



**THE DATASHEET OF  
PDTB113ET**



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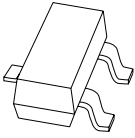
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Team Nexperia



# 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

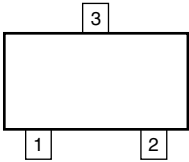
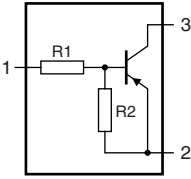
Table 1. Quick reference data

| 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 <sub>tot</sub> | total power dissipation | T <sub>amb</sub> ≤ 25 °C | [1] - | 250  | mW   |
| T <sub>j</sub>   | junction temperature    |                          | -     | 150  | °C   |
| T <sub>amb</sub> | ambient temperature     |                          | -65   | +150 | °C   |
| T <sub>stg</sub> | 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**

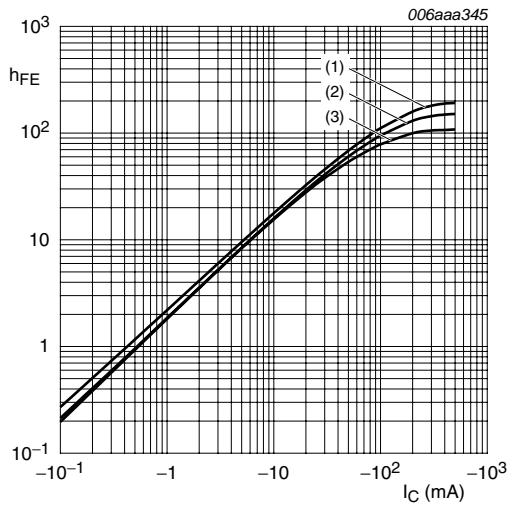
| Symbol               | Parameter                                   | Conditions  | Min   | Typ | Max | Unit |
|----------------------|---|-------------|-------|-----|-----|------|
| R <sub>th(j-a)</sub> | thermal resistance from junction to ambient | in free air | [1] - | -   | 500 | K/W  |

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

## 7. Characteristics

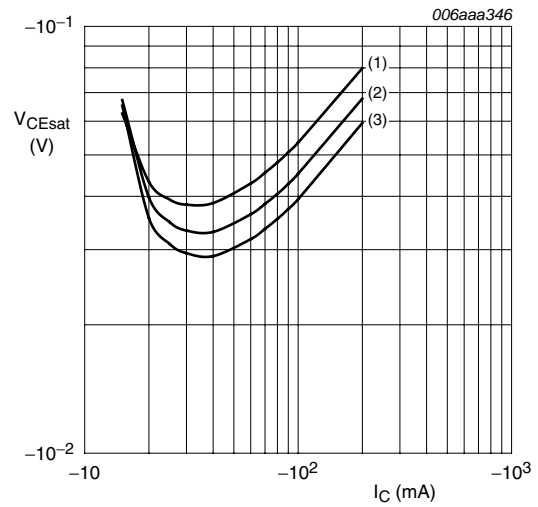
**Table 7. Characteristics***T<sub>amb</sub> = 25 °C unless otherwise specified.*

| Symbol              | Parameter                            | Conditions  | Min  | Typ  | Max  | Unit       |
|---------------------|--------------------------------------|---|------|------|------|------------|
| I <sub>CBO</sub>    | collector-base cut-off current       | V <sub>CB</sub> = -40 V; I <sub>E</sub> = 0 A                                     | -    | -    | -100 | nA         |
|                     |                                      | V <sub>CB</sub> = -50 V; I <sub>E</sub> = 0 A                                     | -    | -    | -100 | nA         |
| I <sub>CEO</sub>    | collector-emitter cut-off current    | V <sub>CE</sub> = -50 V; I <sub>B</sub> = 0 A                                     | -    | -    | -0.5 | μA         |
| I <sub>EBO</sub>    | emitter-base cut-off current         | V <sub>EB</sub> = -5 V; I <sub>C</sub> = 0 A                                      | -    | -    | -4.0 | mA         |
| h <sub>FE</sub>     | DC current gain                      | V <sub>CE</sub> = -5 V;<br>I <sub>C</sub> = -50 mA                                | 33   | -    | -    |            |
| V <sub>CEsat</sub>  | collector-emitter saturation voltage | I <sub>C</sub> = -50 mA;<br>I <sub>B</sub> = -2.5 mA                              | -    | -    | -0.3 | V          |
| V <sub>I(off)</sub> | off-state input voltage              | V <sub>CE</sub> = -5 V;<br>I <sub>C</sub> = -100 μA                               | -0.6 | -1.1 | -1.5 | V          |
| V <sub>I(on)</sub>  | on-state input voltage               | V <sub>CE</sub> = -0.3 V;<br>I <sub>C</sub> = -20 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 <sub>c</sub>      | collector capacitance                | V <sub>CB</sub> = -10 V;<br>I <sub>E</sub> = i <sub>e</sub> = 0 A;<br>f = 100 MHz | -    | 11   | -    | pF         |



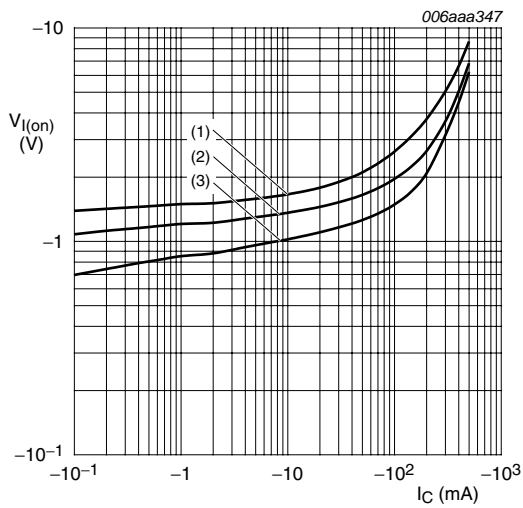
$V_{CE} = -5\text{ V}$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

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



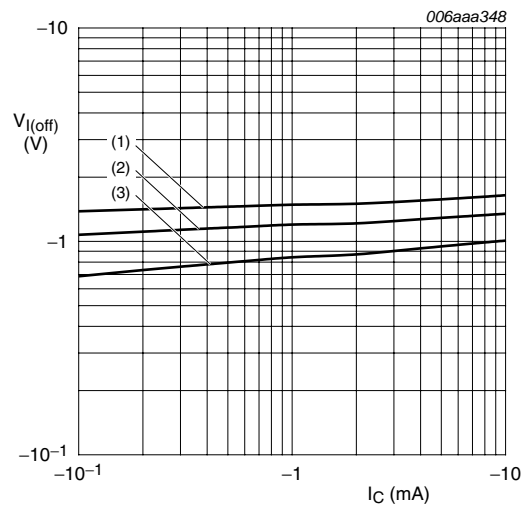
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

**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)  $T_{amb} = 100\text{ °C}$

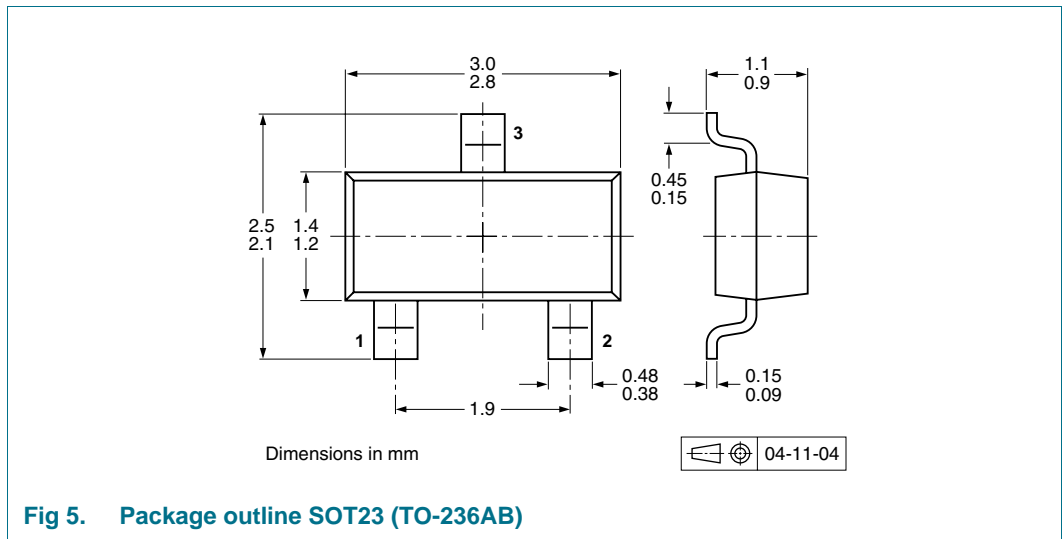
**Fig 4. Off-state input voltage as a function of collector current; typical values**

**8. 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

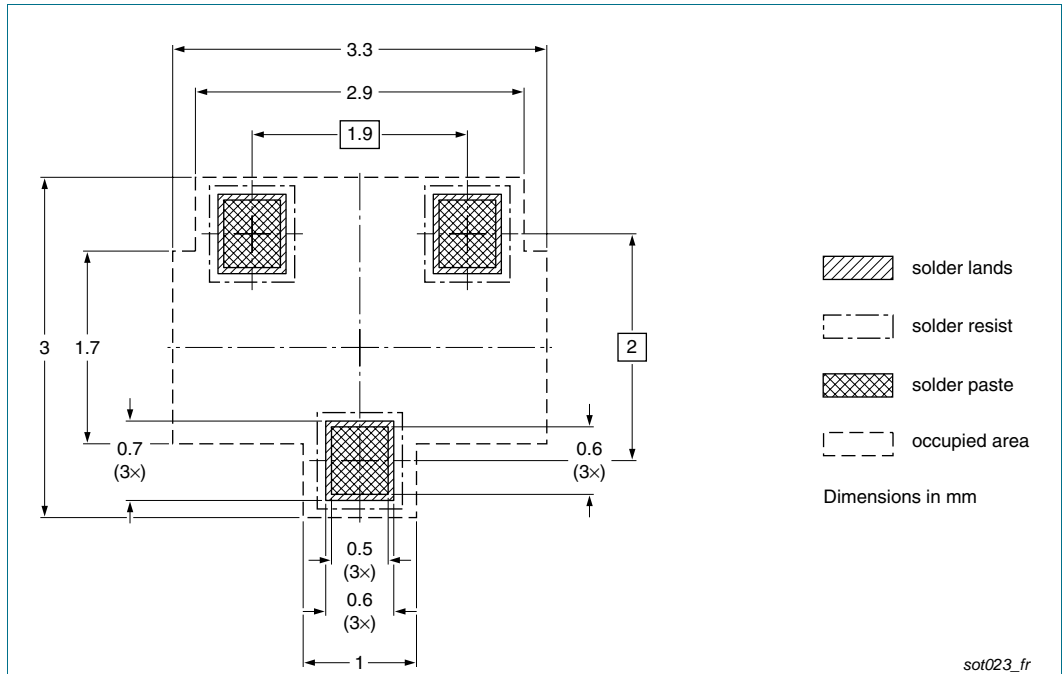


Fig 6. Reflow soldering footprint SOT23 (TO-236AB)

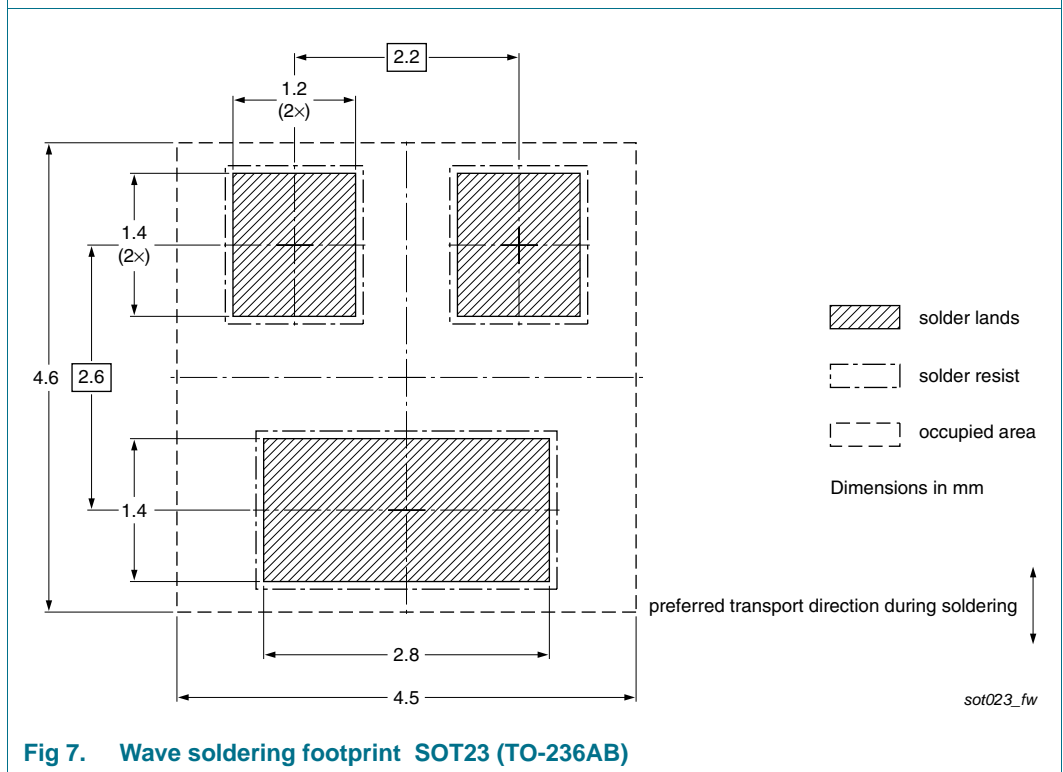


Fig 7. Wave soldering footprint SOT23 (TO-236AB)

## 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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