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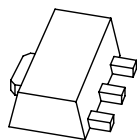
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Kind regards,

Team Nexperia



# 2PD2150

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

Rev. 02 — 2 January 2007

Product data sheet

## 1. Product profile

### 1.1 General description

NPN 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.

PNP complement: 2PB1424.

### 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

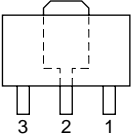
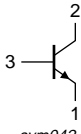
Table 1. Quick reference data

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		 sym042
2	collector		
3	base		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
2PD2150	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
2PD2150	M2

## 5. Limiting values

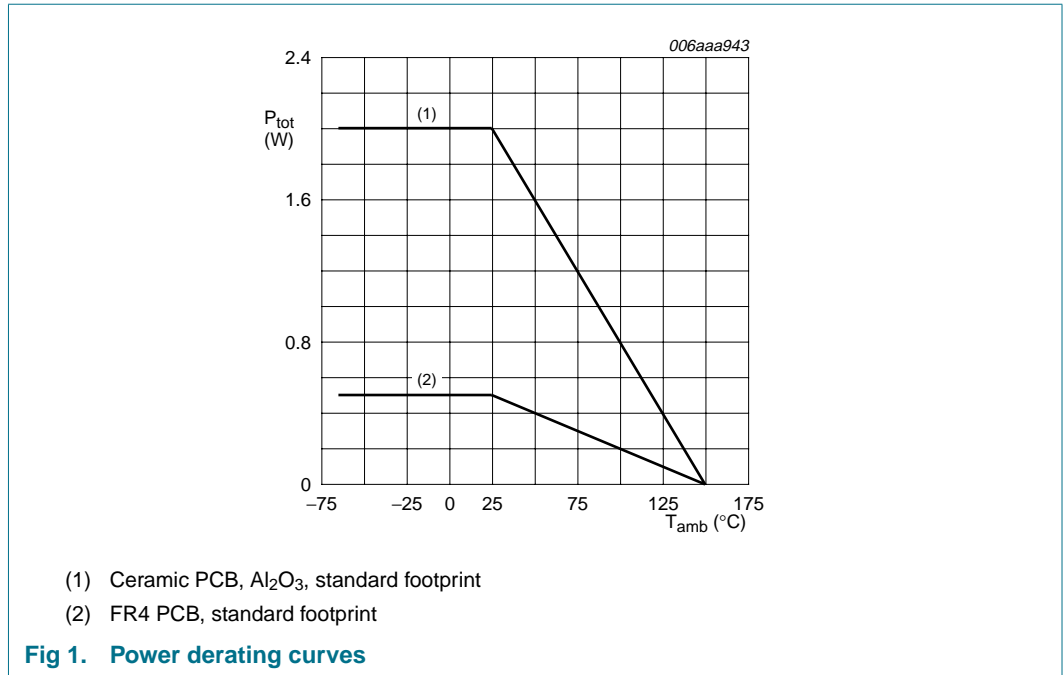
Table 5. Limiting values

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	-	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.



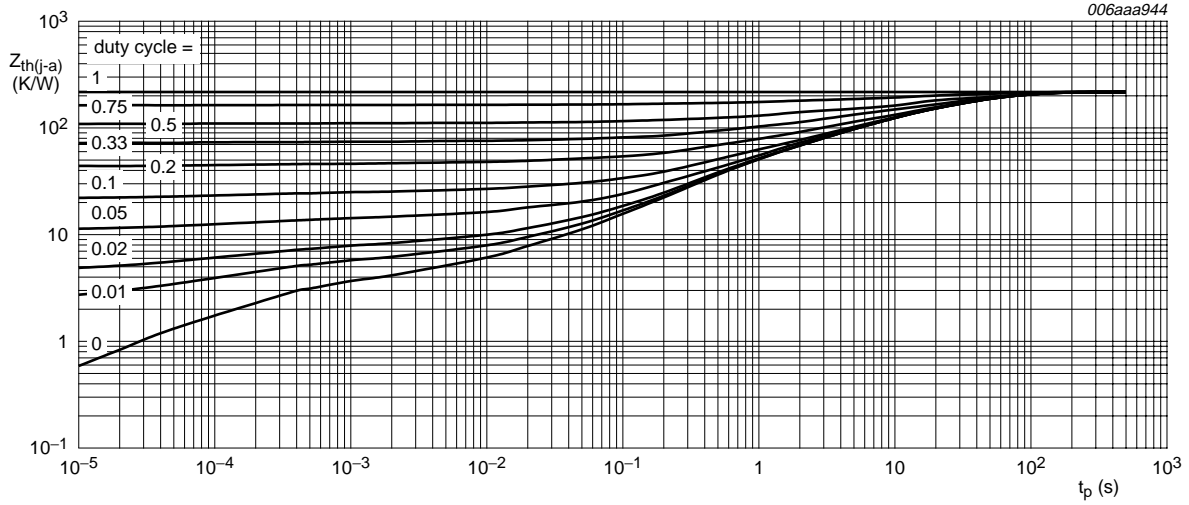
## 6. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	250	K/W
			[2]	-	62	K/W

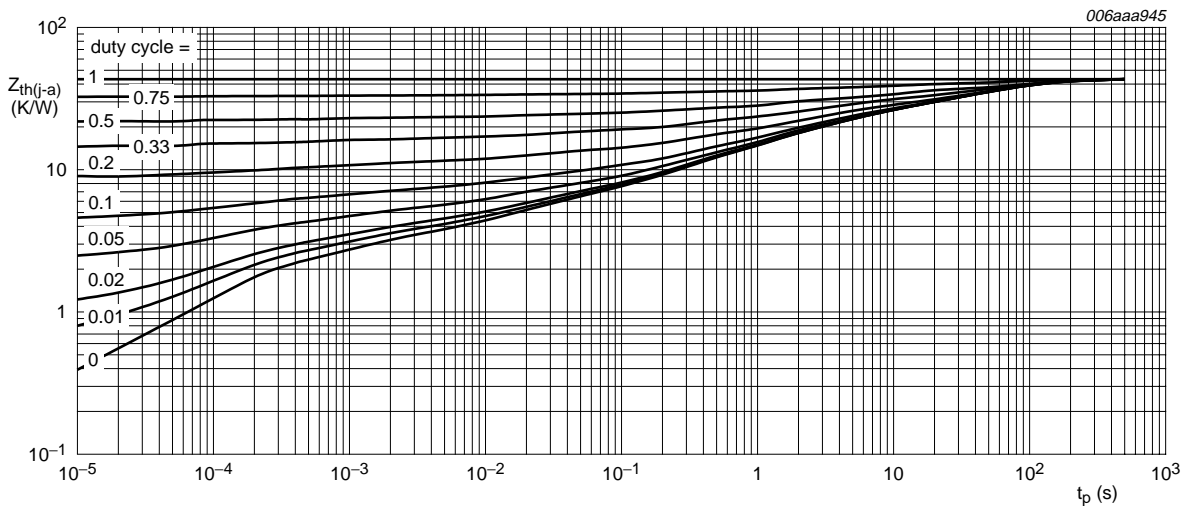
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[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<sub>2</sub>O<sub>3</sub>, standard footprint

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

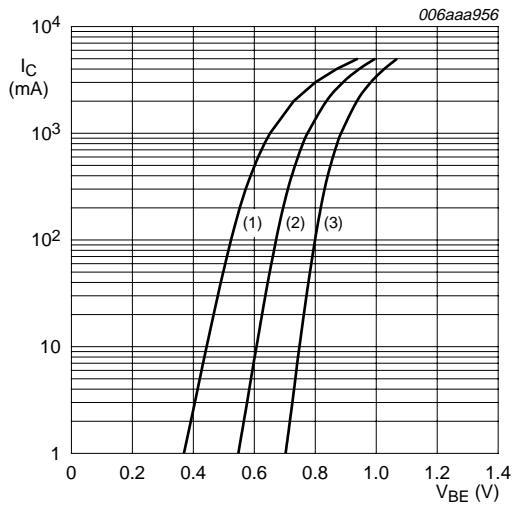
## 7. Characteristics

**Table 7. Characteristics**

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

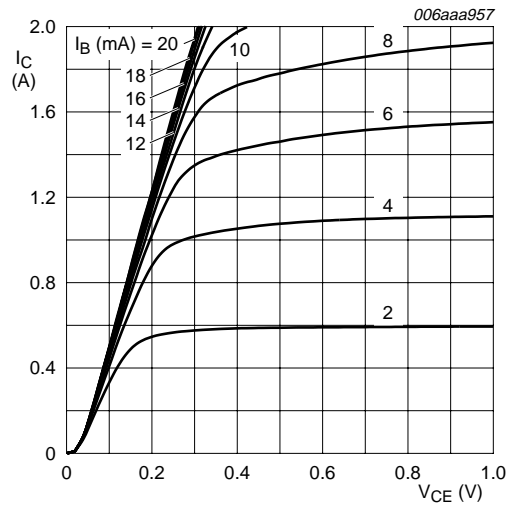
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 30\text{ V}; I_E = 0\text{ A}$	-	-	0.1	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	0.1	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = 2\text{ V}; I_C = 0.1\text{ A}$	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	$V_{CE} = 2\text{ V}; I_E = -0.5\text{ A};$ $f = 100\text{ MHz}$	-	220	-	MHz
$C_{ib}$	common-base input capacitance	$V_{EB} = 5\text{ V}; I_E = i_e = 0\text{ A};$ $f = 1\text{ MHz}$	-	180	-	pF
$C_{ob}$	common-base output capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A};$ $f = 1\text{ MHz}$	-	20	-	pF

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



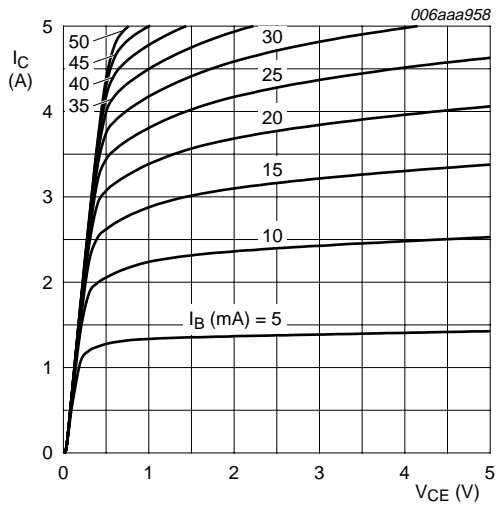
$V_{CE} = 2\text{ V}$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

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



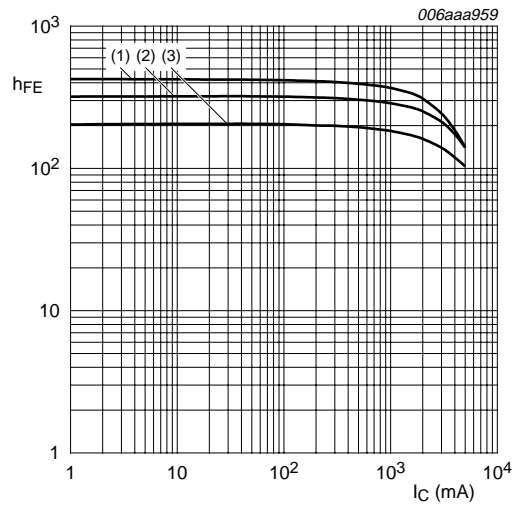
$T_{amb} = 25\text{ °C}$

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



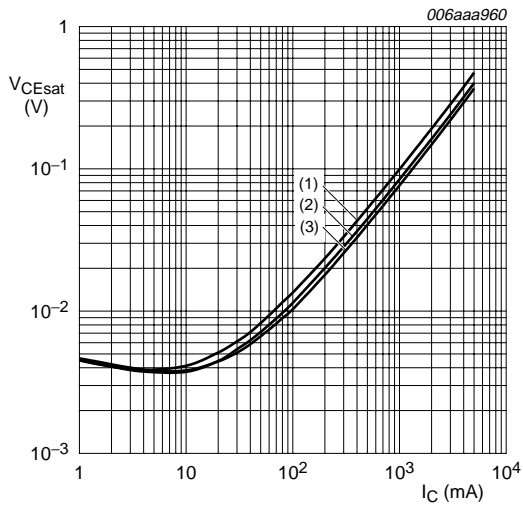
$T_{amb} = 25\text{ °C}$

**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)  $T_{amb} = -40\text{ °C}$

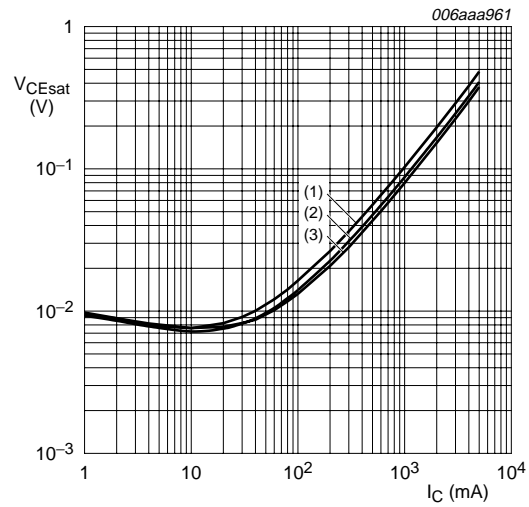
**Fig 7. DC current gain as a function of collector current; typical values**



$I_C/I_B = 10$

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

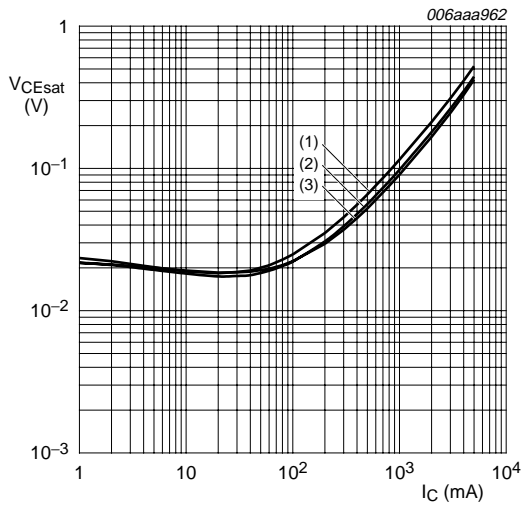
**Fig 8. Collector-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 20$

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

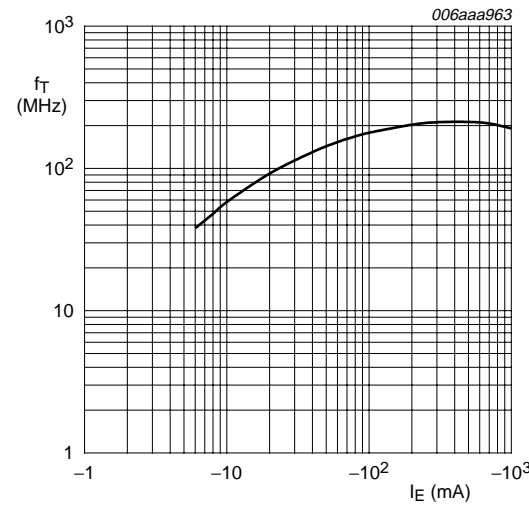
**Fig 9. Collector-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 50$

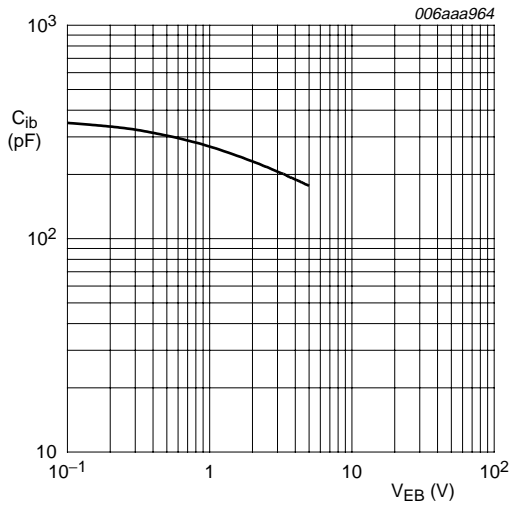
- (1)  $T_{amb} = 100\text{ °C}$
- (2)  $T_{amb} = 25\text{ °C}$
- (3)  $T_{amb} = -40\text{ °C}$

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



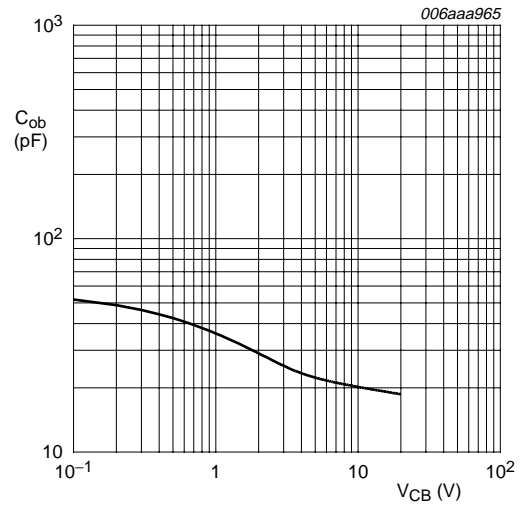
$T_{amb} = 25\text{ °C}; V_{CE} = 2\text{ V}$

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



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

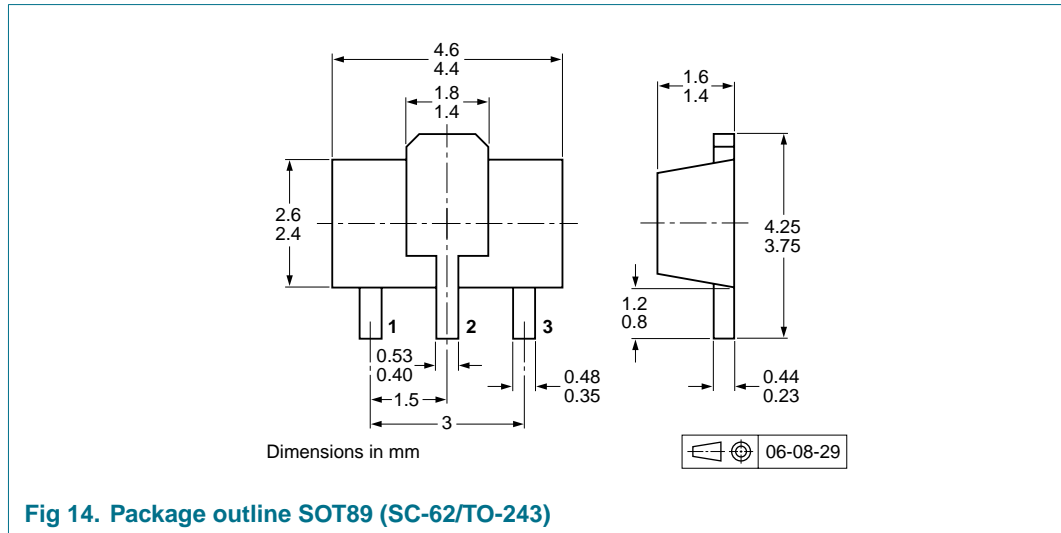
**Fig 12. Common-base input capacitance as a function of emitter-base voltage; typical values**



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

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

## 8. Package outline



## 9. Packing information

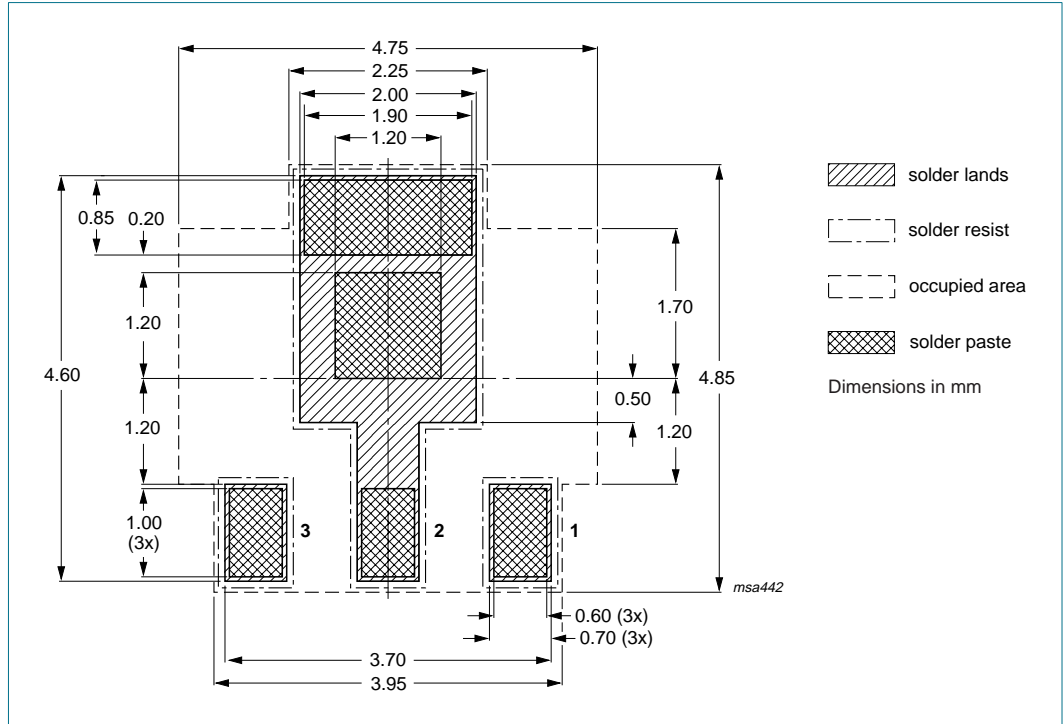
**Table 8. Packing methods**

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

Type number	Package	Description	Packing quantity	
			1000	4000
2PD2150	SOT89	8 mm pitch, 12 mm tape and reel	-115	-135

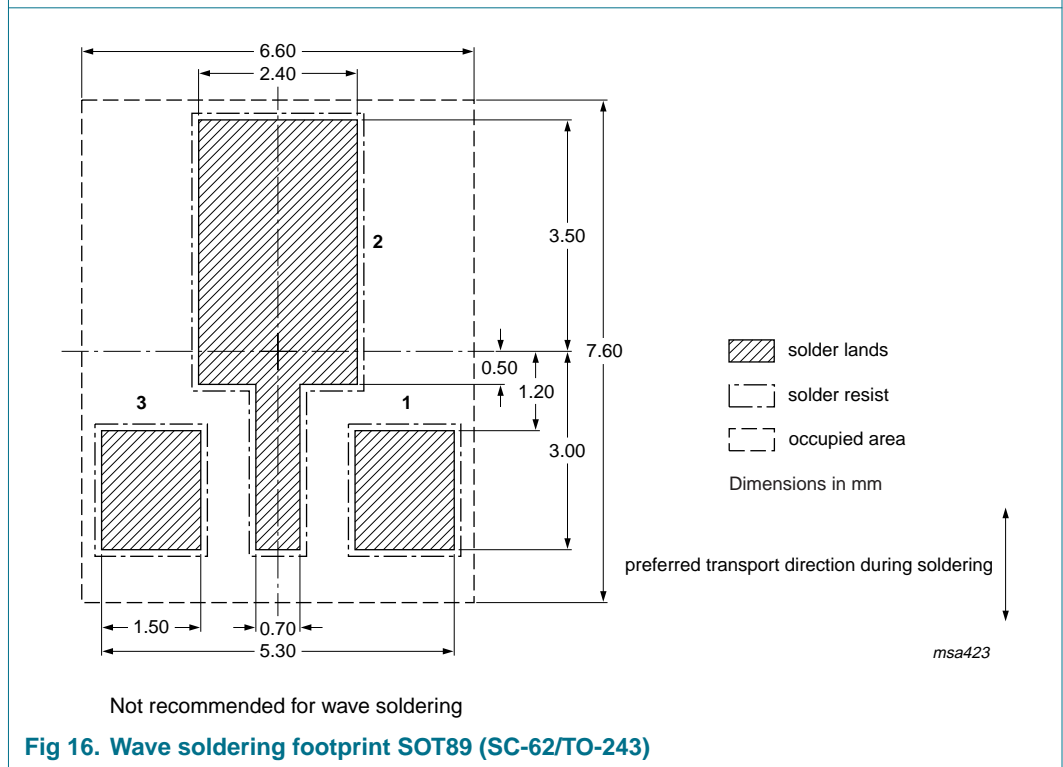
[1] For further information and the availability of packing methods, see [Section 13](#).

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
2PD2150_2	20070102	Product data sheet	-	2PD2150_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_{CEO}</math> collector-emitter 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>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 slightly changed</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>			
2PD2150_1	20050422	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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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