Photo Modules for PCM Remote Control Systems

Available types for different carrier frequencies

<table>
<thead>
<tr>
<th>Type</th>
<th>$f_0$</th>
<th>Type</th>
<th>$f_0$</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. The main benefit is the reliable function even in disturbed ambient and the protection against uncontrolled output pulses.

Features

- Photo detector and preamplifier in one package
- Output active low
- Internal filter for PCM frequency
- High immunity against ambient light
- Improved shielding against electric field disturbance
- 5 Volt supply voltage, low power consumption
- TTL and CMOS compatibility
- Continuous transmission possible ($t_{pu}/T \leq 0.4$)

Block Diagram

![Block Diagram of TSOP17.. Series](image-url)
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>°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td></td>
<td>T_{\text{stg}}</td>
<td>–25...+85</td>
<td>°C</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td></td>
<td>T_{\text{amb}}</td>
<td>–25...+85</td>
<td>°C</td>
</tr>
<tr>
<td>Power Consumption</td>
<td></td>
<td>P_{\text{tot}}</td>
<td>50</td>
<td>mW</td>
</tr>
<tr>
<td>Soldering Temperature</td>
<td>(T_{\text{amb}} \leq 85 ^\circ \text{C})</td>
<td>T_{\text{sd}}</td>
<td>260</td>
<td>°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{ klx}, \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>( E_v = 0, \text{test signal see fig.7, IR diode TSIP5201, } I_f = 400 \text{ mA} )</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_{O SL} = 0.5 mA, ( E_e = 0.7 \text{ mW/m}^2, f = f_o, t_p/T = 0.4 )</td>
<td>V_{O SL}</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/t_o &lt; t_{po} &lt; t_{pi} + 6/t_o ), 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/t_o &lt; t_{po} &lt; t_{pi} + 6/t_o ), 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>( E_{e \text{ max}} )</td>
<td>30</td>
<td></td>
<td></td>
<td>W/m(^2)</td>
<td></td>
</tr>
<tr>
<td>Directivity</td>
<td>Angle of half transmission distance</td>
<td>( \varphi_{1/2} )</td>
<td>±45</td>
<td></td>
<td></td>
<td>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_{amb} = 25^\circ C \text{ unless otherwise specified})

- **Figure 1. Frequency Dependence of Responsivity**

- **Figure 2. Sensitivity in Dark Ambient**

- **Figure 3. Sensitivity in Bright Ambient**

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

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

- **Figure 6. Sensitivity vs. Ambient Temperature**
Optical Test Signal
(IR diode TSIP 5201, \( I_p = 0.4 \, A \), 30 pulses, \( f = f_0 \), \( T = 10 \, \text{ms} \))

\[ t_{pi} \geq 10/f_0 \] is recommended for optimal function

Output Signal

\[ \begin{align*}
V_O & = 7/f_0 < t_d < 15/f_0 \\
V_{OH} & = t_{pi} = 6/f_0 \\
V_{OL} & = t_{pi} \geq 6/f_0
\end{align*} \]

Figure 7. Output Function

Optical Test Signal

\[ \begin{align*}
E_e & = 600 \, \mu s \\
T & = 60 \, \text{ms}
\end{align*} \]

Output Signal

(see Fig.10)

Figure 8. Output Function

Output Pulse Diagram

\[ \begin{align*}
T_{on} & , T_{off} & \text{Output Pulse Length (ms)}
\end{align*} \]

\[ \begin{align*}
E_e & \text{– Irradiance (mW/m}^2\text{)}
\end{align*} \]

Figure 10. Output Pulse Diagram

Supply Current vs. Ambient Temperature

\[ \begin{align*}
I_s & = 5 \, V
\end{align*} \]

\[ \begin{align*}
T_{amb} & \text{– Ambient Temperature (°C)}
\end{align*} \]

Figure 11. Supply Current vs. Ambient Temperature

Sensitivity vs. Duty Cycle

\[ \begin{align*}
F_{\text{off}} & \text{– Threshold Irradiance (mW/m}^2\text{)} \\
N & = 16 \, \text{pulses per burst}
\end{align*} \]

\[ \begin{align*}
t_p/T & \text{– Duty Cycle}
\end{align*} \]

Figure 9. Sensitivity vs. Duty Cycle

Relative Spectral Sensitivity vs. Wavelength

\[ \begin{align*}
S(\lambda) & \text{– Relative Spectral Sensitivity}
\end{align*} \]

\[ \begin{align*}
\lambda & \text{– Wavelength (nm)}
\end{align*} \]

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

Figure 14. Horizontal Directivity $\phi_x$

Dimensions in mm

TELEFUNKEN Semiconductors
Rev. A2, 24-Sep-96
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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 systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

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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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