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Kind regards,

Team Nexperia

# PEMB16; PUMB16

PNP/PNP resistor-equipped transistors;  
R1 = 22 k $\Omega$ , R2 = 47 k $\Omega$

Rev. 03 — 31 August 2009

Product data sheet

## 1. Product profile

### 1.1 General description

PNP/PNP resistor-equipped transistors

Table 1. Product overview

| Type number | Package |       | NPN/PNP complement | NPN/PNP complement |
|-------------|---------|-------|--------------------|--------------------|
|             | NXP     | JEITA |                    |                    |
| PEMB16      | SOT666  | -     | PEMD16             | PEMH16             |
| PUMB16      | SOT363  | SC-88 | PUMD16             | PUMH16             |

### 1.2 Features

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

### 1.3 Applications

- Low current peripheral driver
- Control of IC inputs
- Replacement of general-purpose transistors in digital applications

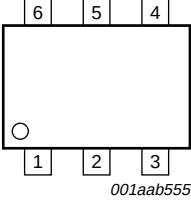
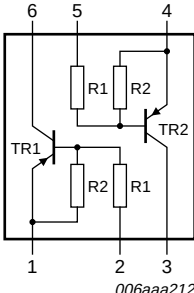
### 1.4 Quick reference data

Table 2. 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            |            | -    | -   | -100 | mA         |
| R1               | bias resistor 1 (input)   |            | 15.4 | 22  | 28.6 | k $\Omega$ |
| R2/R1            | bias resistor ratio       |            | 1.7  | 2.1 | 2.6  |            |

2. Pinning information

Table 3. Pinning

| Pin | Description            | Simplified outline                                                                               | Symbol                                                                                           |
|-----|------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1   | GND (emitter) TR1      | <br>001aab555 | <br>006aaa212 |
| 2   | input (base) TR1       |                                                                                                  |                                                                                                  |
| 3   | output (collector) TR2 |                                                                                                  |                                                                                                  |
| 4   | GND (emitter) TR2      |                                                                                                  |                                                                                                  |
| 5   | input (base) TR2       |                                                                                                  |                                                                                                  |
| 6   | output (collector) TR1 |                                                                                                  |                                                                                                  |

3. Ordering information

Table 4. Ordering information

| Type number | Package |                                          |         |
|-------------|---------|------------------------------------------|---------|
|             | Name    | Description                              | Version |
| PEMB16      | -       | plastic surface mounted package; 6 leads | SOT666  |
| PUMB16      | SC-88   | plastic surface mounted package; 6 leads | SOT363  |

4. Marking

Table 5. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| PEMB16      | 5G                          |
| PUMB16      | B*7                         |

[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>Per transistor</b> |                           |                          |           |      |      |
| V <sub>CBO</sub>      | collector-base voltage    | open emitter             | -         | -50  | V    |
| V <sub>CEO</sub>      | collector-emitter voltage | open base                | -         | -50  | V    |
| V <sub>EBO</sub>      | emitter-base voltage      | open collector           | -         | -5   | V    |
| V <sub>I</sub>        | input voltage             |                          |           |      |      |
|                       | positive                  |                          | -         | +7   | V    |
|                       | negative                  |                          | -         | -40  | V    |
| I <sub>O</sub>        | output current            |                          | -         | -100 | mA   |
| I <sub>CM</sub>       | peak collector current    |                          | -         | -100 | mA   |
| P <sub>tot</sub>      | total power dissipation   | T <sub>amb</sub> ≤ 25 °C |           |      |      |
|                       | SOT363                    |                          | [1] -     | 200  | mW   |
|                       | SOT666                    |                          | [1] [2] - | 200  | mW   |
| T <sub>stg</sub>      | storage temperature       |                          | -65       | +150 | °C   |
| T <sub>j</sub>        | junction temperature      |                          | -         | 150  | °C   |
| T <sub>amb</sub>      | ambient temperature       |                          | -65       | +150 | °C   |
| <b>Per device</b>     |                           |                          |           |      |      |
| P <sub>tot</sub>      | total power dissipation   | T <sub>amb</sub> ≤ 25 °C |           |      |      |
|                       | SOT363                    |                          | [1] -     | 300  | mW   |
|                       | SOT666                    |                          | [1] [2] - | 300  | mW   |

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

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

## 6. Thermal characteristics

**Table 7. Thermal characteristics**

| Symbol                | Parameter                                   | Conditions               | Min       | Typ | Max | Unit |
|-----------------------|---------------------------------------------|--------------------------|-----------|-----|-----|------|
| <b>Per transistor</b> |                                             |                          |           |     |     |      |
| R <sub>th(j-a)</sub>  | thermal resistance from junction to ambient | T <sub>amb</sub> ≤ 25 °C |           |     |     |      |
|                       | SOT363                                      |                          | [1] -     | -   | 625 | K/W  |
|                       | SOT666                                      |                          | [1] [2] - | -   | 625 | K/W  |
| <b>Per device</b>     |                                             |                          |           |     |     |      |
| R <sub>th(j-a)</sub>  | thermal resistance from junction to ambient | T <sub>amb</sub> ≤ 25 °C |           |     |     |      |
|                       | 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.

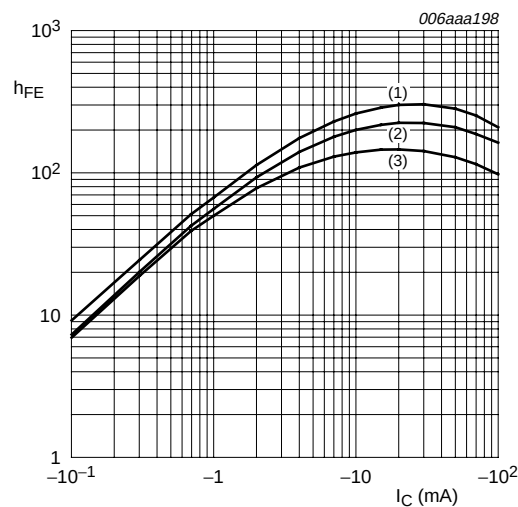
[2] Reflow soldering is the only recommended soldering method.

## 7. Characteristics

**Table 8. Characteristics**

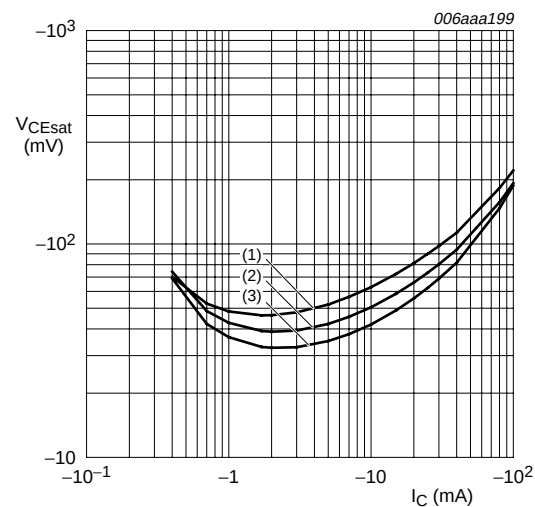
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol                | Parameter                            | Conditions                                                                            | Min  | Typ  | Max  | Unit          |
|-----------------------|--------------------------------------|---------------------------------------------------------------------------------------|------|------|------|---------------|
| <b>Per 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   | $\mu\text{A}$ |
|                       |                                      | $V_{CE} = -30\text{ V}$ ; $I_B = 0\text{ A}$ ;<br>$T_j = 150\text{ }^{\circ}\text{C}$ | -    | -    | -50  | $\mu\text{A}$ |
| $I_{EBO}$             | emitter-base cut-off current         | $V_{EB} = -5\text{ V}$ ; $I_C = 0\text{ A}$                                           | -    | -    | -120 | $\mu\text{A}$ |
| $h_{FE}$              | DC current gain                      | $V_{CE} = -5\text{ V}$ ; $I_C = -5\text{ mA}$                                         | 80   | -    | -    |               |
| $V_{CEsat}$           | collector-emitter saturation voltage | $I_C = -10\text{ mA}$ ; $I_B = -0.5\text{ mA}$                                        | -    | -    | -150 | mV            |
| $V_{I(off)}$          | off-state input voltage              | $V_{CE} = -5\text{ V}$ ; $I_C = -100\text{ }\mu\text{A}$                              | -    | -0.8 | -0.5 | V             |
| $V_{I(on)}$           | on-state input voltage               | $V_{CE} = -0.3\text{ V}$ ; $I_C = -2\text{ mA}$                                       | -2   | -1.1 | -    | V             |
| R1                    | bias resistor 1 (input)              |                                                                                       | 15.4 | 22   | 28.6 | k $\Omega$    |
| R2/R1                 | bias resistor ratio                  |                                                                                       | 1.7  | 2.1  | 2.6  |               |
| $C_c$                 | collector capacitance                | $V_{CB} = -10\text{ V}$ ; $I_E = i_e = 0\text{ A}$ ;<br>$f = 1\text{ MHz}$            | -    | -    | 3    | pF            |



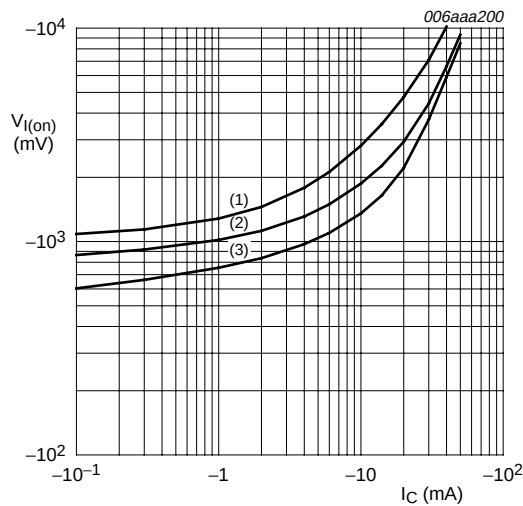
- $V_{CE} = -5\text{ V}$
- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

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



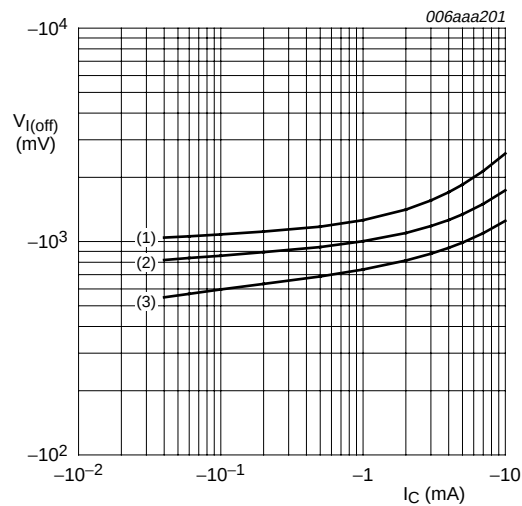
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

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

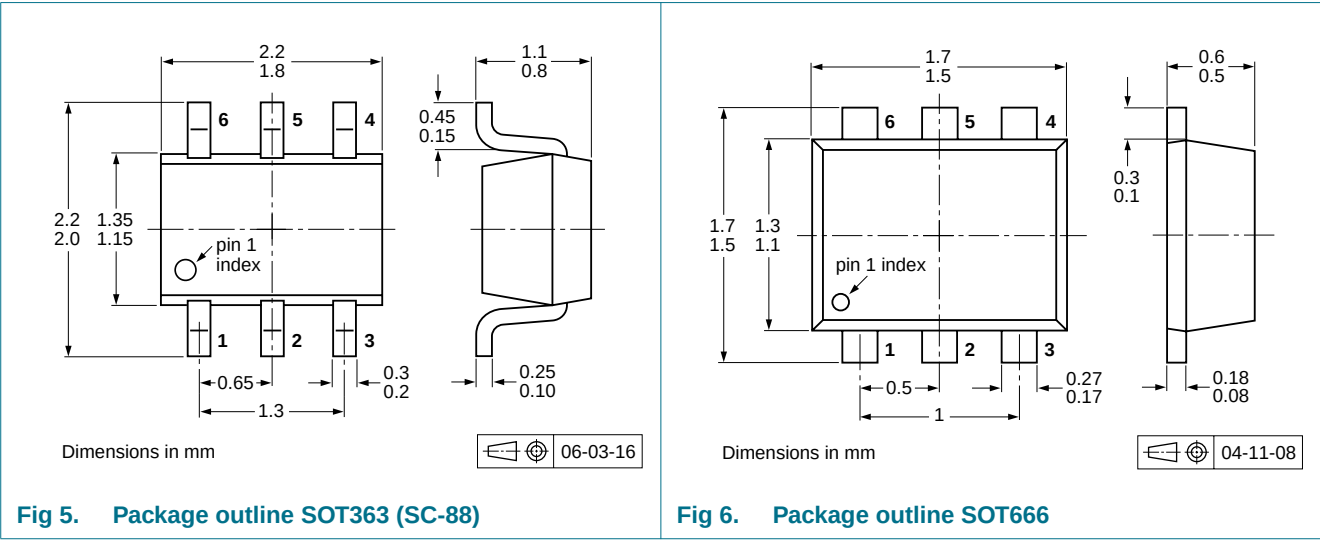
Fig 3. On-state input voltage as a function of collector current; typical values



- $V_{CE} = -5\text{ V}$
- (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. Package outline



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             | 4000 | 10000 |
| PEMB16      | SOT666  | 4 mm pitch, 8 mm tape and reel;        | -                | -115 | -     |
| PUMB16      | SOT363  | 4 mm pitch, 8 mm tape and reel; T1 [2] | -115             | -    | -135  |
| PUMB16      | SOT363  | 4 mm pitch, 8 mm tape and reel; T2 [3] | -125             | -    | -165  |

[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      |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|-----------------|
| PEMB16_PUMB16_3 | 20090831                                                                                                                                                                                                                                                                                                   | Product data sheet    | -             | PEMB16_PUMB16_2 |
| Modifications:  | <ul style="list-style-type: none"><li>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.</li><li><a href="#">Figure 5 “Package outline SOT363 (SC-88)”</a>: updated</li></ul> |                       |               |                 |
| PEMB16_PUMB16_2 | 20050610                                                                                                                                                                                                                                                                                                   | Product data sheet    | -             | PUMB16_1        |
| PUMB16_1        | 20031103                                                                                                                                                                                                                                                                                                   | Product specification | -             | -               |



## 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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Тел: +7 (812) 336 43 04 (многоканальный)

Email: [org@lifeelectronics.ru](mailto:org@lifeelectronics.ru)

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