

Important notice

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Kind regards,

Team Nexperia

PDTC144V series

NPN resistor-equipped transistors; R1 = 47 kΩ, R2 = 10 kΩ

Rev. 04 — 16 November 2009

Product data sheet

1. Product profile

1.1 General description

NPN resistor-equipped transistors.

Table 1. Product overview

| Type number | Package | | PNP complement |
|--------------------------|---------------|--------|----------------|
| | NXP | JEITA | |
| PDTC144VE | SOT416 | SC-75 | PDTA144VE |
| PDTC144VK | SOT346 | SC-59A | PDTA144VK |
| PDTC144VM | SOT883 | SC-101 | PDTA144VM |
| PDTC144VS ^[1] | SOT54 (TO-92) | SC-43A | PDTA144VS |
| PDTC144VT | SOT23 | - | PDTA144VT |
| PDTC144VU | SOT323 | SC-70 | PDTA144VU |

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

1.2 Features

- Built-in bias resistors
- Reduces component count
- Simplifies circuit design
- Reduces pick and place costs

1.3 Applications

- General-purpose switching and amplification
- Circuit drivers
- Inverter and interface circuits

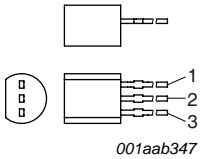
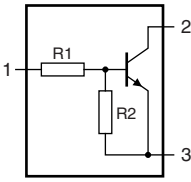
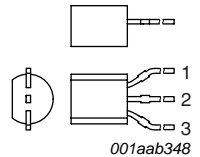
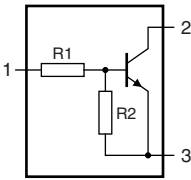
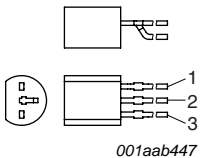
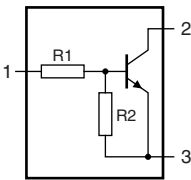
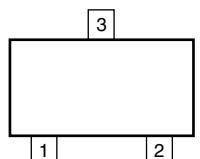
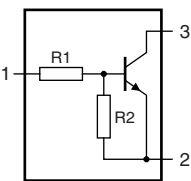
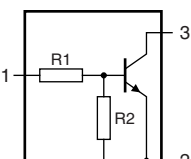
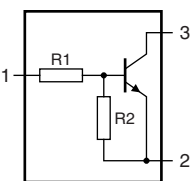
1.4 Quick reference data

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) | | - | - | 100 | mA |
| R1 | bias resistor 1 (input) | | 33 | 47 | 61 | kΩ |
| R2/R1 | bias resistor ratio | | 0.17 | 0.21 | 0.26 | |

2. Pinning information

Table 3. Pinning

| Pin | Description | Simplified outline | Symbol |
|--------------------------------------|--------------------|---|--|
| SOT54 | | | |
| 1 | input (base) |  <p>001aab347</p> |  <p>006aaa145</p> |
| 2 | output (collector) | | |
| 3 | GND (emitter) | | |
| SOT54A | | | |
| 1 | input (base) |  <p>001aab348</p> |  <p>006aaa145</p> |
| 2 | output (collector) | | |
| 3 | GND (emitter) | | |
| SOT54 variant | | | |
| 1 | input (base) |  <p>001aab447</p> |  <p>006aaa145</p> |
| 2 | output (collector) | | |
| 3 | GND (emitter) | | |
| SOT23, SOT323, SOT346, SOT416 | | | |
| 1 | input (base) |  <p>006aaa144</p> |  <p>sym007</p> |
| 2 | GND (emitter) | | |
| 3 | output (collector) | | |
| SOT883 | | | |
| 1 | input (base) |  |  <p>sym007</p> |
| 2 | GND (emitter) | | |
| 3 | output (collector) | | |

3. Ordering information

Table 4. Ordering information

| Type number | Package | | Version |
|--------------------------|---------|---|---------|
| | Name | Description | |
| PDTC144VE | SC-75 | plastic surface mounted package; 3 leads | SOT416 |
| PDTC144VK | SC-59A | plastic surface mounted package; 3 leads | SOT346 |
| PDTC144VM | SC-101 | leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm | SOT883 |
| PDTC144VS ^[1] | SC-43A | plastic single-ended leaded (through hole) package; 3 leads | SOT54 |
| PDTC144VT | - | plastic surface mounted package; 3 leads | SOT23 |
| PDTC144VU | 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] |
|-------------|-----------------------------|
| PDTC144VE | 18 |
| PDTC144VK | 29 |
| PDTC144VM | G6 |
| PDTC144VS | TC144V |
| PDTC144VT | *AA |
| PDTC144VU | *18 |

[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 | - | 15 | V |
| V _I | input voltage | | | | |
| | positive | | - | +40 | V |
| | negative | | - | -15 | V |
| I _O | output current (DC) | | - | 100 | mA |
| I _{CM} | peak collector current | | - | 100 | mA |
| P _{tot} | total power dissipation | | | | |
| | SOT416 | T _{amb} ≤ 25 °C | [1] - | 150 | mW |
| | SOT346 | T _{amb} ≤ 25 °C | [1] - | 250 | mW |
| | SOT883 | T _{amb} ≤ 25 °C | [2][3] - | 250 | mW |
| | SOT54 | T _{amb} ≤ 25 °C | [1] - | 500 | mW |
| | SOT23 | T _{amb} ≤ 25 °C | [1] - | 250 | mW |
| | SOT323 | T _{amb} ≤ 25 °C | [1] - | 200 | mW |
| | T _{stg} | storage temperature | | -65 | +150 |
| T _j | junction temperature | | - | 150 | °C |
| T _{amb} | ambient temperature | | -65 | +150 | °C |

[1] Refer to standard mounting conditions.

[2] Reflow soldering is the only recommended soldering method.

[3] Refer to SOT883 standard mounting conditions; FR4 printed-circuit board with 60 μm copper strip line.

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] Refer to standard mounting conditions.

[2] Reflow soldering is the only recommended soldering method.

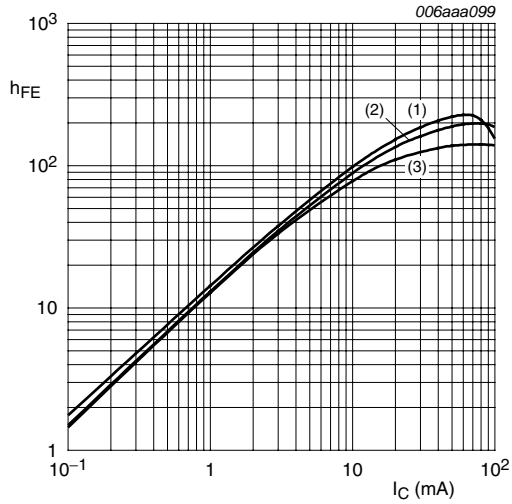
[3] Refer to SOT883 standard mounting conditions; FR4 printed-circuit board with 60 μm copper strip line.

7. Characteristics

Table 8. Characteristics

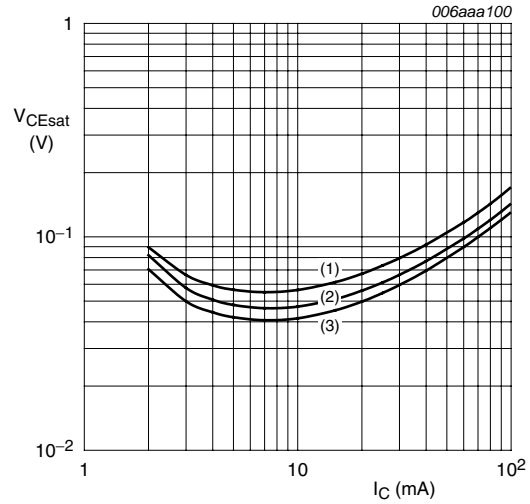
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------|--------------------------------------|--|------|------|------|------|
| I_{CBO} | collector-base cut-off current | $V_{CB} = 50\text{ V}; I_E = 0\text{ A}$ | - | - | 100 | nA |
| I_{CEO} | collector-emitter cut-off current | $V_{CE} = 30\text{ V}; I_B = 0\text{ A}$ | - | - | 1 | μA |
| | | $V_{CE} = 30\text{ V}; I_B = 0\text{ A}; T_j = 150\text{ °C}$ | - | - | 50 | μA |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = 5\text{ V}; I_C = 0\text{ A}$ | - | - | 150 | μA |
| h_{FE} | DC current gain | $V_{CE} = 5\text{ V}; I_C = 5\text{ mA}$ | 40 | - | - | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$ | - | - | 150 | mV |
| $V_{I(off)}$ | off-state input voltage | $V_{CE} = 5\text{ V}; I_C = 100\text{ μA}$ | - | 3.1 | 1 | V |
| $V_{I(on)}$ | on-state input voltage | $V_{CE} = 300\text{ mV}; I_C = 2\text{ mA}$ | 6 | 3.8 | - | V |
| R1 | bias resistor 1 (input) | | 33 | 47 | 61 | kΩ |
| R2/R1 | bias resistor ratio | | 0.17 | 0.21 | 0.26 | |
| C_c | collector capacitance | $V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$ | - | - | 2 | pF |



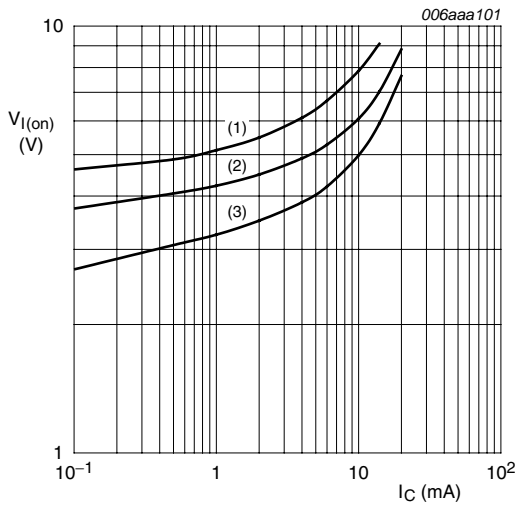
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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



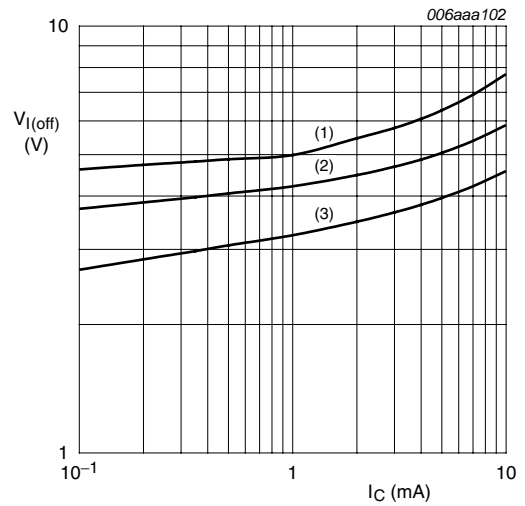
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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

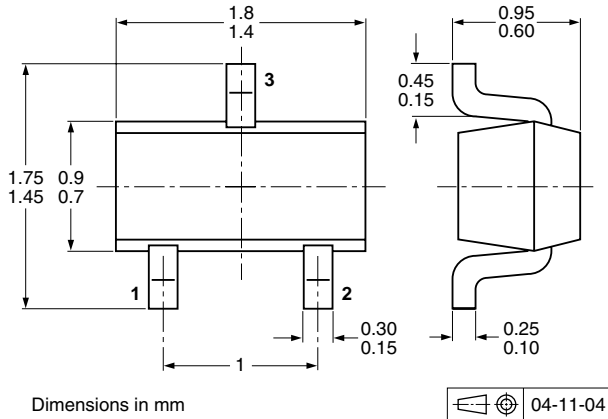


Fig 5. Package outline SOT416 (SC-75)

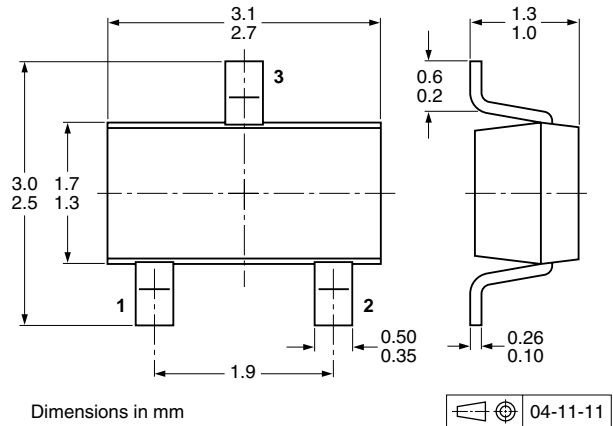


Fig 6. Package outline SOT346 (SC-59A/TO-236)

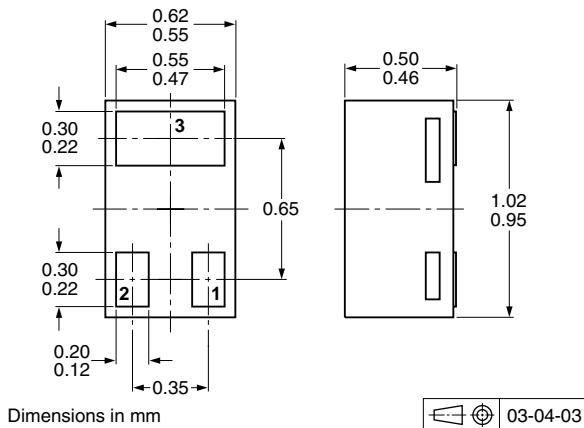


Fig 7. Package outline SOT883 (SC-101)

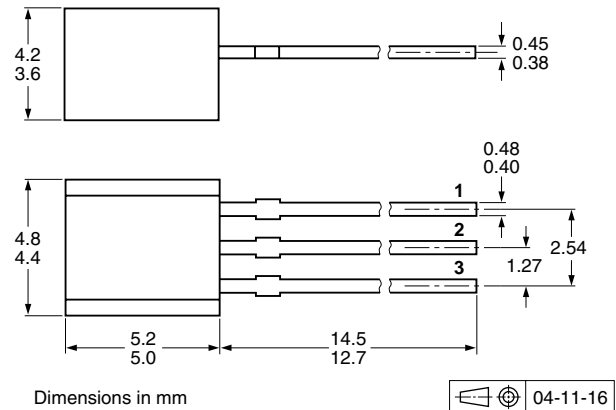


Fig 8. Package outline SOT54 (SC-43A/TO-92)

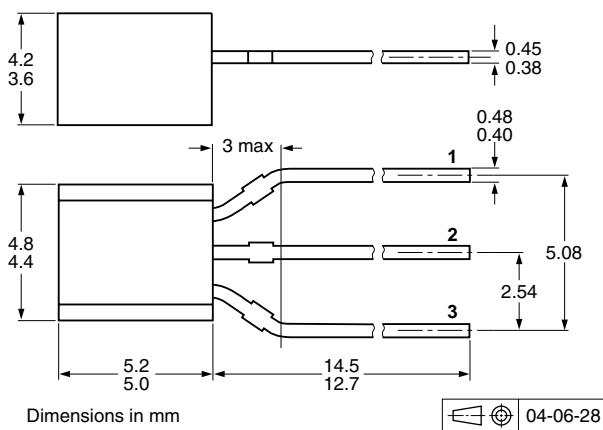


Fig 9. Package outline SOT54A

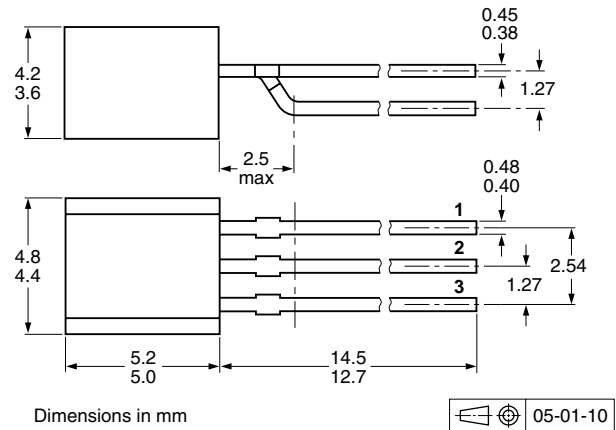


Fig 10. Package outline SOT54 variant

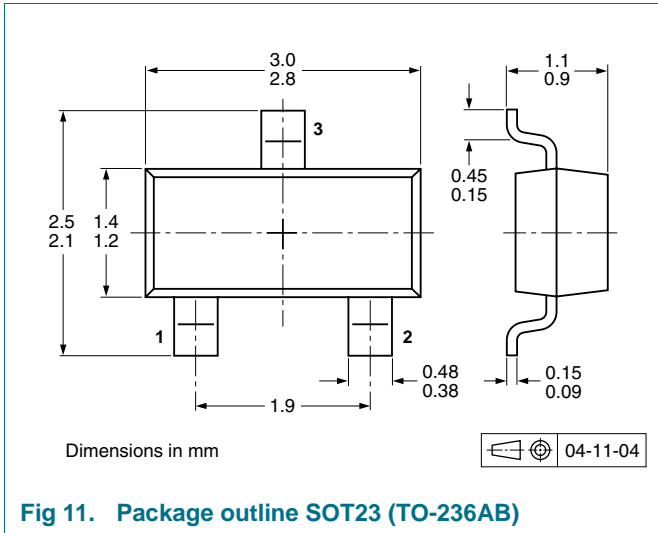


Fig 11. Package outline SOT23 (TO-236AB)

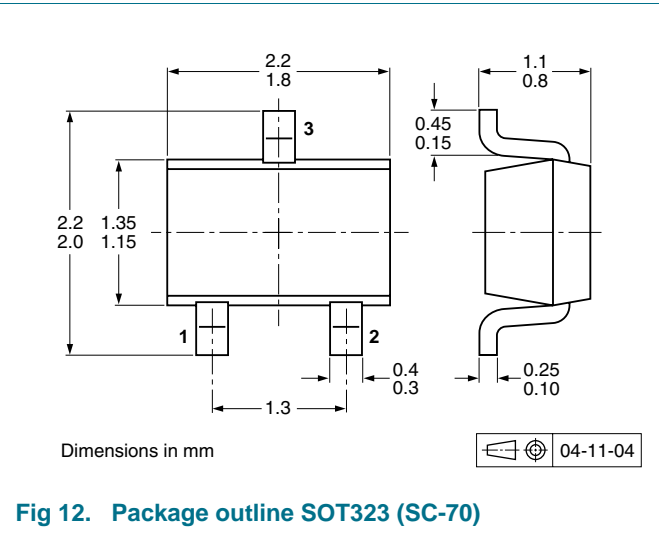


Fig 12. Package outline SOT323 (SC-70)

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 |
| PDTC144VE | SOT416 | 4 mm pitch, 8 mm tape and reel | -115 | - | -135 |
| PDTC144VK | SOT346 | 4 mm pitch, 8 mm tape and reel | -115 | - | -135 |
| PDTC144VM | SOT883 | 2 mm pitch, 8 mm tape and reel | - | - | -315 |
| PDTC144VS | SOT54 | bulk, straight leads | - | -412 | - |
| | SOT54A | tape and reel, wide pitch | - | - | -116 |
| | | tape ammpack, wide pitch | - | - | -126 |
| | SOT54 variant | bulk, delta pinning | - | -112 | - |
| PDTC144VT | SOT23 | 4 mm pitch, 8 mm tape and reel | -215 | - | -235 |
| PDTC144VU | SOT323 | 4 mm pitch, 8 mm tape and reel | -115 | - | -135 |

[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 |
|----------------|---|----------------------|---------------|----------------|
| PDTC144V_SER_4 | 20091116 | Product data sheet | - | PDTC144V_SER_3 |
| 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. | | | |
| PDTC144V_SER_3 | 20050215 | Product data sheet | - | PDTC144VT_2 |
| PDTC144VT_2 | 20040511 | Objective data sheet | - | PDTC144VT_1 |
| PDTC144VT_1 | 20040305 | Objective 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. |
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[2] The term 'short data sheet' is explained in section "Definitions".

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