



PEMH14

50 V, 100 mA NPN/NPN resistor-equipped transistor;
R1 = 47 k Ω , R2 = open

29 December 2022

Product data sheet

1. General description

NPN/NPN Resistor-Equipped Transistor (RET) in an ultra small and flat lead SOT666 Surface-Mounted Device (SMD) plastic package.

NPN/PNP complement: PEMD14

PNP/PNP complement: PEMB14

2. Features and benefits

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

3. Applications

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

4. Quick reference data

Table 1. Quick reference data

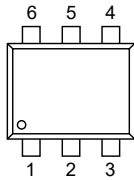
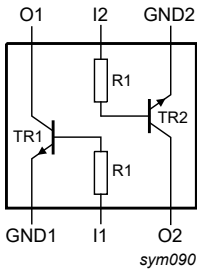
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|---------------------------|------------|-----|-----|-----|------------|
| Per transistor | | | | | | |
| V _{CEO} | collector-emitter voltage | open base | - | - | 50 | V |
| I _O | output current | | - | - | 100 | mA |
| R1 | bias resistor 1 (input) | | [1] | 47 | 61 | k Ω |

[1] See section "Test information" for resistor calculation and test conditions.

50 V, 100 mA NPN/NPN resistor-equipped transistor; R1 = 47 k Ω , R2 = open

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|------------------------|--|--|
| 1 | GND1 | GND (emitter) TR1 |  <p style="text-align: center;">SOT666</p> |  <p style="text-align: center;"><i>sym090</i></p> |
| 2 | I1 | input (base) TR1 | | |
| 3 | O2 | output (collector) TR2 | | |
| 4 | GND2 | GND (emitter) TR2 | | |
| 5 | I2 | input (base) TR2 | | |
| 6 | O1 | output (collector) TR1 | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|------------------------|---------|---|------------------------|
| | Name | Description | Version |
| PEMH14 | SOT666 | plastic, surface-mounted package; 6 leads; 0.5 mm pitch; 1.6 mm x 1.2 mm x 0.55 mm body | SOT666 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PEMH14 | 5C |

8. Limiting values

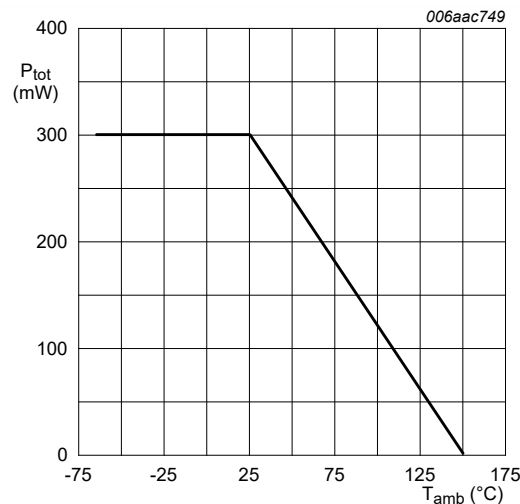
Table 5. Limiting values

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 | | - | 5 | V |
| I_O | output current | | | - | 100 | mA |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | [1] [2] | - | 200 | mW |
| Per device | | | | | | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | [1] [2] | - | 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.

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



FR4 PCB, single-sided, 35 μm copper, tin-plated and standard footprint

Fig. 1. Per device: Power derating curve

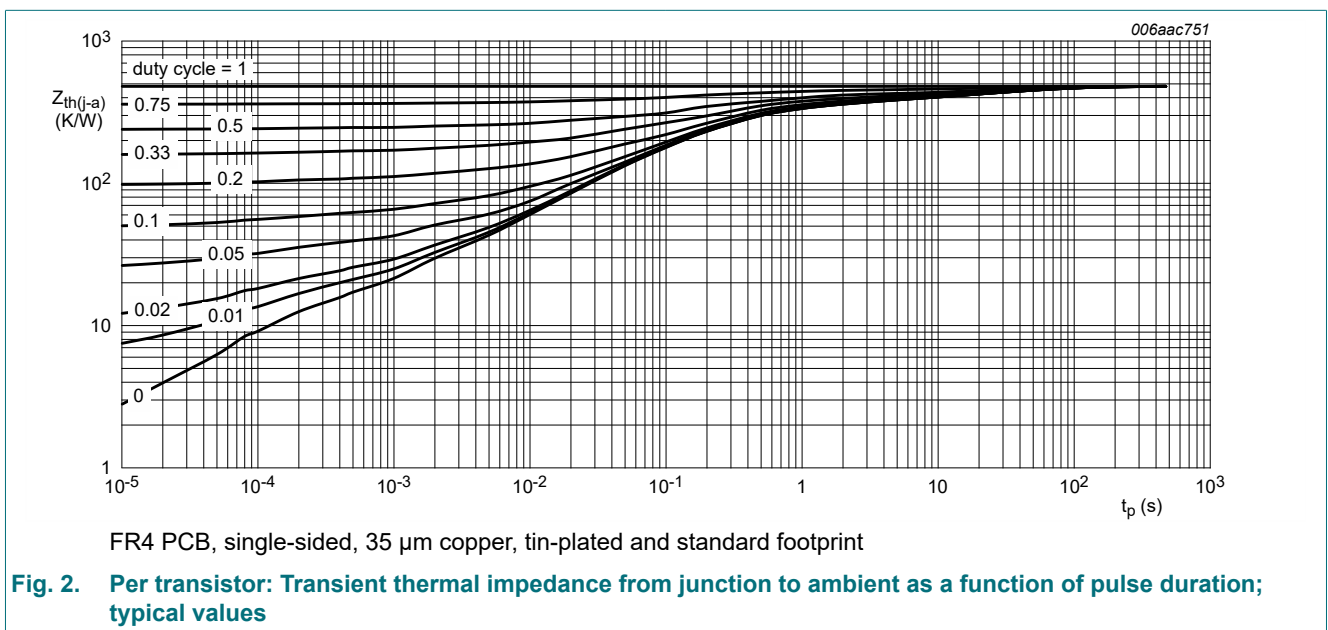
9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-----------------------|---|-------------|---------|-----|-----|-----|------|
| Per transistor | | | | | | | |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] [2] | - | - | 625 | K/W |
| Per device | | | | | | | |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [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.

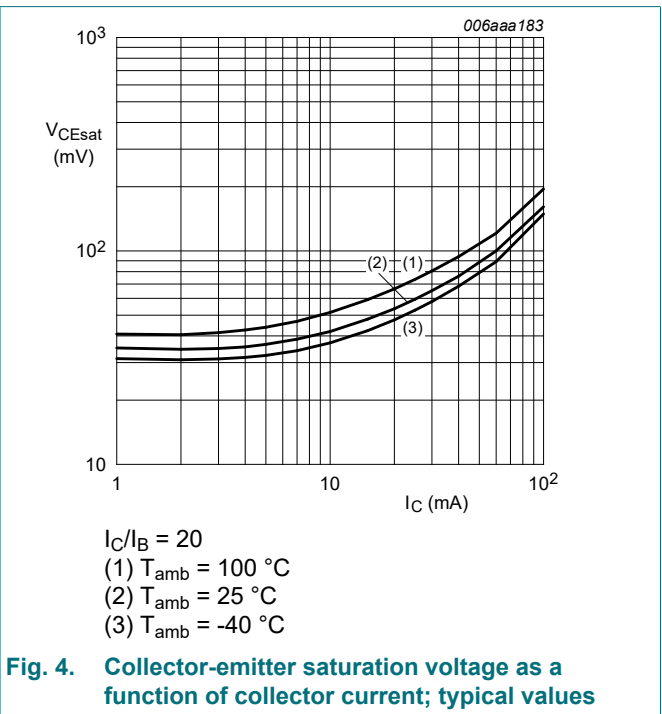
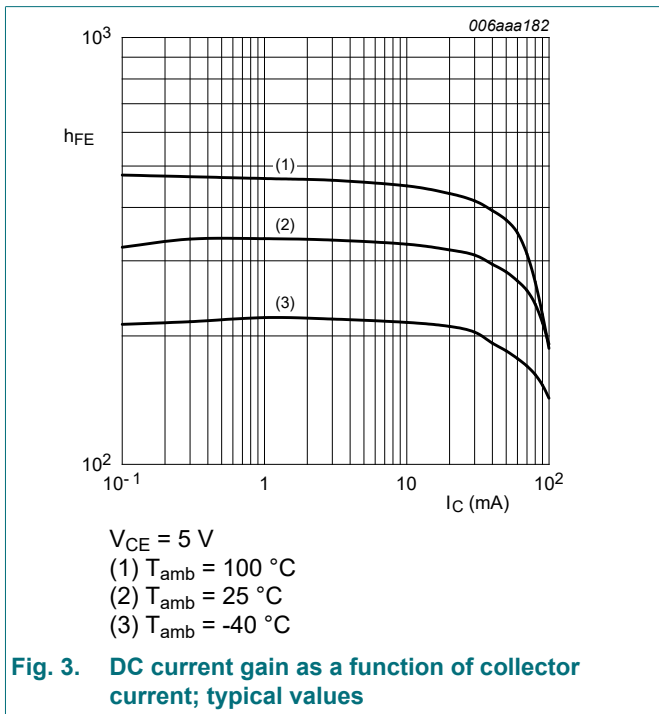


10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|--------------------------------------|--|-----|-----|-----|---------------|
| Per transistor | | | | | | |
| $V_{(BR)CBO}$ | collector-base breakdown voltage | $I_C = 100 \mu\text{A}$; $I_E = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | 50 | - | - | V |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | $I_C = 2 \text{ mA}$; $I_B = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | 50 | - | - | V |
| I_{CBO} | collector-base cut-off current | $V_{CB} = 50 \text{ V}$; $I_E = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | - | - | 100 | nA |
| I_{CEO} | collector-emitter cut-off current | $V_{CE} = 30 \text{ V}$; $I_B = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | - | - | 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 | $V_{EB} = 5 \text{ V}$; $I_C = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | - | - | 100 | nA |
| h_{FE} | DC current gain | $V_{CE} = 5 \text{ V}$; $I_C = 1 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | 100 | - | - | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = 10 \text{ mA}$; $I_B = 0.5 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | - | - | 150 | mV |
| R1 | bias resistor 1 (input) | | [1] | 47 | 61 | kΩ |
| C_c | collector capacitance | $V_{CB} = 10 \text{ V}$; $I_E = 0 \text{ A}$; $i_e = 0 \text{ A}$; $f = 1 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | - | - | 2.5 | pF |

[1] See section "Test information" for resistor calculation and test conditions.



11. Test information

Resistor calculation

- Calculation of bias resistor 1 (R1)

$$R_1 = \frac{V(I_2) - V(I_1)}{I_2 - I_1}$$

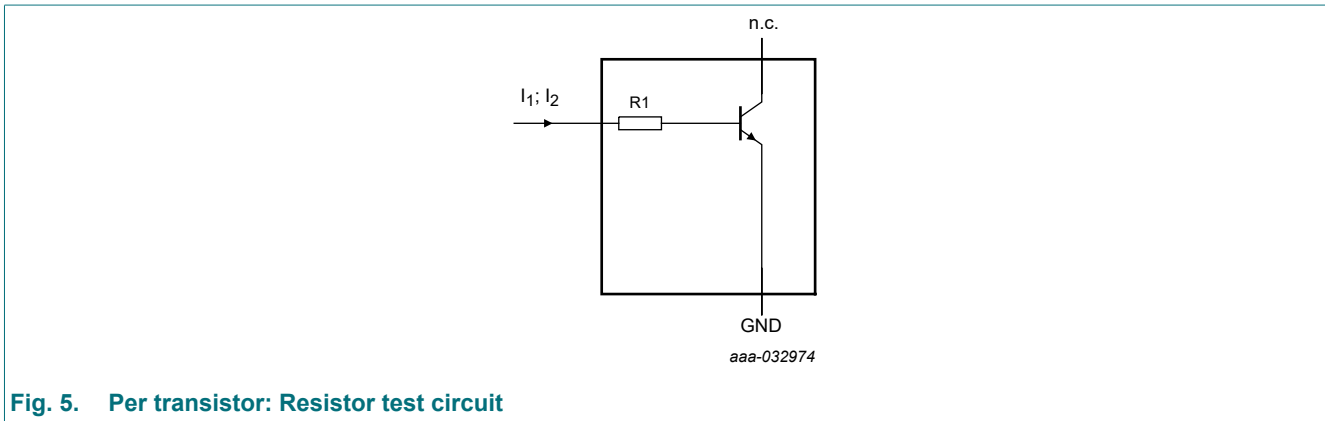


Fig. 5. Per transistor: Resistor test circuit

Resistor test conditions

Table 8. Resistor test conditions

| Type number | R1 (kΩ) | R2 (kΩ) | Test conditions | |
|-------------|---------|---------|-----------------|----------------|
| | | | I ₁ | I ₂ |
| PEMH14 | 47 | open | 60 μA | 110 μA |

12. Package outline

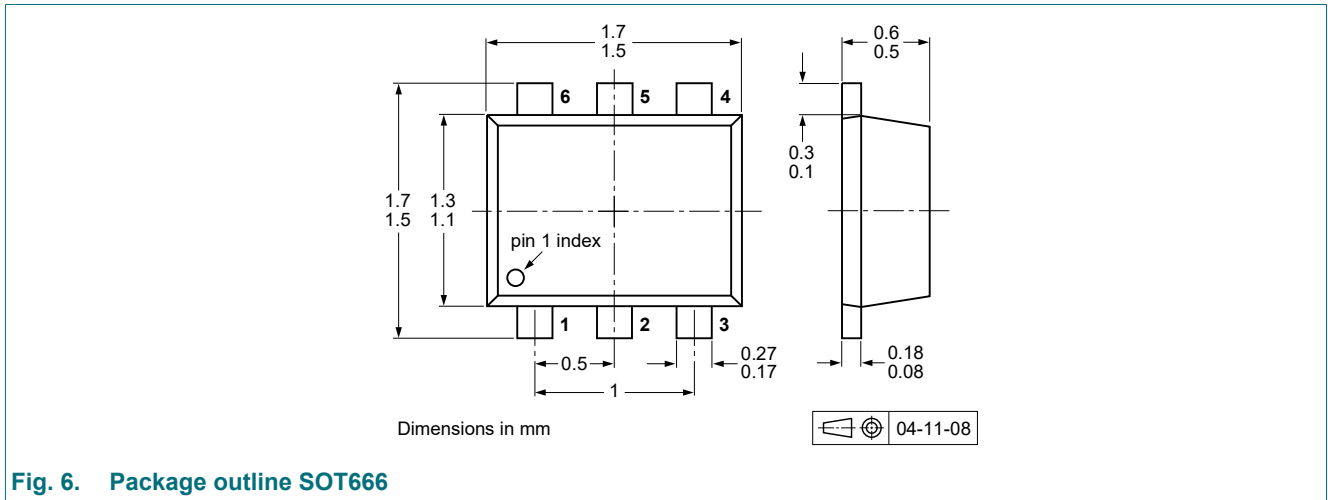


Fig. 6. Package outline SOT666

13. Soldering

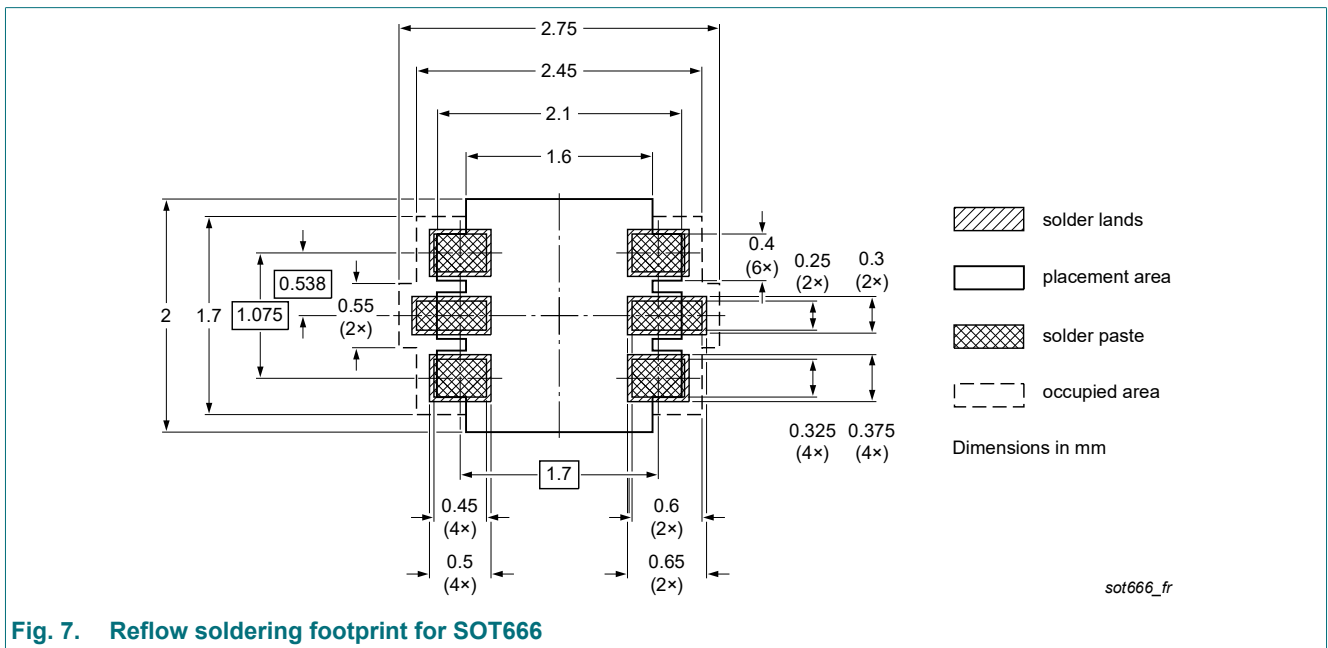


Fig. 7. Reflow soldering footprint for SOT666

14. Revision history

Table 9. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|-----------------|--|-----------------------|---------------|-----------------|
| PEMH14 v.4 | 20221229 | Product data sheet | - | PEMH14_PUMH14_3 |
| Modifications: | <ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Family data sheet reduced to single type data sheet. Packing information removed. Product(s) changed to non-automotive qualification. | | | |
| PEMH14_PUMH14_3 | 20091115 | Product data sheet | - | PEMH14_PUMH14_2 |
| PEMH14_PUMH14_2 | 20050429 | Product data sheet | - | PUMH14_1 |
| PUMH14_1 | 20031016 | Product specification | - | - |

15. Legal information

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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