PDTC124X series

NPN resistor-equipped transistors; R1 = 22 kΩ, R2 = 47 kΩ

Rev. 06 — 14 July 2005 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
	Philips	JEITA	JEDEC	
PDTC124XE	SOT416	SC-75	-	PDTA124XE
PDTC124XEF	SOT490	SC-89	-	PDTA124XEF
PDTC124XK	SOT346	SC-59A	TO-236	PDTA124XK
PDTC124XM	SOT883	SC-101	-	PDTA124XM
PDTC124XS [1]	SOT54	SC-43A	TO-92	PDTA124XS
PDTC124XT	SOT23	-	TO-236AB	PDTA124XT
PDTC124XU	SOT323	SC-70	-	PDTA124XU

[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

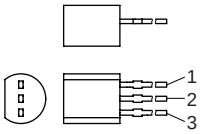
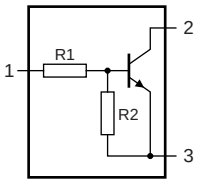
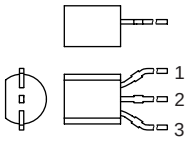
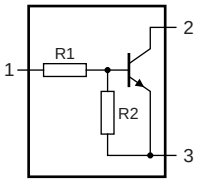
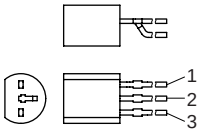
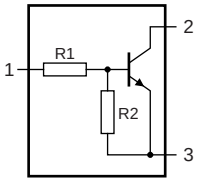
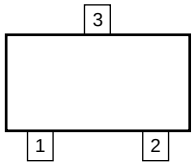
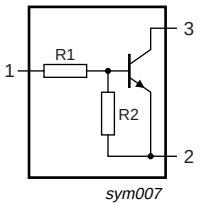
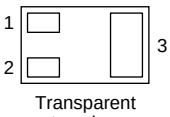
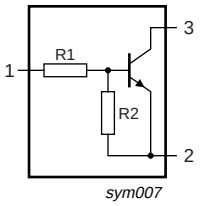
Table 2: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	50	V
I_O	output current		-	-	100	mA
R1	bias resistor 1 (input)		15.4	22	28.6	kΩ
R2/R1	bias resistor ratio		1.7	2.1	2.6	

PHILIPS

2. Pinning information

Table 3: Pinning

Pin	Description	Simplified outline	Symbol
SOT54			
1	input (base)	 001aab347	 006aaa145
2	output (collector)		
3	GND (emitter)		
SOT54A			
1	input (base)	 001aab348	 006aaa145
2	output (collector)		
3	GND (emitter)		
SOT54 variant			
1	input (base)	 001aab447	 006aaa145
2	output (collector)		
3	GND (emitter)		
SOT23; SOT323; SOT346; SOT416; SOT490			
1	input (base)	 006aaa144	 sym007
2	GND (emitter)		
3	output (collector)		
SOT883			
1	input (base)	 Transparent top view	 sym007
2	GND (emitter)		
3	output (collector)		

3. Ordering information

Table 4: Ordering information

Type number	Package		
	Name	Description	Version
PDTC124XE	SC-75	plastic surface mounted package; 3 leads	SOT416
PDTC124XEF	SC-89	plastic surface mounted package; 3 leads	SOT490
PDTC124XK	SC-59A	plastic surface mounted package; 3 leads	SOT346
PDTC124XM	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm	SOT883
PDTC124XS [1]	SC-43A	plastic single-ended leaded (through hole) package; 3 leads	SOT54
PDTC124XT	-	plastic surface mounted package; 3 leads	SOT23
PDTC124XU	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]
PDTC124XE	32
PDTC124XEF	32
PDTC124XK	51
PDTC124XM	DZ
PDTC124XS	TC124X
PDTC124XT	*46
PDTC124XU	*51

[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		-	7	V
V_I	input voltage					
	positive			-	+40	V
	negative			-	–7	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
	SOT490		[1] [2]	-	250	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
	SOT490		[1] [2]	-	-	500	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.

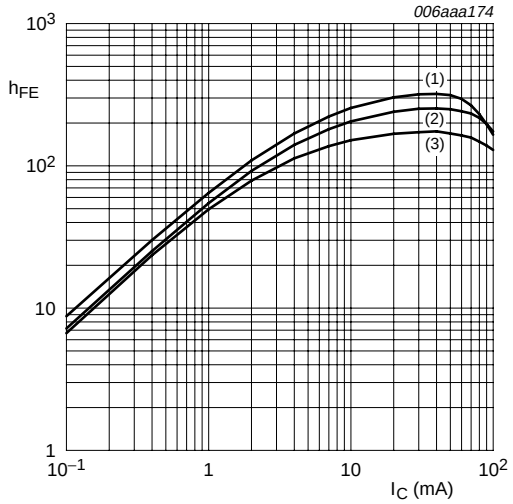
[3] Device mounted on an FR4 PCB with 60 µm copper strip line, standard footprint.

7. Characteristics

Table 8: Characteristics

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = 50 V; I_E = 0 A	-	-	100	nA
I_{CEO}	collector-emitter cut-off current	V_{CE} = 30 V; I_B = 0 A	-	-	1	µA
		V_{CE} = 30 V; I_B = 0 A; T_j = 150 °C	-	-	50	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A	-	-	120	µA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 5 mA	80	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA	-	-	150	mV
$V_{I(off)}$	off-state input voltage	V_{CE} = 5 V; I_C = 100 µA	-	0.8	0.5	V
$V_{I(on)}$	on-state input voltage	V_{CE} = 300 mV; I_C = 2 mA	2	1.1	-	V
R1	bias resistor 1 (input)		15.4	22	28.6	kΩ
R2/R1	bias resistor ratio		1.7	2.1	2.6	
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz	-	-	2.5	pF



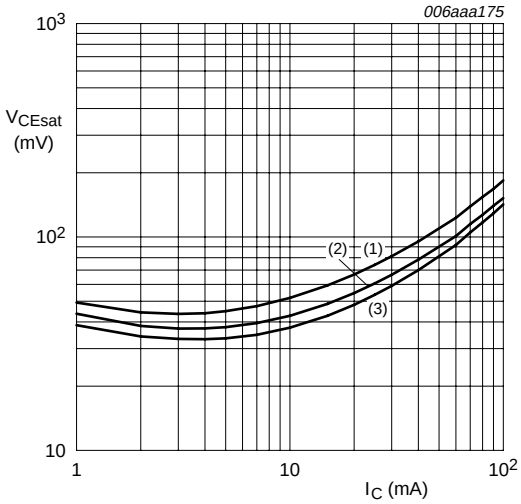
V_{CE} = 5 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –40 °C

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



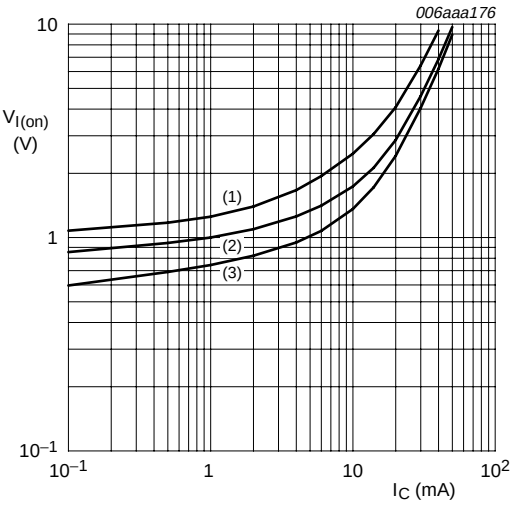
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –40 °C

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



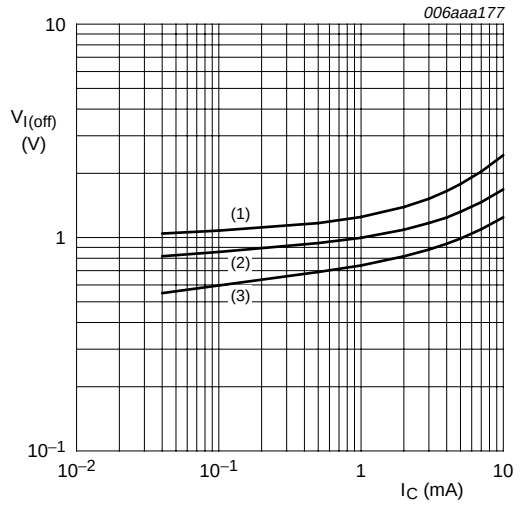
V_{CE} = 0.3 V

(1) T_{amb} = –40 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



V_{CE} = 5 V

(1) T_{amb} = –40 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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

8. Package outline

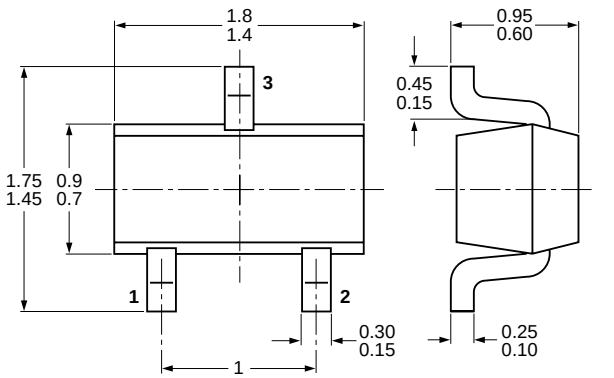


Fig 5. Package outline SOT416 (SC-75)

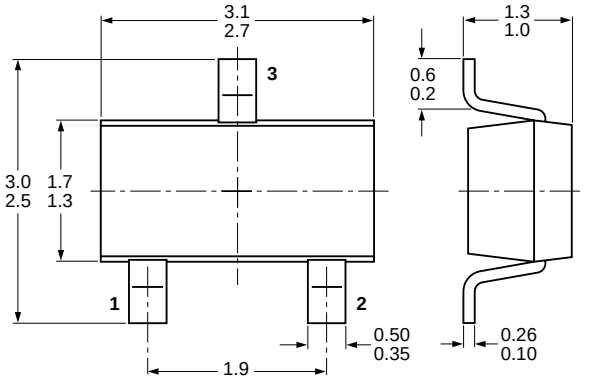


Fig 6. Package outline SOT346 (SC-59A/TO-236)

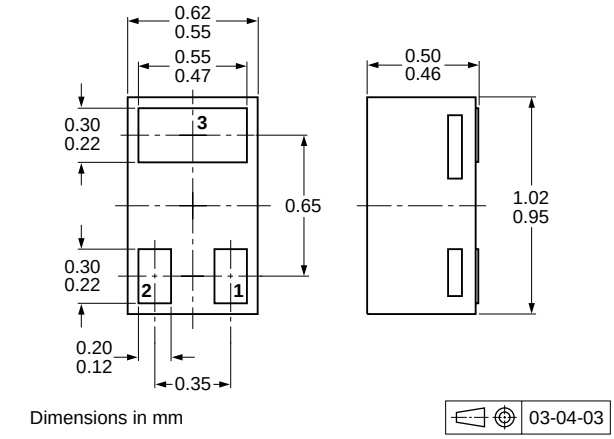


Fig 7. Package outline SOT883 (SC-101)

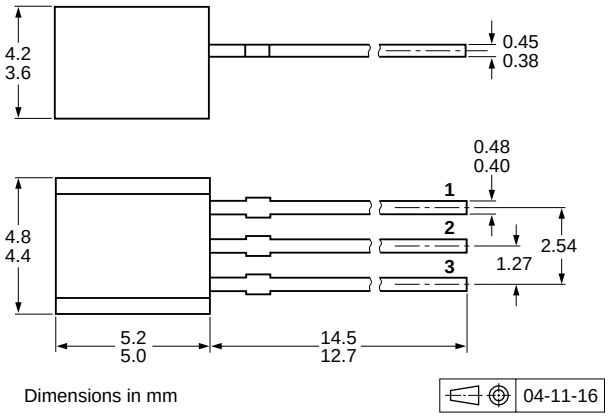


Fig 8. Package outline SOT54 (SC-43A/TO-92)

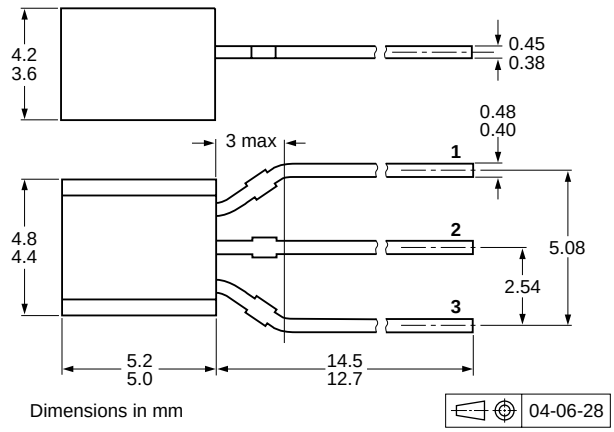


Fig 9. Package outline SOT54A

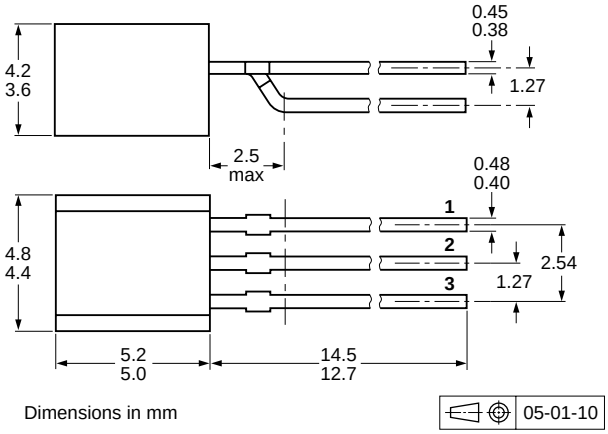


Fig 10. Package outline SOT54 variant

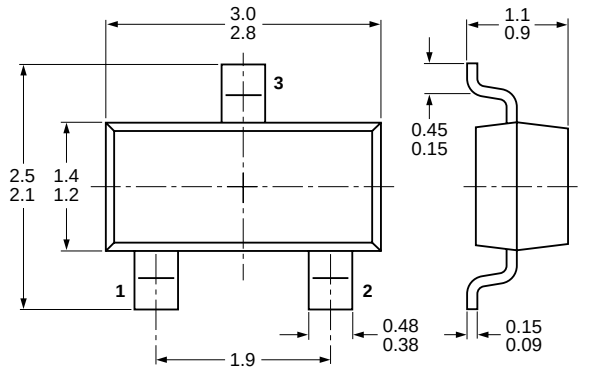


Fig 11. Package outline SOT23 (TO-236AB)

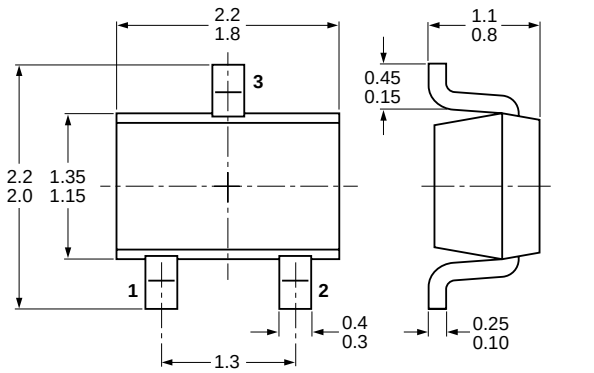


Fig 12. Package outline SOT323 (SC-70)

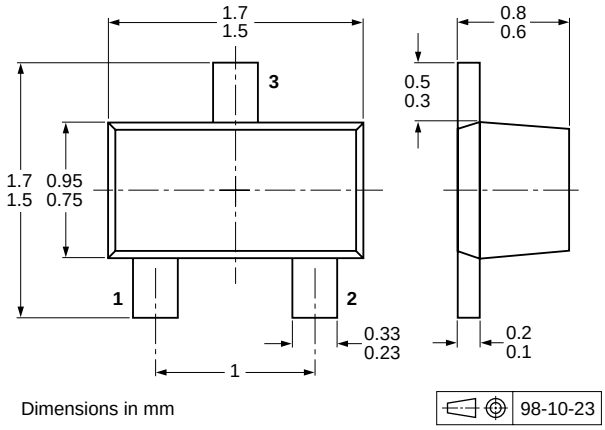


Fig 13. Package outline SOT490 (SC-89)

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	4000	5000	10000
PDTC124XE	SOT416	4 mm pitch, 8 mm tape and reel	-115	-	-	-135
PDTC124XEF	SOT490	4 mm pitch, 8 mm tape and reel	-	-115	-	-
PDTC124XK	SOT346	4 mm pitch, 8 mm tape and reel	-115	-	-	-135
PDTC124XM	SOT883	2 mm pitch, 8 mm tape and reel	-	-	-	-315
PDTC124XS	SOT54	bulk, straight leads	-	-	-412	-
	SOT54A	tape and reel, wide pitch	-	-	-	-116
		tape ammopack, wide pitch	-	-	-	-126
	SOT54 variant	bulk, delta pinning	-	-	-112	-
PDTC124XT	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-	-235
PDTC124XU	SOT323	4 mm pitch, 8 mm tape and reel	-115	-	-	-135

[1] For further information and the availability of packing methods, see Section 15.

10. Revision history

Table 10: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PDTC124X_SER_6	20050714	Product data sheet	-	-	PDTC124X_SERIES_5
Modifications:	• The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors. • Table 6 “Limiting values”: typing error for value of V_{EBO} emitter-base voltage corrected • Table 8 “Characteristics”: $V_{i(on)}$ redefined to $V_{I(on)}$ on-state input voltage • Table 8 “Characteristics”: $V_{i(off)}$ redefined to $V_{I(off)}$ off-state input voltage • Figure 1, 2, 3, 4, 9 and 10: added • Figure 5, 6, 7, 8, 11, 12 and 13: superseded by minimized package outlines • Section 9 “Packing information”: added • Section 14 “Trademarks”: added				
PDTC124X_SERIES_5	20040813	Product specification	-	9397 750 13672	PDTC124X_SERIES_4
PDTC124X_SERIES_4	20030410	Product specification	-	9397 750 11018	PDTC124XEF_2 PDTC124XE_3
PDTC124XE_3	19990518	Product specification	-	9397 750 05861	PDTC124XE_2
PDTC124XE_2	19980921	Product specification	-	9397 750 04129	PDTC124XE_1
PDTC124XE_1	19971215	Product specification	-	9397 750 03081	-
PDTC124XEF_2	19990518	Preliminary specification	-	9397 750 05862	PDTC124XEF_1
PDTC124XEF_1	19981111	Preliminary specification	-	9397 750 04644	-

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.

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16. Contents

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