



# PBRP123ET

PNP 800 mA, 40 V BISS RET; R1 = 2.2 k $\Omega$ , R2 = 2.2 k $\Omega$

Rev. 01 — 16 January 2008

Product data sheet

## 1. Product profile

### 1.1 General description

800 mA PNP low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) Resistor-Equipped Transistor (RET) in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

NPN complement: PBRN123ET.

### 1.2 Features

- 800 mA repetitive peak output current
- High current gain  $h_{FE}$
- Built-in bias resistors
- Simplifies circuit design
- Low collector-emitter saturation voltage  $V_{CEsat}$
- Reduces component count
- Reduces pick and place costs
- $\pm 10\%$  resistor ratio tolerance

### 1.3 Applications

- Digital application in automotive and industrial segments
- Medium current peripheral driver
- Switching loads

### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	-40	V
$I_O$	output current		[1][2]	-	-600	mA
$I_{ORM}$	repetitive peak output current	$t_p \leq 1$ ms; $\delta \leq 0.33$	[3]	-	-800	mA
R1	bias resistor 1 (input)		1.54	2.2	2.86	k $\Omega$
R2/R1	bias resistor ratio		0.9	1	1.1	

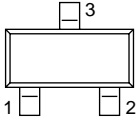
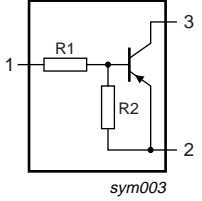
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

[2] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Symbol
1	input (base)		 <p style="text-align: center;"><i>sym003</i></p>
2	GND (emitter)		
3	output (collector)		

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
PBRP123ET	-	plastic surface-mounted package; 3 leads	SOT23

## 4. Marking

**Table 4. Marking codes**

Type number	Marking code <sup>[1]</sup>
PBRP123ET	*7H

- [1] \* = -: made in Hong Kong  
 \* = p: made in Hong Kong  
 \* = t: made in Malaysia  
 \* = W: made in China

## 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	-	-40	V
$V_{CEO}$	collector-emitter voltage	open base	-	-40	V
$V_{EBO}$	emitter-base voltage	open collector	-	-10	V
$V_I$	input voltage				
	positive		-	+10	V
	negative		-	-22	V
$I_O$	output current		<sup>[1][2]</sup> -	-600	mA
$I_{ORM}$	repetitive peak output current	$t_p \leq 1$ ms; $\delta \leq 0.33$	<sup>[3]</sup> -	-800	mA

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

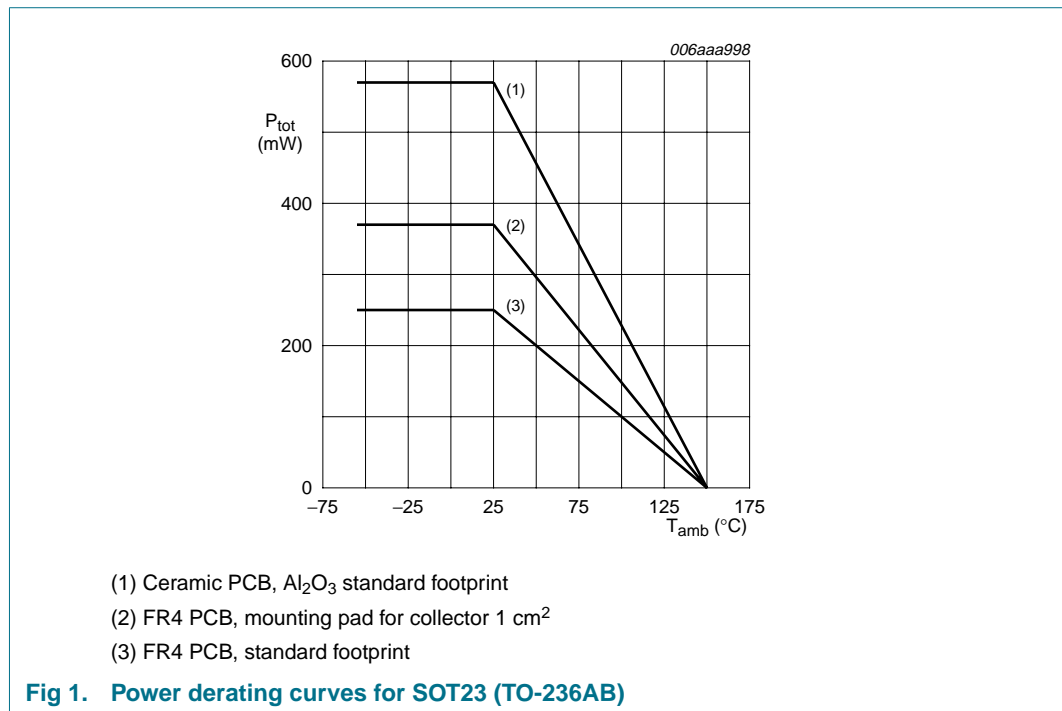
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[3]	-	250	mW
			[1]	-	370	mW
			[2]	-	570	mW
T <sub>j</sub>	junction temperature		-	150	°C	
T <sub>amb</sub>	ambient temperature		-55	+150	°C	
T <sub>stg</sub>	storage temperature		-65	+150	°C	

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

[2] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

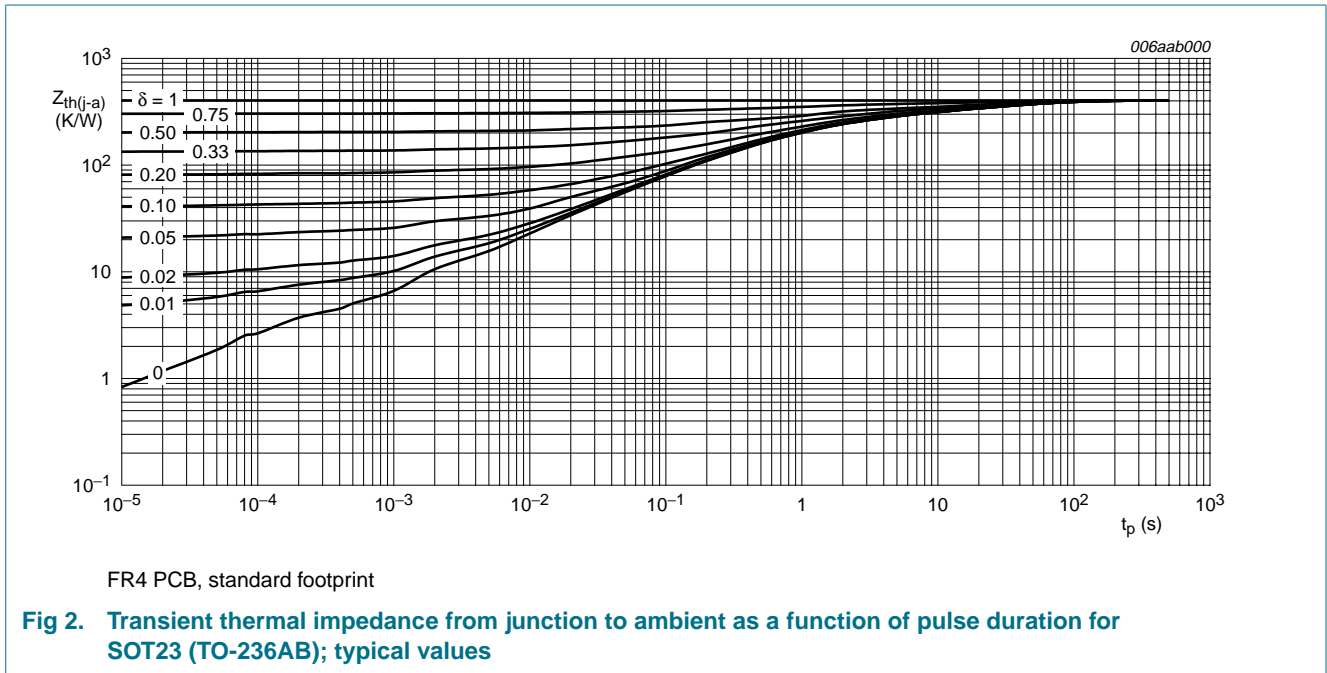


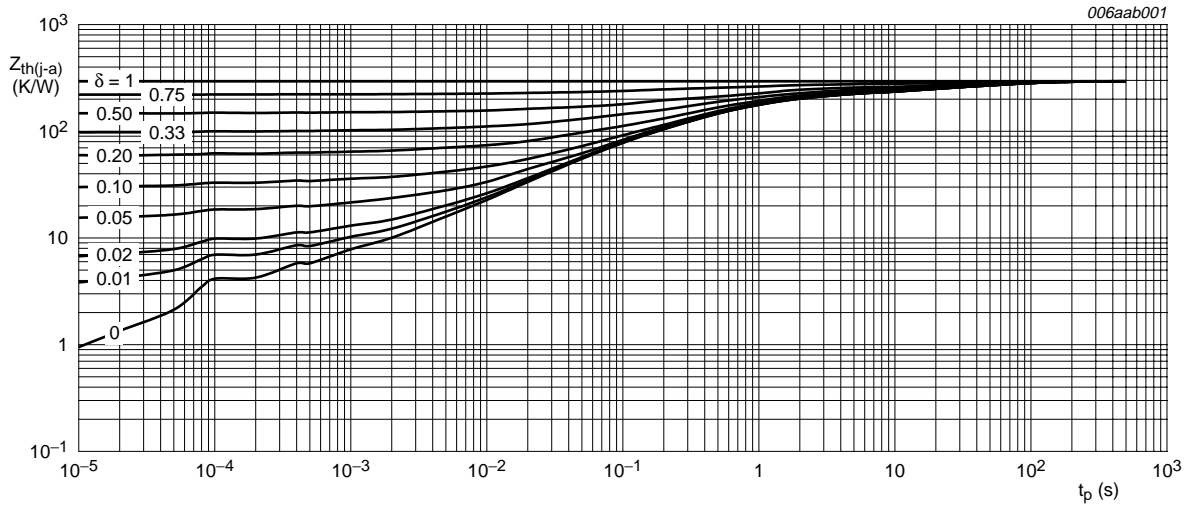
**6. Thermal characteristics**

**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]	-	-	500	K/W
			[2]	-	-	338	K/W
			[3]	-	-	219	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	105	K/W	

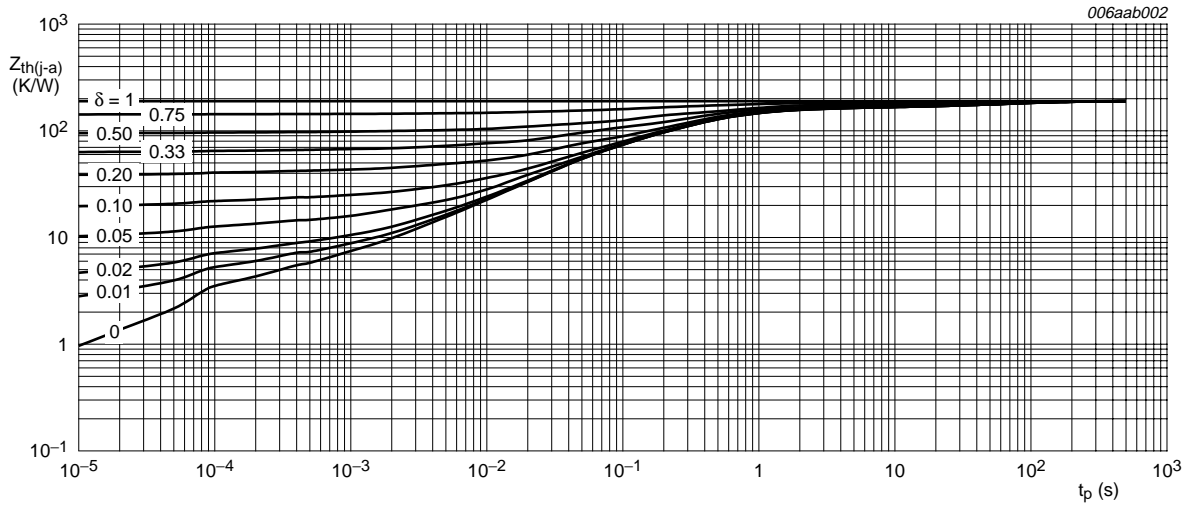
- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.
- [3] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.





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 for SOT23 (TO-236AB); typical values**



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

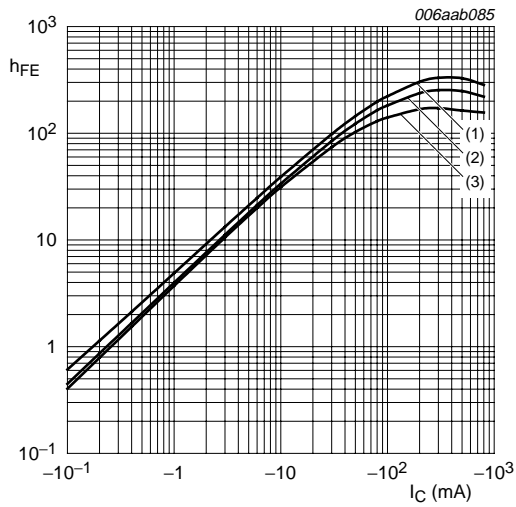
**Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT23 (TO-236AB); typical values**

## 7. Characteristics

**Table 7. Characteristics**
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

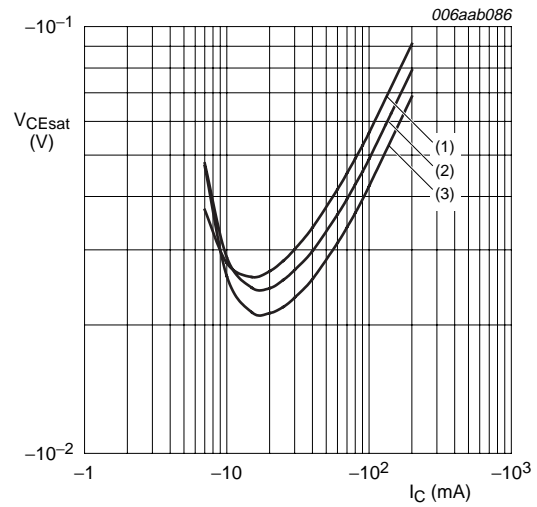
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = -30 V; I <sub>E</sub> = 0 A	-	-	-100	nA
I <sub>CEO</sub>	collector-emitter cut-off current	V <sub>CE</sub> = -30 V; I <sub>B</sub> = 0 A	-	-	-0.5	$\mu$ A
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = -5 V; I <sub>C</sub> = 0 A	-	-	-2	mA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = -5 V; I <sub>C</sub> = -50 mA	70	120	-	
		V <sub>CE</sub> = -5 V; I <sub>C</sub> = -300 mA	[1] 180	250	-	
		V <sub>CE</sub> = -5 V; I <sub>C</sub> = -600 mA	[1] 170	240	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = -50 mA; I <sub>B</sub> = -2.5 mA	-	-35	-45	mV
		I <sub>C</sub> = -200 mA; I <sub>B</sub> = -10 mA	-	-70	-100	mV
		I <sub>C</sub> = -500 mA; I <sub>B</sub> = -10 mA	[1] -	-200	-300	mV
		I <sub>C</sub> = -600 mA; I <sub>B</sub> = -6 mA	[1] -	-450	-750	mV
V <sub>I(off)</sub>	off-state input voltage	V <sub>CE</sub> = -5 V; I <sub>C</sub> = -100 $\mu$ A	-0.6	-1	-1.8	V
V <sub>I(on)</sub>	on-state input voltage	V <sub>CE</sub> = -0.3 V; I <sub>C</sub> = -20 mA	-1	-1.3	-2	V
R1	bias resistor 1 (input)		1.54	2.2	2.86	k $\Omega$
R2/R1	bias resistor ratio		0.9	1	1.1	
C <sub>c</sub>	collector capacitance	V <sub>CB</sub> = -10 V; I <sub>E</sub> = i <sub>e</sub> = 0 A; f = 1 MHz	-	11	-	pF

[1] Pulse test: t<sub>p</sub>  $\leq$  300  $\mu$ s;  $\delta \leq$  0.02.



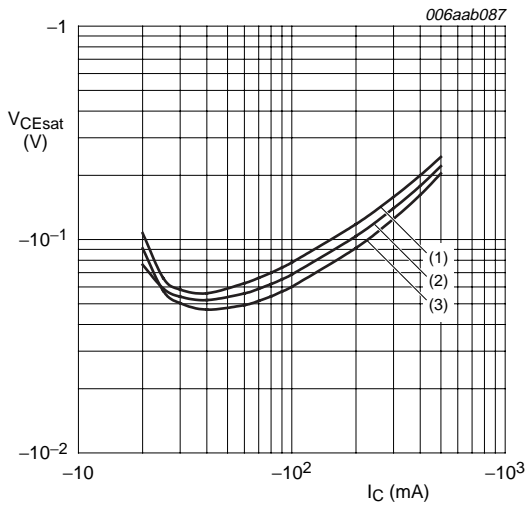
$V_{CE} = -5\text{ V}$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

**Fig 5. DC current gain as a function of collector current; typical values**



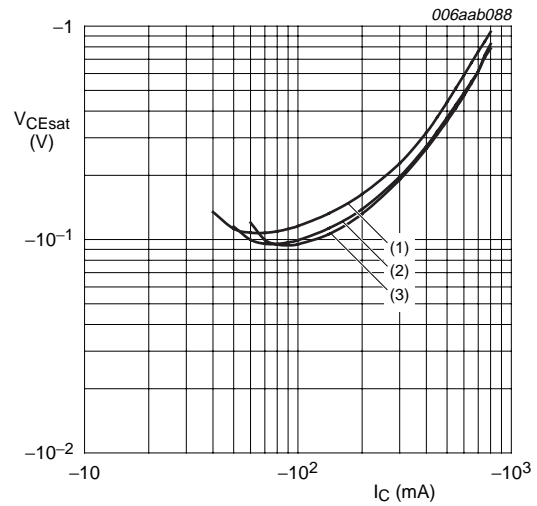
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

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



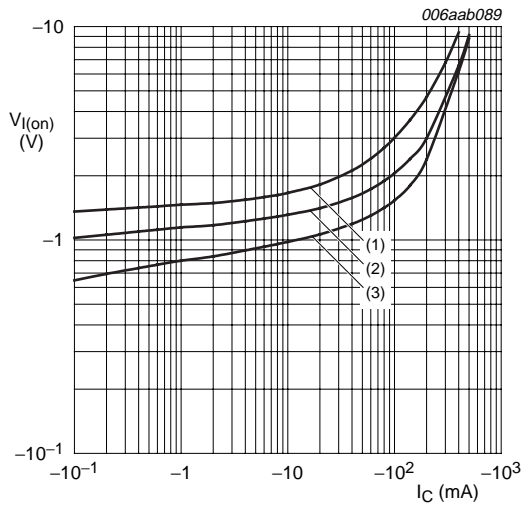
$I_C/I_B = 50$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

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



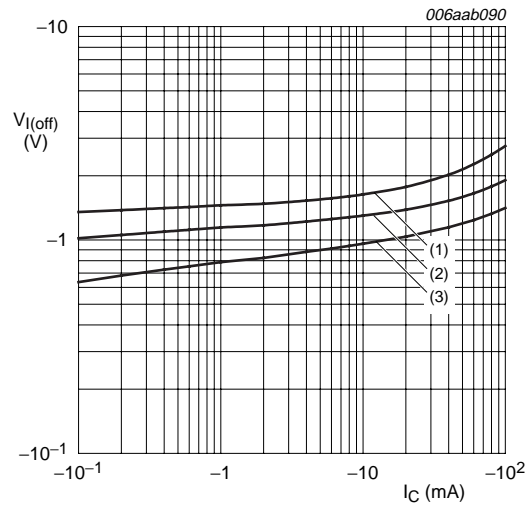
$I_C/I_B = 100$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

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



$V_{CE} = -0.3 \text{ V}$   
 (1)  $T_{amb} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100 \text{ }^\circ\text{C}$

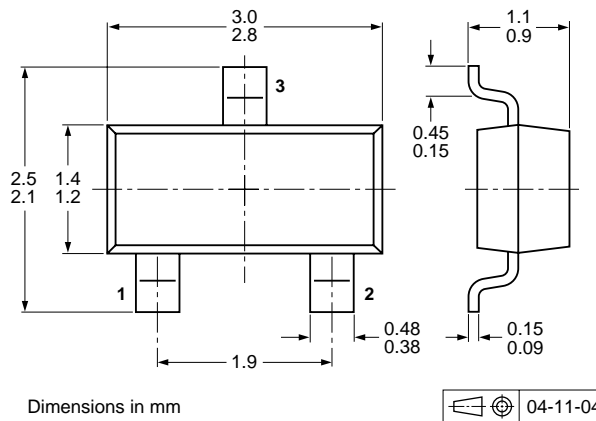
**Fig 9. On-state input voltage as a function of collector current; typical values**



$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100 \text{ }^\circ\text{C}$

**Fig 10. Off-state input voltage as a function of collector current; typical values**

## 8. Package outline



**Fig 11. Package outline SOT23 (TO-236AB)**



## 9. Packing information

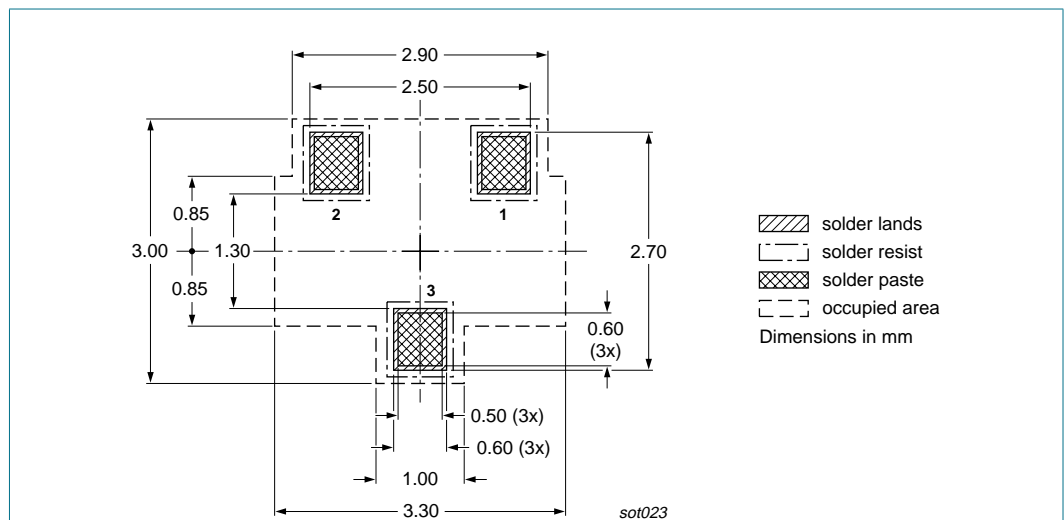
**Table 8. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

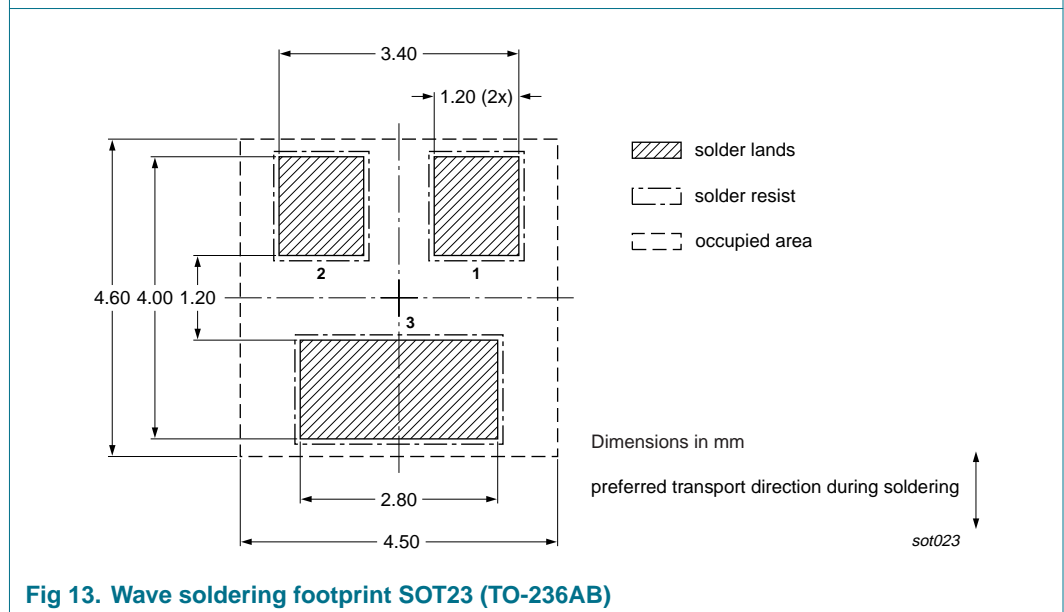
Type number	Package	Description	Packing quantity	
			3000	10000
PBRP123ET	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235

[1] For further information and the availability of packing methods, see [Section 13](#).

## 10. Soldering



**Fig 12. Reflow soldering footprint SOT23 (TO-236AB)**



**Fig 13. Wave soldering footprint SOT23 (TO-236AB)**

## 11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBRP123ET_1	20080116	Product data sheet	-	-

## 12. Legal information

### 12.1 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".

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Date of release: 16 January 2008

Document identifier: PBRP123ET\_1