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Kind regards,

Team Nexperia

PEMH16; PUMH16

NPN/NPN resistor-equipped transistors;

R1 = 22 k Ω , R2 = 47 k Ω

Rev. 04 — 15 November 2009

Product data sheet

1. Product profile

1.1 General description

NPN/NPN Resistor-Equipped Transistors (RET).

Table 1. Product overview

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

1.2 Features

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

1.3 Applications

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

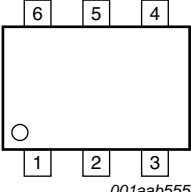
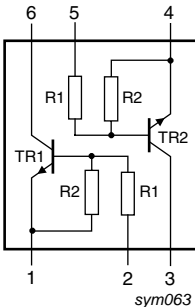
1.4 Quick reference data

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 | Symbol |
|-----|------------------------|--|---|
| 1 | GND (emitter) TR1 |  <p>001aab555</p> |  <p>sym063</p> |
| 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 | |
| PEMH16 | - | plastic surface mounted package; 6 leads | SOT666 |
| PUMH16 | SC-88 | plastic surface mounted package; 6 leads | SOT363 |

4. Marking

Table 5. Marking codes

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| PEMH16 | 5K |
| PUMH16 | H3* |

- [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 | |
|-----------------------|---------------------------|---|--------|------|------------------|----|
| Per transistor | | | | | | |
| 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 | - | 7 | V | |
| V_I | input voltage | | | | | |
| | positive | | - | +40 | V | |
| | negative | | - | -7 | V | |
| I_O | output current | | - | 100 | mA | |
| I_{CM} | peak collector current | | - | 100 | mA | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ }^\circ\text{C}$ | | | | |
| | SOT363 | | [1] | - | 200 | mW |
| | SOT666 | | [1][2] | - | 200 | mW |
| T_{stg} | storage temperature | | -65 | +150 | $^\circ\text{C}$ | |
| T_j | junction temperature | | - | 150 | $^\circ\text{C}$ | |
| T_{amb} | ambient temperature | | -65 | +150 | $^\circ\text{C}$ | |
| Per device | | | | | | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ }^\circ\text{C}$ | | | | |
| | 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.

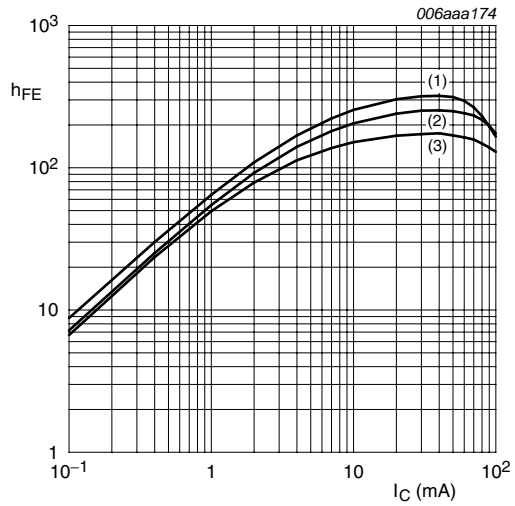
[2] Reflow soldering is the only recommended soldering method.

7. Characteristics

Table 8. Characteristics

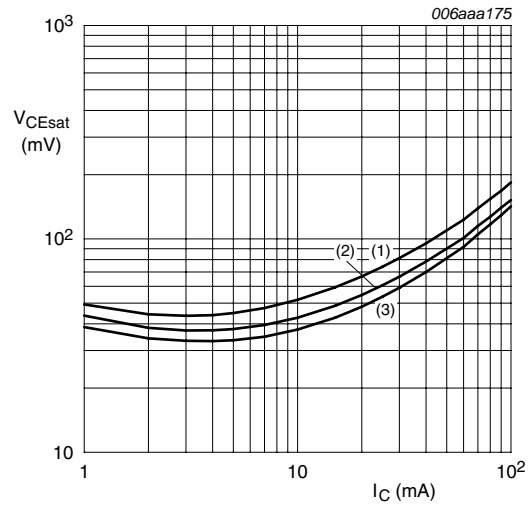
$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|--------------------------------------|---|------|-----|------|---------------|
| Per transistor | | | | | | |
| 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 | $V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$ | - | - | 2.5 | pF |



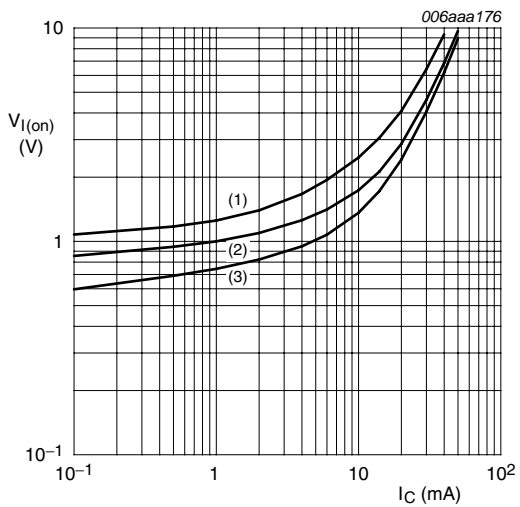
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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



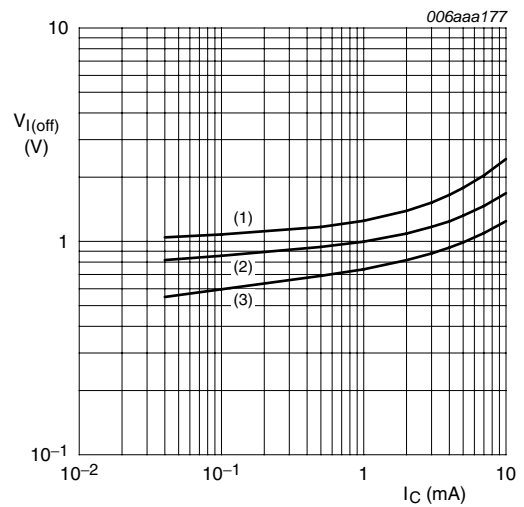
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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. Package outline

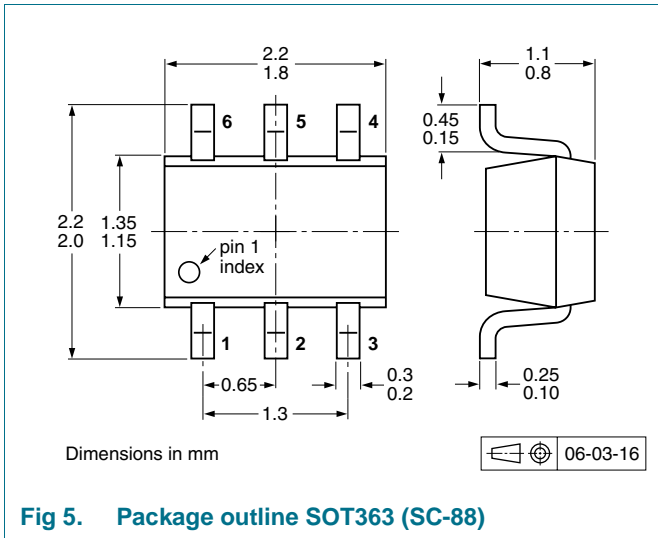


Fig 5. Package outline SOT363 (SC-88)

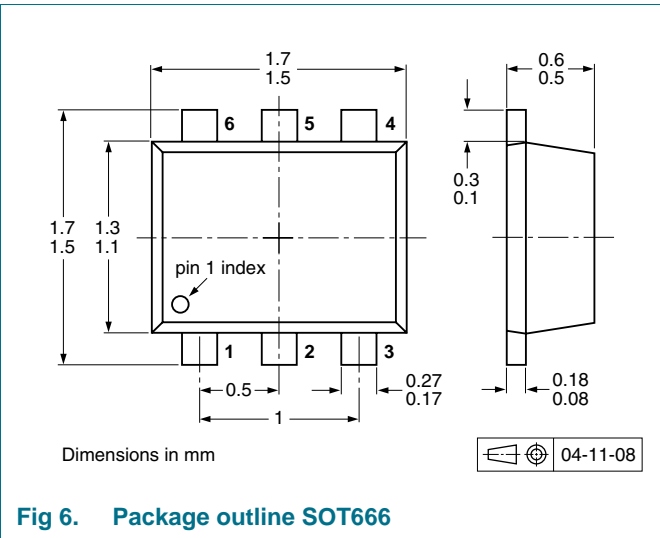


Fig 6. Package outline SOT666

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 | 8000 | 10000 |
| PEMH16 | SOT666 | 2 mm pitch, 8 mm tape and reel | - | - | -315 | - |
| | | 4 mm pitch, 8 mm tape and reel | - | -115 | - | - |
| PUMH16 | 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 |
|-----------------|---|-----------------------|---------------|-----------------|
| PEMH16_PUMH16_4 | 20091115 | Product data sheet | - | PEMH16_PUMH16_3 |
| Modifications: | <ul style="list-style-type: none"> 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. Figure 5 "Package outline SOT363 (SC-88)"; updated | | | |
| PEMH16_PUMH16_3 | 20050607 | Product data sheet | - | PUMH16_2 |
| PUMH16_2 | 20040414 | Product specification | - | PUMH16_1 |
| PUMH16_1 | 20031009 | 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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13. Contents

1 Product profile 1

1.1 General description 1

1.2 Features 1

1.3 Applications 1

1.4 Quick reference data 1

2 Pinning information 2

3 Ordering information 2

4 Marking 2

5 Limiting values 3

6 Thermal characteristics 4

7 Characteristics 4

8 Package outline 6

9 Packing information 6

10 Revision history 7

11 Legal information 8

11.1 Data sheet status 8

11.2 Definitions 8

11.3 Disclaimers 8

11.4 Trademarks 8

12 Contact information 8

13 Contents 9

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