

PDTC123Y series

NPN resistor-equipped transistors; $R1 = 2.2 \text{ k}\Omega$, $R2 = 10 \text{ k}\Omega$

Rev. 04 — 16 November 2009

Product data sheet

1. Product profile

1.1 General description

NPN Resistor-Equipped Transistors (RET) family.

Table 1. Product overview

Type number	Package			PNP complement
	NXP	JEITA	JEDEC	
PDTC123YE	SOT416	SC-75	-	PDTA123YE
PDTC123YK	SOT346	SC-59A	TO-236	PDTA123YK
PDTC123YM	SOT883	SC-101	-	PDTA123YM
PDTC123YS ^[1]	SOT54	SC-43A	TO-92	PDTA123YS
PDTC123YT	SOT23	-	TO-236AB	PDTA123YT
PDTC123YU	SOT323	SC-70	-	PDTA123YU

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

1.2 Features

- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs

1.3 Applications

- General-purpose switching and amplification
- Inverter and interface circuits
- Circuit drivers

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 (DC)		-	-	100	mA
R1	bias resistor 1 (input)		1.54	2.2	2.86	$\text{k}\Omega$
R2/R1	bias resistor ratio		3.6	4.5	5.5	

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Symbol
SOT54			
1	input (base)		
2	output (collector)		
3	GND (emitter)		
SOT54A			
1	input (base)		
2	output (collector)		
3	GND (emitter)		
SOT54 variant			
1	input (base)		
2	output (collector)		
3	GND (emitter)		
SOT23; SOT323; SOT346; SOT416			
1	input (base)		
2	GND (emitter)		
3	output (collector)		
SOT883			
1	input (base)		
2	GND (emitter)		
3	output (collector)		

3. Ordering information

Table 4. Ordering information

Type number	Package			Version
	Name	Description		
PDTC123YE	SC-75	plastic surface mounted package; 3 leads		SOT416
PDTC123YK	SC-59A	plastic surface mounted package; 3 leads		SOT346
PDTC123YM	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm		SOT883
PDTC123YS ^[1]	SC-43A	plastic single-ended leaded (through hole) package; 3 leads		SOT54
PDTC123YT	-	plastic surface mounted package; 3 leads		SOT23
PDTC123YU	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 ^[1]
PDTC123YE	19
PDTC123YK	31
PDTC123YM	G7
PDTC123YS	TC123Y
PDTC123YT	*AL
PDTC123YU	*19

[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 (DC)		-	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]	-	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	$^\circ\text{C}$
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 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.

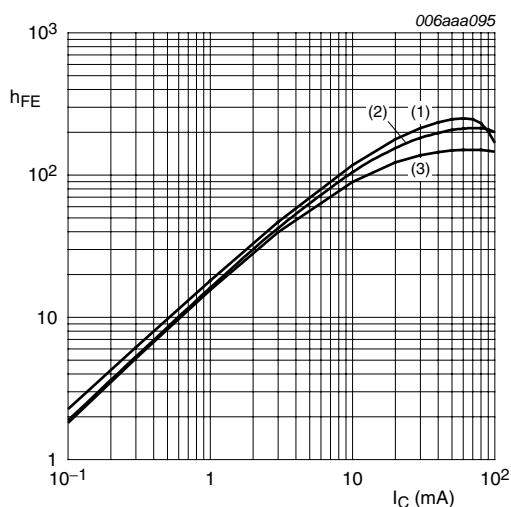
[3] Device mounted on an FR4 PCB with 60 μm copper strip line, standard footprint.

7. Characteristics

Table 8. Characteristics

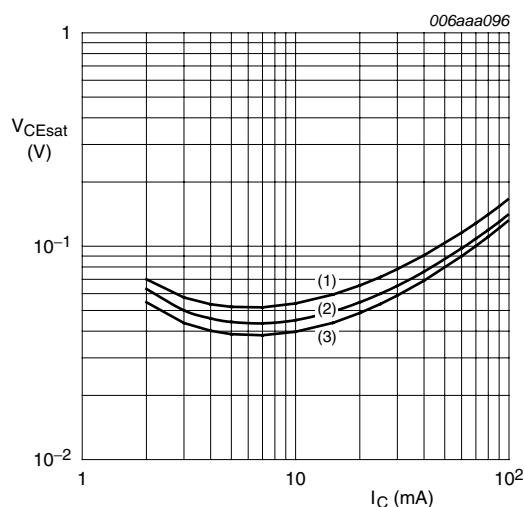
$T_{amb} = 25 \text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = 50 \text{ V}$; $I_E = 0 \text{ A}$	-	-	100	nA
I_{CEO}	collector-emitter cut-off current	$V_{CE} = 30 \text{ V}$; $I_B = 0 \text{ A}$	-	-	1	μA
		$V_{CE} = 30 \text{ V}$; $I_B = 0 \text{ A}$; $T_j = 150 \text{ }^{\circ}\text{C}$	-	-	50	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5 \text{ V}$; $I_C = 0 \text{ A}$	-	-	700	μA
h_{FE}	DC current gain	$V_{CE} = 5 \text{ V}$; $I_C = 5 \text{ mA}$	35	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10 \text{ mA}$; $I_B = 0.5 \text{ mA}$	-	-	150	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5 \text{ V}$; $I_C = 100 \mu\text{A}$	-	0.75	0.3	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 300 \text{ mV}$; $I_C = 20 \text{ mA}$	2.5	1.15	-	V
$R1$	bias resistor 1 (input)		1.54	2.2	2.86	$\text{k}\Omega$
$R2/R1$	bias resistor ratio		3.6	4.5	5.5	
C_c	collector capacitance	$V_{CB} = 10 \text{ V}$; $I_E = i_e = 0 \text{ A}$; $f = 1 \text{ MHz}$	-	-	2	pF



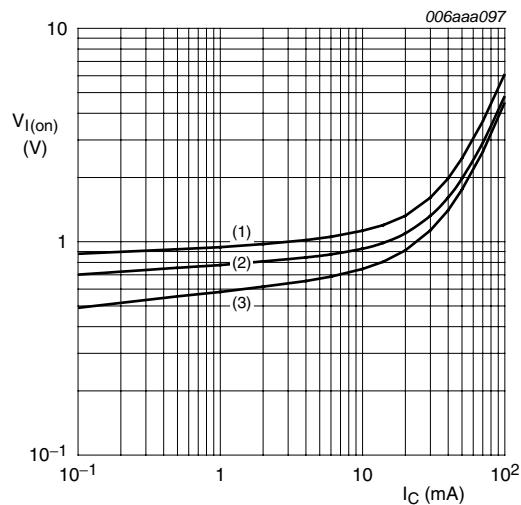
$V_{CE} = 5 \text{ V}$
 (1) $T_{amb} = 100 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -40 \text{ }^{\circ}\text{C}$

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



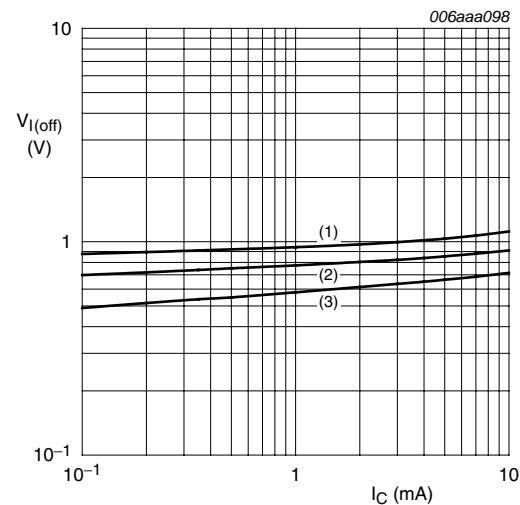
$I_C/I_B = 20$
 (1) $T_{amb} = 100 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -40 \text{ }^{\circ}\text{C}$

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

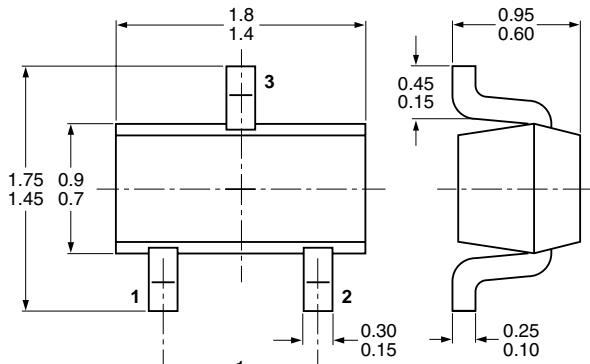


Fig 5. Package outline SOT416 (SC-75)

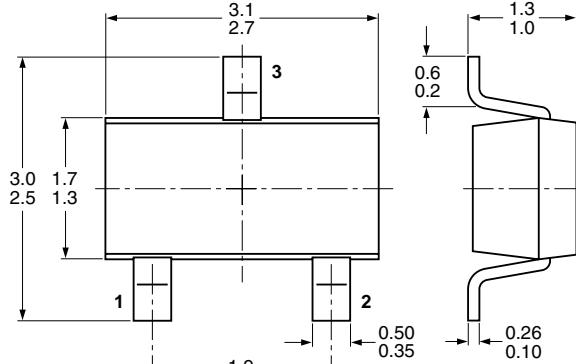


Fig 6. Package outline SOT346 (SC-59A/TO-236)

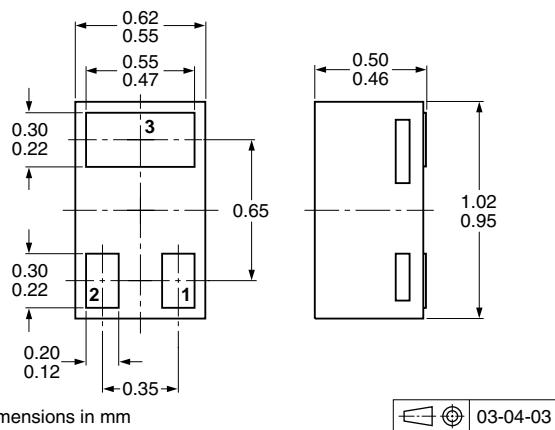


Fig 7. Package outline SOT883 (SC-101)

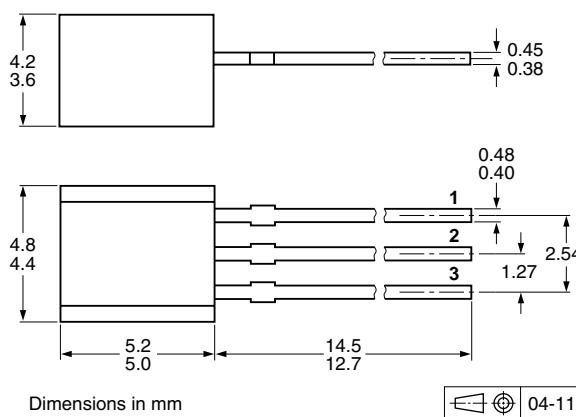


Fig 8. Package outline SOT54 (SC-43A/TO-92)

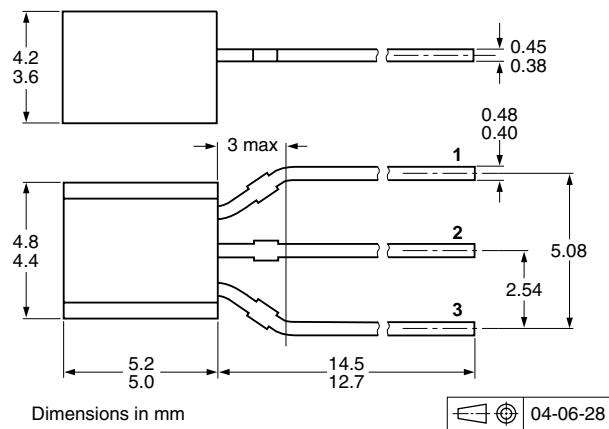


Fig 9. Package outline SOT54A

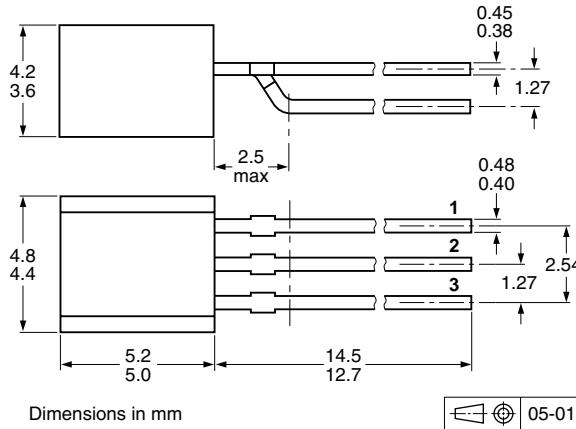
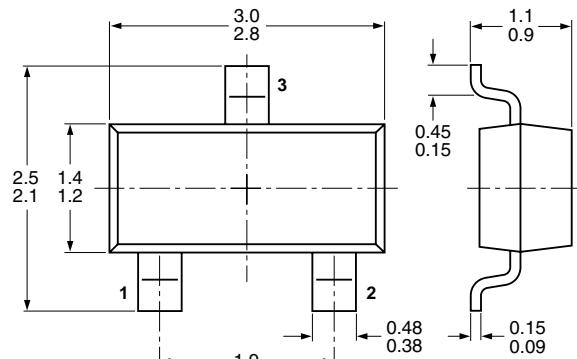
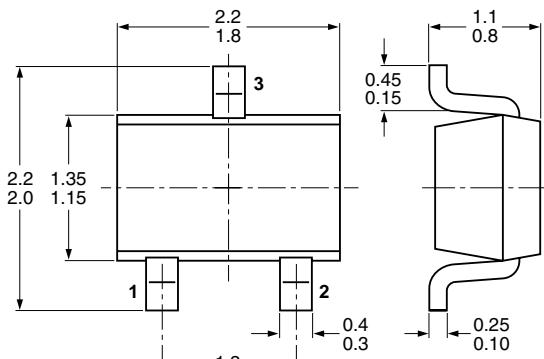


Fig 10. Package outline SOT54 variant



Dimensions in mm

04-11-04



Dimensions in mm

04-11-04

Fig 11. Package outline SOT23 (TO-236AB)

Fig 12. 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
PDTC123YE	SOT416	4 mm pitch, 8 mm tape and reel	-115	-	-135
PDTC123YK	SOT346	4 mm pitch, 8 mm tape and reel	-115	-	-135
PDTC123YM	SOT883	2 mm pitch, 8 mm tape and reel	-	-	-315
PDTC123YS	SOT54	bulk, straight leads	-	-412	-
	SOT54A	tape and reel, wide pitch	-	-	-116
		tape ammopack, wide pitch	-	-	-126
	SOT54 variant	bulk, delta pinning	-	-112	-
PDTC123YT	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-235
PDTC123YU	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
PDTC123Y_SER_4	20091116	Product data sheet	-	PDTC123Y_SER_3
Modifications:	<ul style="list-style-type: none">• 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.			
PDTC123Y_SER_3	20050324	Product data sheet	-	PDTC123YT_2
PDTC123YT_2	20040510	Objective data sheet	-	PDTC123YT_1
PDTC123YT_1	20040406	Objective data sheet	-	-

11. Legal information

11.1 Data sheet status

Document status ^{[1][2]}	Product status ^[3]	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".

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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	4
6	Thermal characteristics	4
7	Characteristics	5
8	Package outline	7
9	Packing information	8
10	Revision history	9
11	Legal information	10
11.1	Data sheet status	10
11.2	Definitions	10
11.3	Disclaimers	10
11.4	Trademarks	10
12	Contact information	10
13	Contents	11

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