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Kind regards,

Team Nexperia
1. Product profile

1.1 General description

500 mA, 50 V NPN/PNP double Resistor-Equipped Transistor (RET) in a small SOT457 (SC-74) Surface-Mounted Device (SMD) plastic package.

NPN/NPN complement: PIMN31

1.2 Features

- 500 mA output current capability
- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs
- AEC-Q101 qualified

1.3 Applications

- Digital application in automotive and industrial segments
- Switching loads

1.4 Quick reference data

Table 1. Quick reference data

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Conditions</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Typ</td>
</tr>
<tr>
<td>V_{CEO}</td>
<td>collector-emitter voltage</td>
<td>open base</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>I_{O}</td>
<td>output current</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R1</td>
<td>bias resistor 1 (input)</td>
<td></td>
<td>0.7</td>
<td>1</td>
</tr>
<tr>
<td>R2/R1</td>
<td>bias resistor ratio</td>
<td></td>
<td>9</td>
<td>10</td>
</tr>
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</table>
2. Pinning information

Table 2. Pinning

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND (emitter) TR1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>input (base) TR1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>output (collector) TR2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>GND (emitter) TR2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>input (base) TR2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>output (collector) TR1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Description</th>
<th>Version</th>
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</thead>
<tbody>
<tr>
<td>PIMC31</td>
<td>SC-74</td>
<td>plastic surface-mounted package (TSOP6); 6 leads</td>
<td>SOT457</td>
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4. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
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<tbody>
<tr>
<td>PIMC31</td>
<td>ZH</td>
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</table>

5. Limiting values

Table 5. Limiting values

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{CBO}</td>
<td>collector-base voltage</td>
<td>open emitter</td>
<td>-</td>
<td>50</td>
<td>V</td>
</tr>
<tr>
<td>V_{CEO}</td>
<td>collector-emitter voltage</td>
<td>open base</td>
<td>-</td>
<td>50</td>
<td>V</td>
</tr>
<tr>
<td>V_{EBO}</td>
<td>emitter-base voltage</td>
<td>open collector</td>
<td>-</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>V_I</td>
<td>input voltage TR1</td>
<td>positive</td>
<td>-</td>
<td>+10</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>negative</td>
<td>-</td>
<td>-5</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>input voltage TR2</td>
<td>positive</td>
<td>+5</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>negative</td>
<td>-</td>
<td>-10</td>
<td>V</td>
</tr>
</tbody>
</table>
500 mA, 50 V NPN/PNP double RET; $R_1 = 1 \, k\Omega$, $R_2 = 10 \, k\Omega$

### 6. Thermal characteristics

#### Table 5. Limiting values \(\ldots\) continued

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_O$</td>
<td>output current</td>
<td>-</td>
<td>500</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>$P_{tot}$</td>
<td>total power dissipation</td>
<td>$T_{amb} \leq 25 , ^\circ C$</td>
<td>[1] -</td>
<td>290 mW</td>
<td></td>
</tr>
</tbody>
</table>

**Per device**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_{tot}$</td>
<td>total power dissipation</td>
<td>$T_{amb} \leq 25 , ^\circ C$</td>
<td>[1] -</td>
<td>420 mW</td>
<td></td>
</tr>
<tr>
<td>$T_j$</td>
<td>junction temperature</td>
<td>-</td>
<td>150</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>$T_{amb}$</td>
<td>ambient temperature</td>
<td>-</td>
<td>-55</td>
<td>+150 °C</td>
<td></td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>storage temperature</td>
<td>-</td>
<td>-65</td>
<td>+150 °C</td>
<td></td>
</tr>
</tbody>
</table>


---

![Power derating curve](image-url)

**Fig 1.** Power derating curve

---

#### Table 6. Thermal characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per transistor</td>
<td>$R_{th(j-a)}$</td>
<td>thermal resistance from junction to ambient</td>
<td>in free air</td>
<td>[1] -</td>
<td>-</td>
<td>431</td>
</tr>
<tr>
<td>Per transistor</td>
<td>$R_{th(j-sp)}$</td>
<td>thermal resistance from junction to solder point</td>
<td>-</td>
<td>-</td>
<td>105</td>
<td>K/W</td>
</tr>
<tr>
<td>Per device</td>
<td>$R_{th(j-a)}$</td>
<td>thermal resistance from junction to ambient</td>
<td>in free air</td>
<td>[1] -</td>
<td>-</td>
<td>298</td>
</tr>
</tbody>
</table>

7. Characteristics

Table 7. Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{CBO} )</td>
<td>collector-base cut-off current</td>
<td>( V_{CB} = 50 \text{ V}; I_E = 0 \text{ A} )</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>( I_{CEO} )</td>
<td>collector-emitter cut-off current</td>
<td>( V_{CE} = 50 \text{ V}; I_B = 0 \text{ A} )</td>
<td>-</td>
<td>-</td>
<td>0.5</td>
<td>( \mu \text{A} )</td>
</tr>
<tr>
<td>( I_{EBO} )</td>
<td>emitter-base cut-off current</td>
<td>( V_{EB} = 5 \text{ V}; I_C = 0 \text{ A} )</td>
<td>-</td>
<td>-</td>
<td>0.72</td>
<td>mA</td>
</tr>
<tr>
<td>( h_{FE} )</td>
<td>DC current gain</td>
<td>( V_{CE} = 5 \text{ V}; I_C = 50 \text{ mA} )</td>
<td>70</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>( V_{CEsat} )</td>
<td>collector-emitter saturation voltage</td>
<td>( I_C = 50 \text{ mA}; I_B = 2.5 \text{ mA} )</td>
<td>-</td>
<td>-</td>
<td>0.3</td>
<td>V</td>
</tr>
<tr>
<td>( V_{I(off)} )</td>
<td>off-state input voltage</td>
<td>( V_{CE} = 5 \text{ V}; I_C = 100 \text{ ( \mu )A} )</td>
<td>0.3</td>
<td>0.6</td>
<td>1</td>
<td>V</td>
</tr>
<tr>
<td>( V_{I(on)} )</td>
<td>on-state input voltage</td>
<td>( V_{CE} = 0.3 \text{ V}; I_C = 20 \text{ mA} )</td>
<td>0.4</td>
<td>0.8</td>
<td>1.4</td>
<td>V</td>
</tr>
<tr>
<td>R1</td>
<td>bias resistor 1 (input)</td>
<td></td>
<td>0.7</td>
<td>1</td>
<td>1.3</td>
<td>k( \Omega )</td>
</tr>
<tr>
<td>R2/R1</td>
<td>bias resistor ratio</td>
<td></td>
<td>9</td>
<td>10</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>( C_c )</td>
<td>collector capacitance</td>
<td>( V_{CB} = 10 \text{ V}; I_E = I_E = 0 \text{ A}; f = 1 \text{ MHz} )</td>
<td>-</td>
<td>7</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>TR1 (NPN)</td>
<td></td>
<td></td>
<td>-</td>
<td>11</td>
<td>-</td>
<td>pF</td>
</tr>
</tbody>
</table>

Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

FR4 PCB, standard footprint
**Fig 3.** TR1 (NPN): DC current gain as a function of collector current; typical values

- $V_{CE} = 5$ V
- $I_{C}/I_{B} = 20$
- $I_{C}/I_{B} = 50$
- $I_{C}/I_{B} = 100$

**Fig 4.** TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values

- $V_{CE} = 5$ V
- $I_{C}/I_{B} = 20$
- $I_{C}/I_{B} = 50$
- $I_{C}/I_{B} = 100$

**Fig 5.** TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values

- $V_{CE} = 5$ V
- $I_{C}/I_{B} = 20$
- $I_{C}/I_{B} = 50$
- $I_{C}/I_{B} = 100$
V_{CE} = 0.3 \, V
(1) T_{amb} = -40 \, ^\circ C
(2) T_{amb} = 25 \, ^\circ C
(3) T_{amb} = 100 \, ^\circ C

Fig 6. TR1 (NPN): On-state input voltage as a function of collector current; typical values

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

Fig 7. TR1 (NPN): Off-state input voltage as a function of collector current; typical values
NXP Semiconductors

500 mA, 50 V NPN/PNP double RET; $R_1 = 1 \, \text{k}\Omega$, $R_2 = 10 \, \text{k}\Omega$

---

**Fig 8.** TR2 (PNP): DC current gain as a function of collector current; typical values

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

---

**Fig 9.** TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values

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

---

**Fig 10.** TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values

- $I_C/I_B = 50$
- (1) $T_{amb} = 100 \, ^\circ\text{C}$
- (2) $T_{amb} = 25 \, ^\circ\text{C}$
- (3) $T_{amb} = -40 \, ^\circ\text{C}$
Fig 11. TR2 (PNP): On-state input voltage as a function of collector current; typical values

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

Fig 12. TR2 (PNP): Off-state input voltage as a function of collector current; typical values

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

8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

9. Package outline

![Package outline SOT457 (SC-74)](image)

10. Packing information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Description</th>
<th>Packing quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIMC31</td>
<td>SOT457</td>
<td>4 mm pitch, 8 mm tape and reel; T1</td>
<td>3000 10000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 mm pitch, 8 mm tape and reel; T2</td>
<td>115 -135</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 mm pitch, 8 mm tape and reel; T2</td>
<td>125 -165</td>
</tr>
</tbody>
</table>

[1] For further information and the availability of packing methods, see Section 14.
11. Soldering

![Reflow soldering footprint SOT457 (SC-74)](sot457_fr)

![Wave soldering footprint SOT457 (SC-74)](sot457_fw)
12. Revision history

<table>
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<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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<td>20090324</td>
<td>Product data sheet</td>
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13. Legal information

13.1 Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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<tr>
<td>Preliminary [short] data sheet</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Objective [short] data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product [short] data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
</tr>
</tbody>
</table>

[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".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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For sales office addresses, please send an email to: salesaddresses@nxp.com
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