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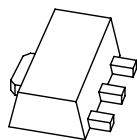
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Kind regards,

Team Nexperia



# 2PB1424

20 V, 3 A PNP low  $V_{CEsat}$  (BISS) transistor

Rev. 02 — 15 January 2007

Product data sheet

## 1. Product profile

### 1.1 General description

PNP low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor in a medium power SOT89 (SC-62/TO-243) flat lead Surface-Mounted Device (SMD) plastic package.

NPN complement: 2PD2150.

### 1.2 Features

- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability  $I_C$  and  $I_{CM}$
- High collector current gain ( $h_{FE}$ ) at high  $I_C$
- High efficiency due to less heat generation
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors

### 1.3 Applications

- DC-to-DC conversion
- MOSFET gate driving
- Motor control
- Charging circuits
- Power switches (e.g. motors, fans)
- Thin Film Transistor (TFT) backlight inverter

### 1.4 Quick reference data

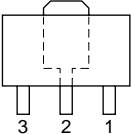
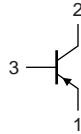
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	-20	V
$I_C$	collector current		-	-	-3	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	-5	A
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -2$ A; $I_B = -0.1$ A	[1]	-	-0.2	-0.5 V

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

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Symbol
1	emitter		
2	collector		
3	base		

006aaa231

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
2PB1424	SC-62	plastic surface-mounted package; collector pad for good heat transfer; 3 leads	SOT89

## 4. Marking

Table 4. Marking codes

Type number	Marking code
2PB1424	M1

## 5. Limiting values

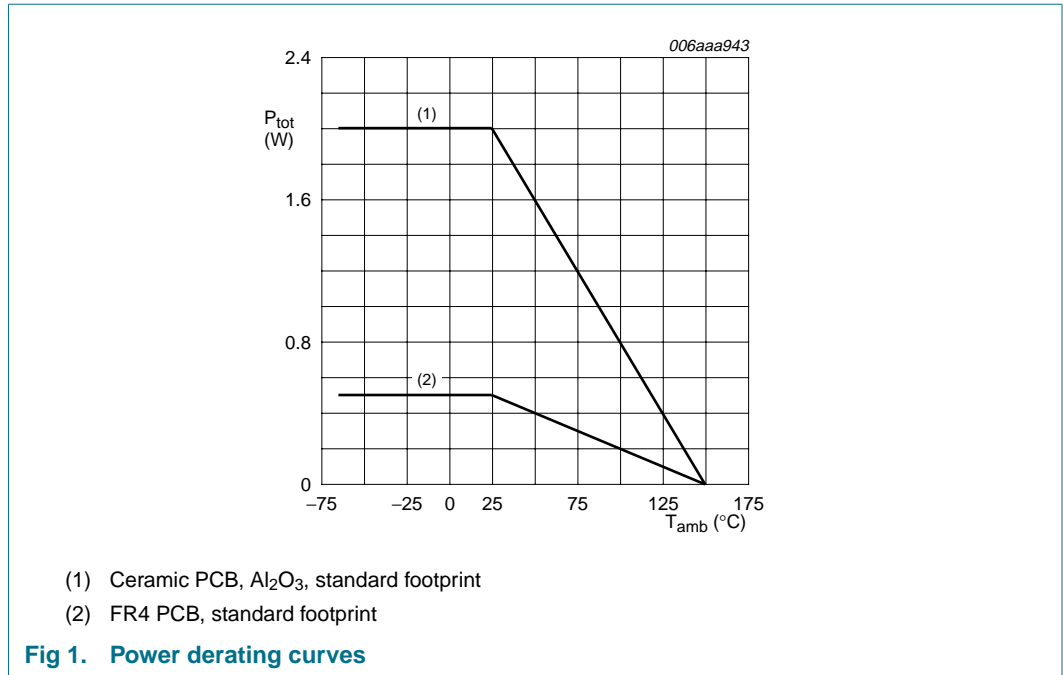
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit	
$V_{CBO}$	collector-base voltage	open emitter	-	-20	V	
$V_{CEO}$	collector-emitter voltage	open base	-	-20	V	
$V_{EBO}$	emitter-base voltage	open collector	-	-6	V	
$I_C$	collector current		-	-3	A	
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-5	A	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.5	W
			[2]	-	2	W
$T_j$	junction temperature		-	150	°C	
$T_{amb}$	ambient temperature		-65	+150	°C	
$T_{stg}$	storage temperature		-65	+150	°C	

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

[2] Device mounted on a ceramic PCB,  $Al_2O_3$ , standard footprint.



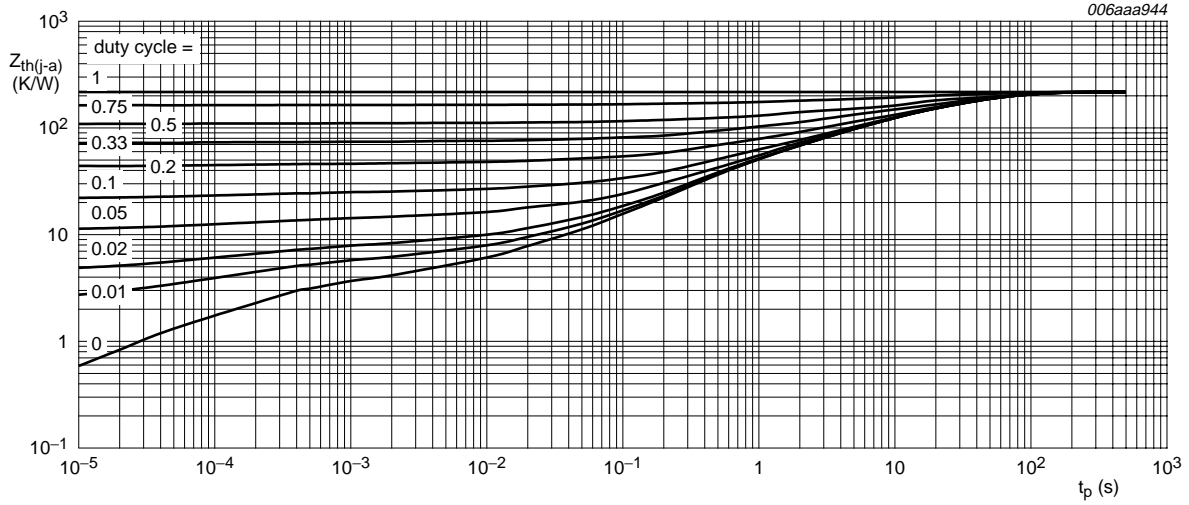
## 6. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	250	K/W
			[2]	-	62	K/W

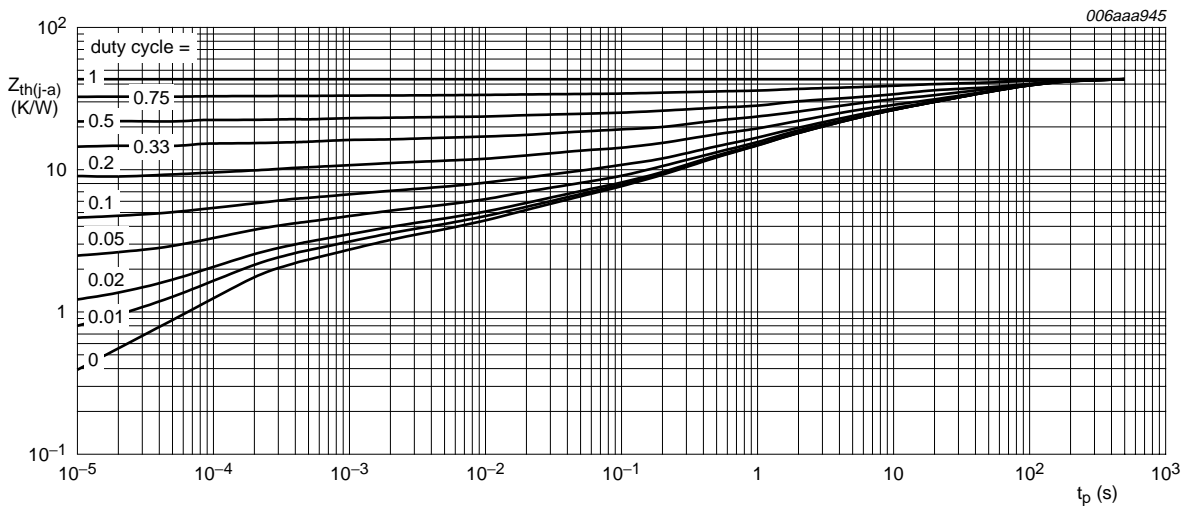
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



FR4 PCB, standard footprint

Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



Ceramic PCB,  $Al_2O_3$ , standard footprint

Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

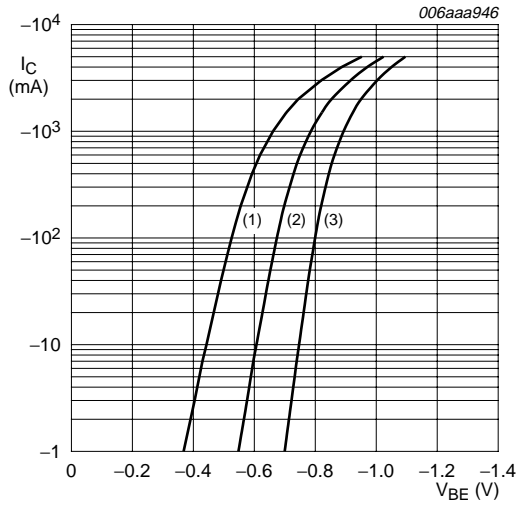
## 7. Characteristics

**Table 7. Characteristics**

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

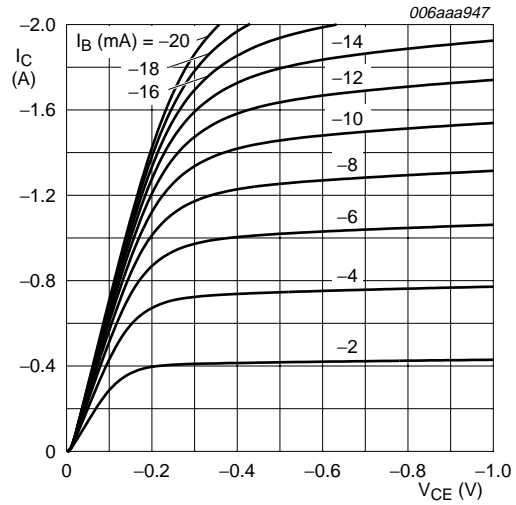
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -20\text{ V}$ ; $I_E = 0\text{ A}$	-	-	-0.1	$\mu\text{A}$	
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\text{ V}$ ; $I_C = 0\text{ A}$	-	-	-0.1	$\mu\text{A}$	
$h_{FE}$	DC current gain	$V_{CE} = -2\text{ V}$ ; $I_C = -0.1\text{ A}$	180	-	390		
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -2\text{ A}$ ; $I_B = -0.1\text{ A}$	[1]	-	-0.2	-0.5	V
$f_T$	transition frequency	$V_{CE} = -2\text{ V}$ ; $I_E = 0.5\text{ A}$ ; $f = 100\text{ MHz}$	-	125	-		MHz
$C_{ib}$	common-base input capacitance	$V_{EB} = -5\text{ V}$ ; $I_E = i_e = 0\text{ A}$ ; $f = 1\text{ MHz}$	-	130	-		pF
$C_{ob}$	common-base output capacitance	$V_{CB} = -10\text{ V}$ ; $I_E = i_e = 0\text{ A}$ ; $f = 1\text{ MHz}$	-	37	-		pF

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



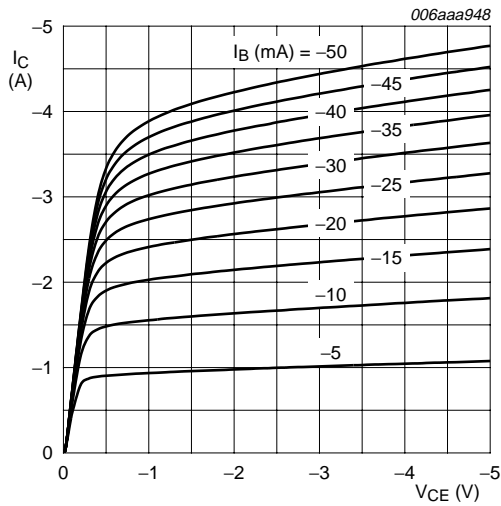
$V_{CE} = -2\text{ V}$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

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



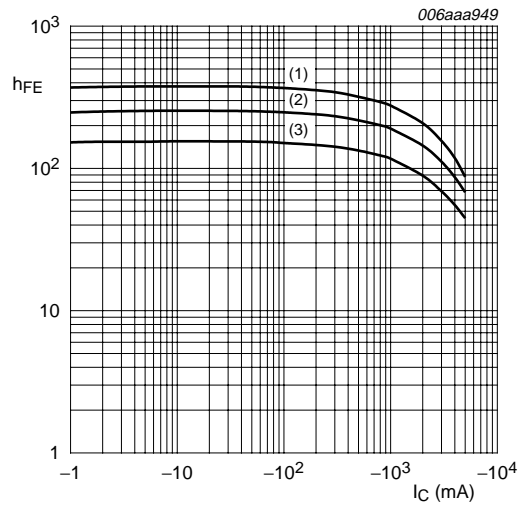
$T_{amb} = 25\text{ °C}$

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



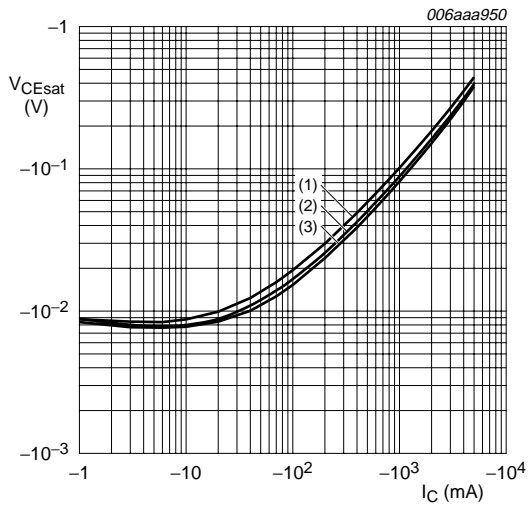
$T_{amb} = 25\text{ °C}$

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



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

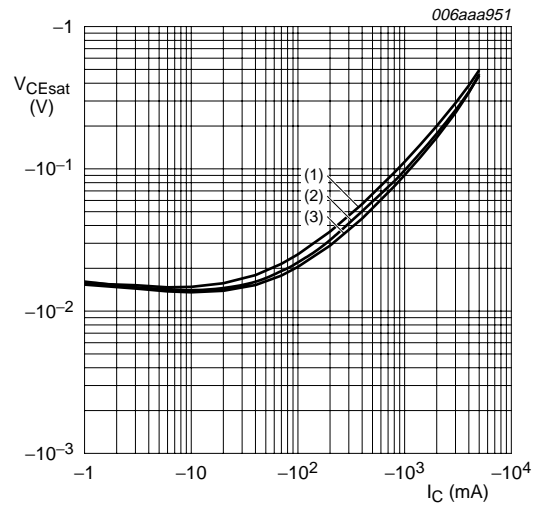
**Fig 7. DC current gain as a function of collector current; typical values**



$I_C/I_B = 10$

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

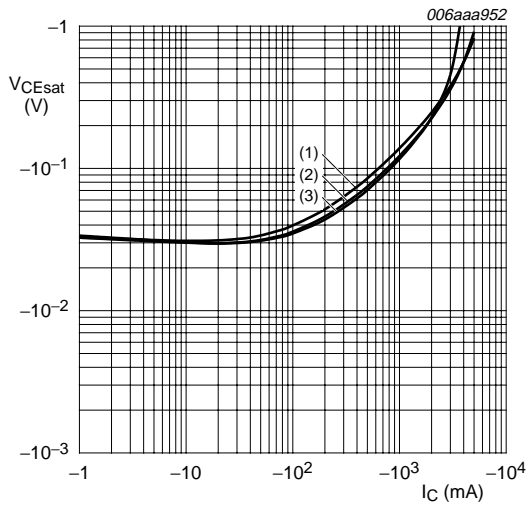
**Fig 8. Collector-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 20$

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

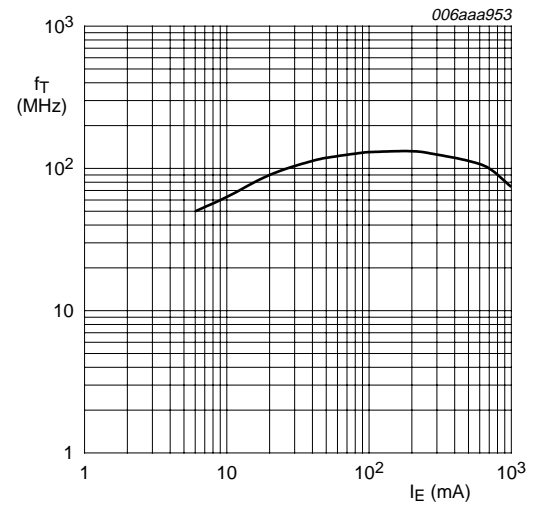
**Fig 9. Collector-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 50$

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

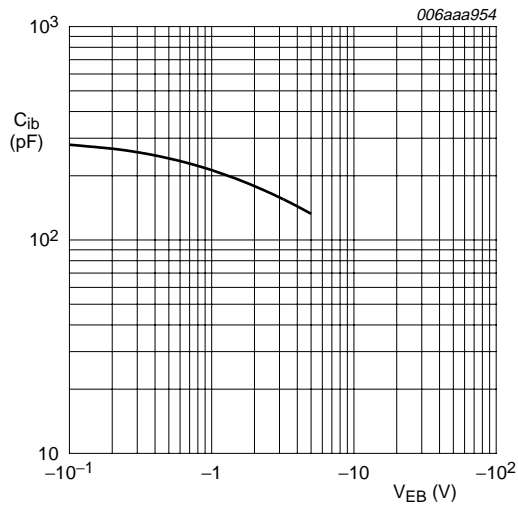
**Fig 10. Collector-emitter saturation voltage as a function of collector current; typical values**



$T_{amb} = 25\text{ °C}; V_{CE} = -2\text{ V}$

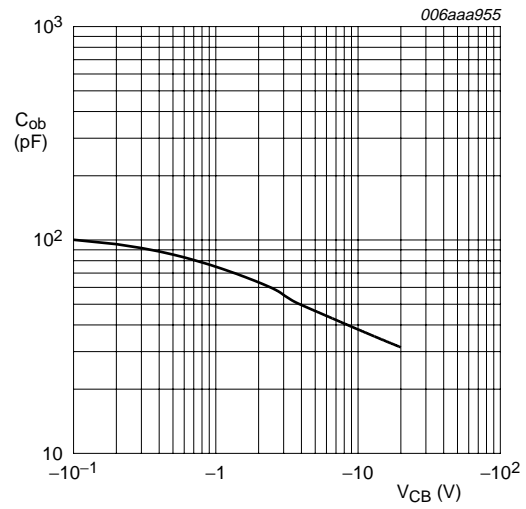
**Fig 11. Transition frequency as a function of emitter current; typical values**





$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $f = 1\text{ MHz}$ ;  $I_E = I_e = 0\text{ A}$

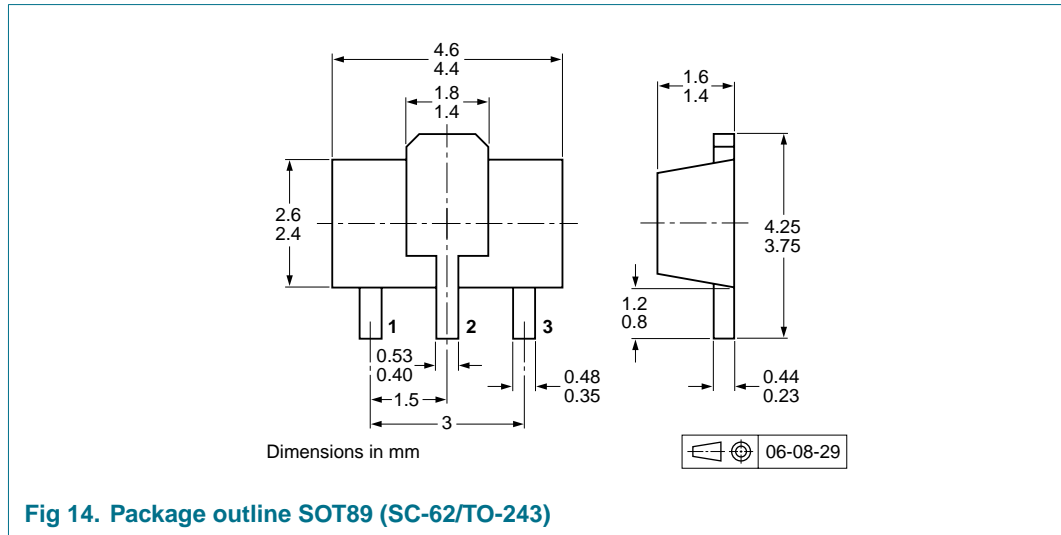
**Fig 12. Common-base input capacitance as a function of emitter-base voltage; typical values**



$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $f = 1\text{ MHz}$ ;  $I_E = I_e = 0\text{ A}$

**Fig 13. Common-base output capacitance as a function of collector-base voltage; typical values**

### 8. Package outline



### 9. Packing information

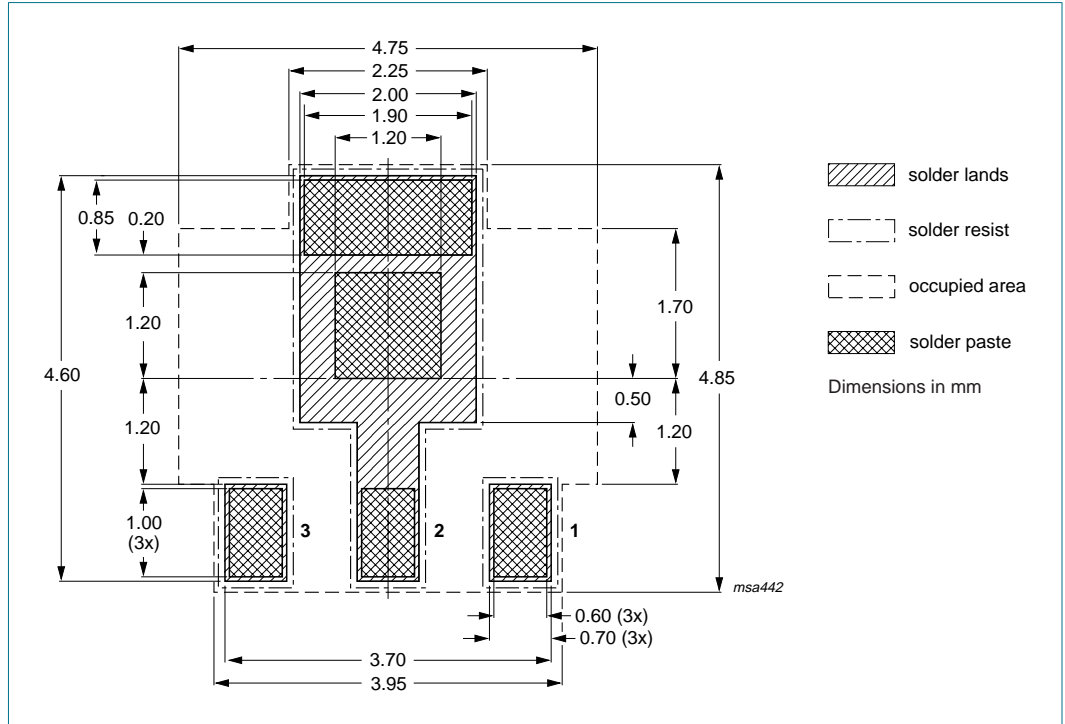
**Table 8. Packing methods**

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

Type number	Package	Description	Packing quantity	
			1000	4000
2PB1424	SOT89	8 mm pitch, 12 mm tape and reel	-115	-135

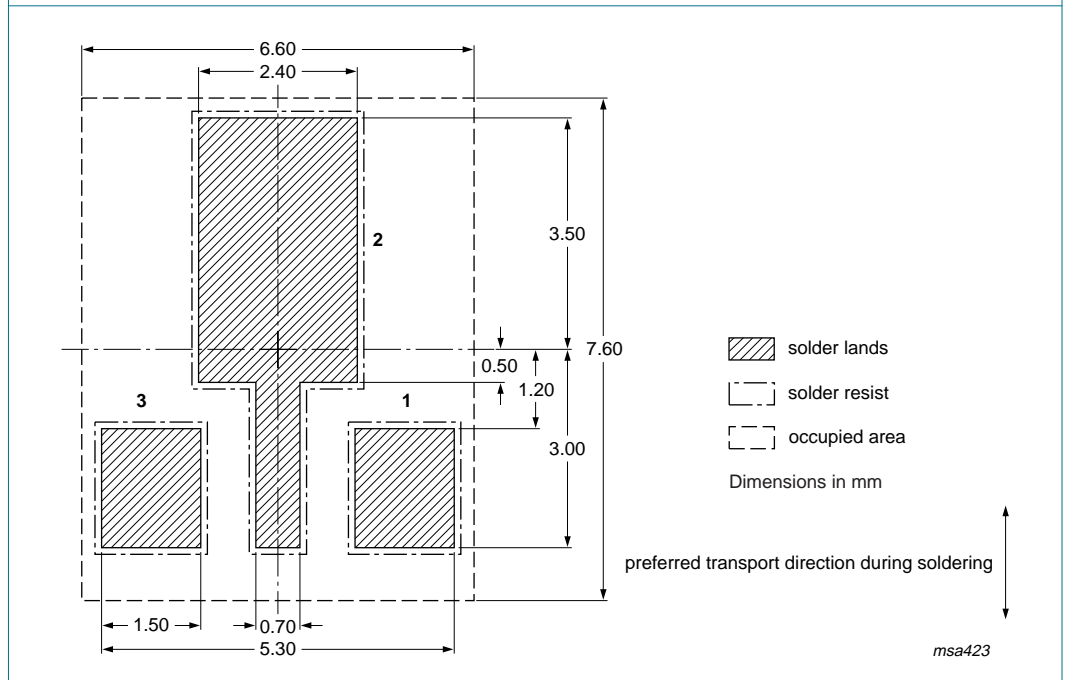
[1] For further information and the availability of packing methods, see [Section 13](#).

10. Soldering



SOT89 standard mounting conditions for reflow soldering

Fig 15. Reflow soldering footprint SOT89 (SC-62/TO-243)



Not recommended for wave soldering

Fig 16. Wave soldering footprint SOT89 (SC-62/TO-243)

## 11. Revision history

**Table 9. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
2PB1424_2	20070115	Product data sheet	-	2PB1424_1
Modifications:	<ul style="list-style-type: none"> <li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• <a href="#">Table 1 “Quick reference data”</a>: <math>I_C</math> collector current added</li> <li>• <a href="#">Table 1 “Quick reference data”</a>: <math>I_{CM}</math> peak collector current maximum value adapted</li> <li>• <a href="#">Table 1 “Quick reference data”</a>: <math>V_{CEsat}</math> collector-emitter saturation voltage added</li> <li>• <a href="#">Table 5 “Limiting values”</a>: <math>V_{CBO}</math> collector-base voltage maximum value adapted</li> <li>• <a href="#">Table 5 “Limiting values”</a>: <math>V_{EBO}</math> emitter-base voltage maximum value adapted</li> <li>• <a href="#">Table 5 “Limiting values”</a>: <math>I_C</math> collector current maximum value adapted</li> <li>• <a href="#">Table 5 “Limiting values”</a>: <math>I_{CM}</math> peak collector current maximum value adapted</li> <li>• <a href="#">Table 5 “Limiting values”</a>: <math>P_{tot}</math> total power dissipation for ceramic PCB condition added</li> <li>• <a href="#">Figure 1 “Power derating curves”</a>: adapted</li> <li>• <a href="#">Table 6 “Thermal characteristics”</a>: adapted</li> <li>• <a href="#">Table 6 “Thermal characteristics”</a>: <math>R_{th(j-a)}</math> thermal resistance from junction to ambient for ceramic PCB condition added</li> <li>• <a href="#">Figure 2</a>: <math>t_p</math> pulse time redefined to pulse duration</li> <li>• <a href="#">Figure 3</a>: added</li> <li>• <a href="#">Table 7 “Characteristics”</a>: <math>I_{CBO}</math> collector-base cut-off current conditions adapted</li> <li>• <a href="#">Table 7 “Characteristics”</a>: <math>V_{CEsat}</math> collector-emitter saturation voltage typical value added</li> <li>• <a href="#">Table 7 “Characteristics”</a>: <math>f_T</math> transition frequency conditions and typical value adapted</li> <li>• <a href="#">Table 7 “Characteristics”</a>: <math>C_{ib}</math> common-base input capacitance added</li> <li>• <a href="#">Table 7 “Characteristics”</a>: <math>C_{ob}</math> common-base output capacitance added</li> <li>• <a href="#">Figure 4</a>, <a href="#">6</a>, <a href="#">10</a>, <a href="#">11</a>, <a href="#">12</a>, <a href="#">13</a> and <a href="#">16</a>: added</li> <li>• <a href="#">Figure 5</a>, <a href="#">7</a>, <a href="#">8</a> and <a href="#">9</a>: adapted</li> <li>• <a href="#">Section 12 “Legal information”</a>: updated</li> </ul>			
2PB1424_1	20050502	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: 15 January 2007

Document identifier: 2PB1424\_2

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