Photo Modules for PCM Remote Control Systems

Available types for different carrier frequencies

<table>
<thead>
<tr>
<th>Type</th>
<th>fo</th>
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<th>fo</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSOP1730</td>
<td>30 kHz</td>
<td>TSOP1733</td>
<td>33 kHz</td>
</tr>
<tr>
<td>TSOP1736</td>
<td>36 kHz</td>
<td>TSOP1737</td>
<td>36.7 kHz</td>
</tr>
<tr>
<td>TSOP1738</td>
<td>38 kHz</td>
<td>TSOP1740</td>
<td>40 kHz</td>
</tr>
<tr>
<td>TSOP1756</td>
<td>56 kHz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description

The TSOP17.. – series are miniaturized receivers for infrared remote control systems. PIN diode and preamplifier are assembled on lead frame, the epoxy package is designed as IR filter. The demodulated output signal can directly be decoded by a microprocessor. TSOP17.. is the standard IR remote control receiver series, supporting all major transmission codes.

Features

- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against electrical field disturbance
- TTL and CMOS compatibility
- Output active low
- Low power consumption
- High immunity against ambient light
- Continuous data transmission possible (1200 bit/s)
- Suitable burst length \( \geq 10 \) cycles/burst

Block Diagram
Absolute Maximum Ratings

\( T_{\text{amb}} = 25^\circ \text{C} \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>(Pin 2)</td>
<td>( V_S )</td>
<td>(-0.3...6.0)</td>
<td>V</td>
</tr>
<tr>
<td>Supply Current</td>
<td>(Pin 2)</td>
<td>( I_S )</td>
<td>5</td>
<td>mA</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>(Pin 3)</td>
<td>( V_O )</td>
<td>(-0.3...6.0)</td>
<td>V</td>
</tr>
<tr>
<td>Output Current</td>
<td>(Pin 3)</td>
<td>( I_O )</td>
<td>5</td>
<td>mA</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td></td>
<td>( T_j )</td>
<td>100</td>
<td>(^\circ\text{C})</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td></td>
<td>( T_{\text{stg}} )</td>
<td>(-25...+85)</td>
<td>(^\circ\text{C})</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td></td>
<td>( T_{\text{amb}} )</td>
<td>(-25...+85)</td>
<td>(^\circ\text{C})</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>( (T_{\text{amb}} \leq 85 , ^\circ\text{C}) )</td>
<td>( P_{\text{tot}} )</td>
<td>50</td>
<td>mW</td>
</tr>
<tr>
<td>Soldering Temperature</td>
<td></td>
<td>( T_{\text{sd}} )</td>
<td>260</td>
<td>(^\circ\text{C})</td>
</tr>
</tbody>
</table>

Basic Characteristics

\( T_{\text{amb}} = 25^\circ \text{C} \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</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_S = 5 , \text{V}, , E_v = 0 )</td>
<td>( I_{SD} )</td>
<td>0.4</td>
<td>0.6</td>
<td>0.8</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>( V_S = 5 , \text{V}, , E_v = 40 , \text{kxl}, , \text{sunlight} )</td>
<td>( I_{SH} )</td>
<td>1.0</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Transmission Distance</td>
<td></td>
<td>( d )</td>
<td>35</td>
<td></td>
<td></td>
<td>m</td>
</tr>
<tr>
<td>Output Voltage Low (Pin 3)</td>
<td>( I_{OSL} = 0.5 , \text{mA}, , E_{e} = 0.7 , \text{mW/m}^2, , f = f_o, , t_p/T = 0.4 )</td>
<td>( V_{OSL} )</td>
<td>250</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Irradiance (30 – 40 kHz)</td>
<td>Pulse width tolerance: ( t_{pi} - 5/f_o &lt; t_{po} &lt; t_{pi} + 6/f_o, , \text{test signal (see fig.7)} )</td>
<td>( E_{e , \text{min}} )</td>
<td>0.35</td>
<td>0.5</td>
<td></td>
<td>mW/m(^2)</td>
</tr>
<tr>
<td>Irradiance (56 kHz)</td>
<td>Pulse width tolerance: ( t_{pi} - 5/f_o &lt; t_{po} &lt; t_{pi} + 6/f_o, , \text{test signal (see fig.7)} )</td>
<td>( E_{e , \text{min}} )</td>
<td>0.4</td>
<td>0.6</td>
<td></td>
<td>mW/m(^2)</td>
</tr>
<tr>
<td>Irradiance</td>
<td></td>
<td>( E_{e , \text{max}} )</td>
<td>30</td>
<td></td>
<td></td>
<td>W/m(^2)</td>
</tr>
<tr>
<td>Directivity</td>
<td></td>
<td>( \varphi_{1/2} )</td>
<td>±45</td>
<td></td>
<td></td>
<td>\text{deg}</td>
</tr>
</tbody>
</table>

Application Circuit

*) only necessary to suppress power supply disturbances

**) tolerated supply voltage range : \( 4.5 \, \text{V} < V_S < 5.5 \, \text{V} \)
Typical Characteristics  \( T_{\text{amb}} = 25^\circ \text{C} \) unless otherwise specified

![Frequency Dependence of Responsivity](image1)

**Figure 1.** Frequency Dependence of Responsivity

![Sensitivity in Dark Ambient](image2)

**Figure 2.** Sensitivity in Dark Ambient

![Sensitivity in Bright Ambient](image3)

**Figure 3.** Sensitivity in Bright Ambient

![Sensitivity vs. Electric Field Disturbances](image4)

**Figure 4.** Sensitivity vs. Electric Field Disturbances

![Sensitivity vs. Supply Voltage Disturbances](image5)

**Figure 5.** Sensitivity vs. Supply Voltage Disturbances

![Sensitivity vs. Ambient Temperature](image6)

**Figure 6.** Sensitivity vs. Ambient Temperature

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**Optical Test Signal**

IR diode TSIP 5201, $I_p = 0.4 \, A$, 30 pulses, $f = f_0$, $T = 10 \, \text{ms}$

$t_{\text{pi}}$ is recommended for optimal function.

**Output Signal**

$V_{\text{O}}$, $V_{\text{OH}}$, $V_{\text{OL}}$

1. $7/f_0 < t_d < 15/f_0$
2. $t_{\text{po}} = t_{\text{pi}} \pm 6/f_0$

Figure 7. Output Function

**Optical Test Signal**

$600 \, \mu\text{s}$

$T = 60 \, \text{ms}$

Figure 8. Output Function

**Output Signal**

(see Fig.10)

$V_{\text{O}}$, $V_{\text{OH}}$, $V_{\text{OL}}$

$T_{\text{on}}$, $T_{\text{off}}$

$\lambda = 950 \, \text{nm}$, optical test signal, fig.8

Figure 10. Output Pulse Diagram

**Sensitivity vs. Duty Cycle**

$N=16$ pulses per burst

$N=32$

Figure 9. Sensitivity vs. Duty Cycle

**Relative Spectral Sensitivity vs. Wavelength**

$\lambda = 750$ to $1150 \, \text{nm}$

Figure 12. Relative Spectral Sensitivity vs. Wavelength
Figure 13. Vertical Directivity $\varphi_y$

Figure 14. Horizontal Directivity $\varphi_x$

Dimensions in mm

[Diagram showing the dimensions of the component with specific measurements and noting 'Center of Sensitive Area' and 'Area Not Plane'].

Technical drawings according to DIN specifications.
Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.

2. Regularly and continuously improve the performance of our products, processes, distribution and operating
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   impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known
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on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use
of ODSs listed in the following documents.


2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental
   Protection Agency (EPA) in the USA


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