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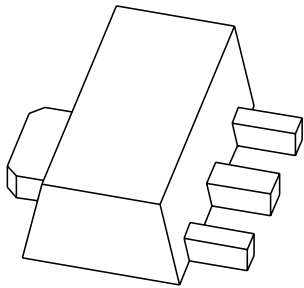
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Kind regards,

Team Nexperia

# DATA SHEET



**PBSS5330X**

30 V, 3 A

PNP low  $V_{CEsat}$  (BISS) transistor

Product data sheet  
Supersedes data of 2003 Nov 28

2004 Nov 03

# 30 V, 3 A PNP low $V_{CEsat}$ (BISS) transistor

PBSS5330X

## FEATURES

- SOT89 (SC-62) package
- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability:  $I_C$  and  $I_{CM}$
- Higher efficiency leading to less heat generation
- Reduced printed-circuit board requirements.

## APPLICATIONS

- Power management
  - DC/DC converters
  - Supply line switching
  - Battery charger
  - LCD backlighting.
- Peripheral drivers
  - Driver in low supply voltage applications (e.g. lamps and LEDs)
  - Inductive load driver (e.g. relays, buzzers and motors).

## DESCRIPTION

PNP low  $V_{CEsat}$  transistor in a SOT89 plastic package.

## MARKING

| TYPE NUMBER | MARKING CODE <sup>(1)</sup> |
|-------------|-----------------------------|
| PBSS5330X   | *1S                         |

## Note

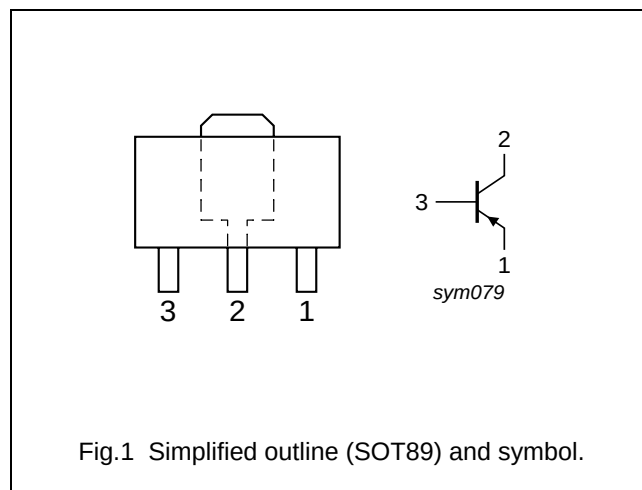
- \* = p: Made in Hong Kong.  
\* = t: Made in Malaysia.  
\* = W: Made in China.

## QUICK REFERENCE DATA

| SYMBOL      | PARAMETER                 | MAX. | UNIT |
|-------------|---------------------------|------|------|
| $V_{CEO}$   | collector-emitter voltage | −30  | V    |
| $I_C$       | collector current (DC)    | −3   | A    |
| $I_{CM}$    | peak collector current    | −5   | A    |
| $R_{CEsat}$ | equivalent on-resistance  | 107  | mΩ   |

## PINNING

| PIN | DESCRIPTION |
|-----|-------------|
| 1   | emitter     |
| 2   | collector   |
| 3   | base        |



## ORDERING INFORMATION

| TYPE NUMBER | PACKAGE |                                                                                |         |
|-------------|---------|--------------------------------------------------------------------------------|---------|
|             | NAME    | DESCRIPTION                                                                    | VERSION |
| PBSS5330X   | SC-62   | plastic surface mounted package; collector pad for good heat transfer; 3 leads | SOT89   |

# 30 V, 3 A

## PNP low $V_{CEsat}$ (BISS) transistor

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### LIMITING VALUES

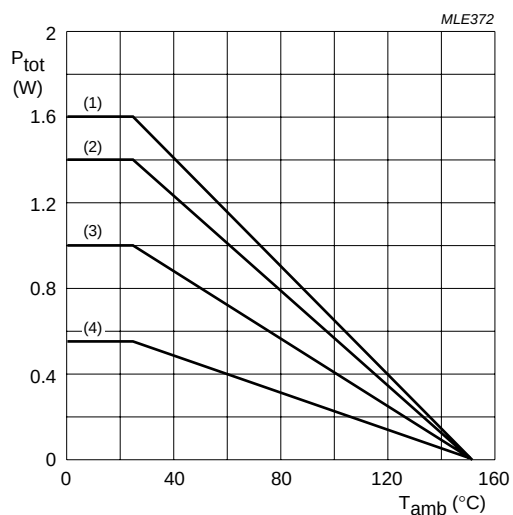
In accordance with the Absolute Maximum Rating System (IEC 60134).

| SYMBOL    | PARAMETER                 | CONDITIONS                  | MIN. | MAX. | UNIT |
|-----------|---------------------------|-----------------------------|------|------|------|
| $V_{CBO}$ | collector-base voltage    | open emitter                | –    | –30  | V    |
| $V_{CEO}$ | collector-emitter voltage | open base                   | –    | –30  | V    |
| $V_{EBO}$ | emitter-base voltage      | open collector              | –    | –6   | V    |
| $I_C$     | collector current (DC)    | note 4                      | –    | –3   | A    |
| $I_{CM}$  | peak collector current    | limited by $T_{j(max)}$     | –    | –5   | A    |
| $I_B$     | base current (DC)         |                             | –    | –0.5 | A    |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25\text{ °C}$ |      |      |      |
|           |                           | note 1                      | –    | 550  | mW   |
|           |                           | note 2                      | –    | 1    | W    |
|           |                           | note 3                      | –    | 1.4  | W    |
|           |                           | note 4                      | –    | 1.6  | W    |
| $T_{stg}$ | storage temperature       |                             | –65  | +150 | °C   |
| $T_j$     | junction temperature      |                             | –    | 150  | °C   |
| $T_{amb}$ | ambient temperature       |                             | –65  | +150 | °C   |

### Notes

1. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; standard footprint.
2. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.
3. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.
4. Device mounted on a ceramic printed-circuit board 7 cm<sup>2</sup>, single-sided copper, tin-plated.

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- (1) Ceramic PCB; 7 cm<sup>2</sup> mounting pad for collector.
- (2) FR4 PCB; 6 cm<sup>2</sup> copper mounting pad for collector.
- (3) FR4 PCB; 1 cm<sup>2</sup> copper mounting pad for collector.
- (4) Standard footprint.

Fig.2 Power derating curves.

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PNP low  $V_{CEsat}$  (BISS) transistor

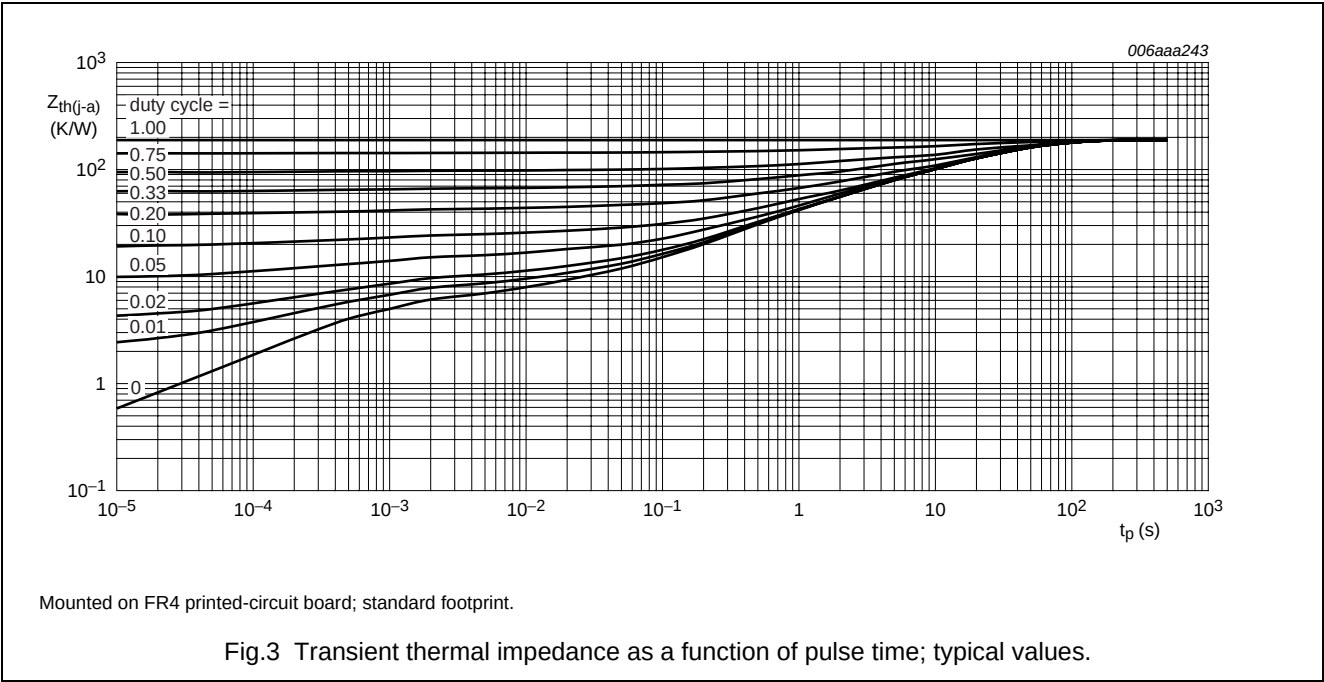
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THERMAL CHARACTERISTICS

| SYMBOL        | PARAMETER                                           | CONDITIONS  | VALUE | UNIT |
|---------------|-----------------------------------------------------|-------------|-------|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient         | in free air |       |      |
|               |                                                     | note 1      | 225   | K/W  |
|               |                                                     | note 2      | 125   | K/W  |
|               |                                                     | note 3      | 90    | K/W  |
|               |                                                     | note 4      | 80    | K/W  |
| $R_{th(j-s)}$ | thermal resistance from junction to soldering point |             | 16    | K/W  |

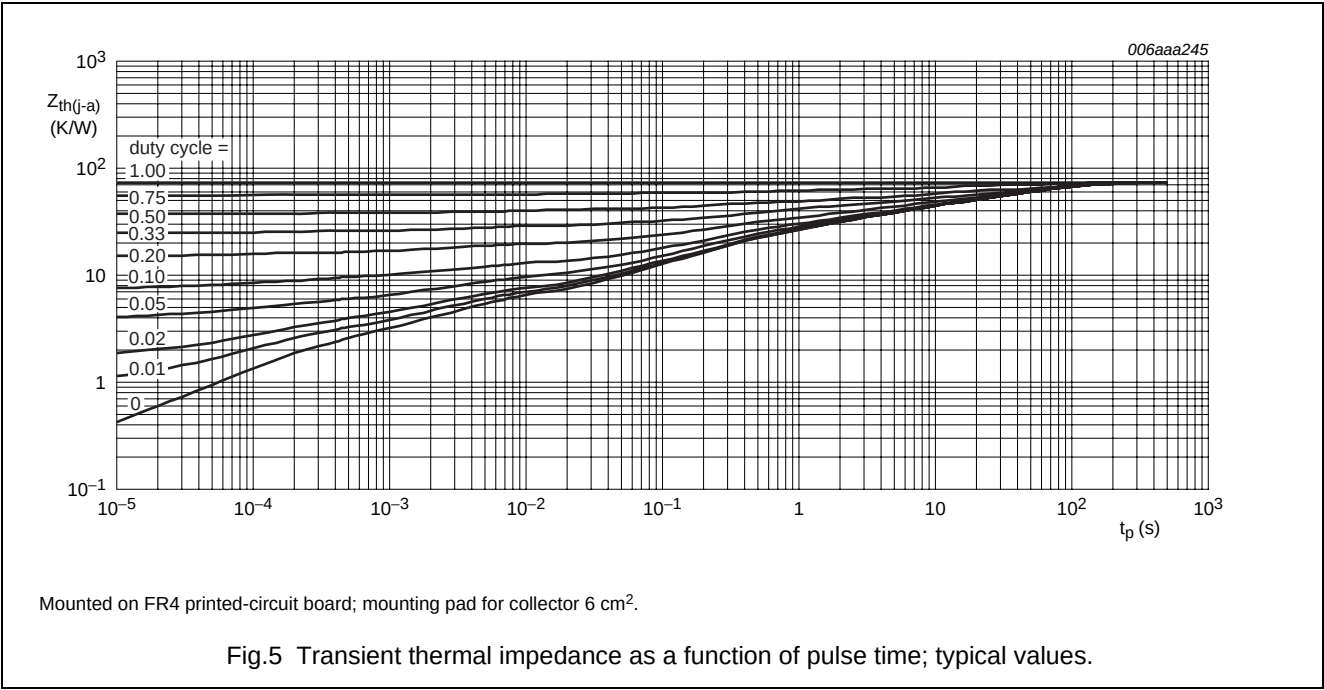
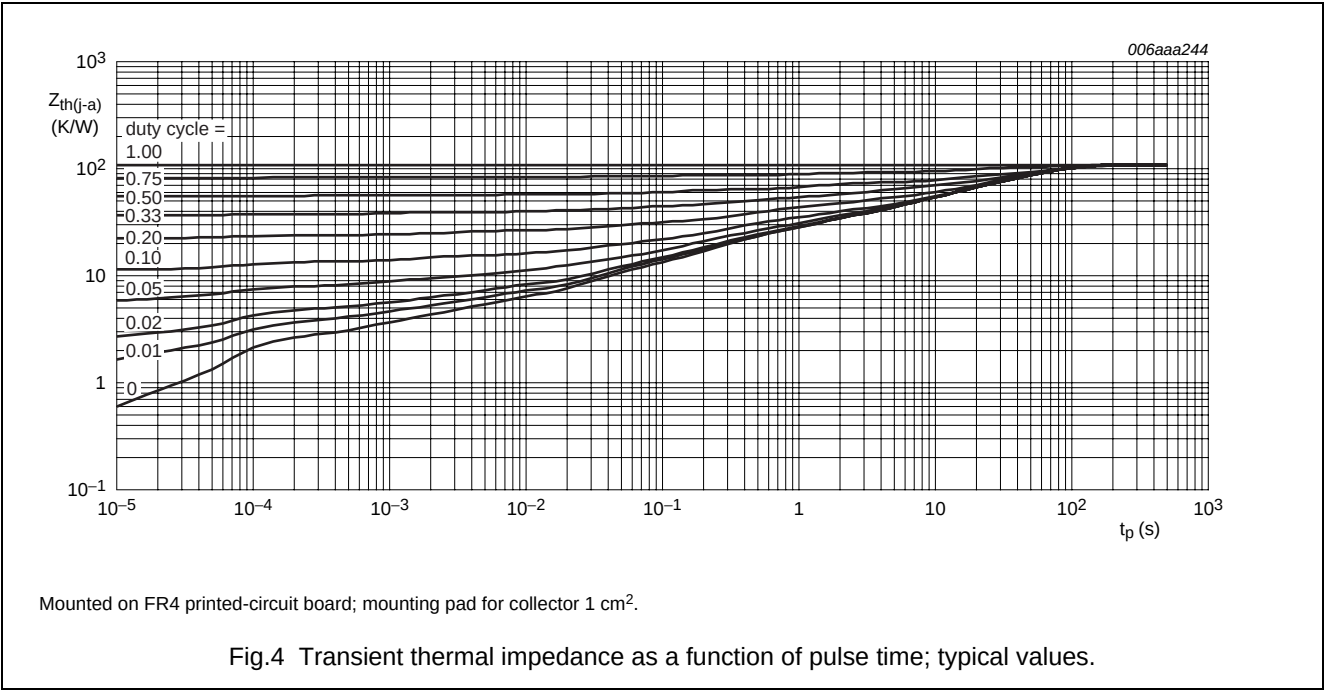
Notes

1. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; standard footprint.
2. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.
3. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.
4. Device mounted on a ceramic printed-circuit board 7 cm<sup>2</sup>, single-sided copper, tin-plated.



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### CHARACTERISTICS

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

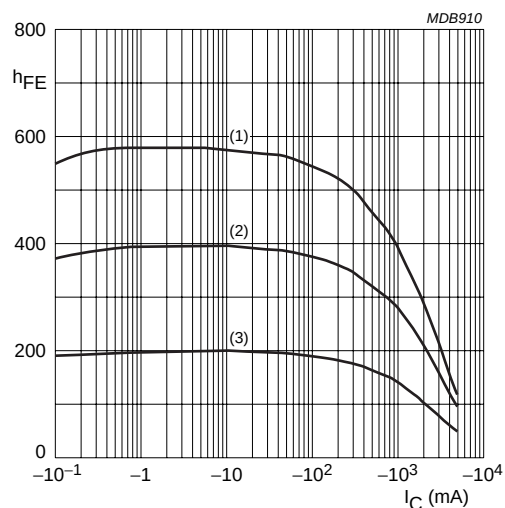
| SYMBOL      | PARAMETER                            | CONDITIONS                                                            | MIN. | TYP. | MAX. | UNIT             |
|-------------|--------------------------------------|-----------------------------------------------------------------------|------|------|------|------------------|
| $I_{CBO}$   | collector-base cut-off current       | $V_{CB} = -30\text{ V}; I_E = 0\text{ A}$                             | –    | –    | –100 | nA               |
|             |                                      | $V_{CB} = -30\text{ V}; I_E = 0\text{ A}; T_J = 150\text{ °C}$        | –    | –    | –50  | $\mu\text{A}$    |
| $I_{CES}$   | collector-emitter cut-off current    | $V_{CE} = -30\text{ V}; V_{BE} = 0\text{ V}$                          | –    | –    | –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                      | $V_{CE} = -2\text{ V}$                                                |      |      |      |                  |
|             |                                      | $I_C = -0.1\text{ A}$                                                 | 200  | –    | –    |                  |
|             |                                      | $I_C = -0.5\text{ A}$                                                 | 200  | –    | –    |                  |
|             |                                      | $I_C = -1\text{ A}; \text{note 1}$                                    | 175  | –    | 450  |                  |
|             |                                      | $I_C = -2\text{ A}; \text{note 1}$                                    | 140  | –    | –    |                  |
|             |                                      | $I_C = -3\text{ A}; \text{note 1}$                                    | 100  | –    | –    |                  |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C = -0.5\text{ A}; I_B = -50\text{ mA}$                            | –    | –    | –70  | mV               |
|             |                                      | $I_C = -1\text{ A}; I_B = -50\text{ mA}$                              | –    | –    | –130 | mV               |
|             |                                      | $I_C = -2\text{ A}; I_B = -100\text{ mA}$                             | –    | –    | –240 | mV               |
|             |                                      | $I_C = -3\text{ A}; I_B = -300\text{ mA}; \text{note 1}$              | –    | –    | –320 | mV               |
| $R_{CEsat}$ | equivalent on-resistance             | $I_C = -3\text{ A}; I_B = -300\text{ mA}; \text{note 1}$              | –    | 80   | 107  | $\text{m}\Omega$ |
| $V_{BEsat}$ | base-emitter saturation voltage      | $I_C = -2\text{ A}; I_B = -100\text{ mA}$                             | –    | –    | –1.1 | V                |
|             |                                      | $I_C = -3\text{ A}; I_B = -300\text{ mA}; \text{note 1}$              | –    | –    | –1.2 | V                |
| $V_{BEon}$  | base-emitter turn-on voltage         | $V_{CE} = -2\text{ V}; I_C = -1\text{ A}$                             | –1.0 | –    | –    | V                |
| $f_T$       | transition frequency                 | $I_C = -100\text{ mA}; V_{CE} = -5\text{ V};$<br>$f = 100\text{ MHz}$ | 100  | –    | –    | MHz              |
| $C_c$       | collector capacitance                | $V_{CB} = -10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$     | –    | –    | 45   | pF               |

### Note

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

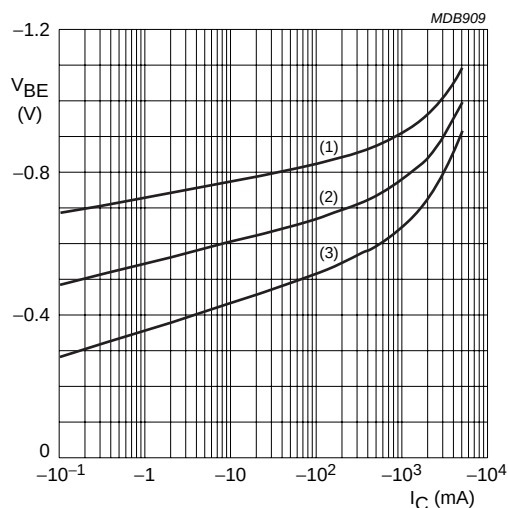
# 30 V, 3 A PNP low $V_{CEsat}$ (BISS) transistor

PBSS5330X

 $V_{CE} = -2$  V.

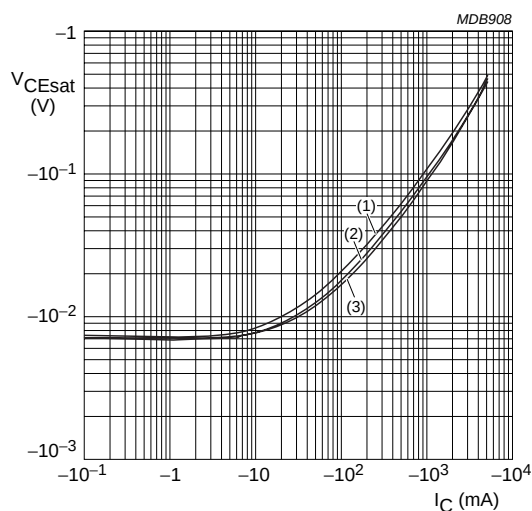
- (1)  $T_{amb} = 100$  °C.  
(2)  $T_{amb} = 25$  °C.  
(3)  $T_{amb} = -55$  °C.

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

 $V_{CE} = -2$  V.

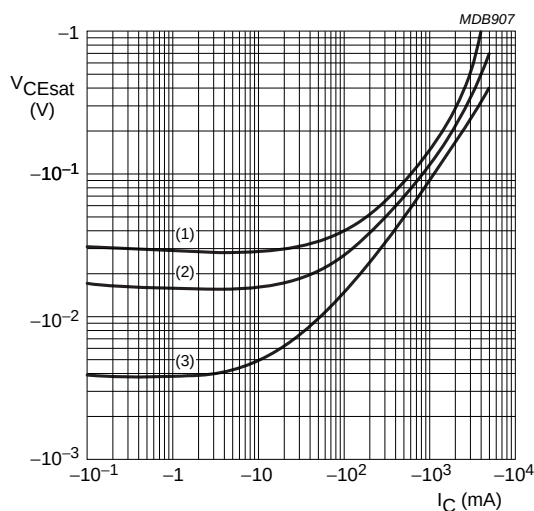
- (1)  $T_{amb} = -55$  °C.  
(2)  $T_{amb} = 25$  °C.  
(3)  $T_{amb} = 100$  °C.

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

 $I_C/I_B = 20$ .

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

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

 $T_{amb} = 25$  °C.

- (1)  $I_C/I_B = 100$ .  
(2)  $I_C/I_B = 50$ .  
(3)  $I_C/I_B = 10$ .

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

# 30 V, 3 A

## PNP low $V_{CEsat}$ (BISS) transistor

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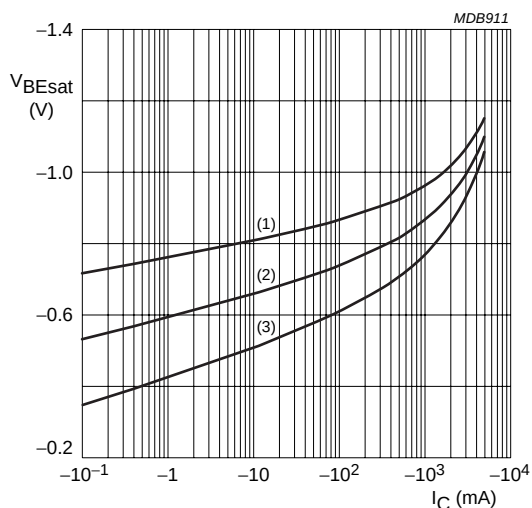
 $I_C/I_B = 20$ .(1)  $T_{amb} = -55\text{ °C}$ .(2)  $T_{amb} = 25\text{ °C}$ .(3)  $T_{amb} = 100\text{ °C}$ .

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

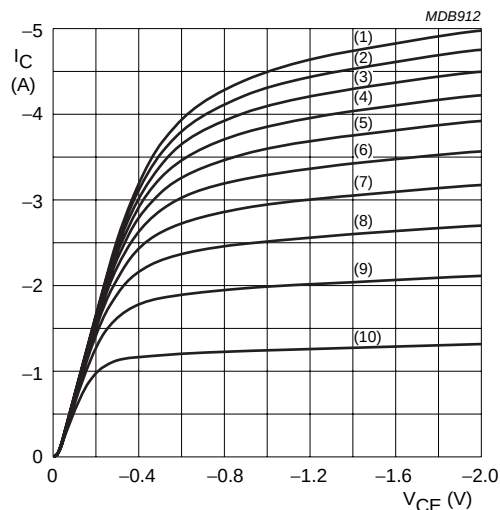
 $T_{amb} = 25\text{ °C}$ .(1)  $I_B = 53.0\text{ mA}$ .(2)  $I_B = 47.7\text{ mA}$ .(3)  $I_B = 42.4\text{ mA}$ .(4)  $I_B = 37.1\text{ mA}$ .(5)  $I_B = 31.8\text{ mA}$ .(6)  $I_B = 26.5\text{ mA}$ .(7)  $I_B = 21.2\text{ mA}$ .(8)  $I_B = 15.9\text{ mA}$ .(9)  $I_B = 10.6\text{ mA}$ .(10)  $I_B = 5.3\text{ mA}$ .

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

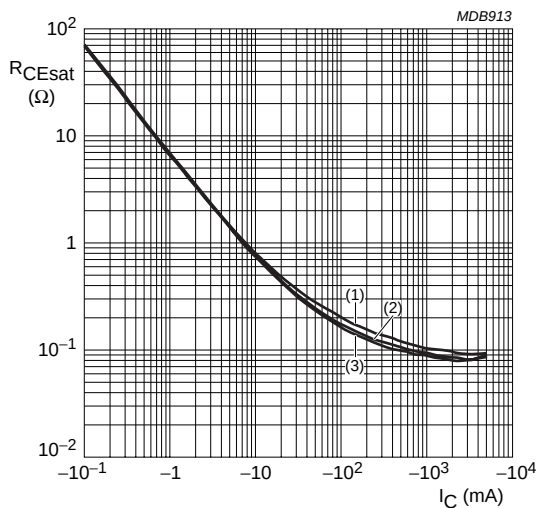
 $I_C/I_B = 20$ .(1)  $T_{amb} = 100\text{ °C}$ .(2)  $T_{amb} = 25\text{ °C}$ .(3)  $T_{amb} = -55\text{ °C}$ .

Fig.12 Equivalent on-resistance as a function of collector current; typical values.

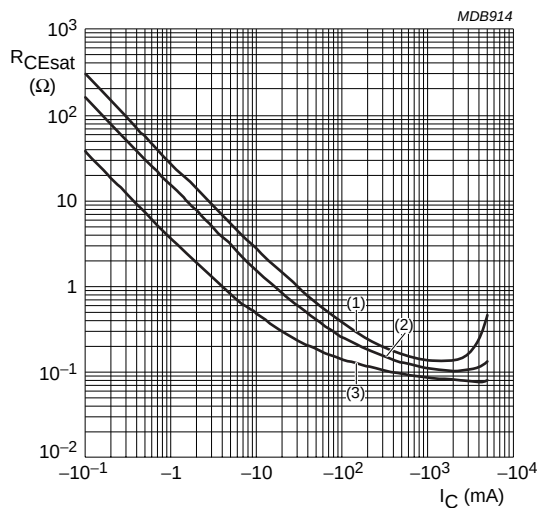
 $T_{amb} = 25\text{ °C}$ .(1)  $I_C/I_B = 10$ .(2)  $I_C/I_B = 5$ .(3)  $I_C/I_B = 1$ .

Fig.13 Equivalent on-resistance as a function of collector current; typical values.

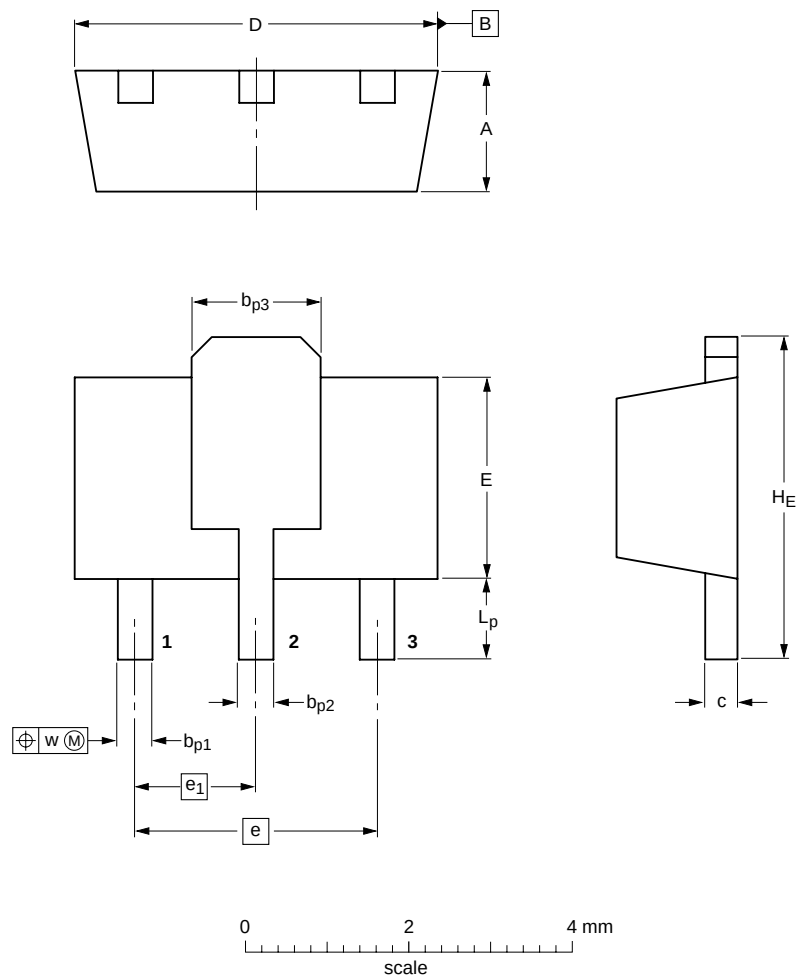
30 V, 3 A  
PNP low  $V_{CEsat}$  (BISS) transistor

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PACKAGE OUTLINE

Plastic surface-mounted package; collector pad for good heat transfer; 3 leads

SOT89



DIMENSIONS (mm are the original dimensions)

| UNIT | A          | $b_{p1}$     | $b_{p2}$     | $b_{p3}$   | c            | D          | E          | e   | $e_1$ | H <sub>E</sub> | $L_p$      | w    |
|------|------------|--------------|--------------|------------|--------------|------------|------------|-----|-------|----------------|------------|------|
| mm   | 1.6<br>1.4 | 0.48<br>0.35 | 0.53<br>0.40 | 1.8<br>1.4 | 0.44<br>0.23 | 4.6<br>4.4 | 2.6<br>2.4 | 3.0 | 1.5   | 4.25<br>3.75   | 1.2<br>0.8 | 0.13 |

| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE           |
|--------------------|------------|--------|-------|--|---------------------------------------------------------------------------------------|----------------------|
|                    | IEC        | JEDEC  | JEITA |  |                                                                                       |                      |
| SOT89              |            | TO-243 | SC-62 |  |  | 04-08-03<br>06-03-16 |

# 30 V, 3 A

## PNP low $V_{CEsat}$ (BISS) transistor

PBSS5330X

### DATA SHEET STATUS

| DOCUMENT STATUS <sup>(1)</sup> | PRODUCT STATUS <sup>(2)</sup> | DEFINITION                                                                            |
|--------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective data sheet           | Development                   | This document contains data from the objective specification for product development. |
| Preliminary data sheet         | Qualification                 | This document contains data from the preliminary specification.                       |
| Product data sheet             | Production                    | This document contains the product specification.                                     |

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## **Contact information**

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founded by

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кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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