

# ANTREX Electronics

## Electronic Components Sourcing Information

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### Product Reference Information

**Part Number:** PBL54001V,115  
**Manufacturer:** NXP USA Inc.  
**Package:** SOT-563, SOT-666  
**Availability:** Please confirm with sales

**Product Page:**

<https://antrexco.com/product/details/nxp-usa-inc/pbls4001v-115.html>

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**Note:**

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

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Kind regards,

Team Nexperia

# PBLS4001Y; PBLS4001V

40 V PNP BISS loadswitch

Rev. 03 — 12 February 2009

Product data sheet

## 1. Product profile

### 1.1 General description

PNP low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor and NPN Resistor-Equipped Transistor (RET) in one package.

Table 1. Product overview

| Type number | Package |       |
|-------------|---------|-------|
|             | NXP     | JEITA |
| PBLS4001Y   | SOT363  | SC-88 |
| PBLS4001V   | SOT666  | -     |

### 1.2 Features

- Low  $V_{CEsat}$  (BISS) and resistor-equipped transistor in one package
- Low threshold voltage (<1 V) compared to MOSFET
- Low drive power required
- Space-saving solution
- Reduction of component count

### 1.3 Applications

- Supply line switches
- Battery charger switches
- High-side switches for LEDs, drivers and backlights
- Portable equipment

### 1.4 Quick reference data

Table 2. Quick reference data

| Symbol                                                | Parameter                               | Conditions                         | Min                   | Typ | Max  | Unit       |
|-------------------------------------------------------|-----------------------------------------|------------------------------------|-----------------------|-----|------|------------|
| <b>TR1; PNP low <math>V_{CEsat}</math> transistor</b> |                                         |                                    |                       |     |      |            |
| $V_{CEO}$                                             | collector-emitter voltage               | open base                          | -                     | -   | -40  | V          |
| $I_C$                                                 | collector current                       |                                    | -                     | -   | -500 | mA         |
| $R_{CEsat}$                                           | collector-emitter saturation resistance | $I_C = -500$ mA;<br>$I_B = -50$ mA | <a href="#">[1]</a> - | 440 | 700  | m $\Omega$ |
| <b>TR2; NPN resistor-equipped transistor</b>          |                                         |                                    |                       |     |      |            |
| $V_{CEO}$                                             | collector-emitter voltage               | open base                          | -                     | -   | 50   | V          |

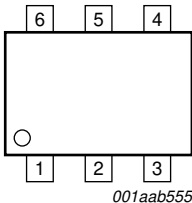
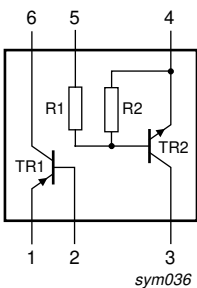
Table 2. Quick reference data ...continued

| Symbol         | Parameter               | Conditions | Min  | Typ | Max  | Unit |
|----------------|-------------------------|------------|------|-----|------|------|
| I <sub>O</sub> | output current          |            | -    | -   | 100  | mA   |
| R1             | bias resistor 1 (input) |            | 1.54 | 2.2 | 2.86 | kΩ   |
| R2/R1          | bias resistor ratio     |            | 0.8  | 1   | 1.2  |      |

[1] Pulse test: t<sub>p</sub> ≤ 300 μs; δ ≤ 0.02.

2. Pinning information

Table 3. Pinning

| Pin | Description            | Simplified outline                                                                 | Graphic symbol                                                                       |
|-----|------------------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1   | emitter TR1            |  |  |
| 2   | base TR1               |                                                                                    |                                                                                      |
| 3   | output (collector) TR2 |                                                                                    |                                                                                      |
| 4   | GND (emitter) TR2      |                                                                                    |                                                                                      |
| 5   | input (base) TR2       |                                                                                    |                                                                                      |
| 6   | collector TR1          |                                                                                    |                                                                                      |

3. Ordering information

Table 4. Ordering information

| Type number | Package |                                          |         |
|-------------|---------|------------------------------------------|---------|
|             | Name    | Description                              | Version |
| PBLS4001Y   | SC-88   | plastic surface-mounted package; 6 leads | SOT363  |
| PBLS4001V   | -       | plastic surface-mounted package; 6 leads | SOT666  |

4. Marking

Table 5. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| PBLS4001Y   | S1*                         |
| PBLS4001V   | K1                          |

[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 |
|-------------------------------------------------------|---------------------------|-------------------------------|-----|------|------|
| <b>TR1; PNP low <math>V_{CEsat}</math> transistor</b> |                           |                               |     |      |      |
| $V_{CBO}$                                             | collector-base voltage    | open emitter                  | -   | -40  | V    |
| $V_{CEO}$                                             | collector-emitter voltage | open base                     | -   | -40  | V    |
| $V_{EBO}$                                             | emitter-base voltage      | open collector                | -   | -6   | V    |
| $I_C$                                                 | collector current         |                               | -   | -500 | mA   |
| $I_{CM}$                                              | peak collector current    | single pulse; $t_p \leq 1$ ms | -   | -1   | A    |
| $I_B$                                                 | base current              |                               | -   | -50  | mA   |
| $I_{BM}$                                              | peak base current         | single pulse; $t_p \leq 1$ ms | -   | -100 | mA   |
| $P_{tot}$                                             | total power dissipation   | $T_{amb} \leq 25$ °C [1]      | -   | 200  | mW   |
| <b>TR2; NPN resistor-equipped transistor</b>          |                           |                               |     |      |      |
| $V_{CBO}$                                             | 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                  |                               | -   | +12  | V    |
|                                                       | negative                  |                               | -   | -10  | V    |
| $I_O$                                                 | output current            |                               | -   | 100  | mA   |
| $I_{CM}$                                              | peak collector current    | single pulse; $t_p \leq 1$ ms | -   | 100  | mA   |
| $P_{tot}$                                             | total power dissipation   | $T_{amb} \leq 25$ °C [1]      | -   | 200  | mW   |
| <b>Per device</b>                                     |                           |                               |     |      |      |
| $P_{tot}$                                             | total power dissipation   |                               | -   | 300  | mW   |
| $T_j$                                                 | junction temperature      |                               | -   | 150  | °C   |
| $T_{amb}$                                             | ambient temperature       |                               | -65 | +150 | °C   |
| $T_{stg}$                                             | 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 7. Thermal characteristics**

| Symbol            | Parameter                                   | Conditions  | Min    | Typ | Max | Unit |
|-------------------|---------------------------------------------|-------------|--------|-----|-----|------|
| <b>Per device</b> |                                             |             |        |     |     |      |
| $R_{th(j-a)}$     | thermal resistance from junction to ambient | in free air |        |     |     |      |
|                   | SOT363                                      |             | [1]    | -   | 416 | K/W  |
|                   | SOT666                                      |             | [1][2] | -   | 416 | K/W  |

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

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

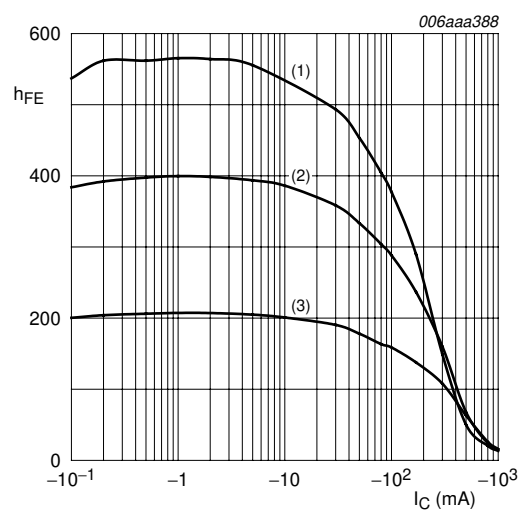
## 7. Characteristics

**Table 8. Characteristics**

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

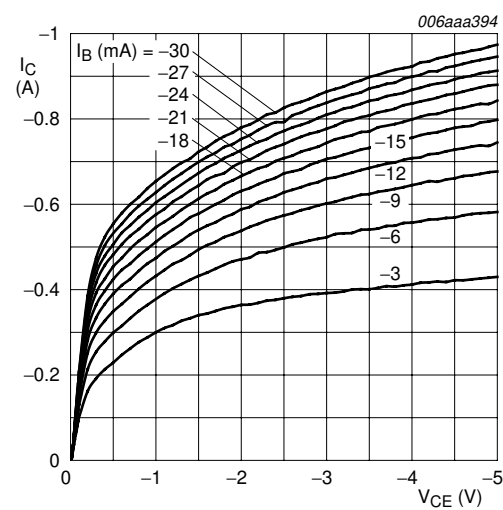
| Symbol                                                | Parameter                               | Conditions                                                                   | Min  | Typ | Max  | Unit             |
|-------------------------------------------------------|-----------------------------------------|------------------------------------------------------------------------------|------|-----|------|------------------|
| <b>TR1; PNP low <math>V_{CEsat}</math> transistor</b> |                                         |                                                                              |      |     |      |                  |
| $I_{CBO}$                                             | collector-base cut-off current          | $V_{CB} = -40\text{ V}; I_E = 0\text{ A}$                                    | -    | -   | -100 | nA               |
|                                                       |                                         | $V_{CB} = -40\text{ V}; I_E = 0\text{ A}; T_J = 150\text{ }^{\circ}\text{C}$ | -    | -   | -50  | $\mu\text{A}$    |
| $I_{EBO}$                                             | emitter-base cut-off current            | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}$                                     | -    | -   | -100 | nA               |
| $h_{FE}$                                              | DC current gain                         | $V_{CE} = -2\text{ V}; I_C = -10\text{ mA}$                                  | 200  | -   | -    |                  |
|                                                       |                                         | $V_{CE} = -2\text{ V}; I_C = -100\text{ mA}$ [1]                             | 150  | -   | -    |                  |
|                                                       |                                         | $V_{CE} = -2\text{ V}; I_C = -500\text{ mA}$ [1]                             | 40   | -   | -    |                  |
| $V_{CEsat}$                                           | collector-emitter saturation voltage    | $I_C = -10\text{ mA}; I_B = -0.5\text{ mA}$                                  | -    | -   | -50  | mV               |
|                                                       |                                         | $I_C = -100\text{ mA}; I_B = -5\text{ mA}$                                   | -    | -   | -130 | mV               |
|                                                       |                                         | $I_C = -200\text{ mA}; I_B = -10\text{ mA}$                                  | -    | -   | -200 | mV               |
|                                                       |                                         | $I_C = -500\text{ mA}; I_B = -50\text{ mA}$ [1]                              | -    | -   | -350 | mV               |
| $R_{CEsat}$                                           | collector-emitter saturation resistance | $I_C = -500\text{ mA}; I_B = -50\text{ mA}$ [1]                              | -    | 440 | 700  | $\text{m}\Omega$ |
| $V_{BEsat}$                                           | base-emitter saturation voltage         | $I_C = -500\text{ mA}; I_B = -50\text{ mA}$ [1]                              | -    | -   | -1.2 | V                |
| $V_{BEon}$                                            | base-emitter turn-on voltage            | $V_{CE} = -2\text{ V}; I_C = -100\text{ mA}$ [1]                             | -    | -   | -1.1 | V                |
| $f_T$                                                 | transition frequency                    | $I_C = -100\text{ mA}; V_{CE} = -5\text{ V}; f = 100\text{ MHz}$             | 100  | 300 | -    | MHz              |
| $C_c$                                                 | collector capacitance                   | $V_{CB} = -10\text{ V}; I_E = I_E = 0\text{ A}; f = 1\text{ MHz}$            | -    | -   | 10   | pF               |
| <b>TR2; NPN resistor-equipped transistor</b>          |                                         |                                                                              |      |     |      |                  |
| $I_{CBO}$                                             | 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    | $\mu\text{A}$    |
|                                                       |                                         | $V_{CE} = 30\text{ V}; I_B = 0\text{ A}; T_J = 150\text{ }^{\circ}\text{C}$  | -    | -   | 50   | $\mu\text{A}$    |
| $I_{EBO}$                                             | emitter-base cut-off current            | $V_{EB} = 5\text{ V}; I_C = 0\text{ A}$                                      | -    | -   | 2    | mA               |
| $h_{FE}$                                              | DC current gain                         | $V_{CE} = 5\text{ V}; I_C = 20\text{ mA}$                                    | 30   | -   | -    |                  |
| $V_{CEsat}$                                           | collector-emitter saturation voltage    | $I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$                                    | -    | -   | 150  | mV               |
| $V_{I(off)}$                                          | off-state input voltage                 | $V_{CE} = 5\text{ V}; I_C = 1\text{ mA}$                                     | -    | 1.2 | 0.5  | V                |
| $V_{I(on)}$                                           | on-state input voltage                  | $V_{CE} = 0.3\text{ V}; I_C = 20\text{ mA}$                                  | 2    | 1.6 | -    | V                |
| R1                                                    | bias resistor 1 (input)                 |                                                                              | 1.54 | 2.2 | 2.86 | $\text{k}\Omega$ |
| R2/R1                                                 | bias resistor ratio                     |                                                                              | 0.8  | 1   | 1.2  |                  |
| $C_c$                                                 | collector capacitance                   | $V_{CB} = 10\text{ V}; I_E = I_E = 0\text{ A}; f = 1\text{ MHz}$             | -    | -   | 2.5  | pF               |

[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$ .



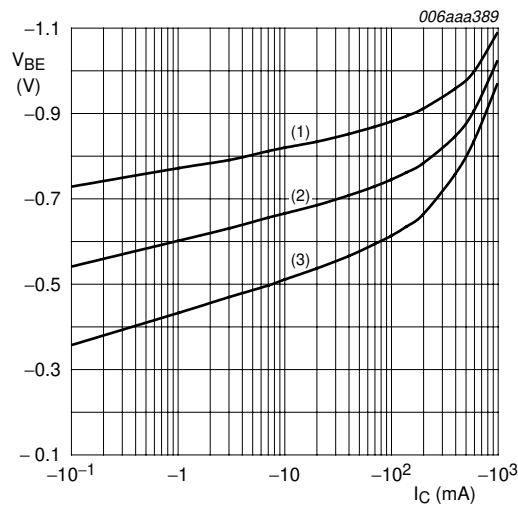
- $V_{CE} = -2\text{ V}$
- (1)  $T_{amb} = 100\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

Fig 1. TR1 (PNP): DC current gain as a function of collector current; typical values



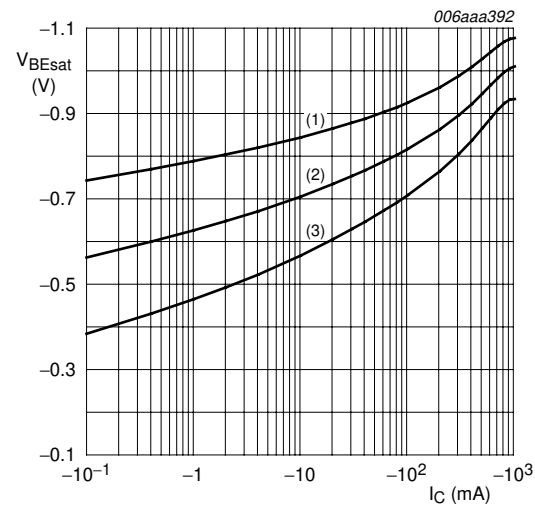
$T_{amb} = 25\text{ °C}$

Fig 2. TR1 (PNP): Collector current as a function of collector-emitter voltage; typical values



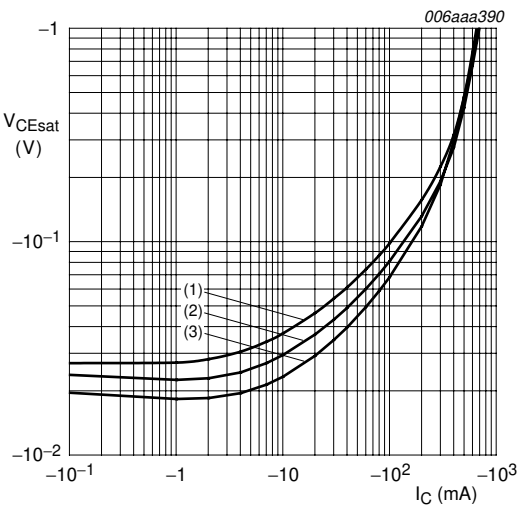
- $V_{CE} = -2\text{ V}$
- (1)  $T_{amb} = -55\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = 100\text{ °C}$

Fig 3. TR1 (PNP): Base-emitter voltage as a function of collector current; typical values



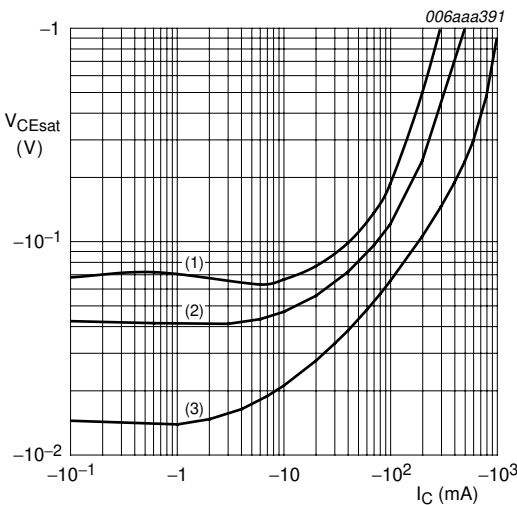
- $I_C/I_B = 20$
- (1)  $T_{amb} = -55\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = 100\text{ °C}$

Fig 4. TR1 (PNP): Base-emitter saturation voltage as a function of collector current; typical values



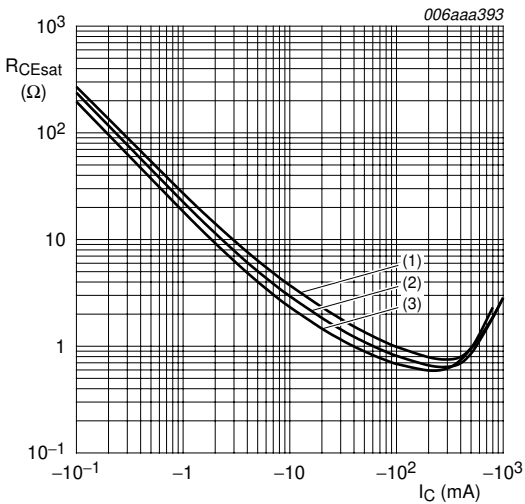
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100^\circ\text{C}$
  - (2)  $T_{amb} = 25^\circ\text{C}$
  - (3)  $T_{amb} = -55^\circ\text{C}$

Fig 5. TR1 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values



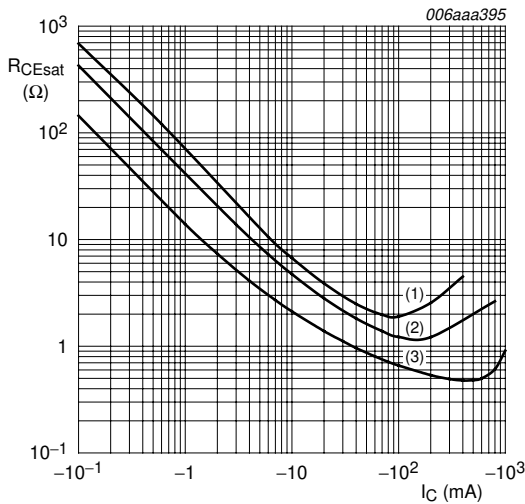
- $T_{amb} = 25^\circ\text{C}$
- (1)  $I_C/I_B = 100$
  - (2)  $I_C/I_B = 50$
  - (3)  $I_C/I_B = 10$

Fig 6. TR1 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values



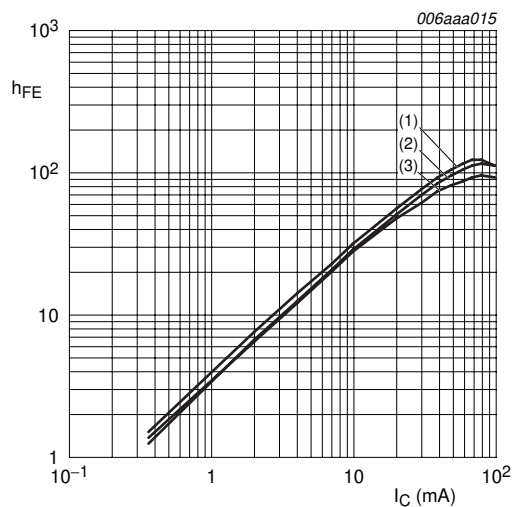
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100^\circ\text{C}$
  - (2)  $T_{amb} = 25^\circ\text{C}$
  - (3)  $T_{amb} = -55^\circ\text{C}$

Fig 7. TR1 (PNP): Collector-emitter saturation resistance as a function of collector current; typical values



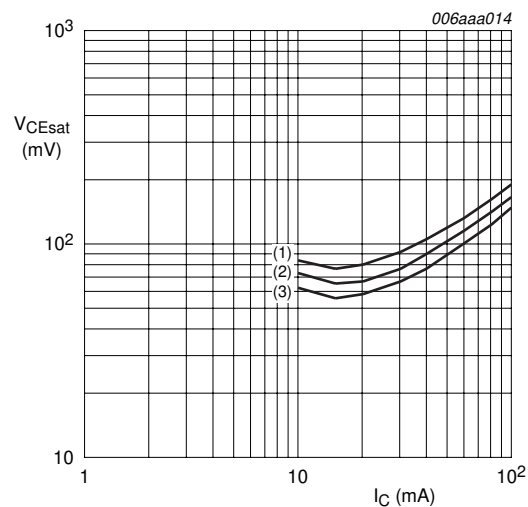
- $T_{amb} = 25^\circ\text{C}$
- (1)  $I_C/I_B = 100$
  - (2)  $I_C/I_B = 50$
  - (3)  $I_C/I_B = 10$

Fig 8. TR1 (PNP): Collector-emitter saturation resistance as a function of collector current; typical values



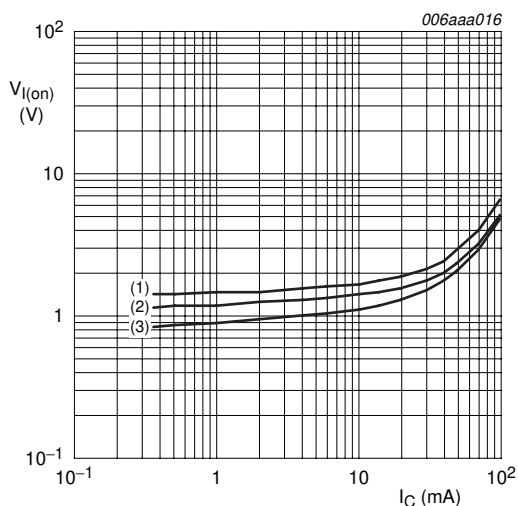
- $V_{CE} = 5\text{ V}$
- (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

Fig 9. TR2 (NPN): DC current gain as a function of collector current; typical values



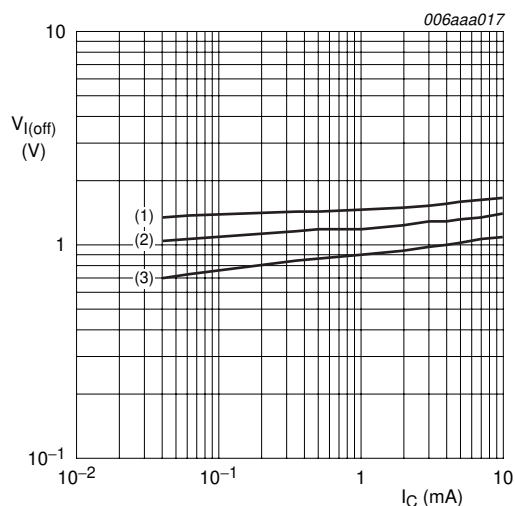
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

Fig 10. TR2 (NPN): 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 11. TR2 (NPN): 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 12. TR2 (NPN): Off-state input voltage as a function of collector current; typical values

## 8. Package outline

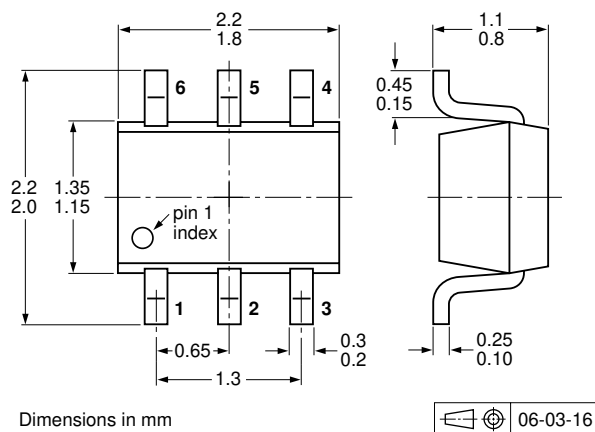


Fig 13. Package outline SOT363 (SC-88)

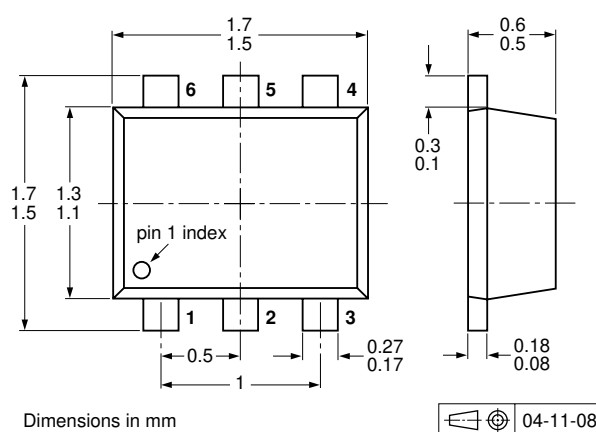


Fig 14. Package outline SOT666

## 9. Packing information

**Table 9. 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                | 4000 | 8000 | 10000 |
| PBL4001Y    | SOT363  | 4 mm pitch, 8 mm tape and reel; T1 | <sup>[2]</sup> -115 | -    | -    | -135  |
|             |         | 4 mm pitch, 8 mm tape and reel; T2 | <sup>[3]</sup> -125 | -    | -    | -165  |
| PBL4001V    | SOT666  | 2 mm pitch, 8 mm tape and reel     | -                   | -    | -315 | -     |
|             |         | 4 mm pitch, 8 mm tape and reel     | -                   | -115 | -    | -     |

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

[2] T1: normal taping

[3] T2: reverse taping

## 10. Revision history

**Table 10. Revision history**

| Document ID                                                                                                                                                                                                                                                                                                                                                                                                                                            | Release date | Data sheet status  | Change notice | Supersedes          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------|---------------|---------------------|
| PBL4001Y_PBL4001V_3                                                                                                                                                                                                                                                                                                                                                                                                                                    | 20090212     | Product data sheet | -             | PBL4001Y_PBL4001V_2 |
| Modifications:                                                                                                                                                                                                                                                                                                                                                                                                                                         |              |                    |               |                     |
| <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• <a href="#">Figure 5</a>: y-axis value unit amended</li><li>• <a href="#">Figure 6</a>: y-axis value unit amended</li><li>• <a href="#">Section 11 “Legal information”</a>: updated</li></ul> |              |                    |               |                     |
| PBL4001Y_PBL4001V_2                                                                                                                                                                                                                                                                                                                                                                                                                                    | 20050425     | Product data sheet | -             | PBL4001Y_PBL4001V_1 |
| PBL4001Y_PBL4001V_1                                                                                                                                                                                                                                                                                                                                                                                                                                    | 20041108     | Product data sheet | -             | -                   |

## 11. Legal information

### 11.1 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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