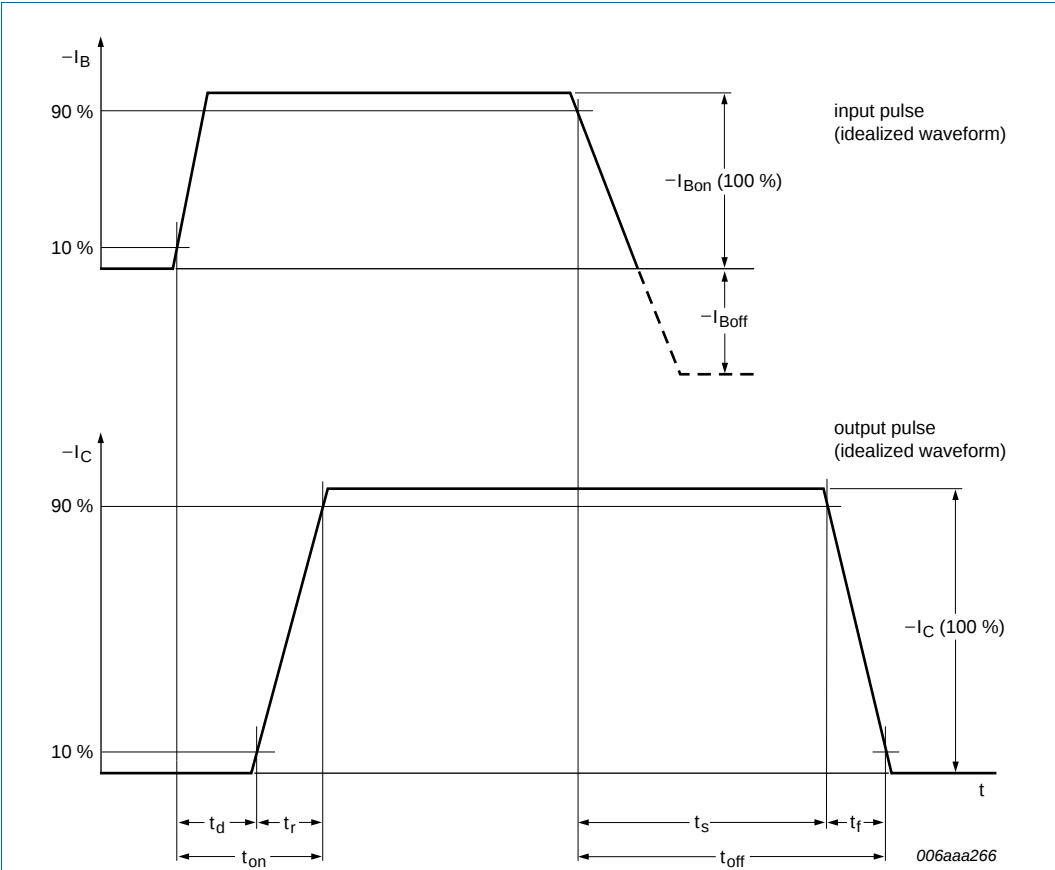
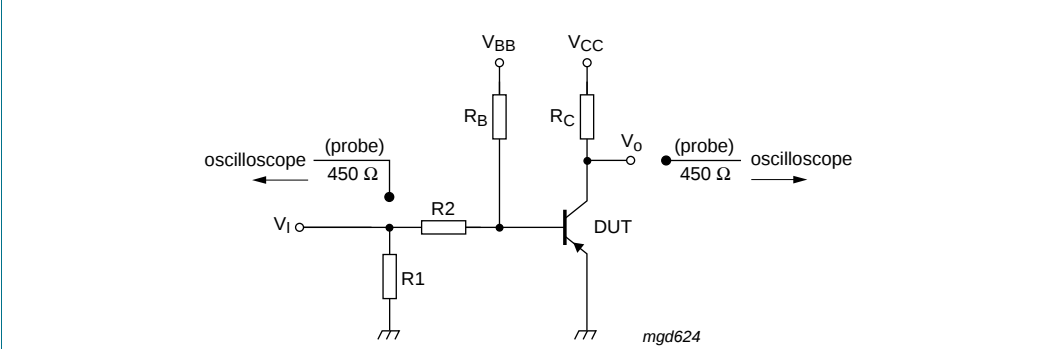


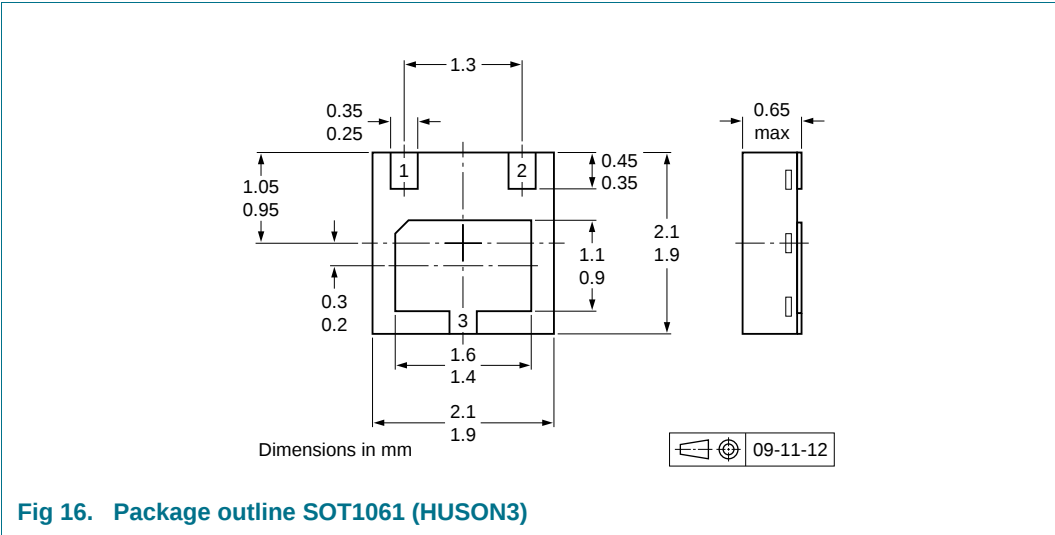
Fig 14. BISS transistor switching time definition



$V_{CC} = -9\text{ V}$ ;  $I_C = -2\text{ A}$ ;  $I_{Bon} = -0.1\text{ A}$ ;  $I_{Boff} = 0.1\text{ A}$

Fig 15. Test circuit for switching times

9. Package outline



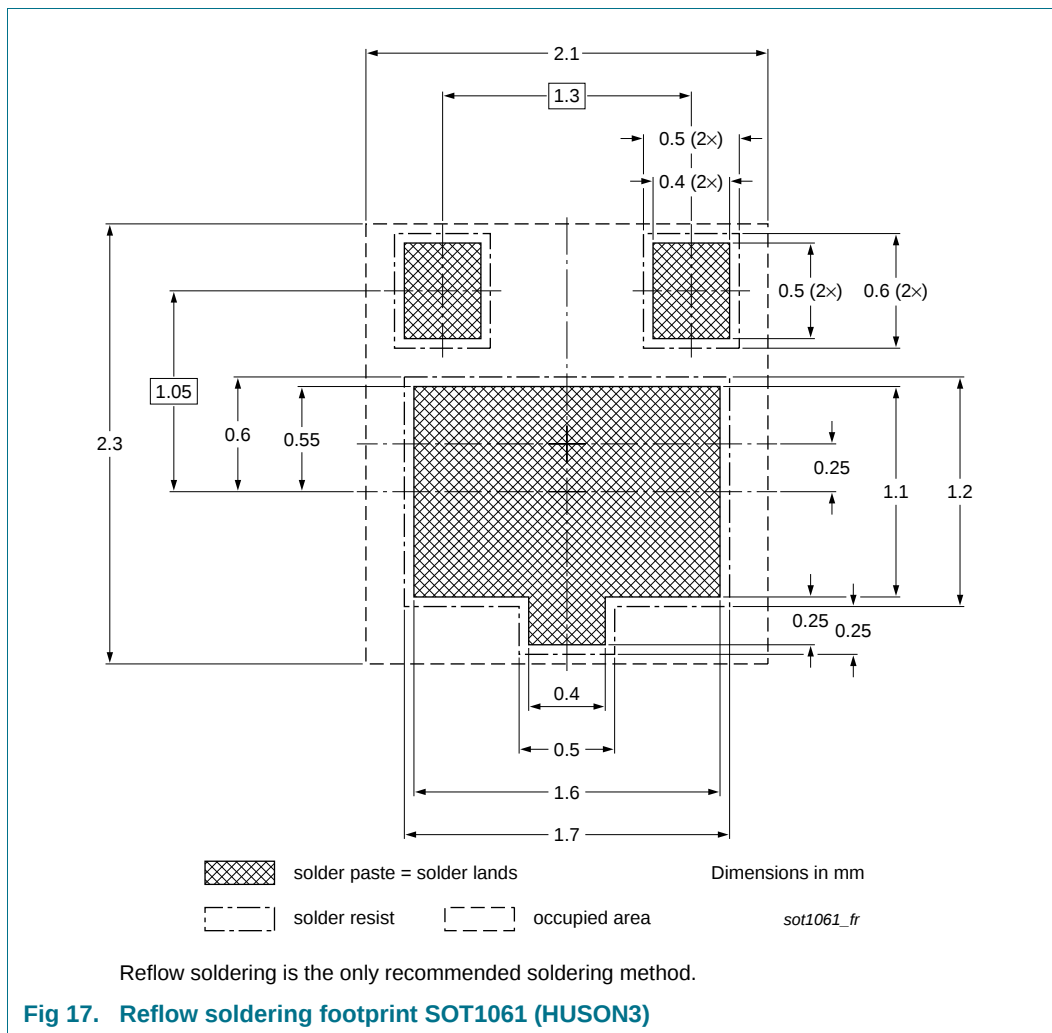
10. Packing information

**Table 8. Packing methods**  
The indicated -xxx are the last three digits of the 12NC ordering code.[\[1\]](#)

| Type number | Package | Description                    | Packing quantity |
|-------------|---------|--------------------------------|------------------|
|             |         |                                | 3000             |
| PBSS5630PA  | SOT1061 | 4 mm pitch, 8 mm tape and reel | -115             |

[1] For further information and the availability of packing methods, see [Section 14](#).

## 11. Soldering



## 12. Revision history

Table 9. Revision history

| Document ID  | Release date | Data sheet status  | Change notice | Supersedes |
|--------------|--------------|--------------------|---------------|------------|
| PBSS5630PA_1 | 20100319     | Product data sheet | -             | -          |

## 13. Legal information

### 13.1 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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In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any

liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

### 13.4 Trademarks

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## 14. Contact information

For more information, please visit: <http://www.nxp.com>

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