PDTC123T series

NPN resistor-equipped transistors; R1 = 2.2 kΩ, R2 = open

Rev. 01 — 10 March 2006 Product data sheet

1. Product profile

1.1 General description

NPN Resistor-Equipped Transistors (RET) family in Surface Mounted Device (SMD) plastic packages.

Table 1. Product overview

Type number	Package			PNP complement
	Philips	JEITA	JEDEC	
PDTC123TE	SOT416	SC-75	-	PDTA123TE
PDTC123TK	SOT346	SC-59A	TO-236	PDTA123TK
PDTC123TM	SOT883	SC-101	-	PDTA123TM
PDTC123TS[1]	SOT54	SC-43A	TO-92	PDTA123TS
PDTC123TT	SOT23	-	TO-236AB	PDTA123TT
PDTC123TU	SOT323	SC-70	-	PDTA123TU

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

1.2 Features

- Built-in bias resistors
- Simplifies circuit design
- 100 mA output current capability
- Reduces component count
- Reduces pick and place costs

1.3 Applications

- Digital applications
- Control of IC inputs
- Cost-saving alternative for BC847 series in digital applications
- Switching loads

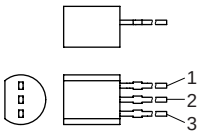
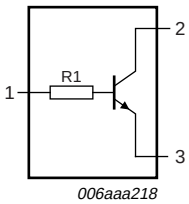
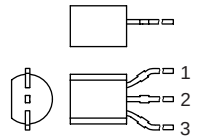
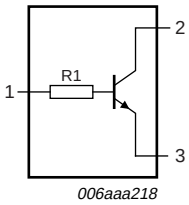
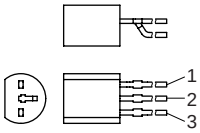
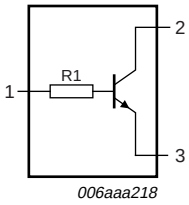
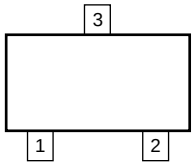
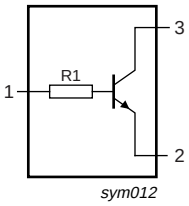
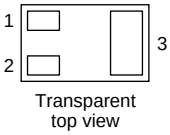
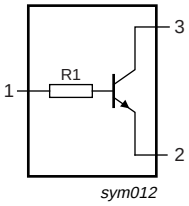
1.4 Quick reference data

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		-	-	100	mA
R1	bias resistor 1 (input)		1.54	2.2	2.86	kΩ

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Symbol
SOT54			
1	input (base)	 001aab347	 006aaa218
2	output (collector)		
3	GND (emitter)		
SOT54A			
1	input (base)	 001aab348	 006aaa218
2	output (collector)		
3	GND (emitter)		
SOT54 variant			
1	input (base)	 001aab447	 006aaa218
2	output (collector)		
3	GND (emitter)		
SOT23; SOT323; SOT346; SOT416			
1	input (base)	 006aaa144	 sym012
2	GND (emitter)		
3	output (collector)		
SOT883			
1	input (base)	 Transparent top view	 sym012
2	GND (emitter)		
3	output (collector)		

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3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PDTC123TE	SC-75	plastic surface mounted package; 3 leads	SOT416
PDTC123TK	SC-59A	plastic surface mounted package; 3 leads	SOT346
PDTC123TM	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm	SOT883
PDTC123TS[1]	SC-43A	plastic single-ended leaded (through hole) package; 3 leads	SOT54
PDTC123TT	-	plastic surface mounted package; 3 leads	SOT23
PDTC123TU	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]
PDTC123TE	2B
PDTC123TK	GB
PDTC123TM	FB
PDTC123TS	TC123T
PDTC123TT	ZM*
PDTC123TU	*1T

[1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

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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
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
	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
	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.

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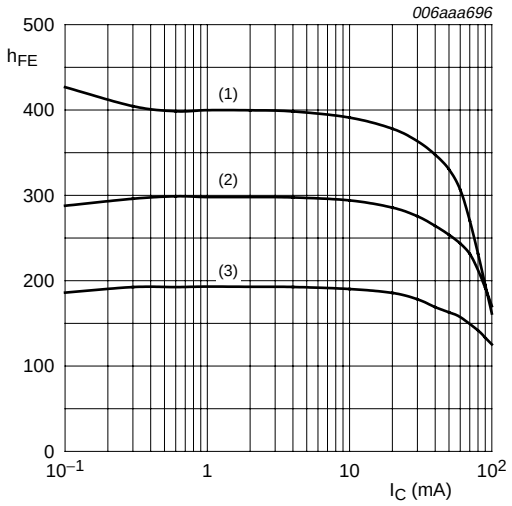
7. Characteristics

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	-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 20 mA	30	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA	-	-	150	mV
R1	bias resistor 1 (input)		1.54	2.2	2.86	kΩ
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz	-	-	2.5	pF



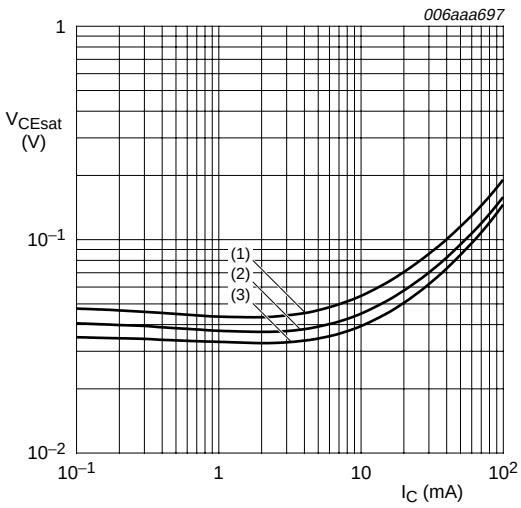
V_{CE} = 5 V

(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

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8. Package outline

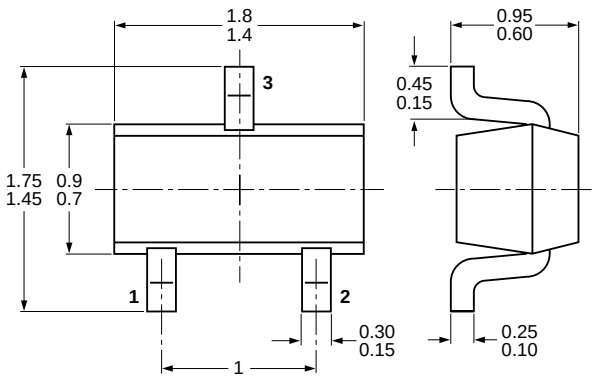

Fig 3. Package outline SOT416 (SC-75)

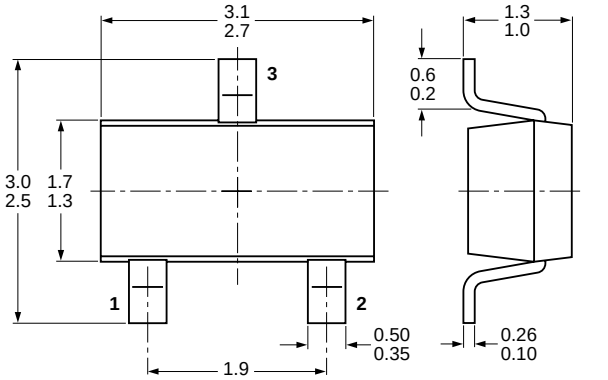

Fig 4. Package outline SOT346 (SC-59A/TO-236)

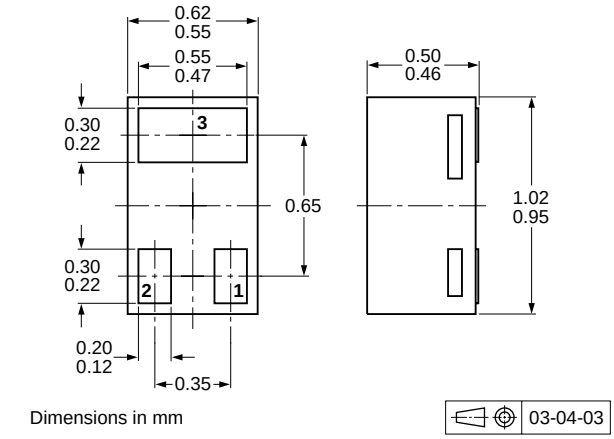

Fig 5. Package outline SOT883 (SC-101)

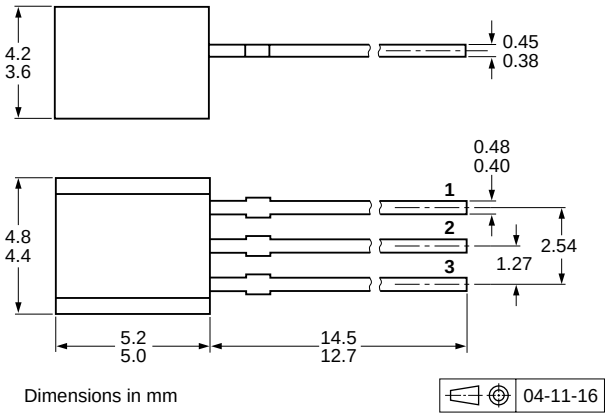

Fig 6. Package outline SOT54 (SC-43A/TO-92)

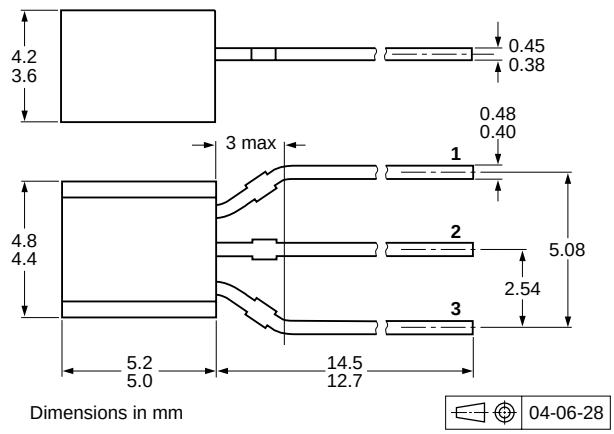

Fig 7. Package outline SOT54A

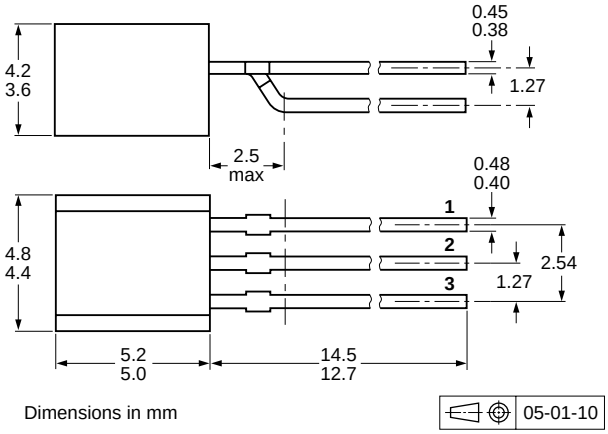

Fig 8. Package outline SOT54 variant

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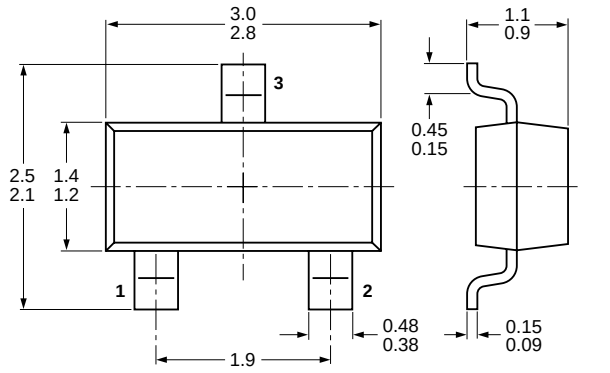

Fig 9. Package outline SOT23 (TO-236AB)

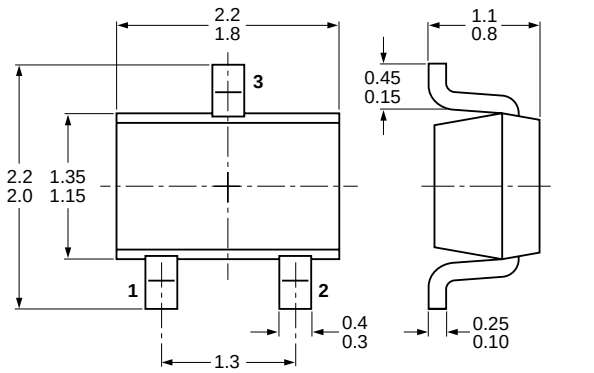

Fig 10. Package outline SOT323 (SC-70)

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
PDTC123TE	SOT416	4 mm pitch, 8 mm tape and reel	-115	-	-135
PDTC123TK	SOT346	4 mm pitch, 8 mm tape and reel	-115	-	-135
PDTC123TM	SOT883	2 mm pitch, 8 mm tape and reel	-	-	-315
PDTC123TS	SOT54	bulk, straight leads	-	-412	-
	SOT54A	tape and reel, wide pitch	-	-	-116
		tape ammopack, wide pitch	-	-	-126
	SOT54 variant	bulk, delta pinning	-	-112	-
PDTC123TT	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-235
PDTC123TU	SOT323	4 mm pitch, 8 mm tape and reel	-115	-	-135

[1] For further information and the availability of packing methods, see Section 12.

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10. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PDTC123T_SER_1	20060310	Product data sheet	-	-

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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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Date of release: 10 March 2006

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