

# PDTC123T series

NPN resistor-equipped transistors; R1 = 2.2 k $\Omega$ , R2 = 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 <sub>CEO</sub>	collector-emitter voltage	open base	-	-	50	V
I <sub>O</sub>	output current		-	-	100	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; 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; $t_p \leq 1$ ms	-	100	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C			
	SOT416		[1] -	150	mW
	SOT346		[1] -	250	mW
	SOT883		[2][3] -	250	mW
	SOT54		[1] -	500	mW
	SOT23		[1] -	250	mW
	SOT323		[1] -	200	mW
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-65	+150	°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 μm 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] -	-	833	K/W
	SOT346		[1] -	-	500	K/W
	SOT883		[2][3] -	-	500	K/W
	SOT54		[1] -	-	250	K/W
	SOT23		[1] -	-	500	K/W
	SOT323		[1] -	-	625	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.

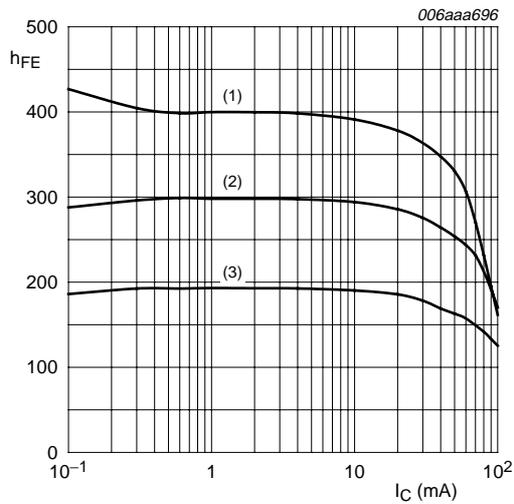
[3] Device mounted on an FR4 PCB with 60 μm copper strip line, standard footprint.

**7. Characteristics**

**Table 8. Characteristics**

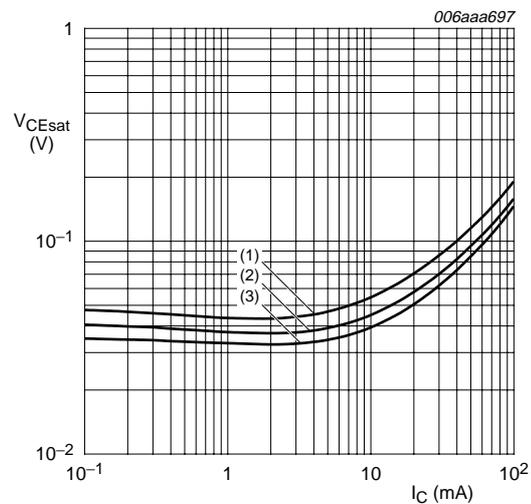
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = 50 V; I <sub>E</sub> = 0 A	-	-	100	nA
I <sub>CEO</sub>	collector-emitter cut-off current	V <sub>CE</sub> = 30 V; I <sub>B</sub> = 0 A	-	-	1	μA
		V <sub>CE</sub> = 30 V; I <sub>B</sub> = 0 A; T <sub>J</sub> = 150 °C	-	-	50	μA
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = 5 V; I <sub>C</sub> = 0 A	-	-	100	nA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 20 mA	30	-	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = 10 mA; I <sub>B</sub> = 0.5 mA	-	-	150	mV
R1	bias resistor 1 (input)		1.54	2.2	2.86	kΩ
C <sub>c</sub>	collector capacitance	V <sub>CB</sub> = 10 V; I <sub>E</sub> = i <sub>e</sub> = 0 A; f = 1 MHz	-	-	2.5	pF



V<sub>CE</sub> = 5 V  
 (1) T<sub>amb</sub> = 100 °C  
 (2) T<sub>amb</sub> = 25 °C  
 (3) T<sub>amb</sub> = -40 °C

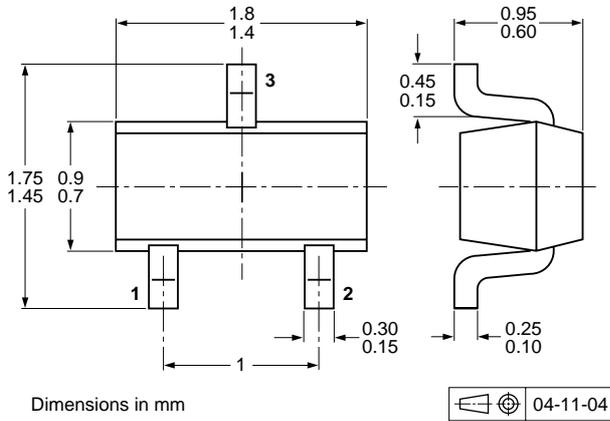
**Fig 1. DC current gain as a function of collector current; typical values**



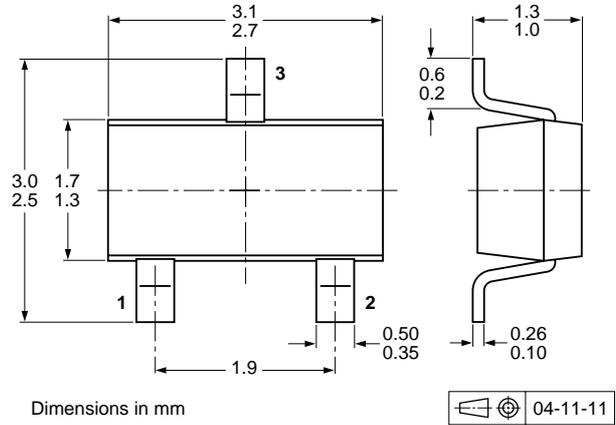
I<sub>C</sub>/I<sub>B</sub> = 20  
 (1) T<sub>amb</sub> = 100 °C  
 (2) T<sub>amb</sub> = 25 °C  
 (3) T<sub>amb</sub> = -40 °C

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

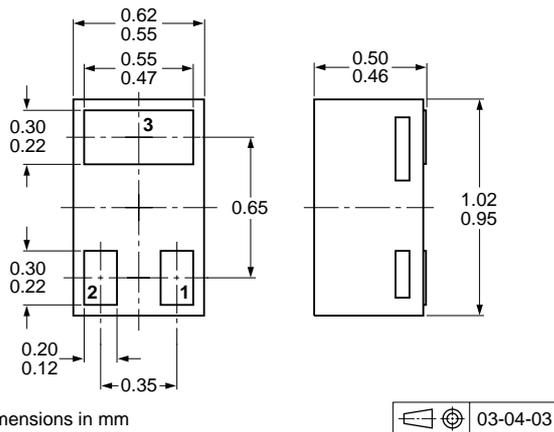
**8. Package outline**



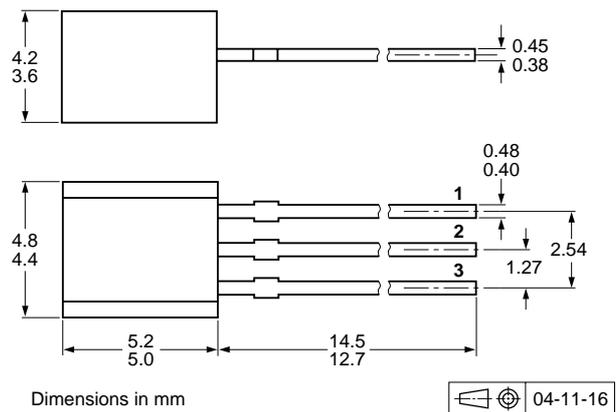
**Fig 3. Package outline SOT416 (SC-75)**



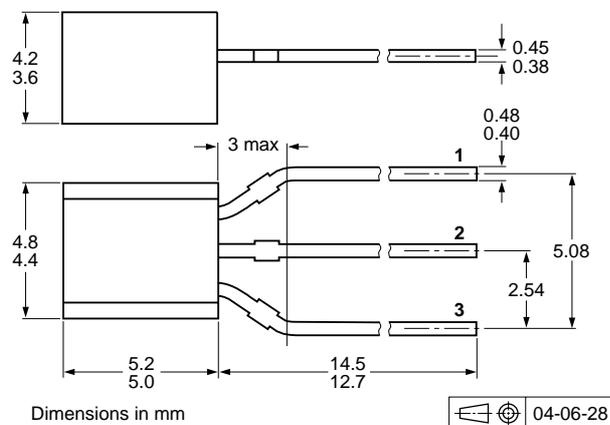
**Fig 4. Package outline SOT346 (SC-59A/TO-236)**



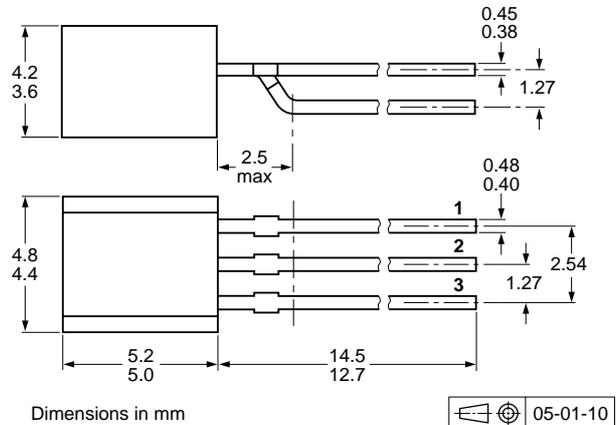
**Fig 5. Package outline SOT883 (SC-101)**



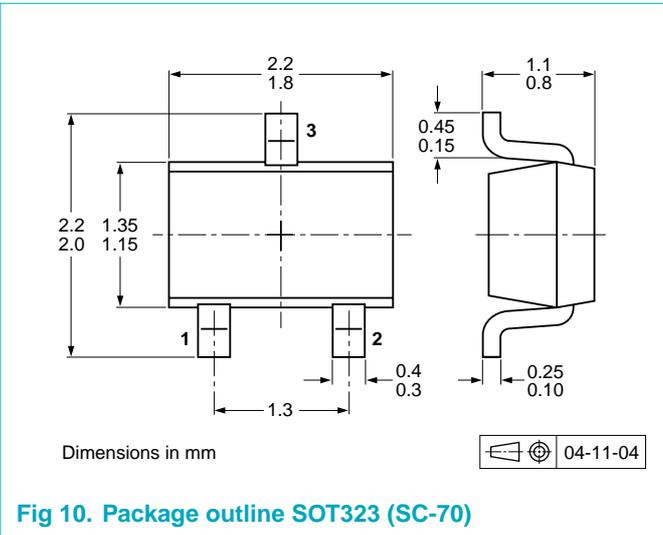
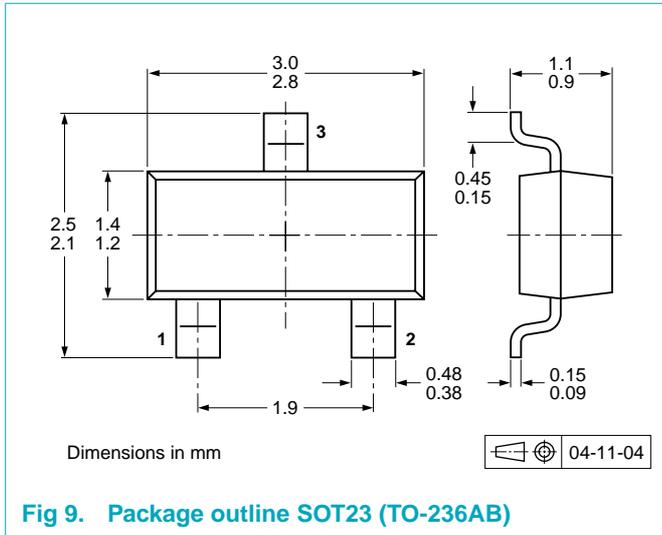
**Fig 6. Package outline SOT54 (SC-43A/TO-92)**



**Fig 7. Package outline SOT54A**



**Fig 8. Package outline SOT54 variant**



## 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
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 ammpack, 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.

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[2] The term 'short data sheet' is explained in section "Definitions".

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