



THE DATASHEET OF PDTD123YK

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Kind regards,

Team Nexperia

PDTD123Y series

NPN 500 mA, 50 V resistor-equipped transistors;
R1 = 2.2 k Ω , R2 = 10 k Ω

Rev. 02 — 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	
PDTD123YK	SOT346	SC-59A	TO-236	PDTB123YK
PDTD123YS ^[1]	SOT54	SC-43A	TO-92	PDTB123YS
PDTD123YT	SOT23	-	TO-236AB	PDTB123YT

[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
- ± 10 % resistor ratio tolerance

1.3 Applications

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

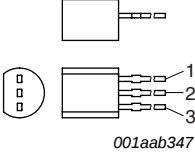
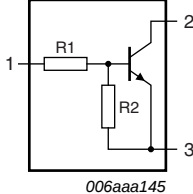
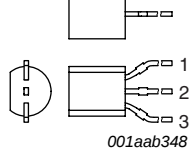
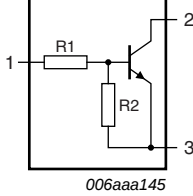
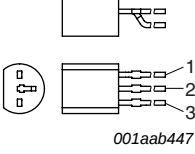
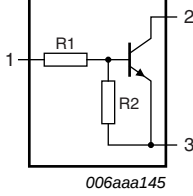
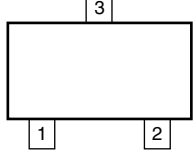
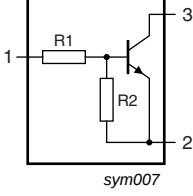
1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CEO}	collector-emitter voltage	open base	-	-	50	V
I _O	output current (DC)		-	-	500	mA
R1	bias resistor 1 (input)		1.54	2.2	2.86	k Ω
R2/R1	bias resistor ratio		4.1	4.55	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, SOT346			
1	input (base)		
2	GND (emitter)		
3	output (collector)		

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PDTD123YK	SC-59A	plastic surface mounted package; 3 leads	SOT346
PDTD123YS ^[1]	SC-43A	plastic single-ended leaded (through hole) package; 3 leads	SOT54
PDTD123YT	-	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 ^[1]
PDTD123YK	E7
PDTD123YS	D123YS
PDTD123YT	*7X

[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)		-	500	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	^[1]		
	SOT346		-	250	mW
	SOT54		-	500	mW
	SOT23		-	250	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.

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

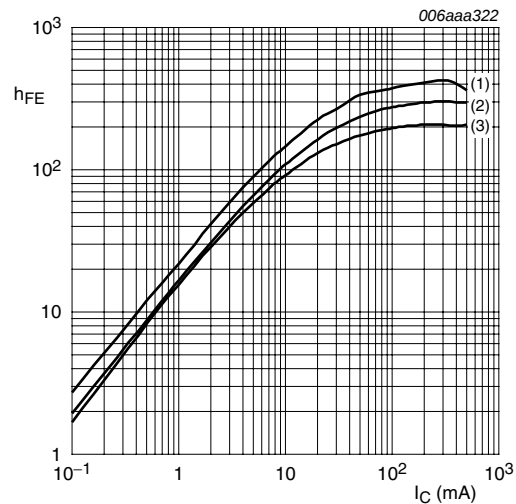
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

7. Characteristics

Table 8. Characteristics

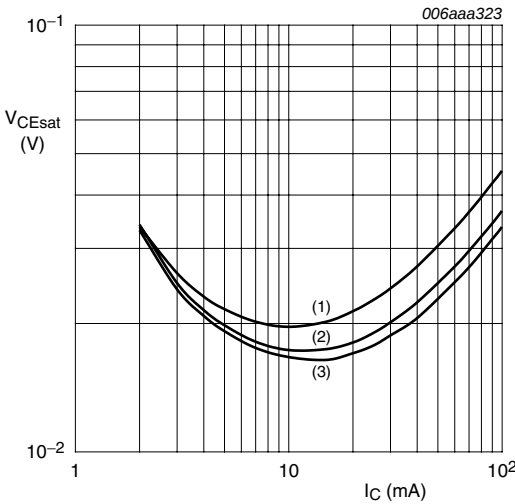
$T_{amb} = 25^\circ\text{C}$ unless otherwise specified.

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	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	0.65	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	$V_{CE} = 5\text{ V}; I_C = 100\text{ }\mu\text{A}$	0.4	0.6	1	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 20\text{ mA}$	0.5	1	1.4	V
R1	bias resistor 1 (input)		1.54	2.2	2.86	k Ω
R2/R1	bias resistor ratio		4.1	4.55	5	
C_c	collector capacitance	$V_{CB} = 10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$	-	7	-	pF



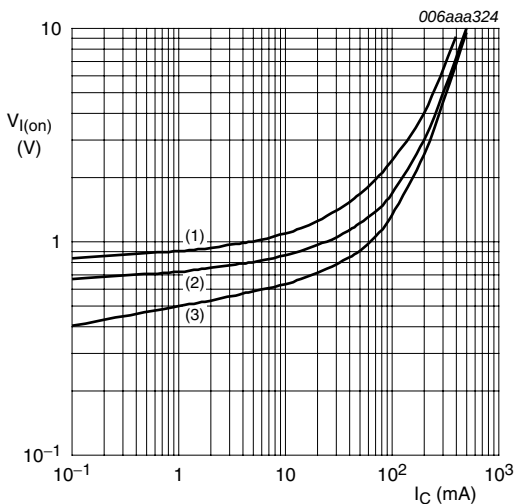
$V_{CE} = 5\text{ V}$
(1) $T_{amb} = 100^\circ\text{C}$
(2) $T_{amb} = 25^\circ\text{C}$
(3) $T_{amb} = -40^\circ\text{C}$

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



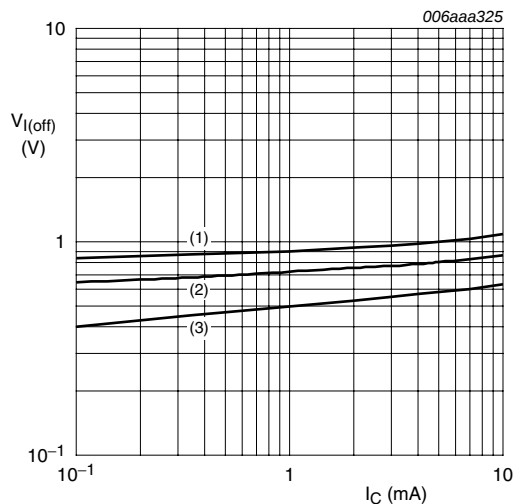
$I_C/I_B = 20$
(1) $T_{amb} = 100^\circ\text{C}$
(2) $T_{amb} = 25^\circ\text{C}$
(3) $T_{amb} = -40^\circ\text{C}$

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



$V_{CE} = 0.3\text{ V}$
(1) $T_{amb} = -40^\circ\text{C}$
(2) $T_{amb} = 25^\circ\text{C}$
(3) $T_{amb} = 100^\circ\text{C}$

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



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

Fig. 4. Off-state input voltage as a function of collector current; typical values

8. Package outline

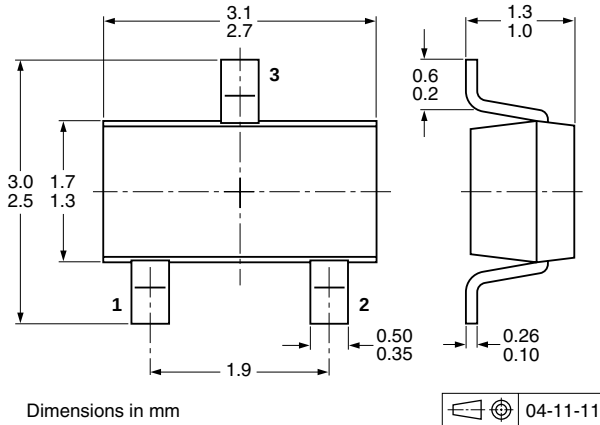


Fig 5. Package outline SOT346 (SC-59A/TO-236)

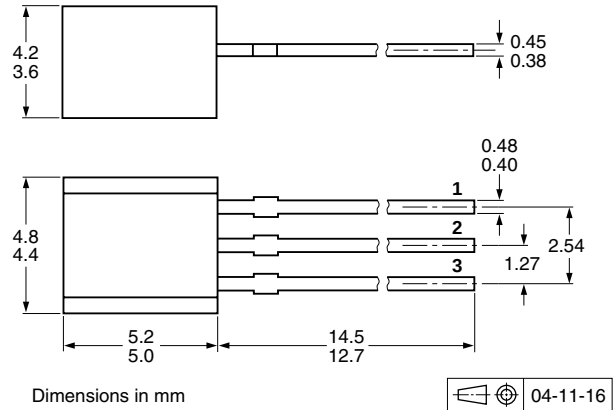


Fig 6. Package outline SOT54 (SC-43A/TO-92)

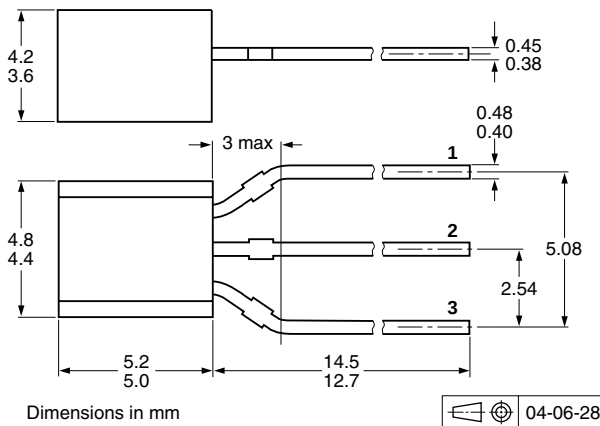


Fig 7. Package outline SOT54A

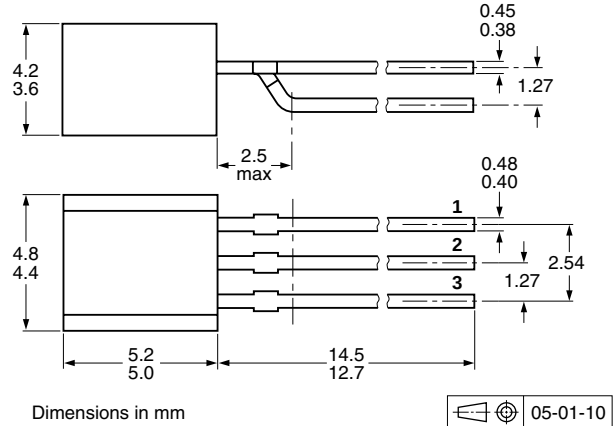


Fig 8. Package outline SOT54 variant

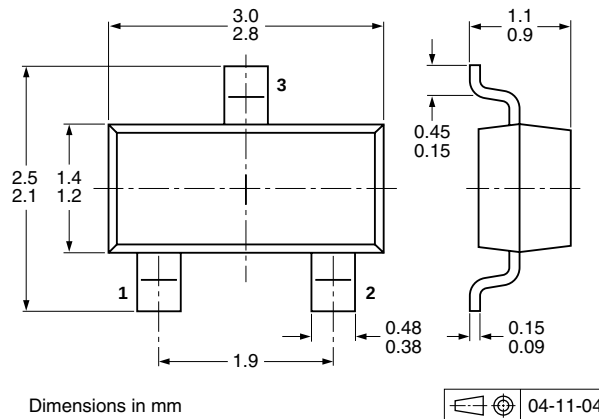


Fig 9. Package outline SOT23 (TO-236AB)

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
PDTD123YK	SOT346	4 mm pitch, 8 mm tape and reel	-115	-	-135
PDTD123YS	SOT54	bulk, straight leads	-	-412	-
	SOT54A	tape and reel, wide pitch	-	-	-116
		tape ammopack, wide pitch	-	-	-126
	SOT54 variant	bulk, delta pinning	-	-112	-
PDTD123YT	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
PDTD123Y_SER_2	20091116	Product data sheet	-	PDTD123Y_SER_1
Modifications:	- 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. Table 3 "Pinning": updated			
PDTD123Y_SER_1	20050412	Product 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..... 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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