

# PBHV9050T

500 V, 150 mA PNP high-voltage low  $V_{CEsat}$  (BISS) transistor

Rev. 01 — 16 September 2009

Product data sheet

## 1. Product profile

### 1.1 General description

PNP high-voltage low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor in a SOT23 (TO-236AB) small Surface-Mounted Device (SMD) plastic package.

NPN complement: PMBTA45.

### 1.2 Features

- High voltage
- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability  $I_C$  and  $I_{CM}$
- High collector current gain ( $h_{FE}$ ) at high  $I_C$
- AEC-Q101 qualified

### 1.3 Applications

- Electronic ballasts
- LED driver for LED chain module
- LCD backlighting
- Automotive motor management
- Flyback converters
- Hook switch for wired telecom
- Switch Mode Power Supply (SMPS)

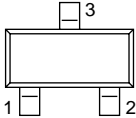
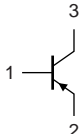
### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CESM}$	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$	-	-	-500	V
$V_{CEO}$	collector-emitter voltage	open base	-	-	-500	V
$I_C$	collector current		-	-	-0.15	A
$h_{FE}$	DC current gain	$V_{CE} = -10\text{ V};$ $I_C = -50\text{ mA}$	80	160	300	

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	base		 <i>sym013</i>
2	emitter		
3	collector		

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
PBHV9050T	-	plastic surface-mounted package; 3 leads	SOT23

## 4. Marking

**Table 4. Marking codes**

Type number	Marking code <sup>[1]</sup>
PBHV9050T	LL*

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

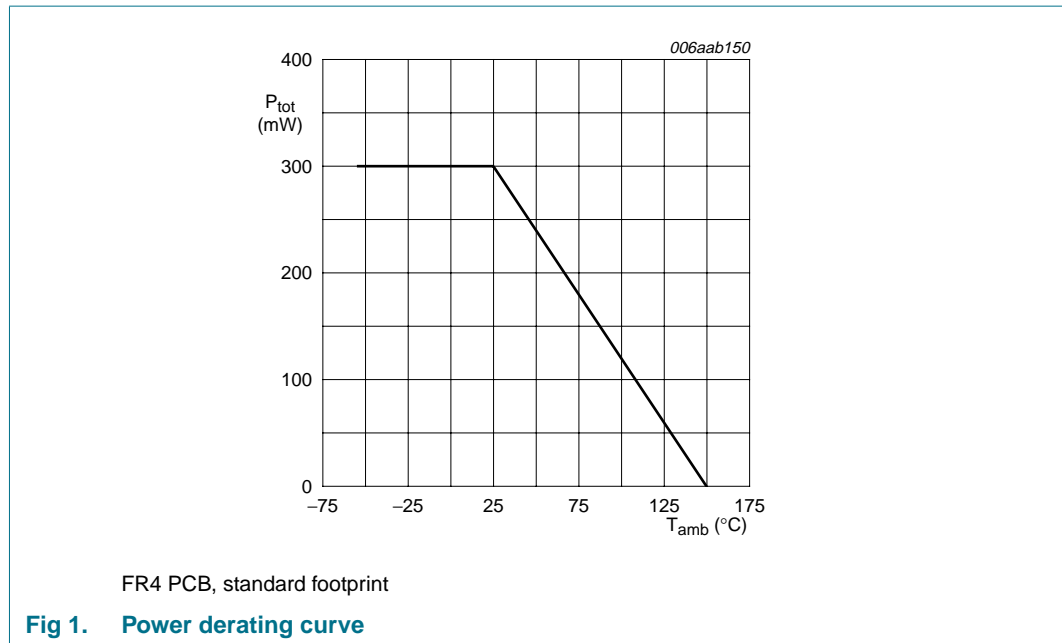
## 5. Limiting values

**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	-	-500	V
$V_{CEO}$	collector-emitter voltage	open base	-	-500	V
$V_{CESM}$	collector-emitter peak voltage	$V_{BE} = 0$ V	-	-500	V
$V_{EBO}$	emitter-base voltage	open collector	-	-6	V
$I_C$	collector current		-	-0.15	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-0.5	A
$I_{BM}$	peak base current	single pulse; $t_p \leq 1$ ms	-	-200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	300	mW
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-55	+150	°C
$T_{stg}$	storage temperature		-65	+150	°C

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

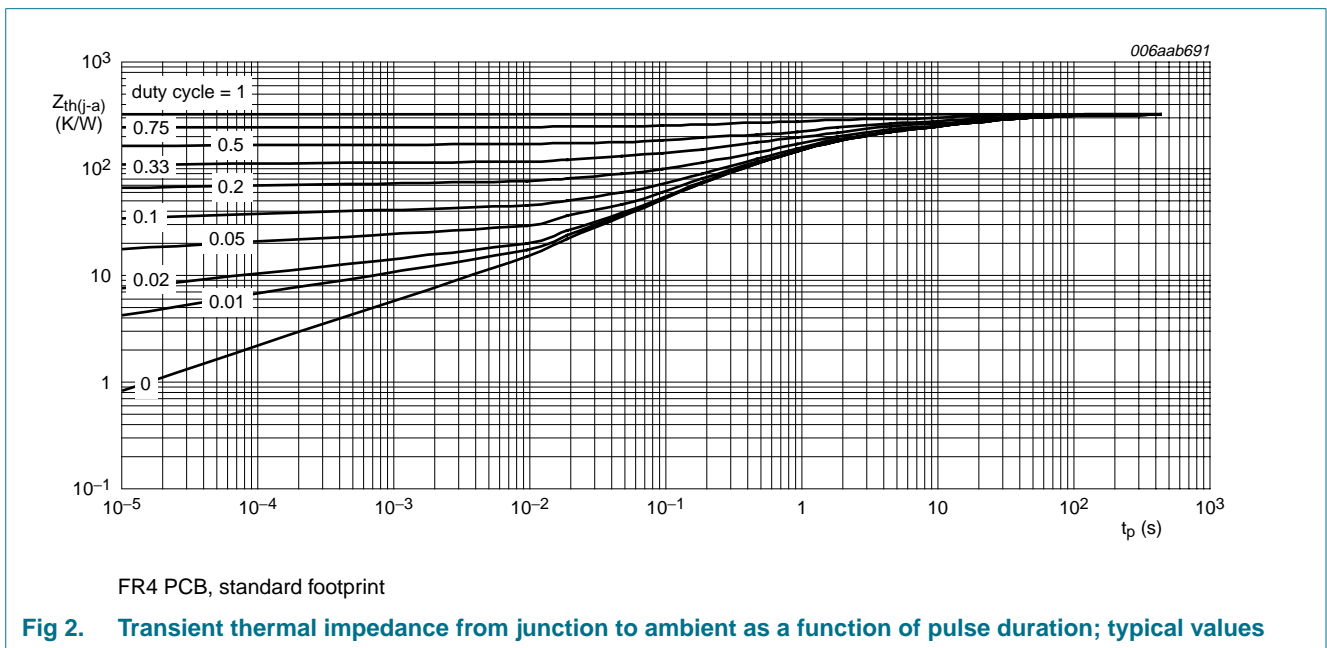


**6. Thermal characteristics**

**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]	-	417	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	70	K/W

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



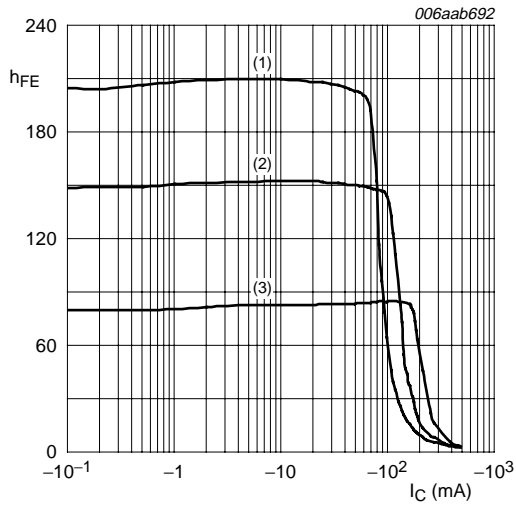
## 7. Characteristics

**Table 7. Characteristics**

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

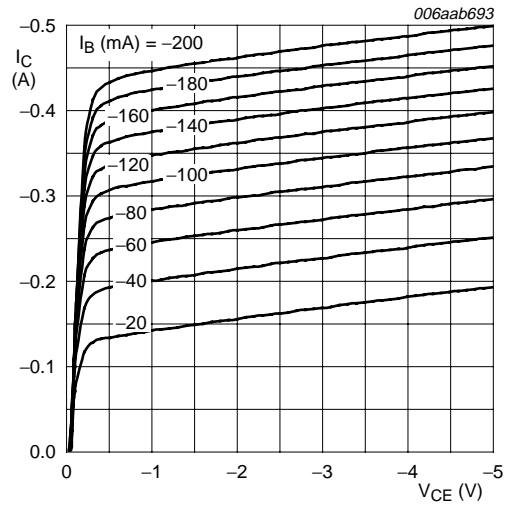
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -360\text{ V};$ $I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -360\text{ V};$ $I_E = 0\text{ A}; T_j = 150^\circ\text{C}$	-	-	-10	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = -360\text{ V};$ $V_{BE} = 0\text{ V}$	-	-	-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	$V_{CE} = -10\text{ V}$				
		$I_C = -10\text{ mA}$	100	160	300	
		$I_C = -50\text{ mA}$	[1] 80	160	300	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -20\text{ mA};$ $I_B = -2\text{ mA}$	-	-115	-200	mV
		$I_C = -50\text{ mA};$ $I_B = -10\text{ mA}$	-	-95	-200	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -50\text{ mA};$ $I_B = -10\text{ mA}$	[1] -	-0.75	-0.9	V
$f_T$	transition frequency	$V_{CE} = -10\text{ V};$ $I_E = -10\text{ mA};$ $f = 100\text{ MHz}$	-	50	-	MHz
$C_c$	collector capacitance	$V_{CB} = -20\text{ V};$ $I_E = i_e = 0\text{ A};$ $f = 1\text{ MHz}$	-	6	-	pF
$C_e$	emitter capacitance	$V_{EB} = -0.5\text{ V};$ $I_C = i_c = 0\text{ A};$ $f = 1\text{ MHz}$	-	170	-	pF
$t_d$	delay time	$V_{CC} = -20\text{ V};$	-	75	-	ns
$t_r$	rise time	$I_C = -0.05\text{ A};$	-	1600	-	ns
$t_{on}$	turn-on time	$I_{Bon} = -5\text{ mA};$ $I_{Boff} = 10\text{ mA}$	-	1675	-	ns
$t_s$	storage time		-	1200	-	ns
$t_f$	fall time		-	550	-	ns
$t_{off}$	turn-off time		-	1750	-	ns

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



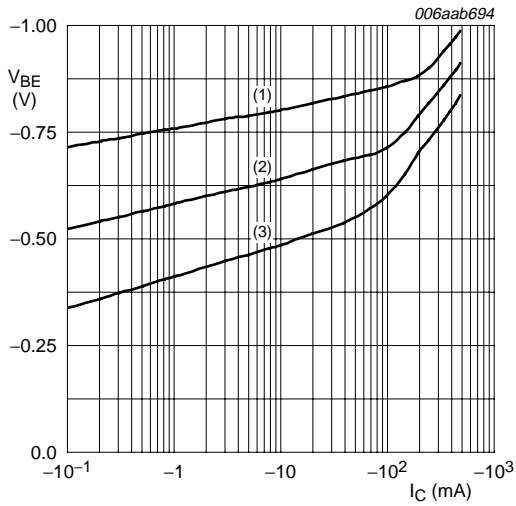
$V_{CE} = -10$  V  
 (1)  $T_{amb} = 100$  °C  
 (2)  $T_{amb} = 25$  °C  
 (3)  $T_{amb} = -55$  °C

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



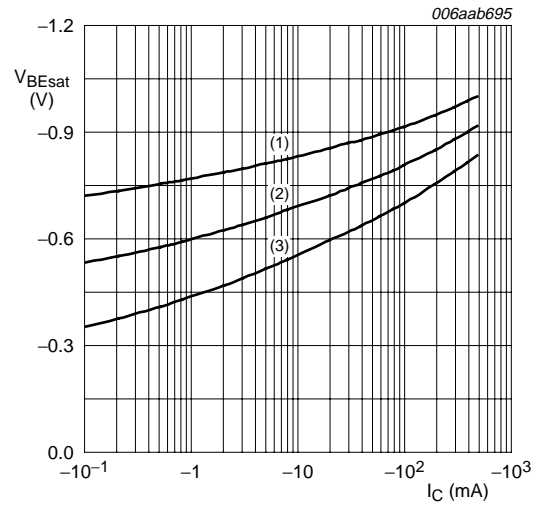
$T_{amb} = 25$  °C

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



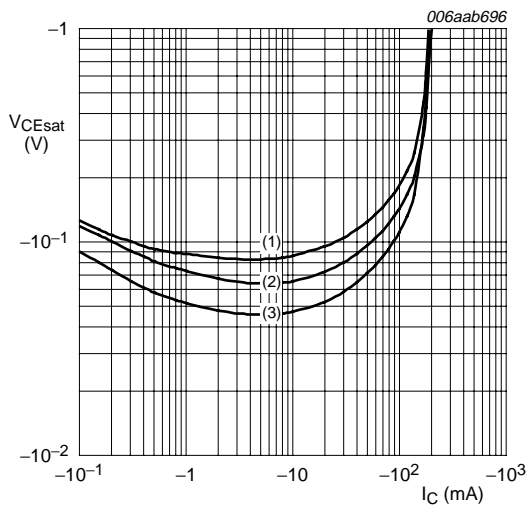
$V_{CE} = -10$  V  
 (1)  $T_{amb} = -55$  °C  
 (2)  $T_{amb} = 25$  °C  
 (3)  $T_{amb} = 100$  °C

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



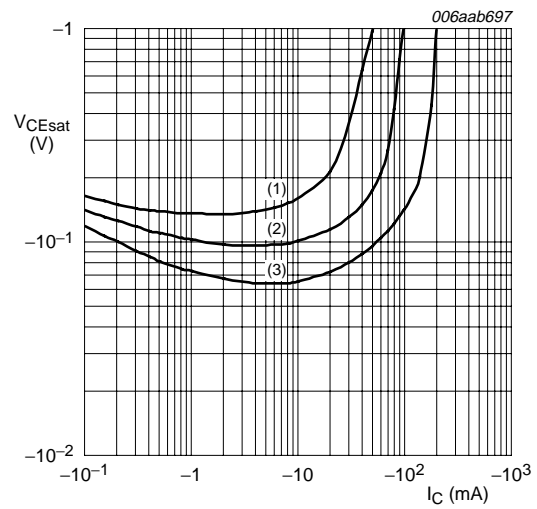
$I_C/I_B = 5$   
 (1)  $T_{amb} = -55$  °C  
 (2)  $T_{amb} = 25$  °C  
 (3)  $T_{amb} = 100$  °C

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



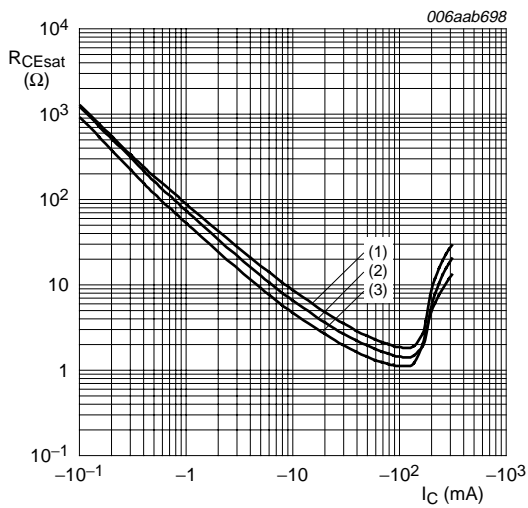
- $I_C/I_B = 5$
- (1)  $T_{amb} = 100\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

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



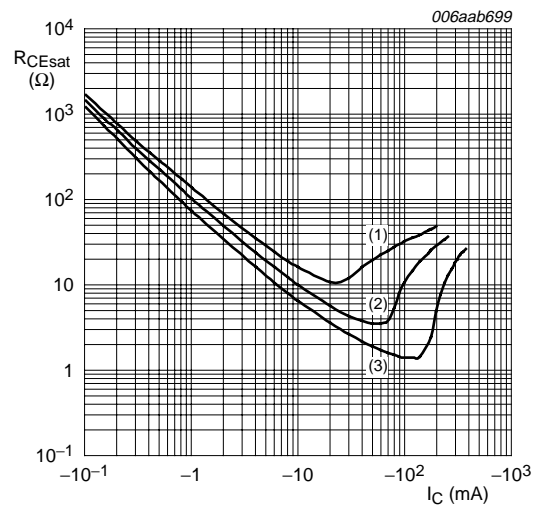
- $T_{amb} = 25\text{ °C}$
- (1)  $I_C/I_B = 20$
  - (2)  $I_C/I_B = 10$
  - (3)  $I_C/I_B = 5$

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



- $I_C/I_B = 5$
- (1)  $T_{amb} = 100\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

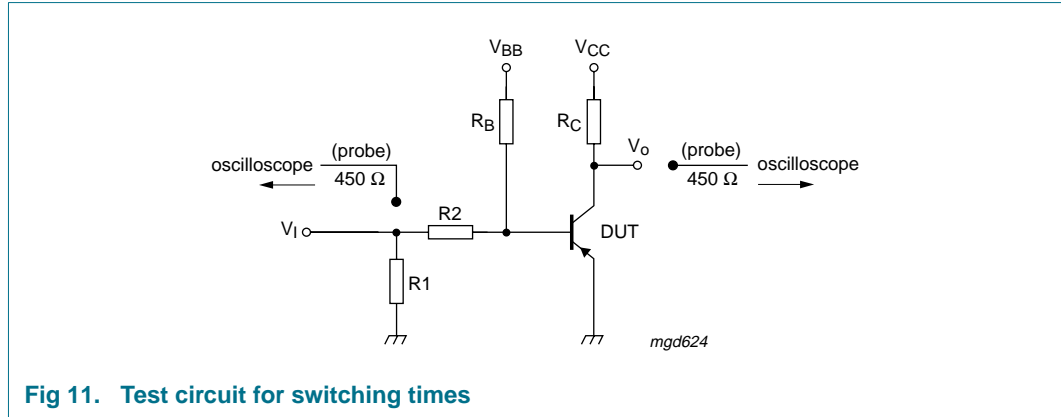
**Fig 9. Collector-emitter saturation resistance as a function of collector current; typical values**



- $T_{amb} = 25\text{ °C}$
- (1)  $I_C/I_B = 20$
  - (2)  $I_C/I_B = 10$
  - (3)  $I_C/I_B = 5$

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

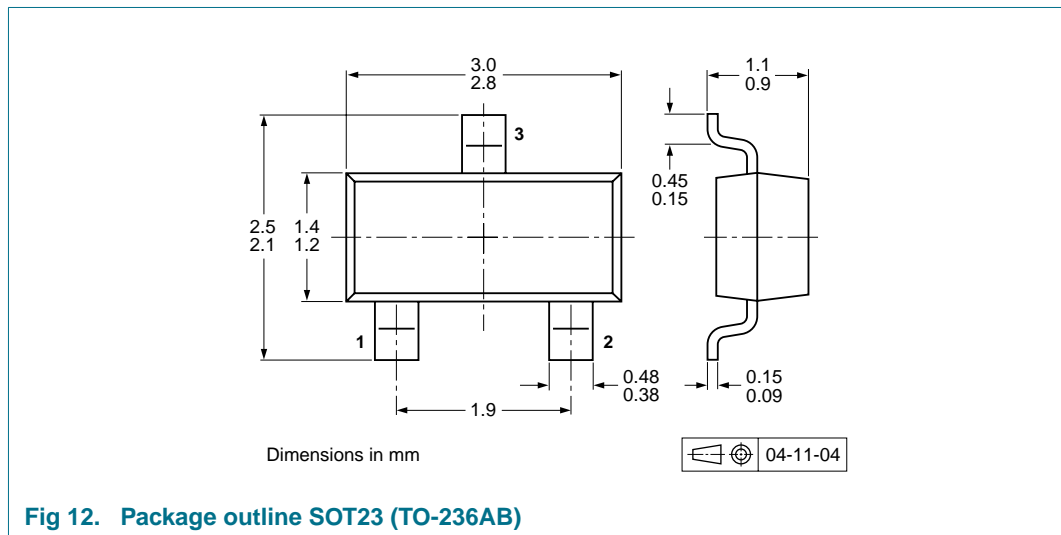
## 8. Test information



### 8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

## 9. Package outline



## 10. Packing information

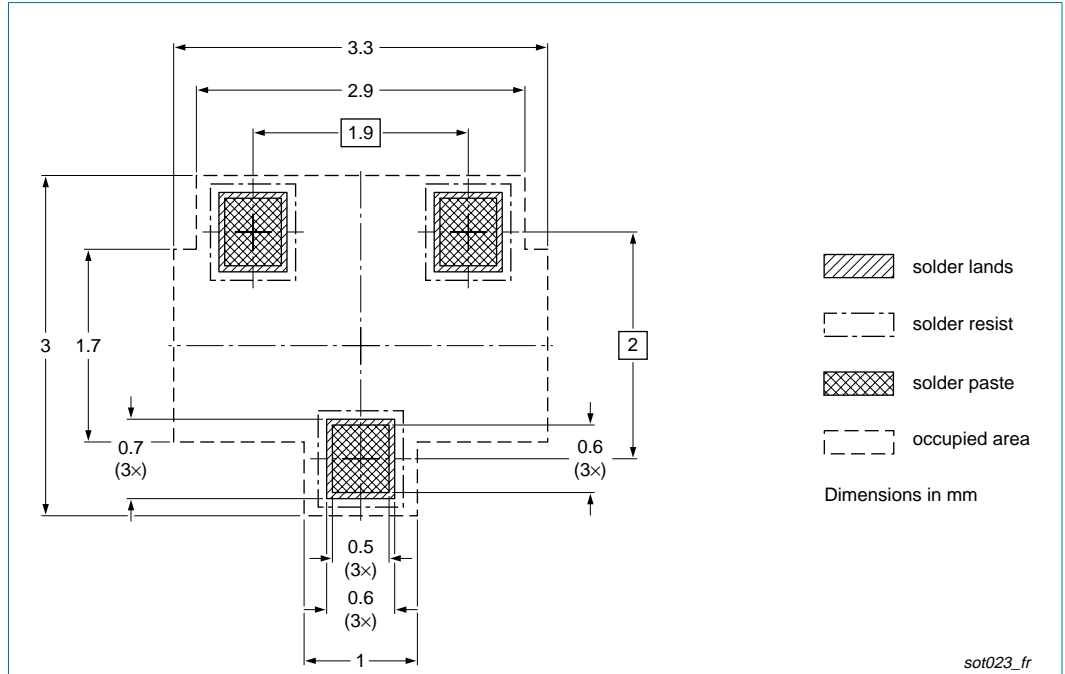
**Table 8. Packing methods**

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

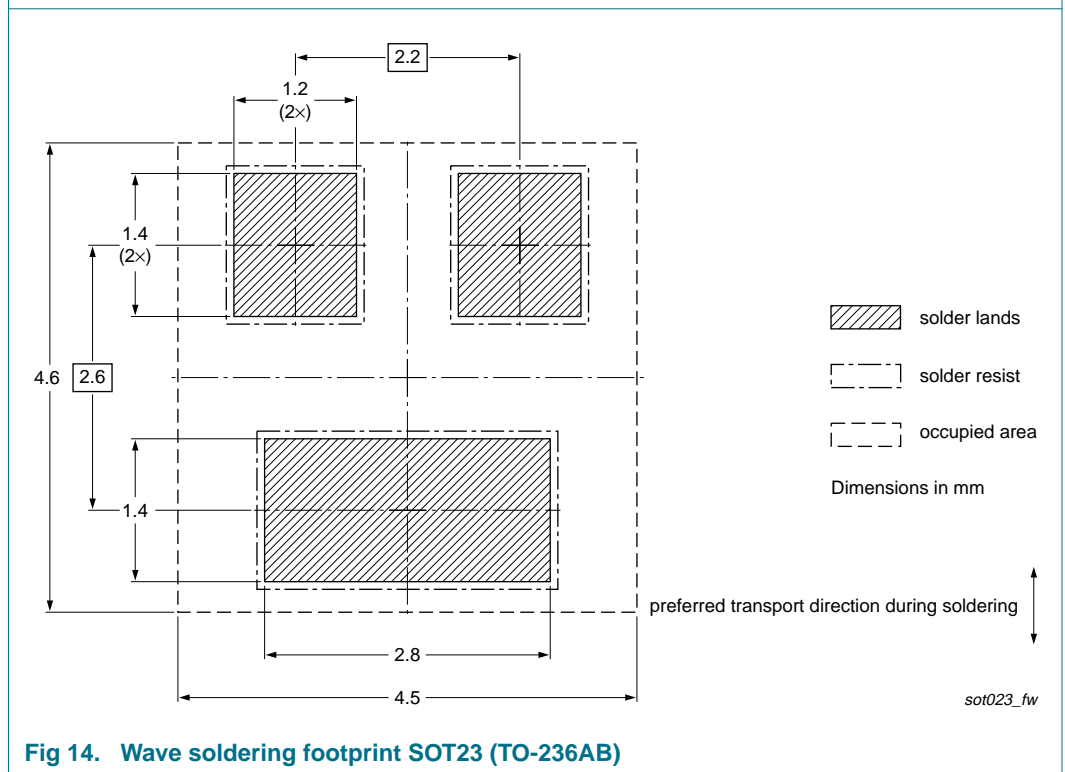
Type number	Package	Description	Packing quantity	
			3000	10000
PBHV9050T	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235

[1] For further information and the availability of packing methods, see [Section 14](#).

**11. Soldering**



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



**Fig 14. Wave soldering footprint SOT23 (TO-236AB)**

## 12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBHV9050T_1	20090916	Product data sheet	-	-

## 13. Legal information

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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.

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[2] The term 'short data sheet' is explained in section "Definitions".

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## 15. Contents

<b>1</b>	<b>Product profile</b> .....	<b>1</b>
1.1	General description .....	1
1.2	Features .....	1
1.3	Applications .....	1
1.4	Quick reference data .....	1
<b>2</b>	<b>Pinning information</b> .....	<b>2</b>
<b>3</b>	<b>Ordering information</b> .....	<b>2</b>
<b>4</b>	<b>Marking</b> .....	<b>2</b>
<b>5</b>	<b>Limiting values</b> .....	<b>3</b>
<b>6</b>	<b>Thermal characteristics</b> .....	<b>4</b>
<b>7</b>	<b>Characteristics</b> .....	<b>5</b>
<b>8</b>	<b>Test information</b> .....	<b>8</b>
8.1	Quality information .....	8
<b>9</b>	<b>Package outline</b> .....	<b>8</b>
<b>10</b>	<b>Packing information</b> .....	<b>8</b>
<b>11</b>	<b>Soldering</b> .....	<b>9</b>
<b>12</b>	<b>Revision history</b> .....	<b>10</b>
<b>13</b>	<b>Legal information</b> .....	<b>11</b>
13.1	Data sheet status .....	11
13.2	Definitions .....	11
13.3	Disclaimers .....	11
13.4	Trademarks .....	11
<b>14</b>	<b>Contact information</b> .....	<b>11</b>
<b>15</b>	<b>Contents</b> .....	<b>12</b>

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