# 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

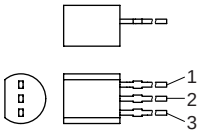
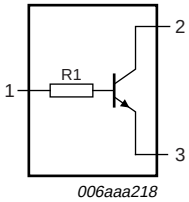
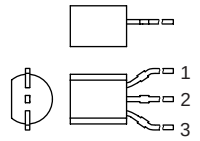
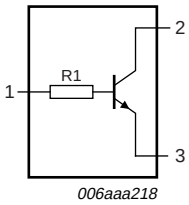
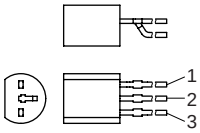
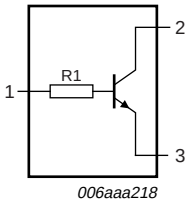
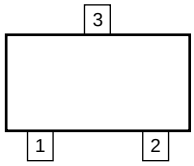
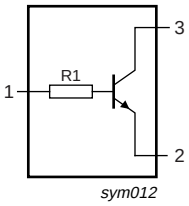
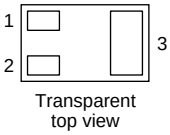
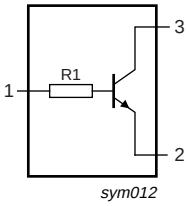
**Table 2. Quick reference data**

| 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 |

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## 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.

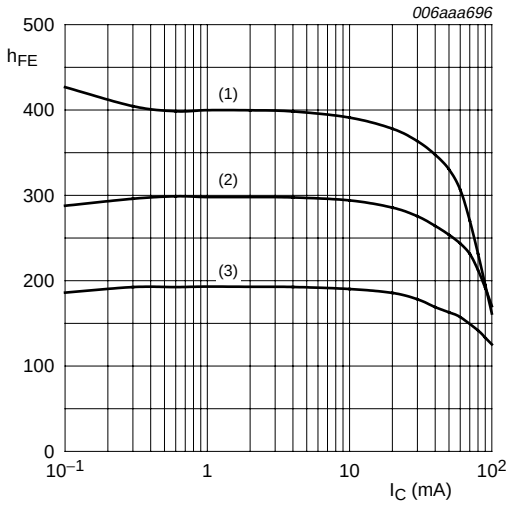

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## 7. Characteristics

**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 |



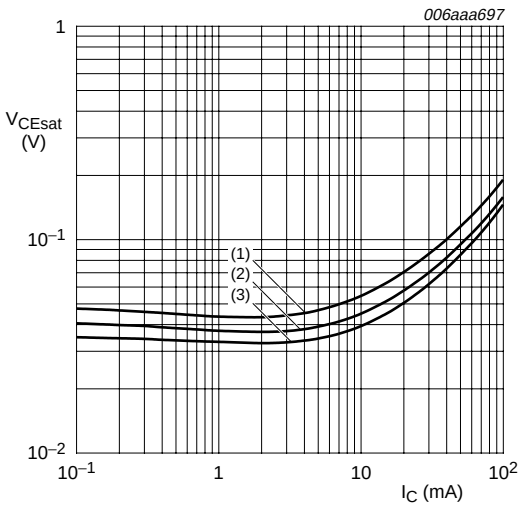

$V_{CE}$ = 5 V

(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

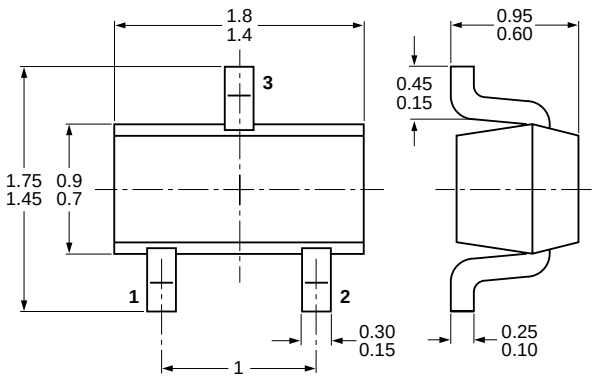



Fig 3. Package outline SOT416 (SC-75)

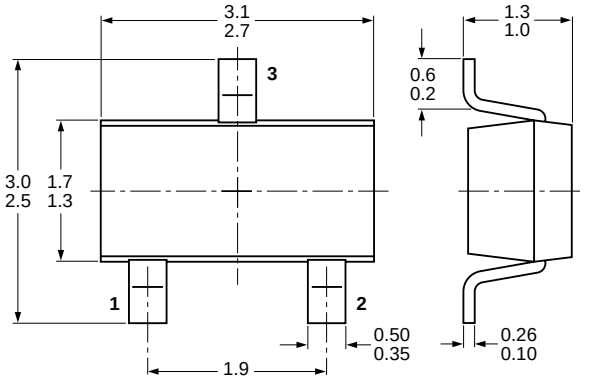



Fig 4. Package outline SOT346 (SC-59A/TO-236)

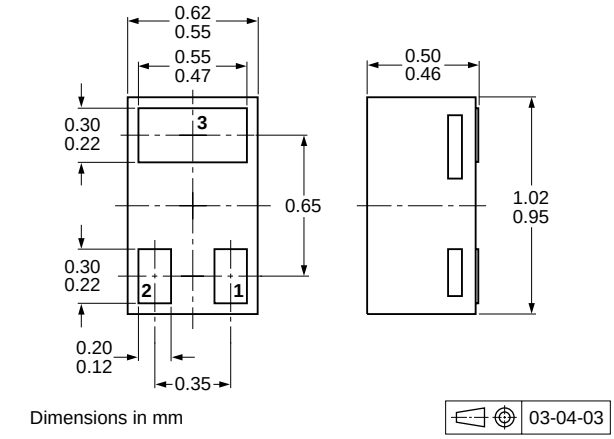



Fig 5. Package outline SOT883 (SC-101)

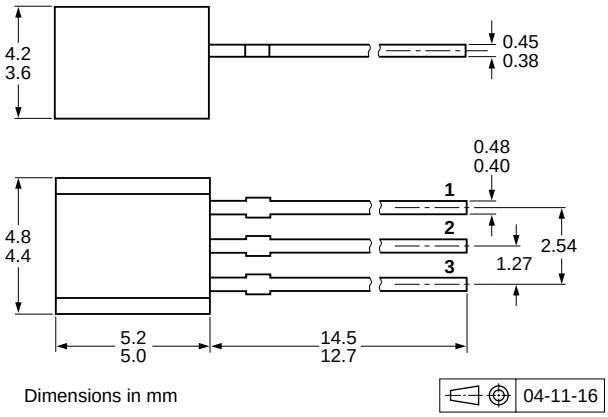



Fig 6. Package outline SOT54 (SC-43A/TO-92)

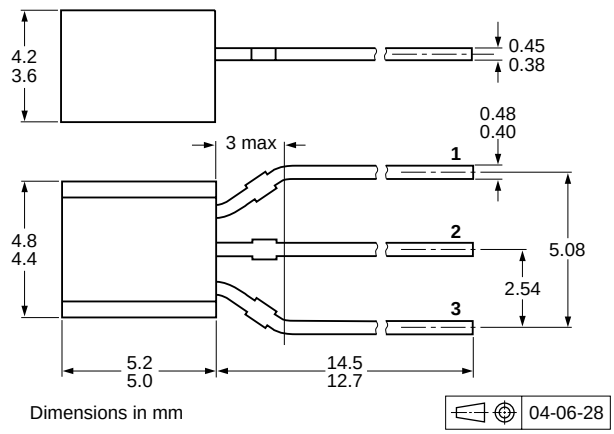



Fig 7. Package outline SOT54A

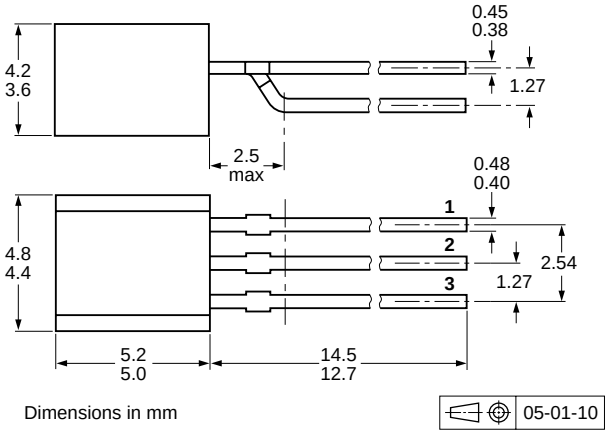



Fig 8. Package outline SOT54 variant


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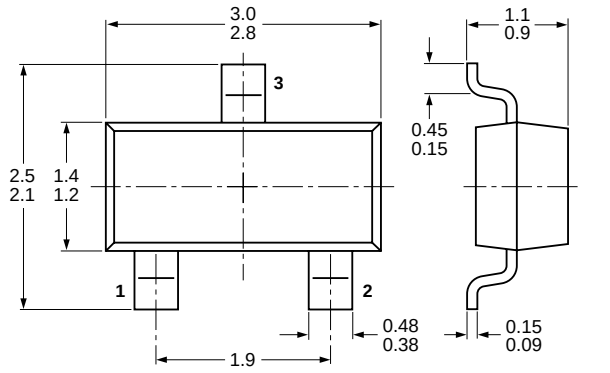



Fig 9. Package outline SOT23 (TO-236AB)

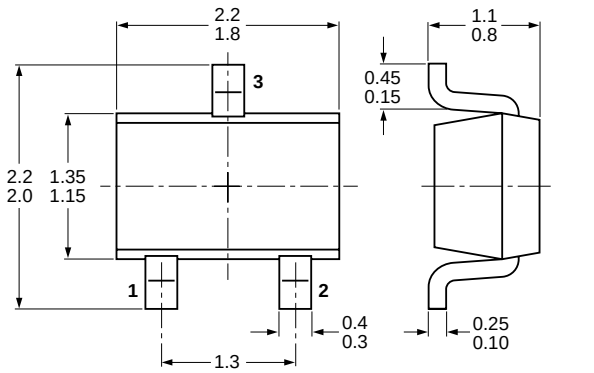



Fig 10. Package outline SOT323 (SC-70)

## 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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## 11.1 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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