

# PEMB24; PUMB24

PNP/PNP resistor-equipped transistors;  
R1 = 100 k $\Omega$ , R2 = 100 k $\Omega$

Rev. 02 — 2 September 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 |                    |                    |
| PEMB24      | SOT666  | -     | PEMD24             | PEMH24             |
| PUMB24      | SOT363  | SC-88 | PUMD24             | PUMH24             |

### 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 (DC)       |            | -   | -   | -20 | mA         |
| R1               | bias resistor 1 (input)   |            | 70  | 100 | 130 | k $\Omega$ |
| R2/R1            | bias resistor ratio       |            | 0.8 | 1   | 1.2 |            |

## 2. Pinning information

**Table 3. Pinning**

| Pin | Description            | Simplified outline | Symbol |
|-----|------------------------|--------------------|--------|
| 1   | GND (emitter) TR1      |                    |        |
| 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 |  | Version |
|-------------|---------|--|---------|
|             | Name    | Description                              |         |
| PEMB24      | -       | plastic surface mounted package; 6 leads | SOT666  |
| PUMB24      | SC-88   | plastic surface mounted package; 6 leads | SOT363  |

## 4. Marking

**Table 5. Marking codes**

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| PEMB24      | 6M                          |
| PUMB24      | T7*                         |

[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           | -       | -10  | V    |    |
| V <sub>I</sub>        | input voltage             |                          |         |      |      |    |
|                       | positive                  |                          | -       | +10  | V    |    |
|                       | negative                  |                          | -       | -40  | V    |    |
| I <sub>O</sub>        | output current (DC)       |                          | -       | -20  | 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, single-sided copper, 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 printed-circuit board, single-sided copper, standard footprint.

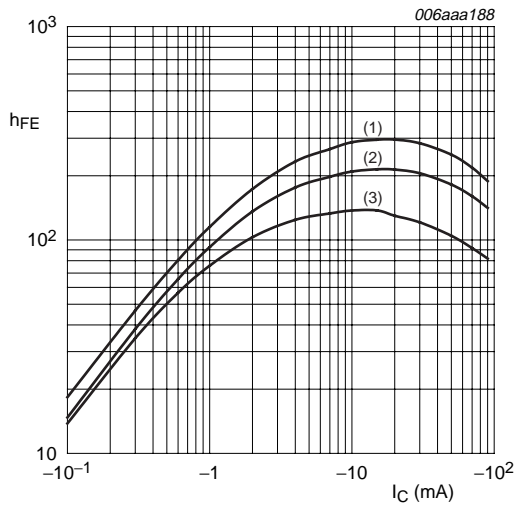
[2] Reflow soldering is the only recommended soldering method.

## 7. Characteristics

**Table 8. Characteristics**

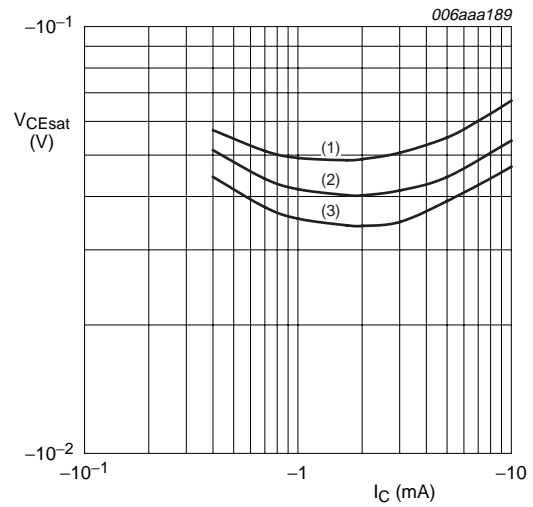
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| 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   | $\mu\text{A}$ |
|                       |                                      | $V_{CE} = -30\text{ V}; I_B = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$ | -   | -    | -50  | $\mu\text{A}$ |
| $I_{EBO}$             | emitter-base cut-off current         | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}$                                     | -   | -    | -50  | $\mu\text{A}$ |
| $h_{FE}$              | DC current gain                      | $V_{CE} = -5\text{ V}; I_C = -5\text{ mA}$                                   | 80  | -    | -    |               |
| $V_{CEsat}$           | collector-emitter saturation voltage | $I_C = -5\text{ mA}; I_B = -0.25\text{ mA}$                                  | -   | -    | -150 | mV            |
| $V_{I(off)}$          | off-state input voltage              | $V_{CE} = -5\text{ V}; I_C = -100\text{ }\mu\text{A}$                        | -   | -1.2 | -0.5 | V             |
| $V_{I(on)}$           | on-state input voltage               | $V_{CE} = -0.3\text{ V}; I_C = -1\text{ mA}$                                 | -3  | -1.6 | -    | V             |
| R1                    | bias resistor 1 (input)              |  | 70  | 100  | 130  | 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            |



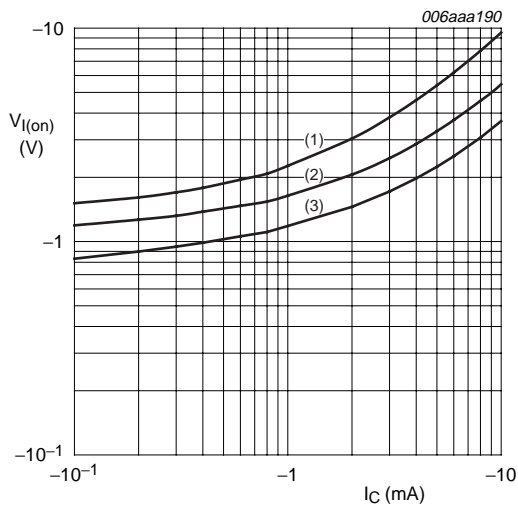
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = 150 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

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



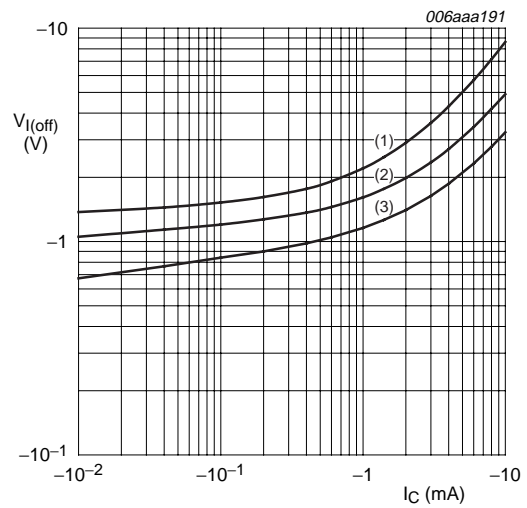
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

**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**



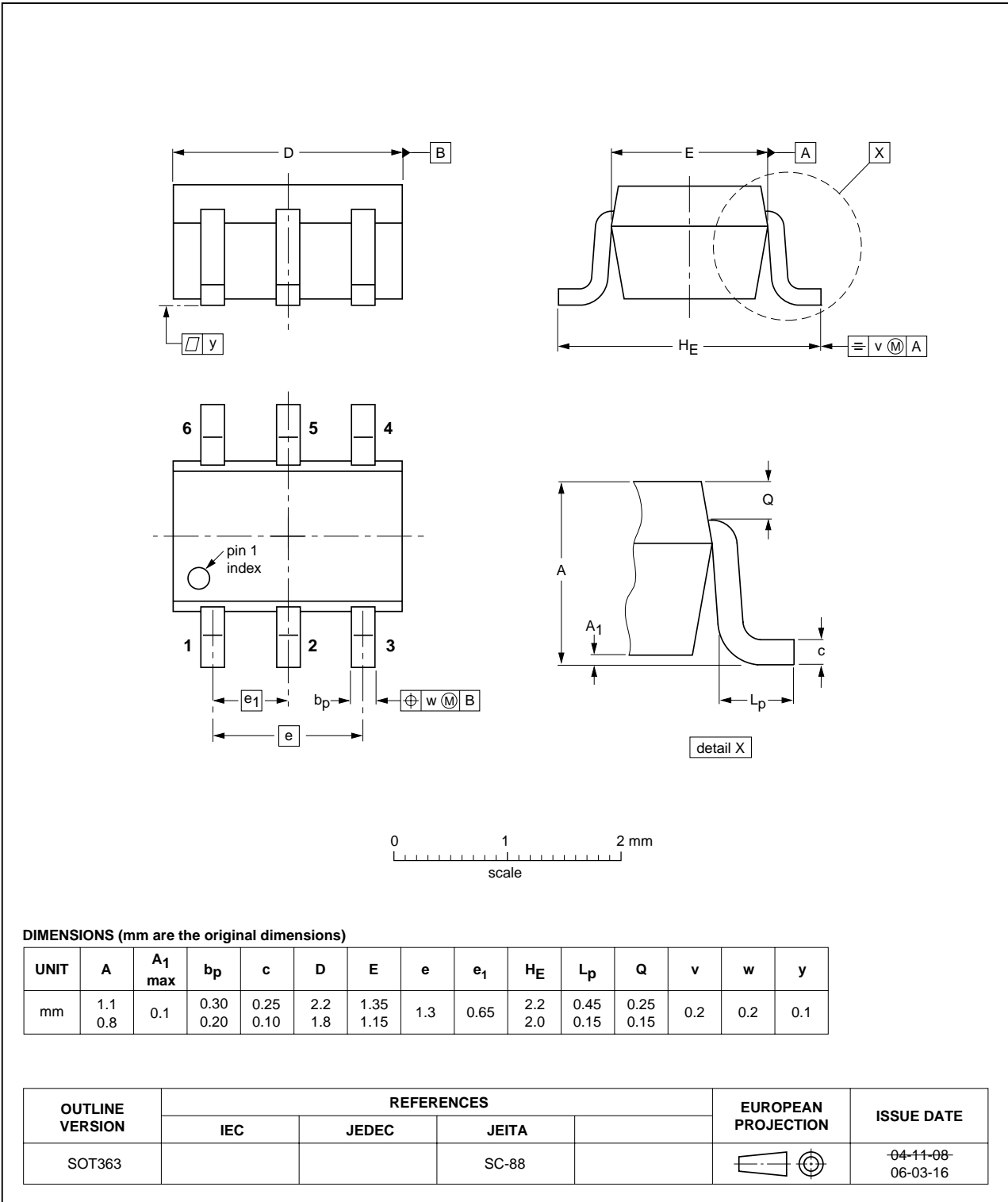
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100 \text{ }^\circ\text{C}$

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

**8. Package outline**

Plastic surface-mounted package; 6 leads

SOT363



**Fig 5. Package outline SOT363 (SC-88)**

Plastic surface-mounted package; 6 leads

SOT666

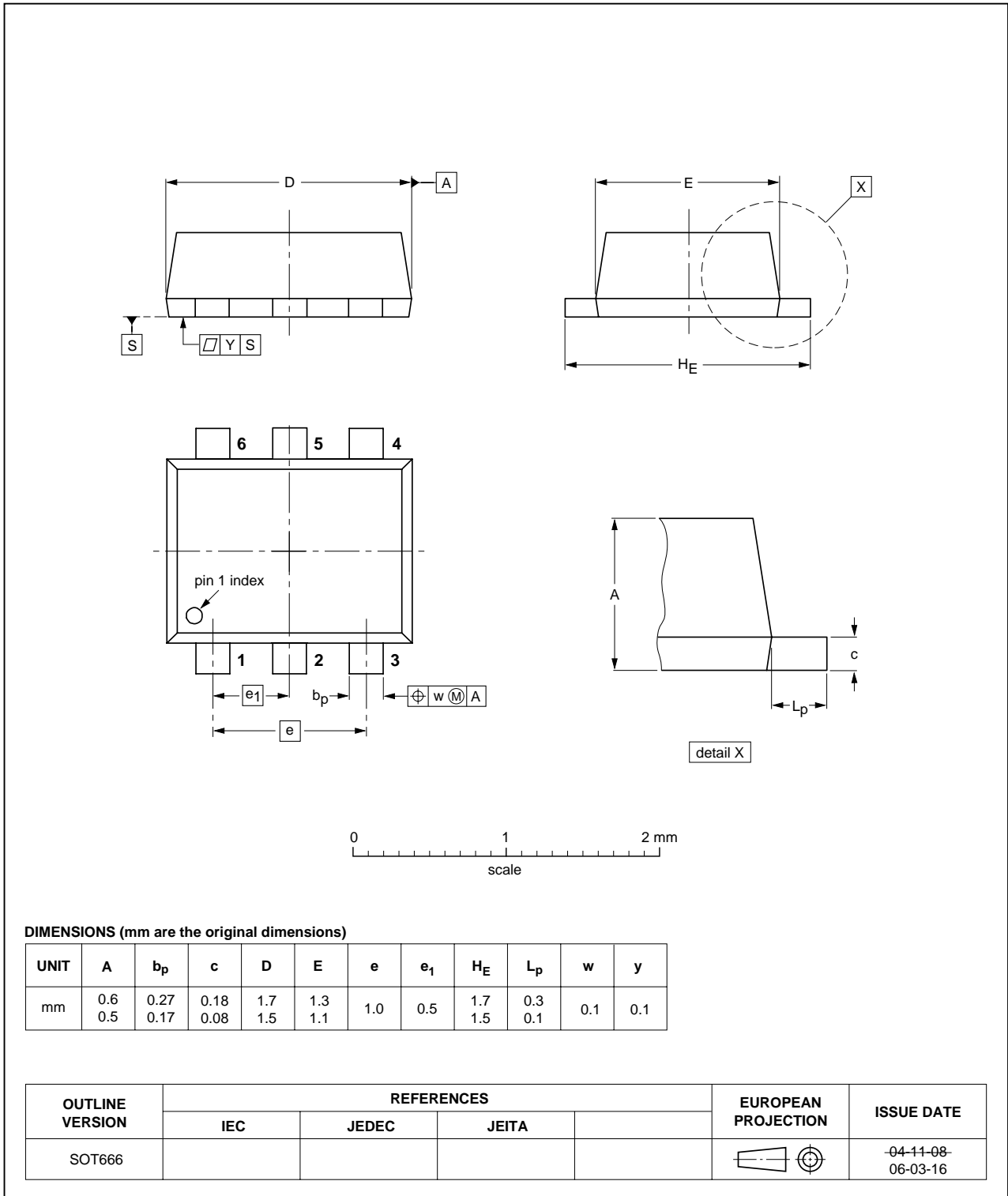


Fig 6. Package outline SOT666

## 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 |
| PEMB24      | SOT666  | 4 mm pitch, 8 mm tape and reel                         | -                | -115 | -     |
| PUMB24      | SOT363  | 4 mm pitch, 8 mm tape and reel; T1 <a href="#">[2]</a> | -115             | -    | -135  |
| PUMB24      | SOT363  | 4 mm pitch, 8 mm tape and reel; T2 <a href="#">[3]</a> | -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      |
|-----------------|---|--------------------|---------------|-----------------|
| PEMB24_PUMB24_2 | 20090902  | Product data sheet | -             | PEMB24_PUMB24_1 |
| 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><li>• <a href="#">Figure 6 “Package outline SOT666”</a>: updated</li></ul> |                    |               |                 |
| PEMB24_PUMB24_1 | 20050218  | Product data sheet | -             | -               |

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| 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.                       |
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[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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