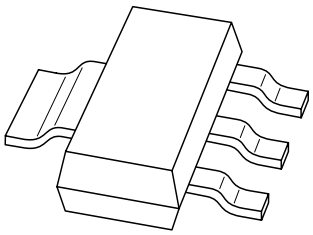
# DATA SHEET



# PBSS5350Z
## 50 V low $V_{CEsat}$ PNP transistor

Product specification
Supersedes data of 2001 Nov 13

2003 Jan 20

Philips
Semiconductors

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# 50 V low $V_{CEsat}$ PNP transistor PBSS5350Z

## FEATURES

- Low collector-emitter saturation voltage
- High collector current capability: $I_C$ and $I_{CM}$
- High collector current gain ($h_{FE}$) at high $I_C$
- Higher efficiency leading to less heat generation
- Reduced PCB area requirements compared to DPAK.

## APPLICATIONS

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

## DESCRIPTION

PNP low $V_{CEsat}$ transistor in a SOT223 plastic package.
NPN complement: PBSS4350Z.

## MARKING

| TYPE NUMBER | MARKING CODE |
|---|---|
| PBSS5350Z | PB5350 |

## QUICK REFERENCE DATA

| SYMBOL | PARAMETER | MAX. | UNIT |
|---|---|---|---|
| $V_{CEO}$ | collector-emitter voltage | –50 | V |
| $I_C$ | collector current (DC) | –3 | A |
| $I_{CM}$ | peak collector current | –5 | A |
| $R_{CEsat}$ | equivalent on-resistance | <150 | mΩ |

## PINNING

| PIN | DESCRIPTION |
|---|---|
| 1 | base |
| 2 | collector |
| 3 | emitter |
| 4 | collector |

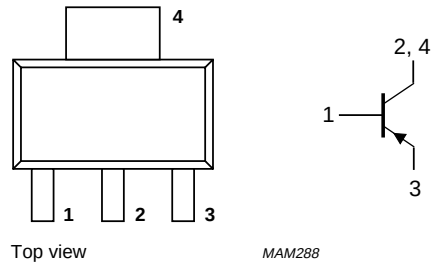



Fig.1 Simplified outline (SOT223) and symbol.

## 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 | – | –50 | V |
| $V_{EBO}$ | emitter-base voltage | open collector | – | –6 | V |
| $I_C$ | collector current (DC) | | – | –3 | A |
| $I_{CM}$ | peak collector current | | – | –5 | A |
| $I_{BM}$ | peak base current | | – | –1 | A |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C; notes 1 and 3 | – | 1.35 | W |
| | | $T_{amb} \leq 25$ °C; notes 2 and 3 | – | 2 | W |
| $T_{stg}$ | storage temperature | | –65 | +150 | °C |
| $T_j$ | junction temperature | | – | 150 | °C |
| $T_{amb}$ | operating ambient temperature | | –65 | +150 | °C |

**Notes**

1. Device mounted on a printed-circuit board; single sided copper; tinplated; mounting pad for collector 1 $cm^2$.
2. Device mounted on a printed-circuit board; single sided copper; tinplated; mounting pad for collector 6 $cm^2$.
3. For other mounting conditions see *"Thermal considerations for SOT223 in the General Part of associated Handbook"*.

## THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---|---|---|---|---|
| $R_{th\ j\text{-}a}$ | thermal resistance from junction to ambient | in free air; notes 1 and 3 | 92 | K/W |
| | | in free air; notes 2 and 3 | 62.5 | K/W |

**Notes**

1. Device mounted on a printed-circuit board; single sided copper; tinplated; mounting pad for collector 1 cm.
2. Device mounted on a printed-circuit board; single sided copper; tinplated; mounting pad for collector 6 $cm^2$.
3. For other mounting conditions see *"Thermal considerations for SOT223 in the General Part of associated Handbook"*.

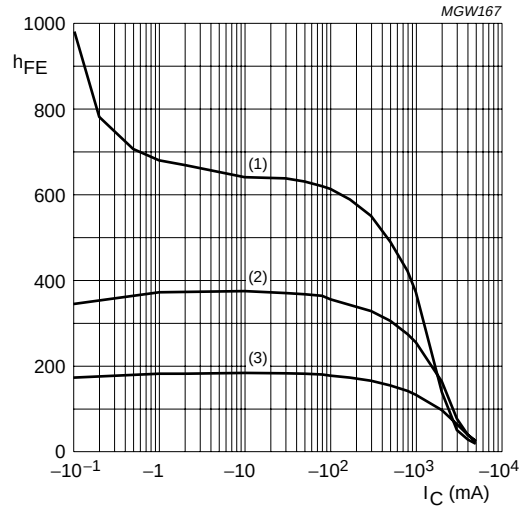
## CHARACTERISTICS

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $I_{CBO}$ | collector-base cut-off current | $V_{CB}$ = –50 V; $I_E$ = 0 | – | – | –100 | nA |
| | | $V_{CB}$ = –50 V; $I_E$ = 0; $T_j$ = 150 °C | – | – | –50 | μA |
| $I_{EBO}$ | emitter-base cut-off current | $V_{EB}$ = –5 V; $I_C$ = 0 | – | – | –100 | nA |
| $h_{FE}$ | DC current gain | $V_{CE}$ = –2 V; | | | | |
| | | $I_C$ = –500 mA | 200 | – | – | |
| | | $I_C$ = –1 A; note 1 | 200 | – | – | |
| | | $I_C$ = –2 A; note 1 | 100 | – | – | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = –500 mA; $I_B$ = –50 mA | – | – | –100 | mV |
| | | $I_C$ = –1 A; $I_B$ = –50 mA | – | – | –180 | mV |
| | | $I_C$ = –2 A; $I_B$ = –200 mA; note 1 | – | – | –300 | mV |
| $R_{CEsat}$ | equivalent on-resistance | $I_C$ = –2 A; $I_B$ = –200 mA; note 1 | – | 120 | <150 | mΩ |
| $V_{BEsat}$ | base-emitter saturation voltage | $I_C$ = –2 A; $I_B$ = –200 mA; note 1 | – | – | –1.2 | V |
| $V_{BEon}$ | base-emitter turn-on voltage | $V_{CE}$ = –2 V; $I_C$ = –1 A; note 1 | – | – | –1.1 | V |
| $f_T$ | transition frequency | $I_C$ = –100 mA; $V_{CE}$ = –5 V; f = 100 MHz | 100 | – | – | MHz |
| $C_c$ | collector capacitance | $V_{CB}$ = –10 V; $I_E$ = $I_e$ = 0; f = 1 MHz | – | – | 40 | pF |

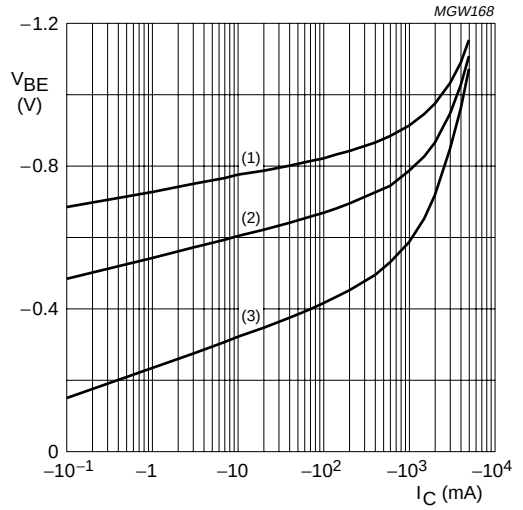
**Note**

1. Pulse test: $t_p \leq 300$ μs; $\delta \leq 0.02$.



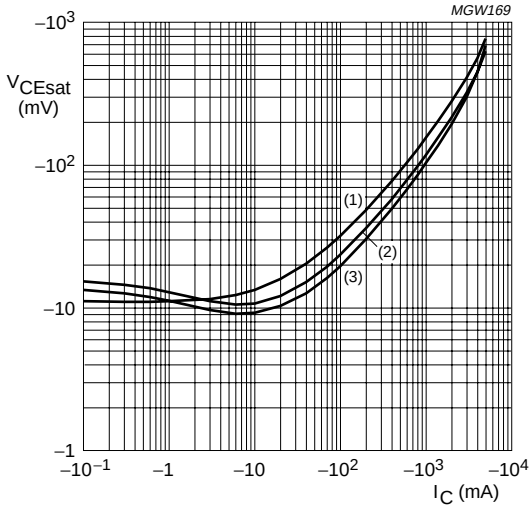

$V_{CE}$ = −2 V.
(1) $T_{amb}$ = 150 °C.
(2) $T_{amb}$ = 25 °C.
(3) $T_{amb}$ = −55 °C.

Fig.2 DC current gain as a function of collector current; typical values.



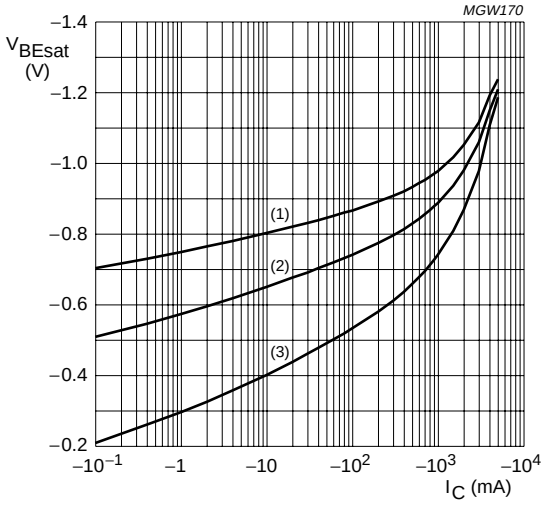

$V_{CE}$ = −2 V.
(1) $T_{amb}$ = −55 °C.
(2) $T_{amb}$ = 25 °C.
(3) $T_{amb}$ = 150 °C.

Fig.3 Base-emitter voltage as a function of collector current; typical values.



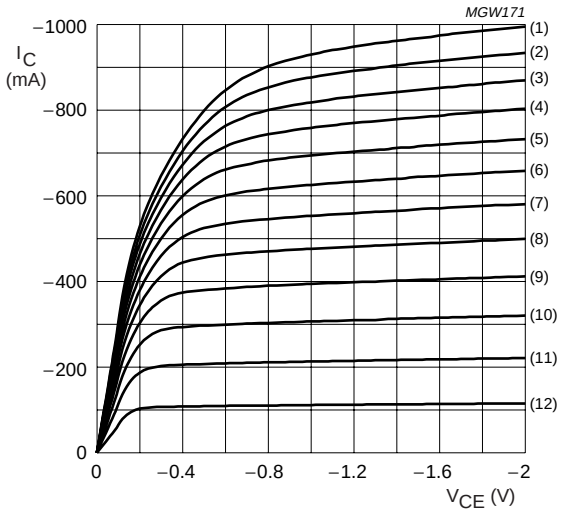

$I_C/I_B$ = 10.
(1) $T_{amb}$ = 150 °C.
(2) $T_{amb}$ = 25 °C.
(3) $T_{amb}$ = −55 °C.

Fig.4 Collector-emitter saturation voltage as a function of collector current; typical values.




$I_C/I_B$ = 10.
(1) $T_{amb}$ = −55 °C.
(2) $T_{amb}$ = 25 °C.
(3) $T_{amb}$ = 150 °C.

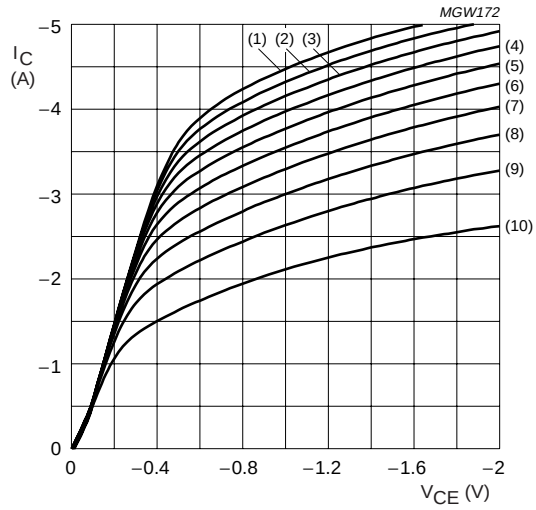
Fig.5 Base-emitter saturation voltage as a function of collector current; typical values.




$T_{amb}$ = 25 °C.

(1) $I_B$ = −3.96 nA.
(2) $I_B$ = −3.63 nA.
(3) $I_B$ = −3.30 nA.
(4) $I_B$ = −2.97 nA.
(5) $I_B$ = −2.64 nA.
(6) $I_B$ = −2.31 nA.
(7) $I_B$ = −1.98 nA.
(8) $I_B$ = −1.65 nA.
(9) $I_B$ = −1.32 nA.
(10) $I_B$ = −0.99 nA.
(11) $I_B$ = −0.66 nA.
(12) $I_B$ = −0.33 nA.

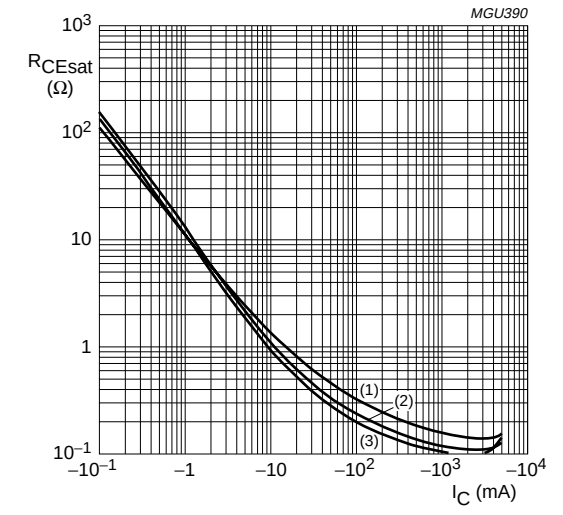
Fig.6 Collector current as a function of collector-emitter voltage; typical values.




$T_{amb}$ = 25 °C.

(1) $I_B$ = −250 mA.
(2) $I_B$ = −225 mA.
(3) $I_B$ = −200 mA.
(4) $I_B$ = −175 mA.
(5) $I_B$ = −150 mA.
(6) $I_B$ = −125 mA.
(7) $I_B$ = −100 mA.
(8) $I_B$ = −75 mA.
(9) $I_B$ = −50 mA.
(10) $I_B$ = −25 mA.

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



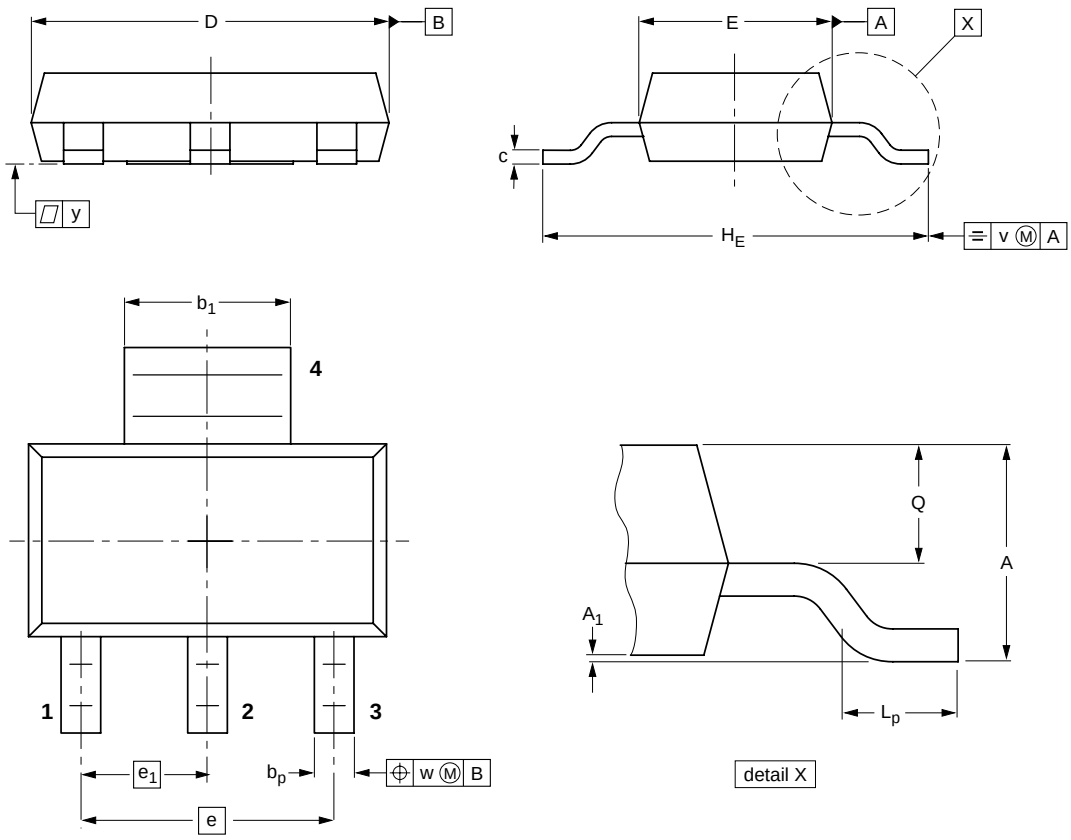

$I_C/I_B$ = 20.

(1) $T_{amb}$ = 150 °C. (2) $T_{amb}$ = 25 °C. (3) $T_{amb}$ = −55 °C.

Fig.8 Collector-emitter equivalent on-resistance as a function of collector current; typical values.

**PACKAGE OUTLINE**

**Plastic surface mounted package; collector pad for good heat transfer; 4 leads** **SOT223**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | $A_1$ | $b_p$ | $b_1$ | c | D | E | e | $e_1$ | $H_E$ | $L_p$ | Q | v | w | y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.8<br>1.5 | 0.10<br>0.01 | 0.80<br>0.60 | 3.1<br>2.9 | 0.32<br>0.22 | 6.7<br>6.3 | 3.7<br>3.3 | 4.6 | 2.3 | 7.3<br>6.7 | 1.1<br>0.7 | 0.95<br>0.85 | 0.2 | 0.1 | 0.1 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOT223 | | | SC-73 | | | ~~97-02-28~~<br>99-09-13 |

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