



THE DATASHEET OF PUMD16,115



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Team Nexperia

PEMD16; PUMD16

NPN/PNP resistor-equipped transistors;
R1 = 22 k Ω , R2 = 47 k Ω

Rev. 3 — 28 June 2011

Product data sheet

1. Product profile

1.1 General description

NPN/PNP resistor-equipped transistors.

Table 1. Product overview

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

1.2 Features and benefits

- 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

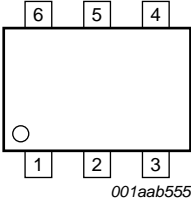
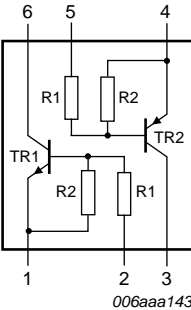
Table 2. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------|---------------------------|------------|------|-----|------|------------|
| V _{CEO} | collector-emitter voltage | open base | - | - | 50 | V |
| I _O | output current | | - | - | 100 | mA |
| R1 | bias resistor 1 (input) | | 15.4 | 22 | 28.6 | k Ω |
| R2/R1 | bias resistor ratio | | 1.7 | 2.1 | 2.6 | |



2. Pinning information

Table 3. Pinning

| Pin | Description | Simplified outline | Graphic 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 | |
| PEMD16 | - | plastic surface-mounted package; 6 leads | SOT666 |
| PUMD16 | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |

4. Marking

Table 5. Marking codes

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| PEMD16 | 5H |
| PUMD16 | D1* |

[1] * = placeholder for manufacturing site code

5. Limiting values

Table 6. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit | |
|--|---------------------------|--------------------------|--------|------|------|----|
| Per transistor; for the PNP transistor with negative polarity | | | | | | |
| 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 | - | 5 | V | |
| V _I | input voltage TR1 | | | | | |
| | positive | | - | +40 | V | |
| | negative | | - | -7 | V | |
| | input voltage TR2 | | | | | |
| | positive | | - | +7 | V | |
| | negative | | - | -40 | V | |
| I _O | output current | | - | 100 | mA | |
| I _{CM} | peak collector current | | - | 100 | mA | |
| P _{tot} | total power dissipation | T _{amb} ≤ 25 °C | | | | |
| | SOT363 | | [1] | - | 200 | mW |
| | SOT666 | | [1][2] | - | 200 | mW |
| T _{stg} | storage temperature | | -65 | +150 | °C | |
| T _j | junction temperature | | - | 150 | °C | |
| T _{amb} | ambient temperature | | -65 | +150 | °C | |
| Per device | | | | | | |
| P _{tot} | total power dissipation | T _{amb} ≤ 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 |
|-----------------------|---|-------------|--------|-----|-----|------|
| Per transistor | | | | | | |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | | | | |
| | SOT363 | | [1] | - | 625 | K/W |
| | SOT666 | | [1][2] | - | 625 | K/W |
| Per device | | | | | | |
| $R_{th(j-a)}$ | 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.

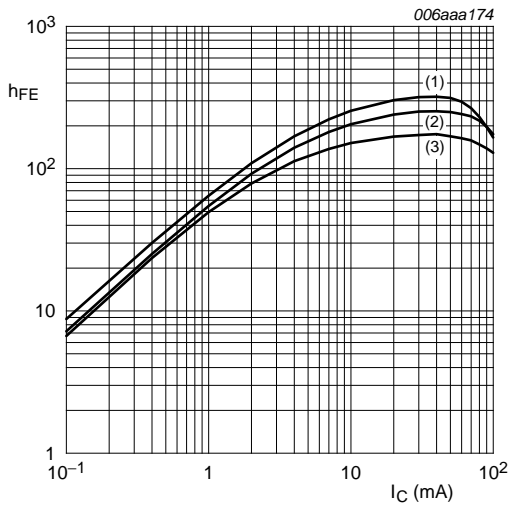
[2] Reflow soldering is the only recommended soldering method.

7. Characteristics

Table 8. Characteristics

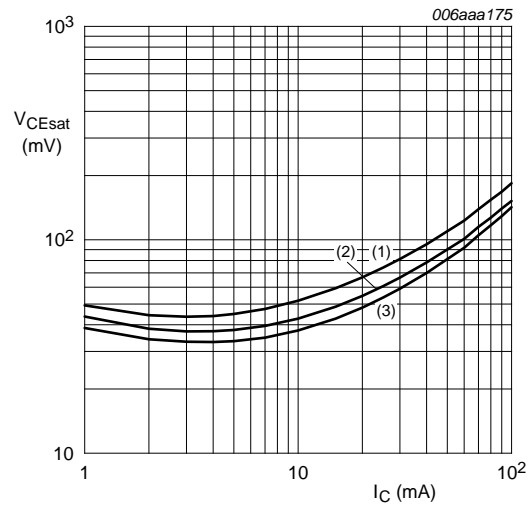
$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|--|--------------------------------------|---|-----------|-----|------|---------------|----|
| Per transistor; for the PNP transistor with negative polarity | | | | | | | |
| 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 | μA | |
| | | $V_{CE} = 30\text{ V}; I_B = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$ | - | - | 50 | μA | |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = 5\text{ V}; I_C = 0\text{ A}$ | - | - | 120 | μA | |
| 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 Ω | |
| R2/R1 | bias resistor ratio | | 1.7 | 2.1 | 2.6 | | |
| C_c | collector capacitance | $V_{CB} = -10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$ | | | | | |
| | | | TR1 (NPN) | - | - | 2.5 | pF |
| | | | TR2 (PNP) | - | - | 3 | pF |



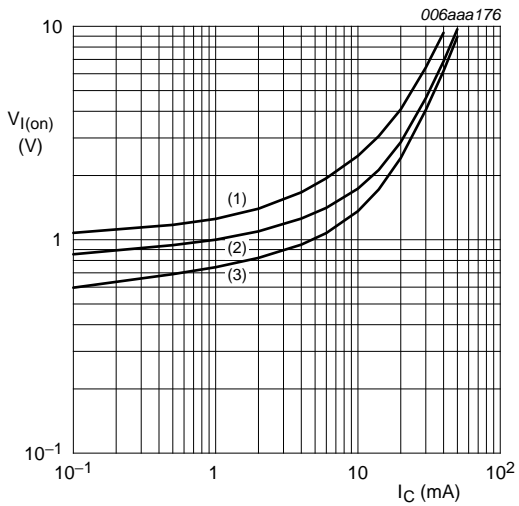
$V_{CE} = 5 \text{ V}$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

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



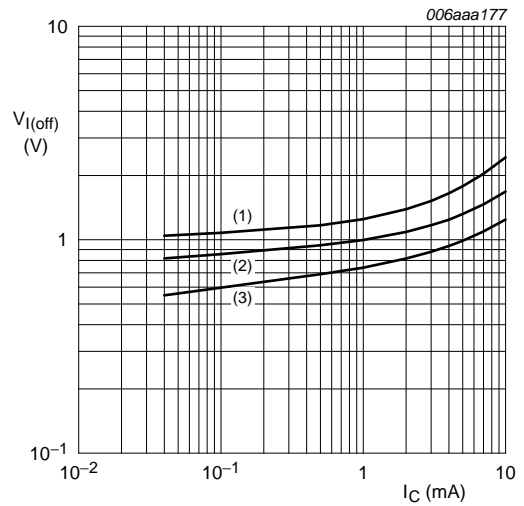
$I_C/I_B = 20$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

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



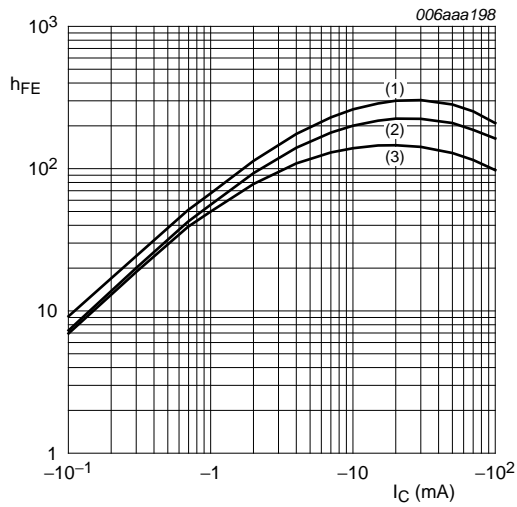
$V_{CE} = 0.3 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

Fig 3. TR1 (NPN): On-state input voltage as a function of collector current; typical values



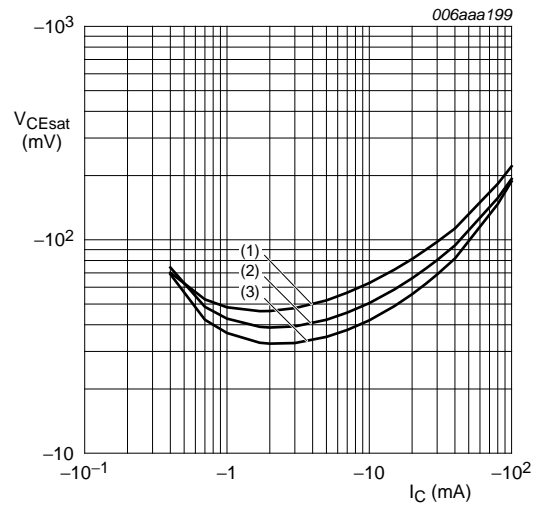
$V_{CE} = 5 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

Fig 4. TR1 (NPN): Off-state input voltage as a function of collector current; typical values



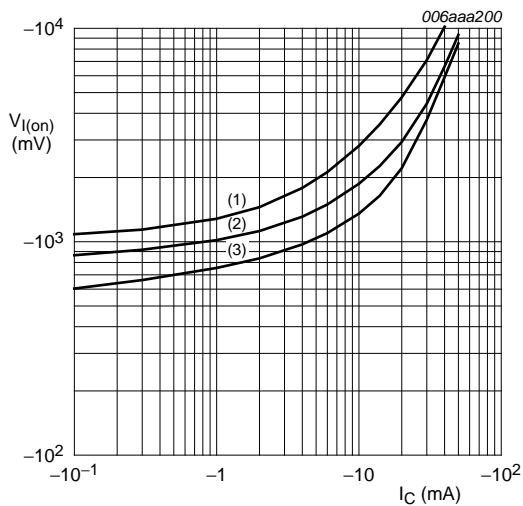
$V_{CE} = -5 \text{ V}$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

Fig 5. TR2 (PNP): DC current gain as a function of collector current; typical values



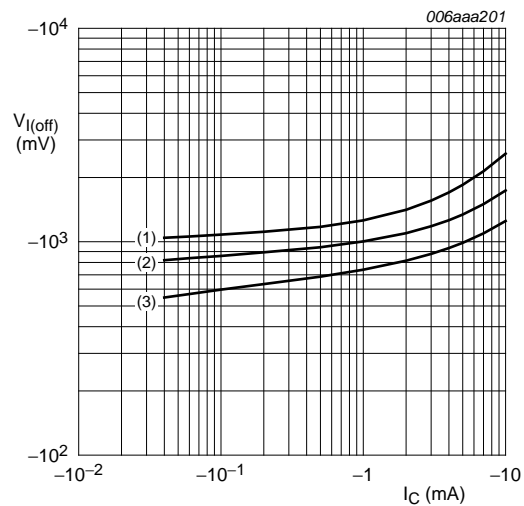
$I_C/I_B = 20$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

Fig 6. TR2 (PNP): 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) $T_{amb} = 100 \text{ }^\circ\text{C}$

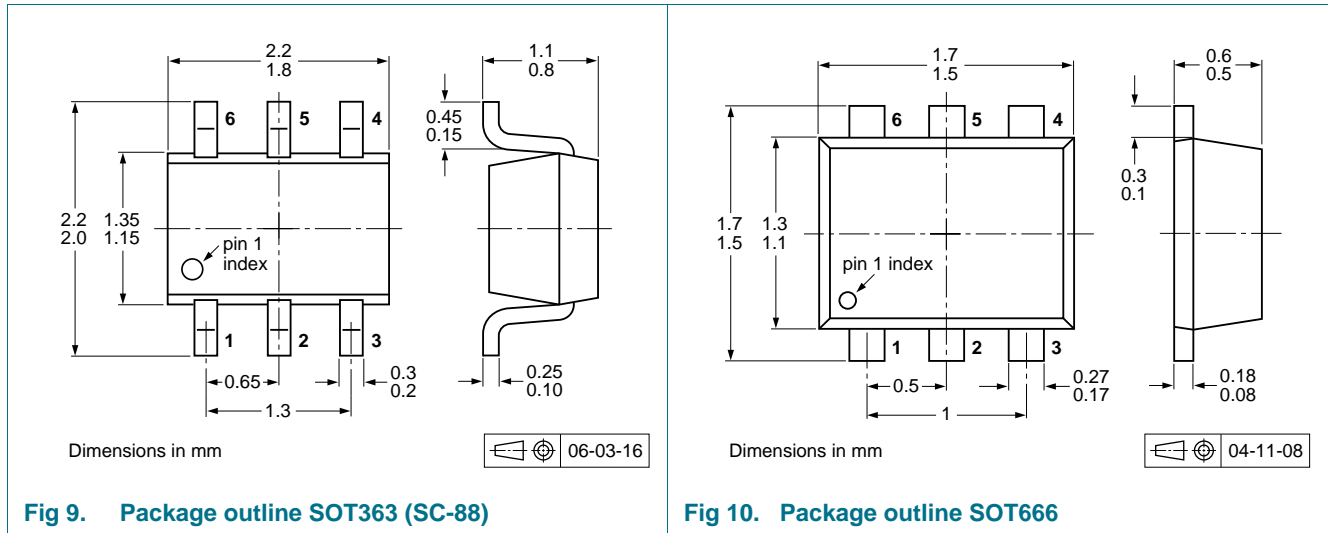
Fig 7. TR2 (PNP): On-state input voltage as a function of collector current; typical values



$V_{CE} = -5 \text{ V}$
 (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 8. TR2 (PNP): 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 |
| PEMD16 | SOT666 | 4 mm pitch, 8 mm tape and reel | - | -115 | - |
| PUMD16 | SOT363 | 4 mm pitch, 8 mm tape and reel; T1 [2] | -115 | - | -135 |
| | | 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 |
|-------------------|--|-----------------------|---------------|-------------------|
| PEMD16_PUMD16 v.3 | 20110628 | Product data sheet | - | PEMD16_PUMD16 v.2 |
| Modifications: | <ul style="list-style-type: none">• The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductor.• Legal texts have been adapted to the new company name where appropriate.• Figure 9 “Package outline SOT363 (SC-88)” is updated.• Section 11 “Legal information” is updated. | | | |
| PEMD16_PUMD16 v.2 | 20050607 | Product data sheet | - | PUMD16 v.1 |
| PUMD16 v.1 | 20031022 | Product specification | - | - |

11. Legal information

11.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | 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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