

# PDTD113E series

NPN 500 mA, 50 V resistor-equipped transistors;  
R1 = 1 k $\Omega$ , R2 = 1 k $\Omega$

Rev. 01 — 14 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	
PDTD113EK	SOT346	SC-59A	TO-236	PDTB113EK
PDTD113ES <a href="#">[1]</a>	SOT54	SC-43A	TO-92	PDTB113ES
PDTD113ET	SOT23	-	TO-236AB	PDTB113ET

[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
- $\pm 10$  % 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

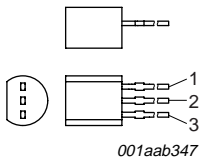
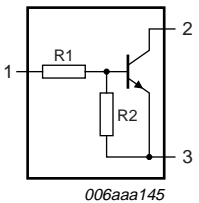
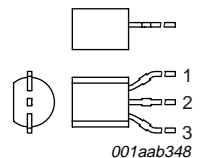
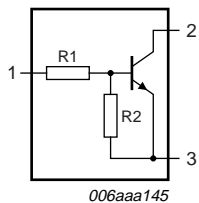
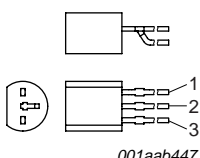
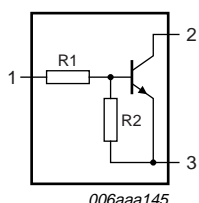
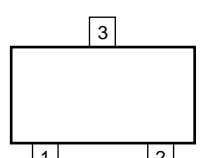
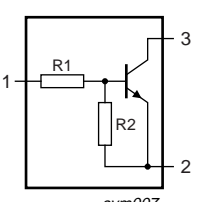
Table 2: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	50	V
I <sub>O</sub>	output current (DC)		-	-	500	mA
R1	bias resistor 1 (input)		0.7	1	1.3	k $\Omega$
R2/R1	bias resistor ratio		0.9	1.0	1.1	

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## 2. Pinning information

**Table 3: Pinning**

Pin	Description	Simplified outline	Symbol
<b>SOT54</b>			
1	input (base)	 <p>001aab347</p>	 <p>006aaa145</p>
2	output (collector)		
3	GND (emitter)		
<b>SOT54A</b>			
1	input (base)	 <p>001aab348</p>	 <p>006aaa145</p>
2	output (collector)		
3	GND (emitter)		
<b>SOT54 variant</b>			
1	input (base)	 <p>001aab447</p>	 <p>006aaa145</p>
2	output (collector)		
3	GND (emitter)		
<b>SOT23, SOT346</b>			
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
PDTD113EK	SC-59A	plastic surface mounted package; 3 leads	SOT346
PDTD113ES <sup>[1]</sup>	SC-43A	plastic single-ended leaded (through hole) package; 3 leads	SOT54
PDTD113ET	-	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 <sup>[1]</sup>
PDTD113EK	E1
PDTD113ES	D113ES
PDTD113ET	*7R

[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		-	+10	V
	negative		-	-10	V
$I_O$	output current (DC)		-	500	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	<sup>[1]</sup>		
	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

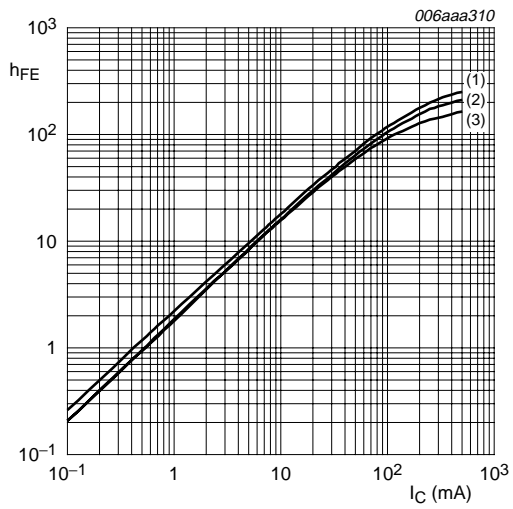
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

## 7. Characteristics

**Table 8: Characteristics**

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

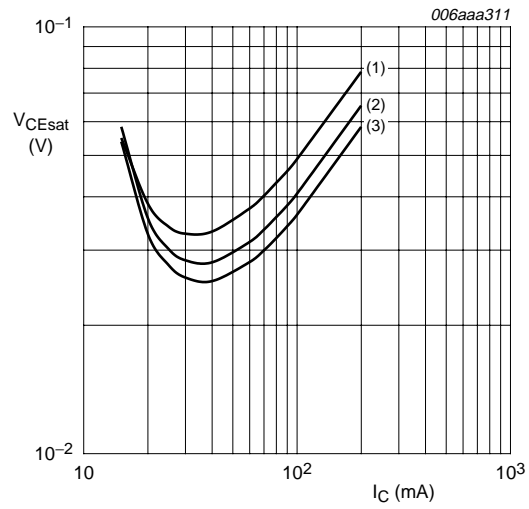
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 40\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 50\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
$I_{CEO}$	collector-emitter cut-off current	$V_{CE} = 50\text{ V}; I_B = 0\text{ A}$	-	-	0.5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	4	mA
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 50\text{ mA}$	33	-	-	
$V_{CEsat}$	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	1.5	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 20\text{ mA}$	1.0	1.4	1.8	V
R1	bias resistor 1 (input)		0.7	1	1.3	k $\Omega$
R2/R1	bias resistor ratio		0.9	1	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)  $T_{amb} = 100 \text{ }^\circ\text{C}$
- (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$
- (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

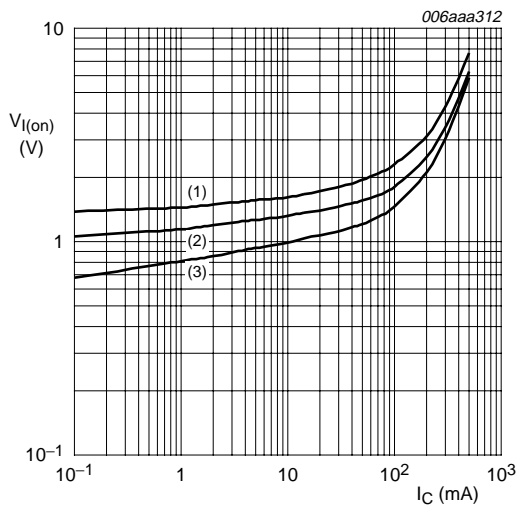
**Fig 1. DC current gain as a function of collector current; typical values**



$I_C/I_B = 20$

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

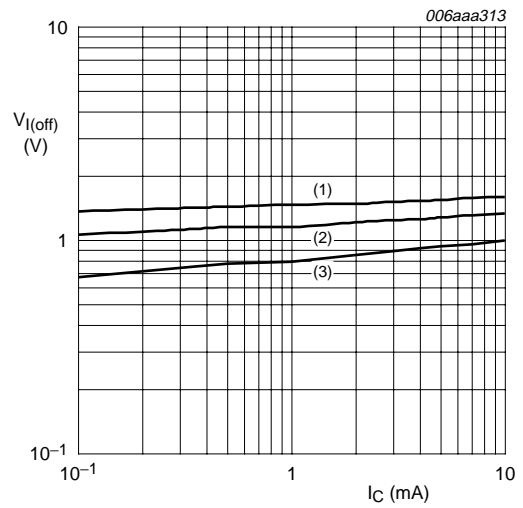
**Fig 2. Collector-emitter saturation voltage as a function of collector current; typical values**



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

- (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**

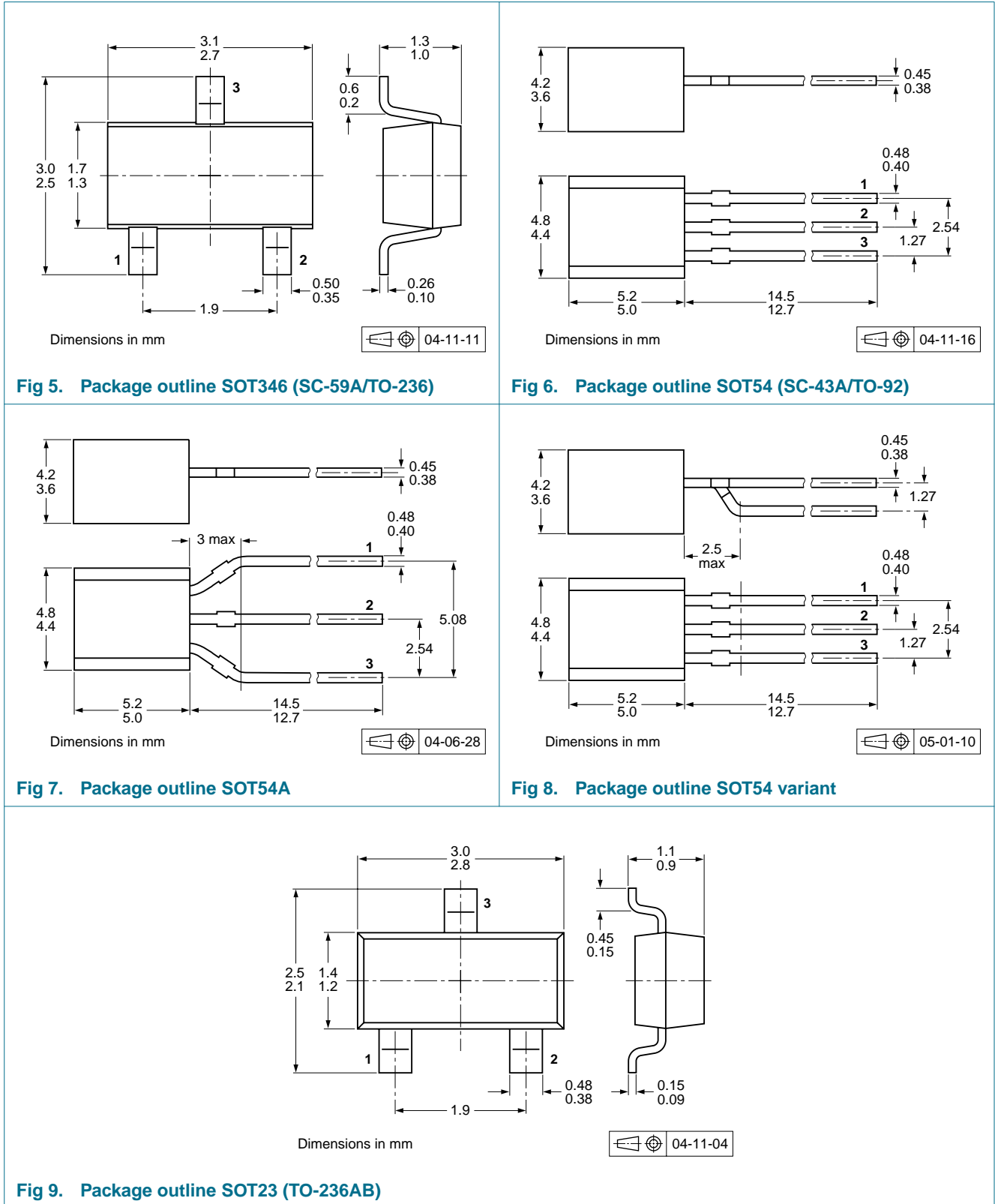


$V_{CE} = 5 \text{ V}$

- (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



## 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
PDTD113EK	SOT346	4 mm pitch, 8 mm tape and reel	-115	-	-135
PDTD113ES	SOT54	bulk, straight leads	-	-412	-
	SOT54A	tape and reel, wide pitch	-	-	-116
		tape ammpack, wide pitch	-	-	-126
	SOT54 variant	bulk, delta pinning	-	-112	-
PDTD113ET	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
PDTD113E_SER_1	20050414	Product data sheet	-	9397 750 14579	-



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

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**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.

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Date of release: 14 April 2005  
Document number: 9397 750 14579

Published in The Netherlands