IR Sensor Module for Remote Control Systems

DESCRIPTION
The TSMP95000 is a two lens miniaturized sensor for receiving various kinds of modulated IR signals. Two PIN diodes and a preamplifier are assembled on a lead frame, the epoxy package is designed as an IR filter. The modulated output signal, carrier out, can be used for code learning applications.

This component has not been qualified according to automotive specifications.

FEATURES
- Photo detector and preamplifier in one package
- AC coupled response from 30 kHz to 60 kHz, all data formats
- Improved shielding against electrical field disturbance
- TTL and CMOS compatibility
- Output active low
- Supply voltage 2.0 V to 5.5 V
- Carrier out signal for code learning functions
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS
- Infrared code repeater

DESIGN SUPPORT TOOLS
- 3D models
- Window size calculator

BLOCK DIAGRAM
MECHANICAL DATA
Pinning:
1, 4 = GND, 2 = V_s, 3 = carrier OUT

ORDERING CODE
Taping:
TSMP95000TT - top view taped, 2200 pcs/reel
TSMP95000TR - side view taped, 2300 pcs/reel

APPLICATION CIRCUIT
R_1 + C_1 recommended to suppress power supply disturbances. 
R_2 recommended to get faster slopes and a correct high level of the output pulses.

PARTS TABLE

| Carrier frequency | 30 kHz to 60 kHz | TSMP95000
| Package           | Heimdall         |
| Pinning           | 1, 4 = GND, 2 = V_s, 3 = carrier OUT |
| Dimensions (mm)   | 6.8 W x 3.0 H x 3.2 D |
| Mounting          | SMD             |
| Application       | Code learning   |
| Special options   | • Extended temperature range: www.vishay.com/doc?82738
|                   | • Narrow optical filter: www.vishay.com/doc?81590
|                   | • Wide optical filter: www.vishay.com/doc?82726 |

ABSOLUTE MAXIMUM RATINGS (T_amb = 25 °C, unless otherwise specified)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage (pin 2)</td>
<td>V_s</td>
<td>-0.3 to +6</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Output voltage (pin 3)</td>
<td>V_o</td>
<td>-0.3 to (V_s + 0.3)</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Output current (pin 3)</td>
<td>I_o</td>
<td>5</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Junction temperature</td>
<td>T_j</td>
<td>100</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>T_stg</td>
<td>-25 to +85</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>T_amb</td>
<td>-25 to +85</td>
<td>°C</td>
<td></td>
</tr>
</tbody>
</table>

Note
• Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect the device reliability.
### ELECTRICAL AND OPTICAL CHARACTERISTICS CARRIER OUT

(T<sub>amb</sub> = 25 °C, unless otherwise specified, V<sub>S</sub> = 3 V)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply current (pin 2)</td>
<td>V&lt;sub&gt;S&lt;/sub&gt; = 3.3 V, E&lt;sub&gt;v&lt;/sub&gt; = 0</td>
<td>I&lt;sub&gt;SD&lt;/sub&gt;</td>
<td>0.25</td>
<td>0.35</td>
<td>0.45</td>
<td>mA</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>V&lt;sub&gt;S&lt;/sub&gt;</td>
<td>2.0</td>
<td>-</td>
<td>5.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Transmission distance</td>
<td>E&lt;sub&gt;v&lt;/sub&gt; = 0, test signal see Fig. 1, IR diode TSAL6200, I&lt;sub&gt;f&lt;/sub&gt; = 50 mA</td>
<td>d</td>
<td>-</td>
<td>1.8</td>
<td>-</td>
<td>m</td>
</tr>
<tr>
<td>Output voltage low (pin 3)</td>
<td>I&lt;sub&gt;OSL&lt;/sub&gt; = 0.5 mA, test signal see Fig. 1</td>
<td>V&lt;sub&gt;OSL&lt;/sub&gt;</td>
<td>-</td>
<td>-</td>
<td>250</td>
<td>mV</td>
</tr>
<tr>
<td>Minimum irradiance</td>
<td>V&lt;sub&gt;S&lt;/sub&gt; = 3 V, (30 kHz to 60 kHz)</td>
<td>E&lt;sub&gt;e min&lt;/sub&gt;</td>
<td>-</td>
<td>12</td>
<td>25</td>
<td>mW/m&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum irradiance</td>
<td>Test signal see Fig. 1, (30 kHz to 60 kHz)</td>
<td>E&lt;sub&gt;e max&lt;/sub&gt;</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>W/m&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Directivity</td>
<td>Angle of half transmission distance</td>
<td>ϕ&lt;sub&gt;1/2&lt;/sub&gt;</td>
<td>-</td>
<td>± 50</td>
<td>-</td>
<td>°</td>
</tr>
<tr>
<td>Output accuracy</td>
<td>N carrier pulses</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Input burst length</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Input burst length + 1 cycle</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Input burst length</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Carrier cycle</td>
<td>Optical burst (input signal)</td>
<td>(26.3 µs in case of 38 kHz)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output voltage</td>
<td>Delay time t&lt;sub&gt;d&lt;/sub&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TYPICAL CHARACTERISTICS

(T<sub>AMB</sub> = 25 °C, unless otherwise specified)

![Relative Spectral Sensitivity vs. Wavelength](image1)

![Horizontal Directivity](image2)
Fig. 4 - Vertical Directivity

PACKAGE DIMENSIONS in millimeters

Drawing-No.: 6.550-5297.01-4
Issue: 4; 13.09.11

0.8

1.8

3 x 1.27 = 3.81

(R1.3)

1.6

1.27

3 x 1.27 = 3.81

(0.635)

1.65

(1.5)

2.2

2.5

(1)

0.5 ± 0.1

(3 x)

6.8 ± 0.1

(3.4)

6.6 ± 0.1

Technical drawings according to DIN specifications

Not indicated tolerances ± 0.15

Pick and place area

Tool separation line

Proposed pad layout from component side (for reference only)

Mold residue

Mold residue

Marking area

Pick and place area

Pick and place area

Pick and place area

Drawing-No.: 6.550-5297.01-4
Issue: 4; 13.09.11

0.8

1.8

3 x 1.27 = 3.81

(R1.3)

1.6

1.27

3 x 1.27 = 3.81

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1.65

(1.5)

2.2

2.5

(1)

0.5 ± 0.1

(3 x)

6.8 ± 0.1

(3.4)

6.6 ± 0.1

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Pick and place area

Drawing-No.: 6.550-5297.01-4
Issue: 4; 13.09.11
ASSEMBLY INSTRUCTIONS

Reflow Soldering

• Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope.

• Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Exercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured.

• Handling after reflow should be done only after the work surface has been cooled off.

Manual Soldering

• Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C.

• Finish soldering within 3 s.

• Handle products only after the temperature has cooled off.

VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE
TAPING VERSION TSMP..TR DIMENSIONS in millimeters

Drawing-No.: 9.700-5337.01-4
Issue: 2; 06.10.15

technical drawings according to DIN specifications
Taping Version TSMP..TT Dimensions in millimeters

Drawing-No.: 9.700-5338.01-4
Issue: 4; 12.06.13
REEL DIMENSIONS in millimeters

Form of the leave open of the wheel is supplier specific.

Dimension acc. to IEC EN 60 786-3

Tape width 16

16734

LEADER AND TRAILER DIMENSIONS in millimeters

COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3

0.1 N to 1.3 N

300 mm/min. ± 10 mm/min.

165° to 180° peel angle
OUTER PACKAGING
The sealed reel is packed into a pizza box.

CARTON BOX DIMENSIONS in millimeters

<table>
<thead>
<tr>
<th></th>
<th>THICKNESS</th>
<th>WIDTH</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pizza box (SMD and heimdal) (taping in reels)</td>
<td>50</td>
<td>340</td>
<td>340</td>
</tr>
</tbody>
</table>

LABEL
Standard bar code labels for finished goods
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)

<table>
<thead>
<tr>
<th>PLAIN WRITING</th>
<th>ABBREVIATION</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item-description</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>Item-number</td>
<td>INO</td>
<td>8</td>
</tr>
<tr>
<td>Selection-code</td>
<td>SEL</td>
<td>3</td>
</tr>
<tr>
<td>LOT-/serial-number</td>
<td>BATCH</td>
<td>10</td>
</tr>
<tr>
<td>Data-code</td>
<td>COD</td>
<td>3 (YWW)</td>
</tr>
<tr>
<td>Plant-code</td>
<td>PTC</td>
<td>2</td>
</tr>
<tr>
<td>Quantity</td>
<td>QTY</td>
<td>8</td>
</tr>
<tr>
<td>Accepted by</td>
<td>ACC</td>
<td>-</td>
</tr>
<tr>
<td>Packed by</td>
<td>PCK</td>
<td>-</td>
</tr>
<tr>
<td>Mixed code indicator</td>
<td>MIXED CODE</td>
<td>-</td>
</tr>
<tr>
<td>Origin</td>
<td>xxxxxxx+</td>
<td>Company logo</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LONG BAR CODE TOP</th>
<th>TYPE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item-number</td>
<td>N</td>
<td>8</td>
</tr>
<tr>
<td>Plant-code</td>
<td>N</td>
<td>2</td>
</tr>
<tr>
<td>Sequence-number</td>
<td>X</td>
<td>3</td>
</tr>
<tr>
<td>Quantity</td>
<td>N</td>
<td>8</td>
</tr>
<tr>
<td>Total length</td>
<td>-</td>
<td>21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SHORT BAR CODE BOTTOM</th>
<th>TYPE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selection-code</td>
<td>X</td>
<td>3</td>
</tr>
<tr>
<td>Data-code</td>
<td>N</td>
<td>3</td>
</tr>
<tr>
<td>Batch-number</td>
<td>X</td>
<td>10</td>
</tr>
<tr>
<td>Filter</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Total length</td>
<td>-</td>
<td>17</td>
</tr>
</tbody>
</table>
DRY PACKING
The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.

FINAL PACKING
The sealed reel is packed into a cardboard box.

RECOMMENDED METHOD OF STORAGE
Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

- 192 h at 40 °C + 5 °C / - 0 °C and < 5 % RH (dry air / nitrogen)
- 96 h at 60 °C + 5 °C and < 5 % RH for all device containers
- 24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC® standard J-STD-020 level 4 label is included on all dry bags.

ESD PRECAUTION
Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electrostatic sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD
BAR CODE LABELS
The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.

CAUTION
This bag contains MOISTURE-SENSITIVE DEVICES

1. Shelf life in sealed bag: 12 months at < 40 °C and < 90 % relative humidity (RH).
2. After this bag is opened, devices that will be subjected to soldering reflow or equivalent processing (peak package body temp. 260 °C) must be:
   2a. Mounted within 72 hours at factory condition of < 30 °C/60 % RH or
   2b. Stored at < 5 % RH
3. Devices require baking before mounting if:
   Humidity Indicator Card is > 10 % when read at 23 °C ± 5 °C or
   2a. or 2b. are not met.
4. If baking is required, devices may be baked for:
   96 hours at 40 °C + 5 °C / - 0 °C and < 5 % RH (dry air/nitrogen) or
   96 hours at 60 °C + 5 °C and < 5 % RH for all device containers
   24 hours at 125 °C + 5 °C not suitable for reel or tubes

Bag Seal Date:

EIA JEDEC standard J-STD-020 level 4 label is included on all dry bags.
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