

# PBSS9110Z

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

Rev. 01 — 9 June 2004

Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.4 Quick reference data

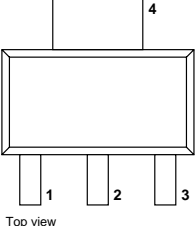
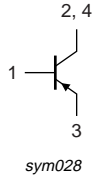
Table 1: Quick reference data

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		-	-	320	m $\Omega$

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## 2. Pinning information

**Table 2: Discrete pinning**

Pin	Description	Simplified outline	Symbol
1	base	 <p>Top view</p>	 <p>sym028</p>
2, 4	collector		
3	emitter		

## 3. Ordering information

**Table 3: Ordering information**

Type number	Package		Version
	Name	Description	
PBSS9110Z	-	plastic surface mounted package; collector pad for good heat transfer; 4 leads	SOT223

## 4. Marking

**Table 4: Marking**

Type number	Marking code
PBSS9110Z	PB9110 [1]

[1] Made in Hong Kong

## 5. Limiting values

**Table 5: Limiting values**

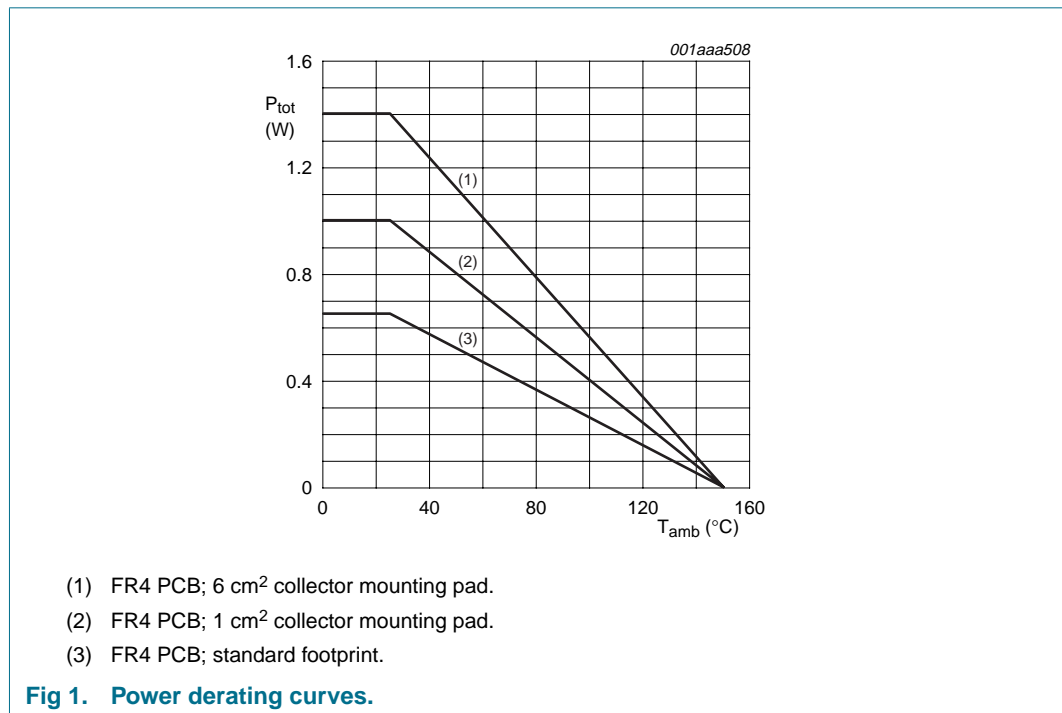
In accordance with the Absolute Maximum Rating System (IEC 60134).

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	$T_{amb} \leq 25\text{ °C}$	[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<sup>2</sup> collector mounting pad.

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

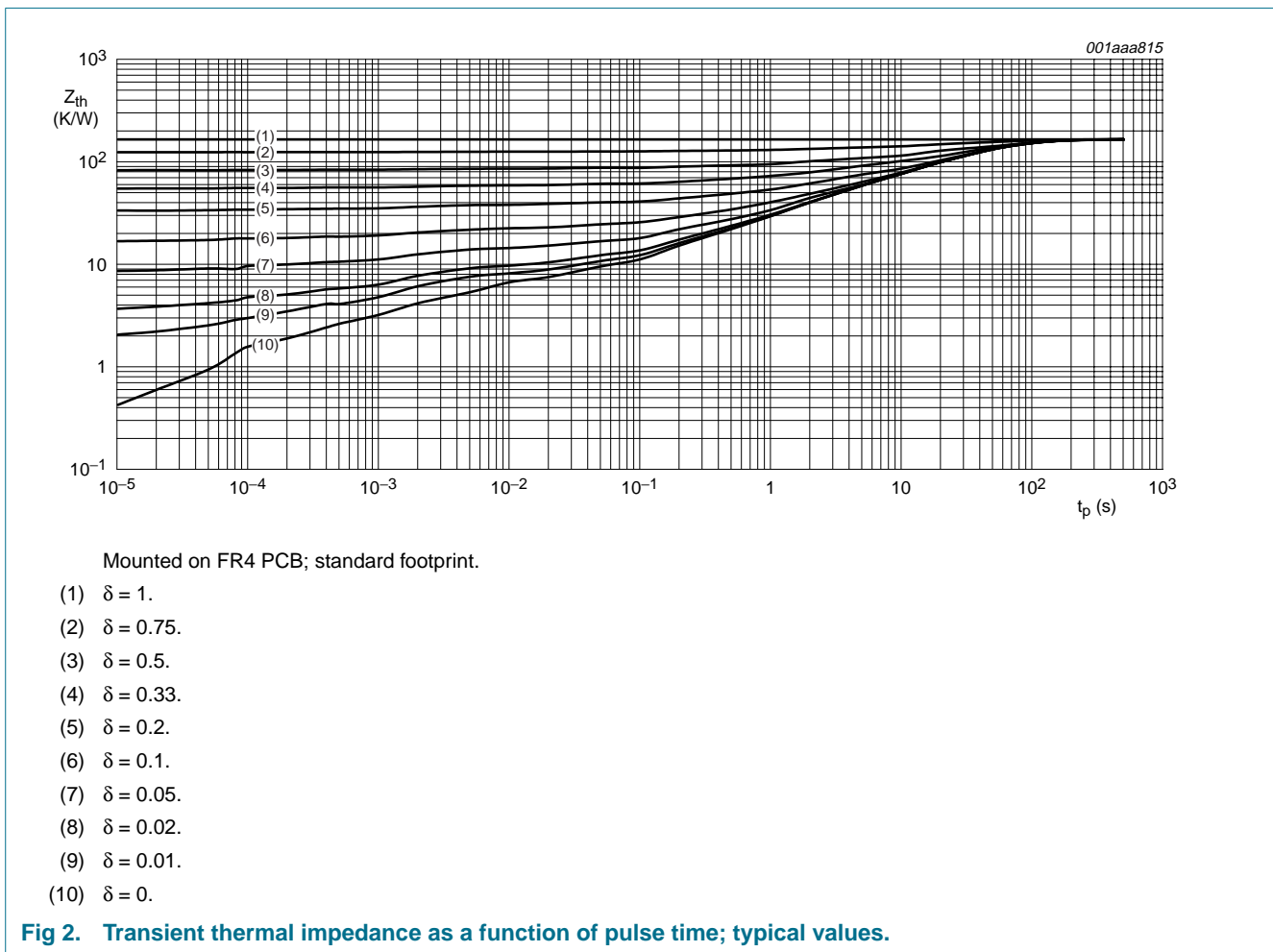


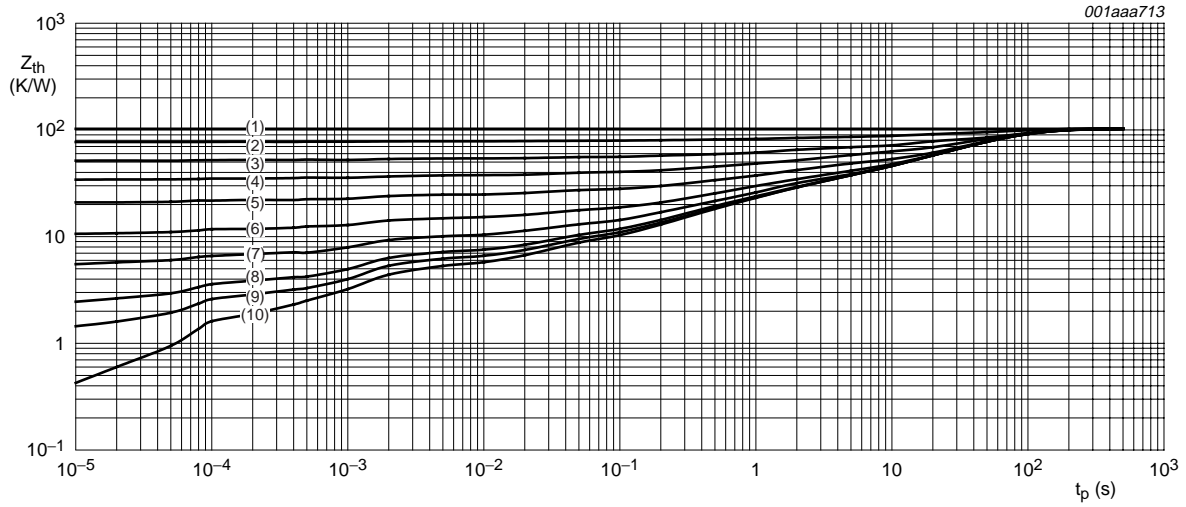
## 6. Thermal characteristics

**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	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<sup>2</sup> collector mounting pad.
- [3] Device mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, 6 cm<sup>2</sup> collector mounting pad.





Mounted on FR4 PCB; 1 cm<sup>2</sup> collector mounting pad.

- (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)  $\delta = 0$ .

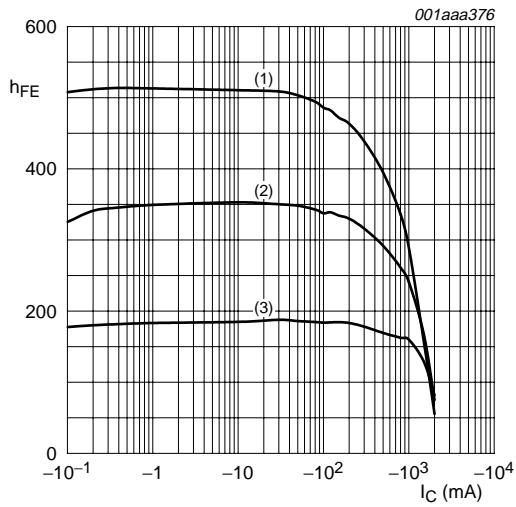
**Fig 3. Transient thermal impedance as a function of pulse time; typical values.**

## 7. Characteristics

**Table 7: Characteristics**
 $T_{amb} = 25\text{ °C}$  unless otherwise specified.

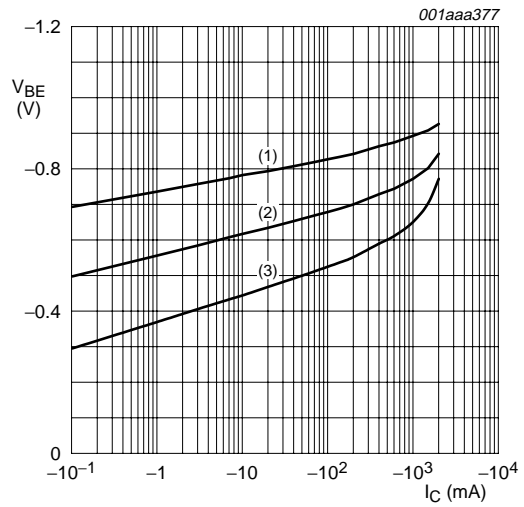
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -80\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA	
		$V_{CB} = -80\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$	-	-	-50	$\mu\text{A}$	
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = -80\text{ V}; V_{BE} = 0\text{ V}$	-	-	-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	
		$I_C = -1\text{ A}; I_B = -100\text{ mA}$	-	-	-320	mV	
$R_{CEsat}$	equivalent on-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	
$f_T$	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:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .



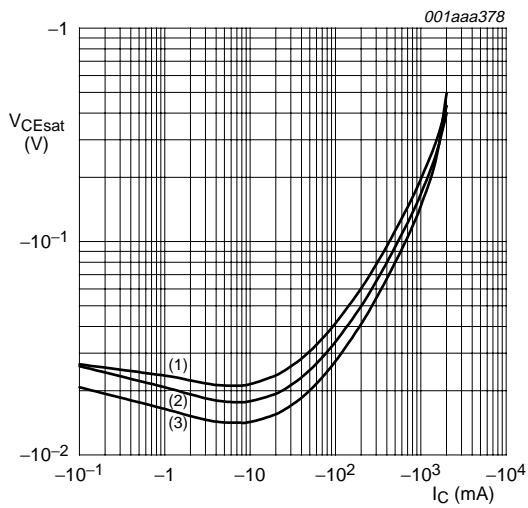
$V_{CE} = -10$  V.  
 (1)  $T_{amb} = 100$  °C.  
 (2)  $T_{amb} = 25$  °C.  
 (3)  $T_{amb} = -55$  °C.

**Fig 4. DC current gain as a function of collector current; typical values.**



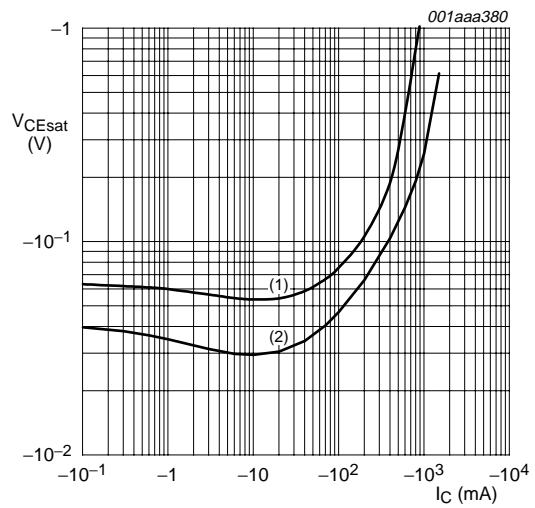
$V_{CE} = -10$  V.  
 (1)  $T_{amb} = -55$  °C.  
 (2)  $T_{amb} = 25$  °C.  
 (3)  $T_{amb} = 100$  °C.

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



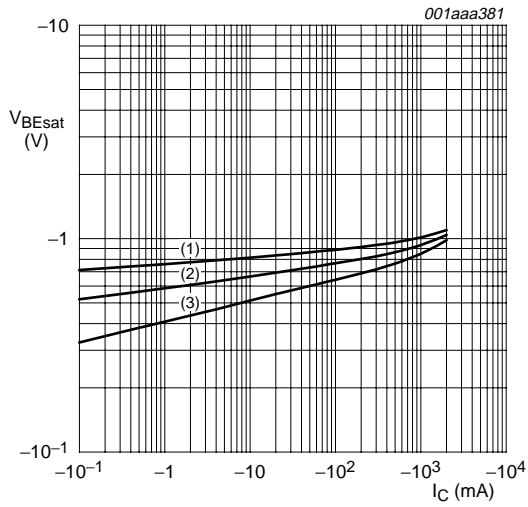
$I_C/I_B = 10$ .  
 (1)  $T_{amb} = 100$  °C.  
 (2)  $T_{amb} = 25$  °C.  
 (3)  $T_{amb} = -55$  °C.

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



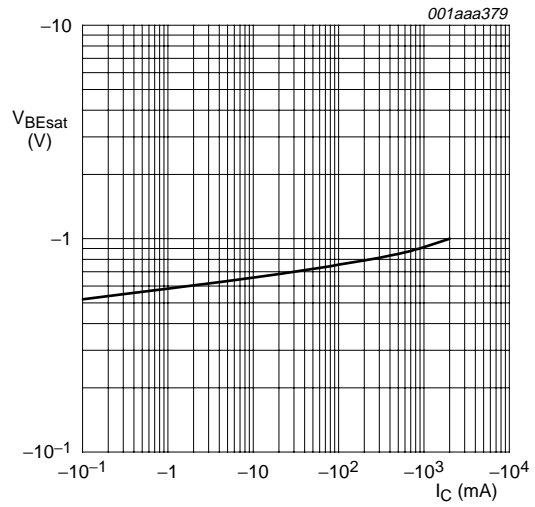
$T_{amb} = 25$  °C.  
 (1)  $I_C/I_B = 50$ .  
 (2)  $I_C/I_B = 20$ .

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



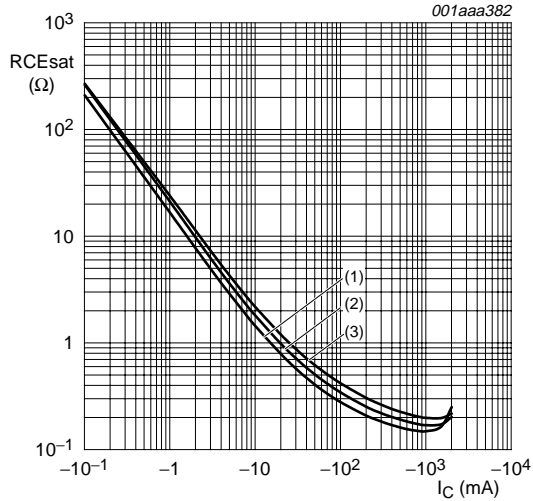
$I_C/I_B = 10$ .  
 (1)  $T_{amb} = -55\text{ °C}$ .  
 (2)  $T_{amb} = 25\text{ °C}$ .  
 (3)  $T_{amb} = 100\text{ °C}$ .

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



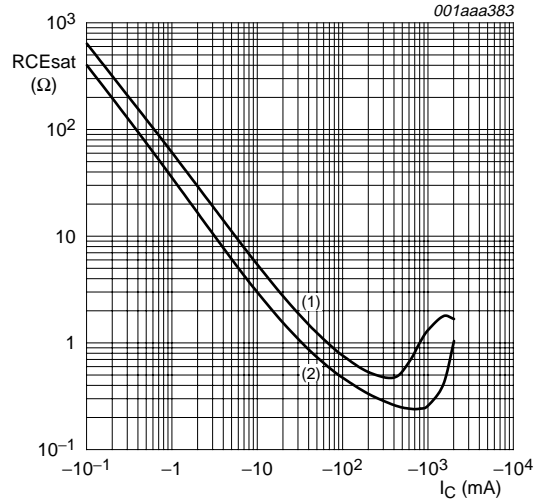
$I_C/I_B = 20$ .  
 $T_{amb} = 25\text{ °C}$ .

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



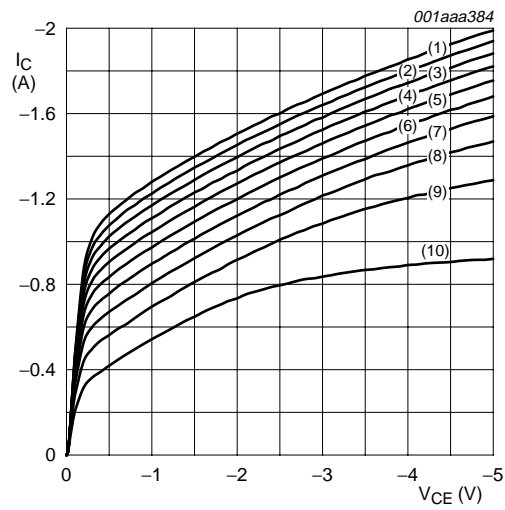
$I_C/I_B = 10$ .  
 (1)  $T_{amb} = -55\text{ °C}$ .  
 (2)  $T_{amb} = 25\text{ °C}$ .  
 (3)  $T_{amb} = 100\text{ °C}$ .

**Fig 10. Equivalent on-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 11. Equivalent on-resistance as a function of collector current; typical values.**



- (1)  $I_B = -45$  mA.
- (2)  $I_B = -40.5$  mA.
- (3)  $I_B = -36$  mA.
- (4)  $I_B = -31.5$  mA.
- (5)  $I_B = -27$  mA.
- (6)  $I_B = -22.5$  mA.
- (7)  $I_B = -18$  mA.
- (8)  $I_B = -13.5$  mA.
- (9)  $I_B = -9$  mA.
- (10)  $I_B = -4.5$  mA.

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

**8. Package outline**

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

SOT223

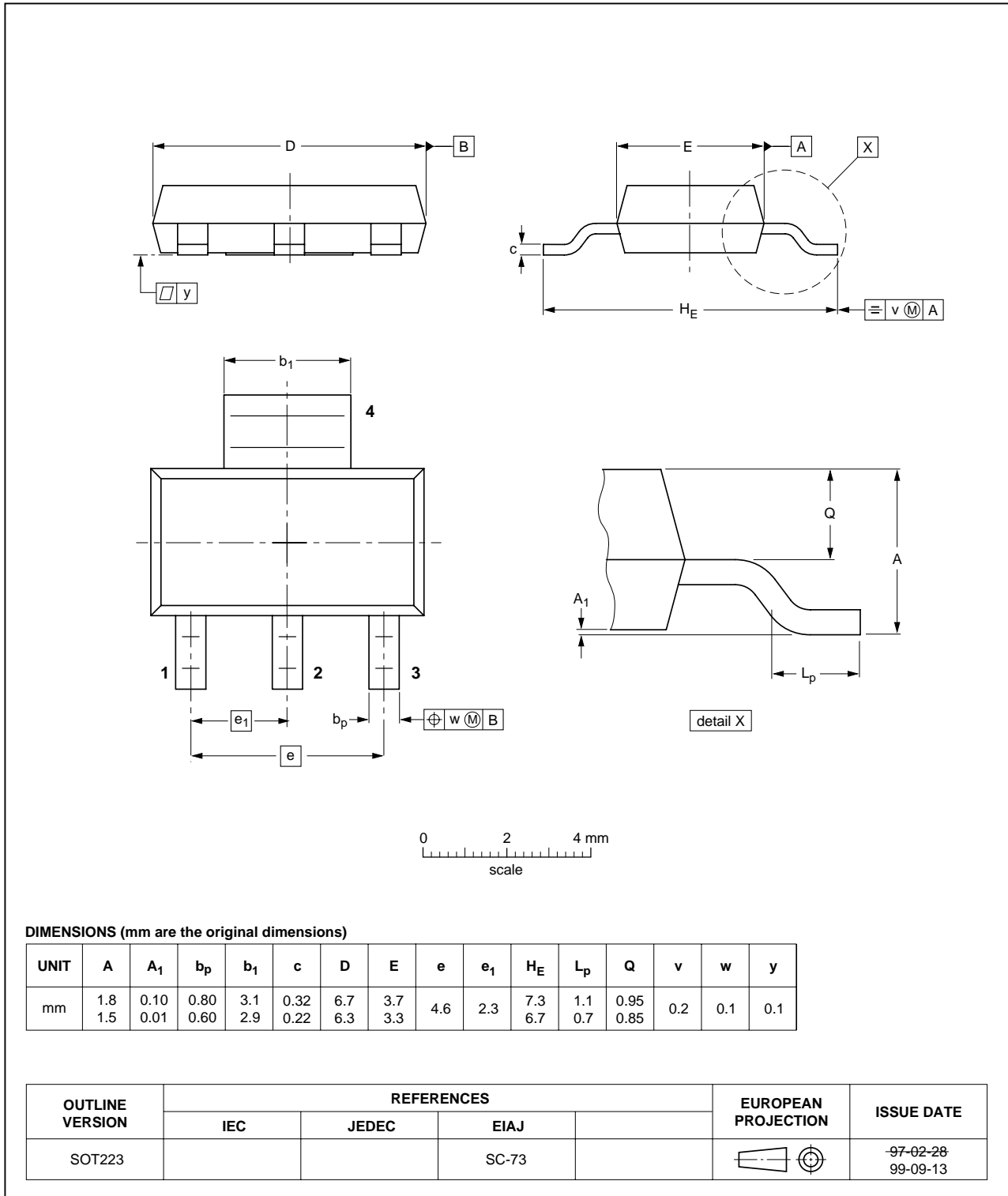


Fig 13. Package outline.

## 9. Revision history

Table 8: Revision history

Document ID	Release date	Data sheet status	Change notice	Order number	Supersedes
PBSS9110Z_1	20040609	Product data	-	9397 750 12845	-

## 10. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2]</sup> <sup>[3]</sup>	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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