IR Receiver Modules for Remote Control Systems

FEATURES
- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for 38 kHz IR signals
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Capable of side or top view
- Insensitive to supply voltage ripple and noise
- Two lenses for high sensitivity and wide receiving angle
- Narrow optical filter to reduce interference from plasma TV emissions
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

DESCRIPTION
The TSSP77038 is a compact two lens SMD 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>SENSOR APPLICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 kHz</td>
<td>TSSP77038</td>
</tr>
</tbody>
</table>

BLOCK DIAGRAM

APPLICATION CIRCUIT
The external components $R_1$ and $C_1$ are optional to improve the robustness against electrical overstress (typical values are $R_1 = 100 \, \Omega$, $C_1 = 0.1 \, \mu F$).
**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</td>
<td>$V_S$</td>
<td>-0.3 to +6</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Supply current</td>
<td>$I_S$</td>
<td>5</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Output voltage</td>
<td>$V_O$</td>
<td>-0.3 to $(V_S + 0.3)$</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Output current</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</td>
<td>$T_{stg}$</td>
<td>-25 to +85</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Operating temperature</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>

**ELECTRICAL AND OPTICAL CHARACTERISTICS**  $(T_{amb} = 25 {^\circ}C, \text{unless otherwise specified})$

<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 voltage</td>
<td>$V_S$</td>
<td>2.5</td>
<td>5.5</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply current</td>
<td>$I_S$</td>
<td>0.55</td>
<td>0.7</td>
<td>0.9</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Transmission distance</td>
<td>$E_v = 40 \text{kx, sunlight}$</td>
<td>$I_{SH}$</td>
<td>0.8</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Output voltage low</td>
<td>$I_{OSL} = 0.5 \text{mA, } E_e = 0.7 \text{mW/m}^2$, 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>$t_{pi} - 5/f_o &lt; t_{po} &lt; t_{pi} + 6/f_o$, test signal see fig. 1</td>
<td>$E_{e \text{min.}}$</td>
<td>0.2</td>
<td>0.4</td>
<td></td>
<td>mW/m$^2$</td>
</tr>
<tr>
<td>Maximum irradiance</td>
<td>$t_{pi} - 5/f_o &lt; t_{po} &lt; t_{pi} + 6/f_o$, test signal see fig. 1</td>
<td>$E_{e \text{max.}}$</td>
<td>50</td>
<td></td>
<td></td>
<td>W/m$^2$</td>
</tr>
<tr>
<td>Directivity</td>
<td>Angle of half transmission distance</td>
<td>$\phi_{1/2}$</td>
<td>$\pm$ 50</td>
<td></td>
<td></td>
<td>deg</td>
</tr>
</tbody>
</table>

**TYPICAL CHARACTERISTICS**  $(T_{amb} = 25 {^\circ}C, \text{unless otherwise specified})$

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**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.

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**Fig. 1 - Output Active Low**

**Fig. 2 - Pulse Length and Sensitivity in Dark Ambient**
Optical Test Signal

Output Function

Output Signal, (see fig. 4)

Optical Test Signal

Output Function

Output Pulse Diagram

Sensitivity vs. Supply Voltage Disturbances

Sensitivity vs. Ambient Temperature

Frequency Dependence of Responsivity

Relative Spectral Sensitivity vs. Wavelength

Correlation with Ambient Light Sources:
- 10 W/m² = 1.4 kLx (Std. illum. A, T = 2855 K)
- 10 W/m² = 8.2 kLx (Daylight, T = 5900 K)

Wavelength of Ambient Illumination: \( \lambda = 950 \text{ nm} \)

Ambient DC Irradiance (W/m²)

Threshold Irradiance (mW/m²)

Relative Spectral Sensitivity

Relative Spectral Sensitivity vs. Wavelength

Correlation with Ambient Light Sources:
- 10 W/m² = 1.4 kLx (Std. illum. A, T = 2855 K)
- 10 W/m² = 8.2 kLx (Daylight, T = 5900 K)

Wavelength of Ambient Illumination: \( \lambda = 950 \text{ nm} \)
**Fig. 9 - Horizontal Directivity**

**Fig. 10 - Vertical Directivity**

**Fig. 11 - Sensitivity vs. Supply Voltage**

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21427  \( d_{rel} \) - Relative Transmission Distance

21428  \( d_{rel} \) - Relative Transmission Distance
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 TSSP..TR DIMENSIONS in millimeters

Drawing-No.: 9.700-5337.01-4
Issue: 1: 16.10.08

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

Direction of feed

Ø 1.5 min.

Drawing-No.: 9.700-5338.01-4
Issue: 3; 09.06.09

Vishay Semiconductors

Rev. 1.0, 09-Mar-12

Document Number: 82470

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**REEL DIMENSIONS** in millimeters

![Reel Dimensions Diagram]

**LEADER AND TRAILER DIMENSIONS** in millimeters

<table>
<thead>
<tr>
<th>Trailer</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>no devices</td>
<td>devices</td>
</tr>
<tr>
<td>min. 200</td>
<td>min. 400</td>
</tr>
</tbody>
</table>

**COVER TAPE REEL STRENGTH**

According to DIN EN 60286-3

- 0.1 N to 1.3 N
- 300 ± 10 mm/min.
- 165° to 180° peel angle

**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.
**DRI 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. A secondary cardboard box is used for shipping purposes.

**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 JSTD-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. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS (example)

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