

PEMD48; PUMD48

NPN/PNP resistor-equipped transistors;

R1 = 47 k Ω , R2 = 47 k Ω and R1 = 2.2 k Ω , R2 = 47 k Ω

Rev. 05 — 13 April 2010

Product data sheet

1. Product profile

1.1 General description

NPN/PNP double Resistor-Equipped Transistors (RET) in small Surface-Mounted Device (SMD) plastic packages.

Table 1. Product overview

| Type number | Package | | Package configuration |
|-------------|---------|-------|---------------------------|
| | NXP | JEITA | |
| PEMD48 | SOT666 | - | ultra small and flat lead |
| PUMD48 | SOT363 | SC-88 | very small |

1.2 Features and benefits

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

1.3 Applications

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

1.4 Quick reference data

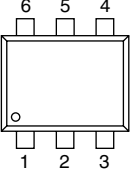
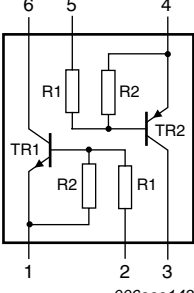
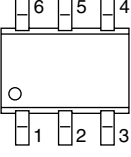
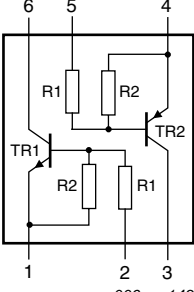
Table 2. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--|---------------------------|------------|------|-----|------|------------|
| Per transistor; for the PNP transistor with negative polarity | | | | | | |
| V _{CEO} | collector-emitter voltage | open base | - | - | 50 | V |
| I _O | output current | | - | - | 100 | mA |
| Transistor TR1 (NPN) | | | | | | |
| R1 | bias resistor 1 (input) | | 33 | 47 | 61 | k Ω |
| R2/R1 | bias resistor ratio | | 0.8 | 1 | 1.2 | |
| Transistor TR2 (PNP) | | | | | | |
| R1 | bias resistor 1 (input) | | 1.54 | 2.2 | 2.86 | k Ω |
| R2/R1 | bias resistor ratio | | 17 | 21 | 26 | |



2. Pinning information

Table 3. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|------------------------|------------------------|--|--|
| PEMD48 (SOT666) | | | |
| 1 | GND (emitter) TR1 |  |  <p style="text-align: right; font-size: small;">006aaa143</p> |
| 2 | input (base) TR1 | | |
| 3 | output (collector) TR2 | | |
| 4 | GND (emitter) TR2 | | |
| 5 | input (base) TR2 | | |
| 6 | output (collector) TR1 | | |
| PUMD48 (SOT363) | | | |
| 1 | GND (emitter) TR1 |  |  <p style="text-align: right; font-size: small;">006aaa143</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 | |
| PEMD48 | - | plastic surface-mounted package; 6 leads | SOT666 |
| PUMD48 | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |

4. Marking

Table 5. Marking codes

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| PEMD48 | 48 |
| PUMD48 | 4*8 |

[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; 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 | - | 10 | V | |
| V_I | input voltage TR1 | | | | | |
| | positive | | - | +40 | V | |
| | negative | | - | -10 | V | |
| | input voltage TR2 | | | | | |
| | positive | | - | +5 | V | |
| | negative | | - | -12 | V | |
| I_O | output current | | - | 100 | mA | |
| I_{CM} | peak collector current | | - | 100 | mA | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | | | | |
| | PEMD48 (SOT666) | | [1][2] | - | 200 | mW |
| | PUMD48 (SOT363) | | [1] | - | 200 | mW |
| Per device | | | | | | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | | | | |
| | PEMD48 (SOT666) | | [1][2] | - | 300 | mW |
| | PUMD48 (SOT363) | | [1] | - | 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.

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 | $T_{amb} \leq 25\text{ °C}$ | | | | |
| | PEMD48 (SOT666) | | [1][2] | - | 625 | K/W |
| | PUMD48 (SOT363) | | [1] | - | 625 | K/W |
| Per device | | | | | | |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | $T_{amb} \leq 25\text{ °C}$ | | | | |
| | PEMD48 (SOT666) | | [1][2] | - | 416 | K/W |
| | PUMD48 (SOT363) | | [1] | - | 416 | K/W |

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

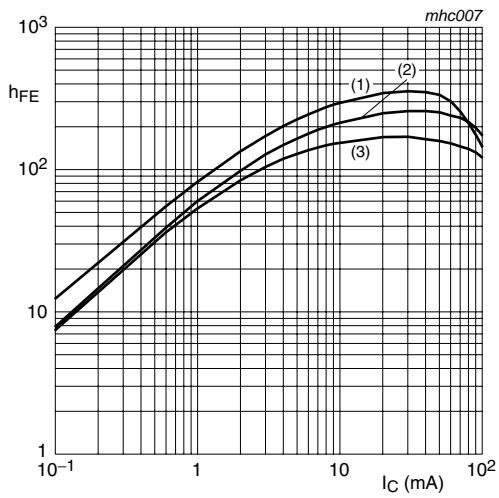
[2] Reflow soldering is the only recommended soldering method.

7. Characteristics

Table 8. Characteristics

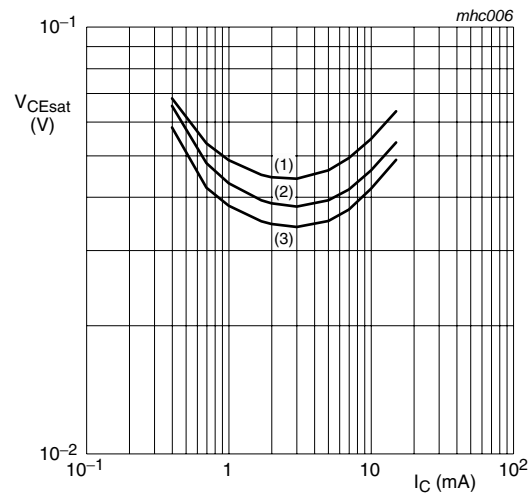
$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

| 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 |
| Transistor TR1 (NPN) | | | | | | |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = 5\text{ V};$ $I_C = 0\text{ A}$ | - | - | 90 | 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 | $V_{CE} = 5\text{ V};$ $I_C = 100\text{ }\mu\text{A}$ | - | 1.2 | 0.8 | V |
| $V_{I(on)}$ | on-state input voltage | $V_{CE} = 0.3\text{ V};$ $I_C = 2\text{ mA}$ | 3 | 1.6 | - | V |
| R1 | bias resistor 1 (input) | | 33 | 47 | 61 | $\text{k}\Omega$ |
| 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 |
| Transistor TR2 (PNP) | | | | | | |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = -5\text{ V};$ $I_C = 0\text{ A}$ | - | - | -180 | μA |
| h_{FE} | DC current gain | $V_{CE} = -5\text{ V};$ $I_C = -10\text{ mA}$ | 100 | - | - | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = -5\text{ mA};$ $I_B = -0.25\text{ mA}$ | - | - | -100 | mV |
| $V_{I(off)}$ | off-state input voltage | $V_{CE} = -5\text{ V};$ $I_C = -100\text{ }\mu\text{A}$ | - | -0.6 | -0.5 | V |
| $V_{I(on)}$ | on-state input voltage | $V_{CE} = -0.3\text{ V};$ $I_C = -5\text{ mA}$ | -1.1 | -0.75 | - | V |
| R1 | bias resistor 1 (input) | | 1.54 | 2.2 | 2.86 | $\text{k}\Omega$ |
| R2/R1 | bias resistor ratio | | 17 | 21 | 26 | |
| C_c | collector capacitance | $V_{CB} = -10\text{ V};$ $I_E = I_e = 0\text{ A};$ $f = 1\text{ MHz}$ | - | - | 3 | pF |



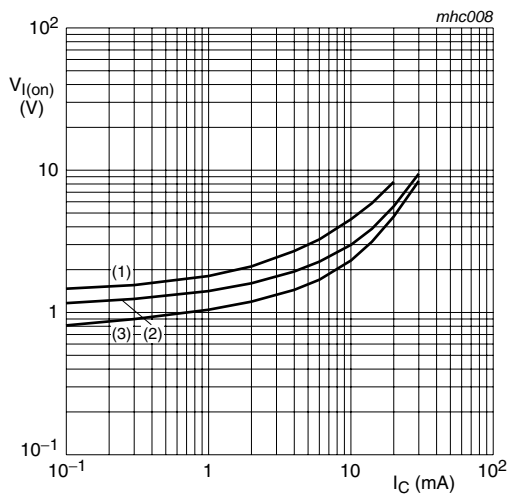
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 150\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -40\text{ }^{\circ}\text{C}$

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



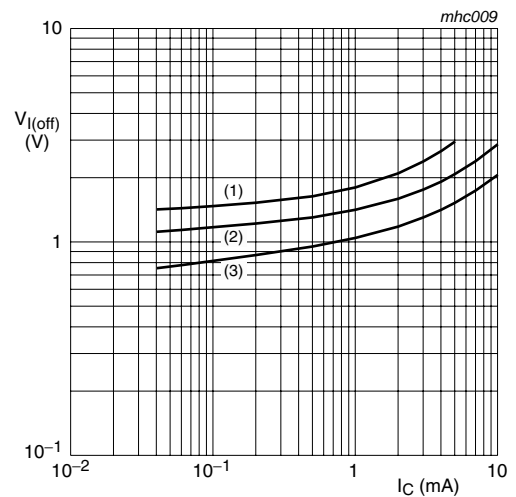
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -40\text{ }^{\circ}\text{C}$

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



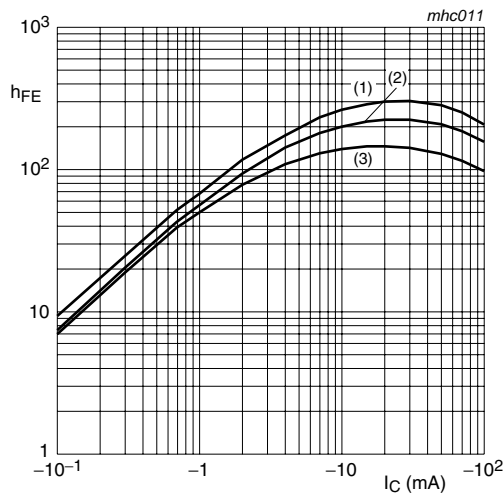
$V_{CE} = 0.3\text{ V}$
 (1) $T_{amb} = -40\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



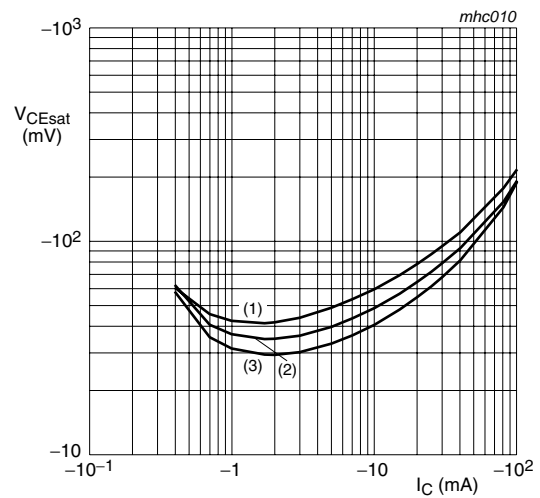
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -40\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



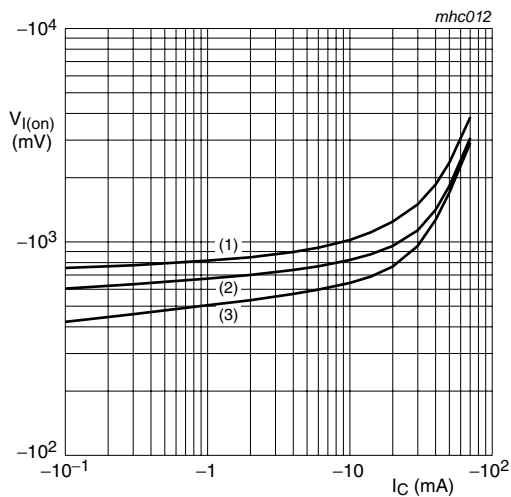
$V_{CE} = -5\text{ V}$
 (1) $T_{amb} = 150\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -40\text{ }^{\circ}\text{C}$

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



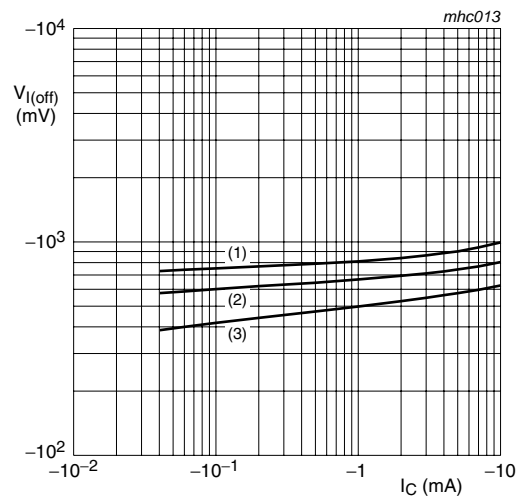
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -40\text{ }^{\circ}\text{C}$

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

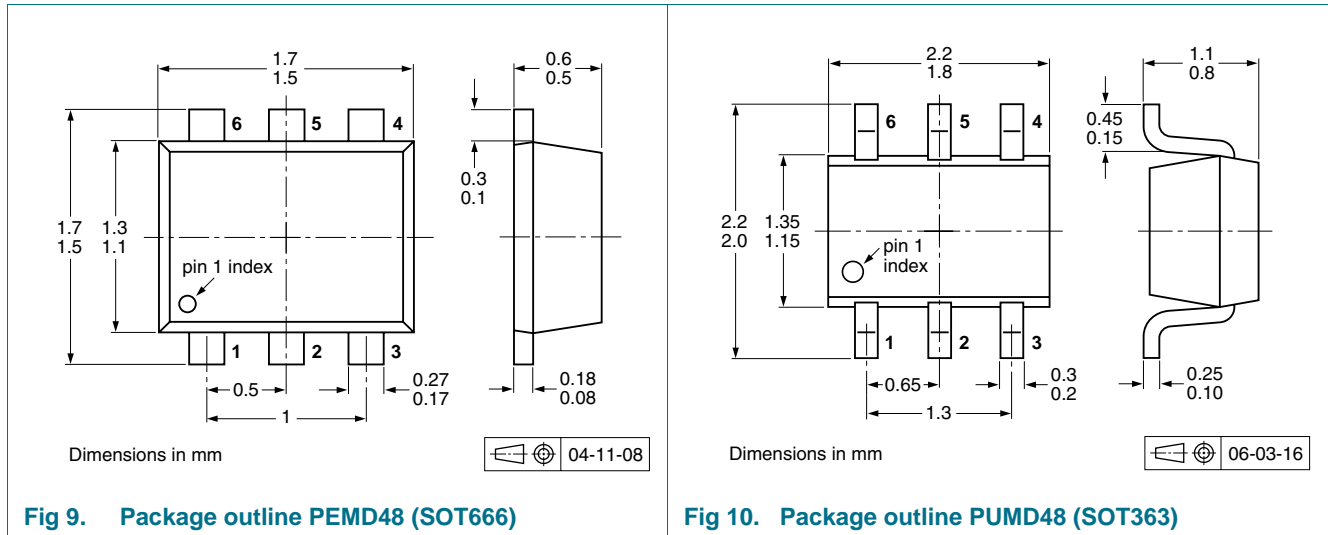


Fig 9. Package outline PEMD48 (SOT666)

Fig 10. Package outline PUMD48 (SOT363)

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 |
| PEMD48 | SOT666 | 2 mm pitch, 8 mm tape and reel | - | - | -315 | - |
| | | 4 mm pitch, 8 mm tape and reel | - | -115 | - | - |
| PUMD48 | 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 |
|-----------------|--|---------------------------|---------------|----------------------|
| PEMD48_PUMD48_5 | 20100413 | Product data sheet | - | PEMD48_PUMD48_4 |
| Modifications: | <ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Section 1 “Product profile”: amended • Table 3 “Pinning”: amended • Table 8 “Characteristics”: $V_{i(on)}$ redefined to $V_{I(on)}$ on-state input voltage and $V_{i(off)}$ redefined to $V_{I(off)}$ off-state input voltage • Figure 9 and 10: superseded by minimized package outline drawings • Section 9 “Packing information”: added • Section 11 “Legal information”: updated | | | |
| PEMD48_PUMD48_4 | 20040624 | Product specification | - | PEMD48_PUMD48_3 |
| PEMD48_PUMD48_3 | 20040602 | Product specification | - | PEMD48_2 PUMD48_2 |
| PUMD48_2 | 20010201 | Product specification | - | PUMD48_1 |
| PUMD48_1 | 19990422 | Product specification | - | - |
| PEMD48_2 | 20011107 | Product specification | - | PEMD48_1 |
| PEMD48_1 | 20010924 | Preliminary 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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