

# PDTC123T series

NPN resistor-equipped transistors;  $R1 = 2.2 \text{ k}\Omega$ ,  $R2 = \text{open}$

Rev. 01 — 10 March 2006

Product data sheet

## 1. Product profile

### 1.1 General description

NPN Resistor-Equipped Transistors (RET) family in Surface Mounted Device (SMD) plastic packages.

Table 1. Product overview

Type number	Package			PNP complement
	Philips	JEITA	JEDEC	
PDTC123TE	SOT416	SC-75	-	PDTA123TE
PDTC123TK	SOT346	SC-59A	TO-236	PDTA123TK
PDTC123TM	SOT883	SC-101	-	PDTA123TM
PDTC123TS <sup>[1]</sup>	SOT54	SC-43A	TO-92	PDTA123TS
PDTC123TT	SOT23	-	TO-236AB	PDTA123TT
PDTC123TU	SOT323	SC-70	-	PDTA123TU

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

### 1.2 Features

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

### 1.3 Applications

- Digital applications
- Control of IC inputs
- Cost-saving alternative for BC847 series in digital applications
- Switching loads

### 1.4 Quick reference data

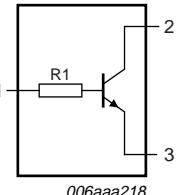
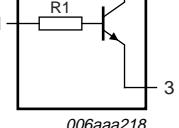
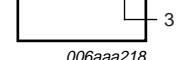
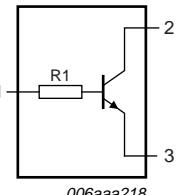
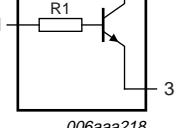
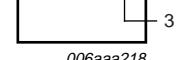
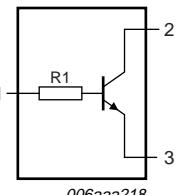
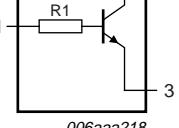
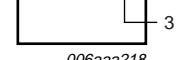
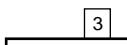
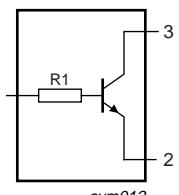
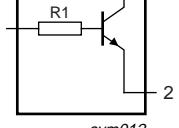
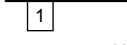
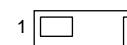
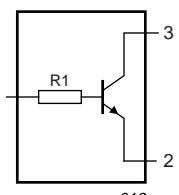
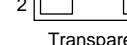
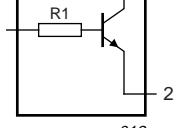
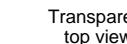
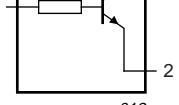
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	50	V
$I_o$	output current		-	-	100	mA
R1	bias resistor 1 (input)		1.54	2.2	2.86	$\text{k}\Omega$

**nexperia**

## 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; SOT323; SOT346; SOT416</b>			
1	input (base)		
2	GND (emitter)		
3	output (collector)		
<b>SOT883</b>			
1	input (base)		
2	GND (emitter)		
3	output (collector)		

### 3. Ordering information

Table 4. Ordering information

Type number	Package			Version
	Name	Description		
PDTC123TE	SC-75	plastic surface mounted package; 3 leads		SOT416
PDTC123TK	SC-59A	plastic surface mounted package; 3 leads		SOT346
PDTC123TM	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm		SOT883
PDTC123TS <sup>[1]</sup>	SC-43A	plastic single-ended leaded (through hole) package; 3 leads		SOT54
PDTC123TT	-	plastic surface mounted package; 3 leads		SOT23
PDTC123TU	SC-70	plastic surface mounted package; 3 leads		SOT323

[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>
PDTC123TE	2B
PDTC123TK	GB
PDTC123TM	FB
PDTC123TS	TC123T
PDTC123TT	ZM*
PDTC123TU	*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
$I_o$	output current		-	100	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1 \text{ ms}$	-	100	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25 \text{ }^{\circ}\text{C}$			
	SOT416		[1]	-	mW
	SOT346		[1]	-	mW
	SOT883		[2][3]	-	mW
	SOT54		[1]	-	mW
	SOT23		[1]	-	mW
	SOT323		[1]	-	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.

[2] Reflow soldering is the only recommended soldering method.

[3] Device mounted on an FR4 PCB with 60  $\mu\text{m}$  copper strip line, 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				
	SOT416		[1]	-	-	K/W
	SOT346		[1]	-	-	K/W
	SOT883		[2][3]	-	-	K/W
	SOT54		[1]	-	-	K/W
	SOT23		[1]	-	-	K/W
	SOT323		[1]	-	-	K/W

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

[2] Reflow soldering is the only recommended soldering method.

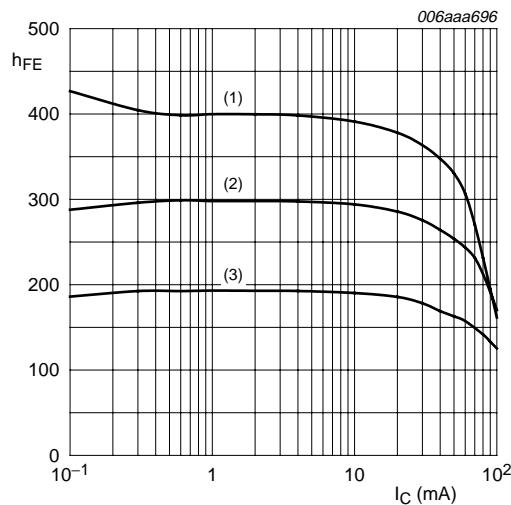
[3] Device mounted on an FR4 PCB with 60  $\mu\text{m}$  copper strip line, standard footprint.

## 7. Characteristics

**Table 8. Characteristics**

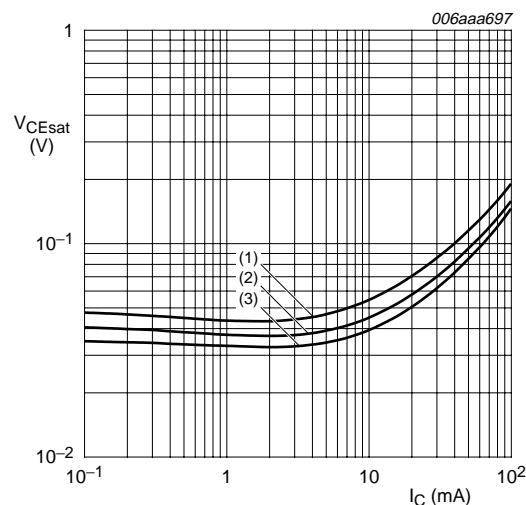
$T_{amb} = 25^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 50 \text{ V}$ ; $I_E = 0 \text{ A}$	-	-	100	nA
$I_{CEO}$	collector-emitter cut-off current	$V_{CE} = 30 \text{ V}$ ; $I_B = 0 \text{ A}$	-	-	1	$\mu\text{A}$
		$V_{CE} = 30 \text{ V}$ ; $I_B = 0 \text{ A}$ ; $T_j = 150^\circ\text{C}$	-	-	50	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5 \text{ V}$ ; $I_C = 0 \text{ A}$	-	-	100	nA
$h_{FE}$	DC current gain	$V_{CE} = 5 \text{ V}$ ; $I_C = 20 \text{ mA}$	30	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10 \text{ mA}$ ; $I_B = 0.5 \text{ mA}$	-	-	150	mV
$R1$	bias resistor 1 (input)			1.54	2.2	$\text{k}\Omega$
$C_c$	collector capacitance	$V_{CB} = 10 \text{ V}$ ; $I_E = i_e = 0 \text{ A}$ ; $f = 1 \text{ MHz}$	-	-	2.5	pF



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

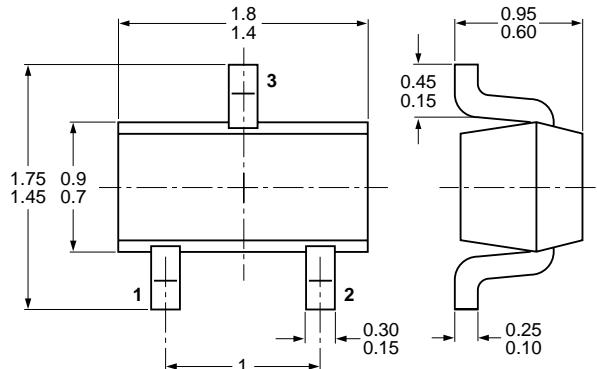
**Fig 1. DC current gain as a function of collector current; typical values**



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

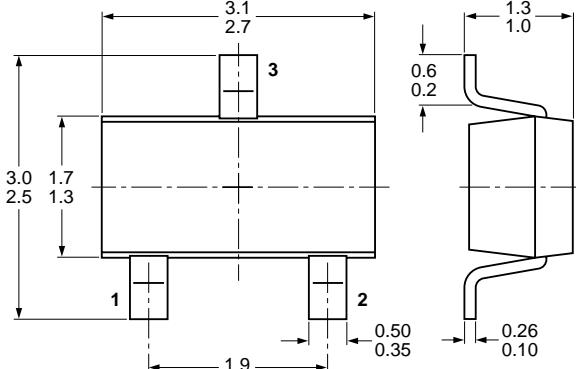
**Fig 2. Collector-emitter saturation voltage as a function of collector current; typical values**

## 8. Package outline



Dimensions in mm

04-11-04

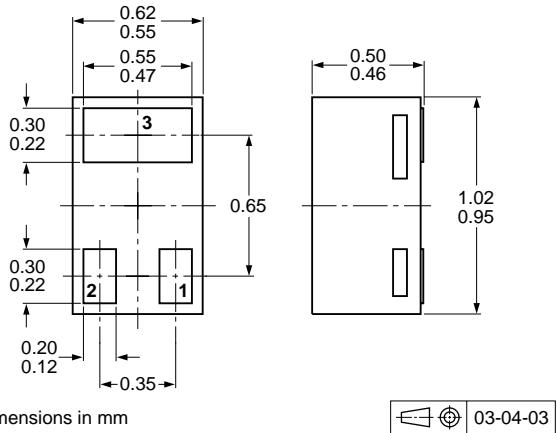


Dimensions in mm

04-11-11

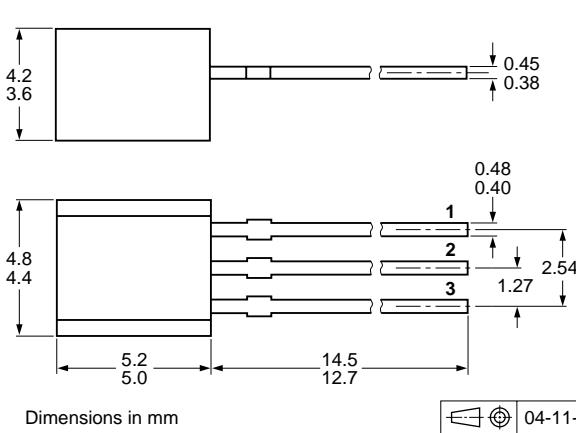
Fig 3. Package outline SOT416 (SC-75)

Fig 4. Package outline SOT346 (SC-59A/TO-236)



Dimensions in mm

03-04-03

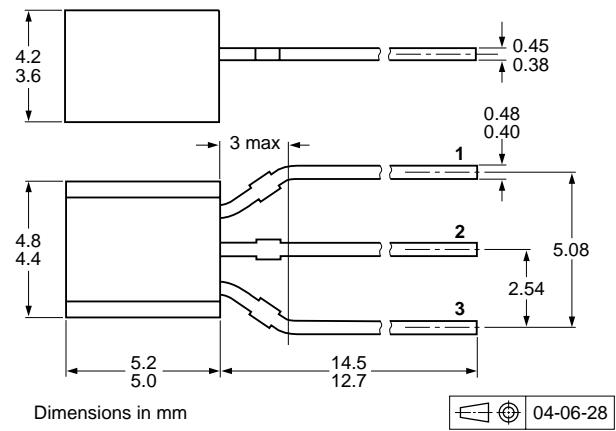


Dimensions in mm

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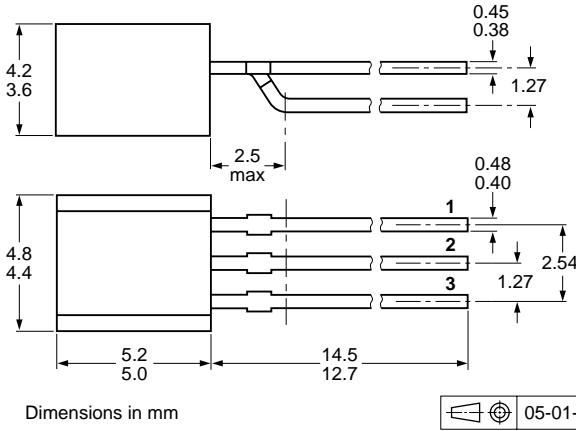
Fig 5. Package outline SOT883 (SC-101)

Fig 6. Package outline SOT54 (SC-43A/TO-92)



Dimensions in mm

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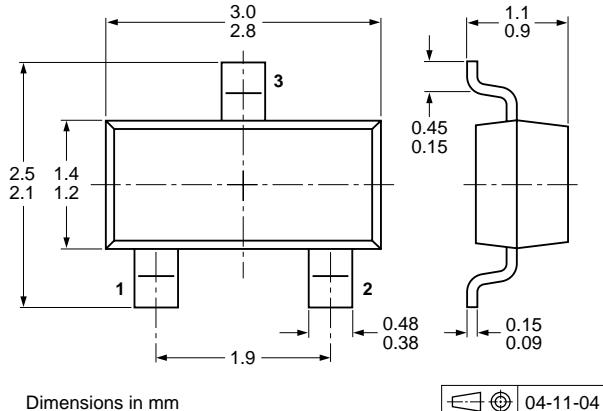


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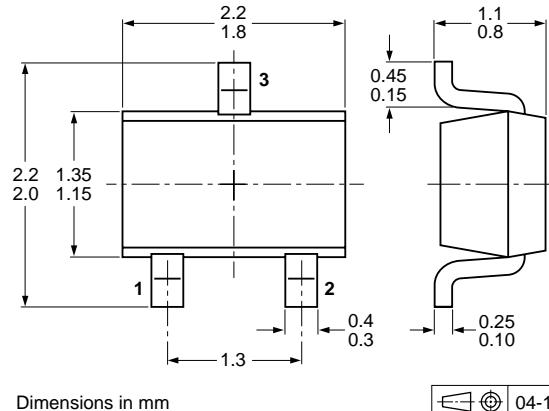
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Fig 7. Package outline SOT54A

Fig 8. Package outline SOT54 variant



**Fig 9. Package outline SOT23 (TO-236AB)**



**Fig 10. Package outline SOT323 (SC-70)**

## 9. Packing information

**Table 9. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.[\[1\]](#)

Type number	Package	Description	Packing quantity		
			3000	5000	10000
PDTC123TE	SOT416	4 mm pitch, 8 mm tape and reel	-115	-	-135
PDTC123TK	SOT346	4 mm pitch, 8 mm tape and reel	-115	-	-135
PDTC123TM	SOT883	2 mm pitch, 8 mm tape and reel	-	-	-315
PDTC123TS	SOT54	bulk, straight leads	-	-412	-
	SOT54A	tape and reel, wide pitch	-	-	-116
		tape ammopack, wide pitch	-	-	-126
	SOT54 variant	bulk, delta pinning	-	-112	-
PDTC123TT	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-235
PDTC123TU	SOT323	4 mm pitch, 8 mm tape and reel	-115	-	-135

[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
PDTC123T_SER_1	20060310	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.semiconductors.philips.com>.

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