**IR Receiver Modules for Remote Control Systems**

**DESCRIPTION**
This IR receiver series is optimized for long burst remote control systems in different environments. The customer can choose between different IC settings (AGC variants), to find the optimum solution for his application. The higher the AGC, the better noise is suppressed, but the lower the code compatibility.

The devices contain a PIN diode and a preamplifier assembled on a lead frame. The epoxy package contains an IR filter. The demodulated output signal can be directly connected to a microprocessor for decoding. These components have not been qualified to automotive specifications.

**FEATURES**
- Individual IC settings to reach maximum performance
- Immunity against noise (lamps, LCD TV, Wi-Fi)
- Low supply current
- Photo detector and preamplifier in one package
- Supply voltage: 2.0 V to 5.5 V
- Material categorization:
  for definitions of compliance please see www.vishay.com/doc?99912

**APPLICATIONS**
- Infrared remote control systems

**DESIGN SUPPORT TOOLS**
- 3D models

**BLOCK DIAGRAM**

![Block Diagram](image)
MECHANICAL DATA
Pinning:
1 = GND, 2 = VS, 3 = OUT

ORDERING CODE
TSOP11... - 1000 pieces in tubes

APPLICATION CIRCUIT

PARTS TABLE

<table>
<thead>
<tr>
<th>AGC</th>
<th>BASIC NOISE SUPPRESSION (AGC2)</th>
<th>ENHANCED NOISE SUPPRESSION (AGC4)</th>
<th>MAXIMIZED NOISE SUPPRESSION (AGC6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier frequency</td>
<td>30 kHz</td>
<td>TSOP11230</td>
<td>TSOP11430</td>
</tr>
<tr>
<td></td>
<td>33 kHz</td>
<td>TSOP11233</td>
<td>TSOP11433</td>
</tr>
<tr>
<td></td>
<td>36 kHz</td>
<td>TSOP11236</td>
<td>TSOP11436</td>
</tr>
<tr>
<td></td>
<td>38 kHz</td>
<td>TSOP11238</td>
<td>TSOP11438</td>
</tr>
<tr>
<td></td>
<td>40 kHz</td>
<td>TSOP11240</td>
<td>TSOP11440</td>
</tr>
<tr>
<td></td>
<td>56 kHz</td>
<td>TSOP11256</td>
<td>TSOP11456</td>
</tr>
</tbody>
</table>

Package
Cast

Pinning
1 = GND, 2 = VS, 3 = OUT

Dimensions (mm)
10.0 W x 12.5 H x 5.8 D

Mounting
Leaded

Application
Remote control

Best choice for
(1) Cisco (2) Mitsubishi (3) NEC (4) Panasonic (5) RC-5 (6) RC-6 (7) RCA (8) r-step (9) Sejin 4PPM (10) Sharp (11) Sony

Note
• 30 kHz and 33 kHz only available on written request

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 2)</td>
<td></td>
<td>VS</td>
<td>-0.3 to +6.0</td>
<td>V</td>
</tr>
<tr>
<td>Supply current (pin 2)</td>
<td></td>
<td>I_S</td>
<td>3</td>
<td>mA</td>
</tr>
<tr>
<td>Output voltage (pin 3)</td>
<td></td>
<td>V_O</td>
<td>-0.3 to (VS + 0.3)</td>
<td>V</td>
</tr>
<tr>
<td>Output current (pin 3)</td>
<td></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_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.
**TYPICAL CHARACTERISTICS** \( (T_{\text{amb}} = 25 \, ^\circ\text{C}, \text{unless otherwise specified}) \)

<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 current (pin 2)</td>
<td>( E_v = 0, V_S = 3.3 , \text{V} )</td>
<td>( I_{SD} )</td>
<td>0.25</td>
<td>0.35</td>
<td>0.45</td>
<td>mA</td>
</tr>
<tr>
<td>Supply voltage</td>
<td></td>
<td>( V_S )</td>
<td>2.0</td>
<td>-</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>Transmission distance</td>
<td>( E_v = 0 ), test signal see Fig. 1, IR diode TSAL6200, ( I_p = 50 , \text{mA} )</td>
<td>( d )</td>
<td>-</td>
<td>30</td>
<td>-</td>
<td>m</td>
</tr>
<tr>
<td>Output voltage low (pin 3)</td>
<td>( I_{DSL} = 0.5 , \text{mA}, \ E_v = 0.7 , \text{mW/m}^2 ), test signal see Fig. 1</td>
<td>( V_{DSL} )</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>mV</td>
</tr>
<tr>
<td>Minimum irradiance</td>
<td>Test signal: RC5 code</td>
<td>( E_{\text{e, min.}} )</td>
<td>-</td>
<td>0.08</td>
<td>0.20</td>
<td>mW/m^2</td>
</tr>
<tr>
<td>Maximum irradiance</td>
<td>Test signal: NEC code</td>
<td>( E_{\text{e, min.}} )</td>
<td>-</td>
<td>0.12</td>
<td>0.25</td>
<td>mW/m^2</td>
</tr>
<tr>
<td>Directivity</td>
<td>Angle of half transmission distance</td>
<td>( \varphi_{1/2} )</td>
<td>-</td>
<td>± 45</td>
<td>-</td>
<td>°</td>
</tr>
</tbody>
</table>

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

![Optical Test Signal](image1)

![Output Signal](image2)

![Output Signal, (see Fig. 4)](image3)

![Pulse-Width vs. Irradiance in Dark Ambient](image4)
Fig. 5 - Frequency Dependence of Responsivity

Fig. 6 - Sensitivity in Bright Ambient

Correlation with ambient light sources:
10 W/m² = 1.4 klux (std. illum. A, T = 2855 K)
10 W/m² = 8.2 klux (daylight, T = 5900 K)

Wavelength of ambient illumination: λ = 950 nm

Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

Fig. 8 - Maximum Envelope Duty Cycle vs. Burst Length

Fig. 9 - Sensitivity vs. Ambient Temperature

Fig. 10 - Relative Spectral Sensitivity vs. Wavelength
Datasheet Values Refer to PCN-OPT-1240-2022

Fig. 11 - Horizontal and Vertical Directivity

Fig. 12 - Sensitivity vs. Supply Voltage
SUITABLE DATA FORMAT
This series is designed to suppress spurious output pulses due to noise or disturbance signals. The devices can distinguish data signals from noise due to differences in frequency, burst length, and envelope duty cycle. The data signal should be close to the device’s band-pass center frequency (e.g. 38 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the product in the presence of a disturbance, the sensitivity of the receiver is automatically reduced by the AGC to insure that no spurious pulses are present at the receiver’s output. Some examples which are suppressed are:

- DC light (e.g. from tungsten bulbs sunlight)
- Continuous signals at any frequency
- Strongly or weakly modulated patterns from fluorescent lamps with electronic ballasts (see Fig. 13 or Fig. 14).
- 2.4 GHz and 5 GHz Wi-Fi

Note
- For data formats with short bursts please see the datasheet for TSOP111.., TSOP113.., TSOP115..
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