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Kind regards,

Team Nexperia

# PDTD123T series

NPN 500 mA, 50 V resistor-equipped transistors;  
R1 = 2.2 k $\Omega$ , R2 = open

Rev. 03 — 16 November 2009

Product data sheet

## 1. Product profile

### 1.1 General description

500 mA NPN Resistor-Equipped Transistors (RET) family.

Table 1. Product overview

Type number	Package			PNP complement
	NXP	JEITA	JEDEC	
PDTD123TK	SOT346	SC-59A	TO-236	PDTB123TK
PDTD123TS <sup>[1]</sup>	SOT54	SC-43A	TO-92	PDTB123TS
PDTD123TT	SOT23	-	TO-236AB	PDTB123TT

[1] Also available in SOT54A and SOT54 variant packages (see [Section 2](#)).

### 1.2 Features

- Built-in bias resistors
- Simplifies circuit design
- 500 mA output current capability
- Reduces component count
- Reduces pick and place costs

### 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 2. 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)		1.54	2.2	2.86	k $\Omega$

## 2. Pinning information

**Table 3. Pinning**

Pin	Description	Simplified outline	Symbol
<b>SOT54</b>			
1	input (base)		
2	output (collector)		
3	GND (emitter)		
<b>SOT54A</b>			
1	input (base)		
2	output (collector)		
3	GND (emitter)		
<b>SOT54 variant</b>			
1	input (base)		
2	output (collector)		
3	GND (emitter)		
<b>SOT23, SOT346</b>			
1	input (base)		
2	GND (emitter)		
3	output (collector)		

### 3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PDTD123TK	SC-59A	plastic surface mounted package; 3 leads	SOT346
PDTD123TS <sup>[1]</sup>	SC-43A	plastic single-ended leaded (through hole) package; 3 leads	SOT54
PDTD123TT	-	plastic surface mounted package; 3 leads	SOT23

[1] Also available in SOT54A and SOT54 variant packages (see [Section 2](#) and [Section 9](#)).

### 4. Marking

Table 5. Marking codes

Type number	Marking code <sup>[1]</sup>
PDTD123TK	E9
PDTD123TS	TD123TS
PDTD123TT	*1T

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

### 5. Limiting values

Table 6. 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	-	50	V
$V_{CEO}$	collector-emitter voltage	open base	-	50	V
$V_{EBO}$	emitter-base voltage	open collector	-	5	V
$V_I$	input voltage				
	positive		-	+12	V
	negative		-	-5	V
$I_O$	output current		-	500	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	<sup>[1]</sup>		
	SOT346		-	250	mW
	SOT54		-	500	mW
	SOT23		-	250	mW
$T_{stg}$	storage temperature		-65	+150	$^\circ\text{C}$
$T_j$	junction temperature		-	150	$^\circ\text{C}$
$T_{amb}$	ambient temperature		-65	+150	$^\circ\text{C}$

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

## 6. Thermal characteristics

**Table 7. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]			
	SOT346		-	-	500	K/W
	SOT54		-	-	250	K/W
	SOT23		-	-	500	K/W

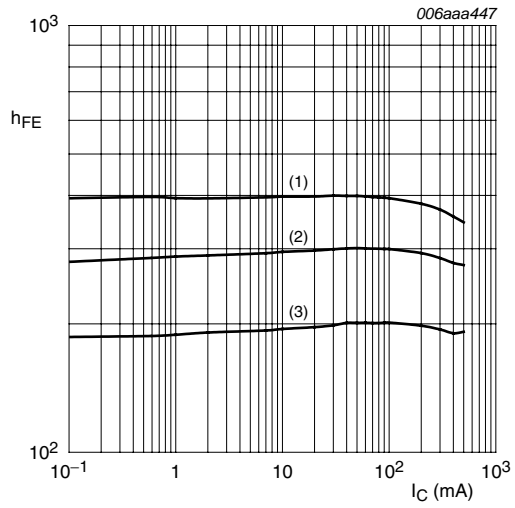
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

## 7. Characteristics

**Table 8. Characteristics**

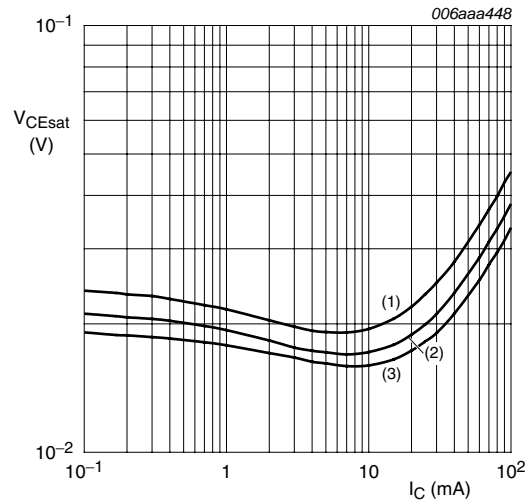
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 40\text{ V}; I_E = 0\text{ A}$	-	-	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	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	100	nA
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 50\text{ mA}$	100	300	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 50\text{ mA}; I_B = 2.5\text{ mA}$	-	-	0.3	V
R1	bias resistor 1 (input)		1.54	2.2	2.86	k $\Omega$
$C_c$	collector capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A};$ $f = 1\text{ MHz}$	-	7	-	pF



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

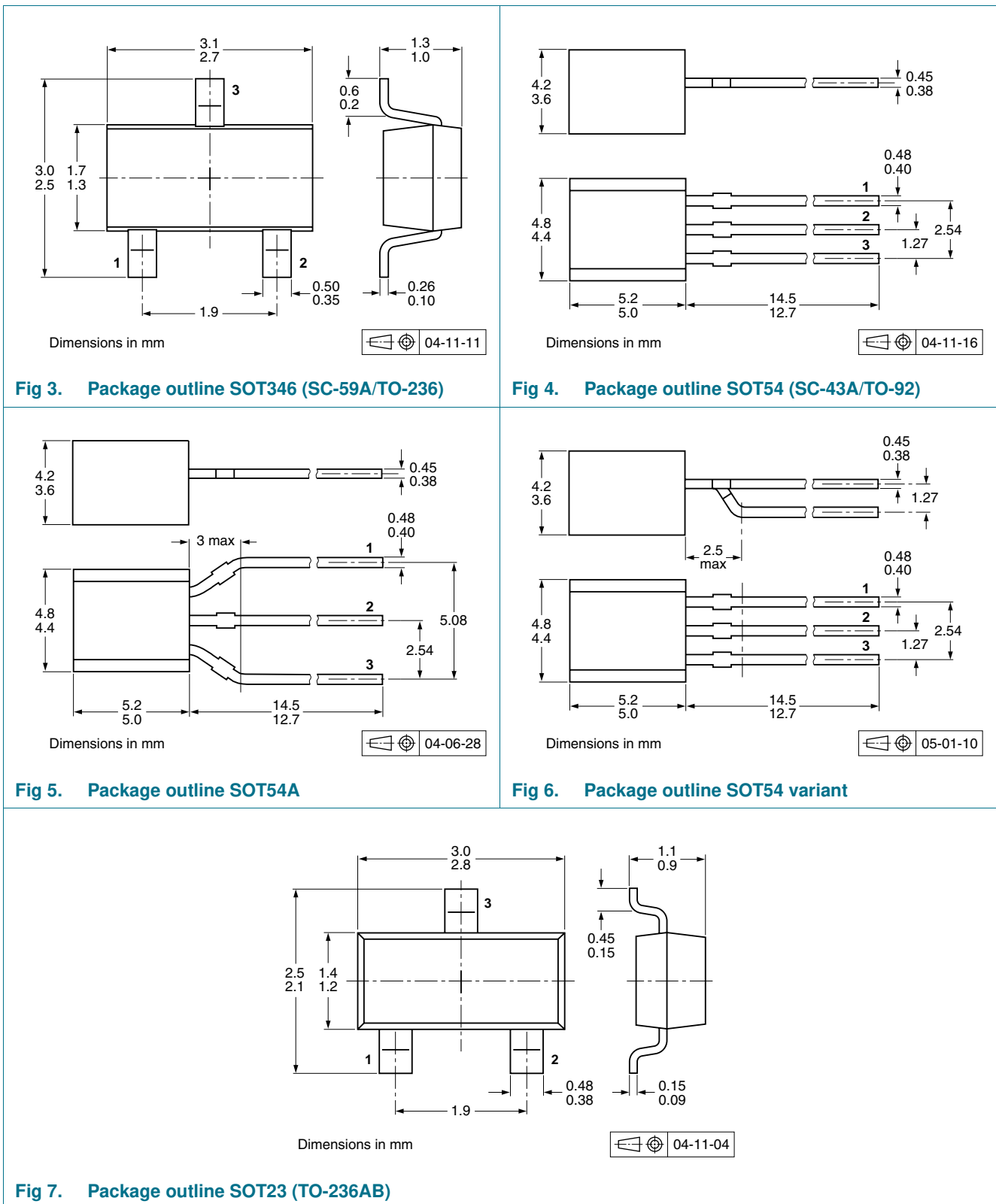
**Fig 1. DC current gain as a function of collector current; typical values**



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

**Fig 2. Collector-emitter saturation voltage as a function of collector current; typical values**

## 8. Package outline



## 9. Packing information

**Table 9. 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	5000	10000
PDTD123TK	SOT346	4 mm pitch, 8 mm tape and reel	-115	-	-135
PDTD123TS	SOT54	bulk, straight leads	-	-412	-
	SOT54A	tape and reel, wide pitch	-	-	-116
		tape ammopack, wide pitch	-	-	-126
	SOT54 variant	bulk, delta pinning	-	-112	-
PDTD123TT	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-235

[1] For further information and the availability of packing methods, see [Section 12](#).



## 10. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PDTD123T_SER_3	20091116	Product data sheet	-	PDTD123T_SER_2
Modifications:	<ul style="list-style-type: none"><li>This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content</li></ul>			
PDTD123T_SER_2	20050721	Product data sheet	-	PDTD123T_SER_1
PDTD123T_SER_1	20050603	Product data sheet	-	-

## 11. Legal information

### 11.1 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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**13. Contents**

**1 Product profile . . . . . 1**

1.1 General description . . . . . 1

1.2 Features . . . . . 1

1.3 Applications . . . . . 1

1.4 Quick reference data . . . . . 1

**2 Pinning information . . . . . 2**

**3 Ordering information . . . . . 3**

**4 Marking . . . . . 3**

**5 Limiting values . . . . . 3**

**6 Thermal characteristics . . . . . 4**

**7 Characteristics . . . . . 4**

**8 Package outline . . . . . 6**

**9 Packing information . . . . . 7**

**10 Revision history . . . . . 8**

**11 Legal information . . . . . 9**

11.1 Data sheet status . . . . . 9

11.2 Definitions . . . . . 9

11.3 Disclaimers . . . . . 9

11.4 Trademarks . . . . . 9

**12 Contact information . . . . . 9**

**13 Contents . . . . . 10**

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