IR Receiver Module for Light Barrier Systems

FEATURES
- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for 38 kHz IR signals
- Shielding against EMI
- Supply voltage: 2.5 V to 5.5 V
- Visible light is suppressed by IR filter
- Insensitive to supply voltage ripple and noise
- Material categorization:
  For definitions of compliance please see www.vishay.com/doc?99912

DESCRIPTION
The TSSP4038 is a compact IR receiver for sensor applications. It has a high gain for IR signals at 38 kHz. The detection level does not change when ambient light or strong IR signals are applied. It can receive continuous 38 kHz signals or 38 kHz bursts.
This component has not been qualified according to automotive specifications.

PARTS TABLE

<table>
<thead>
<tr>
<th>Carrier frequency</th>
<th>38 kHz</th>
<th>TSSP4038</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package</td>
<td>Mold</td>
<td></td>
</tr>
<tr>
<td>Pinning</td>
<td>1 = OUT, 2 = GND, 3 = VS</td>
<td></td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>6.0 W x 6.95 H x 5.6 D</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Leaded</td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td>Presence sensors</td>
<td></td>
</tr>
</tbody>
</table>

BLOCK DIAGRAM

APPLICATION CIRCUIT

The external components R1 and C1 are optional to improve the robustness against electrical overstress (typical values are R1 = 100 Ω, C1 = 0.1 μF).
**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>VS</td>
<td>-0.3 to +6.0</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Supply current (pin 3)</td>
<td>I_S</td>
<td>5</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Output voltage (pin 1)</td>
<td>V_O</td>
<td>-0.3 to 5.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Voltage at output to supply</td>
<td>V_S - V_O</td>
<td>-0.3 to (V_S + 0.3)</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Output current (pin 1)</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>
<tr>
<td>Power consumption</td>
<td>P_tot</td>
<td>10</td>
<td>mW</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** *(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_SD</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_SH</td>
<td>0.8</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>V_S</td>
<td>2.5</td>
<td>5.5</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Transmission distance</td>
<td>E_v = 0, test signal see fig. 1, IR diode TSAL6200, I_F = 200 mA</td>
<td>d</td>
<td>25</td>
<td></td>
<td></td>
<td>m</td>
</tr>
<tr>
<td>Output voltage low (pin 1)</td>
<td>I_OSL = 0.5 mA, E_e = 2 mW/m², test signal see fig. 1</td>
<td>V_OSL</td>
<td>100</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Minimum irradiance</td>
<td>Pulse width tolerance: t_p1 - 5/10 &lt; t_p0 &lt; t_p1 + 6/10, test signal see fig. 1</td>
<td>E_e,min.</td>
<td>0.4</td>
<td>0.7</td>
<td></td>
<td>mW/m²</td>
</tr>
<tr>
<td>Maximum irradiance</td>
<td>Pulse width tolerance: t_p1 - 5/10 &lt; t_p0 &lt; t_p1 + 6/10, test signal see fig. 1</td>
<td>E_e,max.</td>
<td>50</td>
<td></td>
<td></td>
<td>W/m²</td>
</tr>
<tr>
<td>Directivity</td>
<td>Angle of half transmission distance</td>
<td>θ_1/2</td>
<td>± 45</td>
<td></td>
<td></td>
<td>deg</td>
</tr>
</tbody>
</table>

**TYPICAL CHARACTERISTICS** *(T_amb = 25 °C, unless otherwise specified)*

![Optical Test Signal](image)

![Output Signal](image)

![Output Pulse Width](image)

![Pulse Length and Sensitivity in Dark Ambient](image)
Fig. 3 - Output Function

Fig. 4 - Output Pulse Diagram

Fig. 5 - Frequency Dependence of Responsivity

Fig. 6 - Sensitivity vs. Ambient Temperature

Fig. 7 - Relative Spectral Sensitivity vs. Wavelength

Fig. 8 - Directivity
Fig. 9 - Sensitivity vs. Supply Voltage

PACKAGE DIMENSIONS in millimeters

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Drawing-No.: 6.550-5169.11-4
Issue: 13; 17.12.08

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R 2.5

Marking area

V5 - Supply Voltage (V)

E_{\text{sn min}} - Sensitivity (mW/m^2)

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Not indicated tolerances ± 0.2

technical drawings according to DIN specifications

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specifications according to DIN technical drawings

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IR Receiver Modules for Remote Control Systems

Vishay offers stock molded IR receivers in four different packages:
- Loose packed in tubes, mounted on tape for reel or ammopack, or packed bulk in plastic bags.
- Vishay IR receiver with metal holders are packed in plastic trays. Vishay IR receiver with plastic holders are packed in plastic tubes.

### LOOSE PACKED IN TUBE

#### ORDERING INFORMATION

<table>
<thead>
<tr>
<th>T</th>
<th>S</th>
<th>d</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>for IR receiver applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>for repeater/learning applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>for sensor applications</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Note
- d = “digit”, please consult the list of available devices create a valid part number.

**Example:** TSOP4838

#### PACKAGING QUANTITY
- 90 pieces per tube
- 24 tubes per carton

### FEATURES
- Material categorization:
  For definitions of compliance please see www.vishay.com/doc?99912

### AVAILABLE FOR
- TSOP348..
- TSOP344..
- TSOP343..
- TSOP341..
- TSOP44..
- TSOP48..
- TSOP41..
- TSOP324..
- TSOP323..
- TSOP322..
- TSOP321..
- TSOP24..
- TSOP22..
- TSOP21..
- TSOP345..
- TSOP325..
- TSOP43..
- TSOP23..
- TSSP4..
- TSMP4..

### PACKAGING DIMENSIONS in millimeters

![Packaging Dimensions Diagram]
**Molded IR Receiver Packaging Options**

**Vishay Semiconductors**

**TAPE AND REEL/AMMOPACK**

Up to 3 consecutive components may be missing if the gap is followed by at least 6 components. A maximum of 0.5% of the components per reel quantity may be missing. At least 5 empty positions are present at the start and the end of the tape to enable insertion.

- Tensile strength of the tape: > 15 N
- Pulling force in the plane of the tape, at right angles to the reel: > 5 N

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>T</th>
<th>S</th>
<th>d</th>
<th>P</th>
<th>d</th>
<th>d</th>
<th>d</th>
<th>d</th>
<th>S</th>
<th>S</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>O = for IR receiver applications</td>
<td>M = for repeater/learning applications</td>
<td>S = for sensor applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**
- d = “digit”, please consult the list of available devices create a valid part number.

**Example:**
- TSOP4838SS1BS12
- TSOP2238SS1BS12Z

**PACKAGING QUANTITY**

- 1000 pieces per reel
- 1000 pieces per ammopack

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** VERSION **

<table>
<thead>
<tr>
<th>DIMENSION “H”</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
</tr>
<tr>
<td>PS</td>
</tr>
<tr>
<td>OS</td>
</tr>
</tbody>
</table>

---

80079 tape on reel-s

80079 ammopack-s
BULK PACKAGING
The option “BK” signifies bulk packaging in conductive plastic bags. A maximum of 0.3 % of the components per box may be missing.

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>T</th>
<th>S</th>
<th>d</th>
<th>P</th>
<th>d</th>
<th>d</th>
<th>d</th>
<th>d</th>
<th>d</th>
<th>S</th>
<th>S</th>
<th>1</th>
<th>B</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 or 3 digit product series</td>
<td>2 digit frequency</td>
<td>SS1 for tape and reel, bulk or ammopack</td>
<td>Bulk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

O = for IR receiver applications
M = for repeater/learning applications
S = for sensor applications

Note
• d = “digit”, please consult the list of available devices create a valid part number.

EXAMPLE: TSOP4838SS1BK
TSOP2238SS1BK

PACKAGING QUANTITY
• 250 pieces per bag (each bag is individually boxed)
• 6 bags per carton

OUTER PACKAGING

CARTON BOX DIMENSIONS in millimeters

<table>
<thead>
<tr>
<th>KINDS OF CARTON BOX</th>
<th>THICKNESS</th>
<th>WIDTH</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging Plastic Tubes (Normal/auxiliary devices)</td>
<td>80</td>
<td>150</td>
<td>600</td>
</tr>
<tr>
<td>Packaging Plastic Trays (Devices with metal holders)</td>
<td>120</td>
<td>290</td>
<td>490</td>
</tr>
<tr>
<td>Tape and Reel Box (Taping in reels)</td>
<td>400</td>
<td>310</td>
<td>410</td>
</tr>
<tr>
<td>Ammo-Box (Zigzag taping)</td>
<td>50</td>
<td>130</td>
<td>350</td>
</tr>
</tbody>
</table>
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