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Kind regards,

Team Nexperia



# PDTB113ET

PNP 500 mA, 50 V resistor-equipped transistor;  
R1 = 1 k $\Omega$ , R2 = 1 k $\Omega$

Rev. 3 — 14 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: PDTD113ET.

### 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

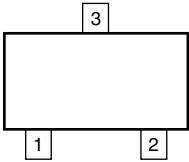
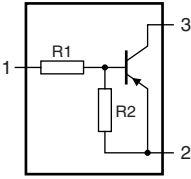
Table 1. Quick reference data

| 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)   |            | 0.7 | 1.0 | 1.3  | 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 |
| PDTB113ET   | -       | plastic surface-mounted package; 3 leads | SOT23   |

## 4. Marking

Table 4. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| PDTB113ET   | *7U                         |

- [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                  |                | -   | -10  | 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               |
|-----------|-------------------------|---|-------|------|--------------------|
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ | [1] - | 250  | mW                 |
| $T_j$     | junction temperature    |   | -     | 150  | $^{\circ}\text{C}$ |
| $T_{amb}$ | ambient temperature     |   | -65   | +150 | $^{\circ}\text{C}$ |
| $T_{stg}$ | storage 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 6. Thermal characteristics**

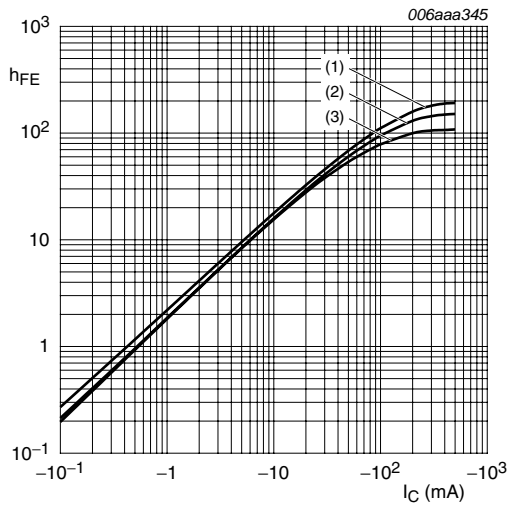
| Symbol        | Parameter                                   | Conditions  | Min   | Typ | Max | Unit |
|---------------|---|-------------|-------|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] - | -   | 500 | K/W  |

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

## 7. Characteristics

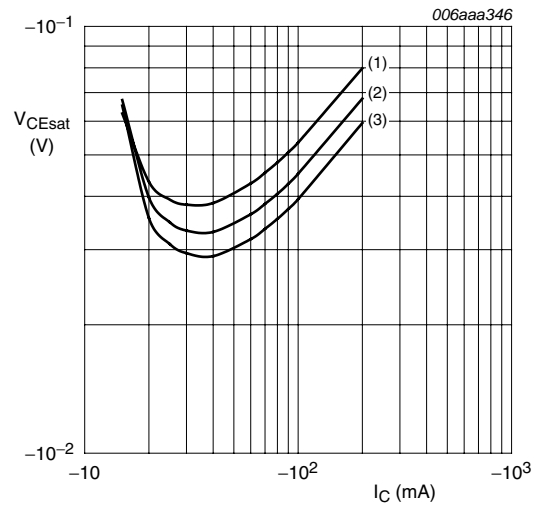
**Table 7. Characteristics** $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol       | Parameter                            | Conditions  | Min  | Typ  | Max  | Unit          |
|--------------|--------------------------------------|---|------|------|------|---------------|
| $I_{CBO}$    | collector-base cut-off current       | $V_{CB} = -40\text{ V}; I_E = 0\text{ A}$                           | -    | -    | -100 | nA            |
|              |                                      | $V_{CB} = -50\text{ V}; I_E = 0\text{ A}$                           | -    | -    | -100 | nA            |
| $I_{CEO}$    | collector-emitter cut-off current    | $V_{CE} = -50\text{ V}; I_B = 0\text{ A}$                           | -    | -    | -0.5 | $\mu\text{A}$ |
| $I_{EBO}$    | emitter-base cut-off current         | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}$                            | -    | -    | -4.0 | mA            |
| $h_{FE}$     | DC current gain                      | $V_{CE} = -5\text{ V}; I_C = -50\text{ mA}$                         | 33   | -    | -    |               |
| $V_{CEsat}$  | collector-emitter saturation voltage | $I_C = -50\text{ mA}; I_B = -2.5\text{ mA}$                         | -    | -    | -0.3 | V             |
| $V_{I(off)}$ | off-state input voltage              | $V_{CE} = -5\text{ V}; I_C = -100\text{ }\mu\text{A}$               | -0.6 | -1.1 | -1.5 | V             |
| $V_{I(on)}$  | on-state input voltage               | $V_{CE} = -0.3\text{ V}; I_C = -20\text{ mA}$                       | -1.0 | -1.4 | -1.8 | V             |
| R1           | bias resistor 1 (input)              |   | 0.7  | 1.0  | 1.3  | k $\Omega$    |
| 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            |



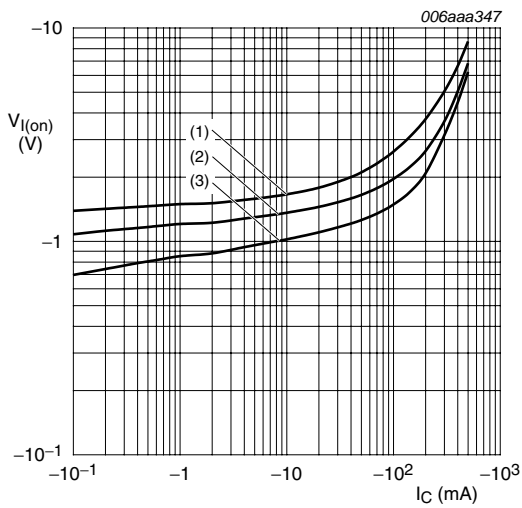
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

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



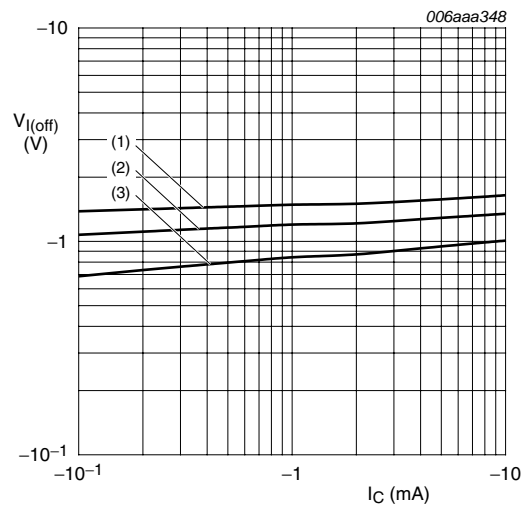
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

**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)  $T_{amb} = 100 \text{ }^\circ\text{C}$

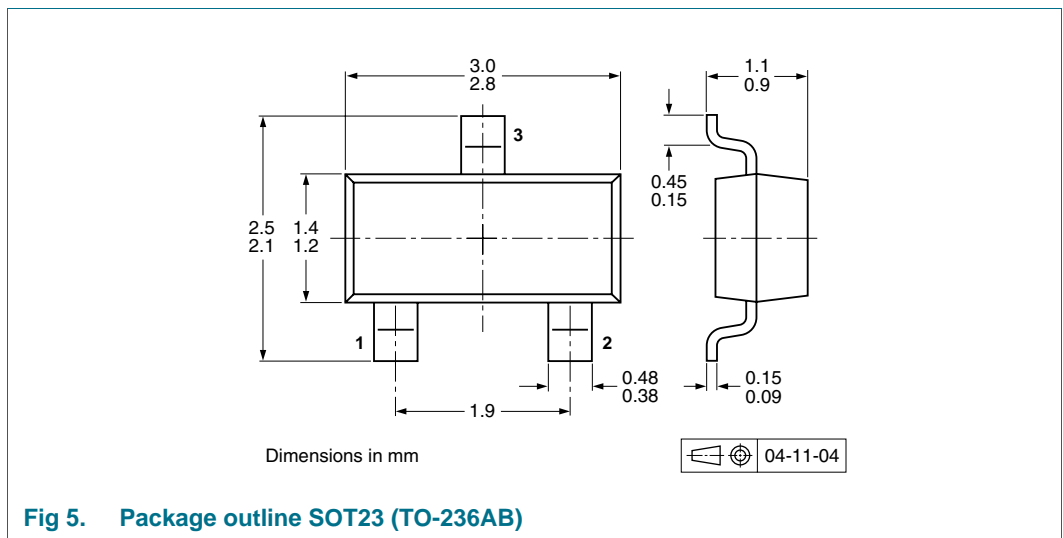
**Fig 4. Off-state input voltage as a function of collector current; typical values**

## 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.<sup>[1]</sup>

| Type number | Package | Description                    | Packing quantity |       |
|-------------|---------|--------------------------------|------------------|-------|
|             |         |                                | 3000             | 10000 |
| PDTB113ET   | 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

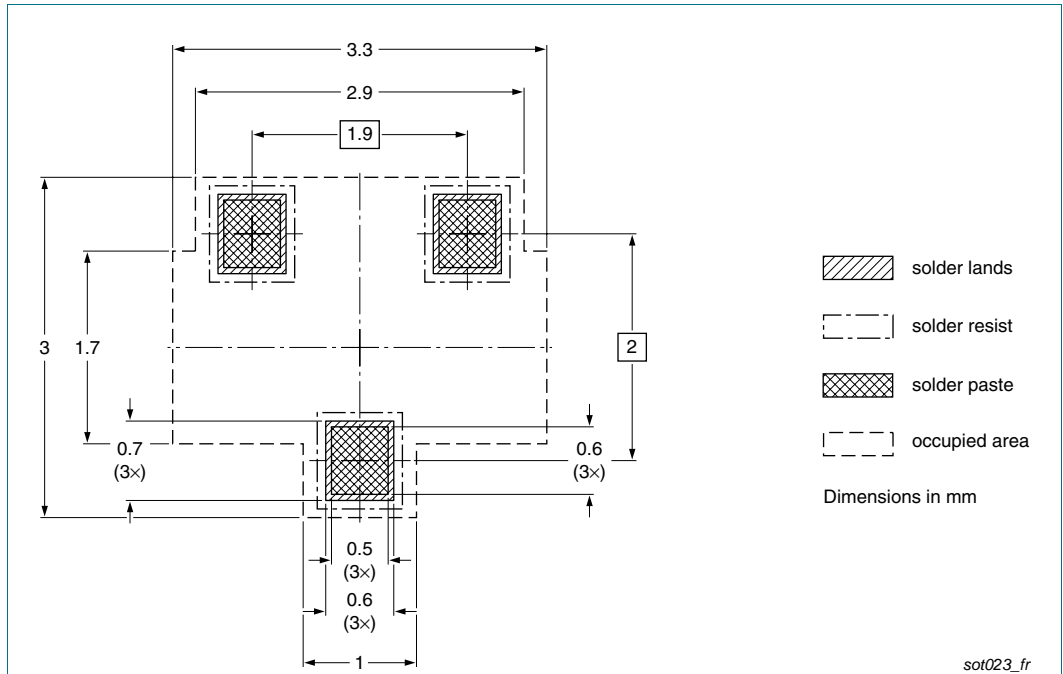


Fig 6. Reflow soldering footprint SOT23 (TO-236AB)

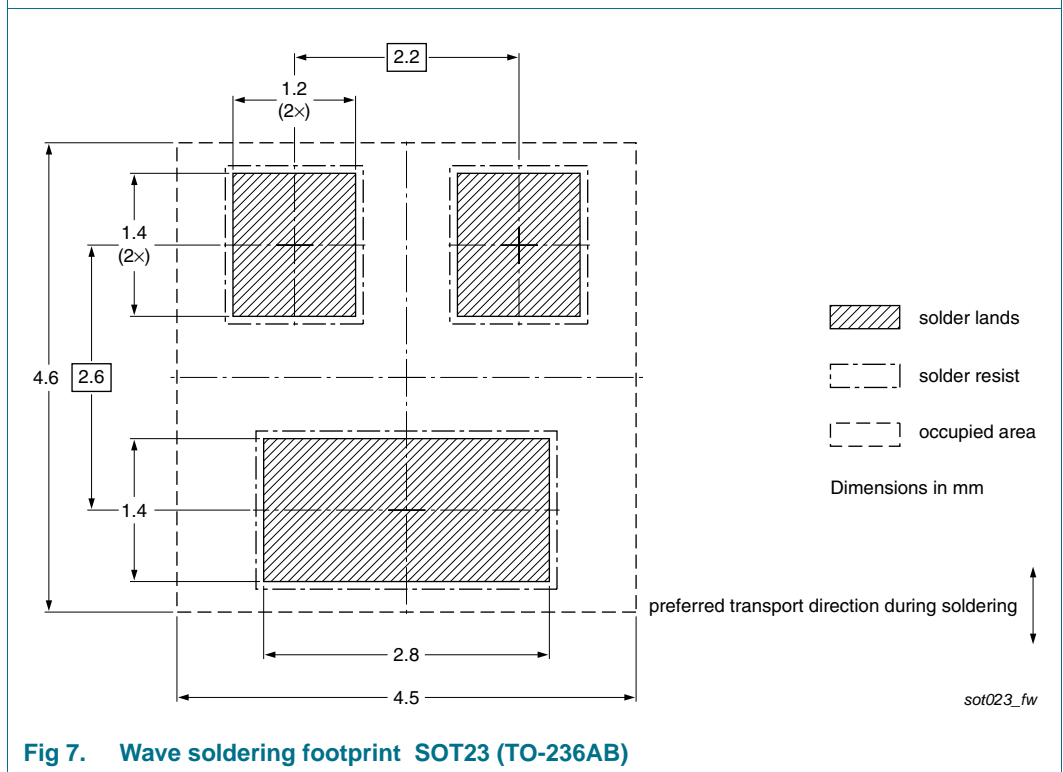


Fig 7. Wave soldering footprint SOT23 (TO-236AB)

## 12. Revision history

**Table 9.** Revision history

| Document ID    | Release date | Data sheet status   | Change notice | Supersedes     |
|----------------|--------------|---|---------------|----------------|
| PDTB113ET v.3  | 20100914     | Product data sheet  | -             | PDTB113E_SER_2 |
| Modifications: |              | <ul style="list-style-type: none"><li>Type numbers PDTB113EK and PDTB113ES deleted.</li><li><a href="#">Table 7 “Characteristics”</a>: unit for <math>V_{CEsat}</math> 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> |               |                |
| PDTB113E_SER_2 | 20091116     | Product data sheet  | -             | PDTB113E_SER_1 |
| PDTB113E_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".

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