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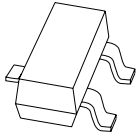
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Kind regards,

Team Nexperia



# PDTB123ET

PNP 500 mA, 50 V resistor-equipped transistor;  
R1 = 2.2 k $\Omega$ , R2 = 2.2 k $\Omega$

Rev. 3 — 22 September 2010

Product data sheet

## 1. Product profile

### 1.1 General description

500 mA PNP Resistor-Equipped Transistor (RET) in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

NPN complement: PDTD123ET.

### 1.2 Features and benefits

- 500 mA output current capability
- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs
- $\pm 10\%$  resistor ratio tolerance
- AEC-Q101 qualified

### 1.3 Applications

- Digital application in automotive and industrial segments
- Control of IC inputs
- Cost-saving alternative for BC807 series in digital applications
- Switching loads

### 1.4 Quick reference data

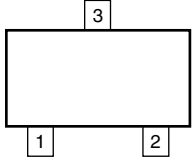
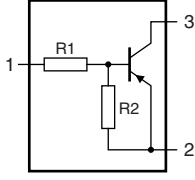
Table 1. Quick reference data

| Symbol           | Parameter                 | Conditions | Min  | Typ | Max  | Unit       |
|------------------|---------------------------|------------|------|-----|------|------------|
| V <sub>CEO</sub> | collector-emitter voltage | open base  | -    | -   | -50  | V          |
| I <sub>O</sub>   | output current            |            | -    | -   | -500 | mA         |
| R1               | bias resistor 1 (input)   |            | 1.54 | 2.2 | 2.86 | k $\Omega$ |
| R2/R1            | bias resistor ratio       |            | 0.9  | 1.0 | 1.1  |            |



## 2. Pinning information

Table 2. Pinning

| Pin | Description        | Simplified outline                                                                               | Graphic symbol                                                                                |
|-----|--------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | input (base)       | <br>006aaa144 | <br>sym003 |
| 2   | GND (emitter)      |                                                                                                  |                                                                                               |
| 3   | output (collector) |                                                                                                  |                                                                                               |

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |                                          |         |
|-------------|---------|------------------------------------------|---------|
|             | Name    | Description                              | Version |
| PDTB123ET   | -       | plastic surface-mounted package; 3 leads | SOT23   |

## 4. Marking

Table 4. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| PDTB123ET   | *7S                         |

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

## 5. Limiting values

Table 5. 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            |                | -   | -500 | mA   |

**Table 5.** Limiting values ...continued

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol           | Parameter               | Conditions                         | Min   | Max  | Unit |
|------------------|-------------------------|------------------------------------|-------|------|------|
| $P_{\text{tot}}$ | total power dissipation | $T_{\text{amb}} \leq 25\text{ °C}$ | [1] - | 250  | mW   |
| $T_j$            | junction temperature    |                                    | -     | 150  | °C   |
| $T_{\text{amb}}$ | ambient temperature     |                                    | -65   | +150 | °C   |
| $T_{\text{stg}}$ | storage temperature     |                                    | -65   | +150 | °C   |

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

## 6. Thermal characteristics

**Table 6.** Thermal characteristics

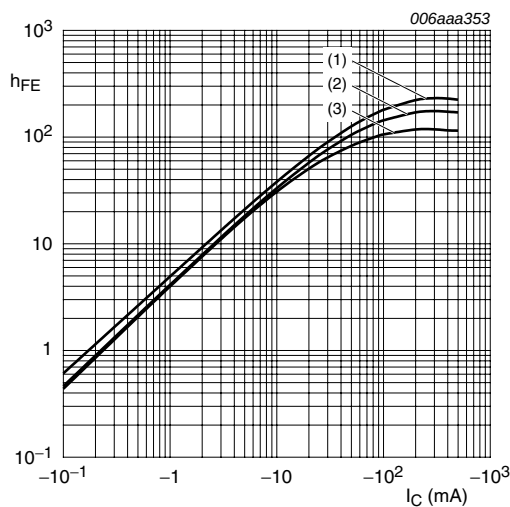
| Symbol               | Parameter                                   | Conditions  | Min   | Typ | Max | Unit |
|----------------------|---------------------------------------------|-------------|-------|-----|-----|------|
| $R_{\text{th(j-a)}}$ | thermal resistance from junction to ambient | in free air | [1] - | -   | 500 | K/W  |

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

## 7. Characteristics

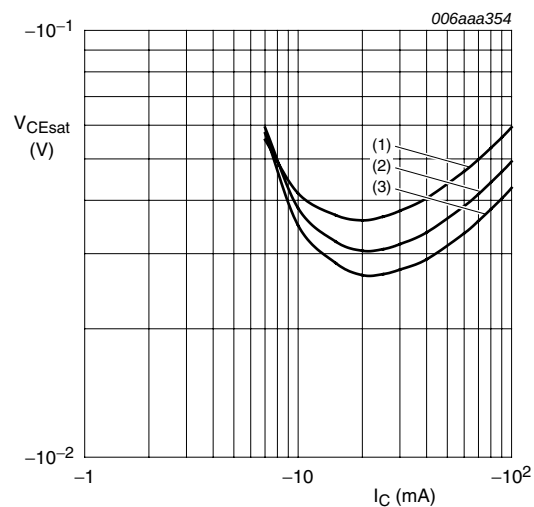
**Table 7.** Characteristics $T_{\text{amb}} = 25\text{ °C}$  unless otherwise specified.

| Symbol              | Parameter                            | Conditions                                                                                             | Min  | Typ  | Max  | Unit |
|---------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------|------|------|------|------|
| $I_{\text{CBO}}$    | collector-base cut-off current       | $V_{\text{CB}} = -40\text{ V}; I_{\text{E}} = 0\text{ A}$                                              | -    | -    | -100 | nA   |
|                     |                                      | $V_{\text{CB}} = -50\text{ V}; I_{\text{E}} = 0\text{ A}$                                              | -    | -    | -100 | nA   |
| $I_{\text{CEO}}$    | collector-emitter cut-off current    | $V_{\text{CE}} = -50\text{ V}; I_{\text{B}} = 0\text{ A}$                                              | -    | -    | -0.5 | μA   |
| $I_{\text{EBO}}$    | emitter-base cut-off current         | $V_{\text{EB}} = -5\text{ V}; I_{\text{C}} = 0\text{ A}$                                               | -    | -    | -2.0 | mA   |
| $h_{\text{FE}}$     | DC current gain                      | $V_{\text{CE}} = -5\text{ V};$<br>$I_{\text{C}} = -50\text{ mA}$                                       | 40   | -    | -    |      |
| $V_{\text{CEsat}}$  | collector-emitter saturation voltage | $I_{\text{C}} = -50\text{ mA};$<br>$I_{\text{B}} = -2.5\text{ mA}$                                     | -    | -    | -0.3 | V    |
| $V_{\text{I(off)}}$ | off-state input voltage              | $V_{\text{CE}} = -5\text{ V};$<br>$I_{\text{C}} = -100\text{ μA}$                                      | -0.6 | -1.1 | -1.8 | V    |
| $V_{\text{I(on)}}$  | on-state input voltage               | $V_{\text{CE}} = -0.3\text{ V};$<br>$I_{\text{C}} = -20\text{ mA}$                                     | -1.0 | -1.5 | -2.0 | V    |
| R1                  | bias resistor 1 (input)              |                                                                                                        | 1.54 | 2.2  | 2.86 | kΩ   |
| R2/R1               | bias resistor ratio                  |                                                                                                        | 0.9  | 1.0  | 1.1  |      |
| $C_{\text{c}}$      | collector capacitance                | $V_{\text{CB}} = -10\text{ V};$<br>$I_{\text{E}} = I_{\text{e}} = 0\text{ A};$<br>$f = 100\text{ MHz}$ | -    | 11   | -    | pF   |



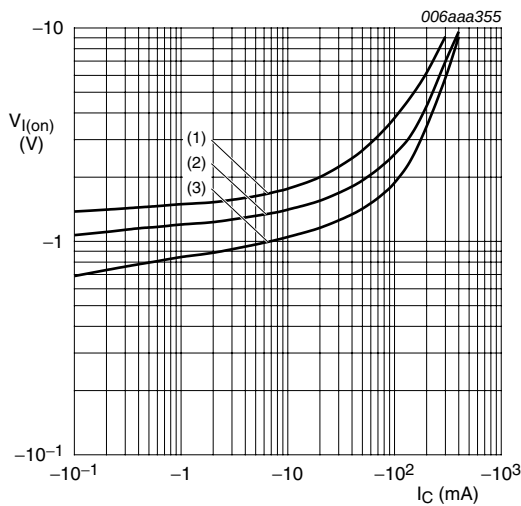
- $V_{CE} = -5\text{ V}$
- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

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



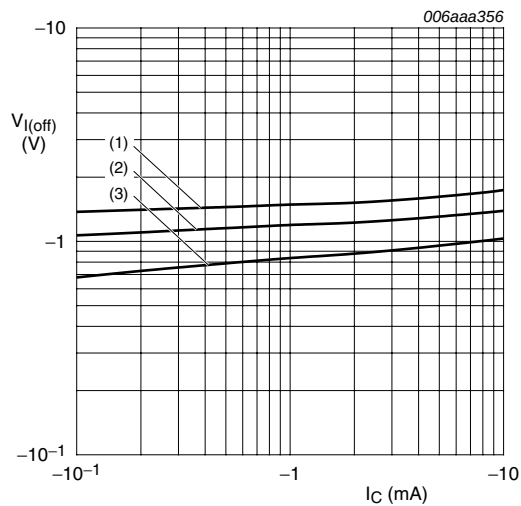
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

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



- $V_{CE} = -0.3\text{ V}$
- (1)  $T_{amb} = -40\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



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

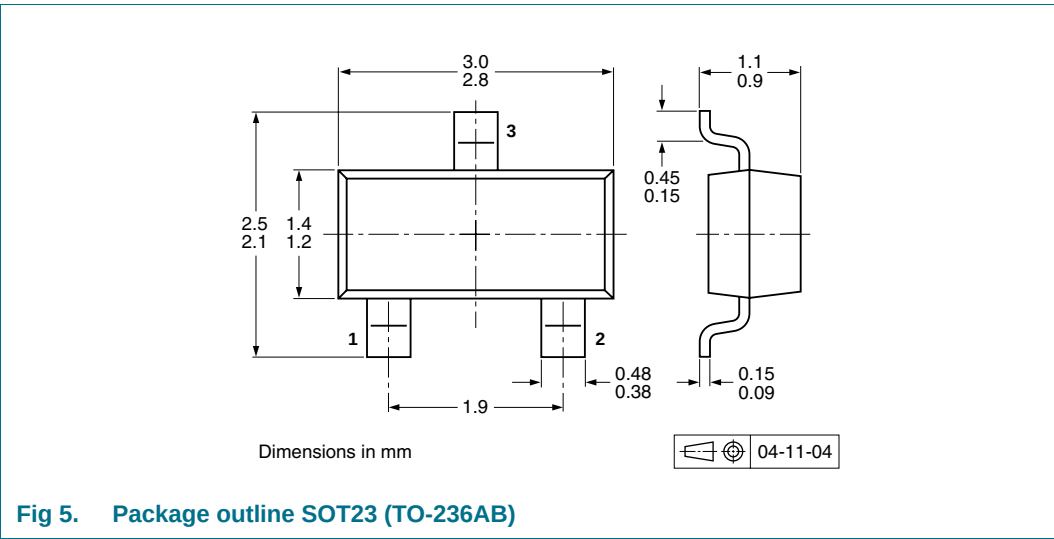
Fig 4. Off-state input voltage as a function of collector current; typical values

8. Test information

8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

9. Package outline



10. Packing information

**Table 8. Packing methods**  
The indicated -xxx are the last three digits of the 12NC ordering code.[\[1\]](#)

| Type number | Package | Description                    | Packing quantity |       |
|-------------|---------|--------------------------------|------------------|-------|
|             |         |                                | 3000             | 10000 |
| PDTB123ET   | SOT23   | 4 mm pitch, 8 mm tape and reel | -215             | -235  |

[1] For further information and the availability of packing methods, see [Section 14](#).

11. Soldering

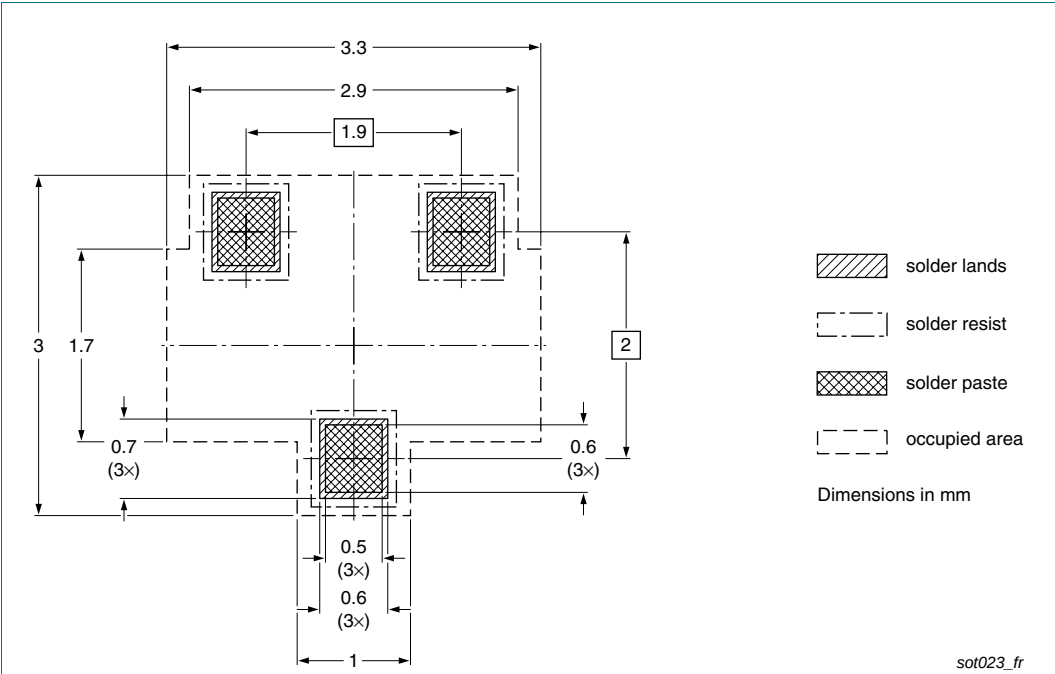


Fig 6. Reflow soldering footprint SOT23 (TO-236AB)

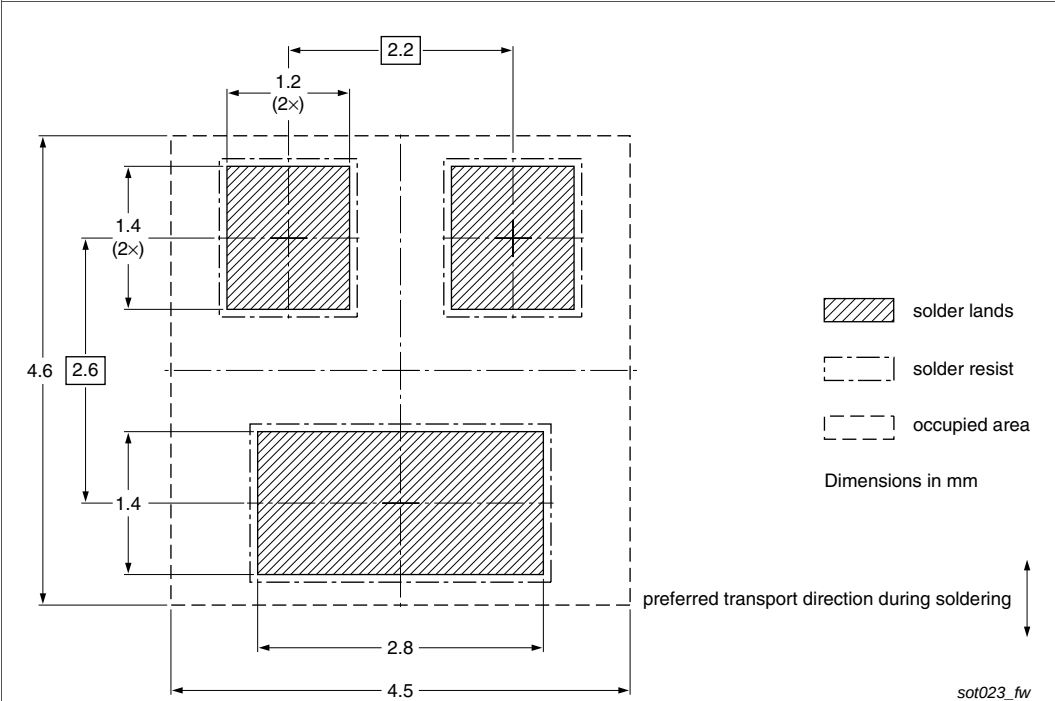


Fig 7. Wave soldering footprint SOT23 (TO-236AB)

12. Revision history

Table 9. Revision history

| Document ID    | Release date                                                                                                                                                                                                                                                                                                                                                                           | Data sheet status  | Change notice | Supersedes     |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|----------------|
| PDTB123ET v.3  | 20100922                                                                                                                                                                                                                                                                                                                                                                               | Product data sheet | -             | PDTB123E_SER_2 |
| Modifications: | <ul style="list-style-type: none"><li>Type numbers PDTB123EK and PDTB123ES deleted.</li><li><a href="#">Table 7 “Characteristics”</a>: unit for V<sub>CEsat</sub> changed from mV to V.</li><li><a href="#">Section 8 “Test information”</a>: added.</li><li><a href="#">Section 11 “Soldering”</a>: added.</li><li><a href="#">Section 13 “Legal information”</a>: updated.</li></ul> |                    |               |                |
| PDTB123E_SER_2 | 20091116                                                                                                                                                                                                                                                                                                                                                                               | Product data sheet | -             | PDTB123E_SER_1 |
| PDTB123E_SER_1 | 20050427                                                                                                                                                                                                                                                                                                                                                                               | Product data sheet | -             | -              |



## 13. Legal information

### 13.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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