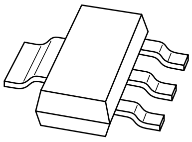

# PBSS8110Z

## 100 V, 1 A NPN low $V_{CEsat}$ (BISS) transistor

Rev. 01 — 26 April 2004 Product data sheet

## 1. Product profile

### 1.1 General description

NPN low $V_{CEsat}$ transistor in a plastic SOT223 (SC-73) package.

### 1.2 Features

- SOT223 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.
- DC-to-DC converter
- Peripheral driver
  - Driver in low supply voltage applications (e.g. lamps and LEDs)
  - Inductive load drivers (e.g. relays, buzzers and motors).

### 1.4 Quick reference data

Table 1: Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CEO}$ | collector-emitter voltage | | - | - | 100 | V |
| $I_C$ | collector current (DC) | | - | - | 1 | A |
| $I_{CM}$ | peak collector current | | - | - | 3 | A |
| $R_{CEsat}$ | equivalent on-resistance | | - | - | 200 | mΩ |

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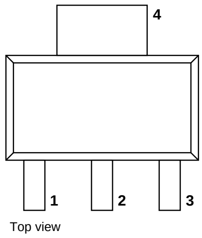
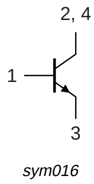
## 2. Pinning information

**Table 2: Discrete pinning**

| Pin | Description | Simplified outline | Symbol |
|---|---|---|---|
| 1 | base |   |   |
| 2, 4 | collector | | |
| 3 | emitter | | |

## 3. Ordering information

**Table 3: Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PBSS8110Z | - | plastic surface mounted package; collector pad for good heat transfer; 4 leads | SOT223 |

## 4. Marking

**Table 4: Marking**

| Type number | Marking code [1] |
|---|---|
| PBSS8110Z | PB8110 |

[1] Made in Hong Kong.

# 5. Limiting values

**Table 5: Limiting values**

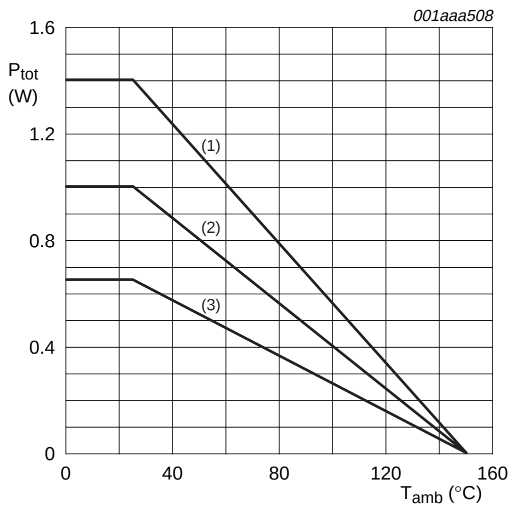
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| 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 |
| $I_{CM}$ | peak collector current | $T_{j(max)}$ | | - | 3 | A |
| $I_C$ | collector current (DC) | | | - | 1 | A |
| $I_B$ | base current (DC) | | | - | 0.3 | A |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 650 | mW |
| | | | [2] | - | 1000 | mW |
| | | | [3] | - | 1.4 | W |
| $T_j$ | junction temperature | | | - | 150 | °C |
| $T_{amb}$ | operating ambient temperature | | | –65 | +150 | °C |
| $T_{stg}$ | storage temperature | | | –65 | +150 | °C |

[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, 1 $cm^2$ collector mounting pad.

[3] Device mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, 6 $cm^2$ collector mounting pad.




(1) FR4 PCB; 6 $cm^2$ collector mounting pad.

(2) FR4 PCB; 1 $cm^2$ collector mounting pad.

(3) FR4 PCB; standard footprint.

**Fig 1. Power derating curves.**

## 6. Thermal characteristics

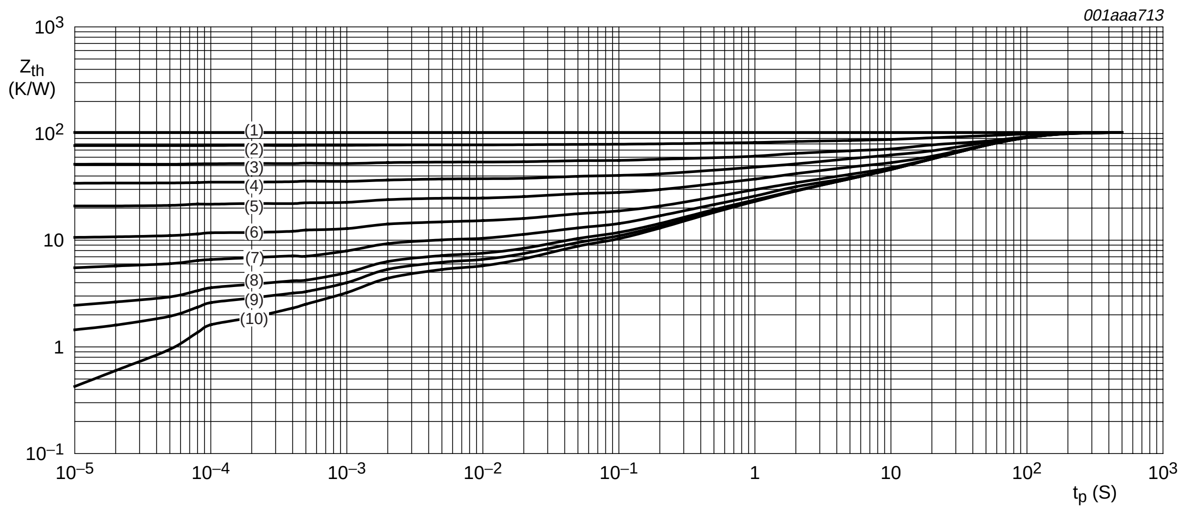
**Table 6: Thermal characteristics**

| Symbol | Parameter | Conditions | | Typ | Unit |
|---|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | 192 | K/W |
| | | | [2] | 125 | K/W |
| | | | [3] | 89 | K/W |
| $R_{th(j-s)}$ | thermal resistance from junction to soldering point | in free air | [1] | 17 | K/W |

[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, 1 $cm^2$ collector mounting pad.

[3] Device mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, 6 $cm^2$ collector mounting pad.




Mounted on FR4 PCB; standard footprint.

(1) $\delta = 1$.

(2) $\delta = 0.75$.

(3) $\delta = 0.5$.

(4) $\delta = 0.33$.

(5) $\delta = 0.2$.

(6) $\delta = 0.1$.

(7) $\delta = 0.05$.

(8) $\delta = 0.02$.

(9) $\delta = 0.01$.

(10) $\delta = 0$.

**Fig 2. Transient thermal impedance as a function of pulse time; typical values.**

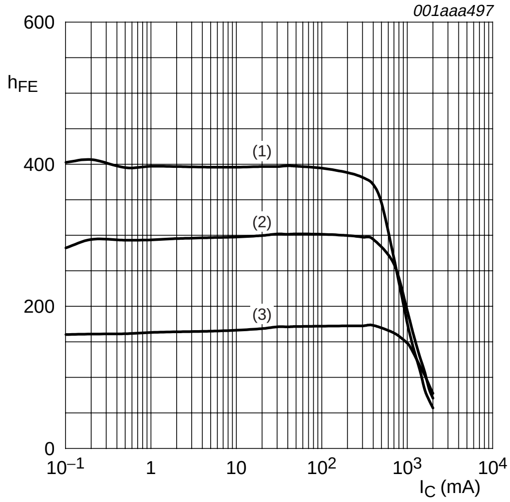
# 7. Characteristics

**Table 7: Characteristics**

*$T_j$ = 25 °C; unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $I_{CBO}$ | collector-base cut-off current | $V_{CB}$ = 80 V; $I_E$ = 0 A | - | - | 100 | nA |
| | | $V_{CB}$ = 80 V; $I_E$ = 0 A; $T_j$ = 150 °C | - | - | 50 | µA |
| $I_{CES}$ | collector-emitter cut-off current | $V_{CE}$ 80 V; $V_{BE}$ = 0 V | - | - | 100 | nA |
| $I_{EBO}$ | emitter-base cut-off current | $V_{EB}$ = 4 V; $I_C$ = 0 A | - | - | 100 | nA |
| $h_{FE}$ | DC current gain | $V_{CE}$ = 10 V; $I_C$ = 1 mA | 150 | - | - | |
| | | $V_{CE}$ = 10 V; $I_C$ = 250 mA | 150 | - | 500 | |
| | | $V_{CE}$ = 10 V; $I_C$ = 0.5 A [1] | 100 | - | - | |
| | | $V_{CE}$ = 10 V; $I_C$ = 1 A [1] | 80 | - | - | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = 100 mA; $I_B$ = 10 mA | - | - | 40 | mV |
| | | $I_C$ = 500 mA; $I_B$ = 50 mA | - | - | 120 | mV |
| | | $I_C$ = 1 A; $I_B$ = 100 mA | - | - | 200 | mV |
| $R_{CEsat}$ | equivalent on-resistance | $I_C$ = 1 A; $I_B$ = 100 mA [1] | - | 160 | 200 | mΩ |
| $V_{BEsat}$ | base-emitter saturation voltage | $I_C$ = 1 A; $I_B$ = 100 mA | - | - | 1.05 | V |
| $V_{BEon}$ | base-emitter turn-on voltage | $V_{CE}$ 10 V; $I_C$ = 1 A | - | - | 0.9 | V |
| $f_T$ | transition frequency | $V_{CE}$ = 10 V; $I_C$ = 50 mA; f = 100 MHz | 100 | - | - | MHz |
| $C_c$ | collector capacitance | $V_{CB}$ = 10 V; $I_E$ = $I_e$ = 0 A; f = 1 MHz | - | - | 7.5 | pF |

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



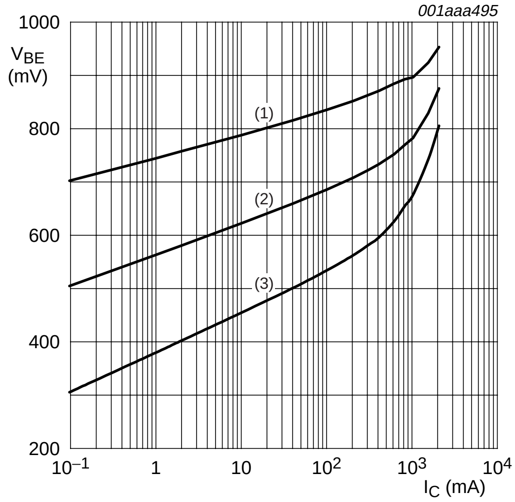

$V_{CE}$ = 10 V.

(1) $T_{amb}$ = 100 °C.

(2) $T_{amb}$ = 25 °C.

(3) $T_{amb}$ = –55 °C.

**Fig 3. DC current gain as a function of collector current; typical values.**



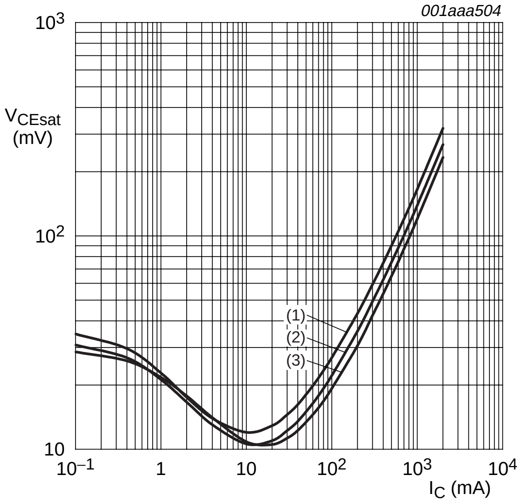

$V_{CE}$ = 10 V.

(1) $T_{amb}$ = –55 °C.

(2) $T_{amb}$ = 25 °C.

(3) $T_{amb}$ = 100 °C.

**Fig 4. Base-emitter voltage as a function of collector current; typical values.**



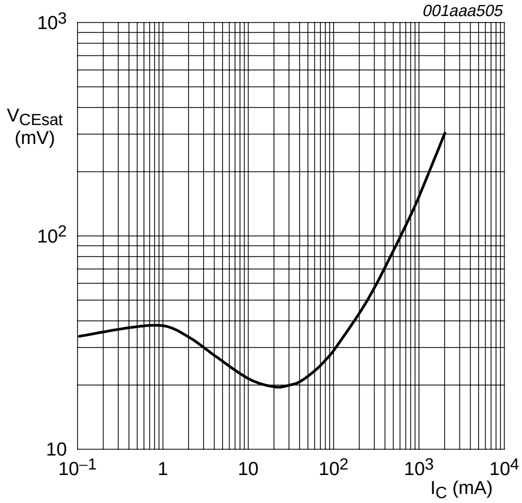

$I_C/I_B$ = 10.

(1) $T_{amb}$ = 100 °C.

(2) $T_{amb}$ = 25 °C.

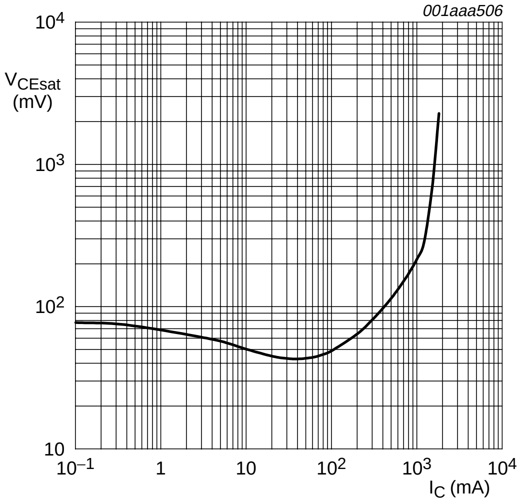
(3) $T_{amb}$ = –55 °C.

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



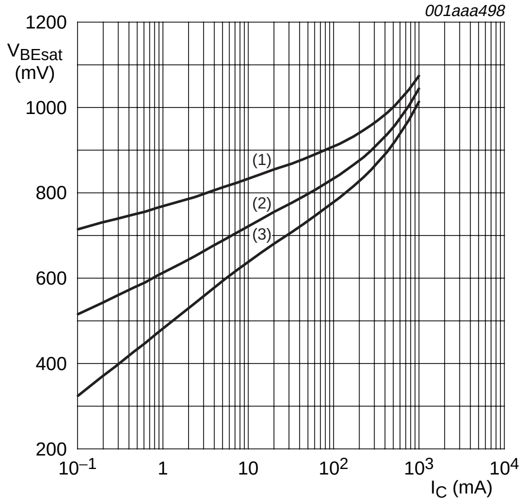

$I_C/I_B$ = 20; $T_{amb}$ = 25 °C.

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




$I_C/I_B = 50$; $T_{amb} = 25$ °C.

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



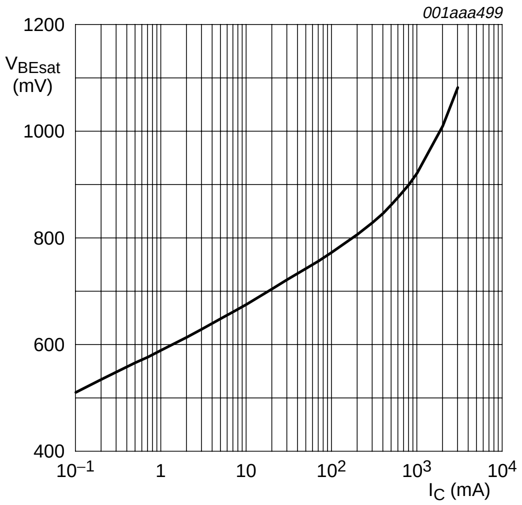

$I_C/I_B = 10$.

(1) $T_{amb} = -55$ °C.

(2) $T_{amb} = 25$ °C.

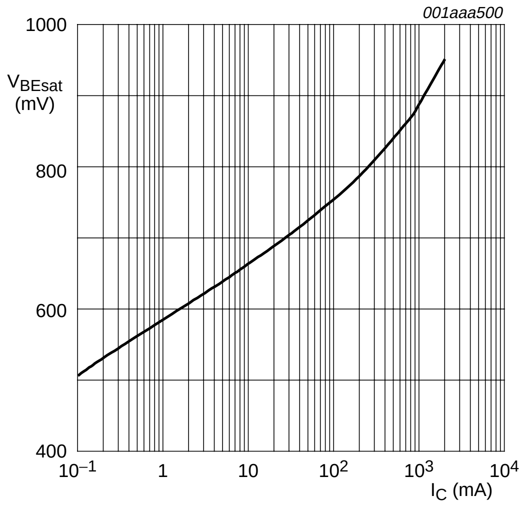
(3) $T_{amb} = 100$ °C.

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



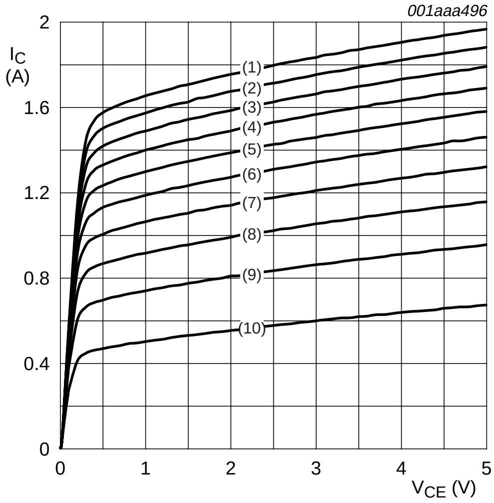

$I_C/I_B = 20$; $T_{amb} = 25$ °C.

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




$I_C/I_B = 50$; $T_{amb} = 25$ °C.

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




$T_{amb}$ = 25 °C.

(1) $I_B$ = 35 mA.

(2) $I_B$ = 31.5 mA.

(3) $I_B$ = 28 mA.

(4) $I_B$ = 24.5 mA.

(5) $I_B$ = 21 mA.

(6) $I_B$ = 17.5 mA.

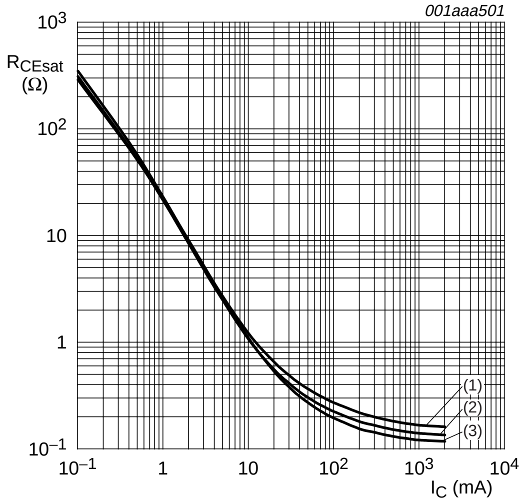
(7) $I_B$ = 14 mA.

(8) $I_B$ = 10.5 mA.

(9) $I_B$ = 7 mA.

(10) $I_B$ = 3.5 mA.

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



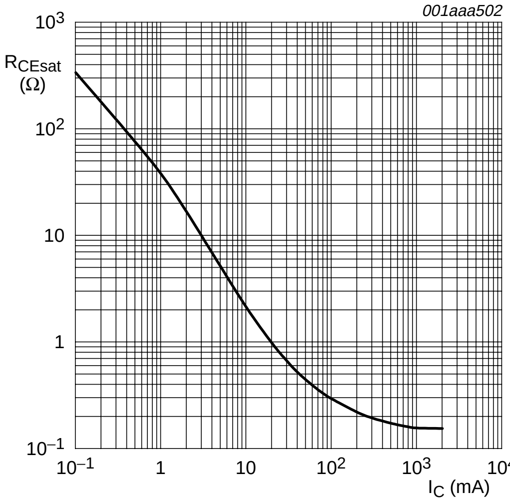

$I_C/I_B$ = 10.

(1) $T_{amb}$ = 100 °C.

(2) $T_{amb}$ = 25 °C.

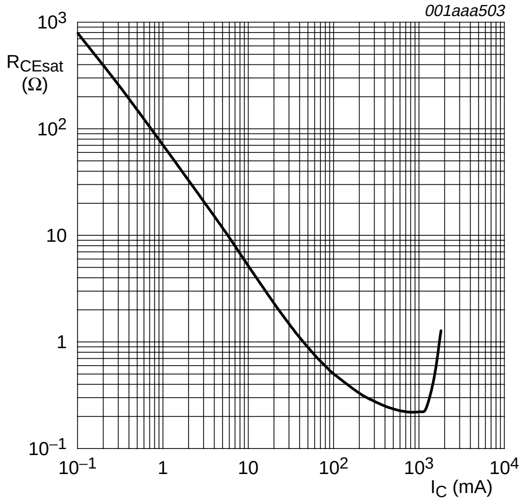
(3) $T_{amb}$ = –55 °C.

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




$I_C/I_B$ = 20; $T_{amb}$ = 25 °C.

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

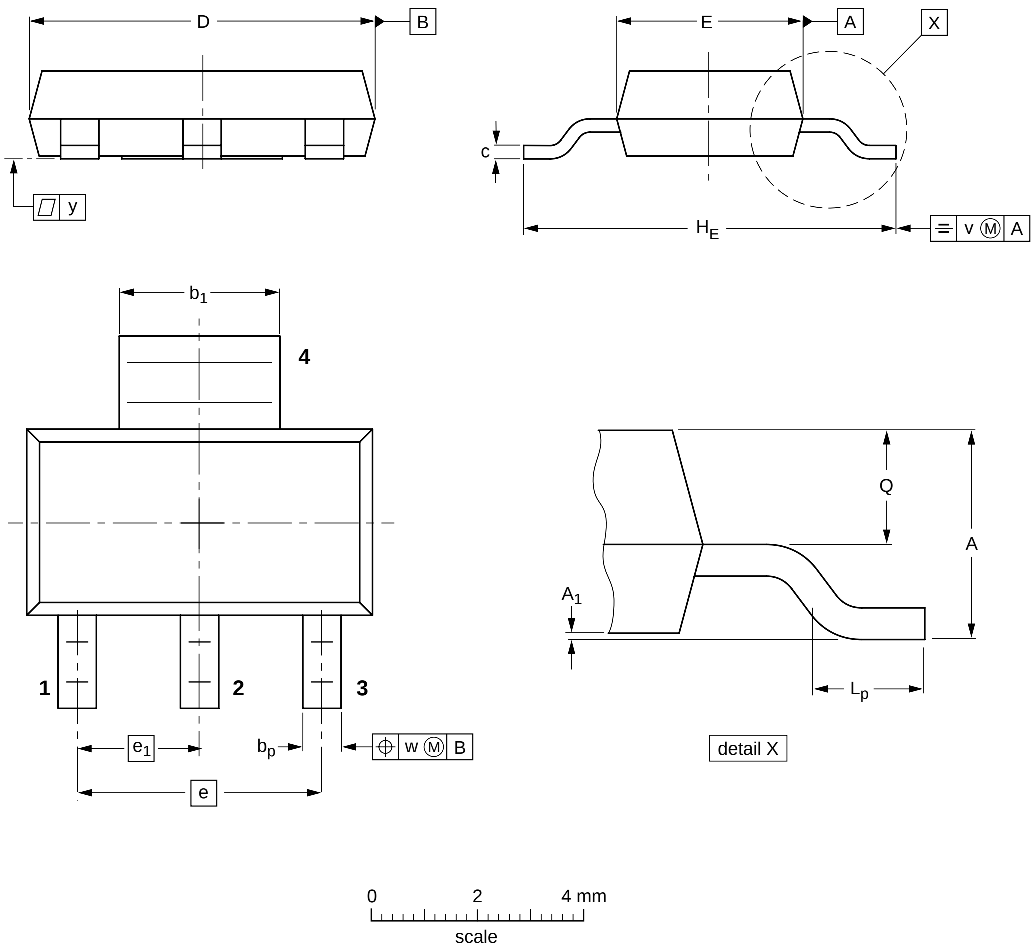



$I_C/I_B$ = 50; $T_{amb}$ = 25 °C.

**Fig 14. Equivalent on-resistance as a function of collector current; typical values.**

# 8. 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 |

**Fig 15. Package outline.**

## 9. Revision history

**Table 8: Revision history**

| Document ID | Release date | Data sheet status | Change notice | Order number | Supersedes |
|---|---|---|---|---|---|
| PBSS8110Z_1 | 20040426 | Product data | - | 9397 750 12568 | - |

## 10. Data sheet status

| Level | Data sheet status [1] | Product status [2] [3] | Definition |
|---|---|---|---|
| I | Objective data | Development | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice. |
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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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**Limiting values definition —** Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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## 14. Contents





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