First Sensor Evaluation Boards Data Sheet
Wavelength Sensitive Diodes
Part Description WS7.56 PCBA2
US Order # 10-044
International Order # 5000004

DESCRIPTION

The WS7.56 PCBA2 is a unique wavelength sensor based on silicon photodiode technology. The sensor is constructed monolithically by superimposing two photodiodes vertically. The active area is 7.56 mm² (2.7 mm X 2.7 mm). This device is most useful for wavelength determination of monochromatic light sources such as lasers and LED’s. More component level information is available on the Wavelength Sensitive Photodiode on data sheet WS7.56 TO5.

The sensor is mounted on a PCB which contains all of the necessary circuitry to convert incident wavelength to an output voltage. The voltage is proportional to wavelength in the range of 450 nm to 850 nm. The output is independent of intensity. The circuit provides switched gain controls to accommodate various output requirements. As an example a typical output is 1.7 volts for a wavelength of 670 nm, with a gain setting of 5. The data in this sheet provides typical information. The actual output must be calibrated against known sources for accuracy. Resolution of 0.1 nm is possible. The circuit requires ±15 volts and consists of two logarithmic amplifiers and a ratio calculator. The sensor is mounted on a temperature sensor for reference. Applications include laser monitoring, matching of LED’s and other light sources. A jumper is provided for optimizing photodiode biasing.

APPLICATIONS

- Precision photometry
- Analytical instruments
- Medical equipment
- Wavelength determination for monochromatic light

RoHS

2011/65/EU

Absolute maximum ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSTG</td>
<td>Storage Temp</td>
<td>-40</td>
<td>+100</td>
<td>°C</td>
</tr>
<tr>
<td>TOP</td>
<td>Operating Temp</td>
<td>-20</td>
<td>+55</td>
<td>°C</td>
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<tr>
<td>V1</td>
<td>Power Supply Voltage</td>
<td>±12.0</td>
<td>±18.0</td>
<td>V</td>
</tr>
<tr>
<td>I5</td>
<td>Supply Current</td>
<td>20</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>V8</td>
<td>Applied Bias Voltage*</td>
<td>0</td>
<td>±10</td>
<td>V</td>
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</tbody>
</table>

Electro-optical characteristics @ 23°C

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>Test conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>V0</td>
<td>Output Voltage</td>
<td></td>
<td>-4.5</td>
<td>---</td>
<td>+6.0</td>
<td>V</td>
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<tr>
<td>I0</td>
<td>Output Current Limit (Temp sensor)</td>
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<td>---</td>
<td>10</td>
<td>mA</td>
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<tr>
<td></td>
<td>Input Dynamic Range</td>
<td>V1 = ± 15 V; V2 = 0 V</td>
<td>0.01</td>
<td>---</td>
<td>3</td>
<td>mW</td>
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<tr>
<td></td>
<td>Spectral responsivity</td>
<td>Diode 1; λ = 550 nm</td>
<td>---</td>
<td>0.17</td>
<td>---</td>
<td>A/W</td>
</tr>
<tr>
<td></td>
<td>Spectral responsivity</td>
<td>Diode 2; λ = 890 nm</td>
<td>---</td>
<td>0.45</td>
<td>---</td>
<td>A/W</td>
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</tbody>
</table>

Spectral response @ 23°C

Connections

PIN CONNECTIONS
TP1  -15V
TP2  GND
TP3  +15V
TP4  WAVELENGTH IN
TP5  TEMP IN

FRONTSIDE VIEW

BACKSIDE VIEW
APPLICATION NOTES

Description
The WS7.56 PCBA2 is a circuit board complete with a precision wavelength sensing diode array, a precision temperature sensor and processing circuitry. Two output signals are 1) a voltage output proportional to the wavelength of the light sensed by the photodiode array and 2) a voltage output proportional to the temperature of the case of the photodiode array. The photodiode array is made using silicon technology. The WS7.56 PCBA2 is rated for the wavelength range of 450 nm to 850 nm. It is best suited to determine the wavelength of monochromatic light.

Operation
The magnitude of the wavelength voltage output is controlled by three slide switches that change the gain amplifier. The gain ranges are shown in table 1.

Detector Characteristics
The detector used is the WS7.56 TO5. Please see the WS7.56 TO5 datasheet for specifications for this detector response.

Temperature Considerations
The WS7.56 PCBA2 operating temperature range is -20 °C to +55 °C. The wavelength output has a temperature dependence of 1 nm per degree C. Variations in temperature will cause changes to dark currents that can affect accuracy. The circuitry also includes a precision temperature sensor LM35 from National Semiconductor. This sensor allows users to calibrate the wavelength output based on the temperature of the wavelength detector. The temperature sensor output is 10 mV per degree C, and is typically accurate to ±0.25 °C. The range of the temperature sensor is from +2 °C to +150 °C. If additional information is needed for the temperature sensor component specifications or circuit suggestions please see the LM35 data sheet on the National Semiconductor website.

Detector Bias
The circuitry provides a jumper JP1, to allow either a zero volt bias or an internal 5 volt bias to the photodiode array. The zero volt bias eliminates dark currents from the photodiode array, enabling better results over varying temperatures. The 5 volt bias slightly extends the NIR performance range and increases frequency response. For bias options other than 0 V and 5 V, remove the jumper and connect an external bias supply directly to the center pin JP1.

Frequency Response
The amplifier used is a logarithmic amplifier and consequently the frequency response is a function of the input signal amplitude. For typical input signals in the 0.5 milliwatt range and wavelengths in the range of 450 nm to 850 nm the -3db frequency response will be approximately 10 KHz with the 5 V bias option engaged.
*Typical values. Calibrate using known light sources.

FIG. 1 VOLTAGE OUT VS WAVELENGTH @ 23°C*