

PDTD123E series

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

Rev. 01 — 8 April 2005

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
	Philips	JEITA	JEDEC	
PDTD123EK	SOT346	SC-59A	TO-236	PDTB123EK
PDTD123ES [1]	SOT54	SC-43A	TO-92	PDTB123ES
PDTD123ET	SOT23	-	TO-236AB	PDTB123ET

[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 segments
- Controlling IC inputs
- Cost saving alternative for BC817 series in digital applications
- Switching loads

1.4 Quick reference data

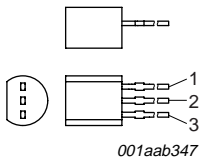
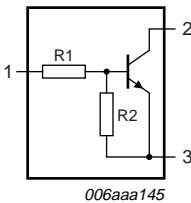
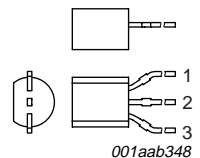
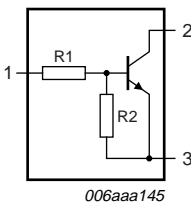
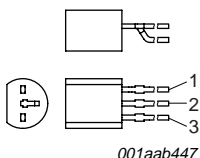
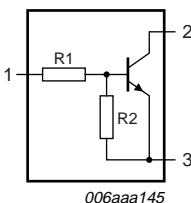
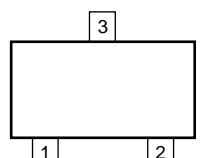
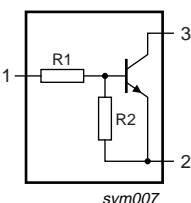
Table 2: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{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		0.9	1.0	1.1	

PHILIPS

2. Pinning information

Table 3: Pinning

Pin	Description	Simplified outline	Symbol
SOT54			
1	input (base)	 <p>001aab347</p>	 <p>006aaa145</p>
2	output (collector)		
3	GND (emitter)		
SOT54A			
1	input (base)	 <p>001aab348</p>	 <p>006aaa145</p>
2	output (collector)		
3	GND (emitter)		
SOT54 variant			
1	input (base)	 <p>001aab447</p>	 <p>006aaa145</p>
2	output (collector)		
3	GND (emitter)		
SOT23, SOT346			
1	input (base)	 <p>006aaa144</p>	 <p>sym007</p>
2	GND (emitter)		
3	output (collector)		

3. Ordering information

Table 4: Ordering information

Type number	Package		
	Name	Description	Version
PDTD123EK	SC-59A	plastic surface mounted package; 3 leads	SOT346
PDTD123ES ^[1]	SC-43A	plastic single-ended leaded (through hole) package; 3 leads	SOT54
PDTD123ET	-	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]
PDTD123EK	E3
PDTD123ES	D123ES
PDTD123ET	*7T

[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	-	10	V
V_I	input voltage				
	positive		-	+12	V
	negative		-	-10	V
I_O	output current (DC)		-	500	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	^[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

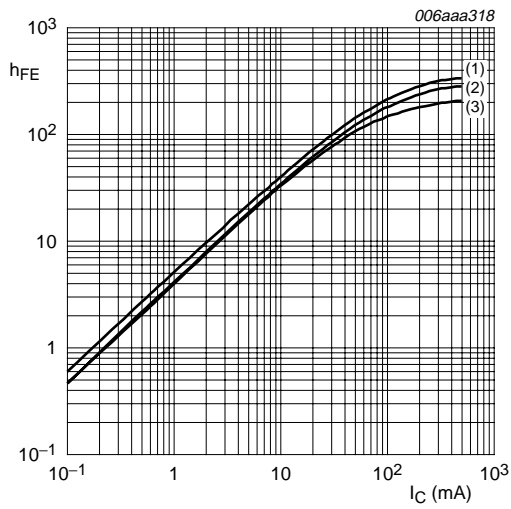
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

7. Characteristics

Table 8: Characteristics

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

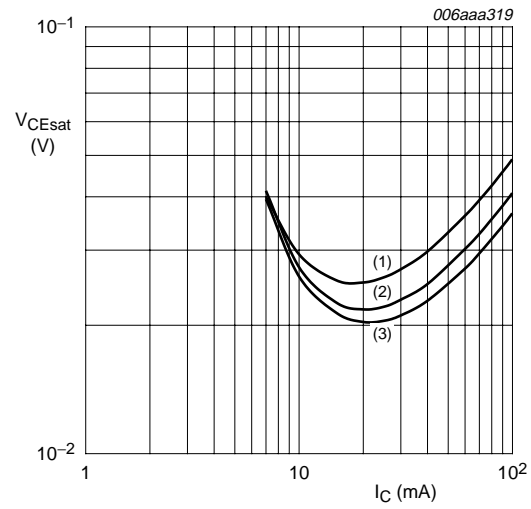
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = 40\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 50\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
I_{CEO}	collector-emitter cut-off current	$V_{CE} = 50\text{ V}; I_B = 0\text{ A}$	-	-	0.5	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	2	mA
h_{FE}	DC current gain	$V_{CE} = 5\text{ V}; I_C = 50\text{ mA}$	40	-	-	
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	$V_{CE} = 5\text{ V}; I_C = 100\text{ }\mu\text{A}$	0.6	1.1	1.8	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 20\text{ mA}$	1.0	1.5	2.0	V
R1	bias resistor 1 (input)		1.54	2.2	2.86	k Ω
R2/R1	bias resistor ratio		0.9	1.0	1.1	
C_c	collector capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A};$ $f = 100\text{ MHz}$	-	7	-	pF



$V_{CE} = 5\text{ V}$

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

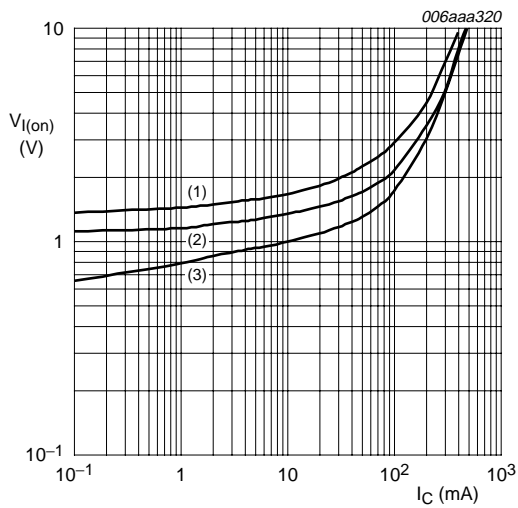
Fig 1. DC current gain as a function of collector current; typical values



$I_C/I_B = 20$

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

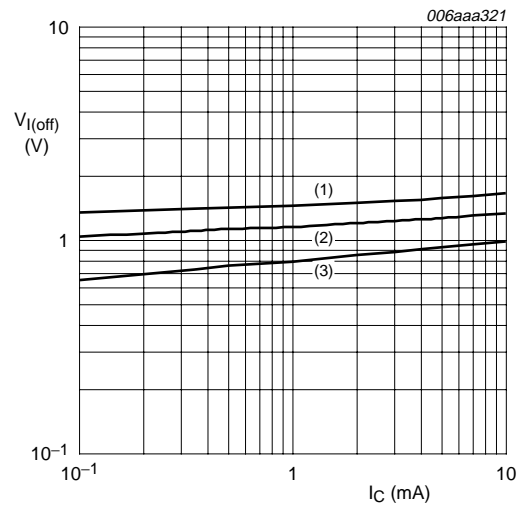
Fig 2. Collector-emitter saturation voltage as a function of collector current; typical values



$V_{CE} = 0.3\text{ V}$

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

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

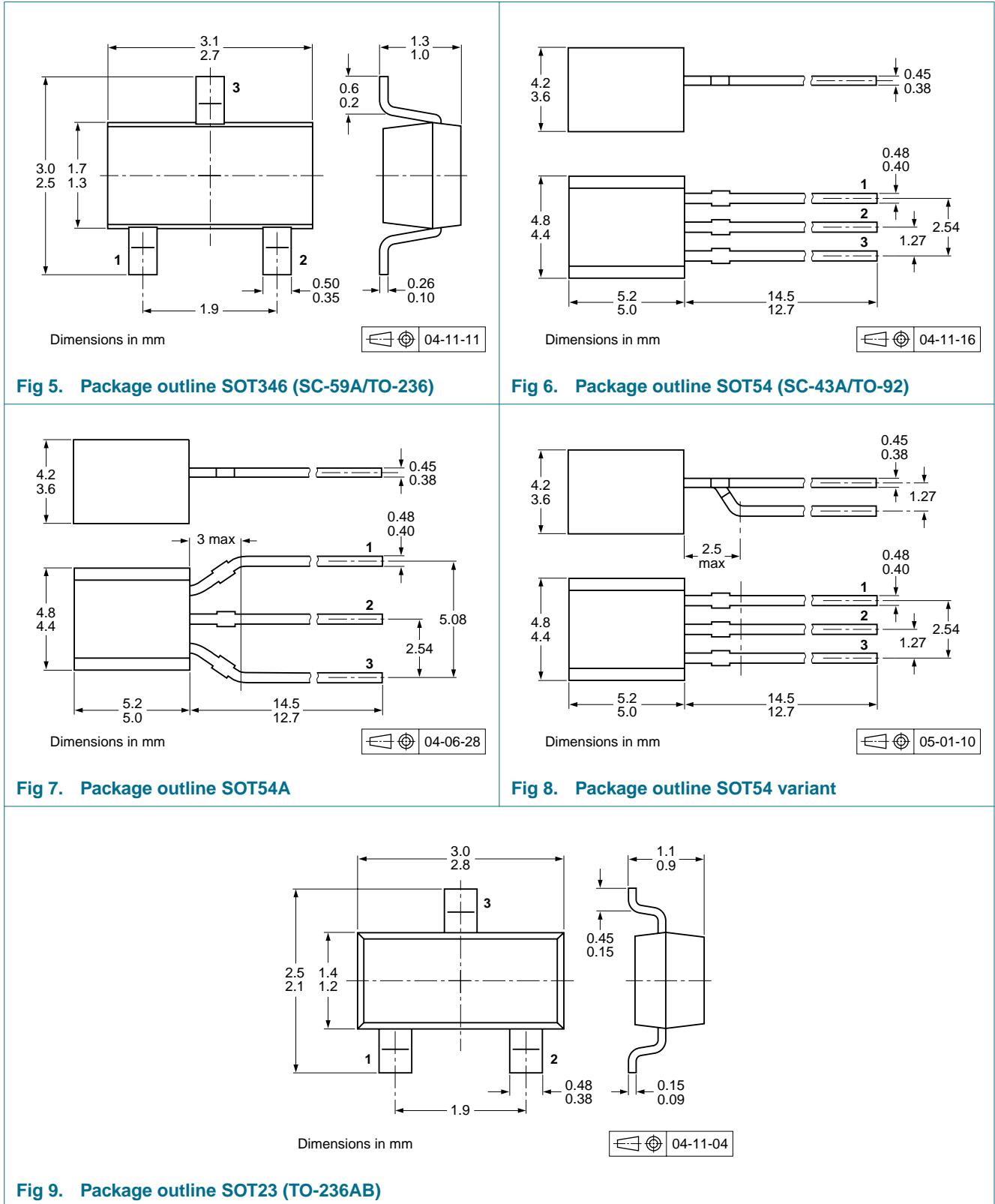


$V_{CE} = 5\text{ V}$

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

Fig 4. Off-state input 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. [\[1\]](#)

Type number	Package	Description	Packing quantity		
			3000	5000	10000
PDTD123EK	SOT346	4 mm pitch, 8 mm tape and reel	-115	-	-135
PDTD123ES	SOT54	bulk, straight leads	-	-412	-
	SOT54A	tape and reel, wide pitch	-	-	-116
		tape ammopack, wide pitch	-	-	-126
	SOT54 variant	bulk, delta pinning	-	-112	-
PDTD123ET	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-235

[1] For further information and the availability of packing methods, see [Section 14](#).

10. Revision history

Table 10: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PDTD123E_SER_1	20050408	Product data sheet	-	9397 750 14582	-

11. Data sheet status

Level	Data sheet status ^[1]	Product status ^[2] ^[3]	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

12. Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

13. Disclaimers

Life support — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

Right to make changes — Philips Semiconductors reserves the right to make changes in the products - including circuits, standard cells, and/or software - described or contained herein in order to improve design and/or performance. When the product is in full production (status 'Production'), relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

14. Contact information

For additional information, please visit: <http://www.semiconductors.philips.com>

For sales office addresses, send an email to: sales.addresses@www.semiconductors.philips.com

15. 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	Data sheet status	9
12	Definitions	9
13	Disclaimers	9
14	Contact information	9



© Koninklijke Philips Electronics N.V. 2005

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Date of release: 8 April 2005
Document number: 9397 750 14582

Published in The Netherlands