

# PDTD113ZT

NPN 500 mA, 50 V resistor-equipped transistor;  
R1 = 1 k $\Omega$ , R2 = 10 k $\Omega$

Rev. 02 — 23 March 2009

Product data sheet

## 1. Product profile

### 1.1 General description

NPN 500 mA Resistor-Equipped Transistor (RET) in a small Surface-Mounted Device (SMD) plastic package.

PNP complement: PDTB113ZT.

### 1.2 Features

- Built-in bias resistors
- Simplifies circuit design
- 500 mA output current capability
- Reduces component count
- Reduces pick and place costs
- $\pm 10$  % resistor ratio tolerance

### 1.3 Applications

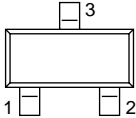
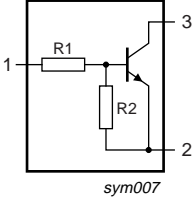
- Digital application in automotive and industrial segments
- Controlling IC inputs
- Cost-saving alternative for BC817 series in digital applications
- Switching loads

### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	50	V
I <sub>O</sub>	output current		-	-	500	mA
R1	bias resistor 1 (input)		0.7	1	1.3	k $\Omega$
R2/R1	bias resistor ratio		9	10	11	

2. Pinning information

Table 2. Pinning			
Pin	Description	Simplified outline	Graphic symbol
1	input (base)		
2	GND (emitter)		
3	output (collector)		

3. Ordering information

Table 3. Ordering information			
Type number	Package		
	Name	Description	Version
PDTD113ZT	-	plastic surface-mounted package; 3 leads	SOT23

4. Marking

Table 4. Marking codes	
Type number	Marking code <sup>[1]</sup>
PDTD113ZT	*7V

[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 <sub>CBO</sub>	collector-base voltage	open emitter	-	50	V
V <sub>CEO</sub>	collector-emitter voltage	open base	-	50	V
V <sub>EBO</sub>	emitter-base voltage	open collector	-	5	V
V <sub>I</sub>	input voltage				
	positive		-	+10	V
	negative		-	-5	V
I <sub>O</sub>	output current		-	500	mA

**Table 5. Limiting values ...continued***In accordance with the Absolute Maximum Rating System (IEC 60134).*

Symbol	Parameter	Conditions	Min	Max	Unit
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1] -	250	mW
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-65	+150	°C
$T_{stg}$	storage temperature		-65	+150	°C

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

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

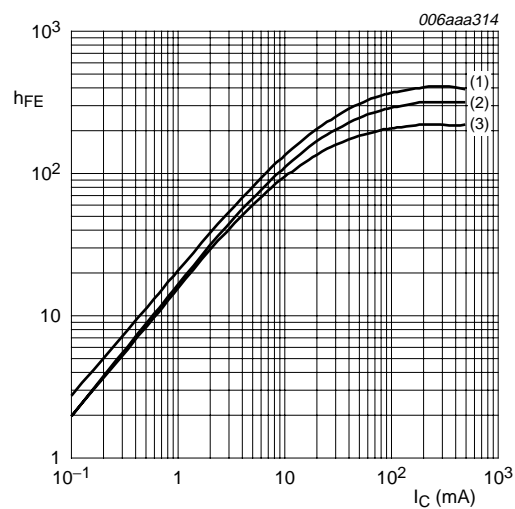
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] -	-	500	K/W

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

## 7. Characteristics

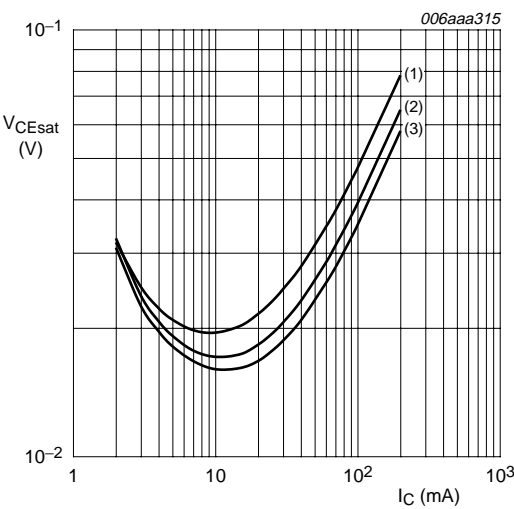
**Table 7. Characteristics** *$T_{amb} = 25\text{ °C}$  unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 40\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 50\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
$I_{CEO}$	collector-emitter cut-off current	$V_{CE} = 50\text{ V}; I_B = 0\text{ A}$	-	-	0.5	μA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	0.8	mA
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 50\text{ mA}$	70	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 50\text{ mA}; I_B = 2.5\text{ mA}$	-	-	0.3	V
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5\text{ V}; I_C = 100\text{ μA}$	0.3	0.6	1	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 20\text{ mA}$	0.4	0.8	1.4	V
R1	bias resistor 1 (input)		0.7	1	1.3	kΩ
R2/R1	bias resistor ratio		9	10	11	
$C_c$	collector capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A};$ $f = 100\text{ MHz}$	-	7	-	pF



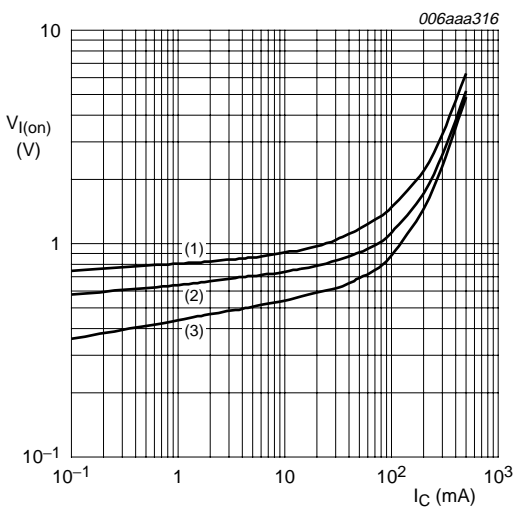
- $V_{CE} = 5\text{ V}$
- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

Fig 1. DC current gain as a function of collector current; typical values



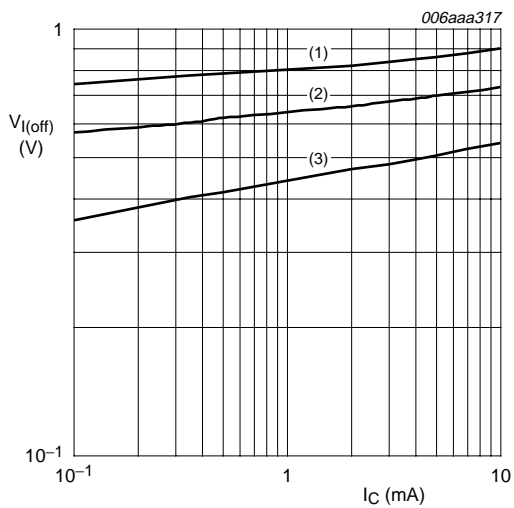
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

Fig 2. 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)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

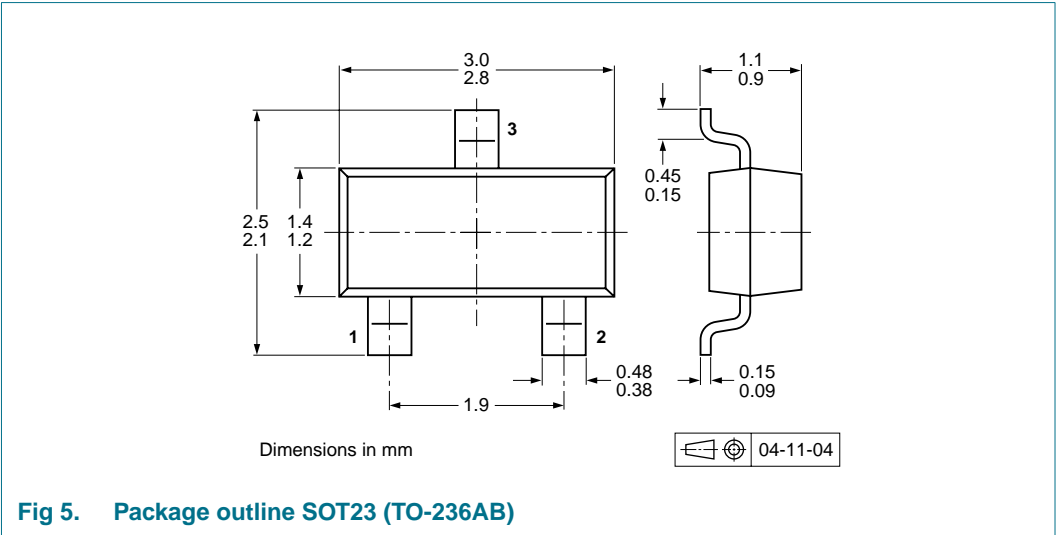
Fig 3. On-state input voltage as a function of collector current; typical values



- $V_{CE} = 5\text{ V}$
- (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 4. Off-state input voltage as a function of collector current; 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	
			3000	10000
PDTD113ZT	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

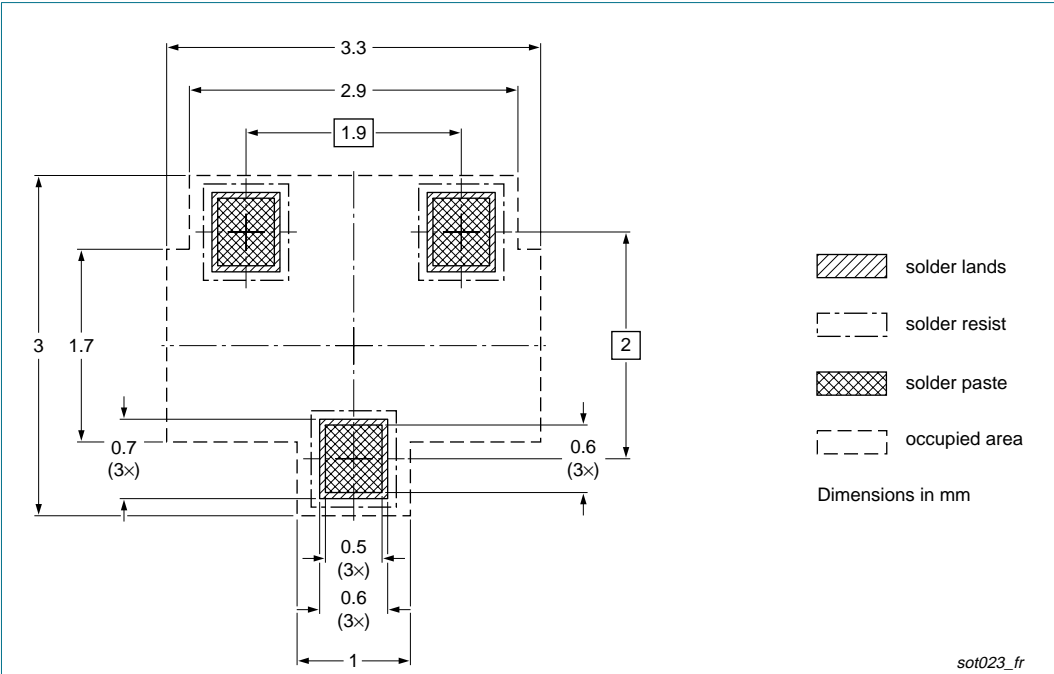


Fig 6. Reflow soldering footprint SOT23 (TO-236AB)

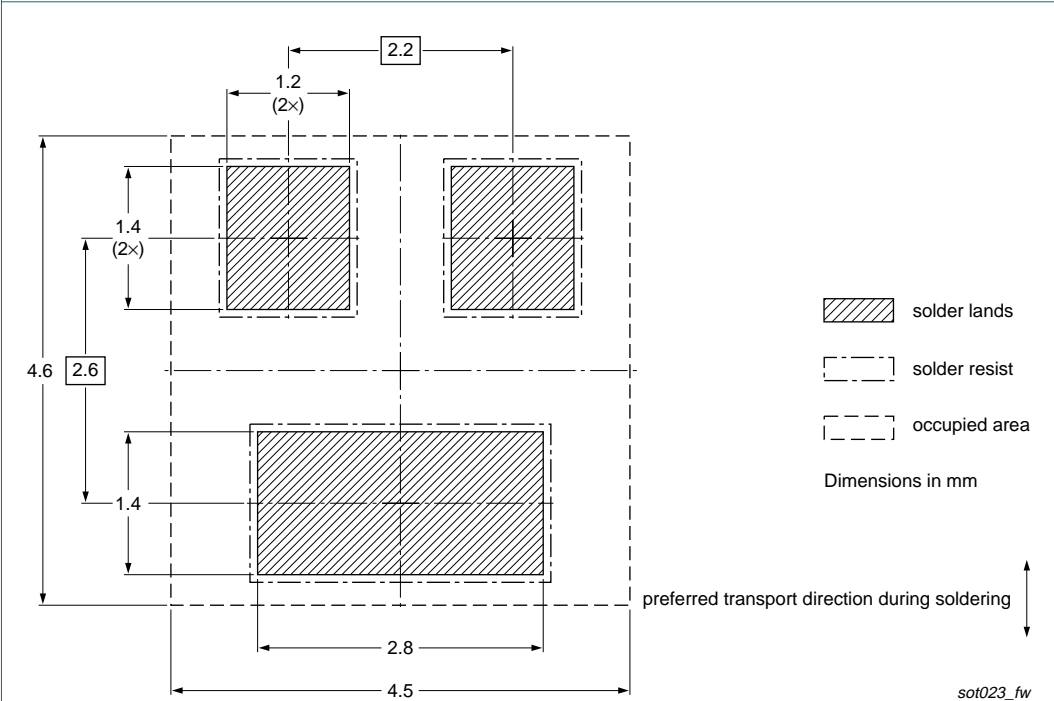


Fig 7. Wave soldering footprint SOT23 (TO-236AB)

## 11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PDTD113ZT_2	20090323	Product data sheet	-	PDTD113Z_SER_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>• Type numbers PDTD113ZK and PDTD113ZS removed</li><li>• <a href="#">Table 5 "Limiting values"</a>: typo for maximum value of <math>V_I</math> positive corrected</li><li>• <a href="#">Section 10 "Soldering"</a>: added</li><li>• <a href="#">Section 12 "Legal information"</a>: updated</li></ul>			
PDTD113Z_SER_1	20050405	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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