IR Sensor Module for Remote Control Systems

DESCRIPTION
The TSMP58138 is a miniaturized sensor for receiving the modulated signal of infrared remote control systems. A PIN diode and 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 repeater applications and 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
- If the IR signal strength is more than 1000 mW/m² (distance less than 0.35 m with a typical IR remote control), the frequency range is limited to 55 kHz
- Improved shielding against electrical field disturbance
- AGC to suppress ambient noise
- High sensitivity, long receiving range
- Supply voltage: 2.5 V to 5.5 V
- Carrier out signal for IR repeater applications
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

MECHANICAL DATA
Pinning:
1 = carrier OUT, 2 = GND, 3 = V_S

ORDERING CODE
TSMP58138 - 1500 pieces in bags

APPLICATION CIRCUIT
Recommended circuit for best sensitivity in repeater applications. It limits the output voltage swing V_OUT to about 0.7 V in order to avoid internal coupling.

1 μF

33 kΩ

3

V_S

1

OUT

GND

33 kΩ

Input

AGC

Band pass

Comparator

Control circuit

TSMPxxxx

1 μF

100 100 47 μF

680 680

3 Ω

0 V

GND

In case of a supply voltage of 3 V, use one IR emitter only

Supply voltage +3 V or +5 V

0 V

3 Ω

GND
### PARTS TABLE

<table>
<thead>
<tr>
<th>Carrier frequency</th>
<th>38 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package</td>
<td>Minicast</td>
</tr>
<tr>
<td>Pinning</td>
<td>1 = carrier OUT, 2 = GND, 3 = V_S</td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>5.0 W x 6.95 H x 4.8 D</td>
</tr>
<tr>
<td>Mounting</td>
<td>Leaded</td>
</tr>
<tr>
<td>Application</td>
<td>Repeater</td>
</tr>
</tbody>
</table>

### ABSOLUTE MAXIMUM RATINGS

<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 3)</td>
<td></td>
<td>VS</td>
<td>-0.3 to +6</td>
<td>V</td>
</tr>
<tr>
<td>Supply current (pin 3)</td>
<td></td>
<td>IS</td>
<td>5</td>
<td>mA</td>
</tr>
<tr>
<td>Output voltage (pin 1)</td>
<td></td>
<td>VO</td>
<td>-0.3 to 5.5</td>
<td>V</td>
</tr>
<tr>
<td>Voltage at output to supply</td>
<td></td>
<td>V_S - V_O</td>
<td>-0.3 to (V_S + 0.3)</td>
<td>V</td>
</tr>
<tr>
<td>Output current (pin 1)</td>
<td></td>
<td>IO</td>
<td>5</td>
<td>mA</td>
</tr>
<tr>
<td>Junction temperature</td>
<td></td>
<td>T_j</td>
<td>100</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td></td>
<td>T_stg</td>
<td>-25 to +85</td>
<td>°C</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td></td>
<td>T_amb</td>
<td>-25 to +85</td>
<td>°C</td>
</tr>
<tr>
<td>Power consumption</td>
<td>T_amb ≤ 85 °C</td>
<td>P_tot</td>
<td>10</td>
<td>mW</td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>t ≤ 10 s, 1 mm from case</td>
<td>T_sd</td>
<td>260</td>
<td>°C</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 (T_amb = 25 °C, unless otherwise specified)

<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 3)</td>
<td>E_v = 0, V_S = 5 V</td>
<td>I_SSD</td>
<td>0.55</td>
<td>0.7</td>
<td>0.9</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>E_v = 40 klx, sunlight</td>
<td>I_SGH</td>
<td>-</td>
<td>0.8</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>Supply voltage</td>
<td></td>
<td>V_S</td>
<td>2.5</td>
<td>-</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>Transmission distance</td>
<td></td>
<td>d</td>
<td>7</td>
<td>--</td>
<td>--</td>
<td>m</td>
</tr>
<tr>
<td>Output voltage low (pin 1)</td>
<td></td>
<td>V_OSL</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>mV</td>
</tr>
<tr>
<td>Minimum irradiance</td>
<td></td>
<td>E_e min.</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>mW/m²</td>
</tr>
<tr>
<td>Maximum irradiance</td>
<td></td>
<td>E_e max.</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>W/m²</td>
</tr>
<tr>
<td>Directivity</td>
<td></td>
<td>φ_1/2</td>
<td>-</td>
<td>± 45</td>
<td>-</td>
<td>deg</td>
</tr>
</tbody>
</table>
TYPICAL CHARACTERISTICS (T_{amb} = 25 ^\circ C, unless otherwise specified)

Fig. 1 - Output Function

Optical Test Signal:
IR diode TSAL6200, I_d = 0.35 A,
N = 15 carrier pulses per burst, f = 38 kHz,
burst repetition time: 3 ms

The number of carrier-out pulses might not be exactly the same as the number of carrier cycles in t_{pi} (input burst)

$t_{pi}$ - burst length

Fig. 2 - Frequency Dependence of Sensitivity

$E_{e_{min}}$ - Detection Threshold (mW/m²)

$t_{pi} \geq 6$ carrier cycles is recommended for optimum function

$t_{pi}$ - burst length

Fig. 3 - Relative Spectral Sensitivity vs. Wavelength

$S (\lambda)_{rel}$ - Relative Spectral Sensitivity

Fig. 4 - Horizontal Directivity

$E_{e}$ - Detection Threshold (mW/m²)

$t_{pi}$ - burst length

The number of carrier-out pulses might not be exactly the same as the number of carrier cycles in $t_{pi}$ (input burst)

$t_{pi}$ - burst length

Fig. 5 - Vertical Directivity

$d_{rel}$ - Relative Transmission Distance

$\lambda$ - Wavelength (nm)

The number of carrier-out pulses might not be exactly the same as the number of carrier cycles in $t_{pi}$ (input burst)

$t_{pi}$ - burst length

The number of carrier-out pulses might not be exactly the same as the number of carrier cycles in $t_{pi}$ (input burst)
PACKAGE DIMENSIONS in millimeters

Drawing-No.: 6.550-5263.01-4
Issue: 12; 16.04.10
19009

Marking area

technical drawings according to DIN specifications

Not indicated to tolerances ± 0.2
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