

PDTB123E series

PNP 500 mA, 50 V resistor-equipped transistors;

R1 = 2.2 k Ω , R2 = 2.2 k Ω

Rev. 02 — 16 November 2009

Product data sheet

1. Product profile

1.1 General description

500 mA PNP Resistor-Equipped Transistors (RET) family.

Table 1. Product overview

| Type number | Package | | | NPN complement |
|--------------------------|---------|--------|----------|----------------|
| | NXP | JEITA | JEDEC | |
| PDTB123EK | SOT346 | SC-59A | TO-236 | PDTD123EK |
| PDTB123ES ^[1] | SOT54 | SC-43A | TO-92 | PDTD123ES |
| PDTB123ET | SOT23 | - | TO-236AB | PDTD123ET |

[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 BC807 series in digital applications
- Switching loads

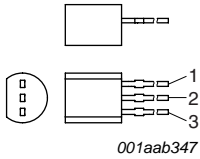
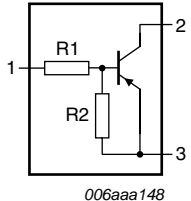
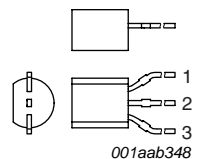
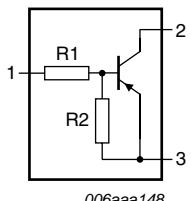
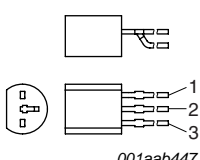
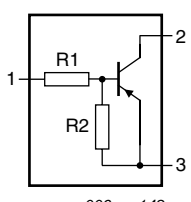
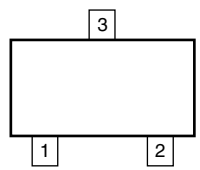
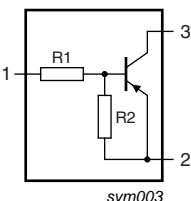
1.4 Quick reference data

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 | |

2. Pinning information

Table 3. Pinning

| Pin | Description | Simplified outline | Symbol |
|----------------------|--------------------|---|--|
| SOT54 | | | |
| 1 | input (base) |  <p>001aab347</p> |  <p>006aaa148</p> |
| 2 | output (collector) | | |
| 3 | GND (emitter) | | |
| SOT54A | | | |
| 1 | input (base) |  <p>001aab348</p> |  <p>006aaa148</p> |
| 2 | output (collector) | | |
| 3 | GND (emitter) | | |
| SOT54 variant | | | |
| 1 | input (base) |  <p>001aab447</p> |  <p>006aaa148</p> |
| 2 | output (collector) | | |
| 3 | GND (emitter) | | |
| SOT23, SOT346 | | | |
| 1 | input (base) |  <p>006aaa144</p> |  <p>sym003</p> |
| 2 | GND (emitter) | | |
| 3 | output (collector) | | |

3. Ordering information

Table 4. Ordering information

| Type number | Package | | |
|--------------------------|---------|---|---------|
| | Name | Description | Version |
| PDTB123EK | SC-59A | plastic surface mounted package; 3 leads | SOT346 |
| PDTB123ES ^[1] | SC-43A | plastic single-ended leaded (through hole) package; 3 leads | SOT54 |
| PDTB123ET | - | 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] |
|-------------|-----------------------------|
| PDTB123EK | E2 |
| PDTB123ES | B123ES |
| PDTB123ET | *7S |

[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 | | - | -12 | V |
| I_O | output current (DC) | | - | -500 | mA |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ }^\circ\text{C}$ | | | |
| | SOT346 | | ^[1] - | 250 | mW |
| | SOT54 | | ^[1] - | 500 | mW |
| | SOT23 | | ^[1] - | 250 | mW |
| T_{stg} | storage temperature | | -65 | +150 | $^\circ\text{C}$ |
| T_j | junction temperature | | - | 150 | $^\circ\text{C}$ |
| T_{amb} | ambient temperature | | -65 | +150 | $^\circ\text{C}$ |

[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 |

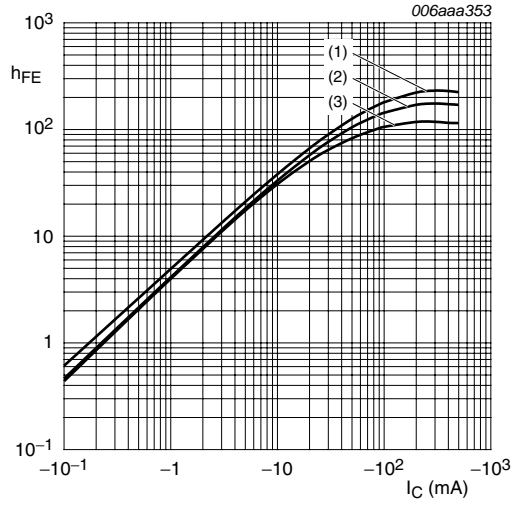
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

7. Characteristics

Table 8. Characteristics

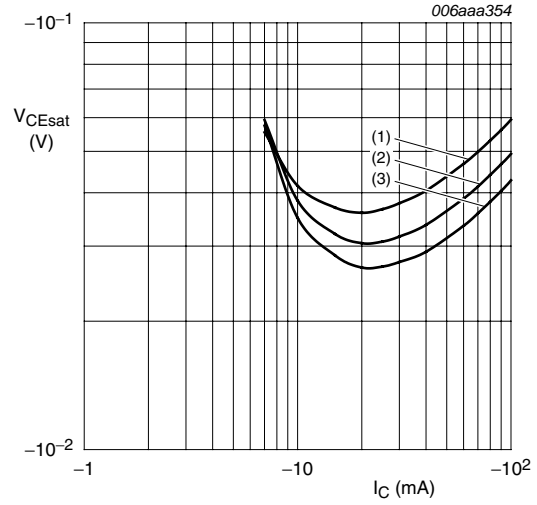
$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------|--------------------------------------|--|------|------|------|---------------|
| I_{CB0} | collector-base cut-off current | $V_{CB} = -40\text{ V}; I_E = 0\text{ A}$ $V_{CB} = -50\text{ V}; I_E = 0\text{ A}$ | - | - | -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 | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}$ | - | - | -2.0 | 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 | mV |
| $V_{I(off)}$ | 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 | $V_{CB} = -10\text{ V}; I_E = i_e = 0\text{ A};$ $f = 100\text{ MHz}$ | - | 11 | - | pF |



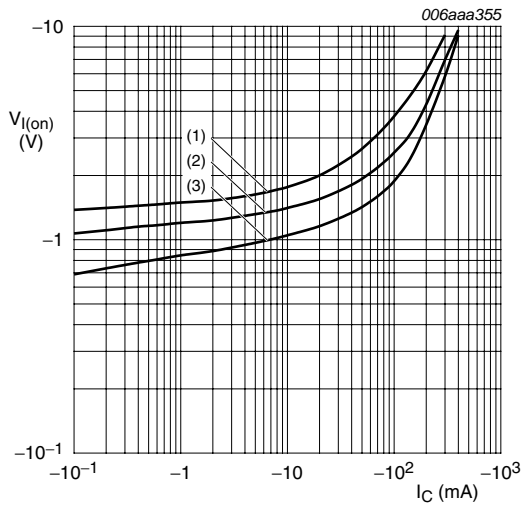
$V_{CE} = -5\text{ V}$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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



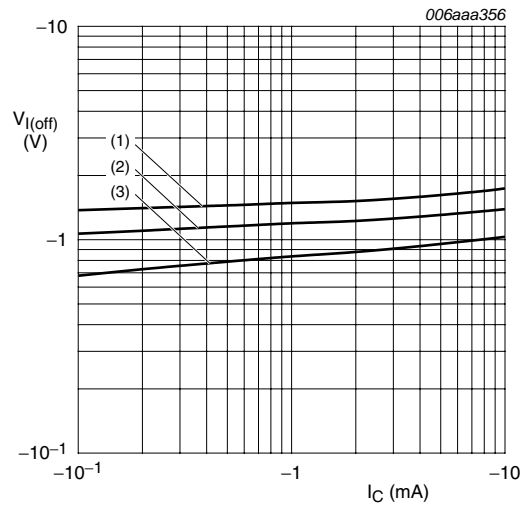
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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

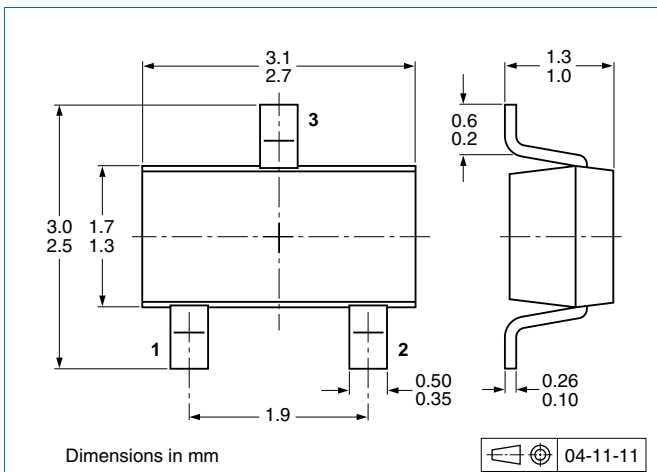


Fig 5. Package outline SOT346 (SC-59A/TO-236)

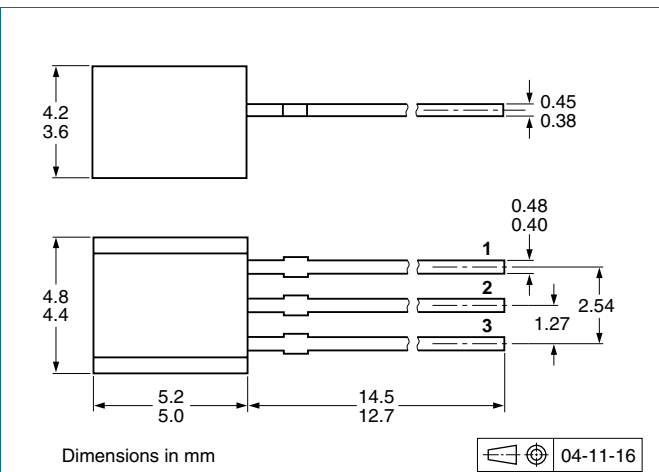


Fig 6. Package outline SOT54 (SC-43A/TO-92)

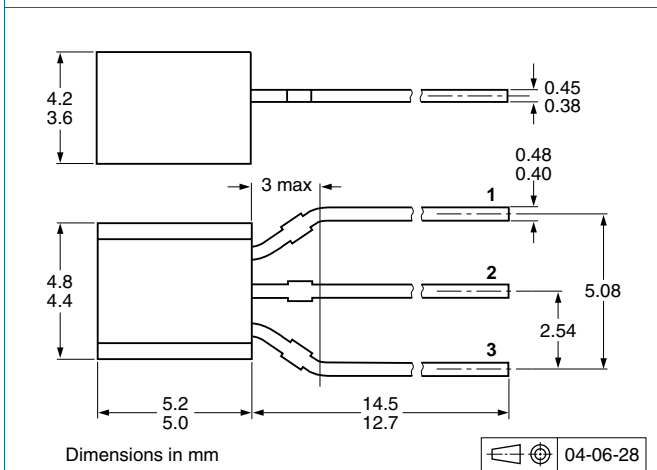


Fig 7. Package outline SOT54A

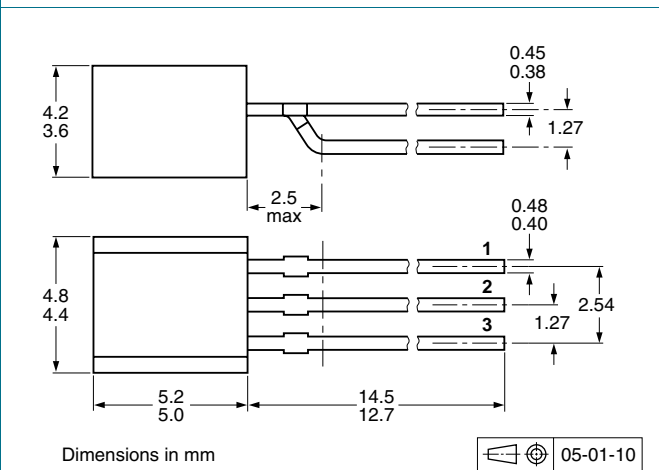


Fig 8. Package outline SOT54 variant

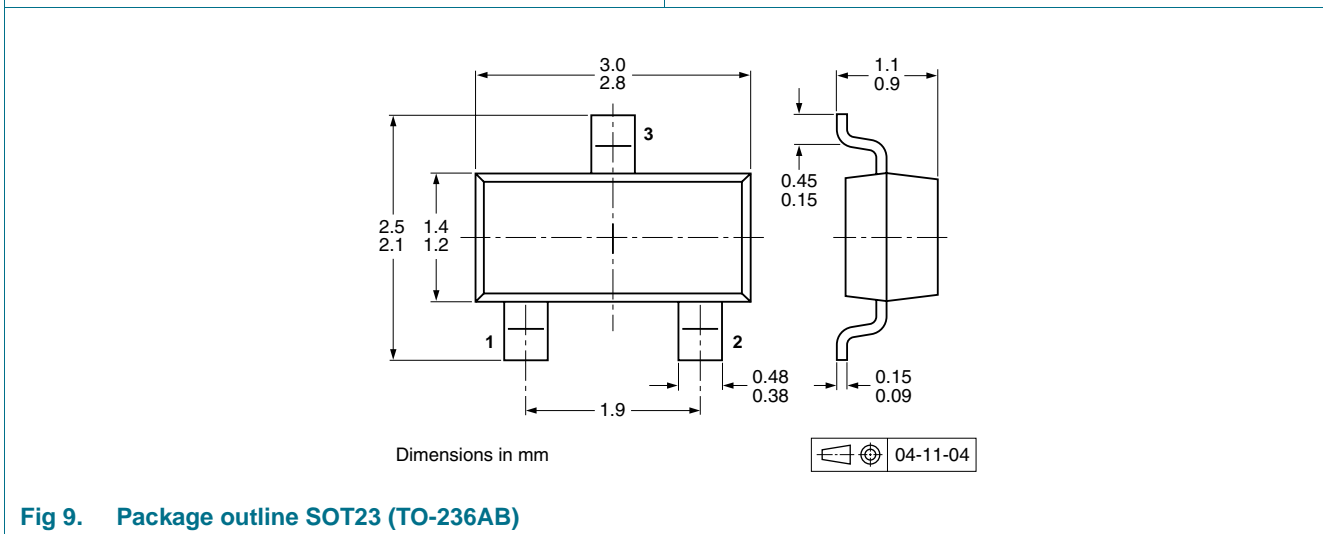


Fig 9. Package outline SOT23 (TO-236AB)

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 |
| PDTB123EK | SOT346 | 4 mm pitch, 8 mm tape and reel | -115 | - | -135 |
| PDTB123ES | SOT54 | bulk, straight leads | - | -412 | - |
| | SOT54A | tape and reel, wide pitch | - | - | -116 |
| | | tape ammopack, wide pitch | - | - | -126 |
| | SOT54 variant | bulk, delta pinning | - | -112 | - |
| PDTB123ET | SOT23 | 4 mm pitch, 8 mm tape and reel | -215 | - | -235 |

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

10. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|---|--------------------|---------------|----------------|
| PDTB123E_SER_2 | 20091116 | Product data sheet | - | PDTB123E_SER_1 |
| Modifications: | <ul style="list-style-type: none">This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content. | | | |
| PDTB123E_SER_1 | 20050427 | Product data sheet | - | - |

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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